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THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

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Contents

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ABSTRACT

It is generally understood that the Greek economy has long been characterised by a range of structural and institutional inefficiencies – which, arguably, are at least partly responsible for the crisis that engulfed the country since 2009. In turn, the crisis has also led to a significant adjustment of the Greek economy, both behaviourally (e.g., with regard to labour supply) and institutionally (e.g., with regard to labour market regulations). In this paper we ask whether this adjustment has helped resolve some of the inefficiencies that characterised the Greek economy in the past. We focus on the particular case of sectoral wage premia and examine (a) whether these did indeed reflect economic inefficiency in the past and (b) whether they have declined systematically since the crisis. Sectoral wage premia are generally linked to unobserved worker heterogeneity and compensating differentials (in a competitive framework) or to market distortions, such as monopsony power or information asymmetries (in an imperfect markets framework). Our results show that sectoral premia in Greece are only weakly linked to unobserved worker heterogeneity, but strongly linked to non-competitive factors reflecting market inefficiency. Looking at three such factors – the *availability of rents* (as measured by sectoral profitability), the *potential for rents* (measured via a proxy for intra-sectoral competition) and workers' *ability to extract such rents* (measured by the share of public sector jobs) – we find that the crisis altered the relative contribution of such factors but did not lead to a decline in sectoral premia on the whole. Indeed, wage premia appear to have increased in the least competitive sectors while the overall disparity of wages across sectors increased. We conclude that market inefficiencies, as manifested by the presence of unaccounted-for sectoral wage differentials, intensified despite all policy efforts in the opposite direction.

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1. Introduction

When the Great Depression hit Greece in 2009, the country was extremely ill-prepared to deal with the consequences and the new threats that emerged, with much of the burden falling on the labour market. In part, this had also to do with the level and depth of knowledge about the workings of the market, e.g. about the sources of wage disparity across workers and jobs. Before the crisis, a large, albeit mainly descriptive, volume of research focused on issues of wage-setting, collective bargaining and industrial relations (see Kornelakis and Voskeritsian, 2014, for a review), but studies that enlighten policy-makers about the presence of disequilibria, at large and across sectors of the economy, and the extent of inefficiency associated to these, were lacking. To a large degree this remains so today, despite the relative blooming of academic research in the country after the eruption of the crisis. Of course, the sources of wage disparities in labour markets and across sectors are not easy to track, also for the international literature. Researchers do not fully understand why similar workers who do similar work in different sectors of the economy often receive different wages. In this chapter, we study how inter-sectoral wage differentials in Greece evolved before and during the recent crisis and try to uncover their sources, also asking the pertinent question of how the crisis has influenced both the level and the drivers of such differentials.

Competitive labour market theories attribute sectoral premia that cannot be explained by observed worker and job characteristics to compensative differentials; i.e. to working conditions or unobserved abilities that are difficult to measure, such as motivation, perseverance and commitment (the literature on this is long and longstanding - see Ge and Macieira 2014 for recent evidence). Non-competitive theories link sectoral premia to the presence of market distortions and, more specifically, to efficiency wages mechanisms and to monopolistic market power. Efficiency wages are set above market-clearing level to avoid turnover, monitoring costs, adverse selection of workers, and worker dissatisfaction due to wage differentials perceived as unfair (Akerlof and Yellen 1986, Katz 1986, Murphy and Topel 1990). Monopolistic market power allows rents to be created which will then spill-over to workers, at least partly, either due to the presence of strong unions (which can be endogenous to the existence of rents) or due to sector-specific supply-shortages and skill mismatches (Manning, 2011, provides a review).

In a dynamic sense, however, for sectoral premia to persist, additional forms of market distortion and imperfection must be present: from asymmetric information and other information costs which may not allow individuals to move across sectors so as to dampen unaccounted-for sectoral pay differentials; to union-based or legal restrictions on sectoral (and occupational) mobility (e.g., closed-shop policies or restricted occupational licensing); to the presence of sector-specific positive externalities on labour productivity (so that, for example, workers with a fixed set of productivity-related individual characteristics are more productive in one sector than in another); to capital market imperfections (so that investment rates in different sectors do not respond to sectoral differences or changes in productivity and/or profitability).

Given this, it is interesting to examine the size and evolution of sectoral wage premia in the Greek economy during the crisis because Greece has undergone a substantially transformative process, aiming to modernise its economy and to remove long-standing distortions and inefficiencies there. Indeed, the pervasive programme of fiscal consolidation imposed through the bailout conditionality of the so-called Troika was combined with extensive measures of structural reforms, including liberalisation of closed professions (deregulation of occupational licensing), decentralisation of wage bargaining and broader measures for labour market deregulation, and deregulation of product markets (Ioannou 2016, Lyberaki et al. 2017, Katsoulakos et al. 2017). It is, thus, pertinent to ask whether this policy effort has led to a measurable decrease in market inefficiencies and distortions, at least as captured by the existence of sectoral wage premia. In addressing this question, we also provide a wider commentary about the sectoral structure of the Greek economy.

To our knowledge there exist three studies that have previously examined inter-industry wage differentials in Greece. Du Caju et al. (2010) included Greece in a sample of eight European countries and estimated sectoral premia for 1995 and 2002. Their results suggest that the premia are inconsistent with sectoral differences in unobserved worker characteristics but rather reflect variation in rents and industry structure. Nikolitsas (2011) used data for 2006 focusing on Greece alone. This study, too, found a significant role for non-competitive factors but also provided evidence that competitive factors, namely the risk of accidents at work, contribute to explaining sectoral premia. Lastly, Papapetrou and Tsalaporta (2017) used data for 2010 to more elaborately test whether Greek sectoral premia can be

explained by unobserved worker ability. Their results reject this hypothesis. By and large, the findings of these studies are consistent with evidence from other countries that non-competitive factors are the leading determinants of unexplained inter-industry wage differentials (e.g. Du Caju et al. 2011).

Compared to all three, our paper makes a clear and significant contribution: we describe and attempt to explain Greek sectoral premia in every year over 2002-2016, i.e. we cover the entire period from Greece's entry to the eurozone to the end of the recent crisis. Our results corroborate the previous findings that unobserved worker characteristics cannot explain sectoral premia whereas non-competitive factors play a significant role. Provocatively enough, our findings suggest that this role has shifted sizeably during the crisis and has in some way become more important. We show that the least competitive sectors recorded an increase in wage premia during the crisis and, thus, the overall disparity of wages across sectors increased. This happened even though the influence of sectoral rents on premia over the same period decreased and intra-sectoral wage adjustments linked to the public-sector wage cuts pushed premia to fall. Our results imply that market inefficiencies, as manifested by the presence of unaccounted-for sectoral wage differentials, intensified despite all policy efforts in the opposite direction.

2. Empirical Strategy

For our analysis we use data from the Greek Labor Force Survey (LFS) – a household survey that collects detailed information on demographic characteristics and labor market outcomes. The LFS reports our main variable of interest – the industry in which workers are employed – at the two-digit level but changes its classification after 2008. To end up with harmonized industry categories over the entire period of study we create 19 aggregate sectors which resemble very closely the one-digit sectors of NACE Rev. 2.

All previous studies on Greece (Du Caju et al. 2010, Nikolitsas 2011, Papapetrou and Tsalaporta 2017) have used the Structure of Earnings Survey (SES), which is in some ways superior as it collects information from employers instead of households, thus providing more information (e.g. the SES reports firm IDs, the principal market for each firm's products, and the level at which bargaining takes place) and more precise information (e.g. employer

reports on wages and their components are more accurate compared to those reported by individuals, which is especially true for the LFS which reports wages in bundles for most years of study[2]). In some respects, however, the SES is unsuited for studying the case of Greece as it surveys only large firms (those with 10 or more workers), thus covering a small share of Greek employers, and does not report worker citizenship and marital status, both of which are important determinants of Greek wages. The LFS covers firms of all sizes and includes richer demographics (place of birth, marital status, number of children). More importantly, the SES is collected every four years and is therefore inferior to the LFS when studying dynamics.

With the data at hand we describe annual sectoral wage premia both at the observational level (gross) and from the following Mincer wage regressions (net):

$$\ln W_i = \beta X_i + \varepsilon_i \quad (1)$$

Where W_i is the monthly wage of individual i, X is a vector of control variables (see Table A1 in the Appendix for a list of the variables used and summary statistics), β the respective returns, and ε is a random error. In both cases, we calculate premia as deviations of log mean sectoral wages from the grand mean (i.e., the premia sum up to zero over all sectors).

We then attempt to test whether net premia can be attributed to productive characteristics of workers that are unobserved. To do this, we follow Martins (2004) who argues that if unobserved worker heterogeneity is indeed the driving source of sectoral premia then these should be higher at the top tail of the wage distribution compared to the bottom.[3] We test this by applying interquantile regressions to differences in log wages at the 25th versus the

[2] Prior to 2015, the LFS collected wage data in bundles which differ from year to year and cannot be fully harmonized for the period of study. Although this clearly prohibits comparisons of wage levels over time it poses no challenges to comparisons of relative wages, as is the case here. Following common practice, we take the mean value of the bundles as a proxy for each individual's monthly wage. In previous work we have shown that this measure produces robust estimates of Mincer equations when using alternative methods of estimation, namely OLS and interval regressions (Christopoulou and Monastiriotis 2014). From 2015 onward the LFS reports actual values of wages rather than wage bundles.

[3] Other researchers have applied alternative tests for this hypothesis based on workers moving across sectors (Krueger and Summers 1988, Murphy and Topel 1987) and on differences in sectoral premia across occupations (Dickens and Katz 1987, Krueger and Summers 1988). The former test runs the risk of selectivity bias and it is impossible to do with the LFS data as they lack the necessary longitudinal dimension. The latter test is unsuitable for Greece as differences of sectoral premia across occupations may reflect the prevalence of occupational-level bargaining instead of differences in unobserved worker heterogeneity.

75th percentile and at the 10th versus the 90th percentile of the wage distribution. Formally, we estimate:

$$Q_{0.75}(\ln W_i) - Q_{0.25}(\ln W_i) = (\beta_{0.75} - \beta_{0.25})X_i + \upsilon_i \quad (2)$$

$$Q_{0.90}(\ln W_i) - Q_{0.10}(\ln W_i) = (\beta_{0.90} - \beta_{0.10})X_i + \nu_i \quad (3)$$

Finally, we test the degree to which premia net of worker and job characteristics can be attributed to non-competitive factors. To do so, we pool together all net sectoral premia over the period of study and compile a panel database that varies by sector and year. We then estimate fixed-effects panel-data models of the following form:

$$\hat{\beta}_{st} = \gamma Y_{st} + \eta_s + \phi_{st} \quad (4)$$

where $\hat{\beta}_{st}$ represents the estimated premia of sector *s* in year *t* from equation (1), Y is a vector of explanatory variables that vary by sector and year, η_s represents the unobserved time-invariant sector-effect, and φ_{st} is the error term. In Y we include factors linked to the employers' ability to pay rents (sectoral profitability and a relatively oligopolistic market structure) and to workers' potential for extracting rents (as proxied by the concentration of public-sector jobs). Specifically, we use lagged (ln) gross operating surplus as a direct measure of the availability of rents[4] (derived from the OECDStan database, available over 2002-2015); the share of workers who work in small firms (with less than ten employees) as the (inverse of) potential for rents (calculated from the LFS data); and the share of workers who work in publicly owned firms, as a measure of the potential for workers in the sector to extract rents (also calculated from the LFS data). The rationale behind the latter variable is that higher concentration of public sector jobs implies generally a higher unionisation rate in the sector and also greater 'outside opportunities' and thus bargaining power for workers employed in the private part of the sector. Both create a wage-push potential for the sector as a whole,

[4] We use the lagged value of this variable to sidestep potential endogeneity with wage premia. Endogeneity is plausible because high wages may attract highly productive employees in a particular sector which will then increase the sector's profits.

especially as wages in public-sector jobs, net of individual characteristics, are typically higher (Christopoulou and Monastiriotis, 2014 and 2016).

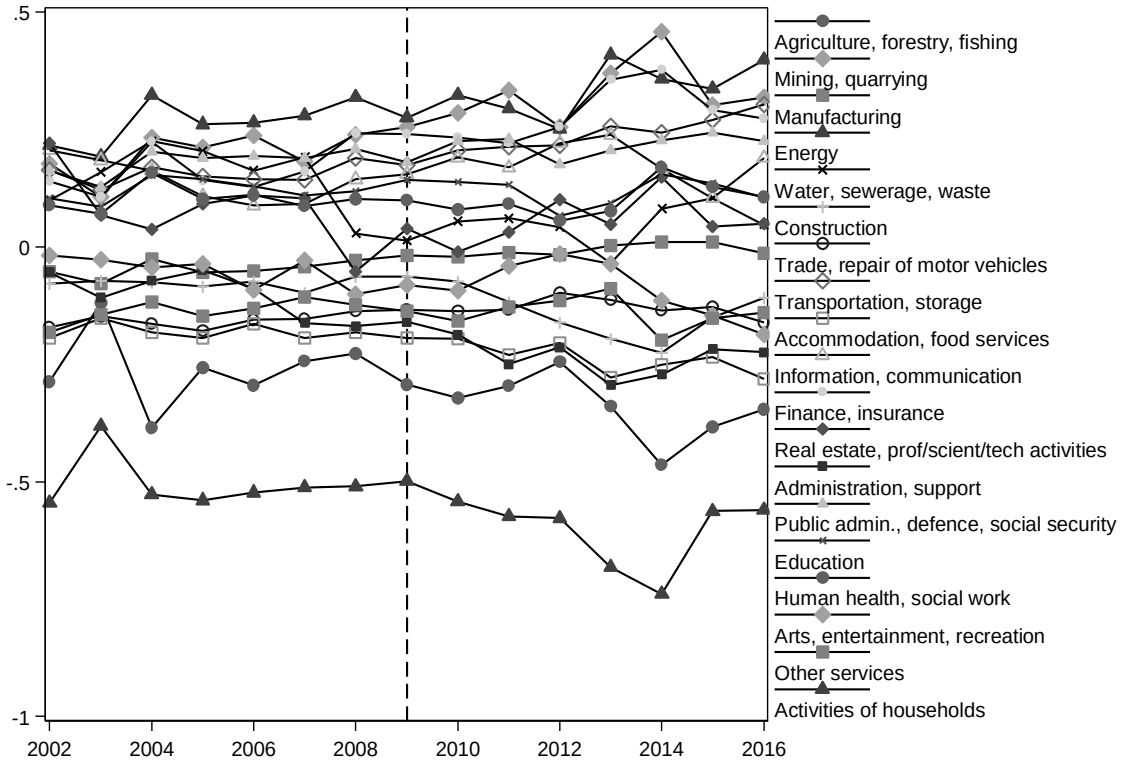
As a last exercise, we test whether the relationship between the sectoral premia and the explanatory variables changes after the onset of the crisis. We do this in two ways. First, we allow the constant term and the coefficients of the explanatory variables to differ between the crisis (2009-2016) and the pre-crisis periods (2002-2008), and subsequently we test whether the difference between the two coefficients is statistically significant.

3. Raw and net premia and their evolution

We present raw and net sectoral premia for the entire period of study in Figure 1. As can be seen, raw premia are substantial, ranging in most years between -50% and 50% of average wages. They are generally higher in sectors with higher minimum efficient scales of production (high fixed costs), such as mining and quarrying; energy; water, sewerage, waste; and transportation and storage; as well as in the public (public administration, defence, and social security) and business services sectors (finance and insurance; real estate; and ICT). Premia net of worker and job characteristics are much lower in value but still sizeable, now ranging between -20% and 20% of average wages in most years. Net premia are higher in the same sectors with high raw premia, though in the sectors where public-sector jobs are dominant they appear to fall over time. This pattern is intuitive: sectoral premia are higher in high value-added sectors, such as banking/finance and ICT; they are also high in monopolistic sectors and in sectors where market competition pressures are low, such as the cases of utilities (energy and water) and public administration. For the public sectors, in particular, the decline in net premia over time is consistent with the deregulation efforts that took place during the crisis and, as we discuss later, they may also signal a labour-supply adjustment process.

Figure 1. Sectoral returns by year, 2002-2016

A. Raw premia



B. Net premia

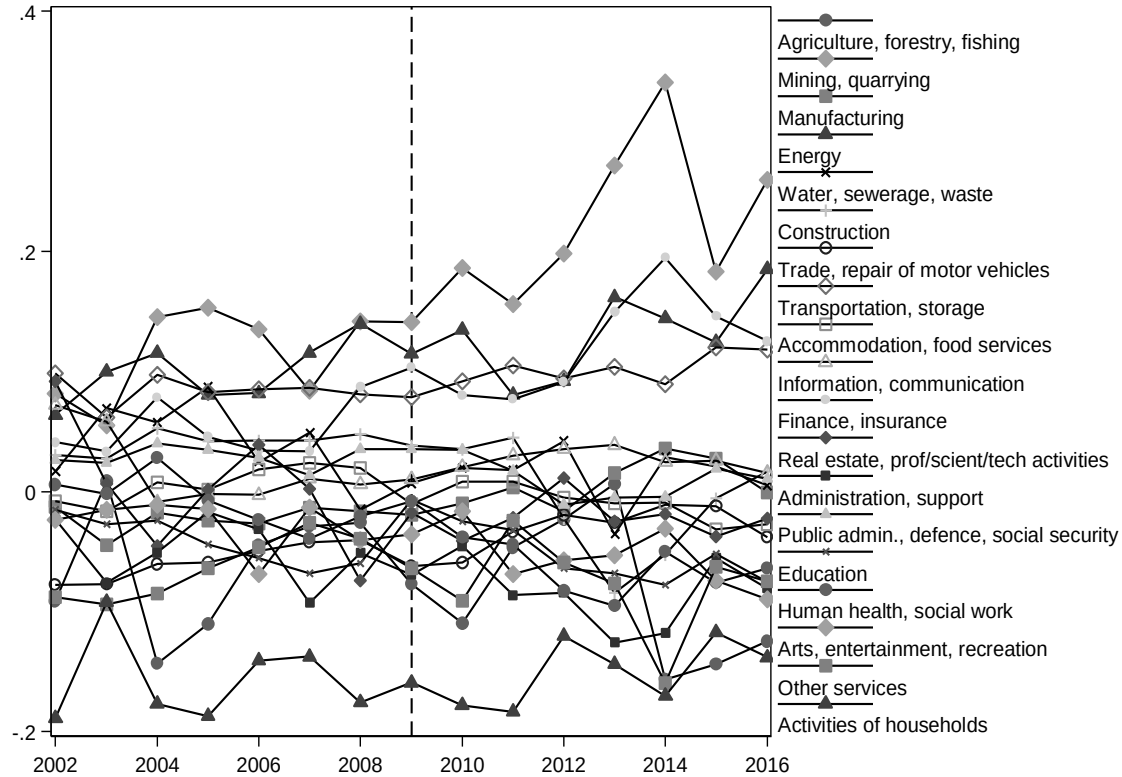
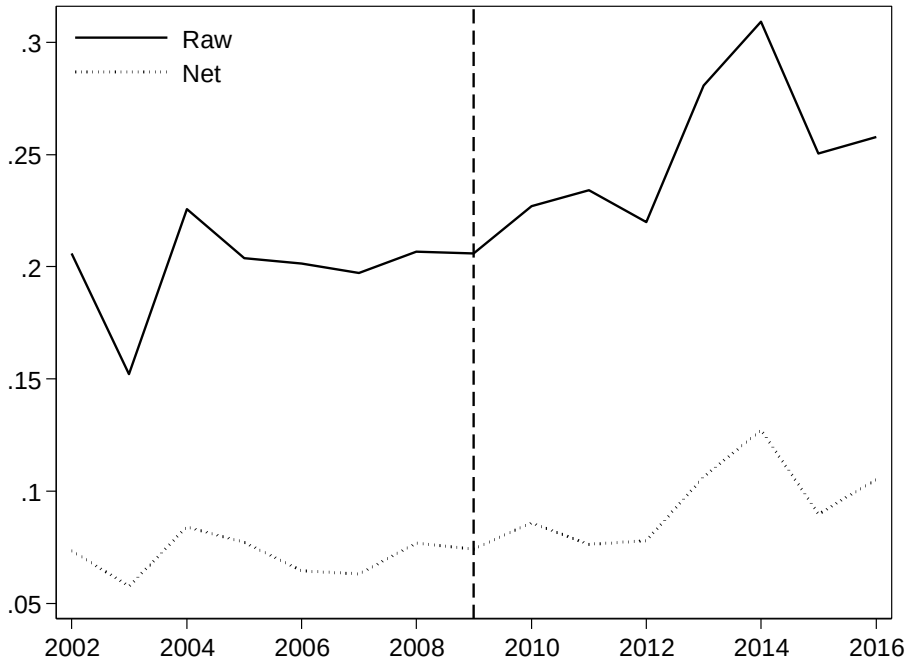


Figure 2. Standard deviation of sectoral premia by year, 2002-2016



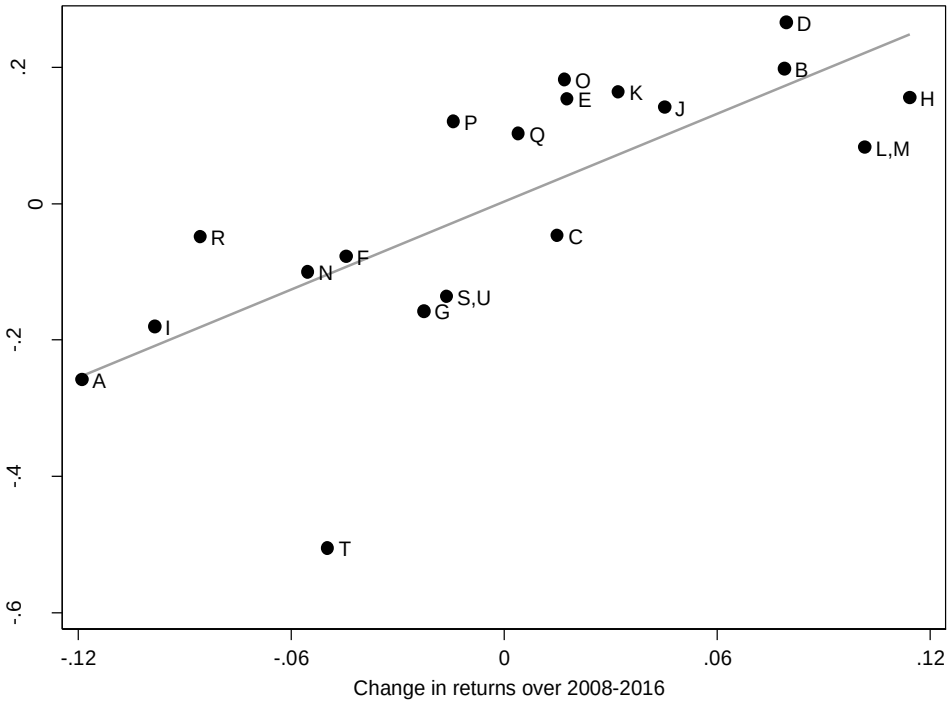
Although Figure 1 is rather busy and contains a lot of information that is difficult to process, one particular pattern stands out. Both gross and net premia appear to diverge during the crisis. This is even more apparent in Figure 2, where we plot the standard deviation of sectoral premia over time. In all years before the crisis, the standard deviation remains more or less constant, but after the beginning of the crisis it increases considerably. Over 2009-2016, the standard deviation of raw premia increases by 42% whereas the standard deviation of net premia increases by 25%.

In practice this means that, as the crisis hit, premia decreased in some sectors and increased in others; i.e., whilst wages were falling on average, in some sectors they endured. To demonstrate this, we plot in Figure 3 mean pre-crisis premia against the change in premia during the crisis. For both gross and net premia there is a clear positive association between premia levels and changes, suggesting that, on the whole, premia increased in those sectors in which they were already high. Focusing on the net premia in particular, which are of more interest for our analysis, this seems to be the case with the high fixed-costs and high value-added sectors identified earlier (B: Mining, quarrying; D: Energy; E: Water, sewerage, waste; H: Transportation, storage; and K: Finance and insurance), although exceptions to this general pattern exist: both in the sense of high-premia sectors experiencing relative decline in their

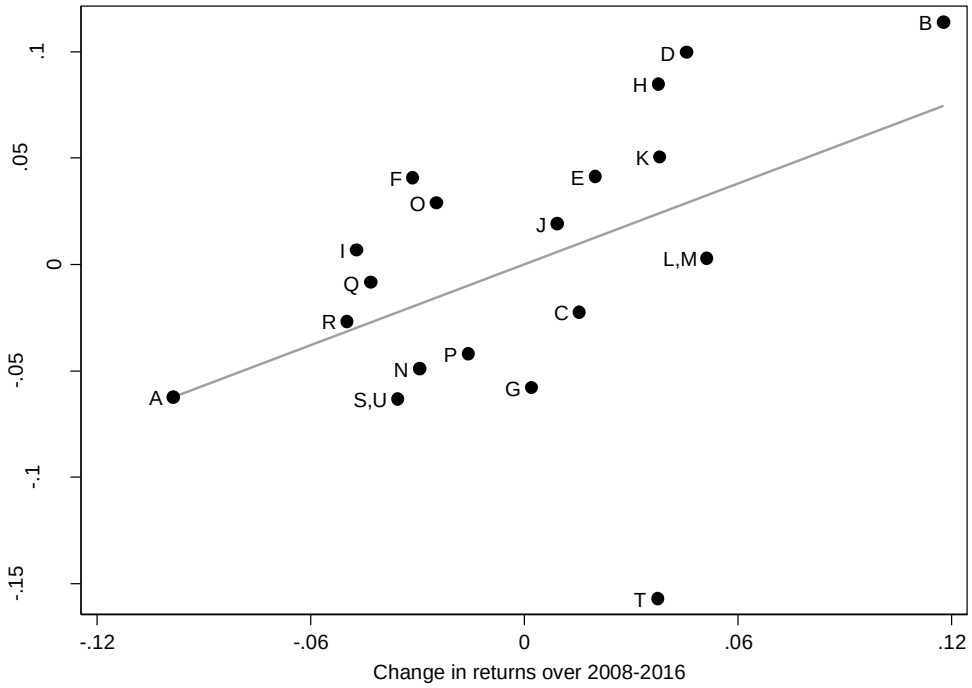
premia (F: Construction; and O: Public administration, defence and social security) and in the sense of low-premia sectors experiencing a rise in their relative premia (mainly L: Real estate; M: Professional, scientific and technical activities; and T: Activities of households). The case of the Construction and Public administration sectors is telling, as it reflects the market (for construction) and non-market (for public administration) pressures that were applied during the crisis pushing wages in these sectors down disproportionately. For the case of sector T (activities of households), which is by far the biggest outlier, the result presented in Figure 3 indicates rather a significant compositional shift in the sector, presumably with a significant worsening of worker quality (compare the position of the sector in the 'net' vis-à-vis the 'raw' parts of Figure 3).

Figure 3. Correlation between pre-crisis sectoral premia and change in premia during the crisis

A. Raw premia



B. Net premia



Note: Labels correspond to one-digit NACE Rev.2 codes (A: Agriculture, forestry, fishing; B: Mining, quarrying; C: Manufacturing; D: Energy; E: Water, sewerage, waste; F: Construction; G: Trade, repair of motor vehicles; H: Transportation, storage; I: Accommodation, food services; J: Information, communication; K: Finance, insurance, L: Real estate, M: Prof/sci/tech activities; N: Administration, support; O: Public adm., defence, social sec.; P: Education; Q: Human health, social work; R: Arts, entertainment, recreation; S: Other services; T: Activities of households; U: Extraterritorial organizations.) Grey lines represent linear fits.

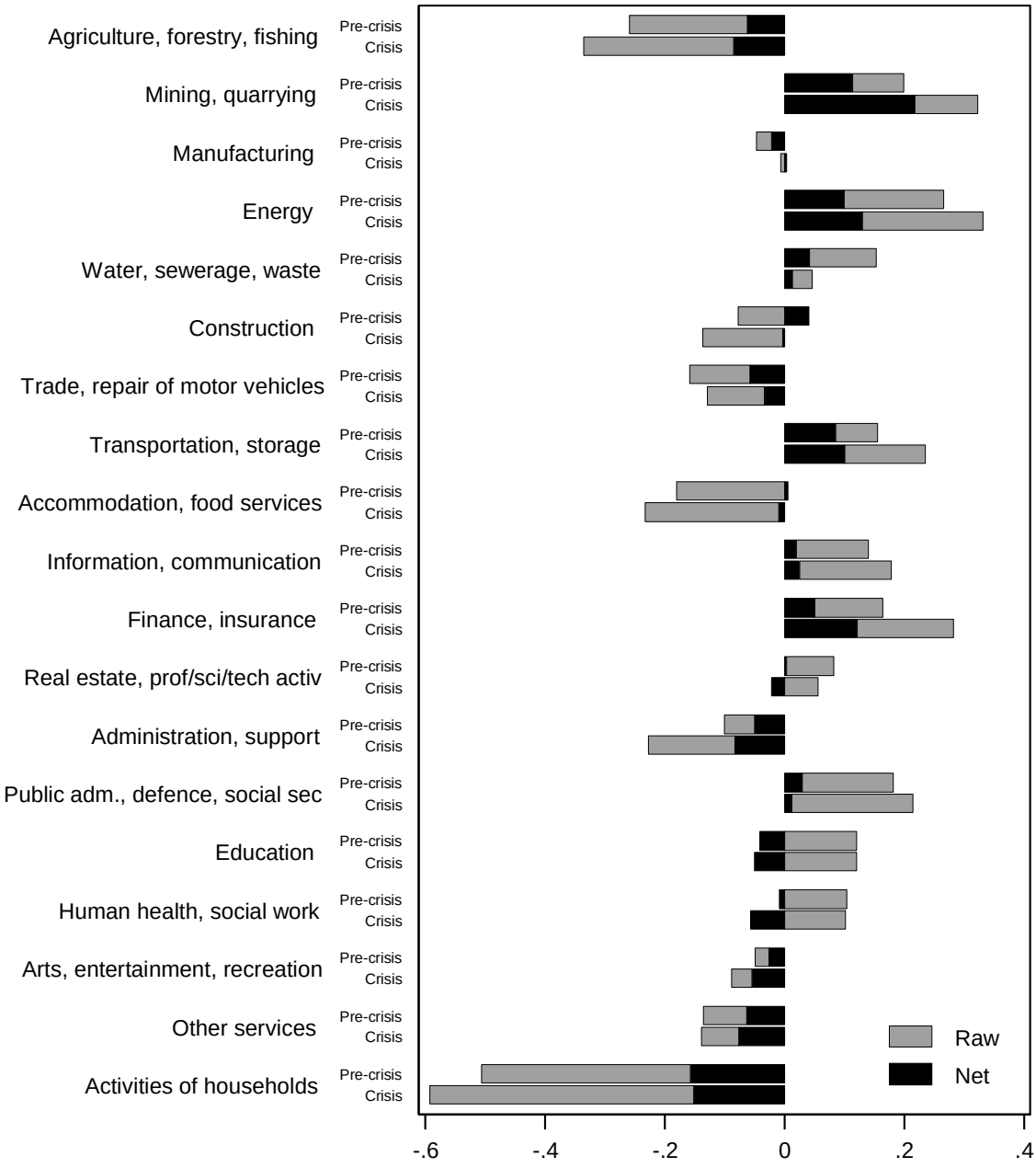
Another insight into these changes can be obtained by plotting jointly the gross and net premia, but separately for the crisis and pre-crisis periods (Figure 4). Note that, when raw and net premia have the same sign, raw premia are represented by the sum of the grey and black bar. In these cases, the black bar demonstrates the portion of the raw premia that cannot be explained by observed characteristics. When raw and net premia have opposite signs, the sum of the black and grey bars demonstrates premia explained by observed characteristics which, in these cases, exceed raw premia in (absolute) value. Plausibly, workers whose observed characteristics beget higher than average wages (i.e. the high-skilled) are concentrated in high-paying sectors, while workers whose characteristics result in lower than

average wages (i.e. the low-skilled) are in low-paying sectors. In general, explained and unexplained premia are in the same direction and only in a few cases they appear with opposite signs. In Education, Health, and Real estate (crisis only) gross premia are positive and sizeable whereas net premia are negative, suggesting that these sectors employ high-skilled workers whose wage premia are dampened by unobserved factors. In Manufacturing (crisis only) and Accommodation and Food services (pre-crisis only) raw premia are negative and sizeable while net premia are positive and small, suggesting that in these cases the two sectors employ low-skilled workers whose wages are somehow boosted by unobserved factors.

Regarding the differences between the pre-crisis and crisis periods, we see again that premia increased in most of the sectors in which they were already high while they declined further in virtually all sectors that had below-average premia pre-crisis. More instructive here, however, is the sectoral heterogeneity in the difference between the 'net' and 'raw' premia. In some sectors (Agriculture, Energy, Water, and ICT) the ratio of net-to-raw premia, and thus the share of the sectoral premium that remains unaccounted for after controlling for worker and job characteristics, remained rather stable, despite some sometimes large shifts in the size of these premia. In some others (Mining, Finance, Arts/entertainment and Other services) this ratio increased – showing that sectoral, rather than compositional, drivers became with the crisis more important. The inverse is true for a host of other sectors (Trade, Transport, Administration, Public administration, and Household activities) where, presumably, compositional shifts during the crisis played a bigger role in maintaining or shifting the observed raw wage premia.

The natural question to ask at this point is what drives the unexplained premia. In the next section we assume the task to illuminate their determinants and their evolution over time.

Figure 4. Sectoral premia before and during the crisis



4. Driving factors of net premia

Despite their sizeable heterogeneity, net premia do not pose efficiency concerns if they are created by differences in unobserved characteristics of workers and jobs and by the way these differences change over time. As we explained in section 2, we examine whether this is indeed the case by employing an interquantile regression analysis to test whether sectoral premia are higher at the upper tail of the wage distribution, i.e., if the difference in the coefficients $\beta_{0.75}$ and $\beta_{0.25}$ in eq.2 (or in $\beta_{0.90}$ and $\beta_{0.10}$ in eq.3) is positive and statistically significant. If that

is the case, this indicates that sectoral premia reflect worker ability for which we have not controlled (as this is expected to be higher for the high-pay earners). Table 1 summarizes the results from this analysis.

The results are generally unsupportive for the unobserved heterogeneity hypothesis. Out of a total 285 coefficients (19 sectors x 15 years) that we estimated for each model, less than 16% appear positive and statistically significant and, in most cases, these are scattered across sectors and years. Further, in over one fifth of cases, the estimated coefficients are negative, thus going against the argument that premia may be reflecting unobserved differences in worker quality across sectors. Transportation and storage is the only sector for which we find positive and significant coefficients relatively consistently for the entire period of study; while we also find a few positive and significant coefficients for the energy and mining sectors, mostly after the crisis and mostly when comparing the 10th and 90th quantiles. These results suggest that unobserved worker ability may play a role in these special cases but definitely not across the board. We thus conclude that one should look for the main determinants of net premia elsewhere – i.e., on non-competitive factors. We remind the reader that a similar result, for the case of Greece (using 2010 data from the SES dataset), has been found by Papapetrou and Tsalaporta (2017).

Table 1. Years in which coefficients of interquantile regressions are positive and stat. significant

Sector	$Q_{0.75}$-$Q_{0.25}$	$Q_{0.90}$-$Q_{0.10}$
Agriculture, forestry, fishing		2004, 2006, 2014
Mining, quarrying	2006, 2010-11, 2013-14	2010-12, 2014-15
Manufacturing		
Energy	2002, 2009, 2013, 2016	2009-10, 2012-13, 2016
Water, sewerage, waste	2009	2009
Construction	2013	2002, 2013
Trade, repair of motor vehicles	2002	2003
Transportation, storage	2002-05, 2007, 2010-11, 2013-16	2002-05, 2007-11, 2015-16
Accommodation, food services		
Information, communication	2010	2008
Finance, insurance		
Real estate, prof/sci/tech activities		2002
Administration, support		
Public adm., defence, social sec.	2009-10, 2015	2009-2011
Education		
Human health, social work	2012	
Arts, entertainment, recreation	2013	2009
Other services	2012, 2015-16	2002-03, 2016
Activities of households	2003-05	2004-08, 2012
Positive coefficients as a share of total estimated coefficients	12.3	15.4

We test the role of non-competitive factors in Table 2. As we described earlier, we pool together all net premia estimates to create a sector-year panel which we use to estimate the impact of variables proxying for the availability of rents and the potential for these to be extracted by workers in the form of sectoral premia. We present estimates of three specifications: in column 1 we test the significance of the explanatory variables over the whole sample period, assuming that the relationships under investigation remain constant between the pre-crisis and crisis years; in column 2 we l the effect of all regressors to change after the beginning of the crisis to allow for a shift in the relationships under investigation between the pre-crisis and crisis periods; in column 3 and in column 4 and 5 we run the same models as in columns 2 and 3 replacing the crisis dummy with a full set of year-specific fixed effects which allow us to examine further the evolution of sectoral premia (net of their econometric determinants) over time. In all cases, the models are estimated using the fixed-effects effects estimator with robust standard errors. The inclusion of sectoral fixed effects, although econometrically warranted (the Hausman test for fixed versus random effects returns a X^2 value for the first of our models of 21.06, p-value=0.0001), removes the time-invariant cross-sectoral variation in our dependent variable, thus forcing estimation on the basis of inter-temporal ('within' sectors) variations. To examine if, by so doing, we are missing out some important sector-specific influences, which are important in the cross-sectional dimension, we re-estimated the regressions presented in Table 1 using instead the GLS random-effects estimator and a simple OLS estimation. The results remained highly consistent across alternative specifications (not reported but available upon request).

Table 2. Fixed effects regressions of net sectoral premia

	(1)	(2)	(3)	(4)	(5)
Lagged ln(gross operating surplus)					
Pre-crisis	1.2589 [0.5549]**	2.4978 [0.8088]***	2.4978 [0.8088]***	3.2405 [0.9663]***	3.2405 [0.9663]***
Crisis		0.8739 [0.5634]		1.4516 [0.7117]**	
Difference			-1.6240 [0.5118]***		-1.7889 [0.5311]***
Share of workers in small					
Pre-crisis	-0.0282 [0.0444]	0.0553 [0.0629]	0.0553 [0.0629]	0.0281 [0.0702]	0.0281 [0.0702]
Crisis		-0.0570 [0.0471]		-0.0821 [0.0593]	
Difference			-0.1123 [0.0334]***		-0.1103 [0.0341]***
Share of workers in public firms					
Pre-crisis	-0.0358 [0.0340]	0.0228 [0.0417]	0.0228 [0.0417]	0.0219 [0.0417]	0.0219 [0.0417]
Crisis		-0.0571 [0.0352]		-0.0608 [0.0360]*	
Difference			-0.0799 [0.0209]***		-0.0827 [0.0206]***
Crisis period (years 2009-		0.1348 [0.0361]***	0.1348 [0.0361]***		
Year 2003				-0.0023 [0.0136]	-0.0023 [0.0136]
Year 2004				-0.0063 [0.0124]	-0.0063 [0.0124]
Year 2005				-0.0100 [0.0126]	-0.0100 [0.0126]
Year 2006				-0.0102 [0.0120]	-0.0102 [0.0120]
Year 2007				-0.0126 [0.0121]	-0.0126 [0.0121]
Year 2008				-0.0140 [0.0122]	-0.0140 [0.0122]
Year 2009				0.1303 [0.0382]***	0.1303 [0.0382]***
Year 2010				0.1306 [0.0377]***	0.1306 [0.0377]***
Year 2011				0.1350 [0.0379]***	0.1350 [0.0379]***
Year 2012				0.1303 [0.0381]***	0.1303 [0.0381]***
Year 2013				0.1303 [0.0392]***	0.1303 [0.0392]***
Year 2014				0.1402 [0.0423]***	0.1402 [0.0423]***
Year 2015				0.1400 [0.0386]***	0.1400 [0.0386]***
Year 2016				0.1389 [0.0387]***	0.1389 [0.0387]***
Constant	-0.0165 [0.0366]	-0.1177 [0.0569]**	-0.1177 [0.0569]**	-0.1232 [0.0583]**	-0.1232 [0.0583]**
R-squared	0.828	0.845	0.845	0.848	0.848

Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1. Observations: 285.

Starting from the first specification, which looks at the total period under investigation as a whole, we find some very instructive results. Our proxy for profitability (gross operating surplus) returns a positive and statistically significant coefficient (at the 5% level), showing that sectors with higher profitability offer higher wage premia. This result is highly intuitive: sectoral premia appear larger in high-profitability sectors where employers' ability to pay rents is higher. In turn, our second and third variables, measuring the extent of intra-sectoral competition (share of workers in small firms) and workers' ability to extract rents (the weight of public-sector jobs in the sector), return coefficients which are statistically indistinguishable from zero. This is a very interesting finding suggesting that sectoral wage premia are linked more directly with the *availability* of rents in the sector than with the sector's *potential* for rents or the *ability* of workers to extract such rents.[5] Importantly, this also means that, despite the known tendency of the public sector to offer sizeable wage premia, the presence of public sector jobs per se in not responsible for the presence of high wage premia in particular sectors.

The results from specifications (2)-(5) examine how these relationships have been altered with the crisis. As can be seen, we find strong evidence that sectoral premia went up during the crisis. In columns 2 and 3 the crisis-specific constant term is statistically significant and positive, showing directly that the crisis is associated with a substantial increase in wage premia[6]; while in columns 4 and 5 the year dummies show a similar effect, which appears to be largely non-trended (so that the estimated effect of the crisis can be rather safely attributed to the qualitative changes brought about by the crisis than to any underlying trend pre-dating the crisis – see Figure A.1 in Appendix for a visual illustration of this). The crisis effect emerges after we control for the (period-varying) effects of the level of profitability, the share of small firms and the presence of public sector jobs in each sector, and in that sense it appears to be a horizontal, economy-wide effect. Following Nikolitsas (2011), one could attribute this to competitive factors that our analysis does not account for, such as relative changes in pure compensating wage differentials related to job quality (e.g. the risk

[5] Note that in the random-effects and OLS specifications we find the coefficient on the share of small-firm employment to also be statistically significant (negative), suggesting that in the cross-sectional dimension the potential for rents, or the degree of inter-firm competition, also matters.

[6] With an expected mean value at zero (by construction) and a range, for the full period, between -19% and +34% (from the data), the inclusion of the crisis dummy returns a fixed effect for the post-crisis period of 13.5% (significant at 5%), which naturally renders the derived constant significantly negative.

of work accidents and the associated wage compensation may have increased in the Mining or Energy sectors relative to the Construction sector, given that nearly all activity there came to a halt during the crisis). However, our view is that such effects cannot be far-reaching (if present at all) as job quality during the crisis has likely worsened in similar degree throughout the economy (also in terms of pace of work, insecurity etc.). We are more inclined to attribute the year fixed effects to non-competitive factors for which we have not directly controlled.

The remainder of Table 2 also points to significant non-competitive factors. For the public-sector variable we find an effect which is not different from zero pre-crisis but statistically significant and negative during the crisis period – showing that sectoral premia fell during the crisis in public-sector dominated sectors. This effect is statistically significant both when measured in terms of differences from the pre-crisis period (cols. 3 and 5) and, marginally, when measured as a total period-specific effect (col.4). Given that the pre-crisis effect for this variable is not statistically positive (and noting that private-sector wages declined with the crisis in parallel with public-sector wages – Christopoulou and Monastiriotis, 2016), it is unlikely that the crisis estimate captures a purely compositional effect (reflecting the decline in public sector wages per se).[7] Instead, it appears that the obtained result reflects more a labour-market effect whereby public sector wage-cuts and downsizing triggers downward wage pressures also in private firms the more so the larger is the proportion of public-sector jobs in the sector. To conceptualize this, think of the education sector: as hiring of teachers in state schools essentially froze with the crisis and wages declined, an excess supply of teachers must have been directed to the private part of the sector, pushing down wages there as a result; to the extent that this downward pressure was horizontal (i.e., not fully mediated by sorting on the basis of productive characteristics), this would show as an absolute reduction in net wage premia in the sector. This interpretation is consistent with the sizeable literature that argues for, and empirically demonstrates, wage interactions and feedback effects between the public and private sector, with Greece categorised among the countries were the public sector operates as the wage leader (e.g. Camarero et al. 2014).

[7] The result is also inconsistent with a market-share interpretation, where we would expect the decline in public sector jobs to lead to market-share gains for private firms with subsequent positive effects in their profitability and thus potentially also in their sectoral wage premia.

Moving on to the profitability variable, we find that the crisis dampened the influence of this on wage premia: gross operating surplus continues to have a strong positive association with sectoral premia before the crisis, but this association diminishes both in size and in statistical significance during the crisis (the difference is always statistically significant at the 1%, but the overall effect in the post-crisis period, reported columns 2 and 4, is reduced by between half and two thirds and is statistically different from zero only in column 4). This is a novel but broadly intuitive result: as employers have become with the crisis more resource-constrained and perhaps also more prudent – and as the crisis has significantly weakened the bargaining power of organised labour and individual workers – we would expect to see a lower increase in wage premia for any extra percentage point of profitability post-crisis compared to the increase in wage premia for a similar percentage increase in profitability pre-crisis.

In contrast, in the case of the small-firms variable, we find that it returns an effect which is again not different from zero pre-crisis (nor during the crisis) but its crisis value is negative and statistically different from the pre-crisis value. Thus, it is only with the advent of the crisis that we see wage premia to become lower in sectors with larger proportions of small-firm employment and presumably with a more competitive market structure. Taken literally this indicates that, controlling for actual sectoral rents, the sectors' potential for rents as captured by market structure did not explain in any way the distribution of wage premia across sectors throughout the study period; however, the crisis allowed for such wage premia to emerge in sectors over-represented by large firms, even if the overall effect has remained statistically not different from zero. This is again a novel but rather intuitive result: as the crisis progressed, small firms suffered more by the fall in domestic demand and struggled more with costs and liquidity; whereas larger firms may have found it easier to tip into export markets and into external borrowing in a way that allowed them to maintain higher wages overall.

On the whole, these results provide a very interesting – and intimate – picture of the nature of wage premia in Greece. On the one hand, they tell us that, generally, such premia are not driven by unobservables and worker sorting across sectors (Table 1) nor are they driven by the ability of workers to 'extract' rents (see our discussion around column 1 of Table 2) or the employers' potential for rents. Rather, the drivers of sectoral rents appear to be related to the availability of rents / ability to pay rents as captured by the extent of profitability in each

sector. On the other hand, they show that the crisis had a variable effect on these premia. It suppressed the wage premia afforded by high profitability (i.e., it reduced the elasticity of these premia to the gross operating surplus), but it also led to a wage disadvantage in sectors dominated by smaller firms and sectors dominated by public-sector jobs – neither of which had high premia, in a statistical sense, and thus evidence of inefficiency, pre-crisis. The end result of these influences was a divergence of sectoral wage premia for the economy as a whole, as is corroborated both by our descriptive evidence (Figure 2) and by our econometric results (Table 2). In other words, the crisis did not lead to an overall decline in cross-sectoral wage differentials, either on the whole or in the part that was due to non-competitive attributes – despite the fact that rents (profits) as a driver of wage differentials became indeed less significant and deregulation also played its part. In this token, the crisis does not seem to have led to a more efficient labour market equilibrium.

5. Conclusion

In this study we examined the extent, sources and temporal change of inter-sectoral wage differentials in Greece over a 15-year period which coincided with dramatic changes – and challenges – for the Greek economy. We were motivated to do this by the general perception that sectoral wage premia reflect market distortions and inefficiencies; and the lack of systematic evidence about sectoral wage premia in the country, especially post-crisis. Specifically, our interest was to explore to what extend the crisis may have worked to dampen sectoral premia, i.e., unaccounted-for sectoral wage differentials. This could be for two reasons. First, because the crisis should naturally have compressed 'excess' (non-competitive) wages and put pressure for more market-based (competitive) practices in wage-setting, by removing the scope/space for non-competitive premia. Second, because the crisis was followed by an extensive programme of labour and product market reforms that were meant to rationalise the Greek economy and improve competitive conditions across all sectors.

Our analysis of the issue followed previous research, both in Greece and in the international literature. To measure sectoral wage premia we relied on data derived from the Greek Labour Force Survey, which is an imperfect but by far the best source of relevant information, especially in its historical-temporal dimension. We calculated raw sectoral wage differentials directly from the data and estimated net wage differentials (sectoral premia) using a

Mincerian wage equation as is standard in the literature – controlling for various individual and job characteristics. Our descriptive evidence presented a rather unexpected picture of widening differentials – both in their 'raw' and in their 'net' form. While such differentials have remained rather stable in the pre-crisis period, they increased rather substantially post-crisis, by 42% and 25%, respectively (measured in terms of standard deviations).

In trying to explain this temporal pattern, as well as the very existence of these premia, we implemented two pieces of analysis. First, we employed an interquantile regression approach, seeking to examine whether differentials at the top end of the distribution are systematically higher compared to the bottom end of the distribution. As is standard in the literature, evidence in favour of this could be interpreted as suggesting that sectoral premia are, to some extent at least, driven by sectoral differences in unobservable characteristics of workers, thus reflecting equilibrium processes of sorting (across sectors, on the basis of unobservable skills). Second, we employed a panel-data analysis, treating the estimated sectoral net premia as our dependent variable and examining their drivers by introducing a number of controls associated to the availability and appropriation-potential of rents. Our results showed that sectoral wage premia are on the whole associated more strongly with 'rent availability' factors (sectoral profits) than with 'rent potential', 'appropriation' or 'competitive' factors. They also showed, rather unequivocally, that the heterogeneity of sectoral premia – and, in this token, market inefficiency – increased with the crisis. Indeed, while the crisis seems to have coincided with a decline in the extent to which premia may be attributable to the availability of rents (as proxied by sectoral profits), it also led to a widening of gross and net sectoral wage differentials, which is only in part accounted for by the suppression of wages in sectors dominated by small firms and public sector jobs.

We find these results particularly instructive. They indicate to us an area where it can be argued that economic efficiency has not increased in the post-2009 period: in the sense that unaccounted-for sectoral wage differentials have not declined, despite the dramatic economic pressures that were applied to the Greek economy and the significant reform effort which was undertaken by successive governments – even if imperfectly and not fully whole-heartedly. We believe that this has by and large to do with more structural characteristics of the Greek economy. As the evidence for the pre-crisis period shows, sectoral premia and penalties were almost exclusively linked to profitability ('appropriated rents'), with practically

no influence from factors linked to asymmetric worker (or union) power. In this sense, sectoral premia were of a "supply-side" nature: where firms could afford to do so, they would offer higher wages horizontally (i.e., not rationed in relation to any individual or job characteristics), but this would be independent of characteristics that afford workers more power such as the presence of a large public-sector employer or of large employers more generally (both of which are linked, for example, to higher rates of unionisation). The crisis reduced the intensity of the relationship between profits and premia, but it also led to new sectoral cleavages – with sectors dominated by public sector jobs now offering lower wages ceteris paribus. The end result was not an overall reduction in sectoral wage differentials, i.e., a tendency towards cross-sectoral equalisation of net wages, but rather an amplification of these. Thus, on the whole, the reforms and economic pressures that came with the crisis did not lead to a more competitive market environment. Firms continue to offer wage premia when they can (when they have higher profits) and they offer lower wages, horizontally, when they are exposed to more competitive pressures. But equilibration mechanisms, which would dampen the existing sectoral differentials (for example, sectoral mobility or capital shifts), do not seem to have been strengthened with the crisis – and if anything, they have become more subdued.

Of course, the amount and type of evidence presented here is not sufficient to categorically support such a conclusion. But our evidence nevertheless points undoubtedly to this direction. To us, this indicates the importance of examining further the workings of the Greek labour market, both prior and after the eruption of the crisis. The continuing study of this is a necessary condition for obtaining a deeper understanding of the problems of the Greek economy in general and of its labour market in particular and thus for devising policies that can help with the sustainable recovery of the economy and the enhancement of its competitiveness.

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Appendix

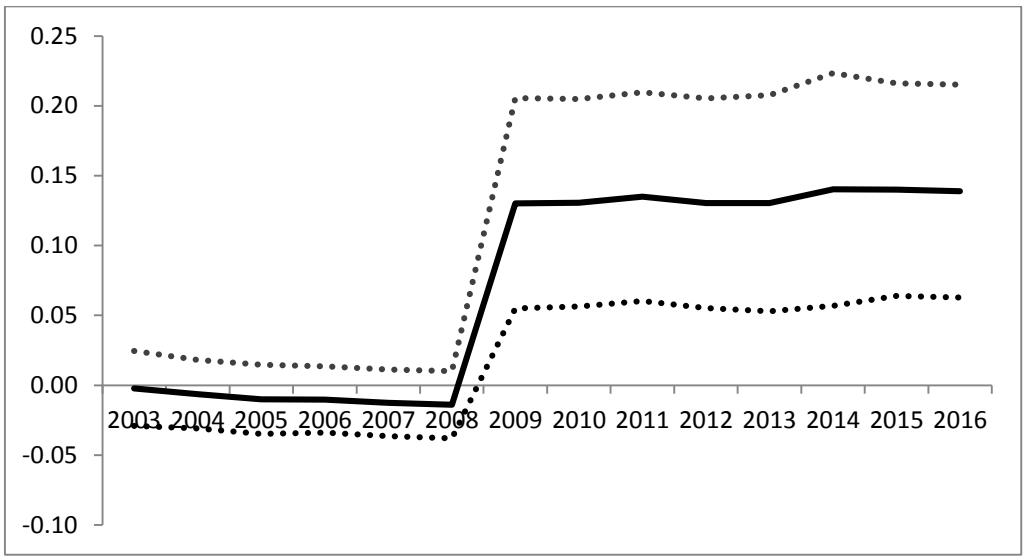
Table A1. Weighted means and frequencies of variables used in the analysis

year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Ln(monthly wage)	6.56	6.65	6.74	6.76	6.78	6.81	6.85	6.90	6.90	6.90	6.79	6.70	6.62	6.67	6.66
Weekly hours of work	40.2	40.2	39.9	40.0	39.7	39.6	39.9	39.5	39.3	39.0	38.9	38.7	38.6	38.7	38.8
Female	0.40	0.40	0.41	0.41	0.42	0.42	0.42	0.43	0.44	0.44	0.45	0.44	0.46	0.47	0.46
Years of education	12.6	12.8	13.0	13.0	13.1	13.2	13.2	13.3	13.4	13.6	13.9	14.0	14.5	14.5	14.7
Years of experience	18.9	19.0	18.8	19.2	19.3	19.6	19.6	19.7	20.0	20.3	20.3	20.5	19.5	19.7	19.8
Married	0.61	0.60	0.63	0.61	0.60	0.61	0.60	0.60	0.61	0.62	0.62	0.64	0.60	0.61	0.60
Has child(ren)	0.39	0.38	0.40	0.39	0.39	0.38	0.37	0.38	0.39	0.40	0.39	0.41	0.40	0.38	0.38
Foreign-born	0.08	0.09	0.09	0.09	0.09	0.10	0.12	0.13	0.13	0.13	0.11	0.11	0.10	0.10	0.09
Public job	0.35	0.35	0.37	0.35	0.36	0.36	0.35	0.35	0.35	0.36	0.36	0.37	0.36	0.34	0.33
Part-time job	0.04	0.03	0.04	0.04	0.05	0.05	0.04	0.05	0.06	0.06	0.08	0.10	0.11	0.11	0.11
Temporary job	0.12	0.11	0.12	0.12	0.11	0.11	0.11	0.12	0.13	0.12	0.10	0.10	0.12	0.12	0.12
Small firm worker	0.41	0.43	0.42	0.43	0.42	0.43	0.43	0.44	0.44	0.43	0.39	0.38	0.51	0.53	0.50
Agriculture, forestry, fishing	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Mining, quarrying	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Manufacturing	0.17	0.16	0.15	0.15	0.15	0.14	0.14	0.13	0.13	0.12	0.11	0.11	0.10	0.11	0.11
Energy	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Water, sewerage, waste	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Construction	0.08	0.09	0.08	0.09	0.08	0.09	0.09	0.08	0.07	0.06	0.05	0.04	0.04	0.04	0.04
Trade, repair of motor vehicles	0.14	0.14	0.14	0.15	0.14	0.14	0.15	0.15	0.16	0.16	0.16	0.17	0.16	0.17	0.16
Transportation, storage	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Accommodation, food services	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.09	0.10	0.09
Information, communication	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Finance, insurance	0.03	0.04	0.04	0.04	0.04	0.03	0.04	0.03	0.04	0.04	0.04	0.04	0.03	0.03	0.03
Real estate, prof/sci/tech activities	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.04	0.03	0.03	0.03	0.04	0.03	0.04	0.04
Administration, support	0.04	0.04	0.04	0.05	0.04	0.04	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.03
Public adm., defence, social sec.	0.12	0.12	0.13	0.12	0.14	0.14	0.13	0.13	0.14	0.14	0.14	0.15	0.14	0.13	0.14
Education	0.10	0.10	0.11	0.11	0.11	0.11	0.10	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12

Table A1 (continued)

year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Human health, social work	0.06	0.06	0.07	0.07	0.07	0.07	0.06	0.07	0.07	0.08	0.08	0.08	0.07	0.07	0.07
Arts, entertainment, recreation	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Other services	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Activities of households	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02
Kentriki Makedonia	0.17	0.17	0.17	0.18	0.18	0.17	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Dytiki Makedonia	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Ipeiros	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03
Thessalia	0.06	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.06	0.06	0.06	0.06	0.06
Ionia Nisia	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Dytikh Ellada	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.03	0.05	0.05
Sterea Ellada	0.05	0.04	0.04	0.05	0.04	0.05	0.05	0.04	0.04	0.05	0.05	0.05	0.05	0.04	0.04
Attikh	0.45	0.45	0.43	0.42	0.42	0.42	0.42	0.44	0.44	0.45	0.45	0.44	0.45	0.41	0.41
Peloponnisos	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.04	0.04
Voreio Aigaio	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.02	0.02
Notio Aigaio	0.03	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.04	0.03
Kriti	0.04	0.05	0.06	0.06	0.05	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06
Managers	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01
Professionals	0.15	0.15	0.17	0.16	0.16	0.16	0.16	0.17	0.17	0.20	0.22	0.22	0.21	0.21	0.21
Technicians and associates	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.11
Clerical support workers	0.17	0.16	0.17	0.17	0.18	0.17	0.17	0.16	0.16	0.15	0.15	0.14	0.14	0.15	0.15
Service and sales workers	0.17	0.17	0.17	0.18	0.17	0.17	0.17	0.18	0.18	0.20	0.21	0.21	0.22	0.24	0.24
Skilled primary sector workers	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Craft and related trades workers	0.18	0.18	0.16	0.16	0.15	0.16	0.15	0.14	0.13	0.11	0.10	0.10	0.09	0.09	0.09
Plant/mach. operators/assemblers	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.07	0.07	0.07	0.08	0.06	0.06
Elementary occupations	0.10	0.10	0.09	0.10	0.10	0.09	0.10	0.10	0.11	0.11	0.10	0.10	0.10	0.11	0.10
Observations	15142	14722	16301	15998	15292	14851	14749	15379	15186	12520	9182	8277	8543	9328	10571

Figure A.1. Estimated year fixed-effects for the net sectoral wage premia



Note: Estimates as reported in columns 4 and 5 of Table 2 in the text. Dotted lines show 95% confidence intervals.

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