Productivity in German manufacturing firms: Does fixed-term employment matter?

Sebastian Nielen & Alexander Schiersch

Motivation

Schumpeter School of Business and Economics

- In Germany as well as in other countries fixed-term employment became more and more important in the last years
- Share of fixed-term workers in total workforce contributing to social security increased from 6% in 2000 to 9% in 2010
- Share of fixed-term contracts for new hires increased from 30 % in 2000 to about 45% in 2010

Motivation

Schumpeter School of Business and Economics

- Contribution to the literature:

  First study analyzing the effects of using fixed-term employment on labor productivity controlling for selection effects and taking into account potential endogeneity as well as firm specific fixed effects by using dynamic panel data models for German manufacturing establishments

Outline

Schumpeter School of Business and Economics

1. Hypothesis development
2. Data, variables and descriptive statistics
3. Estimation strategy
4. Results
5. Conclusion

Hypothesis development

Schumpeter School of Business and Economics

- Three channels how fixed-term employment affect labor productivity
- Adjust work force on changes in product demand (flexibility)
- Screen potential new employees
- Incentive to invest in firm specific human capital

Flexibility

Schumpeter School of Business and Economics

- Fixed-term employment as a form of external flexibility
- Allows firms to react quickly to fluctuations in product demand with adjustment of labor input without paying firing costs (Nunziata and Staffolani 2007, Hagen 2003, Bentolila and Saint-Paul 1992)
- Regarding increased flexibility labor productivity should also increase

Screening

Schumpeter School of Business and Economics

- True quality (productivity) of job applicants is unknown
- Fixed-term employment as a tool to extend the period of probation (Vidal and Tigges 2009, Boockmann and Hagen 2008)
- The more productive employee will get an open end contract
- Screening helps to separate good from bad agents (Wang and Weiss 1998)

Screening

Schumpeter School of Business and Economics

- But if temporary workers are used to substitute permanent ones, positive screening incentives fail to appear (Vidal and Tigges 2009)
- Job satisfaction and motivation of temporary workers and of permanent ones may decrease (Brown and Sessions 2005)
- This could reduce labor productivity
- Overall effect due to screening directly depends on the share of employees with a fixed-term contract

Human capital

Schumpeter School of Business and Economics

- Investing in firm-specific human capital is profitable in the long run
- Due to lower incentives to invest in firm-specific human capital, because fixed-term workers only work for a relative short period for the respective firm, firm-specific human capital is lower for them (Booth et al. 2002, Albert et al. 2005)
- Regarding firm-specific human capital the use of fixed-term contracts may reduce labor productivity

Hypothesis development

	Flexibility	Screening/ Motivation	Human capital
Low share	+	+	-
High share	+	-	-

We expect a nonlinear, maybe inverse u-shaped relationship between the use of fixed-term contracts and labor productivity

Data

Schumpeter School of Business and Economics

- Data from the IAB establishment panel
- Period: 2004-2008
- Only manufacturing establishments
- After data preparation: 8821 observations from 2244 establishments

Variables

Schumpeter School of Business and Economics

- Depended Variable: Labor productivity= real sales divided by number of employees
- Variable of interest: Share of employees with a fixed-term contract on total work force of an establishment
- Share of fixed-term employees also included as a squared term to test for the expected inverse u-shaped relationship between fixed-term employment and labor productivity

Variables

Schumpeter School of Business and Economics

- Control variables: Size (number of employees), investments per employee as a proxy for capital intensity, material intensity, export intensity, share of qualified employees, share of female employees
- All these variables are included in logs
- Dummy controls: legal form, year dummies, ownership, establishment profile, collective agreement, work council, industry dummies, federal state dummies, age dummies

Descriptive statistics

Schumpeter School of Business and Economics

	all firms					only firms using fixed-term contracts				
Industry	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
food/luxury	955	0.0448	0.0996	0.0000	0.9500	439	0.0975	0.1284	0.0034	0.9500
textiles/clothing	273	0.0350	0.0674	0.0000	0.4348	127	0.0753	0.0821	0.0034	0.4348
paper/printing/	453	0.0272	0.0670	0.0000	0.8451	199	0.0619	0.0900	0.0016	0.8451
wood sector	480	0.0300	0.0862	0.0000	0.9756	143	0.1009	0.1338	0.0062	0.9756
chemical/pharmaceutical sector	522	0.0414	0.0700	0.0000	0.6000	309	0.0699	0.0793	0.0022	0.6000
plastics industry	484	0.0464	0.0733	0.0000	0.8667	312	0.0721	0.0805	0.0025	0.8667
glass/stones/ore extraction	485	0.0448	0.0830	0.0000	0.6667	235	0.0924	0.0992	0.0011	0.6667
manufacture of basic metals	649	0.0427	0.0858	0.0000	0.9932	359	0.0772	0.1033	0.0005	0.9932
recycling	93	0.0381	0.0826	0.0000	0.4500	27	0.1313	0.1070	0.0152	0.4500
manufacture of fabricated metal	1203	0.0319	0.0528	0.0000	0.4688	541	0.0710	0.0585	0.0020	0.4688
machinery and equipment	1288	0.0281	0.0457	0.0000	0.4286	696	0.0520	0.0511	0.0009	0.4286
motor vehicles, trailers and semitrailers	366	0.0484	0.0645	0.0000	0.3804	245	0.0724	0.0670	0.0013	0.3804
other vehicle production	148	0.0491	0.1209	0.0000	0.8333	83	0.0876	0.1510	0.0021	0.8333
manufacture of electrical equipment	594	0.0389	0.0710	0.0000	0.5238	306	0.0755	0.0839	0.0025	0.5238
precision and optical equipment	524	0.0207	0.0391	0.0000	0.2642	195	0.0557	0.0466	0.0026	0.2642
furniture, jewelry/toys	304	0.0495	0.1388	0.0000	0.9524	121	0.1243	0.1981	0.0029	0.9524

Estimation Strategy

Schumpeter School of Business and Economics

- First estimation of a probit selection model where dependent variable takes value of one if the establishment used fixed-term employment and zero otherwise
- Based on that inverse Mills Ratio is calculated and added as an additional variable to take into account selection effects (Heckman 1979, Briggs 2004)
- OLS Model for a first impression
- Fixed Effects Model to control for establishment-specific fixed effects

Estimation strategy

Schumpeter School of Business and Economics

- Using dynamic panel data models to take into account potential endogenity
- Two different System GMM specifications (all variables are treated as exogenous/ both share variables and the export variable are traeted as predetermined (Arellano and Bover 1995, Blundell and Bond 1998)
- Robustness check 1: Estimations without taking into account selection effects
- Robustness check 2: Separate models West and East Germany

Results

Schumpeter School of Business and Economics

Variable	1	2	3	4	5
L1 LaborProd				0.4321***	0.4482***
				(0.0887)	(0.0722)
Share		0.2182	0.2083	0.0027	-0.0044
		(0.1897)	(0.127)	(0.3363)	(0.2686)
Share2		-2.1818**	-1.3218*	-0.8666	-1.2378
		(1.0678)	(0.6896)	(1.0163)	(1.2448)
Size	0.6076***	0.0468***	-0.3484***	0.0292	-0.0058
	(0.0215)	(0.0076)	(0.044)	(0.1216)	(0.0502)
Intermediate	0.1020**	0.4059***	0.0348**	0.2041***	0.2008***
	(0.0404)	(0.0169)	(0.0135)	(0.0263)	(0.0257)
Qualified	-0.3933***	0.4627***	0.0453	0.2546***	0.2588***
	(0.1246)	(0.0538)	(0.038)	(0.0798)	(0.0632)
Female	0.2093	-0.9952***	-0.0400	-0.5732***	-0.5549***
	(0.1349)	(0.0554)	(0.0823)	(0.1231)	(0.0894)
Export	0.3215***	0.5122***	0.2853***	0.3528***	0.4402***
	(0.1027)	(0.044)	(0.0643)	(0.106)	(0.1464)
Investment	0.0201***	0.0219***	0.0044***	0.0068	0.0089**
	(0.0049)	(0.002)	(0.0012)	(0.0088)	(0.004)

Appendix 2

Schumpeter School of Business and Economics

Variable	1	2	3	4
L1 LaborProd			0.4356***	0.4467***
			(0.0890)	(0.0723)
Share	-0.1407	-0.0202	-0.1335	-0.2292
	(0.1153)	(0.0729)	(0.1984)	(0.1712)
Size	0.0483***	-0.3450***	0.0254	-0.0034
	(0.0076)	(0.0440)	(0.1231)	(0.0526)
Intermediate	0.4061***	0.0355***	0.2036***	0.2013***
	(0.0169)	(0.0136)	(0.0262)	(0.0258)
Qualified	0.4628***	0.0460	0.2544***	0.2565***
	(0.0539)	(0.0378)	(0.0791)	(0.0632)
Female	-0.9974***	-0.0442	-0.5694***	-0.5570***
	(0.0553)	(0.0823)	(0.1235)	(0.0897)
Export	0.5131***	0.2843***	0.3489***	0.4378***
	(0.0440)	(0.0643)	(0.1068)	(0.1465)
Investment	0.0221***	0.0045***	0.0072	0.0089**
	(0.0020)	(0.0012)	(0.0090)	(0.0041)

Robustness checks

Schumpeter School of Business and Economics

- Estimation of all regression models without taking into account possible selection effects and separate models for East and West Germany
- Expected inverse u-shaped relationship is found in the fixed-effects model without taking into account selection effects
- Separate models for West and East Germany show also no significant effects
- In general robustness checks confirm the result that there is no effect

Conclusion

Schumpeter School of Business and Economics

- Expected inverse u-shaped relationship between the share of employees with fixed-term contracts on total workforce of an establishment and labor productivity was not found

- Even did not find empirical evidence for any relationship

- Future research: - Other countries
  - Other industries (maybe service)

Appendix 1

Schumpeter School of Business and Economics

Closed		-0.1304**	0.0251	0.0348	0.0471
		(0.0532)	(0.0291)	(0.054)	(0.0413)
Outsourced		0.0452	-0.0309	0.0356	0.0344
		(0.0602)	(0.0312)	(0.0472)	(0.0431)
Spin		0.0808	0.0762**	0.1026*	0.0992
		(0.0764)	(0.0326)	(0.062)	(0.0629)
Integrated		0.0529	0.0065	-0.0469	-0.0489
		(0.0405)	(0.0209)	(0.0325)	(0.0321)
Mills		0.0979***	0.4056***	0.0544	0.3692
		(0.0241)	(0.0918)	(1.2618)	(0.496)
Age Dummies	Yes	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Federal State Dummies	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes
Legal Status Dummies	Yes	Yes	Yes	Yes	Yes
Ownership Dummies	Yes	Yes	Yes	Yes	Yes
Collective Agreement	Yes	No	No	No	No
Work Council	Yes	Yes	Yes	Yes	Yes
Constant	-2.849***	8.8645***	11.8994***	5.1643*	4.4982***
	(0.2378)	(0.1055)	(0.3359)	(2.7049)	(1.093)
No. of observations	8821	8821	8821	6224	6224
No. ID			2244	2124	2124
(Pseudo) R-squared	0.3211	0.5164	0.1276		
Wald chi2	2538.34			8146.84	7219.44
No. of instruments				65	77
Hansen test p-value				0.292	0.096
AR(2) test p-value				0.766	0.829

Results

Schumpeter School of Business and Economics

Closed	-0.1327**	0.0227	0.0357	0.0462
	(0.0533)	(0.0294)	(0.0541)	(0.0416)
Outsourced	0.0458	-0.0290	0.0357	0.0348
	(0.0603)	(0.0313)	(0.0470)	(0.0432)
Spin	0.0805	0.0765**	0.1025*	0.0991
	(0.0766)	(0.0326)	(0.0622)	(0.0627)
Integrated	0.0522	0.0064	-0.0468	-0.0479
	(0.0405)	(0.0209)	(0.0324)	(0.0320)
Mills	0.0965***	0.4126***	0.0994	0.3586
	(0.0241)	(0.0920)	(1.2827)	(0.5200)
Age Dummies	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Federal State Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Legal Status Dummies	Yes	Yes	Yes	Yes
Ownership Dummies	Yes	Yes	Yes	Yes
Work Council	Yes	Yes	Yes	Yes
Constant	8.8609***	11.8656***	5.0513*	4.5266***
	(0.1057)	(0.3366)	(2.7497)	(1.1371)
No. of observations	8821	8821	6224	6224
No. ID		2244	2124	2124
(Pseudo) R-squared	0.5161	0.1267		
Wald chi2			8131.38	7227.44
No. of instruments			64	72
Hansen test p-value			0.296	0.070
AR(2) test p-value			0.779	0.838