



## Double qualifications and gender: The case of Germany

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## **Abstract**

After obtaining the German upper secondary school-leaving certificate (Abitur), school-leavers are free in their choice of career path. Obtaining a double qualification by first completing an apprenticeship and then graduate from university is thereby popular. Using the BIBB/BAuA Employment Survey of the Working Population on Qualification and Working Conditions 2018, this paper analyses the individual effects of these double qualifications by exploiting the rich information on education in the data. In relation to earlier studies, we find that the proportion of men gaining a double qualification decreased by 8 percentage points but is almost constant for women. Furthermore, we detect a significantly negative effect of double qualification on wages for women, but no significant effect on wages for men. We presume that these changes may be related to the rising wage dispersion at the beginning of the twentieth century.

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## **Author note**

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# 1 Introduction

In the last decade both the absolute and relative number of individuals who pass the Abitur increased. As these individuals can enter universities or polytechnics (*Fachhochschule*), dual apprenticeship training may be expected to become less attractive. Nevertheless, 20 % of these school-leavers decide against studying and in favour of apprenticeship training (Autorengruppe Bildungsberichterstattung 2020). Furthermore, 22 % of freshmen at universities and universities of applied sciences have already completed an apprenticeship training in 2016 (Autorengruppe Bildungsberichterstattung 2018). They therefore want to pursue a double qualification, which means that they hold a training qualification as well as a university or polytechnic degree. We define double qualifications as an educational strategy available for individuals who hold an entrance qualification for universities or universities of applied sciences when they finish schooling. Individuals pursuing a double qualification choose to complete apprenticeship training first and then go to university afterwards. In the end, they hold both a training qualification as well as a university or polytechnic degree.

The number of individuals who pass the Abitur and start their career with an apprenticeship training considerably increased after the double high school graduation finished in the year 2014. Dohmen et al (2021) find that the relation of school-leavers with Abitur who start an apprenticeship training to the total number of school-leavers with Abitur was 21 % in the year 2002, reached 31 % in 2014 and increased to 35 % in 2019. Many school leavers conducted their studies with a delay caused by the double high school graduation. Furthermore, the proportion of students who conduct part-time studies at private universities and universities of applied sciences has risen (Dohmen et al. 2021).

Despite the relevance to investigate the individuals' strategies of double qualifications, the number of studies on this topic is rather limited. They focus on the incidence of double qualifications and the impact on individual

earnings and job satisfaction. However, these studies are based on data that refers to the early 1990s and the beginning of the twentieth century, when wage polarization had just begun. Technological progress and competition from low-wage countries contributed to an increase of earnings inequality (Dustmann et al. 2009 for Germany; Spitz-Oener 2006; Goos et al. 2014 for European Countries). Since 2010, the inequality has not increased further (Baumgartner et al. 2020; Möller 2016; Fitzenberger and Seidlitz 2020). Card et al. (2013) and Möller (2016) show that a rise in the dispersion of firm pay premiums as well as large changes in the composition of employees contributed substantially to the recent changes in wage inequality in Germany. Looking at differences in wage inequality in Germany by gender, parallel trends for men and women can be found (Antonczyk et al. 2010; Card et al. 2013) Brüll and Gathmann (2020) demonstrate the relevance of the increased supply of highly qualified employees for the development of the wage dispersion in Eastern Germany.

We use the BIBB/BAuA Employment Survey of the Working Population on Qualification and Working Conditions in Germany 2018 to look anew at double qualifications in Germany. We focus on the impact of double qualifications on individual earnings and compare it with previous studies. This is worthwhile against the backdrop of the rising number of academics in the German labour market and the increase of earnings inequality. During the last two decades, the proportion of employees working part-time has increased from 5.2 % in the year 2001 to 11.5 % in the year 2019 for men and from 39.6 % in the year 2001 to 48.4 % in the year 2019 for women (IAQ 2020). Working part-time and switching between part- and full-time employment decreases the earnings received compared to men and women working full-time without intervening part time employment spells (Fitzenberger and Seidlitz 2020). Thus, the inclusion of part-time employees into our analyses seems to be important. Our paper contributes to economic literature about the effects of double qualification using data for the time after the double high school

graduation and the subsequent rise of the proportion of individuals seeking a double qualification, the rise in both the earnings inequality and part-time employment. The BIBB/BAuA Employment Survey is unique in covering students at both, public and private universities, and universities of applied sciences.

The outline of the paper is as follows: In section 2, we summarise the findings of theoretical background and previous studies. In section 3, the data set and the descriptive results are presented. We outline our empirical strategy, model specification and report our econometric results in section 4. Section 5 provides some concluding remarks.

## **2 Theoretical Background and Previous Research**

Traditional human capital theory regards double qualifications as useful if the direct costs of an additional educational path are covered by extra returns. Following Buttler and Tessaring (1993) education cannot be regarded as a requirement for certain occupations any longer; instead, nowadays education increases the individual's overall occupational options. In the case of double qualifications, individuals can "upgrade" their skills obtained during apprenticeship training by entering a university or a university of applied sciences. The crucial question is whether the strategy of double qualifications and thus to increase the number of "arrows in the quiver" improves or worsens the individual's earnings position. In their pioneering study, Büchel and Helberger (1995) find no positive effect of double qualifications on wages at the beginning of the career. Bellmann et al. (1996), Büchel and Bausch (1998) and Bellmann and Stephani (2012) do not restrict their analysis to the start of the working life but still do not find positive income effects for individuals with double qualifications. Nevertheless, the effects are also not significantly negative.

Individuals who complete a double qualification will not get the full re-

turns of their educational path, as there is technical and economic obsolescence of human capital. In the wake of rising wage dispersion in Germany in conjunction with the higher absolute and relative number of academics, it is important to take this obsolescence into account (Van Loo et al. 2001). In the context of double qualifications the depreciations of human capital are even more prevalent than in the case of university studies as it takes years to hold a training qualification as well as a university or polytechnic degree.

Janßen and Backes-Gellner (2009) distinguish between knowledge-based and experience-based tasks. They argue that the human capital of individuals performing knowledge-based tasks strongly suffers from depreciation, whereas the human capital of individuals performing experience-based tasks does not. Human capital related to older technologies and work processes depreciates. Therefore, individuals who only focus on high technological skills throughout the career will be outperformed by younger colleagues at later stages of his working life.

Besides, risk considerations could play a role when it comes to double qualifications. Albeit their relevance it was not until the beginning of this century that risk considerations were introduced into the economics of education (Christiansen et al.; 2007; Palacios-Huerta, 2003). As future earnings cannot be predicted precisely during education, the question arises how future earnings and the wage risk are correlated and whether there is an efficient trade-off between them (Christiansen et al., 2007; Tuor and Backes-Gellner, 2010). Individuals, who pursue a double qualification, are risk averse (Behrens et al., 2008; Büchel and Helberger, 1995). Double qualifications can be seen as a strategy to diversify human capital investments and should thus result in a lower wage risk (Edeling and Pilz 2017; Hammen 2011; Hillmert and Jacob 2013). This could be especially relevant for women who are in general believed to be more risk averse than men (Croson and Gneezy 2009). However, results obtained by Tuor and Backes-Gellner (2010), Hammen (2011) and Bellmann and Stephani (2012) on systematic differences in the wage risk of

individuals with and without double qualifications are mixed.

### 3 Data and Descriptive Results

To investigate the effect of double qualifications on earnings we use the BIBB/BAuA Employment Survey 2018 (Hall et al. 2020). This rich data set provides a representative sample of 20,012 individuals from the German active labour force. The survey is restricted to individuals who work at least 10 hours per week and are at least 15 years old. The questionnaire was developed by the Federal Institute for Vocational Education and Training (Bundesinstitut für Berufsbildung, BIBB) and the Federal Institute for Occupational Safety and Health (Bundesanstalt für Arbeitsschutz und Arbeitsmedizin, BAuA). Further information about the data set and the methodology can be found in Rohrbach-Schmidt and Hall (2020). One caveat of the data set is that it is a cross section and thus, results cannot be interpreted causally. Still, as the survey contains rich information on employees' characteristics and their "educational biography", it is well suited for our analysis.

We only look at individuals who have passed the Abitur or the Fachabitur (German certificate of aptitude for specialized higher education, e.g. at a polytechnic) and have gained their school-leaving certificate in Germany. Additionally, these individuals – after having passed their Abitur or Fachabitur examinations – either went straight to university or completed a course of vocational training in the dual system first and studied afterwards. Therefore, they all hold a university or a polytechnic degree. Since the focus of our paper is on the validity of the hypothesis put forward by Büchel and Helberger (1995), we exclude all educational paths other than the ones mentioned above. School-based vocational training is also excluded due to its limited comparability. Of course, we cannot rule out the possibility that individuals make educational decisions at different points in time. That means, that it is not necessary for individuals to intend to go to university afterwards

when they start vocational training. Our estimation sample consists of 3,909 individuals. Table A.1 in the appendix gives descriptive information.

(Table 1 about here)

Table 1 shows that 21.16 % of all university and polytechnic graduates have a double qualification. Double qualifications are more frequent for men than for women (see Table 1). Compared with the results of Bellmann and Stephani (2012) the proportion of male graduates having a double qualification decreased substantially from 32 % in 2006 to 24.32 % in 2018, whereas there are smaller changes concerning women (21 % in 2006 vs. 17.93 % in 2018). Table 1 also shows that there are no regional differences between Western and Eastern Germany. Again, when compared with the results of Bellmann and Stephani (2012), there is a decline in the percentage of graduates having a double qualification in both Western and – more pronounced – Eastern Germany. We cannot corroborate the regional differences found by Bellmann and Stephani (2012).

(Figure 1 about here)

Figure 1 presents the Kernel densities of the hourly wage distributions for men and women separately. It can be seen that the wage distribution of women without double qualification is slightly shifted to the right compared to the wage distribution of women with double qualification. For men there is no such rightward shift of the distribution of those without a double qualification. Contrarily, in the third quarter of the distribution there is a rightward shift of the distribution for men with a double qualification, meaning that those earn more than men without a double qualification.

## 4 Results and Discussion

We use Two stage least squares (2SLS) estimations to look anew at the relation of earnings and double qualifications. We choose a 2SLS estimator



because of its simplicity and asymptotic efficiency. Alternatively, a full-information maximum likelihood (FIML) estimator is based on the entire system of equations. With normally distributed disturbances, FIML is efficient among all estimators. However, in the presence of errors of measurement only the 2SLS-estimator is consistent (Greene 2018).

(Table 2 about here)

As there are gender differences in the incidence of double qualifications (as seen in Table 1), we estimate our model separately for women and men. Table 2 shows the estimations of wages. We include a dummy for having a double qualification, which is instrumented by the age at Abitur, Abitur mark, having an entrance qualification for a university of applied sciences, field of university studies and field of apprenticeship training on the first stage. The coefficient of the double qualification dummy is insignificant for men. For women, the double qualification dummy is significant and negatively associated with hourly wages (see Table 2). Having a double qualification reduces the log hourly wages of women c.p. by 10.6 percent. Thus, our results for men are in line with Bellmann and Stephani (2012), who found no significant results for men, too. For women, our results are in contrast to the ones of Bellmann and Stephani (2012) as they do not find a significant association of double qualifications and wages for women either.

The other coefficients in Table 2 mostly reveal the expected pattern with respect to the direction of their effect and their significance: Older employees are better remunerated than younger employees (with a decreasing rate). Women whose mother tongue is German earn significantly more. For men, the effect of the mother tongue is also positive, but statistically insignificant. There is also a positive correlation of tenure and the number of subordinates with the log hourly wages. Additionally, larger firms pay significantly better than smaller ones.

When it comes to sector affiliation, we see differences between women and men (see Table 2). If employees working in public service are taken as the

reference, women earn significantly less in all other sectors but manufacturing. Men earn significantly more when they are employed in manufacturing and services and less when they are employed in craft compared to being employed in public service. For the other sectors, we find no significant association with the log hourly wages compared to public service.

(Table 3 about here)

Next, we investigate whether there are systematic differences between the wage risk of individuals with and without double qualifications. In line with Tuor and Backes-Gellner (2010) we use the average squared coefficient of variance proposed by Hartog and Vijverberg (2002) as a measure of wage risk. The same measure is used by Hammen (2011) and Bellmann and Stephani (2012). Thus, we ensure comparability with existing studies on double qualifications. According to the results presented in Table 3, we see only a small difference in the wage risk of individuals with and without double qualifications. For women with a double qualification the wage risk is slightly lower than for those without a double qualification. For men the opposite is true: the wage risk for men with a double qualification is slightly higher than the wage risk of men without a double qualification. Thus, the hypothesis of a lower wage risk for individuals with a double qualification presented in section 2 can only be supported for women, although the difference in the wage risk with and without double qualifications is rather small. For men, the hypothesis cannot be supported. This is in line with Hammen (2011) and Tuor and Backes-Gellner (2010).

## 5 Conclusions

The release of the BIBB/BAuA Employment Survey 2018 enables us to use current data to revisit double qualifications, i.e. after obtaining the German upper secondary school-leaving certificate (Abitur) completing an apprenticeship first and then graduate from university. We provide fresh insights

into individual effects of this education strategy although our results cannot be interpreted causally. This is worthwhile against the backdrop of a rising wage dispersion in Germany.

Our analyses reveal that – in comparison with Bellmann and Stephani (2012) – the proportion of men with a double qualification decreased by 8 percentage points between the year 2006 and 2018 but only 3 percentage points for women. Furthermore, our findings suggest that having a double qualification has a negative association with hourly wages. However, the respective regression coefficient is not significant for men. Although, the significant negative relation of double qualifications and earnings for women can be seen in connection with gender specific developments on the German labour market, e.g. the prevalence of part-time employment, further research is needed to corroborate the impact of part-time jobs on earnings for women.

Finally yet importantly, for women with a double qualification the wage risk is slightly lower than for those without a double qualification, but for men the opposite is true. Thus, the hypothesis of a lower wage risk with a double qualification can only be corroborated for women, but not for men.

Summing up, double qualifications are a widespread educational strategy among Abitur holders. Our results suggest pronounced differences in the incidence and the impacts on earnings of double qualifications between men and women. This is especially of interest in light of the rising wage dispersion in Germany.

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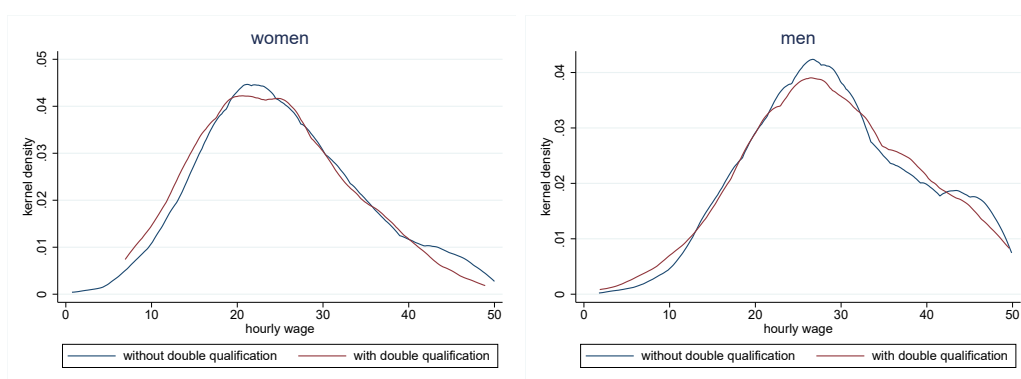
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## Figures

Figure 1: Kernel densities of the hourly wage distributions with and without double qualifications, separately for women and men



*Note:* The data set used is the BIBB/BAuA employment survey 2018.

## Tables

Table 1: Double qualifications of university and polytechnic graduates, by gender and region

	with double qualifi- cation	without double qualification
Total (N=3,909)	21.16 %	78.84 %
Women (N=1,935)	17.93 %	82.07 %
Men (N=1,974)	24.32 %	75.68 %
Western Germany (N=3,436)	21.10 %	78.90 %
Eastern Germany (N=473)	21.56 %	78.44 %

*Note:* The data set used is the BIBB/BAuA employment survey 2018.

Table 2: Log hourly wages of university and polytechnic graduates, 2SLS regressions by gender

	Women	Men
Double qualification (dummy)	-0.106** (0.047)	-0.002 (0.050)
Age (years)	0.044*** (0.013)	0.031*** (0.010)
Age, squared	-0.0004** (0.0001)	-0.0002 (0.0001)
Foreigner (dummy)	-0.058 (0.066)	-0.004 (0.058)
Mother tongue German (dummy)	0.114** (0.047)	0.071 (0.047)
Actual experience (years)	-0.001 (0.005)	-0.0004 (0.005)
Actual experience, squared	-0.0001 (0.0001)	-0.0002** (0.0001)
Tenure (years)	0.008*** (0.001)	0.005*** (0.001)
Number of direct subordi-	0.001* (0.001)	0.001*** (0.001)



nates, in 100	(0.001)	(0.0002)
Establishment size (reference:		
1-19 employees)		
20-99 employees	0.143***	0.136***
(dummy)	(0.029)	(0.033)
100-499 employees	0.148***	0.155***
(dummy)	(0.030)	(0.033)
500 or more employees	0.220***	0.273***
(dummy)	(0.030)	(0.033)
Sector (reference: public ser-		
vice)		
Manufacturing	0.088**	0.201***
(dummy)	(0.036)	(0.024)
Craft	-0.329***	-0.239***
(dummy)	(0.090)	(0.085)
Trade	-0.222***	0.013
(dummy)	(0.046)	(0.053)
Other services	-0.028	0.058**
(dummy)	(0.025)	(0.023)
Other sector	-0.090**	0.044
(dummy)	(0.038)	(0.043)
Eastern Germany	-0.140***	-0.164***
(dummy)	(0.026)	(0.030)
Weekly working hours	0.008***	0.014***
	(0.001)	(0.001)
Number of observations	1,935	1,974
R <sup>2</sup>	0.2312	0.2992
Joint significance of dummy	Establishment	Establishment
variable groups	size***	size***
	Sector***	Sector***

*Notes:* The data set used is the BIBB/BAuA employment survey 2018. Standard errors in brackets. \*/\*\*/\*\* indicates statistical significance at the 10/5/1 percent level. Having a double qualification (Dummy) is instrumented by age at the Abitur (years), age at the Abitur, squared, Abitur mark (3 dummies), having an entrance qualification for a university of applied sciences (dummy), field of university studies (5 dummies) and field of apprenticeship training (9 dummies).

Table 3: Wage risk measure by gender and double qualification

	Women	Men
with double qualification	0.014	0.016
without double qualification	0.016	0.012

*Note:* The data set used is the BIBB/BAuA employment survey 2018.

## Appendix

Table A.1: Descriptive Statistics

	Women		Men		Differences in means (t-test)
	Mean	Std. Dev.	Mean	Std. Dev.	
Double qualification (dummy)	0.18	0.38	0.24	0.43	-0.06***
Hourly wage in €	26.47	13.31	32.97	17.63	-6.50***
Log hourly wages	3.18	0.44	3.39	0.45	-0.21***
Age (years)	46.32	10.86	46.09	11.09	0.23
Age at Abitur (years)	19.88	2.62	20.30	2.86	-0.42***
Foreigner (dummy)	0.03	0.17	0.03	0.16	0.004
Mother tongue German (dummy)	0.94	0.24	0.95	0.23	-0.01
Actual experience (years)	21.57	11.53	21.12	11.47	0.45
Tenure (years)	12.97	10.87	12.75	10.63	0.22
Number of direct subordi- nates	3.42	13.44	9.86	45.36	-6.45***
Eastern Germany (dummy)	0.13	0.34	0.11	0.31	0.03**
Abitur mark very good (dummy)	0.21	0.41	0.16	0.37	0.05***
Abitur mark good (dummy)	0.60	0.49	0.58	0.49	0.02
Abitur mark fair (dummy)	0.19	0.39	0.25	0.43	-0.06***
Abitur mark satisfactory (dummy)	0.004	0.06	0.01	0.10	-0.01*
1-19 employees (dummy)	0.16	0.37	0.10	0.31	0.06***
20-99 employees (dummy)	0.35	0.48	0.25	0.43	0.10***
100-499 employees (dummy)	0.24	0.43	0.27	0.45	-0.03*
More than 500 employees (dummy)	0.24	0.43	0.38	0.48	-0.14***
Public Service (dummy)	0.54	0.50	0.38	0.48	0.16***

Manufacturing (dummy)	0.10	0.30	0.26	0.44	-0.16***
Craft (dummy)	0.01	0.10	0.01	0.10	0.0002
Trade (dummy)	0.05	0.22	0.04	0.19	0.02**
Other services (dummy)	0.23	0.42	0.28	0.45	-0.05***
Other sectors (dummy)	0.07	0.25	0.04	0.19	0.03***
Observations	1,935		1,974		

*Notes:* The data set used is the BIBB/BAuA employment survey 2018. \*/\*\*/\*\* indicates statistical significance at the 10/5/1 percent level.

Table A.2: First-stage regressions by gender

	Women	Men
Age (years)	0.041*** (0.009)	0.015 (0.011)
Age, squared	-0.001** (0.0001)	-0.0003*** (0.0001)
Foreigner (dummy)	-0.134*** (0.039)	-0.054 (0.047)
Mother tongue German (dummy)	0.026 (0.033)	0.092** (0.039)
Actual experience (years)	0.006 (0.004)	0.016*** (0.005)
Actual experience, squared	0.0001 (0.0001)	0.00003 (0.0001)
Tenure (years)	-0.001 (0.001)	-0.002 (0.001)
Number of direct subordinates, in 100	0.0004 (0.0003)	-0.0002 (0.0001)
Establishment size (reference: 1-19 employees)		
20-99 employees (dummy)	0.014 (0.023)	-0.007 (0.031)
100-499 employees (dummy)	-0.001 (0.026)	0.012 (0.032)
500 or more employees (dummy)	0.007 (0.027)	-0.027 (0.032)
Sector (reference: public service)		
Manufacturing (dummy)	-0.004 (0.033)	-0.014 (0.027)

Craft	-0.025	0.055
(dummy)	(0.084)	(0.098)
Trade	0.023	-0.044
(dummy)	(0.040)	(0.051)
Other services	0.022	0.023
(dummy)	(0.021)	(0.024)
Other sector	0.002	0.019
(dummy)	(0.027)	(0.045)
Eastern Germany	0.005	-0.012
(dummy)	(0.024)	(0.027)
Weekly working hours	0.0004	0.0007
	(0.001)	(0.001)
Age at Abitur (years)	0.025	0.116***
	(0.019)	(0.032)
Age at Abitur, squared	-0.0001	-0.002***
	(0.0004)	(0.001)
University of applied sciences entrance qualification (dummy)	0.156***	0.111***
	(0.041)	(0.037)
Abitur mark (reference: very good)		
Good (dummy)	0.030*	-0.002
	(0.018)	(0.023)
Fair (dummy)	0.057**	-0.0002
	(0.024)	(0.027)
Satisfactory (dummy)	-0.038	0.139
	(0.138)	(0.092)
Field of university/ polytech- nic degree (5 dummies)	Yes	Yes
Field of apprenticeship (9 dummies)	Yes	Yes
Number of observations	1,935	1,974
R <sup>2</sup>	0.3373	0.2721

*Notes:*The data set used is the BIBB/BAuA employment survey 2018. Standard errors in brackets. \*/\*\*/\*\* indicates statistical significance at the 10/5/1 percent level.