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Skills and Wage Inequality in Greece: Evidence from Matched Employer-Employee Data, 1995-2002

Rebekka Christopoulou and Theodora Kosma

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Rebekka Christopoulou# and Theodora Kosma*

ABSTRACT

This paper examines changes in the Greek wage distribution over 1995-2002 and the role of skill in these changes. The methodology adopted is the Machado-Mata counterfactual decomposition, which separates the part of wage changes that is due to job and workers' characteristics (composition effects) from the part due to the returns to these characteristics (price effects). We find that mean wages have not increased substantially, but wage inequality has, mostly at the upper tail of the distribution. The role of skill has been decisive. Falling tenure levels at all but the very high wage deciles, and rising education across the board, have carried much of the inequality-increasing influence of overall composition effects. Although to a lesser extent, changes in the returns to skill have contributed to inequality by forming a U-shaped pattern along the wage distribution. This pattern is further reinforced when price-effects of skill are added together with the composition effect of tenure to produce the share of skill-effects that is responsive to market forces. Drawing on this evidence, we make a case for the routinization hypothesis.

Keywords: Returns to skill; Wage inequality; Quantile regression.

Hellenic Observatory, European Institute, London School of Economics, Houghton Street, London WC2A 2AE, UK. R.Christopoulou@lse.ac.uk (corresponding author).

* Economic Research Department, Bank of Greece, 21 E. Venizelos Ave., GR-102 50 Athens, Greece. tkosma@bankofgreece.gr.

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1. Introduction

Education and job experience are traditionally seen as the most important dimensions of 'skill' for labour market participants, going hand in hand with inequalities in labour market outcomes. Highly educated and experienced workers are typically the ones that receive the highest wages, the most job opportunities and the best working terms and conditions. In advanced economies, their labour market advantages have increased further through recent decades and, according to the consensus view, these increases have materialised differently for different levels of institutional 'flexibility'. 'Liberal' Anglo-Saxon markets have mostly experienced increases in wage inequality, while 'coordinated' continental European countries have mostly seen changes on the employment-side (Krugman 1994; Blanchard and Wolfers 2000). As a result, a large and exciting international literature has developed to examine the macro shocks that are to blame for these trends.

The skill-biased technical change (SBTC) hypothesis, which assumes that technology in interaction with international trade biases labour demand in favour of the skilled and against the unskilled, has been the prevalent explanation since the early 90s (Katz and Autor 1999; Acemoglu 2002). Lately, however, it has been losing ground over the novel idea of 'routinization'.

Routinization is a modified version of the SBTC hypothesis that takes the focus away from education and experience as carriers of bias and moves it to the type of job content and, in particular, to the degree that can be routinized. Specifically, it assumes that technology increases demand for both high-skilled and very low-skilled workers and decreases the demand for middle-skilled workers, as it replaces human labour mostly in routine tasks, which are typically the middle-skilled jobs (Autor, Levy and Murnane 2003; Autor, Katz and Kearny 2006, 2008; Goos and Manning 2007; Goos, Manning and Salomons 2009). In addition, a different line of thought doubts the significance of technical change altogether. Arguing that inequalities by skill are mostly driven by non-market, mainly socio-demographic changes, this literature has justly earned itself the title of the 'revisionist' (Card and DiNardo 2002; Lemieux 2006).

In comparison to these research dynamics, evidence for Greece is limited. Undoubtedly, since the early 1990s, and in the midst of continuous discussions regarding the quality of the Greek education system and a succession of educational reforms and counter-reforms by alternate governments, the effect of education on inequality and labour market performance has attracted much attention from Greek academics and policy-makers. In this climate, a group of applied economic studies emerged to examine the link between skills and pay. Most of them, however, focused mainly on the education dimension of skill, and have only partially explored the reasons behind the changes in the returns to education (Tsakloglou and Cholezas 2005 give a brief review).

The bulk of the Greek research utilizes the Household Budget Survey data that provide information on consumption expenditures, incomes and socio-economic characteristics of the households and their members. This information has allowed the estimation of the returns to skills in the Greek labour market from the mid-1970s till the late 1990s in Mincer-type wage equations. The available evidence suggests that both overall wage inequality and the returns to education declined between the mid-1970s and the 1980s, but recovered again during the 1990s. This pattern has been attributed to interactions between an expanding educational system, a stagnant demand for educated workers, and changing institutional labour market structures (i.e. minimum wage and other income policies).

However, as in many other countries, the returns to education seem to have evolved differently across the wage distribution. On this, especially, the empirical research on the Greek labour market has provided mixed results. In particular, by estimating Mincer wage equations on data from the early 1990s using quantile regressions, Martins and Pereira (2004) find that Greece is the only country out of 16 that shows higher returns to education at the lower end of the wage distribution. Conversely, Cholezas (2004) examines Greek wages for years 1974, 1988, 1994 and 1999, and finds that in most cases returns to education follow a U-shaped pattern across the wage distribution.

This paper analyzes the role of skills in the dynamics of the Greek wage structure. Specifically, we examine how the distribution of individual's wages has changed in Greece and what has been the contribution of education and experience to these changes (a) over a recent period (1995-2002); (b) using an employer-employee matched data set, which gives the opportunity to control for both worker characteristics and job or employer characteristics in the wage equations; and (c) employing a recently developed methodology of counterfactual decomposition by Machado & Mata (2005). This methodology takes a step forward from simple estimations of returns to skill; it separates the part of wage changes that is attributable to composition changes of individual or workplace characteristics (net composition effects) from the part that is due to changes in the returns to these characteristics (net price effects) and, ultimately, enables the isolation of the market-driven share of wage-change from the share that is due to predetermined socio-demographic factors (e.g. changes in age, educational participation etc.).

We find that wage inequality over the period of study has increased; more so for men and those on the upper end of the wage distribution. Interestingly, unlike the experience of any other highly coordinated European labour market for which data is available, these trends in Greek wages are both qualitatively and quantitatively comparable to the trends observed in the liberal markets of the US and the UK over the same eight-year period. Skills have had a significant contribution to wage inequality; mostly through the composition effects of education and tenure. However small, the price-effects of skill formulates a familiar U-shaped pattern across the wage distribution: workers on the tails of the wage distribution appear to enjoy higher increases in the returns to skill than those in the middle. We take this as evidence in favour of the routinization hypothesis. Our routinization hypothesis case becomes even stronger when we calculate the overall share of skill-effects that is attributable to market forces (i.e. the sum of price effects of skill and the market-responsive part of composition skill-effects) and find that not only does the U-shaped pattern persist but it is also boosted.

The paper is structured as follows: Section 2 describes the data and comments on its timing, section 3 provides a descriptive analysis of wage-changes, section 4 presents the methodology and section 5 the results. The discussion of the results is given in four stages; we comment on the added value of controlling for employer heterogeneity in section 5.1, in 5.2 we give a general introduction to the decomposition results, in 5.3 we focus on the skill-effects, and in 5.4 we isolate the market-driven from the predetermined skill-effects. A final section concludes.

2. Data and Timing

The data used in the empirical analysis are obtained from the Greek Structure of Earnings Survey (SES), which is compiled by the National Statistical Service of Greece. The Structure of Earnings Survey was first conducted in 1995 in the EU member states with the aim of compiling a dataset comparable across countries. This dataset would then serve as a useful basis for analysing the progress of economic and social cohesion. The survey was again conducted in 2002 and it has been decided that the survey will be repeated every four years.[1]

The SES contains rich information on the structure and distribution of earnings and characteristics of employers and employees for two years: 1995 and 2002. Therefore, in comparison to household databases that have been used in the literature to date, the SES has two important advantages. First of all, it avoids the measurement error problems of the household surveys.[2] Further, as already emphasized above, it enables controlling for both workers and firms characteristics when estimating wage equations. Moreover, its timing is also advantageous: it offers a more recent view of the labour market in comparison with previous studies and it coincides with a period of interesting economic developments. Next, the sample and its timing are discussed in turn.

2.1. The sample

The sample of the Structure of Earning Survey is constructed by three-dimensional stratified random sampling covering firms of more than 10 employees in sectors such as manufacturing, construction and services (NACE C-K). The process of deriving the sample is the following: in the first step a sample of firms from the firm registry is selected, in the second step the sample of the local units belonging to the firms of the first stage is selected, and in the

[1] More details on the aim of the Structure of Earning Survey can be found on the website of the National Statistical Service of Greece (www.statistics.gr).

[2] It is widely documented in the literature that household surveys are contaminated with a significant degree of measurement error. Data on wages/income are mostly affected by this measurement error; individuals do not exactly recall their income and pay components or, for various reasons, do not like to provide accurate information on their income sources.

final step a sample of employees belonging to the local unit is selected. Before the selection, firms are classified into strata according to region, economic activity (NACE 2-digit) and firm size (defined by number of employees in the firm).

The data available for the employees contain information on gender, age, the education level completed, tenure with the current employer[3]. The data on job characteristics describe the type of contract (part-time or full-time, contract of definite or indefinite length), the occupation, and whether the job entails supervisory duties. The data on employer characteristics contain information on the firm size, industry, location, main market in which the product of the firm is sold (regional, national, European or global), and the type of collective agreement enforced in the firm (national, sectoral, or firm level agreement).[4]

The Structure of Earnings Survey also contains detailed information on the gross monthly earning of the employee, the various pay components such as overtime, irregular bonuses, hours worked and overtime hours. From the information provided we create the variable referring to hourly earnings including overtime and regular bonuses which we use in the econometric analysis. More precisely, we use real hourly earnings (deflated by the Harmonized CPI).

[3] In 1995, data on tenure with the current employer are available; for 2002, information on date the employee joined the firm is provided and the tenure variable is constructed accordingly.
[4] The sample for 1995 covers around 3585 firms and 52975 employees; the 2002 sample covers around 2907 firms and 48762 employees.

Before the econometric analysis we subject the data to a thorough 'cleaning'. Incomplete or inaccurate observations are unavoidably deleted. Employees with age 15 to 65 are included; employees with earnings below the 1st and above the 99th percentiles are excluded. After the data inspection and cleaning we end up with 38701 observations for 1995 and 41449 for 2002.

Table 1 provides selected information on the final 'clean' version of the sample. One can see the following relevant issues regarding the two waves of the Structure of Earnings survey: Firstly, following the widely-documented

Table 1: Sample characteristics

Employee characteristics		1995	2002	Change
Female (%)		31.70	37.36	5.66
Years of education (average)		10.57	11.49	0.92
Years of tenure (average)		10.08	8.26	-1.82
Age:	15-24 years (%)	5.92	7.30	1.38
	25-34 years (%)	29.95	32.97	3.02
	35-44 years (%)	34.09	30.26	-3.83
	45-64 years (%)	30.01	29.44	-0.57
Employer characteristics				
Private ownership (%)		69.61	83.50	13.89
Firm size:	10-19 employees (%)	9.74	12.35	2.61
	20-49 employees (%)	21.90	16.71	-5.19
	50-99 employees (%)	21.17	10.88	-10.29
	>100 employees (%)	47.19	60.05	12.86
Manufacturing sector (%)		48.30	36.13	-12.17

Note: % refers to % of employees in the sample.

worldwide trend, the proportion of females has increased. Secondly, the average years of education have increased, a trend consistent with the general expansion of the educational system in the country. Thirdly, average tenure with the same employer has decreased. This might be explained by a series of developments in the Greek economy. Specifically, there has been an increase in the proportion of employees under contracts of definite length.[5] Also, there has been an increase in newcomers in the labour force, mainly driven by the increase in the working age population. Moreover, there has been a process of integrating immigrants in the Greek labour markets (the SESs have also started including them in the sample)[6]; immigrant workers are more likely to work with contracts of definite length and change jobs more often. Interestingly, there has also been an increase in the number of young workers in the sample. This matches the developments of the tenure variable, and could be explained by the increase of part-time jobs in Greece, which allows young people to combine education with labour force participation.[7]

There are some changes in firm characteristics that are also worth mentioning. The proportion of employees working in the private sector has increased, and so has the proportion of employees working in bigger firms (with more than 100 employees). The former fact may be related to the process of privatizations. Finally, the manufacturing employment seems to have followed a decreasing trend over the period under investigation.

[5] This is verified by the sample; the proportion of employees not having contracts of indefinite length has increased from around 2% in 1995 to 8.8% in 2002.
[6] For a detailed analysis of Greek labour market developments between 1995 and 1999 see Sabethai (2000).
[7] The increase in part-time jobs in Greece is reflected in the sample. In 1995 only 0.97% of the sampled employees was working under part-time status, while this number increased to 3.84% in 2002.

2.2. The timing: an overview of the Greek economy between 1995-2002

Table 2 below provides various indicators that give a general picture of the economic environment in Greece over 1995-2002. This period was special for Greece as it coincided with the years preceding the euro adoption and the need to fulfil the accession criteria; one of them being the decrease in the inflation rate. As one can see in the table, Greece 'delivered' in terms of macroeconomic

Table 2: Macroeconomic background, demographics, and market regulation

	1995	2002	Change
Real GDP growth (2000 constant prices)	2.1	3.9	1.8
Unemployment rate	9.0	10.3	1.3
Inflation rate	9.8	3.7	-6.1
Proportion of foreign labour force	3.7(1996)	5.5	1.8
Female labour force participation	44.3	50.1	5.8
Population share of 15-24 year-olds	20.4	19.3	-1.1
Population share of 25-49 year-olds	51.3	54.4	3.1
Population share of 50-64 year-olds	28.3	26.3	-2.0
Trade in goods and services to GDP	18.8	23.3	4.5
Share of ICT investment in total gross fixed capital formation	10.0	11.5	1.5
Benefit replacement rates (average in the first 5 years of unem.)*	14.7	12.9	-1.8
Minimum relative to median wages of full-time workers	0.53	0.49	-0.04
Strictness of employer protection legislation (range 0-2)*	1.2	1.2	0.0
Overall product market regulation (range 0-4)	2.8 (1998)	2.0	-0.8

Source: OECD Statistics, except for those market with * that are unpublished and tentative (kindly provided by the Hellenic Observatory, LSE)

performance; it experienced a high and increasing GDP growth rate (at the same time that the growth rate in two of the EU's core countries, Germany and France, as well as in the US was low and decreasing). Following the requirement for the euro adoption, inflation was also significantly reduced, with the increase in the unemployment rate being a possible consequence of policies aiming for that reduction.

In addition, the period 1995-2002 was also characterised by strong demographic, macroeconomic and institutional changes - some country-specific and others common across advanced countries - that were directly affecting the labour market. For the demographic developments, we have already gotten a flavour from the description of the sample characteristics. The Greek labour market was experiencing a sharp increase in female labour force participation, like the majority of the OECD countries, and was also under a country-specific supply shock by a huge inflow of immigrants[8]. This could be one of the reasons why the share of prime-age population did not decrease in the country, which was what happened in other advanced countries in the same period (e.g. Germany, France and the US).

At the same time, as shown by the measures of investment in Information and Communication Technologies (ICT) and trade-to-GDP, the Greek labour market was also under the influence of increasing technical change and trade openness; the two forces that, in interaction, have been found to induce a skill-biased (or 'routine-biased') effect on labour demand. To add to this, institutional protectionism was decreasing, both in the labour and in the product markets.[9]

[8] This is documented in detail by Zografakis, Kontis and Mitrakos (2008).
[9] It should be noted that the observed labour market deregulation can partly be an endogenous response to increasing international trade and product market deregulation. In particular, competition from low

On the whole, the period 1995-2002 is a very interesting one to examine for Greece. It is a period of high growth, characterised by technological changes, economic globalization and institutional reforms. This provides a unique opportunity to identify patterns of association between changes in the wage structure and skill-biased demand shifts or institutional features.

3. Observed wage changes

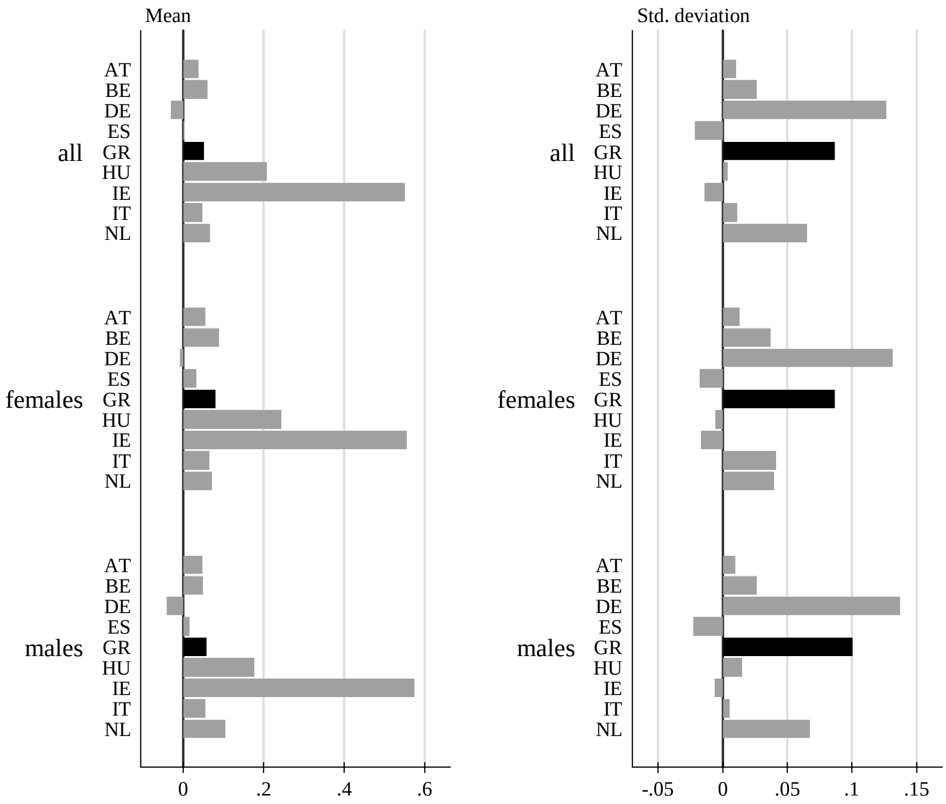
The direction, magnitude and nature of wage-changes between the two sample waves is roughly indicated by changes in the measures of mean and standard deviation, which amount to 0.052 and 0.087 log points respectively, when taking men and women together. These numbers reflect a pattern of slow and asymmetrical wage-movement. Still, it says little if not compared with similar changes in other countries. Figure 1 provides a comparison of the two measures between Greece and eight other EU countries, for which comparable SES data is available.[10] Putting Ireland's and Hungary's impressive wage growth aside, Greece's average wage change is well in line with the experiences of the other European countries. The change in the standard deviation of hourly wage, though, stands out. After Germany, Greece is the second country in the group with the biggest increase in wage dispersion.

cost producers due to trade may indirectly reduce trade unions' bargaining power and wages by decreasing the profits of domestic producers and reducing the scope and extent of profit sharing. The effect of product market deregulation works in the same way (for a discussion see Fiori et.al 2008). Note that the product market regulation indicator presented in Table 2 captures mainly barriers to entry. For a detailed description of its construction see Conway et. al (2005).

[10] Changes are calculated over 1995-2002 in all cases, apart from Austria and Hungary (1996-2002), Belgium (1999-2005), and Germany (1995-2001). Numbers for category ‘all’ in Ireland,are calculated as weighted averages of those for categories ‘males’ and ‘females’.

How exactly has this sizeable increase in wage dispersion reshaped Greece's wage structure? Figure 2 and Table 3 describe the shift in the Greek wage distribution in detail, serving to reveal a very interesting picture. In the aggregate sample, real hourly wages have remained more or less constant up to the 5th decile of the distribution and have monotonically increased thereafter.

Figure 1: Changes in mean and st. deviation of hourly wages by country (log points)

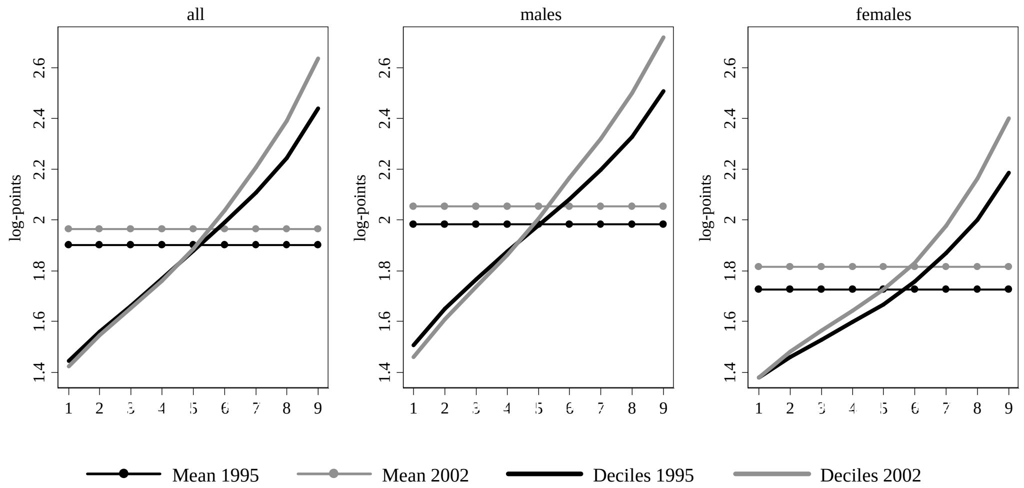


Source: Christopoulou, Jimeno and Lamo (2008)

In other words, the moderate increase in mean wages has not been shared equally among the labour force, but rather the wealthy have become better off while the poor have remained equally poor.

It is noteworthy that this pattern in wage structure dynamics is unique in the group of the nine European countries included in Figure 1. In Christopoulou, Jimeno and Lamo (2008) it is shown that, although both Germany and the Netherlands have experienced comparable increases in overall wage inequality, in both cases the inequality has affected mostly those on the lower end of the wage distribution. In fact, the Greek experience appears to be quantitatively and qualitatively closer to that of the US, than to any of the European countries for which data is available.

Figure 2: Real hourly wages by decile



Like the Greek data, US household data over the same eight-year period show a minimal movement in lower-tail inequality combined with a significant increase (around 0.05 log points) in upper-tail inequality (Autor, Katz and Kearny 2006). Data from the UK also show a similar pattern (Machin and Van Reenen 2007). This result comes as a surprise, especially considering that despite the strong trend towards deregulation, the institutional structure of the Greek labour market still fits better into the ‘European paradigm’ of high coordination, thought to work towards wage compression, rather than the ‘Anglo-Saxon paradigm’ of institutional liberalism.

When disaggregating the sample by sex, the picture becomes slightly different. Specifically, the wage movement is still concentrated at the upper part of the distribution for both men and women. For men, however, at the bottom of the distribution one can clearly see some wage falls, which wear out when moving towards the middle, switching to wage increases after the 5th decile. In contrast, wages of women have not decreased at all. Instead, starting from a low relative wage level in 1995, women have been catching up, experiencing wage increases from the 2nd decile of the distribution onwards. In consequence, overall increase in wage inequality has been larger for men than women.

Table 3: Key indicators of the wage distribution

		Std. Dev	Median	D90/D10	D50/D10	D90/D50	Gini coef.
All	1995	0.38	1.88	1.69	1.30	1.30	0.22
	2002	0.47	1.89	1.85	1.33	1.40	0.27
	Change	0.09	0.01	0.16	0.02	0.10	0.05
Males	1995	0.38	1.98	1.67	1.32	1.27	0.22
	2002	0.48	2.01	1.86	1.37	1.36	0.28
	Change	0.10	0.03	0.20	0.06	0.09	0.06
Females	1995	0.32	1.67	1.59	1.21	1.31	0.19
	2002	0.41	1.73	1.74	1.25	1.39	0.24
	Change	0.09	0.06	0.15	0.04	0.08	0.05

These different experiences come in confirmation of our decision to analyse wage changes both for the sample as a whole and separately by sex, on the assumption of segregation between male and female labour markets. Our assumption is in line with a long-standing tradition, starting with Bergman's (1971, 1974) pioneering work in the early 1970s, and subsequently followed by a long list of literature. The reasons for it stretch from sex discrimination on the demand-side to female self-selection in certain occupations on the supply-side (e.g. occupations that require smaller human capital investment, as women anticipate shorter and less continuous work-lives than men; occupations more compatible with the performance of household work (mummy tracks); and occupations that are traditionally dominated by women (social discrimination)). Strong evidence of sex discrimination in the Greek labour market from a series of empirical studies analysing the earnings gap between sexes also endorses the segregation assumption (e.g. Patrinos and Lambropoulos 1993; Kanellopoulos and Mavromaras 2002; Papapetrou 2004).

4. The Methodology

The analysis relies on the estimation of extended Mincer equations for log (real) hourly wages at different deciles of the wage distribution for each year t, using the quantile regressions method:

$$\ln w_{it}^{\vartheta} = a_{it}^{\vartheta} + \sum_{j} \beta_{jt}^{\vartheta} X_{jit}^{\vartheta} + \varepsilon_{it}^{\vartheta}, \qquad with\ Q_{\vartheta}(\ln w \mid X) = \beta^{\vartheta} X^{\vartheta}$$

where w_i represents the wage of individual *i*, *X* is the vector of observable labour market characteristics, a_{it}^{∂} is a constant, and β□ is the vector of parameters. $Q_{□}(lnw|X)$ denotes the □*th* conditional quantile of *lnw* given *X*. ε is the stochastic error. Given these estimates, we decompose the change between the 1995 and 2002 log wage distributions into a part that is due to changes in labour market characteristics (net of any return effects) and a part that is due to changes in the returns to these characteristics (net of any composition effects). This essentially involves decomposing the difference between two counterfactual densities: (i) the wage density corresponding to the 1995 distribution of characteristics with returns held constant at 2002 levels, and (ii) the wage density corresponding to the 2002 distribution of labour market characteristics with returns constant at 1995 levels. In the spirit of the Oaxaca (1973) technique, recently extended by Machado and Mata (2005), we perform this decomposition by decile.

The linearity of the quantile regression implies:

$$\ln w_{02}^{\vartheta} - \ln w_{95}^{\vartheta} = \left(a_{02}^{\vartheta} - a_{95}^{\vartheta}\right) + \sum_{j} \beta_{j02}^{\vartheta}\left(\overline{X}_{j02}^{\vartheta} - \overline{X}_{j95}^{\vartheta}\right) + \sum_{j}\left(\beta_{j02}^{\vartheta} - \beta_{j95}^{\vartheta}\right)\overline{X}_{j95}^{\vartheta} + \left(\overline{\varepsilon}_{02}^{\vartheta} - \overline{\varepsilon}_{95}^{\vartheta}\right)$$

Where w_t□ is the □*th* decile of the wage distribution in year *t*, X_{jt}□ is the vector of mean characteristics of decile □ and year *t*, and ε_t□ is the mean of the unobserved component.

We carry out the computation of mean characteristics by decile according to the adaptation of the Machado-Mata bootstrap method by Albrecht, Bjorklund and Vroman (2003). To describe it in simple terms, for each year, we draw a random sub-sample of 100 observations (i.e. individuals) from the whole sample. We sort the observations of the sub-sample by hourly pay and obtain the resulting decile values of the variables of interest. We repeat these steps 500 times, obtaining 500 values per variable in each decile. We then calculate the average of these 500 values in each decile, ending up with 10 values per variable (i.e. one for each decile).

Once the mean characteristics have been calculated, the wage change by decile over the period 1995-2002 are decomposed as follows: $\left(a_{02}^{\vartheta} - a_{95}^{\vartheta}\right)$ is due to changes in unobserved features common among employees and due to changes in the reference categories (dummies); $\sum_j \beta_{j02}^{\vartheta}\left(\overline{X}_{j02}^{\vartheta} - \overline{X}_{j95}^{\vartheta}\right)$ is due to changes in (employer or employee) observable characteristics net of any price effects (composition effect); $\sum_j \left(\beta_{j02}^{\vartheta} - \beta_{j95}^{\vartheta}\right)\overline{X}_{j95}^{\vartheta}$ is due to changes in the returns to (employer or employee) characteristics net of any composition effects (price effects); and $\left(\bar{\varepsilon}_{02}^{\vartheta} - \bar{\varepsilon}_{95}^{\vartheta}\right)$ is due to changes in the remaining unobserved component.

It is customary in the empirical analysis of Mincer equations X to include only variables representing individual/employee characteristics (i.e. educational level, age, age squared, tenure, tenure squared, a constant, and a gender dummy for aggregated samples). An important reason for this is that the arrival of matched employer-employee datasets has been relatively recent. In a sweeping review of the international literature, Abowd and Kramarz (1999) note that virtually all papers using matched employer-employee data appeared after the late 1990s and, in their majority, the databases used have been European. In the case of Greece this is the first time that such a database becomes available. Taking advantage of the extra information, we start by estimating Mincer equations in two alternative specifications (subscripts *t* and *i* are suppressed for simplicity):

$$\ln w^{\vartheta} = a^{\vartheta} + \sum_{j} \beta_j^{\vartheta} X_j^{\vartheta} + \varepsilon^{\vartheta} \qquad (1)$$

$$\ln w^{\vartheta} = a^{\vartheta} + \sum_{j} \beta_j^{\vartheta} X_j^{\vartheta} + \sum_{\kappa} \beta_\kappa^{\vartheta} \mathrm{X}_\kappa^{\vartheta} + \varepsilon^{\vartheta} \qquad (2)$$

Where *j* now indicates individual characteristics and *k* employer or job characteristics.[11] This exercise allows us to show that our understanding of the sources of earnings variation is refined to a significant extent when controlling for both worker and workplace heterogeneity, as opposed to controlling for worker heterogeneity only. We then focus the discussion on the estimates of specification 2.

[11] The variables used to capture individual characteristics are: years of education, tenure in years, tenure squared, age dummies, dummy for gender, dummy for vocational degree. The variables used to capture the respective employer characteristics are: sector dummies, occupational dummies, size dummies, dummy for private ownership, dummies for the main market for the firms' products, regional dummies, and dummies for collective agreement.

5. Results

5.1. The added value of controlling for employer heterogeneity

Regressions using worker-based datasets typically explain about 30% of wage variation. This is also the case for the Greek results derived from Household Budget Survey data (see for instance Table 7 in Tsakloglou and Cholezas (2005)). With this as a benchmark, Table 4 presents the estimated R^2 values corresponding to OLS estimations from the SES database by specification, year, and sex-group. Markedly, regressions using only individual characteristics explain 40-53% of wage variation, which is already a significant improvement in explanatory power. However, the incorporation of controls for employer/job characteristics increases the proportion explained even further, to as much as 63%. A similar pattern appears when looking at the residual standard deviation (RSD), the classic measure of within-group wage inequality *à la* Juhn, Murphy, and Pierce (1991, 1993), which is also reported in Table 4. Within-group or 'unexplained' wage inequality appears larger for specification 1 than for specification 2 for all years and samples.

At the same time, the inclusion of employer characteristics also alters the wage effects of key factors. For example, if one looks at the estimated OLS coefficients (Table A1 in the Appendix), while specification 1 suggests that the return to 10 years' education is about 33% in 1995, this falls to 17% once the regression is estimated using information on both employers and employees in specification 2.

Table 4: Estimated R^2-adjusted and RSD from OLS regressions

		1995			2002		
		All	Males	Females	All	Males	Females
R^2-adj.	Spec. 1	0.47	0.40	0.43	0.53	0.52	0.45
	Spec. 2	0.58	0.53	0.57	0.63	0.62	0.60
RSD	Spec. 1	0.28	0.29	0.29	0.32	0.33	0.33
	Spec. 2	0.25	0.25	0.28	0.28	0.29	0.30

Such differences between the two specifications are also manifest in the results of the quantile regressions.[12] For instance, in line with Choleza's (2004) findings for Greece and similar findings for other countries (e.g. Machado and Mata 2005 for Portugal; Izquierdo and Lacuesta 2006 for Spain)[13], the returns to education appear to increase across the wage distribution in both specifications. Also, they increase across time at every point of the distribution in both specifications. However, the increases suggested by specification 1 are always larger in magnitude than the increases suggested by specification 2. The same goes for the coefficients of the sex dummy. In both specifications, they reflect a wage-penalty for being a woman that increases in high paid jobs and decreases in time. However, the magnitudes suggested are always higher for specification 1. The story is similar for the majority of the coefficients on employee characteristics. Qualitatively, the two specifications provide the same results but, quantitatively, part of the effect attributed to employee

[12] Detailed quantile regression results are presented in Tables A1-A6 in the Appendix.

[13] It should be noted that this result is at odds with the findings of Martins and Pereira (2004) for Greece; they find that returns to education are higher at the lower quantiles. This counterintuitive result may be due to the hourly earnings variable they use and/or due to the fact that they do not account for employer characteristics. (They use net hourly earnings. As the authors claim the latter measure is influenced by progressive taxation; this may provide inaccurate results for the returns to education for Greece - returns to education are eroded at higher wage quantiles.)

characteristics in specification 1 is shifted to employer characteristics in specification 2.

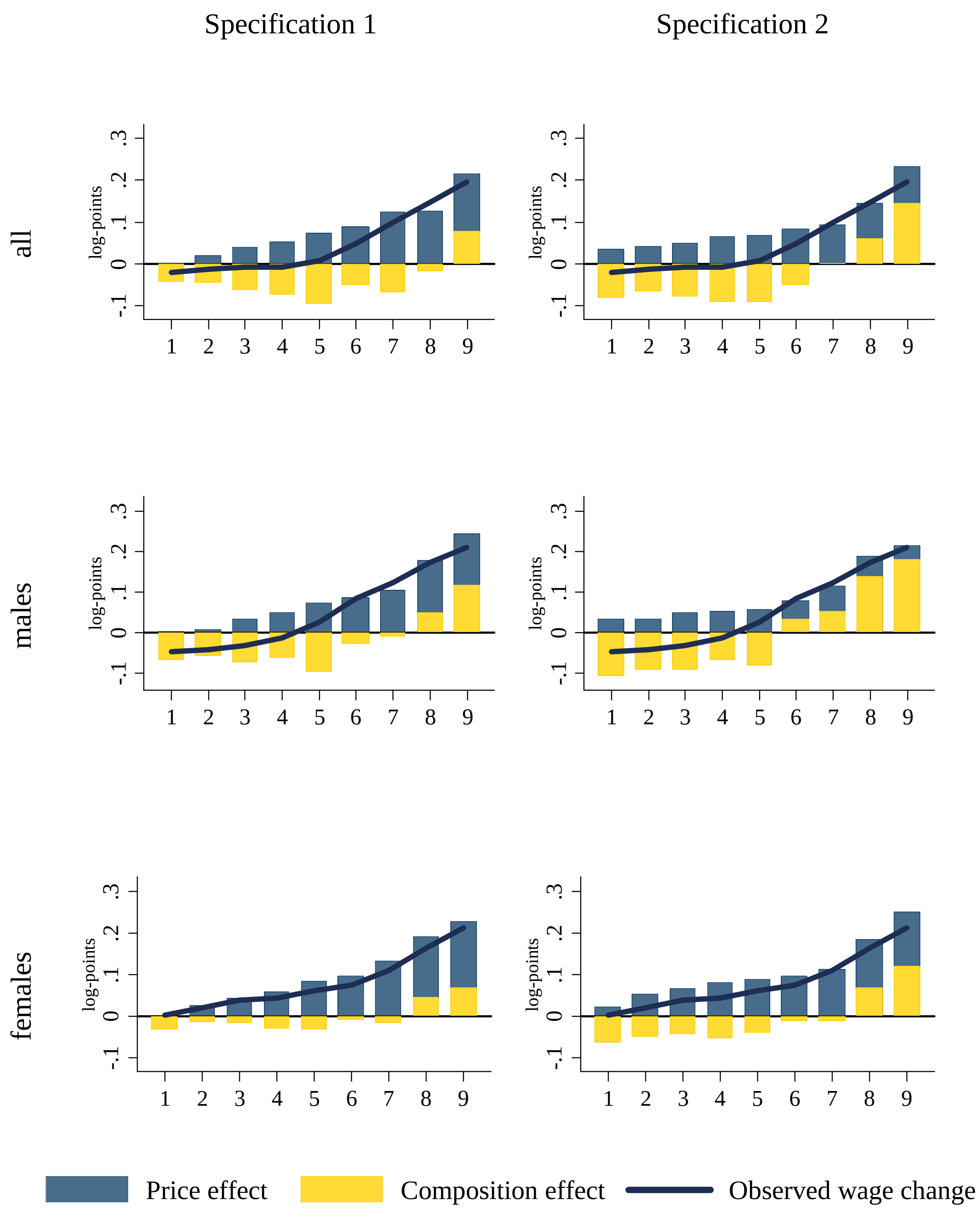
This is indicative of the correlation between employee and employer characteristics, widely discussed in the literature. Take occupation categories as an example. These (at least at 1-digit level) are defined as skill-categories and are, thus, expected to be highly correlated with the education variable. In the absence of controls for occupation, the education variable captures some of the occupation-specific premia. Therefore, controlling for both education and occupation, as we do in specification 2, provides more information, and the impact of collinearity is kept limited due to the large sample size.

As additional evidence, Figure 3 presents the respective decomposition outcomes for each specification, i.e. the breakdown of observed wage changes in composition and price effects by decile. Evidently, when compared to specification 2, specification 1 underestimates the composition effects along the entire wage distribution. Moreover, it appears to overestimate the price effects at high deciles and to underestimate them at low deciles. In other words, the contribution of price and composition effects to wage inequality differs significantly between specifications. Specifically, for specification 1, the composition effects at the 9th decile are 0.12 log points higher than at the 1st decile, while the same difference for the price effects is 0.21. Likewise, the differences between the 9th and 5th deciles is 0.17 and 0.14, respectively. In contrast, for specification 2, the difference between the 9th and 1st deciles is now 0.22 log points for the composition effects and 0.05 for the price effects, while the respective differences between the 9th and the 5th deciles are 0.24 and 0.02.

This suggests that controlling for employer characteristics may be important for the ongoing debate between revisionists and the supporters of the market-forces explanation of wage dynamics. More specifically, as opposed to changes in characteristics that can capture both responses to market forces and predetermined socio-economic changes (e.g. changes in the age structure, female labour force participation, educational participation etc.), changes in the prices of characteristics can be plausibly linked to market forces alone. Evidently, according to specification 1, wage-inequality is driven mostly by ‘price-side’ changes in characteristics, while specification 2 puts more weight on ‘quantity-side’ changes to characteristics.

An important common result of the two specifications should also be acknowledged. Both suggest that ‘price-side’ effects have been favourable for wages throughout the wage distribution, and that the wage-falls that took place at the lower deciles are strictly attributable to ‘quantity-side’ effects.

Figure 3: Breakdown of wage changes into composition and price effects by decile



5.2. Interpreting price and composition effects

By using all the available information, specification 2 inspires more confidence, but what do these results say about the Greek labour market? For example, how can one explain the observed composition (`quantity-side') effects? Looking back at the information provided in Tables 1 and 2, one can quickly identify three candidate causal factors. Firstly, on the employers' side, there is the expansion of the services sector, the shrinking of the manufacturing sector, and the respective decrease in blue collar jobs in relation to white collar jobs. Secondly, there is the much-discussed shift towards more flexible labour market institutions. Thirdly, on the employees side, there has been a higher supply of workers at the lower deciles of the wage distribution as a result of foreign migration inflows. All else equal, these factors exert qualitatively the same effect on wages; that is, they push them downwards for those at the lower deciles of the distribution and tend to raise them for those at the high deciles. So, even if the returns of the employers' and employees' characteristics had remained at 1995 levels, these compositional changes would still imply a high increase in wage inequality.

However, the returns to characteristics did not remain constant during the period. As shown above, their autonomous contribution to overall wage changes has been positive throughout the distribution. Possibly driven by skill-biased market forces, they even pushed towards more wage inequality, favouring those at high wage deciles.

What is also interesting is the difference in price and composition effects between sexes. When looking at men only, composition effects are larger in absolute value than price effects at most deciles, while, for women, it is price effects that dominate over composition effects. In fact, the domination of the price effects is strong enough to make no allowance for wage falls. The reason for this is probably a combination of decreasing sex discrimination at the workplace, and female employment being concentrated in occupations or industries sheltered from adverse market forces and to compositional shifts than male employment. For example, the difference in the return effects by sex could be partly explained by skill-biased technical change, as this is less likely to affect wages in pink-collar jobs as opposed to blue-collar jobs, and, by extension, women as opposed to men. Similarly, the difference in the composition effects could be explained by the decline in industries intensive in blue collar jobs, as well as the migration inflows at the lower end of the wage distribution, which are likely to affect men more than women.

Nonetheless, at this level of aggregation in the decomposition, any conclusions regarding the causal forces of wage-changes can only be tentative. To understand the specifics, one is better off looking at the price and composition effect of each individual variable/characteristic. We do this in the section that follows, and in accordance with the tradition of human capital theory, where skills are seen as the main drivers of wages, we focus on employee characteristics. This presents the opportunity to test two hypotheses. Firstly, by disaggregating the compositional effects, we can test whether rising education in Greece has pushed towards lower wage inequality in line with conventional wisdom; and, secondly, by disaggregating the price effects, we can look for evidence on the hypothesis of skill-biased demand shifts, which prevails in the literature.

5.3. Wage changes due to skill

Table 5 presents the breakdown of wage changes into price and composition effects of each employee characteristic/skill. The list of employee characteristics we control for is: age as a proxy of general labour market experience, years of education, tenure as an indicator of job-specific experience, a dummy variable for holders of vocational degrees and a dummy variable for females in the aggregated sample. Due to the fact that our information on age is given in age bundles rather than in exact years, our regressions included a dummy variable per age-bundle.[14]

In Table 5, we present the decomposition results for age in two categories: the youth or minimal experience category that refers to employees with less than 25 years of age and corresponds to the first age-bundle, and the prime-age adult or medium-high experience category that refers to those with 25 or more years of age and aggregates the effects of the three remaining age-bundles. The decomposition results for tenure include the combined effects of tenure and tenure-squared.

[14] For this reason it was not possible to include age-squared as a variable in the regressions to account for non-linear age effects.

Table 5a: Composition and price effects due to employee characteristics by decile, all

		D10	D20	D30	D40	D50	D60	D70	D80	D90
Observed wage change		-.0214	-.0141	-.0080	-.0077	-.0074	.0480	.0997	.1474	.1953
Total composition effects		-.0819	-.0682	-.0794	-.0936	-.0921	-.0522	-.0002	.0596	.1452
of which due to:	Age (if < 25)	-.0096	-.0175	-.0062	-.0064	-.0068	.0012	-.0006	-.0007	-.0023
	Age (if > 24)	.0056	.0016	-.0047	-.0005	-.0065	-.0119	-.0074	-.0074	.0035
	Education	.0106	.0172	.0151	.0150	.0134	.0214	.0108	.0202	.0308
	Tenure	-.0567	-.0581	-.0580	-.0668	-.0803	-.0574	-.0495	-.0331	.0088
	Vocat. degree	-.0003	-.0003	-.0006	-.0006	-.0006	-.0001	-.0002	.0003	.0000
	All skills	-.0504	-.0571	-.0544	-.0593	-.0808	-.0468	-.0469	-.0207	.0408
	Sex (female)	.0010	.0010	-.0077	-.0086	-.0018	-.0123	-.0159	-.0138	-.0103
Total price effects		.0349	.0418	.0512	.0647	.0683	.0829	.0948	.0847	.0888
of which due to:	Age (if < 25)	-.0050	-.0045	-.0039	-.0017	-.0010	-.0006	-.0008	-.0002	-.0002
	Age (if > 24)	-.0280	-.0523	-.0533	-.0603	-.0690	-.0666	-.0619	-.0600	-.0457
	Education	.0395	.0359	.0306	.0263	.0223	.0296	.0273	.0311	.0341
	Tenure	.0240	.0185	.0118	.0101	.0069	.0083	.0134	.0176	.0211
	Vocat. degree	-.0012	-.0016	-.0029	-.0041	-.0049	-.0070	-.0070	-.0086	-.0061
	All skills	.0293	-.0040	-.0177	-.0279	-.0457	-.0363	-.0290	-.0201	.0032
	Sex (female)	.0067	.0155	.0154	.0117	.0117	.0087	.0085	.0065	.0027

Table 5b: Composition effects due to employee characteristics by decile, males

		D10	D20	D30	D40	D50	D60	D70	D80	D90
Observed wage change		-.0457	-.0412	-.0297	-.0129	.0269	.0835	.1237	.1741	.2111
Total composition effects		-.1066	-.0920	-.0905	-.0666	-.0804	.0345	.0537	.1389	.1820
of which due to:	Age (if < 25)	-.0142	-.0215	-.0085	.0017	-.0042	-.0038	-.0014	-.0008	-.0008
	Age (if > 24)	-.0008	-.0061	-.0129	-.0038	-.0145	-.0138	-.0058	.0091	.0111
	Education	.0098	.0295	.0228	.0158	.0134	.0229	.0193	.0168	.0288
	Tenure	-.0619	-.0723	-.0739	-.0701	-.0757	-.0464	-.0357	.0016	.0233
	Vocat. degree	-.0005	-.0013	-.0004	-.0004	-.0002	.0000	.0002	.0000	.0017
	All skills	-.0677	-.0718	-.0730	-.0567	-.0812	-.0413	-.0234	.0267	.0641
Total price effects		.0358	.0342	.0515	.0533	.0590	.0442	.0619	.0507	.0331
of which due to:	Age (if < 25)	-.0044	-.0021	-.0017	-.0014	-.0004	.0000	.0000	.0000	.0000
	Age (if > 24)	-.0247	-.0579	-.0499	-.0598	-.0652	-.0637	-.0637	-.0613	-.0452
	Education	.0367	.0330	.0335	.0255	.0403	.0375	.0525	.0471	.0400
	Tenure	.0191	.0143	.0106	.0008	.0009	.0027	.0076	.0177	.0329
	Vocat. degree	-.0034	-.0031	-.0044	-.0065	-.0079	-.0088	-.0128	-.0087	-.0111
	All skills	.0233	-.0158	-.0119	-.0414	-.0323	-.0323	-.0164	-.0053	.0166

Table 5c: Composition effects due to employee characteristics by decile, females

		D10	D20	D30	D40	D50	D60	D70	D80	D90
Observed wage change		.0006	.0206	.0367	.0431	.0605	.0739	.1089	.1627	.2135
Total composition effects		-.0657	-.0513	-.0436	-.0539	-.0423	-.0142	-.0148	.0681	.1207
of which due to:	Age (if < 25)	-.0035	.0000	-.0045	-.0046	-.0023	-.0049	-.0015	.0022	.0020
	Age (if > 24)	-.0007	-.0011	-.0082	-.0014	-.0032	.0029	.0013	.0007	.0146
	Education	.0073	.0194	.0160	.0125	.0145	.0156	.0115	.0215	.0127
	Tenure	-.0451	-.0556	-.0384	-.0466	-.0526	-.0436	-.0386	-.0172	.0069
	Vocat. degree	.0004	-.0001	-.0002	-.0007	-.0011	-.0005	-.0007	-.0001	.0000
	All skills	-.0416	-.0374	-.0354	-.0407	-.0447	-.0306	-.0280	.0071	.0362
Total price effects		.0224	.0527	.0671	.0826	.0883	.0963	.1123	.1168	.1303
of which due to:	Age (if < 25)	-.0089	-.0078	-.0060	-.0046	-.0041	-.0034	-.0040	-.0016	-.0020
	Age (if > 24)	-.0355	-.0516	-.0642	-.0730	-.0650	-.0714	-.0929	-.0914	-.0679
	Education	.0410	.0484	.0333	.0288	.0210	.0181	.0184	.0251	.0186
	Tenure	.0262	.0270	.0225	.0232	.0283	.0280	.0243	.0174	.0222
	Vocat. degree	.0000	-.0002	-.0004	-.0003	-.0006	-.0006	-.0009	-.0010	-.0029
	All skills	.0227	.0158	-.0148	-.0260	-.0203	-.0293	-.0552	-.0515	-.0320

Looking, first, at the contribution of skills to the composition effects, already provides confirmation of their leading role in the determination of wages. The estimated composition effects of all skills together account for the biggest part of overall composition effects, especially up to the 7th decile, for as long as overall composition effects are negative. Their relative significance is much lower at the two highest wage deciles, where the key role is played by employer characteristics.[15]

The negative part of the composition effects appears to come primarily from the tenure variable. The negative tenure effects are, in turn, a good reflection of the decrease in the per capita levels of job-specific experience in the sample, at

[15] For the complete accounting of the decomposition results see Table A7 in the Appendix.

all but the last two wage deciles.[16] The repercussion is a strong push towards higher wage inequality.

In contrast, general job market experience, as proxied by the age dummies, do not have an equally noticeable contribution to the way the wage distribution evolved. The respective composition effects are smaller in magnitude and they follow no regular pattern across the distribution.

Regarding educational attainment, our results are similar with the ones provided for Spain over the same period from Izquierdo and Lacuesta (2006) and for Portugal over 1986-1995 from Machado and Mata (2005). Education is the only skill that has had a positive composition effect at all wage deciles, reflecting the general expansion of the educational system. However, although education has risen almost uniformly across the distribution, the estimated composition effects appear to have led to more wage inequality. Specifically, for the aggregate sample, the composition effect of education at the 9th wage decile is 2.90 times higher than at the 1st decile. For males, the respective ratio is 2.93 and, for females, it is 1.74. This result is rather unexpected, given that rising education increases the proportion of the skilled in the labour force and induces their relative wages to fall, thus, pushing towards lower wage inequality. However, there is another factor to consider. The returns to education tend to be more dispersed among high skilled workers than low skilled workers and, therefore, rising education also pushes towards more wage

[16] The evolution of mean tenure by decile is presented in Figure A1 in the Appendix, along with all the (bootstrapped) mean employee characteristics (X_{jt}).

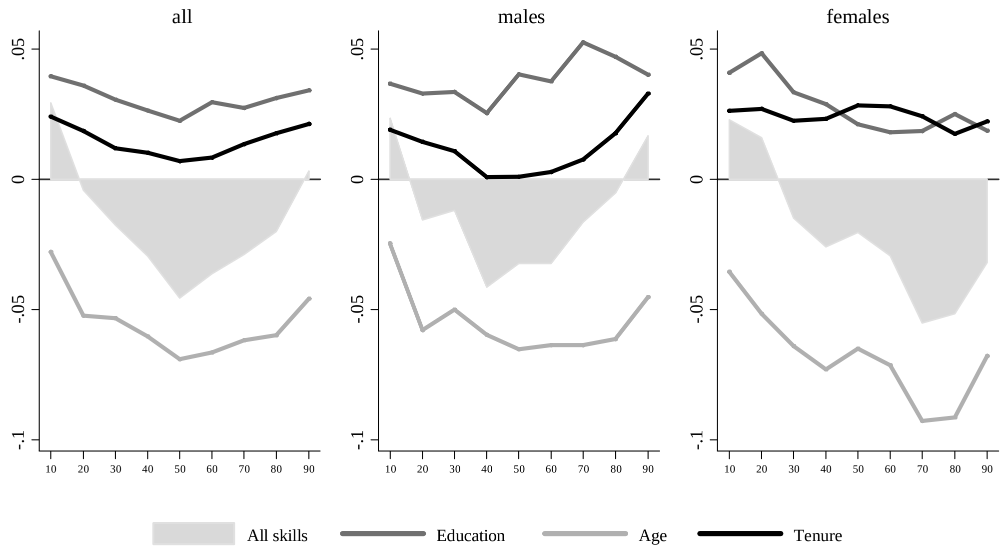
inequality. Which effect dominates is an empirical issue. For the case of Greece in the period 1995-2002, like for Portugal and Spain, the evidence suggests that the latter effect is the one that has prevailed.

Turning the focus on the price effects makes the story even more interesting. As already mentioned, total price effects have had a significant contribution to overall wage changes, but they have been more equally spread across the distribution than composition effects, and their contribution to wage inequality has been relatively mild. Taking this at face value would imply that global market forces, like technical change and trade internationalization, that have been shown to significantly affect the wage distributions of other advanced economies, have only had minor effects on the Greek wage distribution. But, as already mentioned part of the market-forces influence on wages is reflected in the composition effects. Moreover, looking at price effects due to skill-changes in isolation from price effects due to changes in employer characteristics also amends this narrative.

Evidently, even though overall price effects appear to have pushed wages upwards, price effects due to skill are mostly negative, and tend to be larger at the middle wage deciles. This implies that the presence of skilled-biased market forces that have favoured workers in the tails of the wage distribution at the expense of those in the middle of the distribution.

For clarity of exposition, Figure 4 plots the price effects due to education, general labour market experience (age > 24) and job-specific experience (tenure) by decile and sex. Price effects due to total skill changes are also plotted, indicated by the shaded area. Noticeably, for the aggregate sample and for the sample of males only, the price effects form a clear U-shaped pattern across the wage distribution. This pattern is also reflected in the changes of the estimated returns over 1995-2002 for most skill variables.[17]

Figure 4: Changes in price effects due to skill by decile



We interpret this as evidence in favour of the routinization hypothesis, i.e. we take the decrease in the relative returns to skill for workers at the middle wage deciles as a symptom of technology that replaces human labour in routine middle-skilled jobs. To give an example relevant to the Greek tourism industry, with internet bookings of hotel rooms and flights booming, it is only reasonable

[17] Changes in the returns to skill are plotted in Figure A2 in the Appendix. Interestingly, our estimates of the changes in the returns to education over 1995-2002 differ from the equivalent estimates of Cholezas (2004) over 1994-1999. In contrast to our U-shaped pattern, Cholezas finds that changes in the returns to education increase monotonically when moving along the wage distribution. However, apart from the difference in the period under study, Choleza's findings are derived without controlling for employer characteristics.

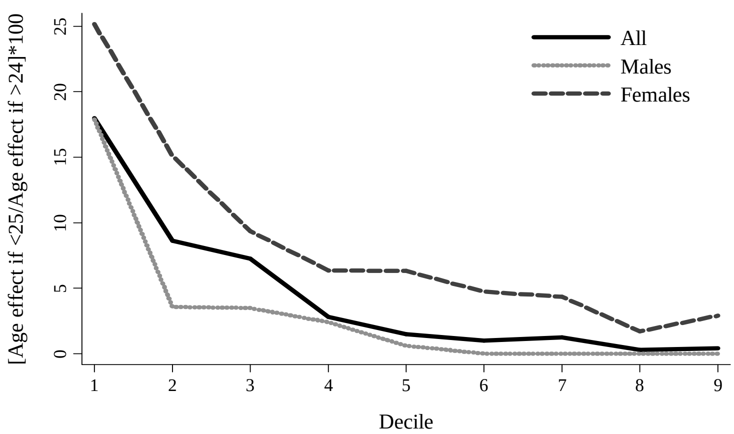
for hotel owners and travel agents to be increasingly frugal in paying for skilled administrative staff. Similarly, with the growing availability of audio guides in museums and archeological sites, the returns to education for tourist guides and translators are also expected to only rise modestly.

When women are examined separately than men the U-shaped pattern is not sustained. Instead, the estimated price-effects display a downward trend when moving along the wage distribution, especially so the price effects due to education and age, reflecting again the respective changes in the returns to skill. To be more accurate, the price effects at the low wage deciles keep their advantage in comparison to the price effects in the middle of the distribution, but the advantage at the upper tail of the wage distribution that is observed for men disappears when looking at women. Given that any skill-biased forces that act in the market should normally affect men and women equally, we perceive this pattern as suggestive of discrimination against females at high-pay, high-profile jobs.

However, the distribution of the skill price-effects across wage deciles only draws part of the picture. Equally important are the direction and the magnitude of the estimated effects. Clearly, in all samples and deciles, price effects due to changes in education and tenure are positive, while price effects due to age are negative and relatively higher in absolute value. The implication is that, with skill composition held constant, market forces would have increased the returns to education and job-specific tenure, but they would have decreased the returns to general labour market experience by a wider margin. And although there is a series of factors that could create a negative age-effect (e.g. discrimination against old people at the workplace), here ones needs to look for a factor that can also explain the U-shaped pattern.

Technical innovation that raises the demand for more educated and more specialized labour force is a candidate market force that could have such an effect. Firstly, with the educational variable measured in number of years, one can take the age price-effect as capturing the unobserved and changing quality of educational qualifications. Academic degrees of older employees, especially those related to technology and computerization, tend to become more and more outdated in time and are, thus, of less value to employers than those of new graduates.

Figure 5: Relative age price-effects of 15-24 and 25-54 year-olds



In addition, with job-specific tenure controlled for, the age variable is capturing general outside-the-job experience, which can be significantly de-valued under conditions of strong technical change. More specifically, an increase in demand for job-specific technology users would favour the educated and long-tenured employees increasing the returns to education and tenure, and it would disfavour the ones that get de-skilled by changing jobs, thus, decreasing the returns to general ('outside-the-job') labour market experience. In this latter case, general labour market experience would work, in fact, as an 'anti-skill'.

To better demonstrate this point, Figure 5 plots the relative price-effects between the youth (minimal experience) and prime-age adult (some experience) groups across the wage distribution. Given that the estimated price-effects for both age-groups are negative at all deciles, Figure 5 presents the relative wage losses due to general labour market experience by age. The result is categorical: the relative wage losses for youth monotonically decrease across the wage distribution. In other words, having minimal outside-the-job experience is less costly for high-skill high-pay jobs (where on-the-job training counts) than for low-skill low-pay jobs (where skills do not count much anyway). Again, this can be explained by forces that raise the demand for job-specific skills as opposed to general labour market skills.

Given the limitations of the age variable, though, spurious age effects are also a possibility. The age dummies provide a poor approximation of the time spent in the labour market and may, therefore, suffer from measurement errors and bias coefficient estimates when participation is not continuous (see Blau and Kahn 2008), which could explain our results for females.

5.4. Market-forces versus predetermined changes

We have now seen the contribution of skill to wage-inequality in detail. But, how do these results inform the debate between revisionists and the supporters of the skill-biased technical change hypothesis? In other words, how does the influence of market forces compare to that of predetermined socio-economic changes in the determination of overall skill-effects and, by extension, to wage inequality?

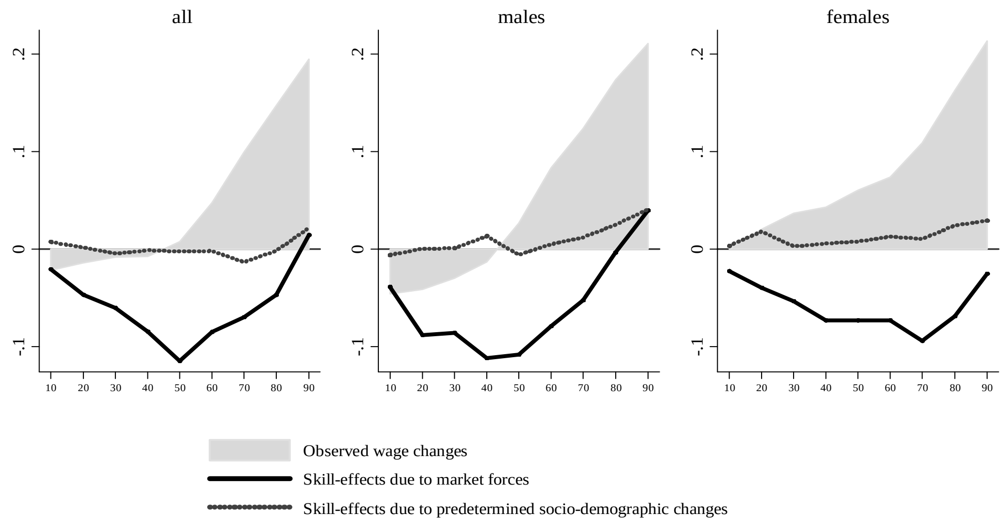
To answer this we need to add all composition skill-effects that could be market-responsive to the price skill-effects. In the group of our skill-variables, we identify tenure as the only one whose composition effects are not strictly predetermined; far from it, we expect tenure composition effects to be most often determined by the employers according to market conditions. In periods of high demand, we expect reduced firing to increase tenure and increased hiring to decrease it, and vice versa in periods of low demand. Which effect prevails is a empirical question; what is certain is that the market unresponsive part of tenure composition is expected to be low.

So, we sum total price-effects of skill with the tenure composition effect and call it the market-responsive part of skill-effect. Then, in Figure 6, we plot it against the sum of the skill composition effects excluding that of tenure (attributable to predetermined socio-demographic changes). The result comes clearly in support of the routinization hypothesis. Not only is the U-shape observed in Figure 5 sustained with the addition of the tenure composition effect to price-effects, but it is also enhanced, and now holds for both men and women. In comparison, the predetermined compositional effects are of very small magnitude, suggesting that they play a secondary role in the determination of skill-effects.

Figure 6 also plots the overall observed wage changes (indicated by the shaded area). This serves to demonstrate two important points. First, that the skill-effects attributable to market forces have contributed both towards the upper-tail wage inequality observed in the wage distribution, and towards the wage-compression observed in the lower half of the distribution. Secondly, as already emphasised several times, that the skill-effects give only part of the picture. There have been other important forces in the Greek labour market over 1995-2002 - either unobserved or reflected in the job characteristics - that were pushing towards more wage inequality across the board, outweighing skill-effects in the lower part of the distribution and reinforcing them in the upper half.

To take the second point further, one needs to ask what lies behind the effects of the constant, the residual and the employer characteristics. Better even, at this stage, is to ask what is least expected to lie behind these effects. And the obvious answer is compositional changes. Most employee characteristics that could carry strong compositional effects have been already controlled for (with the exception perhaps of ethnicity or citizenship status, to account for migration).

Figure 6: Skill-effects by source and observed wage changes



Moreover, if one goes through the employer or job characteristics one by one, s/he will find that most of them are expected to be largerly responsive to market conditions. This is true even for the unobservable institutional forces that could be partly reflected in the constant or the residuals. Therefore, we are more inclined to side against the revisionists' view, in general, and the conclusion of Tsakloglou and Cholezas (2005) about Greece in particular, both of which assign market forces a secondary role in the determination of wage inequality.

6. Conclusion

In this paper we have examined how the wage structure has changed in Greece over 1995-2002 and what has been the contribution of skills to these changes.

We have used a matched employer-employee database, which allowed us to control for both worker and job heterogeneity in Mincerian regressions. Building on the regression results, we used the Machado-Mata decomposition method to separate the part of the wage changes that is due to job and workers' characteristics from the part due to the returns to these characteristics. Ultimately, this enabled us to join together the market-driven price and composition effects and examine them in isolation.

The evidence suggests a small increase in Greek average wages combined with a significant increase in wage inequality, mostly because of sharp wage increases at the upper tail of the distribution. Interestingly, this experience is similar to that observed in the US and the UK during the same period, thus raising a question about the workings of labour market institutions both generally, and particularly in Greece.

The contribution of skill to Greek wage inequality has been important and has come mostly from composition effects. Falling tenure levels at most but the very high wage deciles, have carried much of the inequality-increasing influence of overall composition effects. Markedly, the same holds for rising education across the entire wage distribution. The evidence suggests that even if the returns to education had remained constant, the observed increase in education would have led to increased wage inequality, as high-skilled jobs experience higher wage dispersion than low-skilled jobs. This result, which has also been found for Portugal by Machado and Mata, contradicts standard expectations for a positive relationship between rising education and wage equality. We join Machado and Mata to argue that further investigation is needed to shed light on this finding, given its high policy relevance.

Price effects due to skill have had a relatively lower impact on wage inequality, but, interestingly, they have formed a U-shaped pattern along the wage distribution. Interpreting this evidence to reflect the workings of skill-biased technical change, with the bias affecting mostly those in the middle of the wage distribution, we make a case for the routinization hypothesis. Joining the market-driven part of price and composition skill-effects also produced a U-shaped pattern. In contrast, those remaining effects that are attributable to predetermined changes were of minor scale. The implication is that market forces have been in the driver's seat in the determination of skill-effects, contributing towards higher wage inequality in the upper tail of the distribution and towards wage-compression in the lower tail.

Finally, an unambiguous outcome of the analysis is the key role played by employer or job characteristics. These appear to be driving composition effects at the upper end of the wage distribution, as well as price effects across the board. Given these findings, we believe that a closer examination of the employer/job characteristics and their contribution to wage inequality would be valuable. We intend to take this up in future research.

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Appendix

Table A1: OLS and quantile estimation results, Sample: all, Year: 1995

	OLS	Quantile estimations								
		1	2	3	4	5	6	7	8	9
	Specification 1									
Min. years of education	0.0333	0.0216	0.0242	0.0266	0.0285	0.0311	0.0336	0.0362	0.0390	0.0426
	[0.0004]***	[0.0004]***	[0.0004]***	[0.0004]***	[0.0005]***	[0.0005]***	[0.0006]***	[0.0006]***	[0.0007]***	[0.0009]***
Vocational degree	0.0678	0.0879	0.0879	0.0799	0.0831	0.0804	0.0761	0.0652	0.0498	0.0334
	[0.0060]***	[0.0068]***	[0.0065]***	[0.0060]***	[0.0071]***	[0.0075]***	[0.0076]***	[0.0084]***	[0.0095]***	[0.0114]***
Age:15-24 years old	-0.2806	-0.1407	-0.1608	-0.1907	-0.2239	-0.2530	-0.2792	-0.3050	-0.3381	-0.4094
	[0.0086]***	[0.0096]***	[0.0092]***	[0.0086]***	[0.0101]***	[0.0107]***	[0.0109]***	[0.0121]***	[0.0138]***	[0.0168]***
Age:25-34 years old	-0.1258	-0.0636	-0.0701	-0.0789	-0.0975	-0.1104	-0.1216	-0.1388	-0.1433	-0.1693
	[0.0064]***	[0.0072]***	[0.0070]***	[0.0064]***	[0.0076]***	[0.0081]***	[0.0082]***	[0.0092]***	[0.0105]***	[0.0127]***
Age:35-44 years old	0.0051	0.0378	0.0381	0.0397	0.0223	0.0154	0.0081	-0.0019	-0.0013	-0.0181
	[0.0061]	[0.0068]***	[0.0065]***	[0.0060]***	[0.0072]***	[0.0076]**	[0.0077]	[0.0085]	[0.0097]	[0.0117]
Age:45-54 years old	0.0475	0.0519	0.0605	0.0613	0.0535	0.0509	0.0476	0.0422	0.0426	0.0402
	[0.0060]***	[0.0068]***	[0.0065]***	[0.0060]***	[0.0070]***	[0.0075]***	[0.0076]***	[0.0084]***	[0.0095]***	[0.0113]***
Tenure in years	0.0267	0.0283	0.0286	0.0288	0.0290	0.0291	0.0283	0.0283	0.0259	0.0213
	[0.0007]***	[0.0008]***	[0.0007]***	[0.0007]***	[0.0008]***	[0.0008]***	[0.0008]***	[0.0009]***	[0.0010]***	[0.0013]***
Tenure squared/100	-0.0283	-0.0307	-0.0284	-0.0286	-0.0290	-0.0297	-0.0276	-0.0310	-0.0265	-0.0204
	[0.0023]***	[0.0028]***	[0.0026]***	[0.0024]***	[0.0028]***	[0.0030]***	[0.0030]***	[0.0033]***	[0.0037]***	[0.0044]***
Sex: female	-0.1799	-0.1002	-0.1248	-0.1446	-0.1594	-0.1773	-0.1916	-0.2122	-0.2404	-0.2674
	[0.0032]***	[0.0037]***	[0.0035]***	[0.0032]***	[0.0037]***	[0.0040]***	[0.0040]***	[0.0044]***	[0.0049]***	[0.0059]***
Constant	1.4314	1.1521	1.2213	1.2764	1.3395	1.3936	1.4550	1.5290	1.6302	1.8066
	[0.0074]***	[0.0077]***	[0.0076]***	[0.0072]***	[0.0086]***	[0.0092]***	[0.0094]***	[0.0104]***	[0.0118]***	[0.0140]***
Observations	38071	38071	38071	38071	38071	38071	38071	38071	38071	38071
R-squared	0.47									

Table A1: OLS and quantile estimation results, Sample: all, Year: 1995 (cont.)

	Specification 2									
Min. years of education	0.0173	0.0122	0.0137	0.0150	0.0157	0.0164	0.0164	0.0177	0.0184	0.0194
	[0.0006]***	[0.0007]***	[0.0007]***	[0.0006]***	[0.0006]***	[0.0006]***	[0.0007]***	[0.0007]***	[0.0008]***	[0.0012]***
Vocational degree	0.0643	0.0549	0.0551	0.0645	0.0686	0.0692	0.0705	0.0745	0.0607	0.0727
	[0.0057]***	[0.0076]***	[0.0072]***	[0.0061]***	[0.0060]***	[0.0064]***	[0.0069]***	[0.0072]***	[0.0082]***	[0.0120]***
Age:15-24 years old	-0.2202	-0.1249	-0.1540	-0.1679	-0.1796	-0.1874	-0.2082	-0.2284	-0.2596	-0.2953
	[0.0078]***	[0.0103]***	[0.0098]***	[0.0083]***	[0.0082]***	[0.0087]***	[0.0094]***	[0.0098]***	[0.0113]***	[0.0166]***
Age:25-34 years old	-0.1031	-0.0604	-0.0692	-0.0751	-0.0824	-0.0829	-0.0947	-0.1088	-0.1191	-0.1363
	[0.0059]***	[0.0076]***	[0.0074]***	[0.0062]***	[0.0062]***	[0.0065]***	[0.0070]***	[0.0075]***	[0.0086]***	[0.0126]***
Age:35-44 years old	0.0100	0.0345	0.0279	0.0236	0.0174	0.0211	0.0141	0.0067	-0.0022	-0.0107
	[0.0055]*	[0.0072]***	[0.0069]***	[0.0059]***	[0.0058]***	[0.0061]***	[0.0066]**	[0.0069]	[0.0079]	[0.0116]
Age:45-54 years old	0.0420	0.0533	0.0492	0.0447	0.0423	0.0472	0.0389	0.0363	0.0295	0.0259
	[0.0054]***	[0.0072]***	[0.0069]***	[0.0058]***	[0.0057]***	[0.0060]***	[0.0065]***	[0.0068]***	[0.0078]***	[0.0113]**
Tenure in years	0.0221	0.0228	0.0234	0.0237	0.0233	0.0226	0.0221	0.0208	0.0194	0.0171
	[0.0006]***	[0.0008]***	[0.0008]***	[0.0007]***	[0.0006]***	[0.0007]***	[0.0007]***	[0.0008]***	[0.0009]***	[0.0013]***
Tenure squared/100	-0.0197	-0.0209	-0.0205	-0.0203	-0.0183	-0.0159	-0.0155	-0.0144	-0.0148	-0.0137
	[0.0021]***	[0.0030]***	[0.0028]***	[0.0023]***	[0.0023]***	[0.0024]***	[0.0026]***	[0.0027]***	[0.0030]***	[0.0045]***
Sex: female	-0.1513	-0.0876	-0.1100	-0.1239	-0.1354	-0.1487	-0.1594	-0.1725	-0.1889	-0.2059
	[0.0031]***	[0.0044]***	[0.0041]***	[0.0034]***	[0.0033]***	[0.0034]***	[0.0037]***	[0.0038]***	[0.0043]***	[0.0062]***
Constant	1.6430	1.3550	1.4441	1.4700	1.4914	1.6031	1.6843	1.7810	1.8638	2.0734
	[0.0346]***	[0.0436]***	[0.0433]***	[0.0369]***	[0.0360]***	[0.0381]***	[0.0407]***	[0.0432]***	[0.0491]***	[0.0690]***
Observations	37901	37901	37901	37901	37901	37901	37901	37901	37901	37901
R-squared	0.58									

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors in brackets. Specification 1 controls only for the individual characteristics listed. Specification 2 also controls for observable employer and job characteristics, namely: sector, occupation, firm ownership, region, firm size, main product market and level of collective agreement coverage.

Table A2: OLS and quantile estimation results, Sample: all, Year: 2002

	OLS	Quantile estimations								
		1	2	3	4	5	6	7	8	9
	Specification 1									
Min. years of education	0.0498	0.0335	0.0377	0.0416	0.0450	0.0473	0.0500	0.0525	0.0551	0.0602
	[0.0005]***	[0.0006]***	[0.0005]***	[0.0005]***	[0.0006]***	[0.0005]***	[0.0007]***	[0.0007]***	[0.0009]***	[0.0011]***
Vocational degree	-0.0462	-0.0045	-0.0296	-0.0428	-0.0512	-0.0457	-0.0504	-0.0527	-0.0598	-0.0614
	[0.0057]***	[0.0077]	[0.0061]***	[0.0062]***	[0.0062]***	[0.0060]***	[0.0075]***	[0.0076]***	[0.0086]***	[0.0104]***
Age:15-24 years old	-0.3486	-0.1722	-0.1989	-0.2298	-0.2813	-0.3321	-0.3796	-0.4140	-0.4776	-0.5348
	[0.0094]***	[0.0126]***	[0.0100]***	[0.0102]***	[0.0103]***	[0.0098]***	[0.0124]***	[0.0127]***	[0.0144]***	[0.0173]***
Age:25-34 years old	-0.2141	-0.1011	-0.1211	-0.1429	-0.1774	-0.2068	-0.2404	-0.2540	-0.2851	-0.3153
	[0.0078]***	[0.0103]***	[0.0082]***	[0.0084]***	[0.0085]***	[0.0081]***	[0.0103]***	[0.0105]***	[0.0119]***	[0.0144]***
Age:35-44 years old	-0.0699	-0.0238	-0.0228	-0.0231	-0.0376	-0.0581	-0.0779	-0.0833	-0.1132	-0.1313
	[0.0075]***	[0.0100]**	[0.0080]***	[0.0081]***	[0.0082]***	[0.0079]***	[0.0010]***	[0.0101]***	[0.0114]***	[0.0138]***
Age:45-54 years old	-0.0111	0.0354	0.0372	0.0323	0.0132	-0.0081	-0.0249	-0.0321	-0.0534	-0.0601
	[0.0073]	[0.0099]***	[0.0078]***	[0.0080]***	[0.0080]*	[0.0078]	[0.0097]**	[0.0098]***	[0.0110]***	[0.0133]***
Tenure in years	0.0299	0.0315	0.0300	0.0300	0.0301	0.0308	0.0307	0.0303	0.0295	0.0269
	[0.0006]***	[0.0009]***	[0.0007]***	[0.0007]***	[0.0007]***	[0.0007]***	[0.0008]***	[0.0008]***	[0.0009]***	[0.0011]***
Tenure squared/100	-0.0216	-0.0239	-0.0107	-0.0079	-0.0085	-0.0137	-0.0188	-0.0230	-0.0282	-0.0314
	[0.0023]***	[0.0034]***	[0.0026]***	[0.0026]***	[0.0026]***	[0.0024]***	[0.0030]***	[0.0031]***	[0.0035]***	[0.0042]***
Sex: female	-0.1559	-0.0973	-0.1131	-0.1262	-0.1395	-0.1479	-0.1585	-0.1704	-0.1896	-0.2201
	[0.0034]***	[0.0047]***	[0.0037]***	[0.0037]***	[0.0037]***	[0.0035]***	[0.0044]***	[0.0045]***	[0.0050]***	[0.0061]***
Constant	1.3589	1.0599	1.1351	1.1903	1.2575	1.3330	1.4161	1.5016	1.6273	1.7845
	[0.0088]***	[0.0111]***	[0.0089]***	[0.0092]***	[0.0094]***	[0.0092]***	[0.0117]***	[0.0119]***	[0.0135]***	[0.0161]***
Observations	41449	41449	41449	41449	41449	41449	41449	41449	41449	41449
R-squared	0.53									

Table A2: OLS and quantile estimation results, Sample: all, Year: 2002 (cont.)

	Specification 2									
Min. years of education	0.0204	0.0162	0.0174	0.0180	0.0184	0.0186	0.0192	0.0201	0.0212	0.0223
	[0.0007]***	[0.0008]***	[0.0007]***	[0.0007]***	[0.0007]***	[0.0006]***	[0.0008]***	[0.0008]***	[0.0009]***	[0.0014]***
Vocational degree	-0.0101	-0.0053	-0.0080	-0.0115	-0.0093	-0.0102	-0.0122	-0.0129	-0.0216	-0.0194
	[0.0052]*	[0.0063]	[0.0057]	[0.0052]**	[0.0055]*	[0.0049]**	[0.0060]**	[0.0060]**	[0.0071]***	[0.0108]*
Age:15-24 years old	-0.3000	-0.1552	-0.2030	-0.2230	-0.2443	-0.2608	-0.2894	-0.3055	-0.3453	-0.3907
	[0.0084]***	[0.0101]***	[0.0091]***	[0.0083]***	[0.0089]***	[0.0079]***	[0.0099]***	[0.0099]***	[0.0115]***	[0.0179]***
Age:25-34 years old	-0.1864	-0.0900	-0.1305	-0.1423	-0.1558	-0.1659	-0.1798	-0.1881	-0.2073	-0.2141
	[0.0069]***	[0.0082]***	[0.0075]***	[0.0068]***	[0.0073]***	[0.0065]***	[0.0081]***	[0.0082]***	[0.0095]***	[0.0147]***
Age:35-44 years old	-0.0629	-0.0143	-0.0406	-0.0424	-0.0519	-0.0525	-0.0591	-0.0630	-0.0685	-0.0625
	[0.0067]***	[0.0080]*	[0.0072]***	[0.0066]***	[0.0071]***	[0.0063]***	[0.0078]***	[0.0078]***	[0.0091]***	[0.0140]***
Age:45-54 years old	-0.0163	0.0201	-0.0010	-0.0006	-0.0065	-0.0107	-0.0193	-0.0242	-0.0260	-0.0203
	[0.0065]**	[0.0077]***	[0.0070]	[0.0064]	[0.0068]	[0.0061]*	[0.0076]**	[0.0076]***	[0.0089]***	[0.0136]
Tenure in years	0.0228	0.0295	0.0270	0.0250	0.0240	0.0227	0.0224	0.0213	0.0199	0.0174
	[0.0006]***	[0.0007]***	[0.0006]***	[0.0006]***	[0.0006]***	[0.0005]***	[0.0007]***	[0.0007]***	[0.00086]***	[0.0012]***
Tenure squared/100	-0.0184	-0.0334	-0.0239	-0.0167	-0.0149	-0.0119	-0.0124	-0.0116	-0.0113	-0.0087
	[0.0021]***	[0.0025]***	[0.0023]***	[0.0021]***	[0.0022]***	[0.0019]***	[0.0024]***	[0.0024]***	[0.0028]***	[0.0044]**
Sex: female	-0.1242	-0.0745	-0.0803	-0.0881	-0.1020	-0.1107	-0.1229	-0.1345	-0.1536	-0.1831
	[0.0032]***	[0.0040]***	[0.0036]***	[0.0032]***	[0.0034]***	[0.0030]***	[0.0037]***	[0.0037]***	[0.0041]***	[0.0066]***
Constant	1.7875	1.3543	1.4882	1.5625	1.6458	1.7302	1.8099	1.8759	2.1417	2.2502
	[0.0332]***	[0.0395]***	[0.0358]***	[0.0326]***	[0.0348]***	[0.0309]***	[0.0386]***	[0.0386]***	[0.0448]***	[0.0692]***
Observations	41449	41449	41449	41449	41449	41449	41449	41449	41449	41449
R-squared	0.63									

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors in brackets. Specification 1 controls only for the individual characteristics listed. Specification 2 also controls for observable employer and job characteristics, namely: sector, occupation, firm ownership, region, firm size, main product market and level of collective agreement coverage.

Table A3: OLS and quantile estimation results, Sample: males, Year: 1995

	OLS	Quantile estimations								
		1	2	3	4	5	6	7	8	9
	Specification 1									
Min. years of education	0.0316	0.0230	0.0244	0.0257	0.0278	0.0296	0.0316	0.0340	0.0352	0.0382
	[0.0005]***	[0.0006]***	[0.0006]***	[0.0006]***	[0.0006]***	[0.0006]***	[0.0007]***	[0.00086]***	[0.0010]***	[0.0012]***
Vocational degree	0.0652	0.0825	0.0848	0.0766	0.0804	0.0810	0.0720	0.0558	0.0421	0.0298
	[0.0066]***	[0.0080]***	[0.0085]***	[0.0078]***	[0.0077]***	[0.0078]***	[0.0087]***	[0.0100]***	[0.0114]***	[0.0133]**
Age:15-24 years old	-0.3391	-0.1738	-0.2154	-0.2436	-0.2806	-0.3150	-0.3567	-0.4006	-0.4440	-0.5306
	[0.0117]***	[0.0142]***	[0.0150]***	[0.0138]***	[0.0137]***	[0.0140]***	[0.0155]***	[0.0179]***	[0.0207]***	[0.0242]***
Age:25-34 years old	-0.1529	-0.0807	-0.0929	-0.1119	-0.1311	-0.1506	-0.1646	-0.1844	-0.1921	-0.2194
	[0.0078]***	[0.0093]***	[0.0099]***	[0.0091]***	[0.0091]***	[0.0093]***	[0.0103]***	[0.0120]***	[0.0139]***	[0.0163]***
Age:35-44 years old	-0.0056	0.0351	0.0321	0.0257	0.0044	-0.0066	-0.0147	-0.0256	-0.0247	-0.0331
	[0.0072]	[0.0088]***	[0.0093]***	[0.0085]***	[0.0084]	[0.0086]	[0.0095]	[0.0109]**	[0.0127]*	[0.0148]**
Age:45-54 years old	0.0531	0.0599	0.0669	0.0672	0.0547	0.0511	0.0507	0.0468	0.0494	0.0459
	[0.0070]***	[0.0086]***	[0.0091]***	[0.0083]***	[0.0082]***	[0.0084]***	[0.0092]***	[0.0106]***	[0.0122]***	[0.0142]***
Tenure in years	0.0265	0.0317	0.0311	0.0302	0.0307	0.0299	0.0282	0.0267	0.0232	0.0173
	[0.0008]***	[0.0011]***	[0.0011]***	[0.0010]***	[0.0010]***	[0.0010]***	[0.0011]***	[0.0013]***	[0.0015]***	[0.0017]***
Tenure squared/100	-0.0307	-0.0417	-0.0374	-0.0357	-0.0379	-0.0369	-0.0332	-0.0315	-0.0249	-0.0147
	[0.0029]***	[0.0038]***	[0.0039]***	[0.0035]***	[0.0034]***	[0.0035]***	[0.0038]***	[0.0044]***	[0.0051]***	[0.0059]**
Constant	1.4696	1.1286	1.2191	1.2989	1.3634	1.4348	1.5100	1.5952	1.7211	1.9077
	[0.0091]***	[0.0104]***	[0.0114]***	[0.0107]***	[0.0107]***	[0.0109]***	[0.0120]***	[0.01387]***	[0.0157]***	[0.0179]***
Observations	25994	25994	25994	25994	25994	25994	25994	25994	25994	25994
R-squared	0.40									

Table A3: OLS and quantile estimation results, Sample: males, Year: 1995 (cont.)

	Specification 2									
Min. years of education	0.0166	0.0127	0.0131	0.0148	0.0158	0.0152	0.0158	0.0159	0.0175	0.0189
	[0.0007]***	[0.0008]***	[0.0008]***	[0.0007]***	[0.0008]***	[0.0008]***	[0.0007]***	[0.0008]***	[0.0010]***	[0.0014]***
Vocational degree	0.0614	0.0521	0.0549	0.0635	0.0668	0.0640	0.0668	0.0626	0.0633	0.0560
	[0.0063]***	[0.0077]***	[0.0076]***	[0.0063]***	[0.0073]***	[0.0070]***	[0.0069]***	[0.0074]***	[0.0093]***	[0.0127]***
Age:15-24 years old	-0.2713	-0.1503	-0.1824	-0.2004	-0.2185	-0.2355	-0.2704	-0.3059	-0.3418	-0.4120
	[0.0105]***	[0.0127]***	[0.0128]***	[0.0106]***	[0.0122]***	[0.0117]***	[0.0116]***	[0.0125]***	[0.0158]***	[0.0216]***
Age:25-34 years old	-0.1287	-0.0875	-0.0877	-0.1017	-0.1052	-0.1109	-0.1264	-0.1359	-0.1475	-0.1770
	[0.0070]***	[0.0082]***	[0.0084]***	[0.0070]***	[0.0081]***	[0.0078]***	[0.0078]***	[0.0084]***	[0.0106]***	[0.0145]***
Age:35-44 years old	-0.0016	0.0215	0.0188	0.0134	0.0075	0.0060	0.0032	-0.0016	-0.0101	-0.0240
	[0.0065]	[0.0078]***	[0.0078]**	[0.0065]**	[0.0075]	[0.0072]	[0.0071]	[0.0077]	[0.0096]	[0.0131]*
Age:45-54 years old	0.0452	0.0569	0.0576	0.0488	0.0477	0.0488	0.0466	0.0412	0.0332	0.0354
	[0.0063]***	[0.0077]***	[0.0077]***	[0.0063]***	[0.0073]***	[0.0070]***	[0.0069]***	[0.0074]***	[0.0092]***	[0.0126]***
Tenure in years	0.0224	0.0237	0.0249	0.0247	0.0251	0.0244	0.0239	0.0218	0.0192	0.0152
	[0.0008]***	[0.0010]***	[0.0010]***	[0.0008]***	[0.0009]***	[0.0009]***	[0.0009]***	[0.0009]***	[0.0012]***	[0.0016]***
Tenure squared/100	-0.0233	-0.0240	-0.0264	-0.0252	-0.0264	-0.0252	-0.0253	-0.0208	-0.0169	-0.0123
	[0.0026]***	[0.0033]***	[0.0033]***	[0.0027]***	[0.0031]***	[0.0029]***	[0.0029]***	[0.0031]***	[0.0039]***	[0.0054]**
Constant	1.6815	1.3497	1.3808	1.4119	1.5052	1.5677	1.7074	1.8968	2.0053	2.1575
	[0.0582]***	[0.0697]***	[0.0696]***	[0.0576]***	[0.0663]***	[0.0635]***	[0.0626]***	[0.0674]***	[0.0842]***	[0.1157]***
Observations	25882	25882	25882	25882	25882	25882	25882	25882	25882	25882
R-squared	0.53									

Notes: as in Table A1.

Table A4: OLS and quantile estimation results, Sample: males, Year: 2002

	OLS	Quantile estimations								
		1	2	3	4	5	6	7	8	9
	Specification 1									
Min. years of education	0.0490	0.0345	0.0383	0.0417	0.0452	0.0464	0.0491	0.0515	0.0539	0.0579
	[0.0007]***	[0.0008]***	[0.0007]***	[0.0007]***	[0.0007]***	[0.0007]***	[0.0009]***	[0.0009]***	[0.0010]***	[0.0014]***
Vocational degree	-0.0527	-0.0172	-0.0349	-0.0449	-0.0572	-0.0529	-0.0568	-0.0591	-0.0712	-0.0845
	[0.0067]***	[0.0086]**	[0.0080]***	[0.0078]***	[0.0076]***	[0.0076]***	[0.0089]***	[0.0086]***	[0.0091]***	[0.0126]***
Age:15-24 years old	-0.3965	-0.1837	-0.2237	-0.2564	-0.3091	-0.3652	-0.4267	-0.4783	-0.5557	-0.6599
	[0.0122]***	[0.0153]***	[0.0142]***	[0.0140]***	[0.0137]***	[0.0138]***	[0.0162]***	[0.0157]***	[0.0167]***	[0.0233]***
Age:25-34 years old	-0.2453	-0.1201	-0.1441	-0.1597	-0.1977	-0.2337	-0.2754	-0.2944	-0.3305	-0.3756
	[0.0095]***	[0.0117]***	[0.0109]***	[0.0108]***	[0.0106]***	[0.0106]***	[0.0125]***	[0.0126]***	[0.0130]***	[0.0182]***
Age:35-44 years old	-0.0740	-0.0286	-0.0267	-0.0215	-0.0419	-0.0649	-0.0829	-0.0894	-0.1168	-0.1405
	[0.0091]***	[0.0113]**	[0.0105]**	[0.0104]**	[0.0102]***	[0.0102]***	[0.0120]***	[0.0116]***	[0.0123]***	[0.0172]***
Age:45-54 years old	-0.0045	0.0497	0.0472	0.0431	0.0245	0.0038	-0.0144	-0.0280	-0.0518	-0.0641
	[0.0087]	[0.0109]***	[0.0101]***	[0.0100]***	[0.0097]**	[0.0097]	[0.0114]	[0.0110]**	[0.0117]***	[0.0163]***
Tenure in years	0.0285	0.0314	0.0311	0.0311	0.0315	0.0310	0.0299	0.0293	0.0274	0.0225
	[0.0008]***	[0.0011]***	[0.0010]***	[0.0010]***	[0.0009]***	[0.0009]***	[0.0011]***	[0.0010]***	[0.0011]***	[0.0016]***
Tenure squared/100	-0.0193	-0.0199	-0.0127	-0.0113	-0.0147	-0.0177	-0.0205	-0.0242	-0.0263	-0.0243
	[0.0029]***	[0.0040]***	[0.0036]***	[0.0034]***	[0.0033]***	[0.0033]***	[0.0038]***	[0.0037]***	[0.0039]***	[0.0055]***
Constant	1.3888	1.0507	1.1330	1.1909	1.2608	1.3579	1.4513	1.5417	1.6788	1.8715
	[0.0109]***	[0.0130]***	[0.0123]***	[0.0123]***	[0.0121]***	[0.0123]***	[0.0145]***	[0.0139]***	[0.0147]***	[0.0203]***
Observations	25964	25964	25964	25964	25964	25964	25964	25964	25964	25964
R-squared	0.52									

Table A4: OLS and quantile estimation results, Sample: males, Year: 2002 (cont.)

	Specification 2									
Min. years of education	0.0208	0.0165	0.0168	0.0183	0.0184	0.0191	0.0195	0.0209	0.0217	0.0223
	[0.0008]***	[0.0011]***	[0.0009]***	[0.0009]***	[0.0009]***	[0.0010]***	[0.0009]***	[0.0010]***	[0.0012]***	[0.0015]***
Vocational degree	-0.0124	-0.0123	-0.0146	-0.0116	-0.0128	-0.0095	-0.0104	-0.0184	-0.0239	-0.0202
	[0.0063]**	[0.0082]	[0.0067]**	[0.0067]*	[0.0069]*	[0.0073]	[0.0067]	[0.0074]**	[0.0092]***	[0.0116]*
Age:15-24 years old	-0.3346	-0.1822	-0.2342	-0.2486	-0.2839	-0.3012	-0.3179	-0.3507	-0.3895	-0.4229
	[0.0110]***	[0.0142]***	[0.0115]***	[0.0117]***	[0.0120]***	[0.0128]***	[0.0118]***	[0.0130***	[0.0163]***	[0.0208]***
Age:25-34 years old	-0.2141	-0.1111	-0.1552	-0.1634	-0.1860	-0.2022	-0.2115	-0.2249	-0.2441	-0.2434
	[0.0085]***	[0.0108]***	[0.0088]***	[0.0090]***	[0.0092]***	[0.0099]***	[0.0091]***	[0.0101]***	[0.0126]***	[0.0162]***
Age:35-44 years old	-0.0685	-0.0254	-0.0470	-0.0473	-0.0578	-0.0618	-0.0637	-0.0718	-0.0760	-0.0621
	[0.0081]***	[0.0105]**	[0.0085]***	[0.0087]***	[0.0089]***	[0.0095]***	[0.0087]***	[0.0096]***	[0.0120]***	[0.0152]***
Age:45-54 years old	-0.0165	0.0215	0.0004	0.0052	-0.0048	-0.0129	-0.0202	-0.0241	-0.0289	-0.0189
	[0.0077]**	[0.0099]**	[0.0081]	[0.0082]	[0.0084]	[0.0090]	[0.0083]**	[0.0091]***	[0.0114]**	[0.0144]
Tenure in years	0.0216	0.0282	0.0267	0.0255	0.0242	0.0232	0.0227	0.0211	0.0192	0.0162
	[0.0007]***	[0.0010]***	[0.0008]***	[0.0008]***	[0.0008]***	[0.0009]***	[0.0008]***	[0.0009]***	[0.0011]***	[0.0014]***
Tenure squared/100	-0.0165	-0.0281	-0.0239	-0.0210	-0.0191	-0.0170	-0.0165	-0.0143	-0.0109	-0.0074
	[0.0026]***	[0.0034]***	[0.0028]***	[0.0028]***	[0.0028]***	[0.0030]***	[0.0028]***	[0.0031]***	[0.0039]***	[0.0049]
Constant	1.8026	1.3386	1.4204	1.5307	1.6210	1.8157	1.8786	1.9067	2.2022	2.2230
	[0.0490]***	[0.0578]***	[0.0495]***	[0.0512]***	[0.0528]***	[0.0565]***	[0.0520]***	[0.0567]***	[0.0658]***	[0.0828]***
Observations	25964	25964	25964	25964	25964	25964	25964	25964	25964	25964
R-squared	0.62									

Notes: as in Table A1.

Table A5: OLS and quantile estimation results, Sample: females, Year: 1995

	OLS	Quantile estimations								
		1	2	3	4	5	6	7	8	9
	Specification 1									
Min. years of education	0.0360	0.0161	0.0204	0.0242	0.0273	0.0320	0.0346	0.0376	0.0428	0.0501
	[0.0007]***	[0.0008]***	[0.0005]***	[0.0006]***	[0.0008]***	[0.0008]***	[0.0009]***	[0.0010]***	[0.0011]***	[0.0019]***
Vocational degree	0.1027	0.0942	0.0878	0.1216	0.1121	0.1057	0.1181	0.1096	0.0870	0.0808
	[0.0210]***	[0.0236]***	[0.0166]***	[0.0189]***	[0.0225]***	[0.0242]***	[0.0256]***	[0.0278]***	[0.0286]***	[0.0470]*
Age:15-24 years old	-0.1971	-0.0843	-0.1041	-0.1259	-0.1594	-0.1830	-0.1780	-0.2000	-0.2187	-0.3010
	[0.0143]***	[0.0161]***	[0.0115]***	[0.0128]***	[0.0154]***	[0.0166]***	[0.0177]***	[0.0193]***	[0.0202]***	[0.0335]***
Age:25-34 years old	-0.0580	-0.0140	-0.0131	-0.0216	-0.0297	-0.0449	-0.0355	-0.0491	-0.0545	-0.0949
	[0.01278]***	[0.0142]	[0.0102]	[0.0114]*	[0.0137]**	[0.0147]***	[0.0157]**	[0.0171]***	[0.0178]***	[0.0295]***
Age:35-44 years old	0.0526	0.0525	0.0676	0.0737	0.0660	0.0609	0.0739	0.0673	0.0661	0.0259
	[0.0122]***	[0.0138]***	[0.0099]***	[0.0110]***	[0.0132]***	[0.0142]***	[0.0150]***	[0.0163]***	[0.0169]***	[0.0278]
Age:45-54 years old	0.0562	0.0373	0.0582	0.0668	0.0589	0.0660	0.0710	0.0637	0.0673	0.0380
	[0.0125]***	[0.0142]***	[0.0101]***	[0.0113]***	[0.0135]***	[0.0145]***	[0.0154]***	[0.0166]***	[0.0172]***	[0.0282]
Tenure in years	0.0245	0.0236	0.0243	0.0255	0.0244	0.0246	0.0247	0.0257	0.0256	0.0221
	[0.0011]***	[0.0012]***	[0.0009]***	[0.0010]***	[0.0012]***	[0.0013]***	[0.0013]***	[0.0015]***	[0.0015]***	[0.0024]***
Tenure squared/100	-0.0149	-0.0217	-0.0143	-0.0142	-0.0079	-0.0070	-0.0066	-0.0116	-0.0173	-0.0134
	[0.0044]***	[0.0051]***	[0.0036]***	[0.0040]***	[0.0048]*	[0.0051]	[0.0054]	[0.0058]**	[0.0059]***	[0.0095]
Constant	1.1761	1.1117	1.1169	1.1260	1.1588	1.1708	1.1913	1.2325	1.2706	1.3881
	[0.0136]***	[0.0147]***	[0.0105]***	[0.0118]***	[0.0144]***	[0.0157]***	[0.0169]***	[0.0184]***	[0.0191]***	[0.0308]***
Observations	12077	12077	12077	12077	12077	12077	12077	12077	12077	12077
R-squared	0.43									

Table A5: OLS and quantile estimation results, Sample: females, Year: 1995 (cont.)

	Specification 2									
Min. years of education	0.0151	0.0089	0.0093	0.0103	0.0112	0.0125	0.0138	0.0148	0.0159	0.0183
	[0.0010]***	[0.0012]***	[0.0011]***	[0.0012]***	[0.0009]***	[0.0011]***	[0.0011]***	[0.0013]***	[0.0016]***	[0.0019]***
Vocational degree	0.0681	0.0295	0.0226	0.0518	0.0624	0.0771	0.0876	0.0896	0.0586	0.0962
	[0.0186]***	[0.0212]	[0.0211]	[0.0220]**	[0.0175]***	[0.0214]***	[0.0204]***	[0.0242]***	[0.0288]**	[0.0353]***
Age:15-24 years old	-0.1493	-0.0914	-0.0913	-0.1116	-0.1193	-0.1295	-0.1337	-0.1382	-0.1490	-0.2126
	[0.0127]***	[0.0145]***	[0.0145]***	[0.0150]***	[0.0120]***	[0.0147]***	[0.0142]***	[0.0169]***	[0.0201]***	[0.0251]***
Age:25-34 years old	-0.0405	-0.0077	-0.0056	-0.0143	-0.0202	-0.0293	-0.0360	-0.0388	-0.0406	-0.0748
	[0.0113]***	[0.0129]	[0.0128]	[0.0133]	[0.0107]*	[0.0131]**	[0.0126]***	[0.0149]***	[0.0178]**	[0.0219]***
Age:35-44 years old	0.0524	0.0648	0.0667	0.0568	0.0561	0.0544	0.0503	0.0479	0.0486	0.0133
	[0.0108]***	[0.0124]***	[0.0124]***	[0.0129]***	[0.0103]***	[0.0125]***	[0.0120]***	[0.0142]***	[0.0168]***	[0.0204]
Age:45-54 years old	0.0480	0.0430	0.0520	0.0482	0.0511	0.0471	0.0405	0.0464	0.0468	0.0183
	[0.0110]***	[0.0127]***	[0.0127]***	[0.0132]***	[0.0105]***	[0.0127]***	[0.0122]***	[0.0144]***	[0.0170]***	[0.0206]
Tenure in years	0.0188	0.0239	0.0212	0.0195	0.0191	0.0182	0.0176	0.0172	0.0152	0.0121
	[0.0010]***	[0.0011]***	[0.0011]***	[0.0012]***	[0.0009]***	[0.0011]***	[0.0011]***	[0.0013]***	[0.0015]***	[0.0019]***
Tenure squared/100	-0.0063	-0.0323	-0.0162	-0.0060	-0.0056	-0.0009	0.0023	0.0025	0.0118	0.0165
	[0.0040]	[0.0045]***	[0.0044]***	[0.0047]	[0.0037]	[0.0046]	[0.0043]	[0.0051]	[0.0060]**	[0.0074]**
Constant	1.4723	1.3263	1.3571	1.3595	1.4001	1.4654	1.5310	1.5905	1.6070	1.7782
	[0.0390]***	[0.0424]***	[0.0446]***	[0.0458]***	[0.0369]***	[0.0447]***	[0.0427]***	[0.0499]***	[0.0600]***	[0.0697]***
Observations	12019	12019	12019	12019	12019	12019	12019	12019	12019	12019
R-squared	0.57									

Notes: as in Table A1.

Table A6: OLS and quantile estimation results, Sample: females, Year: 2002

	OLS	Quantile estimations								
		1	2	3	4	5	6	7	8	9
	Specification 1									
Min. years of education	0.0497	0.0307	0.0341	0.0380	0.0430	0.0455	0.0504	0.0517	0.0549	0.0606
	[0.0009]***	[0.0009]***	[0.0008]***	[0.00071]***	[0.0009]***	[0.0011]***	[0.0011]***	[0.0012]***	[0.0015]***	[0.0017]***
Vocational degree	-0.0225	0.0121	-0.0148	-0.0314	-0.0346	-0.0300	-0.0348	-0.0401	-0.0353	0.0061
	[0.0111]**	[0.0133]	[0.0113]	[0.00991]***	[0.0113]***	[0.0131]**	[0.0138]**	[0.0134]***	[0.0167]**	[0.0185]
Age:15-24 years old	-0.2834	-0.1571	-0.1660	-0.1977	-0.2599	-0.2895	-0.3239	-0.3359	-0.3476	-0.4266
	[0.0161]***	[0.0193]***	[0.0167]***	[0.01421]***	[0.0164]***	[0.0189]***	[0.0200]***	[0.0195]***	[0.0245]***	[0.0273]***
Age:25-34 years old	-0.1613	-0.0804	-0.0894	-0.1108	-0.1516	-0.1592	-0.1935	-0.1920	-0.1921	-0.2282
	[0.0145]***	[0.0175]***	[0.0147]***	[0.0129]***	[0.0148]***	[0.0171]***	[0.0180]***	[0.0176]***	[0.0220]***	[0.0243]***
Age:35-44 years old	-0.0507	-0.0151	-0.0123	-0.0150	-0.0362	-0.0360	-0.0650	-0.0622	-0.0631	-0.0995
	[0.0142]***	[0.0171]	[0.0144]	[0.0126]	[0.0144]**	[0.0167]**	[0.0175]***	[0.0171]***	[0.0213]***	[0.0235]***
Age:45-54 years old	-0.0148	0.0078	0.0149	0.0156	-0.0140	-0.0149	-0.0381	-0.0281	-0.0141	-0.0419
	[0.01448]	[0.0172]	[0.0146]	[0.0128]	[0.0147]	[0.0170]	[0.0178]**	[0.0173]	[0.0217]	[0.0239]*
Tenure in years	0.0313	0.0328	0.0302	0.0286	0.0281	0.0283	0.0288	0.0296	0.0281	0.0267
	[0.0010]***	[0.0012]***	[0.0011]***	[0.0009]***	[0.0011]***	[0.0012]***	[0.0013]***	[0.0012]***	[0.0015]***	[0.0017]***
Tenure squared/100	-0.0251	-0.0406	-0.0247	-0.0112	-0.0029	-0.0023	-0.0042	-0.0112	-0.0114	-0.0171
	[0.0043]***	[0.0053]***	[0.00461]***	[0.0040]***	[0.0045]	[0.0051]	[0.0052]	[0.0051]**	[0.0064]*	[0.0073]**
Constant	1.1660	0.9943	1.0553	1.0959	1.1374	1.1821	1.2264	1.2936	1.3615	1.4854
	[0.0155]***	[0.0174]***	[0.01481]***	[0.0132]***	[0.0155]***	[0.0182]***	[0.0195]***	[0.0192]***	[0.0242]***	[0.0267]***
Observations	15485	15485	15485	15485	15485	15485	15485	15485	15485	15485
R-squared	0.45									

Table A6: OLS and quantile estimation results, Sample: females, Year: 2002 (cont.)

	Specification 2									
Min. years of education	0.0176	0.0129	0.0144	0.0138	0.0142	0.0146	0.0156	0.0164	0.0180	0.0197
	[0.0011]***	[0.0014]***	[0.0011]***	[0.0010]***	[0.0010]***	[0.0009]***	[0.0011]***	[0.0013]***	[0.0015]***	[0.0021]***
Vocational degree	-0.0109	0.0097	-0.0022	-0.0041	-0.0166	-0.0198	-0.0153	-0.0204	-0.0154	-0.0090
	[0.0097]	[0.0123]	[0.0094]	[0.0090]	[0.0087]*	[0.0082]**	[0.0100]	[0.0118]*	[0.0125]	[0.0181]
Age:15-24 years old	-0.2420	-0.1265	-0.1400	-0.1728	-0.1896	-0.1957	-0.2226	-0.2569	-0.2787	-0.3359
	[0.0140]***	[0.0180]***	[0.0136]***	[0.0131]***	[0.0126]***	[0.0119]***	[0.0146]***	[0.0173]***	[0.0187]***	[0.0270]***
Age:25-34 years old	-0.1348	-0.0605	-0.0742	-0.0982	-0.1081	-0.1062	-0.1200	-0.1445	-0.1479	-0.1683
	[0.0126]***	[0.0162]***	[0.0121]***	[0.0117]***	[0.0113]***	[0.0106]***	[0.0131]***	[0.0155]***	[0.0167]***	[0.0239]***
Age:35-44 years old	-0.0432	0.0082	-0.0011	-0.0196	-0.0302	-0.0279	-0.0346	-0.0534	-0.0480	-0.0545
	[0.0122]***	[0.0158]	[0.0119]	[0.0114]*	[0.0110]***	[0.0103]***	[0.0127]***	[0.0150]***	[0.0161]***	[0.0229]**
Age:45-54 years old	-0.0135	0.0182	0.0115	-0.0029	-0.0160	-0.0044	-0.0108	-0.0275	-0.0183	-0.0229
	[0.0124]	[0.0159]	[0.0120]	[0.0115]	[0.0112]	[0.0105]	[0.0129]	[0.0152]*	[0.0163]	[0.0232]
Tenure in years	0.0251	0.0325	0.0284	0.0248	0.0236	0.0233	0.0224	0.0208	0.0191	0.0171
	[0.0009]***	[0.0012]***	[0.0009]***	[0.0009]***	[0.0008]***	[0.0008]***	[0.0009]***	[0.0011]***	[0.0012]***	[0.0017]***
Tenure squared/100	-0.0263	-0.0526	-0.0351	-0.0208	-0.0154	-0.0134	-0.0106	-0.0062	-0.0043	-0.0034
	[0.0038]***	[0.0047]***	[0.0036]***	[0.0035]***	[0.0034]***	[0.0032]***	[0.0039]***	[0.0046]	[0.0049]	[0.0072]
Constant	1.6458	1.3300	1.4183	1.5260	1.5788	1.5813	1.6084	1.7160	1.9706	2.0660
	[0.0436]***	[0.0546]***	[0.0415]***	[0.0399]***	[0.0390]***	[0.0367]***	[0.0451]***	[0.0525]***	[0.0560]***	[0.0807]***
Observations	15485	15485	15485	15485	15485	15485	15485	15485	15485	15485
R-squared	0.6									

Notes: as in Table A1.

Table A7: Breakdown of observed wage changed by decile

	10	20	30	40	50	60	70	80	90
					All				
Observed pay change (in logs)	-0.021	-0.014	-0.008	-0.008	0.007	0.048	0.100	0.147	0.195
Composition effects of:									
worker characteristics	-0.049	-0.056	-0.062	-0.068	-0.083	-0.059	-0.063	-0.035	0.031
job characteristics	-0.033	-0.012	-0.017	-0.026	-0.010	0.007	0.062	0.094	0.115
Price effects of:									
constant	-0.001	0.044	0.092	0.154	0.127	0.126	0.095	0.278	0.177
worker characteristics	0.036	0.011	-0.002	-0.018	-0.034	-0.028	-0.020	-0.014	0.006
job characteristics	0.000	-0.014	-0.039	-0.072	-0.025	-0.015	0.020	-0.180	-0.094
Residual effects	0.026	0.012	0.020	0.021	0.031	0.017	0.005	0.003	-0.039
					Males				
Observed pay change (in logs)	-0.046	-0.041	-0.030	-0.013	0.027	0.084	0.124	0.174	0.211
Composition effects of:									
worker characteristics	-0.068	-0.072	-0.073	-0.057	-0.081	-0.041	-0.023	0.027	0.064
job characteristics	-0.039	-0.020	-0.018	-0.010	0.001	0.076	0.077	0.112	0.118
Price effects of:									
constant	-0.011	0.040	0.119	0.116	0.248	0.171	0.010	0.197	0.066
worker characteristics	0.023	-0.016	-0.012	-0.041	-0.032	-0.032	-0.016	-0.005	0.017
job characteristics	0.024	0.010	-0.055	-0.021	-0.157	-0.095	0.068	-0.141	-0.049
Residual effects	0.025	0.017	0.009	0.000	0.048	0.005	0.008	-0.015	-0.004
					Females				
Observed pay change (in logs)	0.001	0.021	0.037	0.043	0.060	0.074	0.109	0.163	0.213
Composition effects of:									
worker characteristics	-0.042	-0.037	-0.035	-0.041	-0.045	-0.031	-0.028	0.007	0.036
job characteristics	-0.024	-0.014	-0.008	-0.013	0.002	0.016	0.013	0.061	0.084
Price effects of:									
constant	0.004	0.061	0.166	0.179	0.116	0.077	0.125	0.364	0.288
worker characteristics	0.023	0.016	0.015	-0.026	-0.020	-0.029	-0.055	-0.052	-0.032
job characteristics	-0.004	-0.024	-0.085	-0.070	-0.007	0.048	0.042	-0.195	-0.125
Residual effects	0.044	0.019	0.013	0.014	0.014	-0.008	0.011	-0.022	-0.038

Figure A1: Bootstrapped employee characteristics by sex and year

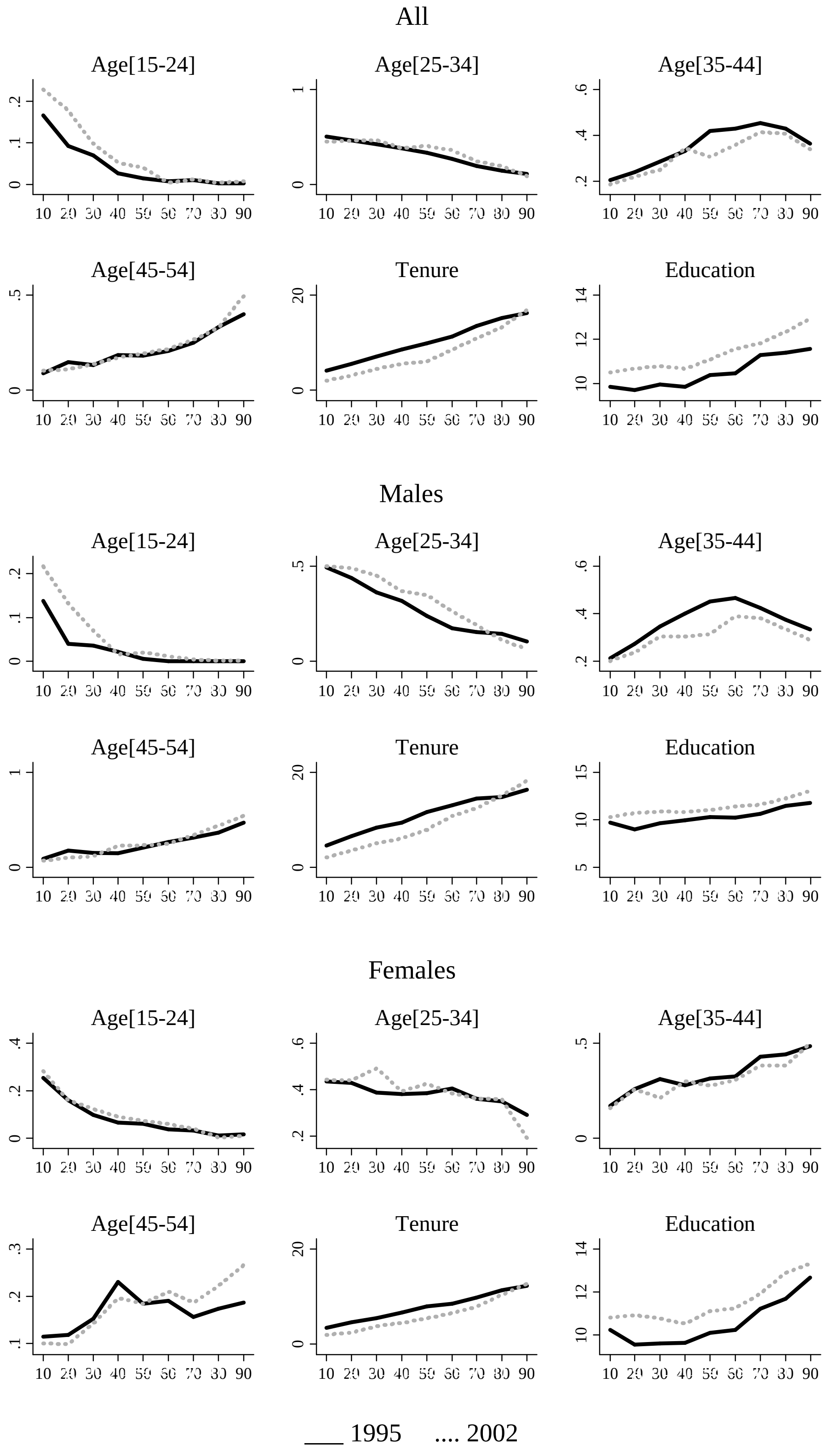
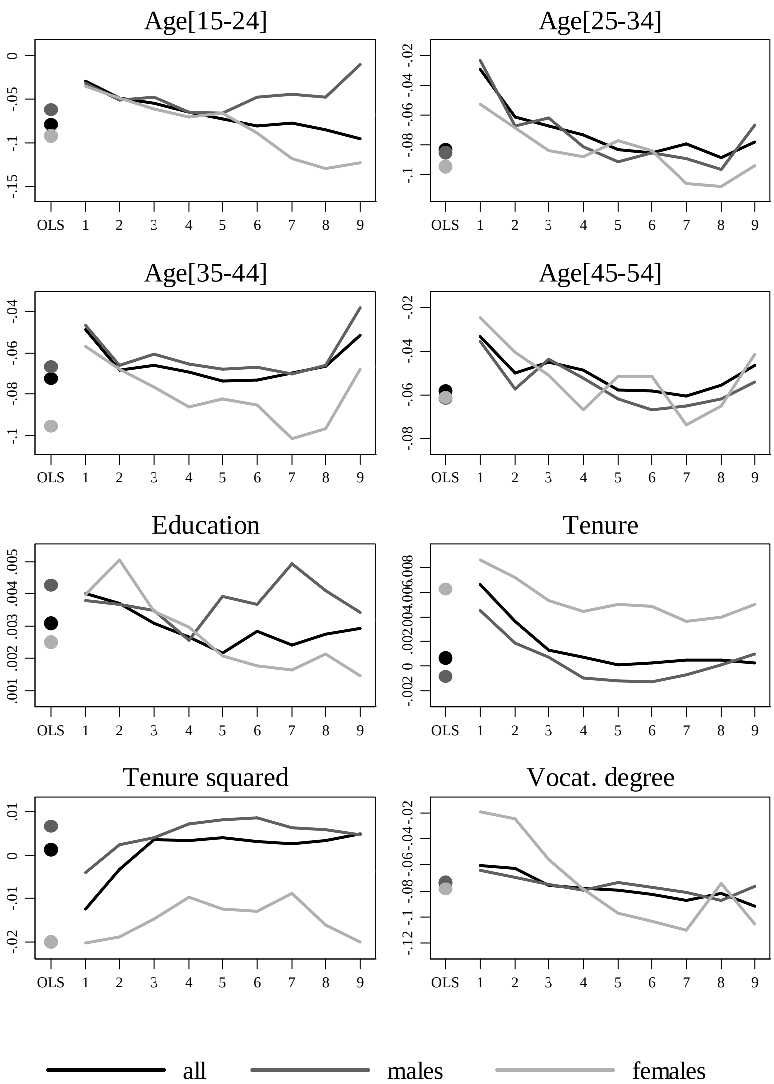


Figure A2: Changes in the estimated returns to employee characteristics over 1995-02



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