

# Additional file 1

Table S1: Descriptive statistics of employed variables

Variable	Min	Median	Mean	Max	Std. Dev.
Apprenticeship	2.9000	5.9500	5.8800	8.9000	0.9222
Share of Mittelstand firms	58.3000	83.9000	82.7000	91.0000	5.0180
Unemployment rate	1.9000	6.3000	6.8200	18.3000	2.9390
Unemployed potential trainees	5.0000	10.9000	10.8000	16.0000	1.7720
Medium-skilled potential trainees	0.0268	0.1080	0.1090	0.2370	0.0327
High-skilled potential trainees	0.0000	0.0635	0.0681	0.1750	0.0302
Size of universities	0.0000	0.0031	0.1390	2.7700	0.3448
Distance to universities	0.0000	0.0000	10.8000	58.0000	13.4600
Small firms	4.7800	8.0000	8.0500	12.3000	1.3630
Large firms	0.8400	2.0400	2.1100	4.0500	0.6640
Working-age population	60.9000	65.3000	65.4000	72.5000	1.7030
Population density	41.0000	232.0000	569.0000	4270.0000	694.5000
GDP per capita	13.3000	27.3000	30.3000	85.4000	11.3500
CDU/CSU/FDP	30.0000	52.0000	51.7000	71.1000	7.9360
Other parties	7.3700	14.2200	14.6200	28.4200	2.895
Sectors					
Agriculture, forestry and fishing	0.1370	1.9000	2.4200	10.2000	1.9600
Mining and quarrying	0.0000	0.0682	0.0927	0.7520	0.0921
Manufacturing	2.8800	6.6100	6.9000	20.9000	2.2490
Electricity	0.0380	0.4060	0.6000	6.9200	0.6696
Water supply and waste management	0.0622	0.2870	0.2920	0.8680	0.1069
Construction	5.4400	11.5000	11.3000	17.0000	2.5310
Wholesale and retail trade	15.0000	22.9000	22.8000	31.0000	2.3440
Transportation and storage	1.5800	3.3800	3.6300	15.4000	1.2090
Accommodation and food service	2.7200	5.5400	5.9000	13.0000	1.6480
Information and communication	0.8310	2.2800	2.5000	9.7800	1.1160
Finance and insurance	1.8700	3.4400	3.4500	5.7800	0.5859
Real estate activities	1.8400	3.7600	3.9300	10.7000	1.1970
Professional and technical activities	6.7600	12.3000	12.9000	23.1000	3.0470
Administrative and support service	3.0100	4.8400	5.0400	11.8000	1.1900
Public administration	0.0561	0.3580	0.4230	1.4300	0.2563
Education	0.4600	1.0700	1.1300	2.3900	0.3095
Human health and social work	1.8800	3.8100	3.9100	7.2500	0.9856
Arts, entertainment and recreation	0.9080	1.7200	1.8000	3.7200	0.4523
Other service activities	2.3400	4.7300	5.1300	16.5000	1.8920
Households as employers	0.0000	0.0217	0.0297	0.1640	0.0305
Extraterritorial organisations	0.0000	0.0000	0.0309	2.7200	0.2018
No sector information	0.0460	5.0800	5.8000	17.3000	3.8470
Occupations					
Farmer, forestry workers and miners	0.3000	1.3000	1.6400	11.1000	1.0990
Chemical worker	0.1000	1.4000	1.9100	16.5000	1.7840
Metal cutters and connectors	0.1000	1.8000	2.2400	11.6000	1.6450
Smiths, fitters and mechanics	2.6000	7.2000	7.3300	20.3000	2.0320
Electricians	1.3000	2.4000	2.5100	6.2000	0.6587
Assemblers	0.1000	1.6000	2.1900	22.7000	2.1560
Food makers	1.0000	2.7000	2.8900	8.7000	1.1510
Building construction labourers	0.6000	2.4000	2.5500	6.9000	1.1950
Wood-product makers	0.2000	0.8000	0.9050	3.5000	0.5707
Painters and surface finishers	0.3000	0.8000	0.8820	3.3000	0.3043

Descriptive statistics of employed variables, continued

Variable	Min	Median	Mean	Max	Std. Dev.
Products testers and packagers	0.2000	1.5000	1.5500	5.4000	0.7334
Labourers no further specified	0.5000	2.0000	2.3000	18.3000	1.5630
Machine operators	0.1000	0.6000	0.7310	5.0000	0.4734
Engineers and chemists	0.5000	1.9000	2.2700	12.1000	1.4330
Technicians	1.3000	4.0000	4.1400	14.3000	1.3060
Sellers and salespersons	4.4000	8.1000	8.2000	15.1000	1.4170
Service agents and clerks	1.3000	3.0000	3.4300	17.4000	1.6400
Surface transport occupations	3.7000	7.2000	7.4900	16.5000	1.8400
Managers and office clerks	9.0000	18.2000	19.5000	38.7000	4.0770
Protective services workers	0.6000	1.2000	1.3400	5.2000	0.5241
Authors and editors	0.2000	0.5000	0.6820	11.4000	0.7499
Health care occupations	3.0000	7.6000	7.6500	15.3000	1.9940
Care occupations and teachers	2.2000	6.0000	6.1500	11.4000	1.4950
Hairdressers and cleaners	2.7000	5.5500	5.8000	15.6000	1.6260
No occupational information	0.3000	0.9000	1.0100	6.3000	0.5478
N = 326					

Table S2: Industrial sector classification (NACE Rev. 2, one digit)

Variable	Industrial sector classification	Description
Agriculture, forestry and fishing	A	Agriculture, forestry and fishing
Mining and quarrying	B	Mining and quarrying
Manufacturing	C	Manufacturing
Electricity	D	Electricity, gas, steam and air conditioning supply
Water supply and waste management	E	Water supply; sewerage, waste management and remediation activities
Construction	F	Construction
Wholesale and retail trade	G	Wholesale and retail trade; repair of motor vehicles and motorcycles
Transportation and storage	H	Transportation and storage
Accommodation and food service	I	Accommodation and food service activities
Information and communication	J	Information and communication
Finance and insurance	K	Financial and insurance activities
Real estate activities	L	Real estate activities
Professional and technical activities	M	Professional, scientific and technical activities
Administrative and support service	N	Administrative and support service activities
Public administration	O	Public administration and defence; compulsory social security
Education	P	Education
Human health and social work	Q	Human health and social work activities
Arts, entertainment and recreation	R	Arts, entertainment and recreation
Other service activities	S	Other service activities
Households as employers	T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
Extraterritorial organisations	U	Activities of extraterritorial organisations and bodies

Source: Federal Statistical Office (2008).

Table S3: Relevant section of the German occupational classification from 1988

Variable	Occupational classification	Description
Farmer, forestry workers and miners	I.II.01.09	Mixed crop and animal producers; livestock and fish farmer; agricultural production manager and advisors; farm hands, mixed crop and livestock farm labourers; gardeners, horticultural and nursery growers; forestry workers and huntspersons; miners; mineral exploitation and quarry workers; mineral and stone processing plant operators
Chemical worker	III.14.15	Chemical worker; plastic products machine operators
Metal cutters and connectors	III.19.24	Metal furnace and rolling-mill operators; moulders, casters; metal moulders non cutting deformation; metal-cutters; metal surface processors and finishers; metal connectors
Smiths, fitters and mechanics	III.25.30	Smiths; thinsmiths, plumbers and pipe fitters; locksmiths and fitters; mechanics; toolmakers, instrument mechanics; precious fitters and related occupations
Electricians	III.31	Electricians
Assemblers	III.32	Assemblers and metal plant operators otherwise undisclosed
Food makers	III.39.43	Bakers, pastry-cooks and confectionery makers; butchers, fish-processing-machine operators and related food preparers; cooks and other food makers; beverage and semiluxury food makers; other food makers
Building construction labourers	III.44.47	Bricklayers and concreters; carpenters, roofers, scaffolders; road, maintenance and civil engineering building experts; building construction labourers
Wood-product makers	III.50	Cabinetmakers, carpenters, joiners and other wood-product makers
Painters and surface finishers	III.51	Painters, wallpaperers, varnishers and surface finishers
Products testers and packagers	III.52	Products testers, packagers and loading agents
Labourers no further specified	III.53	Labourers no further specified
Machine operators	III.54	Machine operators and related occupations
Engineers and chemists	IV.60.61	Engineers; chemists, physicists, mathematicians
Technicians	IV.62.63	Technicians; science technicians
Sellers and salespersons	V.68	Sellers and salespersons
Service agents and clerks	V.69.70	Banking, building society and insurance experts; other service agents, clerks and related occupations
Surface transport occupations	V.71.74	Surface transport occupations; water- and air traffic occupations; communication traffic occupations; stock, loading and transport occupations
Managers and office clerks	V.75.78	Entrepreneurs, managers, consultants, accountants and related clerks; legislators, senior and administrative officials; calculators, bookkeepers, computing and data processing professionals; office clerks and hands
Protective services workers	V.79.81	Attendance and protective services workers; soldiers, police officers, firefighters, safety and health inspectors; judges, lawyers, legal professionals and executory officers
Authors and editors	V.82.83	Authors, editors, interpreters, librarians and related clerks; artists and related occupations
Health care occupations	V.84.85	Medical doctors, pharmacists; remaining health care occupations
Care occupations and teachers	V.86.89	Social welfare, care occupations; teachers and teaching professionals; humanities and natural scientists, otherwise undisclosed; religious professionals, associated professionals and assistants
Hairdressers and cleaners	V.90.93	Hairdressers, barbers, beauticians and related workers; hotel and restaurant occupations; housekeeping occupations; launderers and cleaners

Source: Federal Employment Agency (1988) and Research Data Centre of the German Federal Employment Agency at the Institute for Employment Research (2010).

Table S4: OLS with all German counties		
Dependent variable: Apprenticeship		
	(1)	(2)
Share of Mittelstand firms	0.0370***	0.0304**
Unemployment rate		-0.0448**
Unemployed potential trainees		0.1010***
Medium-skilled potential trainees		-0.5221
High-skilled potential trainees		3.0898
Size of universities		-0.5124***
Distance to universities		0.0026
Small firms		0.2203***
Large firms		0.0029
Working-age population		0.0415
Population density		-0.0000
GDP per capita		-0.0145**
CDU/CSU/FDP		0.0262***
Other parties		0.0277**
Sectors		X
Occupations		X
N	413	413
adj R <sup>2</sup>	0.027	0.568
F-value	12.4***	10.2***

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Figure S1: Moran scatterplot of OLS residuals

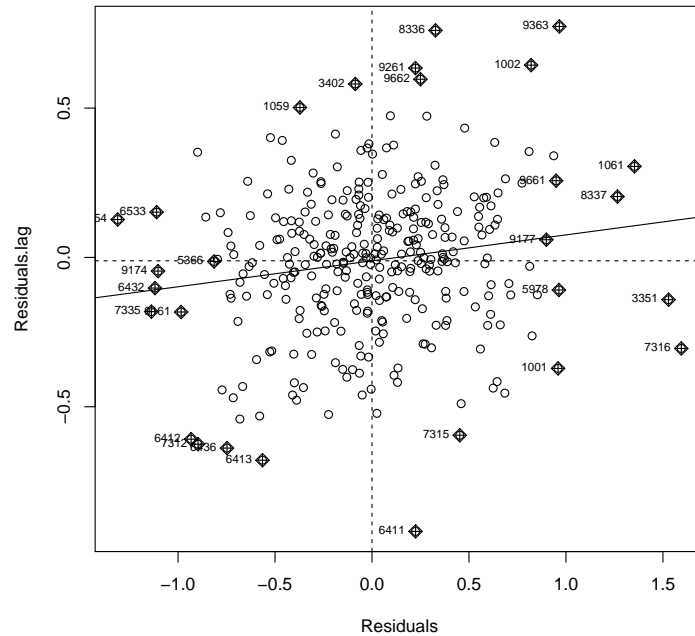


Table S5: Lagrange-Multiplier-tests

	Lagrange Multiplier	p-value
LMerr	5.3	0.02
LMlag	29.4	0.00
RLMerr	5.3	0.02
RLMlag	29.4	0.00

Table S6: Manski model including sectors and occupations

	Direct effects	p-values	Indirect effects	p-values	Total effects	p-values
Share of Mittelstand firms	0.0218	0.0969	-0.0849	0.0616	-0.0631	0.1398
Unemployment rate	0.0273	0.2488	0.0280	0.6783	0.0553	0.4558
Unemployed potential trainees	0.0580	0.0081	0.2556	0.0042	0.3136	0.0007
Medium-skilled potential trainees	0.6358	0.6494	-8.1262	0.1762	-7.4904	0.2559
High-skilled potential trainees	-0.6437	0.7007	1.0097	0.8602	0.3660	0.9362
Size of universities	-0.0666	0.7249	-0.5825	0.5329	-0.6491	0.5259
Distance to universities	0.0066	0.0067	0.0028	0.7550	0.0094	0.3804
Sectors						
Agriculture, forestry and fishing	-0.0597	0.0309	0.0694	0.4664	0.0097	0.9218
Mining and quarrying	0.2063	0.5795	0.9020	0.4876	1.1084	0.4134
Manufacturing	0.0080	0.7702	0.2968	0.0089	0.3048	0.0092
Electricity	-0.0469	0.4297	0.1346	0.3818	0.0877	0.5478
Water supply and waste management	-0.1368	0.6880	-0.3747	0.7329	-0.5115	0.6750
Construction	0.0086	0.7368	0.0196	0.8694	0.0282	0.7937
Wholesale and retail trade	-0.0814	0.0001	0.0759	0.3025	-0.0054	0.9623
Transportation and storage	0.0028	0.9117	0.1808	0.1362	0.1836	0.1563
Accommodation and food service	0.0285	0.3017	0.1060	0.3811	0.1345	0.2671
Information and communication	-0.1111	0.0570	0.2078	0.2987	0.0966	0.5812
Finance and insurance	0.0267	0.6816	0.3584	0.1785	0.3852	0.1748
Real estate activities	0.0130	0.7223	0.2093	0.2138	0.2223	0.1971
Professional and technical activities	-0.0450	0.0515	-0.0395	0.5725	-0.0844	0.2793
Administrative and support service	-0.0040	0.9240	0.0149	0.8490	0.0108	0.8698
Public administration	-0.2864	0.0717	-0.1080	0.8497	-0.3944	0.5041
Education	0.3541	0.0099	0.7498	0.1872	1.1039	0.0625
Human health and social work	0.0971	0.1556	-0.6069	0.0429	-0.5098	0.1026
Arts, entertainment and recreation	-0.0288	0.8010	0.3660	0.2551	0.3371	0.2979
Other service activities	0.0114	0.5453	0.1410	0.1002	0.1525	0.0723
Households as employers	0.0155	0.9911	-0.5546	0.8459	-0.5391	0.8489
Extraterritorial organisations	-0.1006	0.4397	-0.4614	0.4617	-0.5620	0.3611
Occupations						
Farmer, forestry workers and miners	0.0203	0.5796	0.3226	0.0537	0.3428	0.0593
Chemical worker	-0.0433	0.0337	0.0449	0.6021	0.0016	0.9503
Metal cutters and connectors	-0.0359	0.1519	0.1007	0.3319	0.0647	0.5272
Smiths, fitters and mechanics	0.0376	0.0820	0.0365	0.6832	0.0741	0.4246
Electricians	0.0765	0.1127	0.1332	0.5242	0.2097	0.3382
Assemblers	-0.0478	0.0296	0.1431	0.1160	0.0953	0.3259
Food makers	-0.0009	0.9686	0.2873	0.0593	0.2864	0.0730
Building construction labourers	0.1486	0.0009	0.3567	0.1033	0.5053	0.0283
Wood-product makers	0.1743	0.0139	0.1359	0.6144	0.3103	0.3272
Painters and surface finishers	-0.1488	0.1835	0.4874	0.3420	0.3386	0.5322
Products testers and packagers	0.0227	0.6477	0.1471	0.4737	0.1698	0.4530
Labourers no further specified	-0.0558	0.0240	0.0054	0.9658	-0.0504	0.6709
Machine operators	0.1586	0.0331	0.2147	0.3858	0.3733	0.1772

Manski model including sectors and occupations, continued

	Direct effects	p-values	Indirect effects	p-values	Total effects	p-values
Engineers and chemists	-0.0280	0.3880	0.2715	0.0748	0.2434	0.1344
Technicians	0.0837	0.0118	0.0685	0.6073	0.1522	0.2911
Sellers and salespersons	0.1286	0.0000	0.5976	0.0003	0.7262	0.0000
Service agents and clerks	0.0884	0.0042	0.0055	0.9572	0.0940	0.5993
Surface transport occupations	-0.0440	0.0484	-0.0571	0.5049	-0.1011	0.2859
Protective services workers	0.0110	0.8352	-0.6393	0.0630	-0.6282	0.0885
Authors and editors	0.0436	0.4045	-0.5072	0.1827	-0.4636	0.2317
Health care occupations	0.0737	0.0027	0.3876	0.0039	0.4613	0.0014
Care occupations and teachers	-0.0005	0.9995	-0.0790	0.5718	-0.0795	0.5950
Hairdressers and cleaners	-0.0393	0.1548	0.0100	0.9315	-0.0293	0.8317
No occupational information	-0.0810	0.1883	0.2695	0.3475	0.1885	0.5338
Small firms	0.0916	0.0505	-0.0758	0.6159	0.0158	0.9815
Large firms	0.0040	0.9257	0.7407	0.1420	0.7447	0.1498
Working-age population	0.0103	0.7459	0.1370	0.2155	0.1474	0.1989
Population density	0.0000	0.8300	0.0002	0.6656	0.0002	0.6266
GDP per capita	-0.0162	0.0167	0.0132	0.6814	-0.0030	0.8974
CDU/CSU/FDP	0.0306	0.0008	-0.0389	0.1526	-0.0083	0.7406
Other parties	0.0309	0.3036	-0.0799	0.1642	-0.0489	0.3076
N	326					
Nagelkerke	0.8386					
$\rho$	0.5222 (0.0000)					
$\lambda$	- 0.7407 (0.0000)					