Wage and Employment Polarization in Germany - Is there Evidence?*

– Preliminary Version –

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Abstract

Wage inequality has risen over the past years in developed countries. However, changes in wages and employment have not been monotonically across skill levels. Moreover, there is evidence for the USA and Europe that wages and employment have increased at the upper- and the lower-end of the skill distribution. In contrast, wages and employment has decreased for medium-educated workers. This paper tests this development for Germany using information from the Employment Survey on Qualification and Working Conditions. A particular advantage of the data set used in this analysis is that it allows to directly examine the routine input share of a specific occupation. This makes it possible to decompose changes in the routine tasks input within occupations over time into initial conditions, within-occupational changes and structural changes, and enables to gain more insight what exactly is driving wage and employment polarization. In our analysis we come to the conclusion that routine intensive occupations indeed have seen a steeper fall in employment and slower wage growth than other (non-routine) occupations. The main driving force behind this development were within-ouccupational changes in the 80s and early 90s. However, in the late 90s those have been replaced by structural changes in the labor market.

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1 Introduction

A substantial body of research has documented rising labor market inequality in developed countries.[1] In the very basic version of the model underlying most of these studies (Acemoglu and Autor (2010) refer to this as "canonical model"), there are two different skill groups, high- and low-skilled workers, performing two imperfectly substitutable tasks. Technology is factor-augmenting and either complements high- or low-skilled workers. As an immediate consequence wage inequality increases or decreases over time, depending which factor is augmented by the technology.[2] Although the model is very popular in the literature as a foundation to explain trends in wage inequality (see for example Fitzenberger and Kohn (2006) for Germany, Katz and Murphy (1992) for the US and Card and Lemieux (2001) for the US, Canada and the United Kingdom), it has one serious shortcoming: it cannot account for recent empirical trends. In particular, Autor and Dorn (2010) and Autor et al. (2006) provide evidence for the USA that there have been non-monotone changes in wages and employment growth. Wages and employment have increased at both the lower and upper end of the skill distribution but have decreased in the middle. However, polarization is not only a phenomena solely restricted to the USA. Goos and Manning (2007) and Dustmann et al. (2009) show that there have been trends towards employment polarization in the UK and Germany as well. Similarly Goos et al. (2009) and Goos et al. (2010) show that there has been an increase in the employment of high- and low-skilled workers at the expense of manufacturing workers, who are mostly found in the middle of the skill distribution, using the harmonized European Labor Force Survey for 16 European countries.

A possible mechanism underlying these developments has been proposed by Autor et al. (2003). In their model computers are complementing non-routine tasks mostly done by high-skilled workers but substitute for medium-educated workers in performing cognitive and manual tasks. Using information from the Current Population Survey and Census of Populations, and constructing task measures by using information from the Dictionary of Occupational Titles, they find for the USA that increasing computerization decreases the input of routine manual and routine cognitive tasks and favors high-skilled workers.[3] Building on this model as well as the model of Weiss (2008)[4] Autor and Dorn (2010) show that former routine intensive commuting zones in the USA have experienced an increase in service employment, as people migrate

[1] See for example Acemoglu (2002) and Katz and Autor (1999) for an overview.

[2] Machin and van Reenen (1998) conclude that skill-biased technological change is an international phenomena, comparing the changing skill structure of employment for seven countries.

[3] Spitz-Oener (2006) arrives to a similar conclusion for Germany.

[4] Weiss (2008) shows that if consumers have a constant-elasticity of substitutions utility function defined over service and manufacturing goods and those goods are not easily substitutable, technological progress in the goods sector leads to an increase of the prices for service goods. As a consequence wages in the low-skill service sector increases.

from the manufacturing sector into the service sector. Furthermore, they show that both employees in high-skill jobs, e.g. managers and professionals, and workers in low-skilled service occupations have experienced a higher wage growth than workers in routine occupations.

In this paper we take the model of Autor and Dorn (2010) as the foundation for the analysis of the German labor market. However, with the data set in hand we have the possibility to track changes in labor input over time, which enables us to identify the driving sources of employment and wage polarization. In line with Autor and Dorn (2010) we find a hollowing out of the wage and employment structure in the middle of the skill distribution. We find evidence that employment and wages are positively affected by a lower routine input share. Within every skill group, wage inequality has increased, favoring workers in low-routine occupations. Moreover, polarization for medium-skilled employees differs substantially for male and female workers. Medium-skilled males in the middle of the wage distribution have experienced a trend towards a hollowing out of the wage structure in recent years, which is mainly due to structural changes. However, the effect is mitigated by a decrease in job content leading to a bumpy wage structure.[5] A possible explanation for this might be piece wage rates. Furthermore we find, that whereas wages and employement in the 80s and early 90s were driven by within-occupational changes, the structural changes have become the main factor in recent years, implying an adoption of the labor market to external forces.

The reminder of this paper is organized as follows: Section 2 is concerned with the definition of routine intensive work and the construction of the Routine Share-Index. Furthermore, since wages in the Employment Survey on Qualification and Working Conditions are interval censored, this section explains the wage estimation method and gives a short description of the obtained wage structure. The analysis of employment polarization can be found in section 4. The influence of routine job contents on occupational as well as individual wages is tested in section 5. Section 6 concludes the paper. A detailed overview of the data construction and additional estimation results can be found in the appendix.

2 Data, Wages and Routine Employment Share

This section is concerned with a short explanation of the data set as well as the construction and estimation of the routine share input. A more detailed description of the variables can be found in the appendix.

[5] We will refer to a decrease in job content as an increase in routine tasks input within occupations in the rest of the paper. Section (2) describes the definition of routine tasks more detailed.

2.1 Data Source

The analysis in this paper is based on the Employment Survey on Qualification and Working Conditions carried out by the German Federal Institute for Vocational Education and Training (BiBB), the Institute for Employment Research (IAB) and the German Federal Institute for Occupational Safety and Health (BAuA). The survey consists of five waves, launched in 1979, 1985/86, 1991/92, 1998/99 and 2005/06. The first four waves cover approximately 30,000 individuals each, the last wave consists of 20,000 individuals. However as will become clear later, not all observations are useful for the analysis.

A particular drawback is that the survey design has changed over the years and persons interviewed are not homogeneous across waves. To guarantee comparability across time individuals who are either from the eastern part of Germany or foreign born are excluded, since those groups were not considered in the survey before 1991/92. Furthermore, since we are interested in the wage and employment polarization of regular employed, prime age workers (male and female) individuals with an average working time of less than 15 hours per week and persons younger than 16 or older than 65 are excluded. In case either working hours or age is missing the observation is dropped from the analysis as well.

2.2 Occupations

The data covers a wide range of occupations through industries that are categorized according to the 2-digit 1988 classification in all five waves. The fact that the 1988 classification is used through all waves makes using the Employment Survey on Qualification and Working Conditions appealing.

Overall there are 86 occupations. However not all occupations are observed in every wave. To make waves comparable across time those occupations which are observed less than five times are excluded from the analysis.[6] Furthermore occupations related to farming and agriculture, workers without specified occupation (e.g. interns and student apprenticeships) as well as occupations with less than three observations per wave are excluded as well. Overall, there are 67 comparable occupations left. An overview of occupations used and the employment share of each occupation across waves is given in table (A.1) in the appendix.

In the following we refer to high-skilled workers as all those, who possess either an university degree or graduated from a technical college ("Fachhochschule"), whereas medium-educated

[6] Oddly enough some occupations are contained in the data but are not specified in the codebook. Since we take the codebooks as error free reference, those occupations are regarded as not observed in the particular wave and hence, are excluded.

workers are defined as those who either have finished an apprenticeship or graduated from other schools of further education ("Berufsschule" or "Beamtenschule"). Low-skilled workers are all those who do not fit in one of those two categories.[7] In case a participant possesses more than one qualification only the highest achievement is considered. Note that we do not consider secondary education. For example an individual who graduated from a school of higher secondary education ("Gymnasium") without any following qualification is considered as low-skilled.

2.3 Wages

Average monthly gross wages are reported in intervals for the first four waves. Furthermore, those intervals are not uniformly defined across surveys and the highest wage interval is right censored. This makes the analysis slightly complicated. To make wages comparable we first "harmonize" the length of the wage intervals across waves. The interval boundaries as well as the relative frequency of workers falling in the particular interval before and after the harmonization for each survey year is shown in table (B.1)-(B.4) in the appendix. For the last wave, participants directly report their monthly gross income, hence neither a harmonization nor an estimation is necessary. The reported wages in the first four waves are in Deutsch Mark ("DM") and in the last wave in Euros ("EUR"). We convert the reported wages in the last survey into DM using the officially exchange rate of 1.9558 DM per EUR. We estimate the log hourly wages for the first four waves by maximum likelihood method.

To obtain the Maximum Likelihood Estimator we need to make some parametric assumption and specify the shape of the wage distribution first.[8] For that reason we make the common assumption that hourly wages in occupation c are log-normally distributed with

$$ln(w_c) \sim N(\mu_c, \sigma_c^2)$$

With this assumption in hand we can specify the probability that an observed hourly wage of individual i in occupation c falls into the wage interval j as

$$Pr(w_{i,c} \in j) = \Phi(\frac{ln(\overline{w}_{i,c}^j) - \mu_c}{\sigma_c}) - \Phi(\frac{ln(\underline{w}_{i,c}^j) - \mu_c}{\sigma_c}) \quad (1)$$

[7] Note that we use "educated" and "skilled" interchangeably.

[8] Assuming log-normality might be a stark assumption. However, defining a parametric functional form helps to circumvent (maybe more serious) problems of calculating appropriate standard errors for the estimates and choosing an optimal bandwidth when a possible non-parametric density is estimated, see for example DiNardo and Tobias (2001) for an overview and discussion on density estimation and non-parametric regressions.

where $\Phi(\cdot)$ is the standard normal continuous density function and the upper bound of the interval j is now defined as $\overline{w}^j_{i,c} = \frac{\overline{W}^j}{h_i * CPI_{2005}}$. The same argument applies for the lower bound with $\overline{W}^j$ replaced by $\underline{W}^j$. Before maximizing the log likelihood function, all observations with $\overline{w}^j_{i,c}$<10 are dropped.

The log likelihood function is then given by

$$ln(L(\mu_c, \sigma_c^2)) = \sum_{i \in j} ln\left(\Phi(\frac{ln(\overline{w}^j_{i,c}) - \mu_c}{\sigma_c}) - \Phi(\frac{ln(\underline{w}^j_{i,c}) - \mu_c}{\sigma_c})\right) \tag{2}$$

where $\mu_c = \beta_0 + \beta_1 age_c + \beta_2 age_c^2 + \beta_3 his_c + \beta_4 mis_c$. Here *his* and *mis* are education dummy variables for high-skilled and medium-skilled workers respectively. Since the data set does not allow to obtain a direct measure of tenure we include *age* as a proxy of work experience. The coefficient on age^2 is a quadratic of *age* and shall capture the decreasing returns to experience. The log likelihood function is then maximized over μ_c and σ_c^2.

If the Null that the full model is equal to a constant only model cannot be rejected at a 10% level using a Likelihood-Ratio test, the estimation results of the constant only model are used for the subsequent analysis.[9] Once we have μ_c and σ_c^2 the wage in a particular interval j for an occupation c can be estimated according to

$$\hat{w}^j_c = \frac{\int_{\underline{w}^j}^{\overline{w}^j} \phi(\frac{ln(w) - \mu_c}{\sigma_c})}{\int_{\underline{w}^j}^{\overline{w}^j} \frac{1}{w} \phi(\frac{ln(w) - \mu_c}{\sigma_c})} \tag{3}$$

where $\phi(\cdot)$ is the standard normal probability density function. This estimated wage is assigned to every individual working in occupation c and falling into interval j. Table (B.5) in the appendix depicts the estimation results.[10]

2.4 Routine Employment Share

A key building block of the analysis is the Routine Employment Share (RSH). In the Employment Survey on Qualification and Working Conditions participants are asked if they conduct predetermined specific task within their job title. This enables to directly derive a routine index from the work pattern within occupations, which is then used to create a RSH-Index. The RSH-Index consists of that share of workers which perform routine intensive activities within

[9] In very rare situations the Maximum Likelihood Estimator is not converging when the full model is fitted. In this case, the estimates of the constant only model are used as well.

[10] We also estimated wages by assigning each individual the midpoint of the interval in which he/she has fallen. The results indicate even stronger hollowing out of the wage structure (results not reported here). We decided to use the more conservative estimations here.

an occupation. Furthermore, constructing an routine index for every wave, we are able to decompose changes in the RSH-Index over time into changes between and within occupations. This makes it possible to analyze possible structural changes over time, which allows to give a more detailled insight in what is driving labor market inequalities. Compared to other studies this is a huge advantage. For example, Autor and Dorn (2010) build on the work of Autor et al. (2003) to identify routine-intensive occupations. Autor et al. (2003) obtained a measure of tasks performed within an occupation from the U.S Department of Labor's Dictionary of Occupational Choices, which has some short comings limiting the precision of the analysis (see Miller et al. (1980) for an extensive discussion on the short comings of the Dictionary of Occupational Choices). For example, certain skill requirements are assigned to occupations but not to specific positions within this occupation. Furthermore skill requirements in the dictionary are updated very infrequently.[11] This makes it impossible for the mentioned studies to analyze labor market changes over time.

Unfortunately some questions concerning the activities a worker performs at the workplace have changed over time in the survey. This makes it necessary to compare tasks and drop those which are not coherent across survey. A detailed list of routine task inputs used in this analysis is given in table (C.1) in the appendix. Although the data set gives the possibility to directly evaluate the tasks performed by employees regardless of the educational attainment, it might be that including highly-educated workers into the calculation of the routine share might distort the results. This is the case when firms select high-skilled workers primarily with respect to their (educational) attributes, e.g. self-initiating characteristics and professional standards, whereas medium-skilled workers need supervision and are mainly chosen by means of task contents.[12]

Hence we exclude high-skilled workers when the routine intensity index is calculated. The routine intensity index for worker i at time t in occupation c is constructed as follows:

$$RI^t_{i,c} = ln(\frac{\sum_{a^t_i} \mathbf{1}[a^t_i \in R^t]}{\sum_{a^t_i}}) \tag{4}$$

where $\sum_{a^t_i}$ is the sum of tasks performed by worker i and $\mathbf{1}[a^t_i \in R^t]$ is an indicator function with value one if a specific task performed by worker i falls into the set of routine tasks at time t as defined in table (C.1) and zero otherwise.

Equation (4) differs from the corresponding index in Autor and Dorn (2010) in the following way: We do not calculate the ratio of routine to manual task inputs but to total task inputs.

[11] Autor et al. (2003) analyze the change in task contents using the 1977 version and the 1991 updated version of the Dictionary.

[12] See Reich et al. (1973) for one of the first descriptions of the characteristics in different labor markets.

Considering manual tasks instead of total tasks might bias the outcome.[13]

We classify the work of those employees as routine labor intensive who have a "personal" RI-Index above the average RI-Index at a given time t, which is denoted by $\overline{RI}^{\,t}_{c}$.[14] Using the RI-Index as a foundation we define the RSH-Index at time t and occupation c as

$$RSH^t_c = ln(\frac{\sum_i \mathbf{1}[RI^t_{i,c} > \overline{RI}^{\,t}_{c}]}{\sum_{i \in c}}) \tag{5}$$

Hence, the RSH-Index measures the fraction of employees in a given occupation which have a routine task intensive job according to our definition. Constructing the index in this way might have another advantage. As mentioned by Autor and Dorn (2010), if workers with higher routine tasks inputs change occupations this will reduce the routine share. In this case the RSH-Index is endogenous to the outcomes which we wish to analyze and creates the problem of simultaneity. Since Autor and Dorn (2010) cannot decompose their RSH-Index and to circumvent the problem with simultaneity bias they have to run an instrumenten variable regression. However, the nature of the data set used in this work allows us to directly include the changes in the RSH-Index over time in the analysis. This has two advantages. First, we avoid the possibility of having only weak instruments for the RSH-Index in hand and second, we are able to analyze structural changes in the labor market.

To get a measure of the changes within and between occupations we decompose the variation of the RSH-Index between time t and k for a certain occupation as follows

$$\begin{aligned}
\Delta RSH^t_c &= RSH^t_c - RSH^k_c \\
&= ln(\frac{\sum_i \mathbf{1}[RI^t_{i,c} > \overline{RI}^{\,t}_{c}]}{\sum_{i \in c}}) - ln(\frac{\sum_i \mathbf{1}[RI^k_{i,c} > \overline{RI}^{\,k}_{c}]}{\sum_{i \in c}}) \\
&+ ln(\frac{\sum_i \mathbf{1}[RI^t_{i,c} > \overline{RI}^{\,k}_{c}]}{\sum_{i \in c}}) - ln(\frac{\sum_i \mathbf{1}[RI^t_{i,c} > \overline{RI}^{\,k}_{c}]}{\sum_{i \in c}}) \\
&= (ln(\frac{\sum_i \mathbf{1}[RI^t_{i,c} > \overline{RI}^{\,t}_{c}]}{\sum_{i \in c}}) - ln(\frac{\sum_i \mathbf{1}[RI^t_{i,c} > \overline{RI}^{\,k}_{c}]}{\sum_{i \in c}})) \\
&+ (ln(\frac{\sum_i \mathbf{1}[RI^t_{i,c} > \overline{RI}^{\,k}_{c}]}{\sum_{i \in c}}) - ln(\frac{\sum_i \mathbf{1}[RI^k_{i,c} > \overline{RI}^{\,k}_{c}]}{\sum_{i \in c}}))
\end{aligned} \tag{6}$$

where the term in the second to last line represents the variation of the routine share which is due to changes between occupations and the last term represent the variation of the routine

[13] For example, two workers might have the same education level and both conduct seven tasks in total. However three of the first worker's tasks are routine, three are manual tasks and one is non-routine/non-manual task. The second worker performs two routine tasks, one manual and four non-routine/non-manual tasks. According to the definition of Autor and Dorn (2010) the value for the first worker would be one and for the second two. However, given the decomposition of the task content the work of the first employee is clearly more routine labor intensive than the content of the second.

[14] The average RI-Index at time t is equation (4) summed over all occupations and survey participants.

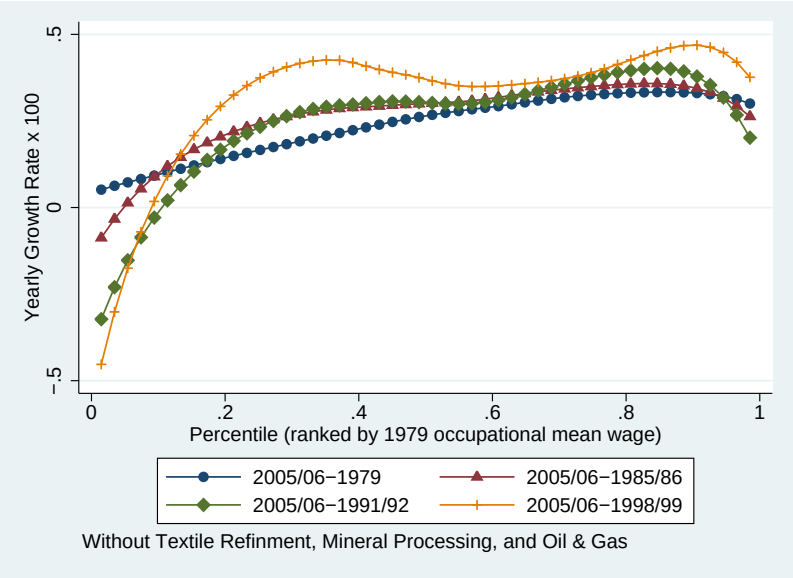

Figure 3.1: Smoothed Yearly Growth Rate of Log Hourly Wages

share which is due to changes within occupations. Hence, the first term gives a measure for structural changes in the whole labor market, e.g. due to a demand shift, which will be denoted by $dRSH^t_{alt.}$ in the reminder of the paper. The second term gives a measure for structural changes within occupations, e.g. due to a change in job skill requirements, and will be abbreviated by $dRMTI^t_{alt.}$ in the following.

3 Initial Evidence

Before a rigorous analysis is conducted, this section provides a first evidence on wage and employment polarization. A central prediction of the model of Autor and Dorn (2010) is, that employees performing relatively routine intense work should migrate to less routine intensive occupations as technical progress makes those jobs obsolete. As a direct implication one should observe a hollowing out of the wage distribution. As demand shifts from routine occupations to other jobs, wages for workers with routine intensive job content should fall.

Figure (3.1) depicts the smoothed yearly growth rate of log hourly wages at each skill percentile for the different waves. Looking the wage changes between 1985/86 and 2005/06 as well as 1991/92 and 2005/06 a tendency towards wage polarization is clearly noticeable. A somewhat surprising outcome is wages are falling at the lower end and lower wage growth rate at the upper end of the skill distribution.

Figure (3.2) shows the smoothed yearly employment growth rate of the occupational em-

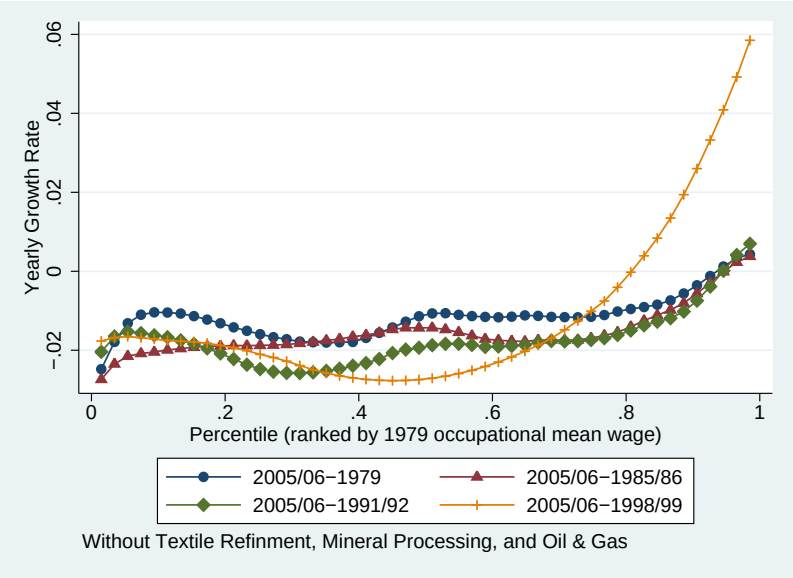

Figure 3.2: Smoothed Yearly Growth Rate in Employment Share (MLE Estimation)

ployment share ranked by skill percentile. As can be seen the employment growth rate is not monotonically increasing, the employment share is rather falling until the 50th percentile, however the contraction rate is slowing down afterwards and occupations at the 80th percentile and above have experienced real employment growth.

Looking at the results more closely it can be seen that the changes in wages between the 80th and 90th percentile are accompanied by an increase in the employment share. After the 90th percentile the increase in the employment share is even stronger, however the growth rate of wages are falling. This might be an indicator for an oversupply of workers in the highest skill percentiles. One can see from figures (3.1) and (3.2) that employment and wage growth at the lowest percentiles are diverging. It seems that between the 10th and 35th percentile wage growth is traded for employment.[15]

These findings are in line with the results in Spitz-Oener (2006). Using the same data set, but only until 1998/99, she finds that there has been a hollowing out of the employment share in the middle of the skill distribution. In contrast to the results in this work she finds a positive employment growth rate at the lowest skill percentile. However Spitz-Oener (2006) ranks occupations by regressing the relative change in high/medium- to low-educated log hourly wages on a set of variables using interval midpoints as a proxy for wages.

Overall, given the outcome of this first evaluation the explanation of wage and employment polarization due to a migration of workers from routine intensive jobs to other occupations,

[15]Comparing the employment growth rate between 1991/92 and 2005/06 with the growth rate between 1998/99 and 2005/06 the contraction rate decreases between the 20th and 35th percentile. Over the same range wages have increased, giving slight support for the demand shift hypothesis.

especially service because of demand shifts is not completely convincing. This conjecture is supported by the findings of Dustmann et al. (2009) who concludes for Germany that the negative correlation between wages and employment at the lower tail of the distribution can hardly be explained by a shift in demand.

4 Employment Polarization in Germany

As previously shown there exist evidence for employment and wage polarization in Germany. The contraction in the employment share has ceased to decline in the lower percentiles and has accelerated in the middle of the distribution. A contrary development has taken place in the upper percentiles of the wage distribution. Those occupatoins have experienced a huge increase in the employment share.

To test for employment polarization in the labor market we use the the following model spefication:

$$\Delta Empl_c^t = \beta_0 + \beta_1 \, \mathrm{x} \, RSH_c^k + \beta_2 \, \mathrm{x} \, dRSH_c^t + \beta_3 \, \mathrm{x} \, dRMTI_c^t + e_c^t \tag{7}$$

Here $\Delta Empl_c^t$ denotes the log change in employment share in occupation c between time t and k and e_c^t is an error term which is assumed to be normally distributed with zero mean.
The estimation results for the overall sample are shown in table (4.1). Those results support the hypothesis that there has been employment polarization in Germany, especially in the last few years. Overall, there is evidence that technological changes has an effect on employment in routine intensive occupations. Over the years structural changes in the labor market have become more important than initial conditions. Technological-led employment polarization, however, has been dampened by decreasing job content in recent years, as can be seen by the positive and significant coefficient on $dRMTI^t$. To investigate if educational groups are affected differently we estimated the model for each skill level seperately. The results can be found in tables (4.2-4.4).

Employment of highly-educated workers has been extremely affected by the initial conditions as well as the change in the skill content of low- and medium-educated workers when using 1991/92 as base year. In 1998/99 the coefficients enter, albeit statistically insignificant, with a different sign than expected. Looking at the results in column (5) of the pooled regression it seems that highly-educated employees are significantly affected by the job content of low- and medium-skilled workers over the years. An increasing job contents for low and medium-skilled

Table 4.1: Change in Overall Employment Share within Occupations

Dependent Variable: Changes in Employment Share, k-2005/06					
	(1)	(2)	(3)	(4)	(5)
	1979	1991/92	1998/99	1979-1998/99	1991/92-1998/99
RSH-Index $^{k}_{alt.}$	-1.85*	-1.28	-1.61**	-1.50**	-1.25*
	(.94)	(.79)	(.71)	(.71)	(.64)
dRSH $^{t}_{alt.}$	-1.07*	-1.10**	-1.55***	-1.10**	-1.12**
	(.59)	(.49)	(.60)	(.50)	(.49)
dRMTI $^{t}_{alt.}$	-.49	-.61	4.54*	.94	2.46
	(6.30)	(5.55)	(2.36)	(4.25)	(3.28)
R^2	.07	.08	.19	.09	.12
N	67	67	67	268	134

Note: Depend variables are changes in the employment share rate between t and k. Robust standard errors are in parentheses. All models include an intercept and if multiple periods are pooled together standard errors are clustered on the occupation level and time dummies are included. Figures in the second line indicate the base year k. In column (4) and (5) figures indicate the time range of the pooled regression.
* Significant at the 10% level.** Significant at the 5% level.*** Significant at the 1% level.

Table 4.2: Change in High-Skilled Employment Share within Occupations

Dependent Variable: Changes in Employment Share, k-2005/06					
	(1)	(2)	(3)	(4)	(5)
	1979	1991/92	1998/99	1979-1998/99	1991/92-1998/99
RSH-Index $^{k}_{alt.}$	-1.50	-3.07**	.71	-1.00	-.58
	(1.53)	(1.33)	(1.45)	(1.18)	(1.14)
dRSH $^{t}_{alt.}$	-1.27	-1.36	.17	-.91	-.52
	(.99)	(.96)	(1.50)	(.85)	(.83)
dRMTI $^{t}_{alt.}$	-6.34	-15.90***	2.98	-6.87	-5.97*
	(7.82)	(5.74)	(5.48)	(4.32)	(3.47)
R^2	.06	.21	.06	.14	.10
N	32	32	34	131	66

Note: Depend variables are changes in the employment share rate between t and k. Robust standard errors are in parentheses. All models include an intercept and if multiple periods are pooled together standard errors are clustered on the occupation level and time dummies are included. Figures in the second line indicate the base year k. In column (4) and (5) figures indicate the time range of the pooled regression.
* Significant at the 10% level.** Significant at the 5% level.*** Significant at the 1% level.

Table 4.3: Change in Medium-Skilled Employment Share within Occupations

Dependent Variable: Changes in Employment Share, k-2005/06

	(1)	(2)	(3)	(4)	(5)
	1979	1991/92	1998/99	1979-1998/99	1991/92-1998/99
RSH-Index $^{k}_{alt.}$	-1.69*	-.87	-1.64**	-1.27*	-1.06
	(.96)	(.95)	(.74)	(.74)	(.71)
dRSH $^{t}_{alt.}$	-1.02*	-1.27**	-1.91***	-1.14**	-1.33**
	(.58)	(.59)	(.70)	(.53)	(.56)
dRMTI $^{t}_{alt.}$	-2.35	-4.77	2.32	-1.32	-.47
	(6.25)	(5.14)	(2.65)	(4.25)	(3.27)
R^2	.05	.07	.14	.06	.08
N	67	67	66	267	133

Note: Depend variables are changes in the employment share rate between t and k. Robust standard errors are in parentheses. All models include an intercept and if multiple periods are pooled together standard errors are clustered on the occupation level and time dummies are included. Figures in the second line indicate the base year k. In column (4) and (5) figures indicate the time range of the pooled regression.
* Significant at the 10% level.** Significant at the 5% level.*** Significant at the 1% level.

Table 4.4: Change in Low-Skilled Employment Share within Occupations

Dependent Variable: Changes in Employment Share, k-2005/06

	(1)	(2)	(3)	(4)	(5)
	1979	1991/92	1998/99	1979-1998/99	1991/92-1998/99
RSH-Index $^{k}_{alt.}$	.01	.02	.02	.01	.02
	(.02)	(.02)	(.03)	(.03)	(.02)
dRSH $^{t}_{alt.}$	-.01	.01	.01	.00	.01
	(.02)	(.01)	(.02)	(.02)	(.01)
dRMTI $^{t}_{alt.}$	-.08	.00	-.01	-.04	-.00
	(.10)	(.07)	(.06)	(.07)	(.05)
R^2	.06	.05	.05	.02	.04
N	67	67	67	268	134

Note: Depend variables are changes in the employment share rate between t and k. Robust standard errors are in parentheses. All models include an intercept and if multiple periods are pooled together standard errors are clustered on the occupation level and time dummies are included. Figures in the second line indicate the base year k. In column (4) and (5) figures indicate the time range of the pooled regression.
* Significant at the 10% level.** Significant at the 5% level.*** Significant at the 1% level.

workers lead to a higher demand for highly-educated workers. However, this result can be traced back to the estimates with 1985/86 and 1991/92 as base years.[16]

Since high-skilled workers mostly conduct non-routine tasks, or in other word are employed in an education-adequate job, they are not affected much by labor-rationalizing. A possible explanation for the different outcome when using 1991/92 as base year compared to the other years is that there might have been a huge mismatch between occupational requirements and education, i.e. a lot of highly-educated workers had been overqualified for the job they were performing.[17] These mismatches might have been resolved afterwards.[18] However, we do neither have an answer why there had not been a mismatch of education and job content before and after 1991/92 nor an explanation what had been the driving forces of mismatches.

A different picture is given when examining the results for medium-educated workers. Looking at the results of table (4.3) employment of medium-skilled workers has been affected the most by the initial routine share and changes in the labor market. The coefficients on $dRMTI^k_{alt.}$ are never significant. It seems that in contrast to the growth in employment of highly-educated workers, employment of medium-skilled workers is not driven by an increase in skill requirements. Looking at the changes of the coefficients over time it seems that the initial routine share was more important at the beginning ot the 80s. However, in recent years structural changes in the labor market have become the main driving force for employment growth for this skill group.

Surprisingly the routine share index has no predictive power to explain the change in employment growth of low skilled workers. None of the coefficients is statistically significant. This finding gives support to the conjecture that the market for low-skilled workers is mainly influenced by labor market institutions.[19]

In conclusion, there are signs of employment polarization in Germany, which has been most evident since 1998/99, especially for medium-skilled workers.[20] Medium-skilled workers have been crowded out from routine intensive occupations, whereas initial conditions have been displaced by structural changes in the labor market as the main driving forces. However, contrary to the finding for highly-educated workers, employment of medium-skilled workers has not been

[16] The estimation results for 1985/86 are not reported in the table. However, the coefficient on $dRMTI^t_{alt}$ is -8.85 with a standard error of 4.85. The coefficients on $RSH^k_{alt.}$ and $dRSH^t_{alt}$ are negative but not significant.

[17] Leuven and Oosterbeek (2011) provides a survey on the overeducation literature.

[18] Bauer (2002) does not find signs of educational mismatch in the German labor market between 1984-1998 using pooled OLS and controlling for unobserved heterogeneity. However, compared to the conjecture in this analysis, which is basically drawn from the skill content he measures signs of over-/undereducation by estimating the effect on wages, like in most studies on overeducation, using the German Socioeconomic Panel.

[19] See for example, Eichhorst and Kaiser (2006).

[20] Using the IABS data set Antonczyk et al. (2010) come to a similar conclusion. They find no evidence in the 1980s and a trend towards employment polarization in the late 1990s and early 2000s. However they do not investigate the causes more deeply.

affected by a change in job contents. In the case of low-skilled workers neither the initial routine share nor changes have any effect on employment. It seems that rigid labor market institutions have played a role.

5 Structural Change in the Labor Market: Do Wages respond?

A huge part of the literature asserts that wage inequality has been stable in Germany over the past decades compared to other countries, especially the USA (see for example Prasad (2004) and OECD (1996)) but also has lacked employment growth.[21] In the words of Freeman (1995) "the rise in joblessness...is thus the flip side of the rise in earnings inequality..." (p.19). The previous section has provided evidence that routine intensive occupations have experienced a decline in employment growth. This section is concerned if wages have responded to the changing environment in the labor market or if the wage structure in Germany has been stable.

Figures (5)-(5.4) visualize the evolvement of wages over the past years. In particular they depict the smoothed yearly wage growth rate by quantiles, which is basically the same as in figure (3.1) but now percentiles are calculated using wage information for every individual. Three features become apparent when looking at the figures. First, inequality among high-skilled workers stems mostly from a steep decline of the wage growth rate in the lower part of the distribution. Second, the wage growth rate for medium-skilled workers exhibits a bumpy shape indicating that different forces might be at work in different parts of the wage distribution. Third, inequality among low-skilled workers has increased because of both an increase in the upper part of the wage distribution and a fall of wages in the lower part.

However, so far nothing can been said if the increasing wage inequality can be traced back to routine job content and technological-led polarization. Before we estimate a wage equation separately for every individual, we first test if the routine share can explain difference in average occupational log hourly average wages. To do so we use the following equation

$$ln(wage_c^t) = \beta_0 + \beta_1 \,\mathrm{x}\, RSH_c^k + \beta_2 \,\mathrm{x}\, dRSH_{alt.}^t + \beta_3 \,\mathrm{x}\, dRMTI_{alt}^t + \beta_4 \,\mathrm{x}\, his_c^k + e_c^t \qquad (8)$$

where $wage_c^t$ is the average occupational wage rate at time t, his_c^k is the share of employees with an university/technical college degree within an occupation and e_c^t is a normally distributed

[21] Nickell et al. (2005) provides a study about unemployment shifts for twenty OECD countries. For 2001, the latest figures available in their analysis, Germany has the 7th highest rate out of those twenty countries.

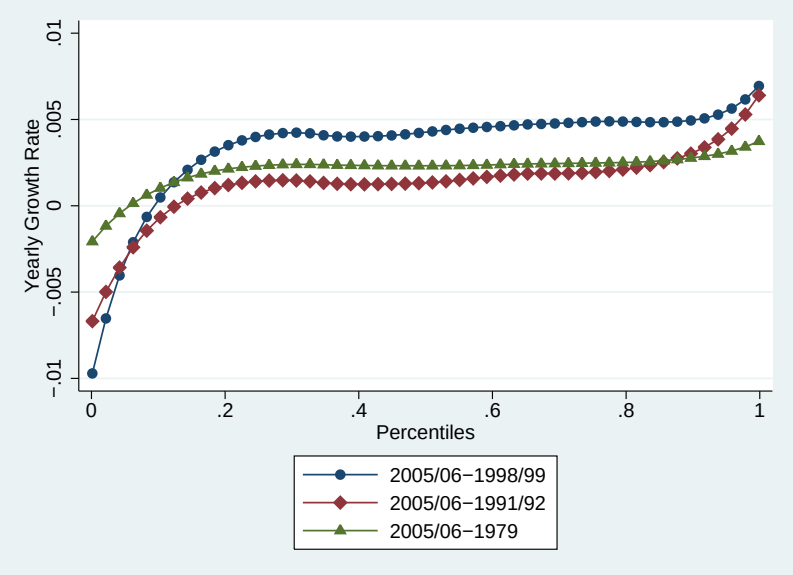

Figure 5.2: Wage Growth by Percentile High-Skilled Workers

Figure depicts the yearly wage growth rate for high-skilled workers by percentiles. The curve has been smoothed via Kernel-weighted local polynomial smoothing using the Epanechnikov-Kernel and a quadratic polynomial.

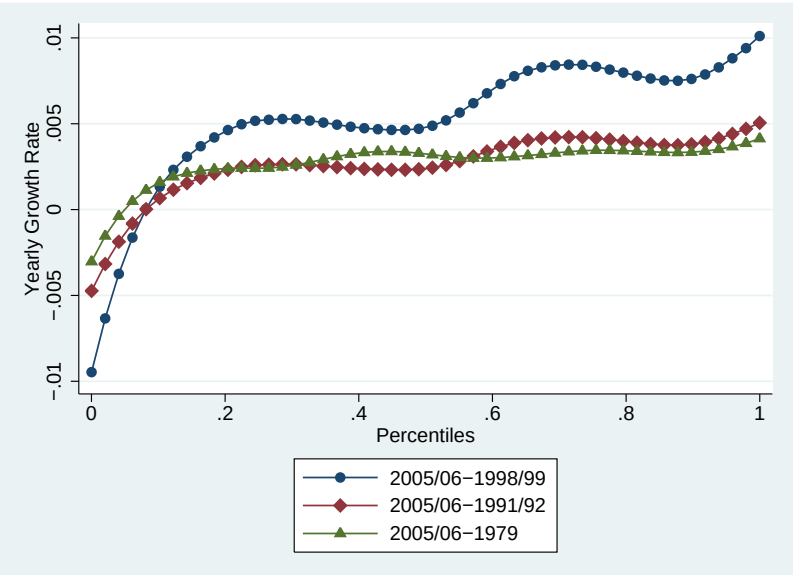

Figure 5.3: Wage Growth by Percentile Medium-Skilled Workers

Figure depicts the yearly wage growth rate for medium-skilled workers by percentiles. The curve has been smoothed via Kernel-weighted local polynomial smoothing using the Epanechnikov-Kernel and a quadratic polynomial.

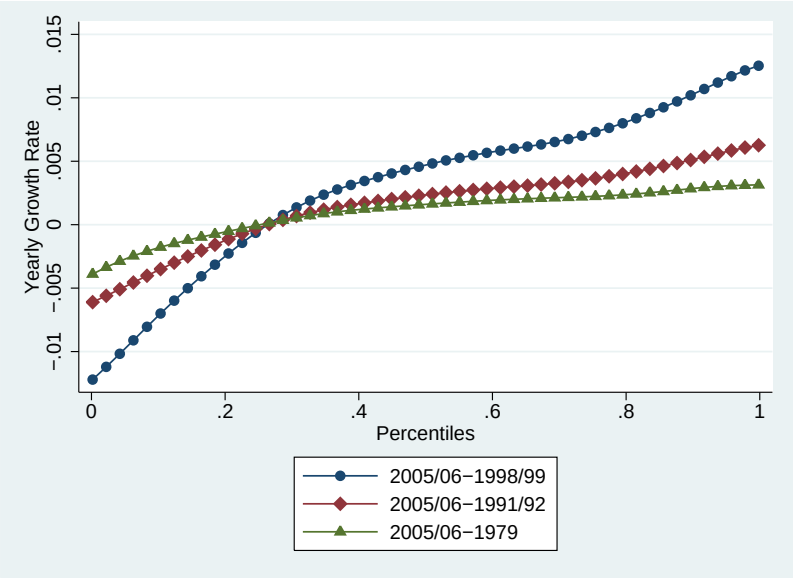

Figure 5.4: Wage Growth by Percentile Low-Skilled Workers

Figure depicts the yearly wage growth rate for low-skilled workers by percentiles. The curve has been smoothed via Kernel-weighted local polynomial smoothing using the Epanechnikov-Kernel and a quadratic polynomial.

error term with zero mean. The term his_c^k captures the effect that skill intensive occupations should pay higher wages. Furthermore, given that women seem to systematically earn less than men, I control for female's employment share in a given occupation at time k. The estimation results with the average occupational wage rate in 2005/06 as dependent variable are given in table (5.1).[22]

Not surprisingly occupations with a higher share of university graduates pay higher wages on average. However, two results are quite puzzling. First, the coefficient on $dRMTI_{alt.}^t$ is positive for all base years. Occupations with a decrease in job content over time seem to pay higher average wages. This might be due to piece rate wages. Second, the initial routine share and structural changes in the labor market seem not to affect average occupational wages. Moreover, only with base year 1998/99 the variables enter with the expected sign. Although, the signs on RSH-Index$_{alt.}^k$ and $dRSH_{alt.}^t$ are as expected when controlled for female's employment share within a given occupation, they are not statistically significant. However, a Wald Test leads to the conclusion that RSH-Index$_{alt.}^k$ and $dRSH_{alt.}^t$ are jointly different from zero. Furthermore, occupations with a higher female's share of the overall workforce pay significantly less on average. This difference need not necessarily the result of gender discrimination but might be related to different "occupational tastes" (see for example Killingsworth (1987) and Machin and Puhani (2003)).

[22]The estimation results with the average occupational wage rate for the other years as dependent variable can be found in appendix D.

Table 5.1: Average Occupational Log Hourly Wages and Routine Occupations

Dependent Variable: Average Occupational Log Hourly Wages in 2005/06

	(1)	(2)	(3)	(4)	(5)	(6)
	1979	1991/92	1998/99	1979	1991/92	1998/99
RSH-Index $^{k}_{alt.}$	.18	.16	-.16	-.27	-.28	-.42
	(.21)	(.23)	(.43)	(.24)	(.21)	(.33)
dRSH $^{t}_{alt.}$	-.04	.04	-.31	-.22	-.23	-.33
	(.14)	(.15)	(.44)	(.15)	(.15)	(.33)
dRMTI $^{t}_{alt.}$	2.78***	2.68*	1.71	1.31	.77	.86
	(1.26)	(1.55)	(2.10)	(.1.25)	(1.36)	(1.61)
his ^{k}	.58***	.55***	.73***	.62***	.62***	.95***
	(.14)	(.15)	(.13)	(.13)	(.12)	(.14)
gender ^{k}				-.36***	-.39***	-.40***
				(.11)	(.09)	(.09)
Wald-Test				7.29*	6.93*	7.05*
R^2	.27	.27	.30	.41	.49	.49
N	67	67	67	67	67	67

Note: Depend variables are average occupational log hourly wages in 2005/06. Robust standard errors are in parentheses. All models include an intercept. Figures in the second line indicate the base year k.
Wald and LM-Test statistics are distributed as χ^2 with three degrees of freedom and H0: RSH-Index$^{k}_{alt.}$,$dRSH^{t}_{alt.}$ and $dRMTI^{t}_{alt.}$ are jointly zero.
* Significant at the 10% level.** Significant at the 5% level.*** Significant at the 1% level.

The results about the relationship between wages and routine intensive work are quite weak on occupational level. Hence, we test the influence of the Routine Share-Index and changes of it on individuals' wages. In particular we estimate an augmented version of equation (8) given by

$$ln(wage_i) = \beta_0 + \beta_1 \, \mathrm{x} \, RSH^k_c + \beta_2 \, \mathrm{x} \, dRSH^t_c + \beta_3 \, \mathrm{x} \, dRMTI^t_c + \beta_4 \, \mathrm{x} \, firmsize_i + \boldsymbol{x_i'}\boldsymbol{\gamma} + e^t_c \quad (9)$$

where $firmsize_i$ is a firm size index, $\boldsymbol{x_i}$ is a vector of an individual's characteristics and e^t_c is a normally distributed error term with zero mean. Table (5.2) gives an overview over the vector $\boldsymbol{x_i}$ and the firm size index.[23] The variable age should capture possible wage increases due to experience , whereas age^2 should capture the possible decreasing return to experience. If a survey was conducted over two years, the age is calculated as the average of the upper and lower base year minus the year of birth, e.g. for the base year 2005/06 it is calculated as $\frac{2006+2005}{2} - year\ of\ birth$. Unfortunately, with the given data set it is not possible to analyze return to firm-tenure of an individual, which seems to be important source of wage growth especially for low-skilled workers (see Dustmann and Meghir (2005)). The variable $firm\ size$

[23]Note: the firm size is only reported in intervals.

Table 5.2: Characteristic Variables and Firm Size Index

Variable Name	Variable Description
Age	Age of an individual; calculated as $(\frac{lower\ base\ year+upper\ base\ year}{2}) - year\ of\ birth$
Age2	Square of the variable Age
Gender	Dummy variable which takes value 0 for male and 1 for female
Futrai	Dummy variable which takes value 1 if individual has taken part in further training for current job and 0 otherwise
HIS	Dummy variable which takes value 1 if individual possesses an university degree or graduated from a technical college and 0 otherwise
MIS	Dummy variable which takes value 1 if individual has finished an apprenticeship or graduated from a school of further education ("Berufsschule") and 0 otherwise
firm size	Index of the size of the firm an individual is employed at, which takes value 1 if firm size$\leq$ 4 2 if 5 $\leq$firm size$\leq$ 9 3 if 10 $\leq$firm size$\leq$ 49 4 if 50 $\leq$firm size$\leq$ 99 5 if 100 $\leq$firm size$\leq$ 499 6 if 500 $\leq$firm size$\leq$ 999 7 if firm size$\geq$ 1000

accounts for possible higher wage payments of larger firms.[24]

The results of equation (9) can be found in tables (5.3)-(5.5). The results in table (5.3) include the Routine Share-Index and changes of this index with base year 1998/99, whereas table (5.4) and (5.5) depict the outcome when the Routine Share-Index, $dRSH^t_{alt.}$ and $dRMTI^k_{alt.}$ for the year 1991/92 and 1979 are used respectively . The dependent variable in all three cases is the log hourly wage of an individual i earned in 2005/06.[25]

Looking at the results of tables (5.3)-(5.5) there are two flamboyant feature. First, the coefficient on $dRMTI^t_{alt.}$ is always positive, regardless which base year is used and the result is robust to the inclusion of control variables. This implies, that individuals who are employed in occupations with decreasing job content earn more on average, keeping all other variables constant. Second, as in the case of employment, there is only mild evidence that there has been a hollowing out of the wage structure before 1998/99. As can be seen in tables (5.4) and (5.5) before 1998/99 the coefficients on the Routine Share-Index and $dRSH^t_{alt.}$ enters only with the expected sings after controlling for gender. When 1979 is used as base year $dRSH^t_{alt.}$

[24]Gibson and Stillman (2009) find evidence that even after accounting for worker's characteristics, larger firms tend to pay higher wages.

[25]In appendix E the results of equation (9) using the log hourly wage in year 1998/99 as dependent variable can be found.

Table 5.3: Log Hourly Wages and Routine Occupations in 1998/99

Dependent Variable: Individual Log Hourly Wages in 2005/06

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
RSH-Index $^{k}_{alt.}$	-.56***	-.52***	-.49***	-.53***	-.87***	-.55***	−.57***
	(.05)	(.05)	(.05)	(.05)	(.05)	(.05)	(.05)
dRSH $^{t}_{alt.}$	-.79***	-.69***	-.65***	-.72***	-.88***	-.64***	-.61***
	(.06)	(.06)	(.06)	(.06)	(.05)	(.06)	(.05)
dRMTI $^{t}_{alt.}$	4.24***	2.36***	1.62***	2.05***	2.02***	1.95***	3.40***
	(.34)	(.28)	(.28)	(.27)	(.26)	(.26)	(.29)
Age		.06***					.05***
		(.00)					(.00)
Age2		-.00***					-.00***
		(.00)					(.00)
HIS			.44***				.38***
			(.02)				(.02)
MIS			.19***				.16***
			(.02)				(.02)
Futrai				.15***			.12***
				(.01)			(.01)
Gender					-.22***		-.19***
					(.01)		(.01)
firm size						.07***	.06***
						(.00)	(.00)
R^2	.05	.12	.10	.08	.11	.14	.35

Note: Sample size are 7,714 observations. Depend variables are average occupational log hourly wages in 2005/06. Robust standard errors are in parentheses. Model includes an intercept. The base year of the Routine Share-Index is 1998/99.
* Significant at the 10% level.** Significant at the 5% level.*** Significant at the 1% level.

Table 5.4: Log Hourly Wages and Routine Occupations in 1991/92

Dependent Variable: Individual Log Hourly Wages in 2005/06

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
RSH-Index $^{k}_{alt.}$	.36***	.33***	.39***	.50***	-.13**	-.11**	−.15***
	(.05)	(.05)	(.05)	(.05)	(.05)	(.05)	(.05)
dRSH $^{t}_{alt.}$	.03*	.05***	.05***	.07***	-.17***	-.03	-.14***
	(.03)	(.02)	(.02)	(.02)	(.05)	(.02)	(.02)
dRMTI $^{t}_{alt.}$	3.96***	4.48***	3.53***	3.80***	3.38***	3.35***	3.02***
	(.31)	(.30)	(.29)	(.30)	(.30)	(.30)	(.27)
Age		.06***					.05***
		(.00)					(.00)
Age2		-.00***					-.00***
		(.00)					(.00)
HIS			.48***				.40***
			(.02)				(.02)
MIS			.20***				.16***
			(.02)				(.02)
Futrai				.17***			.12***
				(.01)			(.01)
Gender					-.21***		-.19***
					(.01)		(.01)
firm size						.07***	.06***
						(.00)	(.00)
R^2	.03	.10	.09	.07	.09	.12	.35

Note: Sample size are 7,714 observations. Depend variables are average occupational log hourly wages in 2005/06. Robust standard errors are in parentheses. Model includes an intercept. The base year of the Routine Share-Index is 1991/92.
* Significant at the 10% level.** Significant at the 5% level.*** Significant at the 1% level.

Table 5.5: Log Hourly Wages and Routine Occupations in 1979

Dependent Variable: Individual Log Hourly Wages in 2005/06

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
RSH-Index $^{k}_{alt.}$	.29***	.30***	.31***	.38***	-.15**	.10***	−.14***
	(.04)	(.04)	(.04)	(.04)	(.05)	(.05)	(.04)
dRSH $^{t}_{alt.}$	.00	.03	.01	.03	-.16***	-.04**	-.12***
	(.02)	(.02)	(.02)	(.02)	(.05)	(.02)	(.02)
dRMTI $^{t}_{alt.}$	3.97***	4.50***	3.55***	3.78***	3.44***	3.37***	3.07***
	(.30)	(.30)	(.29)	(.29)	(.30)	(.30)	(.26)
Age		.06***					.05***
		(.00)					(.00)
Age2		-.00***					-.00***
		(.00)					(.00)
HIS			.48***				.40***
			(.02)				(.02)
MIS			.20***				.16***
			(.02)				(.02)
Futrai				.17***			.12***
				(.01)			(.01)
Gender					-.20***		-.18***
					(.01)		(.01)
firm size						.07***	.06***
						(.00)	(.00)
R^2	.04	.11	.10	.08	.09	.13	.29

Note: Sample size are 7,714 observations. Depend variables are average occupational log hourly wages in 2005/06. Robust standard errors are in parentheses. Model includes an intercept. The base year of the Routine Share-Index is 1979.
* Significant at the 10% level.** Significant at the 5% level.*** Significant at the 1% level.

becomes only significant when controlled for gender or firm size. However, in the latter case the coefficient on the Routine Share-Index enters with a positive sign.[26] However, using 1998/99 as base year both the Routine Share-Index and $dRSH^t_{alt.}$ enter always with the expected sign, are significant and quite large in magnitude. Like for employment growth, it seems that structural changes within the labor market have replace initial condition as main indicator explaining wage growth. All other variables enter with the expected sign.

The results in tables (5.3)-(5.5) help to clarify the ambiguous results in table (5.1). On the individual's level there are clear signs of technological-led wage polarization since 1998/99. However, the effect is dampened by a positive coefficient on $dRMTI^t_{alt.}$. The positive sign is robust to the inclusion of control variables. This implies that there are two contrary forces in the labor market. On one side, structural changes within the labor market lead to wage (and employment) polarization. On the other side, this effect is partly off-set by within-occupation rewards of decreasing job content. A possible explanation for this are piece rate wages or bonus payments for monotone job titles. Support for this hypothesis can be found in table (5.6). The table depicts the results of re-estimating equation (9) considering only individuals working in occupations where more than one fifth of the overall employment share in 1998/99 are high-skilled. The reasoning behind is, that the larger the employment share of high-skilled workers, the lower should be the possibility that piece rate wages or similar are a large part of the overall wage bill. There are six occupations with a high-skilled labor share above 20% in 1998/99, namely Entrepreneurs, Data Processing, Law, Publicists, Artists and Teachers. As can be already infered from the occupations, it seems unlikely that piecewage rates are paid in those jobs. The overall sample size is 1,296.

As can be seen from the results, the coefficient on $dRMTI^t_{alt}$ is always negative and significant for individuals working in "high-skill" occupations. The same is true for the coefficients on the Routine Share-Index and $dRSH^t_{alt}$. Furthermore, besides the significant difference on the routine tasks inputs, individuals working in "high-skill" occupations have a significantly higher return on experience but also a significantly lower return on further job-related training. It seems that indeed wage polarization is mitigated by bonus payments for montone job tasks and piece rate wages. To account for outliers we estimate the model for each skill group seperately using Quantile regressio. The estimation results are given in tables (5.7-5.9).

The results are similar to those obtained via OLS. Wages in each skill group are affected by structural changes, whereas the coefficient are higher for high- and low-skilled workers. Furthermore the difference between the coefficients for the 10th and the 90th percentile indicate

[26] Using log hourly wage from the 1998/99 survey, the Routine Share-Index and $dRSH^t_c$ turn slightly negative after controlling for firm size, as can be seen in tables (H.1) and (H.2) in appendix E.

Table 5.6: Average Occupational Log Hourly Wages and High-Education Occupations in 1998/99

Dependent Variable: Average Occupational Log Hourly Wages in 2005/06							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
RSH-Index $^{k}_{alt.}$	-1.34***	-1.51***	-1.79***	-1.29***	-1.26***	-1.18***	−1.73***
	(.31)	(.29)	(.31)	(.31)	(.31)	(.30)	(.28)
dRSH $^{t}_{alt.}$	-.94***	-1.21***	-1.12***	-.91***	-.96***	-1.03**	-1.45***
	(.32)	(.30)	(.31)	(.32)	(.31)	(.30)	(.27)
dRMTI $^{t}_{alt.}$	-4.44***	-3.01**	-4.88***	-3.92***	-3.85***	-4.79***	-3.04**
	(1.52)	(1.43)	(1.44)	(1.51)	(1.54)	(1.46)	(1.27)
Age		.09***					.07***
		(.00)					(.01)
Age2		-.00***					-.00***
		(.00)					(.00)
HIS			.34***				.28***
			(.05)				(.05)
MIS			.10**				.07
			(.05)				(.05)
Futrai				.08***			.06**
				(.03)			(.03)
Gender					-.22***		-.16***
					(.02)		(.02)
firm size						.08***	.06***
						(.01)	(.01)
R^2	.02	.14	.09	.02	.08	.11	.32

Note: Sample size are 1,296 observations. Depend variables are average occupational log hourly wages in 2005/06 for individuals who are working in the fields of "Entrepreneurs", " Data Processing", "Law", "Publicists", "Artists" or "Teacher". Robust standard errors are in parentheses. Model includes an intercept. The base year of the Routine Share-Index is 1998/99.
* Significant at the 10% level.** Significant at the 5% level.*** Significant at the 1% level.

Table 5.7: Quantile Regression High-Skilled Workers

Dependent Variable: Log Hourly Wages in 2005/06

	(1) 10th	(2) 50th	(3) 90th
RSH-Index $^{k}_{alt.}$	-.81**	-.48*	-1.20***
	(.37)	(.26)	(.33)
dRSH $^{t}_{alt.}$	-.69***	-.46**	-1.27***
	(.36)	(.22)	(.26)
dRMTI $^{t}_{alt.}$	-.10	1.82*	3.09**
	(1.77)	(1.08)	(1.43)
Gender	-.22***	-.16***	-.17***
	(.06)	(.03)	(.04)
Futrai	.29***	.06*	.06
	(.10)	(.04)	(.04)
firm size	.07***	.05***	.05***
	(.02)	(.01)	(.01)
Age	.07*	.06***	.09***
	(.04)	(.02)	(.02)
Age2	-.00	-.00***	-.00***
	(.00)	(.00)	(.00)
Pseudo-R^2	.16	.15	.15

Note: Sample size are 763 observations. Depend variables are log hourly wages in 2005/06. Bootstrapped standard errors with 500 replications are in parentheses. The base year of the Routine Share-Index is 1998/99. * Significant at the 10% level.** Significant at the 5% level.*** Significant at the 1% level.

Table 5.8: Quantile Regression Medium-Skilled Workers

Dependent Variable: Log Hourly Wages in 2005/06			
	(1)	(2)	(3)
	10th	50th	90th
RSH-Index $^{k}_{alt.}$	-.64***	-.49***	-.41***
	(.09)	(.05)	(.08)
dRSH $^{t}_{alt.}$	-.72***	-.53**	-.40***
	(.10)	(.06)	(.09)
dRMTI $^{t}_{alt.}$	2.95***	3.66***	3.68***
	(.52)	(.33)	(.50)
Gender	-.23***	-.17***	-.15***
	(.02)	(.01)	(.02)
Futrai	.18***	.11***	.08***
	(.02)	(.01)	(.02)
firm size	.07***	.06***	.05***
	(.01)	(.00)	(.00)
Age	.03***	.05***	.04***
	(.01)	(.00)	(.01)
Age2	-.00***	-.00***	-.00***
	(.00)	(.00)	(.00)
Pseudo-R^2	.15	.15	.13

Note: Sample size are 6,382 observations. Depend variables are log hourly wages in 2005/06. Bootstrapped standard errors with 500 replications are in parentheses. The base year of the Routine Share-Index is 1998/99. * Significant at the 10% level.** Significant at the 5% level.*** Significant at the 1% level.

Table 5.9: Quantile Regression Low-Skilled Workers

Dependent Variable: Log Hourly Wages in 2005/06

	(1) 10th	(2) 50th	(3) 90th
RSH-Index $^{k}_{alt.}$	-.47	-1.06***	-1.06***
	(.32)	(.19)	(.29)
dRSH $^{t}_{alt.}$	-.60*	-1.20***	-1.12***
	(.32)	(.20)	(.31)
dRMTI $^{t}_{alt.}$	3.15***	4.85***	6.33***
	(1.14)	(1.26)	(1.51)
Gender	-.24***	-.21***	-.24***
	(.05)	(.04)	(.06)
Futrai	.11**	.10***	.19***
	(.05)	(.04)	(.05)
firm size	.08***	.07***	.06***
	(.02)	(.01)	(.01)
Age	.04*	.06***	.07***
	(.02)	(.01)	(.02)
Age2	-.00	-.00***	-.00***
	(.00)	(.00)	(.00)
Pseudo-R^2	.21	.22	.21

Note: Sample size are 569 observations. Depend variables are log hourly wages in 2005/06. Bootstrapped standard errors with 500 replications are in parentheses. The base year of the Routine Share-Index is 1998/99. * Significant at the 10% level.** Significant at the 5% level.*** Significant at the 1% level.

that changing job content leads to an increase of within skill group wage inequality. The result for medium-educated workers is not that pronounced. The coefficients on the RSH-Index and $dRSH^t_{alt.}$ are lower than for the other two skill groups. The high and statistically significant coefficients on $dRMTI^t_{alt.}$ for medium- and low-skilled workers support the piece rate wage hypothesis.

6 Conclusion

The analysis in this work is concerned with wage and employment polarization in Germany. However, compared to previous studies of polarization in Germany (see for example Antonczyk et al. (2010) and Dustmann et al. (2009)) we explicitly account for the average routine input in a given occupation as driving force. Although this idea is not new and has been forwarded by Autor et al. (2003) and Autor and Dorn (2010) the data set used in this analysis has a particular advantage: it allows to track changes in the routine share which are due to within-occupational as well as labor-market (structural) induced adjustments over time. Those adjustments play a very important role in explaining observed employment and wage patterns. Structural changes have become the main force to explain employment for medium-skilled workers. However, what is driving employment for highly- and low-educated workers is not clear. In the first case until recently employment growth was driven by an increase in job content for medium- and low-skilled workers. But this evidence has ceased to exist since 1998/99. Employment growth of low-skilled workers seems to be less affected by the job content. They might be more affected by external factors like unions or immigration. To test this hypothesis is topic of further research. Overall there is evidence of technological-led polarization in the German labor market. In contrast to the prediction of the model of Autor and Dorn (2010) low-skilled workers seem not to uniformly profit from it.

Not only employment is affect by changing job tasks but also wages. On the aggregate level the evidence is not clear with non of the coefficients on the routine variables significant. However, the analysis on the individual level shows that routine intensive occupations pay indeed less. This effect is most pronounced and immune to the inclusion of control variables for the base year 1998/99. Furthermore, the outcome and magnitude differs by skill group. Whereas low- and high-skilled workers are benefiting when working in low routine occupations with decreasing job content leading to increasing wage inequality within those skill groups, this effect is not so clear for medium-skilled workers. On one side occupations with a lower routine share pay more, on the other side this effect is mitigated by a negatively correlated change in $dRMTI^t_{alt.}$. This leads to a bumpy wage structure across percentiles.

The results in this paper show that incorporating job contents can explain a substantial share of changes in the wage and employment structure. Clearly, more has to be done on this. For example, we have not tested for possible labor mobility and regional differences as proposed by Autor and Dorn (2010). Furthermore, using job content might give a deeper insight into the gender wage gap since female workers are more likely found in service/ non-routine occupations. [27]

[27] Black and Spitz-Oener (2010) find that women substantially profit from changes in job tasks.

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A Occupations

The following table shows the occupations according to the 2-digit classification. Occupations marked with an asterisk are not observed in every wave. Occupations marked with a plus have less than three observations in at least one wave. In both cases the occupations are excluded from the analysis. Farming and agricultural related occupations (01-04) and workers without specified occupation (98) are excluded from the analysis as well. Furthermore this table provides the employment share of the specific occupation on overall employment as well as the share of high-, medium- and low-skilled workers within each occupations used in the analysis. Furthermore, it contains the employment share of female workers and PC penetration rate within occupations for every wave.

Table A.1: Occupations according to 2-digit classification

Code	Occupations	1979	1985/86	1991/92	1998/99	2005/06
01	Farming & Agriculture	–	–	–	–	–
02	Livestock Breeding & Fishing	–	–	–	–	–
03	Administration & Consulting in Farming*	–	–	–	–	–
04	Farming Personnel	–	–	–	–	–
05	Horticulturist & related	00.70	00.65	00.87	00.96	00.83
	of which are women	22.60	36.08	30.14	44.19	40.91
	of which are high-skilled	03.42	06.19	06.16	02.33	06.06
	of which are medium-skilled	17.12	14.43	15.75	12.40	01.52
	of which are low-skilled	79.45	79.38	78.08	85.27	92.42
	PC penetration rate	00.00	01.03	05.48	08.53	42.42
06	Forestry and Hunting	00.26	00.17	00.23	00.10	00.14
	of which are women	07.54	00.00	02.56	00.00	00.00
	of which are high-skilled	03.77	07.69	12.82	07.69	09.09
	of which are medium-skilled	56.66	73.08	56.41	76.92	90.91
	of which are low-skilled	39.62	19.23	30.77	15.38	00.00
	PC penetration rate	00.00	03.84	12.82	15.38	54.55
07	Mining	00.47	00.37	00.31	00.23	00.08

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TableA.1 – Continued

Code	Occupations	1979	1985/86	1991/92	1998/99	2005/06
	of which are women	01.02	01.79	00.00	00.00	00.00
	of which are high-skilled	00.00	00.00	00.00	00.00	00.00
	of which are medium-skilled	71.43	94.64	61.54	100.00	100.00
	of which are low-skilled	28.57	05.26	38.46	00.00	00.00
	PC penetration rate	01.02	01.79	01.92	06.46	33.33
08	Oil,Gas and related^{+}	–	–	–	–	–
09	Mineral Processing^{+}	–	–	–	–	–
10	Stone Cutter & related	00.13	00.07	00.11	00.07	00.06
	of which are women	00.00	00.00	00.00	00.00	00.00
	of which are high-skilled	00.00	00.00	00.00	00.00	00.00
	of which are medium-skilled	92.86	90.00	94.44	100.00	80.00
	of which are low-skilled	07.14	10.00	05.56	00.00	20.00
	PC penetration rate	00.00	00.00	05.56	10.00	80.00
11	Construction Material & related	00.07	00.06	00.04	00.03	00.04
	of which are women	20.00	00.00	00.00	00.00	00.00
	of which are high-skilled	00.00	00.00	00.00	00.00	00.00
	of which are medium-skilled	80.00	88.89	83.33	100.00	66.67
	of which are low-skilled	20.00	11.11	16.67	00.00	33.33
	PC penetration rate	06.67	00.00	16.67	00.00	33.33
12	Ceramists	00.08	00.11	00.05	00.09	00.09
	of which are women	37.50	31.25	44.44	25.00	57.14
	of which are high-skilled	00.00	00.00	00.00	00.00	00.00
	of which are medium-skilled	56.25	100.00	55.56	50.00	71.43
	of which are low-skilled	43.75	00.00	44.44	50.00	28.57
	PC penetration rate	00.00	00.00	00.00	00.00	14.29
13	Gaffer	00.20	00.13	00.15	00.10	00.18
	of which are women	04.76	15.79	20.00	30.77	28.57
	of which are high-skilled	00.00	00.00	00.00	00.00	00.00

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TableA.1 – Continued

Code	Occupations	1979	1985/86	1991/92	1998/99	2005/06
	of which are medium-skilled	85.71	78.95	80.00	76.93	71.43
	of which are low-skilled	14.29	21.05	20.00	23.08	28.57
	PC penetration rate	00.00	00.00	08.00	30.77	57.14
14	Chemical Production	00.82	00.97	00.84	00.80	00.89
	of which are women	18.24	15.86	08.51	15.89	17.14
	of which are high-skilled	02.35	01.38	00.00	00.00	02.86
	of which are medium-skilled	68.82	82.07	82.27	85.98	82.86
	of which are low-skilled	28.82	16.55	17.73	14.02	14.29
	PC penetration rate	02.25	12.41	24.11	27.10	85.71
15	Plastic & Synthetic	00.09	00.17	00.20	00.16	00.25
	of which are women	16.67	23.08	23.53	09.09	10.00
	of which are high-skilled	00.00	03.84	02.94	00.00	00.00
	of which are medium-skilled	83.33	80.77	70.59	86.36	90.00
	of which are low-skilled	16.67	15.38	26.47	13.64	10.00
	PC penetration rate	00.00	00.00	11.76	18.18	65.00
16	Paper Production & Processing	00.21	00.24	00.24	00.30	00.30
	of which are women	36.36	27.78	27.50	39.02	33.33
	of which are high-skilled	02.27	00.00	00.00	02.44	08.33
	of which are medium-skilled	68.18	66.67	77.50	80.49	66.67
	of which are low-skilled	29.55	33.33	22.50	17.07	25.00
	PC penetration rate	00.00	02.78	17.50	19.51	58.33
17	Printer Industry	00.82	01.00	00.69	00.74	00.73
	of which are women	07.02	14.00	23.28	22.22	29.31
	of which are high-skilled	00.58	02.00	02.59	00.00	03.45
	of which are medium-skilled	90.06	92.67	83.62	91.92	87.93
	of which are low-skilled	09.46	05.33	13.79	08.08	08.62
	PC penetration rate	08.19	17.33	34.48	33.33	87.93
18	Timber Industry	00.07	00.15	00.13	00.13	00.03
	of which are women	07.14	13.04	19.05	11.11	50.00

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TableA.1 – Continued

Code	Occupations	1979	1985/86	1991/92	1998/99	2005/06
	of which are high-skilled	00.00	00.00	00.00	00.00	00.00
	of which are medium-skilled	71.43	69.57	42.85	55.56	50.00
	of which are low-skilled	28.57	30.43	57.14	44.44	50.00
	PC penetration rate	00.00	00.00	00.00	00.00	00.00
19	Metal Producing	00.23	00.29	00.22	00.14	00.20
	of which are women	02.13	02.32	05.56	00.00	00.00
	of which are high-skilled	02.13	00.00	00.00	00.00	00.00
	of which are medium-skilled	70.21	76.74	58.33	57.89	87.50
	of which are low-skilled	27.66	23.26	41.67	42.11	12.50
	PC penetration rate	00.00	06.98	05.56	15.79	93.75
20	Former & Caster	00.17	00.20	00.17	00.11	00.10
	of which are women	02.78	06.67	00.00	00.00	00.00
	of which are high-skilled	00.00	00.00	00.00	06.67	00.00
	of which are medium-skilled	88.89	83.33	79.31	66.67	75.00
	of which are low-skilled	11.11	16.67	20.69	26.67	25.00
	PC penetration rate	00.00	03.33	00.00	13.33	75.00
21	Metal Forming (non-cutting)	00.17	00.45	00.20	00.08	00.10
	of which are women	36.11	16.18	57.58	36.36	37.50
	of which are high-skilled	00.00	00.00	00.00	00.00	00.00
	of which are medium-skilled	77.78	83.82	48.48	45.45	75.00
	of which are low-skilled	22.22	16.18	51.52	54.55	25.00
	PC penetration rate	00.00	01.47	00.00	00.00	50.00
22	Metal Forming (cutting)	01.11	00.78	01.08	00.79	01.13
	of which are women	00.43	02.59	02.76	03.77	03.37
	of which are high-skilled	00.00	00.86	00.00	00.94	01.12
	of which are medium-skilled	80.60	92.24	89.50	92.45	91.01
	of which are low-skilled	19.40	06.90	10.50	06.60	07.87
	PC penetration rate	00.43	01.72	14.92	10.38	75.28
23	Metal Surface Processing	00.13	00.09	00.14	00.11	00.13

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TableA.1 – Continued

Code	Occupations	1979	1985/86	1991/92	1998/99	2005/06
	of which are women	07.69	14.29	08.70	13.33	10.00
	of which are high-skilled	00.00	00.00	00.00	06.67	10.00
	of which are medium-skilled	73.08	85.72	65.22	80.00	70.00
	of which are low-skilled	26.92	14.29	34.78	13.33	20.00
	PC penetration rate	00.00	00.00	08.70	20.00	80.00
24	Metal Connecting	00.42	00.43	00.41	00.38	00.39
	of which are women	03.40	12.50	14.71	03.92	16.13
	of which are high-skilled	00.00	00.00	00.00	00.00	00.00
	of which are medium-skilled	80.68	85.94	73.53	86.27	96.77
	of which are low-skilled	19.32	14.06	26.47	13.73	03.23
	PC penetration rate	00.00	00.00	01.47	03.92	67.74
25	Blacksmith	00.16	00.10	00.09	00.07	00.05
	of which are women	00.00	00.00	00.00	00.00	00.00
	of which are high-skilled	00.00	06.67	00.00	10.00	00.00
	of which are medium-skilled	78.79	93.33	93.33	90.00	100.00
	of which are low-skilled	21.21	00.00	06.67	00.00	00.00
	PC penetration rate	00.00	00.00	00.00	30.00	50.00
26	Plumber & related	01.46	01.42	01.52	02.22	01.64
	of which are women	00.00	00.47	00.79	07.02	08.46
	of which are high-skilled	00.33	01.41	00.39	00.33	00.77
	of which are medium-skilled	89.77	96.70	97.64	93.98	92.31
	of which are low-skilled	09.90	01.89	01.97	05.69	06.92
	PC penetration rate	00.00	02.83	08.66	14.05	54.62
27	Locksmith	03.89	04.13	03.69	03.46	03.34
	of which are women	00.62	00.49	00.65	01.29	02.27
	of which are high-skilled	00.74	00.65	00.32	00.43	01.89
	of which are medium-skilled	89.83	97.08	96.27	93.98	92.80
	of which are low-skilled	09.43	02.27	03.40	05.59	05.30
	PC penetration rate	00.37	01.78	09.56	15.05	71.97

Continued on next page

TableA.1 – Continued

Code	Occupations	1979	1985/86	1991/92	1998/99	2005/06
28	Mechanic	02.70	02.94	02.76	02.19	01.82
	of which are women	02.14	03.41	01.73	02.03	02.08
	of which are high-skilled	00.00	00.23	00.43	00.34	01.39
	of which are medium-skilled	90.54	97.73	94.81	94.92	96.52
	of which are low-skilled	09.46	02.04	04.76	04.75	02.08
	PC penetration rate	02.14	04.77	14.07	28.14	87.50
29	Tool Making Industry	00.65	00.82	00.68	00.56	00.43
	of which are women	00.00	00.00	00.88	00.00	00.00
	of which are high-skilled	00.00	00.00	01.75	01.33	00.00
	of which are medium-skilled	88.81	99.18	98.25	94.67	100.00
	of which are low-skilled	11.19	00.82	00.00	04.00	00.00
	PC penetration rate	00.00	04.10	17.54	22.67	94.12
30	Precision Mechanics & related	00.37	00.55	00.55	00.68	00.42
	of which are women	28.57	26.83	44.57	57.14	72.73
	of which are high-skilled	01.30	00.00	04.35	04.40	06.06
	of which are medium-skilled	07.79	02.44	05.43	00.00	06.06
	of which are low-skilled	90.91	97.56	90.33	95.60	87.88
	PC penetration rate	01.30	06.10	17.39	32.97	63.64
31	Electrician	03.39	03.99	03.76	03.47	03.15
	of which are women	01.99	03.18	04.30	04.50	05.22
	of which are high-skilled	00.71	01.01	01.91	00.43	00.40
	of which are medium-skilled	91.05	95.48	93.99	96.79	93.98
	of which are low-skilled	08.24	03.52	05.10	02.78	05.62
	PC penetration rate	04.69	09.88	28.66	42.83	87.95
32	Assembling & related	00.88	00.90	00.83	00.62	01.08
	of which are women	36.07	31.11	34.78	35.71	37.65
	of which are high-skilled	01.09	00.74	02.17	01.19	01.18
	of which are medium-skilled	69.40	51.11	55.07	69.05	84.71
	of which are low-skilled	29.51	48.15	42.75	29.76	14.12

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TableA.1 – Continued

Code	Occupations	1979	1985/86	1991/92	1998/99	2005/06
	PC penetration rate	00.55	05.19	05.80	15.48	62.35
33	Spinner & related	00.06	00.08	00.04	00.03	00.04
	of which are women	61.54	41.67	83.33	50.00	100.00
	of which are high-skilled	00.00	00.00	00.00	00.00	00.00
	of which are medium-skilled	61.54	100.00	16.67	50.00	100.00
	of which are low-skilled	38.46	00.00	83.33	50.00	00.00
	PC penetration rate	00.00	08.33	00.00	25.00	33.00
34	Textile Producing	00.19	00.24	00.10	00.07	00.04
	of which are women	25.64	36.11	47.06	44.44	33.33
	of which are high-skilled	00.00	00.00	00.00	00.00	00.00
	of which are medium-skilled	76.92	83.33	82.35	55.56	66.67
	of which are low-skilled	23.08	16.67	17.64	44.44	33.33
	PC penetration rate	00.00	05.56	05.88	00.00	100.00
35	Textile Processing	01.45	00.82	00.67	00.45	00.19
	of which are women	85.67	89.43	91.06	88.33	93.33
	of which are high-skilled	00.00	00.00	00.00	00.00	00.00
	of which are medium-skilled	76.33	86.18	71.21	80.00	73.33
	of which are low-skilled	23.67	13.82	28.79	20.00	26.67
	PC penetration rate	00.33	00.00	03.79	01.67	33.33
36	Textile Refinement^{+}	–	–	–	–	–
37	Leather Producing & related	00.34	00.27	00.21	00.09	00.06
	of which are women	29.58	35.00	40.00	25.00	40.00
	of which are high-skilled	05.63	00.00	00.00	00.00	00.00
	of which are medium-skilled	77.46	100.00	85.71	91.67	100.00
	of which are low-skilled	16.90	00.00	14.29	08.33	00.00
	PC penetration rate	00.00	00.00	02.86	00.00	20.00
39	Baker	00.67	00.59	00.51	00.59	00.33
	of which are women	05.71	07.95	11.63	11.25	26.92

Continued on next page

TableA.1 – Continued

Code	Occupations	1979	1985/86	1991/92	1998/99	2005/06
	of which are high-skilled	01.43	00.00	00.00	01.25	00.00
	of which are medium-skilled	94.29	95.45	96.51	96.25	100.00
	of which are low-skilled	04.29	04.55	03.49	02.50	00.00
	PC penetration rate	00.00	00.00	04.65	05.00	26.92
40	Meat & Fish Processing	00.54	00.35	00.44	00.44	00.23
	of which are women	00.89	01.89	09.59	08.47	22.22
	of which are high-skilled	00.00	00.00	00.00	00.00	05.56
	of which are medium-skilled	91.07	96.23	89.04	91.53	83.33
	of which are low-skilled	09.83	03.77	10.96	08.47	11.11
	PC penetration rate	00.00	00.00	04.11	11.86	50.00
41	Food Processing	00.81	00.76	00.83	01.08	00.95
	of which are women	58.33	53.98	63.04	49.32	56.00
	of which are high-skilled	00.00	00.00	00.72	00.68	00.00
	of which are medium-skilled	74.40	84.96	63.04	78.08	85.33
	of which are low-skilled	25.60	15.04	36.23	21.32	14.67
	PC penetration rate	00.60	00.88	03.62	10.27	42.67
42	Foodstuff, Drinks & Tobacco	00.09	00.11	00.07	00.21	00.08
	of which are women	16.67	00.00	08.33	28.57	00.00
	of which are high-skilled	05.56	05.88	00.00	00.00	00.00
	of which are medium-skilled	72.22	82.35	66.67	82.14	100.00
	of which are low-skilled	22.22	11.76	33.33	17.86	00.00
	PC penetration rate	00.00	05.56	16.67	07.14	100.00
43	oth. Food related	00.13	00.12	00.08	00.07	00.14
	of which are women	11.54	16.67	28.57	20.00	18.18
	of which are high-skilled	00.00	00.00	00.00	00.00	00.00
	of which are medium-skilled	76.92	66.67	71.43	90.00	63.64
	of which are low-skilled	23.08	33.33	28.57	10.00	36.36
	PC penetration rate	00.00	11.11	21.43	20.00	72.73
44	Brick Layer & related	01.94	01.99	01.92	01.58	00.65

Continued on next page

TableA.1 – Continued

Code	Occupations	1979	1985/86	1991/92	1998/99	2005/06
	of which are women	00.25	01.01	00.62	00.94	03.92
	of which are high-skilled	00.50	00.34	00.62	00.00	01.96
	of which are medium-skilled	89.05	93.29	91.30	95.77	94.12
	of which are low-skilled	10.45	06.38	08.07	04.23	03.92
	PC penetration rate	00.00	00.34	01.86	05.16	13.73
45	Carpenter & related	00.70	00.74	00.67	00.77	00.43
	of which are women	02.07	01.82	01.79	00.00	00.00
	of which are high-skilled	00.69	00.00	01.79	00.00	00.00
	of which are medium-skilled	84.14	90.91	89.29	96.15	100.00
	of which are low-skilled	15.17	09.09	08.93	03.85	00.00
	PC penetration rate	00.00	00.91	04.46	04.81	23.53
46	Civil Engineering	00.52	00.37	00.50	00.42	00.30
	of which are women	00.00	00.00	00.00	00.00	00.00
	of which are high-skilled	00.93	01.81	00.00	00.00	00.00
	of which are medium-skilled	71.30	72.73	58.33	84.21	87.50
	of which are low-skilled	27.78	25.45	41.67	15.79	12.50
	PC penetration rate	00.00	01.82	02.38	08.77	29.17
47	Builder's Laborer*	–	–	–	–	–
48	oth. Construction related	00.65	00.77	00.60	00.68	00.34
	of which are women	01.49	00.87	00.99	03.30	00.00
	of which are high-skilled	00.00	00.00	00.00	00.00	00.00
	of which are medium-skilled	89.55	92.17	89.11	87.91	96.30
	of which are low-skilled	10.45	07.82	10.89	12.09	03.70
	PC penetration rate	00.00	00.00	04.95	05.49	29.63
49	Interior Decoration & related	00.27	00.25	00.14	00.17	00.10
	of which are women	05.45	18.42	08.70	13.04	37.50
	of which are high-skilled	00.00	00.00	00.00	00.00	00.00
	of which are medium-skilled	89.09	84.21	65.22	95.65	87.50
	of which are low-skilled	10.91	15.79	34.78	04.34	12.50

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TableA.1 – Continued

Code	Occupations	1979	1985/86	1991/92	1998/99	2005/06
	PC penetration rate	00.00	00.00	00.00	08.70	62.50
50	Cabinet Maker & related	01.46	01.27	01.61	01.32	00.77
	of which are women	00.00	00.53	03.72	03.95	01.64
	of which are high-skilled	00.33	00.00	02.23	02.26	00.00
	of which are medium-skilled	92.43	98.42	95.54	90.96	93.44
	of which are low-skilled	07.24	01.58	02.23	06.78	06.56
	PC penetration rate	00.00	01.05	07.06	11.30	59.02
51	Painting & related	01.19	01.20	01.41	01.08	00.58
	of which are women	02.44	03.89	07.23	06.20	13.04
	of which are high-skilled	00.41	00.00	00.43	00.00	00.00
	of which are medium-skilled	90.65	94.44	91.91	94.48	95.65
	of which are low-skilled	08.94	05.56	07.66	05.51	04.35
	PC penetration rate	00.00	00.56	03.40	06.90	41.30
52	Controlling of Goods & related	01.06	01.06	01.30	01.12	02.11
	of which are women	48.64	43.03	47.47	45.03	51.50
	of which are high-skilled	00.91	00.63	01.84	01.32	02.99
	of which are medium-skilled	65.45	54.43	58.99	68.87	81.44
	of which are low-skilled	33.64	44.94	39.17	29.80	15.57
	PC penetration rate	01.36	05.06	20.28	23.18	78.44
53	Not specified Laborer*	–	–	–	–	–
54	Machine Setter	01.56	01.29	01.48	01.51	01.58
	of which are women	03.70	03.62	03.23	05.91	08.80
	of which are high-skilled	00.00	00.52	01.21	00.49	00.80
	of which are medium-skilled	78.09	82.38	77.42	86.70	89.60
	of which are low-skilled	21.91	17.10	21.37	12.81	09.60
	PC penetration rate	01.54	05.18	09.27	16.75	73.60
60	Engineering*	–	–	–	–	–
61	Chemists,Physicists, Mathematicians*	–	–	–	–	–

Continued on next page

TableA.1 – Continued

Code	Occupations	1979	1985/86	1991/92	1998/99	2005/06
62	Technician	04.69	03.63	03.92	04.50	04.55
	of which are women	05.24	04.97	06.41	07.93	13.89
	of which are high-skilled	03.70	09.76	07.94	05.12	07.78
	of which are medium-skilled	88.28	88.77	89.62	92.73	88.61
	of which are low-skilled	08.02	01.47	02.44	02.15	03.61
	PC penetration rate	10.50	38.49	55.27	66.61	98.05
63	oth. Technic related Industry	01.17	01.41	01.27	01.13	01.05
	of which are women	09.04	14.36	11.45	12.73	12.78
	of which are high-skilled	01.24	03.79	06.13	03.92	07.22
	of which are medium-skilled	89.26	93.84	91.50	94.12	90.36
	of which are low-skilled	09.50	02.37	02.36	01.96	02.41
	PC penetration rate	01.34	07.18	15.27	16.69	23.06
68	Sales	09.30	07.81	09.44	10.05	08.17
	of which are women	53.16	57.62	61.53	68.14	66.41
	of which are high-skilled	01.81	02.57	03.61	02.96	05.57
	of which are medium-skilled	84.87	89.55	84.28	89.80	85.76
	of which are low-skilled	13.32	07.88	12.10	07.24	08.67
	PC penetration rate	03.37	18.75	23.64	35.62	79.88
69	Banking & Insurance	03.12	03.81	03.51	03.90	04.79
	of which are women	34.93	35.96	37.88	47.05	56.99
	of which are high-skilled	02.32	04.39	06.48	05.33	10.55
	of which are medium-skilled	86.24	91.58	88.05	90.86	86.28
	of which are low-skilled	11.44	04.03	05.46	03.81	03.17
	PC penetration rate	22.72	68.25	80.88	73.14	99.74
70	oth. Service related	00.94	01.40	01.24	01.40	01.51
	of which are women	21.54	32.86	32.69	45.50	51.26
	of which are high-skilled	06.15	04.76	10.58	08.47	10.92
	of which are medium-skilled	76.92	82.86	79.33	89.42	79.83
	of which are low-skilled	16.92	12.38	10.10	02.12	09.24

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TableA.1 – Continued

Code	Occupations	1979	1985/86	1991/92	1998/99	2005/06
	PC penetration rate	09.23	40.95	62.02	64.02	95.80
71	Road Traffic	04.02	03.87	03.72	03.43	02.83
	of which are women	02.63	02.76	03.86	04.34	09.38
	of which are high-skilled	00.36	01.21	00.64	00.43	00.00
	of which are medium-skilled	77.49	77.55	67.68	82.21	83.04
	of which are low-skilled	22.16	21.24	31.67	17.35	16.96
	PC penetration rate	00.84	02.76	05.94	07.38	38.84
72	Air Traffic	00.31	00.16	00.17	00.20	00.16
	of which are women	03.08	12.50	03.45	07.41	15.38
	of which are high-skilled	12.31	12.50	17.24	14.81	23.08
	of which are medium-skilled	58.46	70.83	79.31	81.48	76.92
	of which are low-skilled	29.23	16.67	03.45	03.70	00.00
	PC penetration rate	09.23	29.17	41.38	40.74	100.00
73	Communication	01.29	01.11	00.91	00.60	00.89
	of which are women	43.45	37.95	48.68	70.37	62.86
	of which are high-skilled	00.37	00.00	00.00	03.70	05.71
	of which are medium-skilled	79.78	85.54	65.13	82.72	74.19
	of which are low-skilled	19.85	14.46	34.87	13.58	20.00
	PC penetration rate	01.12	06.63	11.94	17.28	77.14
74	Warehouse & Transportation	01.81	02.29	01.92	02.20	02.33
	of which are women	08.00	09.91	11.21	12.16	15.76
	of which are high-skilled	00.27	00.58	00.62	00.34	01.09
	of which are medium-skilled	72.27	71.14	64.17	69.59	85.33
	of which are low-skilled	27.47	28.28	35.20	30.07	13.59
	PC penetration rate	05.07	07.87	19.31	22.64	73.37
75	Entrepreneurs & related	02.88	02.21	02.45	03.89	06.24
	of which are women	20.74	18.43	22.20	32.63	46.25
	of which are high-skilled	14.88	23.56	31.95	21.76	27.78
	of which are medium-skilled	74.92	74.32	62.44	75.76	68.36

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TableA.1 – Continued

Code	Occupations	1979	1985/86	1991/92	1998/99	2005/06
	of which are low-skilled	10.20	02.11	05.61	02.48	03.85
	PC penetration rate	12.04	46.22	73.41	77.67	99.80
76	Parliamentarians & related*	–	–	–	–	–
77	Data Processing	02.39	03.29	03.59	03.83	06.98
	of which are women	56.77	43.70	50.50	50.00	43.66
	of which are high-skilled	04.24	14.43	16.33	22.48	24.09
	of which are medium-skilled	80.40	81.71	73.00	71.31	68.30
	of which are low-skilled	15.35	03.86	10.67	06.20	07.61
	PC penetration rate	33.54	70.32	75.17	72.87	97.46
78	Office Clerks	18.36	16.34	15.42	16.27	13.23
	of which are women	56.07	57.37	61.47	70.27	79.06
	of which are high-skilled	01.94	04.59	05.16	06.84	05.64
	of which are medium-skilled	82.45	87.76	80.40	87.12	88.15
	of which are low-skilled	15.61	07.66	14.44	06.02	06.21
	PC penetration rate	09.03	34.68	63.17	70.05	98.76
79	Priv. Security & related*	–	–	–	–	–
80	Safety	02.01	01.51	02.01	00.25	00.46
	of which are women	01.44	04.87	02.38	08.82	25.00
	of which are high-skilled	02.87	05.31	11.01	05.88	11.11
	of which are medium-skilled	89.47	94.25	71.13	88.24	88.89
	of which are low-skilled	07.66	00.44	17.86	05.88	00.00
	PC penetration rate	09.57	31.86	48.21	58.82	97.22
81	Law & related	00.40	00.58	00.54	00.13	00.28
	of which are women	10.71	12.79	24.44	61.11	50.00
	of which are high-skilled	57.14	59.30	65.56	55.56	86.36
	of which are medium-skilled	38.10	39.53	26.67	44.44	13.64
	of which are low-skilled	04.76	01.16	07.78	00.00	00.00
	PC penetration rate	03.57	08.14	50.00	83.33	100.00

Continued on next page

TableA.1 – Continued

Code	Occupations	1979	1985/86	1991/92	1998/99	2005/06
82	Publicists & related	00.42	00.51	00.49	00.60	00.87
	of which are women	51.72	51.32	54.88	58.02	63.77
	of which are high-skilled	32.18	51.32	50.00	46.91	52.17
	of which are medium-skilled	45.98	30.26	43.90	35.80	36.23
	of which are low-skilled	21.84	18.42	06.10	17.28	11.59
	PC penetration rate	06.90	51.32	71.95	66.67	100.00
83	Artists & related	00.73	00.52	00.76	00.56	00.62
	of which are women	21.85	41.03	36.22	46.67	44.90
	of which are high-skilled	20.53	28.21	25.98	22.67	26.53
	of which are medium-skilled	68.21	66.67	62.99	68.00	63.27
	of which are low-skilled	11.26	05.13	11.02	09.33	10.20
	PC penetration rate	01.99	08.97	31.50	58.67	87.76
84	Medic & Pharmacist*	–	–	–	–	–
85	Health Care & related	03.57	04.05	04.58	06.68	07.78
	of which are women	84.89	84.30	86.03	84.87	88.62
	of which are high-skilled	01.75	02.31	02.74	03.44	05.37
	of which are medium-skilled	89.07	95.04	91.91	92.10	92.85
	of which are low-skilled	09.18	02.64	05.35	04.44	01.79
	PC penetration rate	03.10	07.27	21.93	45.61	91.38
86	Social	01.66	02.39	02.45	04.37	05.31
	of which are women	77.97	73.74	79.51	79.25	85.00
	of which are high-skilled	25.22	32.96	24.39	17.52	22.62
	of which are medium-skilled	68.41	61.17	69.27	77.55	72.14
	of which are low-skilled	06.38	05.87	06.34	04.93	05.24
	PC penetration rate	00.29	02.51	08.78	35.03	74.29
87	Teacher	03.94	05.34	04.40	01.05	01.69
	of which are women	38.34	41.85	41.98	53.19	50.00
	of which are high-skilled	85.23	89.22	88.04	56.74	55.97
	of which are medium-skilled	13.31	09.65	08.83	41.84	42.54

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TableA.1 – Continued

Code	Occupations	1979	1985/86	1991/92	1998/99	2005/06
	of which are low-skilled	01.47	01.13	03.13	01.42	01.49
	PC penetration rate	04.40	11.03	37.09	66.67	94.03
88	Humanities & Natural Science*	–	–	–	–	–
89	Counseling*	–	–	–	–	–
90	Hygiene	00.96	00.68	01.04	00.99	00.24
	of which are women	71.50	85.15	86.78	87.22	89.47
	of which are high-skilled	00.50	00.00	00.57	00.00	00.00
	of which are medium-skilled	90.05	99.01	98.28	96.99	100.00
	of which are low-skilled	09.00	00.99	01.15	03.01	00.00
	PC penetration rate	00.00	00.00	01.15	06.02	26.32
91	Hotelier & related	00.98	01.24	01.16	01.16	01.26
	of which are women	56.16	64.52	67.01	74.36	71.00
	of which are high-skilled	02.96	04.84	02.06	05.13	2.00
	of which are medium-skilled	66.01	51.61	56.70	73.72	72.00
	of which are low-skilled	31.03	43.55	41.24	21.15	26.00
	PC penetration rate	01.97	02.15	09.79	25.64	62.00
92	Housekeeping	00.30	00.41	00.50	00.71	00.82
	of which are women	95.24	93.55	94.05	90.63	81.54
	of which are high-skilled	00.00	04.84	03.57	04.17	07.69
	of which are medium-skilled	66.67	72.58	57.14	79.17	73.85
	of which are low-skilled	33.33	22.58	39.29	16.67	18.46
	PC penetration rate	00.00	00.00	05.95	18.75	41.54
93	Cleaning	01.37	01.81	01.75	01.78	01.35
	of which are women	82.75	75.28	80.48	74.48	80.37
	of which are high-skilled	00.35	00.37	00.34	01.67	01.87
	of which are medium-skilled	58.10	48.71	30.14	56.49	68.22
	of which are low-skilled	41.55	50.92	69.52	41.84	29.91
	PC penetration rate	00.35	00.74	01.37	05.02	16.82

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TableA.1 – Continued

Code	Occupations	1979	1985/86	1991/92	1998/99	2005/06
97	Empl. Family Members outside Agriculture*	–	–	–	–	–
98	Worker w/o spec. Occ.	–	–	–	–	–
99	Oth. non-spec. Occ.*	–	–	–	–	–

Table B.1: Wage Intervals and Frequency of Observations in 1979

Interval old	Freq. in %	Interval new	Freq. in %
≤ 400	00.85	–	–
400≤x<600	01.17	<600	02.02
600≤x<800	02.08	–	–
800≤x<1,000	04.07	600≤x<1,000	06.15
1,000≤x<1,250	05.96	–	–
1,250≤x<1,500	09.02	1,000≤x<1,500	14.98
1,500≤x<1,750	10.86	–	–
1,750≤x<2,000	15.31	1,500≤x<2,000	26.17
2,000≤x<2,500	22.05	2,000≤x<2,500	22.05
2,500≤x<3,000	14.69	2,500≤x<3,000	14.69
3,000≤x<4,000	08.99	3,000≤x<4,000	08.99
4,000≤x<5,000	02.82	4,000≤x<5,000	02.82
5,000≤x	02.12	5,000≤x	02.12

B Wage Intervals, Estimates and Relative Frequency

The wage intervals across the first four waves are not uniform. To obtain comparable results across waves we "harmonize" those intervals. The original and the harmonized intervals as well as the relative frequencies are given in table (B.1-(B.3).

Table (B.5) shows the results of the Maximum Likelihood estimation.

Table B.2: Wage Intervals and Frequency of Observations in 1985/86

Interval old	Freq. in %	Interval new	Freq. in %
≤ 400	00.39	–	–
400≤x<600	00.91	<600	01.30
600≤x<800	01.44	–	–
800≤x<1,000	02.05	600≤x<1,000	03.49
1,000≤x<1,250	03.28	–	–
1,250≤x<1,500	05.35	1,000≤x<1,500	08.63
1,500≤x<1,750	06.99	–	–
1,750≤x<2,000	08.50	1,500≤x<2,000	14.99
2,000≤x<2,250	09.91	–	–
2,250≤x<2,500	11.53	2,000≤x<2,500	21.44
2,500≤x<2,750	10.46	–	–
2,750≤x<3,000	10.48	2,500≤x<3,000	20.94
3,000≤x<3,500	11.09	–	–
3,500≤x<4,000	07.01	3,000≤x<4,000	18.10
4,000≤x<4,500	04.20	–	–
4,500≤x<5,000	02.09	4,000≤x<5,000	06.29
5,000≤x<5,500	01.57	5,000≤x<5,500	01.57
5,500≤x<6,000	00.98	5,500≤x<6,000	00.98
6,000≤x<8,000	01.15	6,000≤x<8,000	01.15
8,000≤x<10,000	00.29	8,000≤x10,000	00.29
10,000≤x<15,000	00.20	10,000≤x<15,000	00.20
15,000≤x	00.14	15,000≤x	00.14

Table B.3: Wage Intervals and Frequency of Observations in 1991/92

Interval old	Freq. in %	Interval new	Freq. in %
≤600	00.78	≤600	00.78
600≤x<1,000	02.46	600≤x<1,000	02.46
1,000≤x<1,500	05.23	1,000≤x<1,500	05.23
1,500≤x<2,000	08.36	1,500≤x<2,000	08.36
2,000≤x<2,500	12.40	2,000≤x<2,500	12.40
2,500≤x<3,000	14.81	2,500≤x<3,000	14.81
3,000≤x<3,500	15.64	–	–
3,500≤x<4,000	15.58	3,000≤x<4,000	31.22
4,000≤x<4,500	07.99	–	–
4,500≤x<5,000	06.09	4,000≤x<5,000	14.08
5,000≤x<5,500	03.90	5,000≤x<5,500	03.90
5,500≤x<6,000	02.83	5,500≤x<6,000	02.83
6,000≤x<7,000	02.38	6,000≤x<7,000	02.38
7,000≤x<8,000	01.19	7,000≤x8,000	01.19
8,000≤x	02.36	8,000≤x	02.36

Table B.4: Wage Intervals and Frequency of Observations in 1998/99

Interval old	Freq. in %	Interval new	Freq. in %
≤600	00.16	≤600	00.16
600≤x<1,000	01.10	600≤x<1,000	01.10
1,000≤x<1,500	02.94	1,000≤x<1,500	02.94
1,500≤x<2,000	06.31	1,500≤x<2,000	06.31
2,000≤x<2,500	09.31	2,000≤x<2,500	09.31
2,500≤x<3,000	11.45	2,500≤x<3,000	11.45
3,000≤x<3,500	12.91	–	–
3,500≤x<4,000	13.23	3,000≤x<4,000	26.14
4,000≤x<4,500	11.40	–	–
4,500≤x<5,000	09.50	4,000≤x<5,000	20.90
5,000≤x<5,500	06.11	5,000≤x<5,500	06.11
5,500≤x<6,000	05.04	5,500≤x<6,000	05.04
6,000≤x<7,000	04.54	6,000≤x<7,000	04.54
7,000≤x<8,000	02.41	7,000≤x8,000	02.41
8,000≤x<9,000	01.34	8,000≤x<9,000	01.34
9,000≤x<10,000	00.71	9,000≤x<10,000	00.71
10,000≤x<15,000	01.12	10,000≤x<15,000	01.12
15,000≤x	00.41	15,000≤x	00.41

Table B.5: Wage Estimations and Descriptive Statistics

	Maximum Likelihood Estimation				
	1979	1985/86	1991/92	1998/99	2005/06
Mean	3.16	3.21	3.28	3.31	3.41
Min.	2.47	2.43	2.41	2.50	2.31
Max.	5.10	5.13	4.86	5.00	6.33
Std.Dev	0.31	0.32	0.34	0.34	0.42
Skewness	0.58	0.58	0.36	0.38	0.28
Kurtosis	3.53	3.78	3.20	3.76	4.75
N	20,773	14,931	16,702	13,240	7,906

Note: Reported figures are estimated inflation adjusted log hourly wages. Without Textile Refinement, Oil&Gas and Mineral Processing. With beginning of 2005/06 wages are directly reported in the survey and hence are not estimated.

C Definitions of Routine Tasks

Table (C.1) provides an overview of the different tasks which are considered as routine input in this analysis and are comparable across waves. As can be seen in the first wave questions about the job content were very detailed and have become more compressed afterwards.
Table (C.2) shows the non-routine input tasks. As non-routine tasks differ from wave to wave, we only use those, which are comparable across waves. The total number of tasks a individual is performing at work is the sum of routine and non-routine tasks. The Routine Index for an individual is then calculated as the number of routine tasks divided by the total number of tasks.

Table C.1: Definition of Routine Tasks across Waves

1979	1985/86	1991/92	1998/99	2005/06
–	Paper work	Paper work	–	–
Controlling goods	–	–	Controlling goods	Controlling goods
Proof-reading	–	–	–	–
	Calculating & book keeping	Calculating & book keeping	–	–
Weighting of goods	–	–	–	–
–	–	Archiving	–	–
Measuring length/weights	–	–	–	–
–	–	Setting machines	Setting machines	Setting machines
Record keeping	–	–	–	–
–	Operating machines	Operating machines	Operating machines	Operating machines
Prepare balance sheets	–	–	–	–
Prepare statistics	–	–	–	–
–	–	–	Supervising machines	Supervising machines
Evaluation of print-outs	–	–	–	–
–	–	–	Programming machines	
–				
–	Producing	Producing	Producing	Producing
Refinement/milling	–	–	–	–
Centrifugation & cracking	–	–	–	–
Melting and Forming	–	–	–	–
Producing of chem. goods	–	–	–	–
Grinding & pressing	–	–	–	–
Brewing and distilling	–	–	–	–
Spinning & weaving	–	–	–	–
Tanning & conserving	–	–	–	–
Milling and forming	–	–	–	–
Surface processing	–	–	–	–
Refining	–	–	–	–
Sewing and cutting	–	–	–	–

Table C.2: Definition of Non-Routine Tasks across Waves

1979	1985/86	1991/92	1998/99	2005/06
Research & development	Research & development	Research & development	Research & development	Research & development
Planning & Organizing	Planning & Organizing	Planning & Organizing	Planning & Organizing	Planning & Organizing
Applying laws	Applying laws	Applying laws	–	–
Survey & evaluation	–	–	–	–
Working journalistically	–	–	–	–
Running own business	–	–	–	–
Bargaining & promotion	–	–	Bargaining & consulting	Bargaining & consulting
Purchasing & selling	Purchasing & selling	Purchasing & selling	Purchasing & selling	Purchasing & selling
Auctioning	–	–	–	–
Consulting & advicing	–	–	Consulting & advicing	Consulting & advicing
Educating	Educating	Educating	Educating	Educating
Care taking	Care taking	Care taking	Care taking	Care taking
Stage-managing	Stage-managing	Stage-managing	–	–
Employing & supervising	Employing & supervising	Employing & supervising	–	–
Repairing & renovating	Repairing & renovating	Repairing & renovating	Repairing & renovating	Repairing & renovating
Accomodating & cooking	Accomodating & cooking	Accomodating & cooking	Accomodating & cooking	Accomodating & cooking

D Average Occupational Wage and Routine Share

This section provides results, when average occupational log hourly wages for the year 1998/99 are used as dependent variable in equation (8). As in table (5.1) we also control for the share of females employees in a given occupation. The figures in the second line indicate the base year k. Neither the coefficients on the Routine Share-Index nor on $dRSH^t_{alt.}$ are statistically significant different from zero. The coefficient on $dRMTI^t_{alt.}$ is always positive and significant, even when controlled for females' labor share. A Wald Test does reject the Null of RSH-Index$^k_{alt.}$, $dRSH^t_{alt.}$ and $dRMTI^t_{alt.}$ are jointly zero on a 10% level. Both the coefficients on $gender^k$ and his^k are lower than in table (5.1) implying two cases. First, there has been an increase in the "college"-premium and second, females increasingly tend to crowd in low-paying occupations. This might be an immediate consequence of the findings of Machin and Puhani (2003). They show that a substantial part of earning differences between high-skilled male and female workers can be traced back to the subject of their degrees.

Table F.1: Average Occupational Log Hourly Wages and Routine Occupations in 1998/99

Dependent Variable: Average Occupational Log Hourly Wages in 1998/99				
	(1)	(2)	(3)	(4)
	1979	1991/92	1979	1991/92
RSH-Index $^k_{alt.}$	-.02	.-10	-.16	-.15
	(.10)	(.10)	(.11)	(.10)
dRSH $^t_{alt.}$	-.00	.04	-.05	-.04
	(.06)	(.06)	(.06)	(.06)
dRMTI $^t_{alt.}$	3.19***	3.22***	2.37***	2.01***
	(.70)	(.76)	(.64)	(.71)
his ^{k}	.45***	.48***	.51***	.56***
	(.07)	(.09)	(.09)	(.10)
gender ^{k}			-.23***	-.23***
			(.07)	(.05)
Wald-Test			15.99***	9.75**
] R^2	.40	.47	.48	.56
N	67	67	67	67

Note: Depend variables are average occupational log hourly wages in 1998/99. Robust standard errors are in parentheses. All models include an intercept. Figures in the second line indicate the base year k.
Wald and LM-Test statistics are distributed as χ^2 with three degrees of freedom and H0: RSH-Index$^k_{alt.}$,$dRSH^t_{alt.}$ and $dRMTI^t_{alt.}$ are jointly zero.
* Significant at the 10% level.** Significant at the 5% level.*** Significant at the 1% level.

E Individual Wages And Routine Share

Tables (H.1)-(H.3) contain the estimation results of equation (9), however the dependent variable is now log hourly wages for the years 1998/99 and 1991/92 respectively. The age variable is hence calculated as following: $\frac{1998+1999}{2} - year\ of\ birth$ for base year 1998/99 and $\frac{1991+1992}{2} - year\ of\ birth$ for base year 1991/92. The base years for the routine share are 1991/92 and 1979 respectively. As one can see from the results in tables (H.1) and (H.2), the coefficients on the Routine Share-Index and $dRMTI^t_{alt.}$ are very sensitive to the inclusion of other explanatory variables, in particular firm size and gender. Using 1979 as base year to explain the wage pattern in 1991/92, one can see from table (H.3) that the coefficients on the Routine Share-Index and on $dRSH^t_{alt.}$ are either negative but quite small or positive, albeit not always significant. Those findings stand against a technological driven explanation of the wage pattern before 1998/99, which confirms the conjecture in the text. All other variables enter with the expected sign and are highly significant. Moreover, the importance of further training for the current job and firm size to determine wages has increased over the years.

Table H.1: Individual Log Hourly Wages and Routine Occupations in 1991/92

Dependent Variable: Individual Log Hourly Wages in 1998/99

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
RSH-Index $^{k}_{alt.}$	.15***	.10***	.19***	.20***)	.02	-.01	-.05**
	(.03)	(.03)	(.02)	(.02)	(.03)	(.03)	(.02)
dRSH $^{t}_{alt.}$	.00	.00	.01***	.02***	-.06***	-.02***	-.04***
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
dRMTI $^{t}_{alt.}$	2.87***	2.86***	2.69***	2.63***	1.87***	2.62***	1.62***
	(.16)	(.15)	(.16)	(.16)	(.16)	(.16)	(.15)
Age		.04***					.03***
		(.00)					(.00)
Age2		-.00***					-.00***
		(.00)					(.00)
HIS			.44***				.37***
			(.02)				(.01)
MIS			.18***				.15***
			(.01)				(.01)
Futrai				.18***			.12***
				(.01)			(.01)
Gender					-.16***		-.12***
					(.01)		(.01)
firm size						.06***	.04***
						(.00)	(.00)
R^2	.04	.10	.10	.10	.08	.12	.28

Note: Sample size are 13,223 observations. Depend variables are average occupational log hourly wages in 1998/99. Robust standard errors are in parentheses. Model includes an intercept. The base year of the Routine Share-Index is 1991/92.
* Significant at the 10% level.** Significant at the 5% level.*** Significant at the 1% level.

Table H.2: Individual Log Hourly Wages and Routine Occupations in 1979

Dependent Variable: Individual Log Hourly Wages in 1998/99

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
RSH-Index $^{k}_{alt.}$	.14***	.12***	.17***	.19***)	-.04*	.03*	-.04**
	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)
dRSH $^{t}_{alt.}$	-.01	-.00	.00	.01*	-.06***	-.02***	-.03***
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
dRMTI $^{t}_{alt.}$	2.75***	2.69***	2.61***	2.49***	2.00***	2.41***	1.56***
	(.16)	(.15)	(.16)	(.16)	(.16)	(.16)	(.15)
Age		.04***					.03***
		(.00)					(.00)
Age2		-.00***					-.00***
		(.00)					(.00)
HIS			.44***				.37***
			(.02)				(.01)
MIS			.18***				.15***
			(.01)				(.01)
Futrai				.18***			.12***
				(.01)			(.01)
Gender					-.15***		-.12***
					(.01)		(.01)
firm size						.06***	.04***
						(.00)	(.00)
R^2	.04	.11	.10	.11	.08	.12	.28

Note: Sample size are 13,223 observations. Depend variables are average occupational log hourly wages in 1998/99. Robust standard errors are in parentheses. Model includes an intercept. The base year of the Routine Share-Index is 1979.
* Significant at the 10% level.** Significant at the 5% level.*** Significant at the 1% level.

Table H.3: Individual Log Hourly Wages and Routine Occupations in 1979

Dependent Variable: Individual Log Hourly Wages in 1991/92

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
RSH-Index $^{k}_{alt.}$	.26***	.19***	.23***	.26***)	23***	.18***	.07***
	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)
dRSH $^{t}_{alt.}$	.06***	.01	.04**	.06***	.20***	.01	.07***
	(.02)	(.02)	(.02)	(.02)	(.02)	(.01)	(.02)
dRMTI $^{t}_{alt.}$	-.79***	-.89***	-.62***	-.78***	-.44***	-.71***	-.39***
	(.14)	(.13)	(.13)	(.14)	(.14)	(.13)	(.13)
Age		.05***					.04***
		(.00)					(.00)
Age2		-.00***					-.00***
		(.00)					(.00)
HIS			.49***				.45***
			(.02)				(.01)
MIS			.16***				.15***
			(.01)				(.01)
Futrai				.06***			.04***
				(.01)			(.01)
Gender					-.17***		-.13***
					(.01)		(.01)
firm size						.03***	.02***
						(.00)	(.00)
R^2	.02	.10	.14	.02	.08	.04	.27

Note: Sample size are 16,672 observations. Depend variables are average occupational log hourly wages in 1991/92. Robust standard errors are in parentheses. Model includes an intercept. The base year of the Routine Share-Index is 1979.
* Significant at the 10% level.** Significant at the 5% level.*** Significant at the 1% level.