New Results on Job Polarization on Local Labour Markets

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Abstract

In many industrialized countries, employment has grown predominately in jobs at the upper and lower tail of the wage distribution, while employment in the middle of the distribution has stagnated or declined. One explanation for this polarised development is that jobs in the middle of the wage distribution, which involve a substantial amount of routine tasks, are substituted by machines. Descriptive analyses at the national level suggest that in West Germany this phenomenon occurred only during recent years. A similar pattern emerges when occupation-specific employment growth rates at the regional level are regressed on indicators for an occupation's position in the income distribution. However, once a measure of routine intensity within an occupation is added to the model the effect of these indicators considerably decreases in magnitude. In contrast, the measure of routine intensity has a negative and significant effect, which provides some evidence for the existence of routine-biased technological change within regional labour markets.

1 Introduction

In a number of industrialized countries employment has grown predominately in jobs at the upper and lower tails of the wage distribution, while employment in the middle of the distribution has stagnated or declined (see Autor and Dorn, 2013; Goos et al., 2015). The theory behind this is based on the hypothesis of Autor et al. (2003) that technological change is routine-biased. This means that technological change is complementary to interactive tasks at the upper tail of the wage distribution and that it erodes demand for routine tasks in the middle. It is also expected, that technological change is neutral to non-routine unskilled tasks, such as those in personal services or that the share of these jobs is also growing.

The term job polarization was popularised by Goos and Manning (2007). When occupations are ranked according to their initial average wage, jobs at both ends grow more strongly than those in the middle of the distribution. The result is the U-shaped wage/employment profile familiar from recent studies. Goos and Manning (2007) and Autor et al. (2006) find strong evidence in support of job polarization and its connection to routine-biased technological change (RBTC), both in the United Kingdom and the United States. Autor and Dorn (2013) derive an integrated model of how technological change leads to a decline in routine manual work but an increase in non-routine service occupations. Taking their model to US data on local labour markets, they find that regions with a high initial share of routine tasks are more inclined to adopt information technology and exhibit a relocation of routine workers to unskilled service jobs.

In this paper we assess to what occupation-specific employment growth in Germany is characterised by polarisation. Moreover, we analyse the effect that an occupation's task content, and in particular the share of routine tasks within an occupation, has on subsequent employment growth. This analysis is conducted at the level of functional labour market regions. Though a number of papers (Senftleben and Wielandt, 2014; Rendall and Weiss, 2016) have already concentrated on this country, we contribute to the literature by exploiting an especially rich dataset with new classifications of occupations and tasks.

2 Data

The analysis of job polarisation at the regional level requires detailed information about the labour force over a longer period of time. An ideal source of such information is the complete register data of the German Federal Employment Agency (BA) which originate from the compulsory notifications made by employers to the social security insurance. Specifically, we make use of the Integrated Employment Biographies (IEB) provided by the Institute for Employment Research (IAB). The data are very reliable, since they are used to calculate retirement pensions. Based on a random sample of the IEB, we use information on those individuals employed on 30 June each year to compute occupation-specific median wages. In

doing so, we differentiate between 67 occupations (while a more disaggregated information is in principle available to us, we refrain from using it because it entails the risk of individual occupations not being separated in a meaningful way). We then aggregate the individual-level information to the region-occupation-year level.

The task composition of each occupation is based on the BIBB/IAB and BIBB/BAuA Qualification and Career Survey, which provides information on various aspects of a worker's job content by asking questions about the tasks carried out ("Tätigkeitsschwerpunkte", see Stooß, 1988). Whereas in other studies information on the content of a job is used to assess its task composition (e.g. whether a worker is involved in the operation of a machine), we use the information whether the job contents are narrowly defined and whether they are highly repetitive.

3 Empirical Results

Tables 1 and 2 show the results of a number of preliminary regressions containing data from the beginning and the end of the observation period. The unit of observation is an occupation within a West German labour market region. The response variable is the rate of employment growth within that unit. For a descriptive assessment of the polarisation question, we introduce three dummy variables, indicating the rank of an occupation's median wage in the overall wage distribution. These dummies are "bottom 25%", "upper middle 25%" and "top 25%". The remaining "lower middle 25%" is the reference category. In the tables, the coefficients of the models are presented with their standard errors in brackets. Fixed effects for regions are included as exogenous variables.

Table 1: Employment growth 1975-1984

Employment growth rate 1975-2014	(1)	(2)	(3)	(4)	(5)	(6)
Occupational ranking						
Bottom 25%	0.0083	-0.0060	0.0134*			
	(0.0077)	(0.0071)	(0.0079)			
Upper middle 25%	0.1416***	0.0383***	0.0371***			
	(0.0114)	(0.0111)	(0.0114)			
Top 25%	0.1730***	0.0400***	0.0080			
	(0.0081)	(0.0083)	(0.0081)			
Routine intensity		-0.5902***	-0.3735***	-0.6795***		-0.4018***
		(0.0226)	(0.0363)	(0.0193)		(0.0358)
Education						
% Unknown			-0.0223		0.1084***	-0.0112
			(0.0431)		(0.0405)	(0.0429)
% Vocational training			0.1586***		0.3465***	0.1622***
			(0.0268)		(0.0125)	(0.0222)
% University degree			0.4174***		0.6410***	0.3976***
			(0.0357)		(0.0212)	(0.0330)
Constant	-0.0872***	0.1400***	-0.0283	0.1842***	-0.2568***	-0.0090
	(0.0239)	(0.0230)	(0.0361)	(0.0215)	(0.0239)	(0.0336)
Dummies						
Region	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,724	8,724	8,724	8,724	8,724	8,724
R^2	0.2664	0.3593	0.3917	0.3538	0.3584	0.3884

***/**/* indicate significance at the 0.01/0.05/0.1 level, respectively. Robust standard errors in parentheses.

The descriptive regressions (Model 1 in Tables 1 & 2) show that for the period 1975-1984 only a degenerated polarization pattern is visible: Employment growth in the lowest quartile is not significantly different from the development in the lower middle part of the distribution. More recently, the lowest quartile is developing significantly better than the reference category. Whereas the development in the first decade can be described by a "J-curve", the development of the last decade is clearly a "U-curve".

Table 2: Employment growth 2004-2014

Employment growth rate 1975-2014	(1)	(2)	(3)	(4)	(5)	(6)
Occupational ranking						
Bottom 25%	0.1050***	0.2237***	0.1650***			
	(0.0193)	(0.0183)	(0.0230)			
Upper middle 25%	0.1613***	0.0843***	0.0462**			
	(0.0226)	(0.0206)	(0.0210)			
Top 25%	0.1968***	-0.0457**	-0.0981***			
	(0.0211)	(0.0203)	(0.0195)			
Routine intensity		-1.2883***	-0.9756***	-0.8899***		-0.8147***
		(0.0611)	(0.0722)	(0.0538)		(0.0700)
Education						
% Unknown			0.7845***		1.4989***	1.1782***
			(0.1334)		(0.1180)	(0.1193)
% Vocational training			0.3159***		0.7090***	0.2522***
			(0.0624)		(0.0621)	(0.0703)
% University degree			0.6074***		1.1809***	0.4437***
			(0.0779)		(0.0664)	(0.0825)
Constant	-0.0704	0.5975***	0.1011	0.4761***	-0.7586***	0.0522
	(0.0500)	(0.0551)	(0.0945)	(0.0532)	(0.0767)	(0.1006)
Dummies						
Region	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,975	7,975	7,975	7,975	7,975	7,975
R^2	0.0624	0.2128	0.2338	0.1551	0.1694	0.2035

***/**/* indicate significance at the 0.01/0.05/0.1 level, respectively. Robust standard errors in parentheses.

In the next step we introduce variables which might work as substitutes for the variables indicating the quartiles of the distribution. The routine intensity of an occupation is included as a right-hand side variable. It is defined as the degree to which workers in a specific occupation perform routine tasks. In addition, three variables are introduced which represent the share of workers with a vocational education and the share of those who have a university degree. In addition, there is a variable for workers, whose educational level is unknown or cannot be classified in the German system (since the degree was acquired in a foreign country).

The most crucial result is that the task share has a negative and significant effect through all specifications. This is even the case if the different qualification levels are controlled for. It is interesting to see that the "effects" of the quartile dummies are not stable after these explanatory variables are included.

4 Conclusion

There is some evidence for a polarised development of employment within Western German regional labour markets. However, while such a pattern is found in recent years, it is not present in the early part of the observation period. In this sense developments in Germany differ from those in other countries. Furthermore, our analysis provides evidence for the existence of routine-biased technical change as jobs with a higher degree of routine intensity experience lower employment growth, ceteris paribus.