Appendix

Table A1: Overview of variables used in the empirical analysis

Variable	Operationalization	Data source
Dependent variable		
Economic performance (GDP)	Log of GDP per capita in real prices	Cambridge Econometrics
Independent variables		
Innovation subsidies	Log of public subsidies for all projects in the field of innovation and technology; aggregated on ROR level, per year and per capita in real prices	Public funding statistics (Förderkatalog)
Innovation activity	Log of number of EPO patents, assigned to ROR by address of the German inventor(s), aggregated on ROR level, per year and per capita	PATSTAT
Human capital	Log of share of highly qualified employees over all employees, aggregated on ROR level, per year	IAB-BHP (Establishment History Panel of the Institute for Employment Research)
Entrepreneurial activity	Log of number of newly founded companies per ROR and year	IAB-BHP (Establishment History Panel of the Institute for Employment Research)

Source: own presentation.

Table A2: Descriptive statistics of the variables included in the analysis

Variable		Mean	Std. Dev.	Min	Max	Observations	
Economic performance (GDP)	overall	25578.46	6223.181	13403.98	53122.09	N =	2611
	between		4934.772	18149.54	45666	n =	75
	within		3817.291	12497.23	49012.5	T =	34.8
Innovation subsidies	overall	17.29275	25.90762	.00607	476.2163	N =	2529
	between		17.26621	1.481157	82.95762	n =	75
	within		19.42233	-51.0595	410.5514	T =	33.7
Innovation activity	overall	2.231784	1.70717	0.012841	9.838541	N =	2611
	between		1.30995	0.332033	5.623759	n =	75
	within		1.101114	-1.90001	6.981406	T =	34.8
Human capital	overall	.0887143	.0497915	.0152253	.3296743	N =	2625
	between		.0289132	.0445895	.1797807	n =	75
	within		.04067	-.016235	.2386079	T =	35
Entrepreneurial activity	overall	721.9112	782.419	99	11941	N =	2625
	between		618.0095	217.0286	3317.4	n =	75
	within		484.9667	-1206.49	9345.511	T =	35

Source: own calculation.

Explanation: The first row for each variable displays the "overall" statistics, across all years and regions. The second one shows "between" statistics, and takes into account only the cross-sectional dimension of the data with n=75 for all variables. The final row of each variable stands for variation across time. It shows that although there are some missing years, they are few (T is close to or equal to 35 for each variable), meaning that our panel is strongly balanced.

Note: For the ease of reading the descriptive statistics, innovation activity is rescaled as a number of patents per 10 000 inhabitants. For the same reason, the numbers in the table are presented in non-log form, whereas natural logarithms are used for calculation, as explained in the text.

Table A3. Correlation matrix for variables used in the estimations, year 1980 (beginning of the observation period)

	GDP per capita	Innovation subsidies	Innovation activity	Human capital	Entrepreneurial activity
GDP per capita	1				
Innovation subsidies	0.576***	1			
Innovation activity	0.478***	0.281*	1		
Human capital	0.711***	0.612***	0.425***	1	
Entrepreneurial activity	0.618***	0.435***	0.438***	0.587***	1

$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Source: own calculation.

Table A4. Correlation matrix for variables used in the estimations, year 2014 (end of the observation period)

	GDP per capita	Innovation subsidies	Innovation activity	Human capital	Entrepreneurial activity
GDP per capita	1				
Innovation subsidies	0.385***	1			
Innovation activity	0.527***	0.263*	1		
Human capital	0.579***	0.687***	0.384***	1	
Entrepreneurial activity	0.460***	0.436***	0.287*	0.728***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: own calculation.

Table A5: Estimation results of different panel cointegration models for the West German planning regions (1980-2014). GDP as a dependant variable.

	PMG	MG	DFE
Innovation subsidies	0.006**	0.008*	0.007
	(2.60)	(1.95)	(1.30)
Innovation activity	0.032***	0.037**	0.044**
	(4.47)	(2.83)	(3.00)
Human capital	0.240***	0.258***	0.221***
	(29.32)	(18.15)	(11.78)
Entrepreneurial activity	-0.001	-0.015	0.014
	(-0.14)	(-1.52)	(0.78)
Speed of adjustment	-0.295***	-0.582***	-0.206***
	(-14.64)	(-18.27)	(-16.91)
SR Innovation subsidies	0.000	-0.001	0.001
	(0.09)	(-0.89)	(0.78)
SR Innovation activity	0.020***	0.010**	0.011**
	(4.35)	(1.96)	(2.89)
SR Human capital	0.009	-0.023	0.026
	(0.43)	(-0.95)	(1.10)
SR Entrepreneurial activity	-0.007**	-0.001	-0.007**
	(-2.79)	(-0.48)	(-2.48)

Constant term	3.257***	6.599***	2.275***
	(14.62)	(16.98)	(15.86)
No. of obs	2400	2400	
BIC	-10130	-10794	.
Log pseudolikelihood	5104	5436	
Hausman test	0.2741		

z statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.001

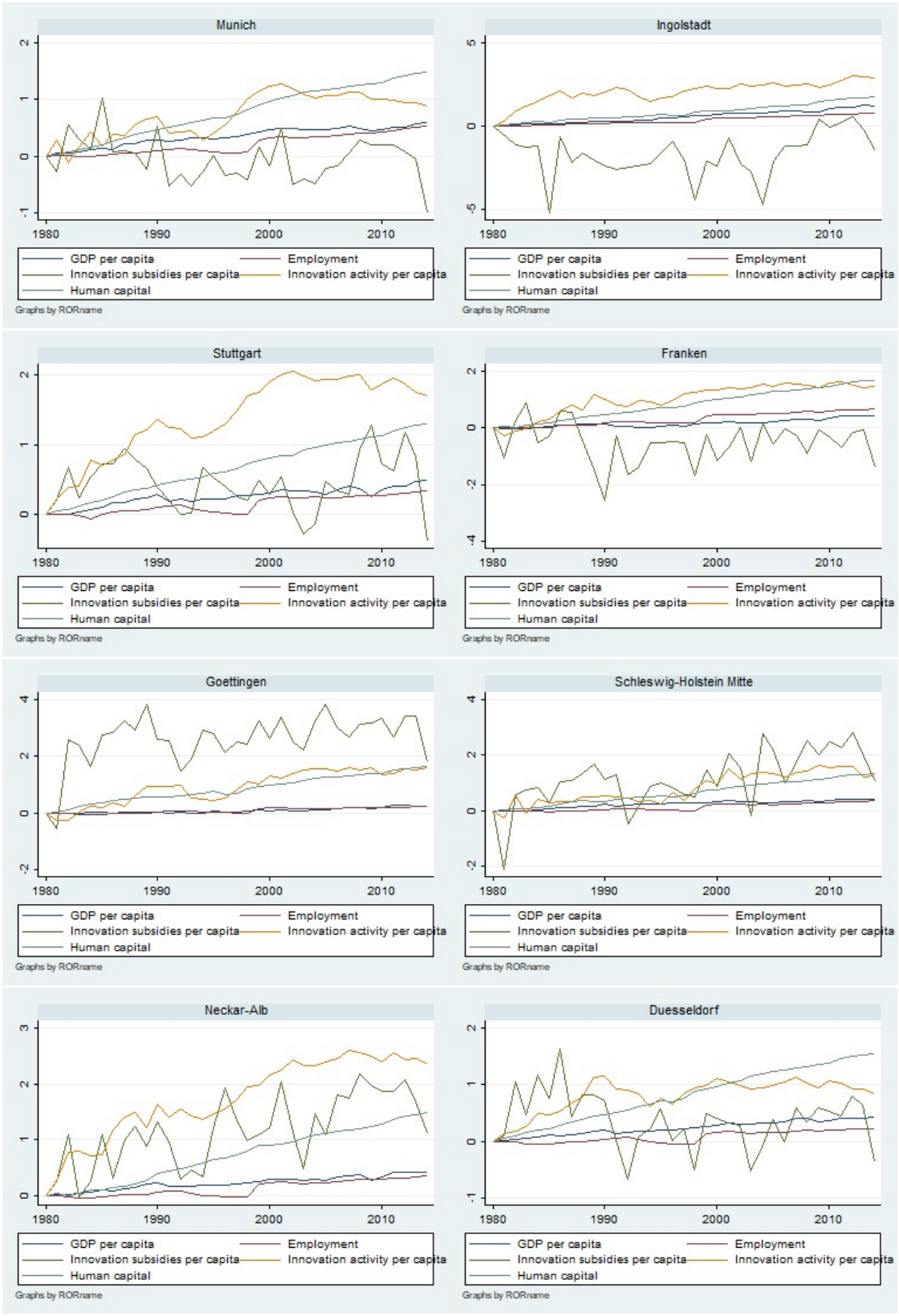
Table A6: Estimation results of the panel cointegration model for West German planning regions (1984-2014). GDP as a dependant variable. Top performers.

	PMG	MG	DFE
Innovation subsidies	0.009**	0.009*	0.011*
	(2.93)	(1.86)	(1.68)
Innovation activity	0.042***	0.039**	0.049**
	(5.48)	(2.46)	(2.73)
Human capital	0.243***	0.264***	0.236***
	(29.57)	(16.41)	(10.75)
Entrepreneurial activity	-0.001	-0.012	0.007
	(-0.08)	(-1.24)	(0.34)
Speed of adjustment	-0.308***	-0.587***	-0.201***
	(-12.50)	(-18.74)	(-14.51)
SR Innovation subsidies per capita	-0.001	-0.002	0.000
	(-0.48)	(-0.92)	(0.15)
SR Innovation activity	0.026***	0.017**	0.021***
	(4.55)	(2.78)	(4.21)
SR Human capital	0.021	-0.025	0.052*
	(0.89)	(-0.92)	(1.81)
SR Entrepreneurial activity	-0.008***	-0.004	-0.007**
	(-3.53)	(-1.44)	(-2.13)

Constant term	3.427*** (12.47)	6.655*** (17.99)	2.239*** (13.68)
No. of obs	1838	1838	
BIC	-7702	-8171	.
Log pseudolikelihood	3889	4123	
Hausman test	0.0157		

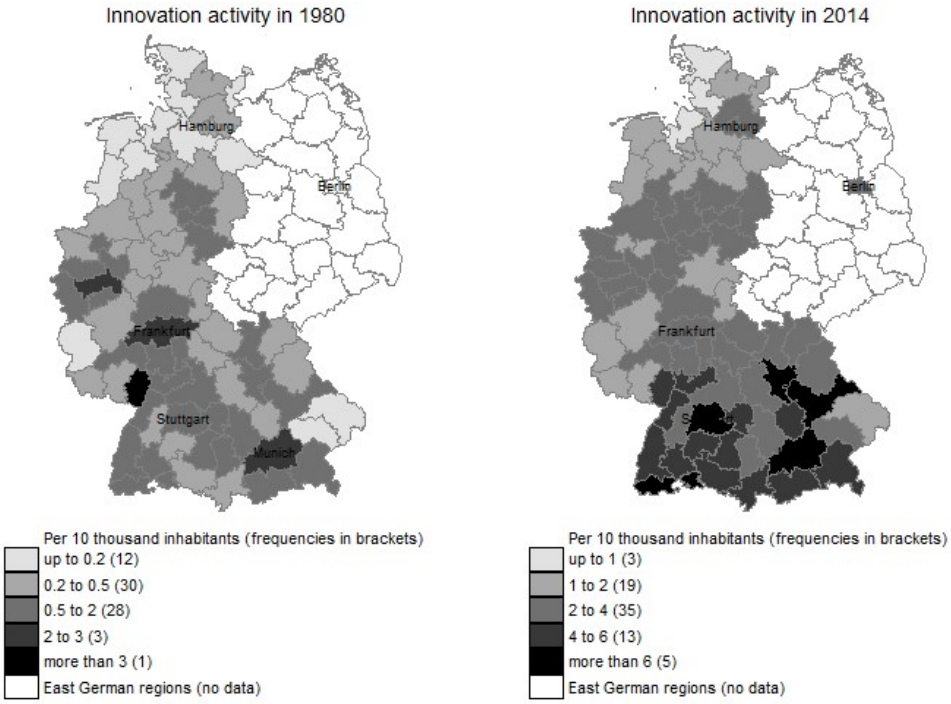
z statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.001
Source: own calculation.

Figure A1: Time series for variables used in the analysis (standardized) for selected regions



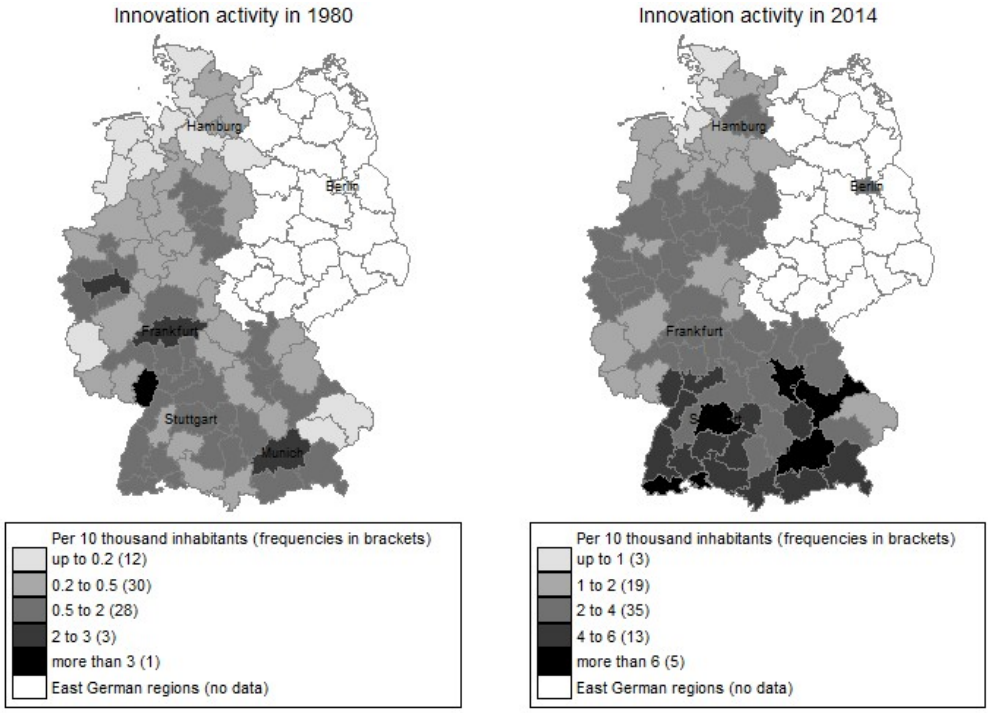
Data source: Cambridge Econometrics, Förderkatalog, PATSTAT. Own calculation.

Figure A2. Real GDP per capita per planning region (ROR). Comparison between 1980 and 2014.



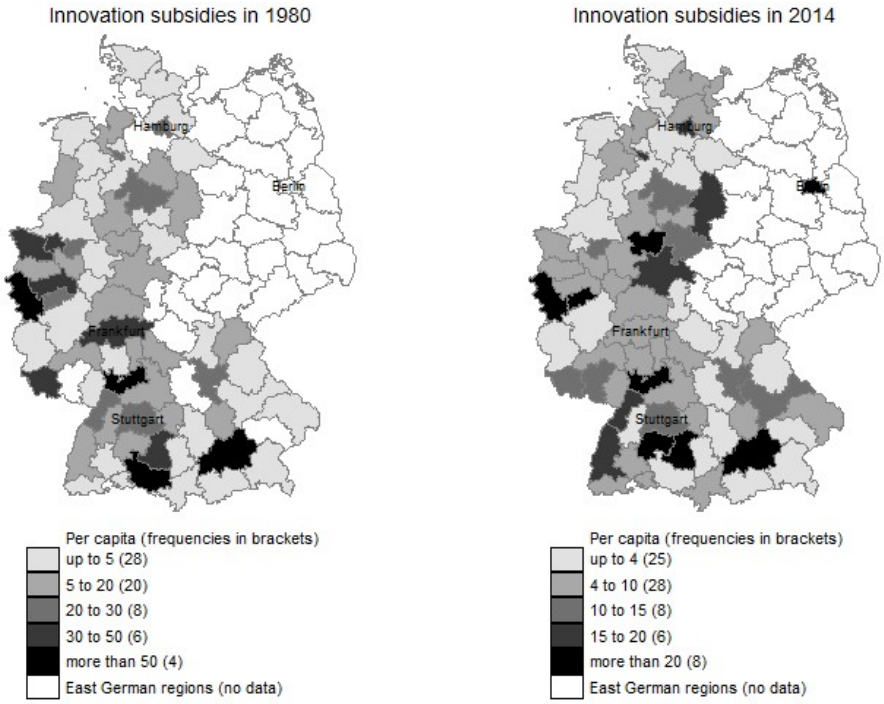
Source: Cambridge econometrics. Own calculations.

Figure A3. Number of patents with at least one German applicant per capita per planning region (ROR). Comparison between 1980 and 2014.



Source: PATSTAT, Cambridge econometrics. Own calculations.

Figure A4. Share of public innovation subsidies per capita per planning region (ROR). Comparison between 1980 and 2014.



Source: Förderkatalog, Cambridge econometrics. Own calculations.