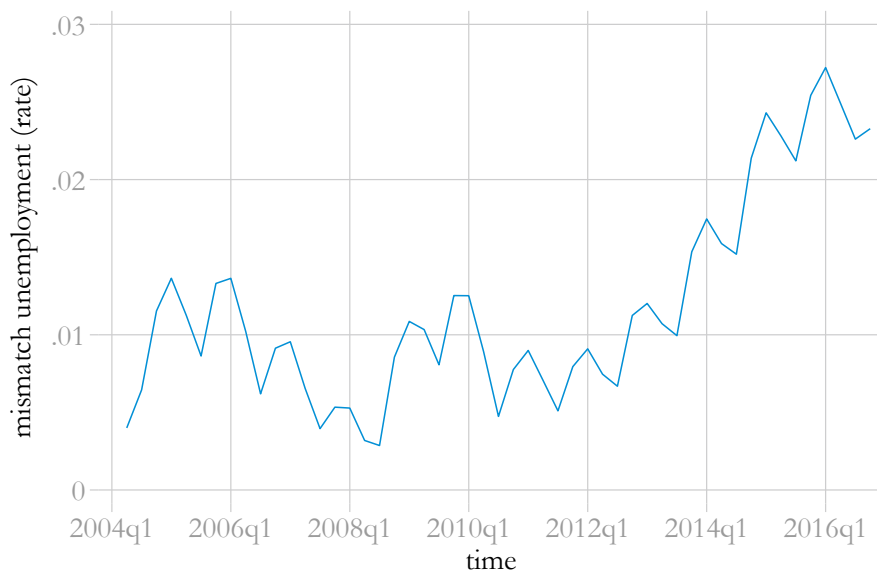


## Appendix A. Robustness Checks

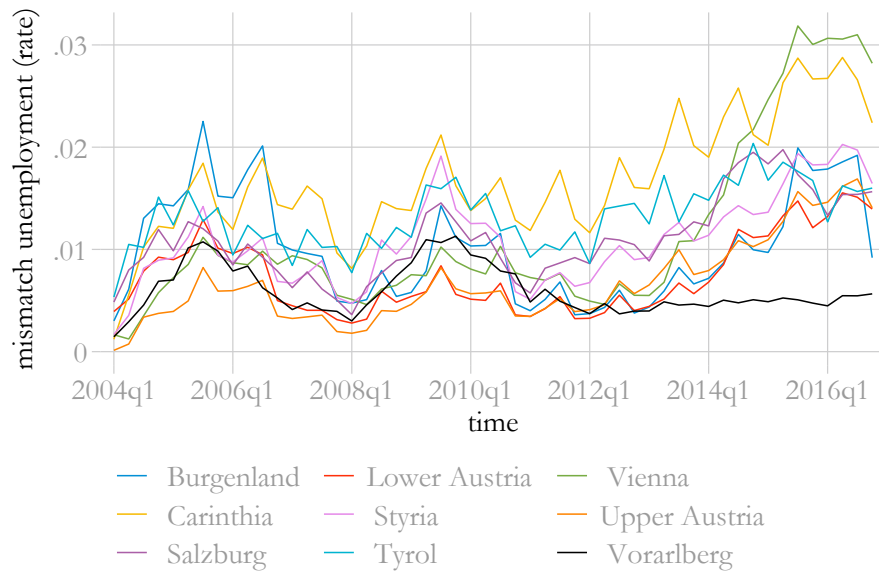
The estimated mismatch unemployment might be sensitive to the specification of the model. We assume a constant transition rate (as observed empirically), however, this assumption might not be true and, in consequence, could result in biased calculations. As a robustness check, we follow [Veracierto \(2011\)](#) who estimates the matching function directly using OLS to account for potential fluctuations in the transition rate. Figures [A.1](#), [A.2](#), and [A.3](#) present the results from these specifications. Since these results differ only slightly from our main results, we conclude that the main results are not caused by the assumption of a constant transition rate.

Figure A.1: Estimated mismatch unemployment (OLS), aggregated data for Austria, 2004–2016.



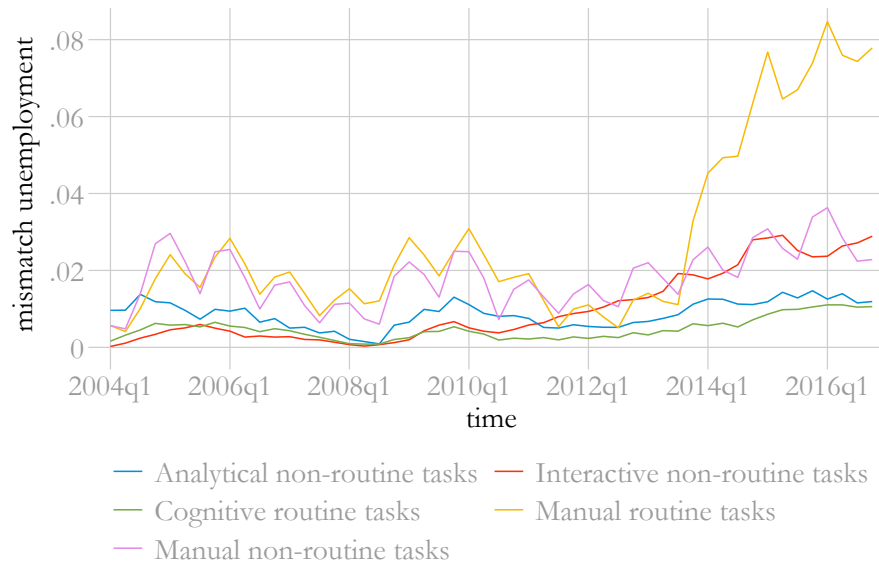
*Notes:* Mismatch unemployment as the difference between the unemployment rate under a stable matching productivity and the steady-state unemployment rate.

Figure A.2: Estimated mismatch unemployment (OLS), by region, 2004–2016.



*Notes:* Mismatch unemployment as the difference between the unemployment rate under a stable matching productivity and the steady-state unemployment rate.

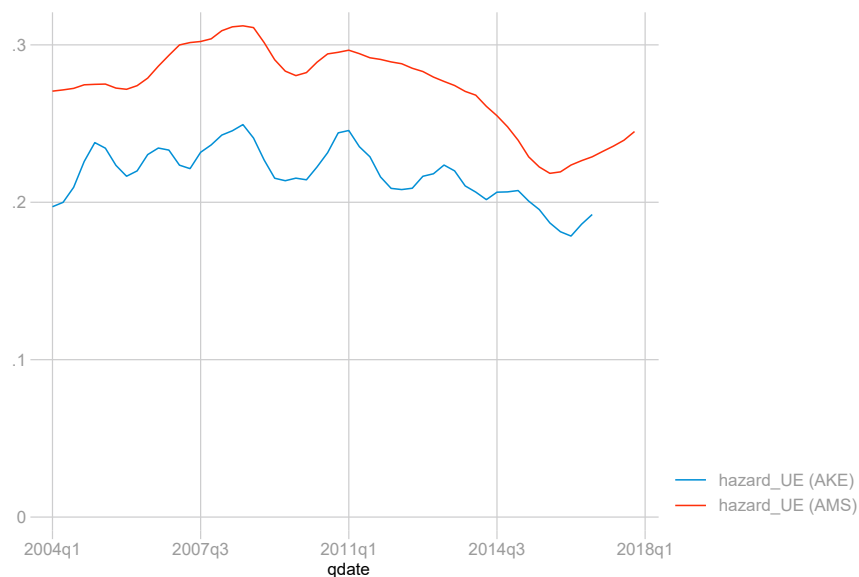
Figure A.3: Estimated mismatch unemployment (OLS), by skill level, 2004–2016.



*Notes:* Mismatch unemployment as the difference between the unemployment rate under a stable matching productivity and the steady-state unemployment rate.

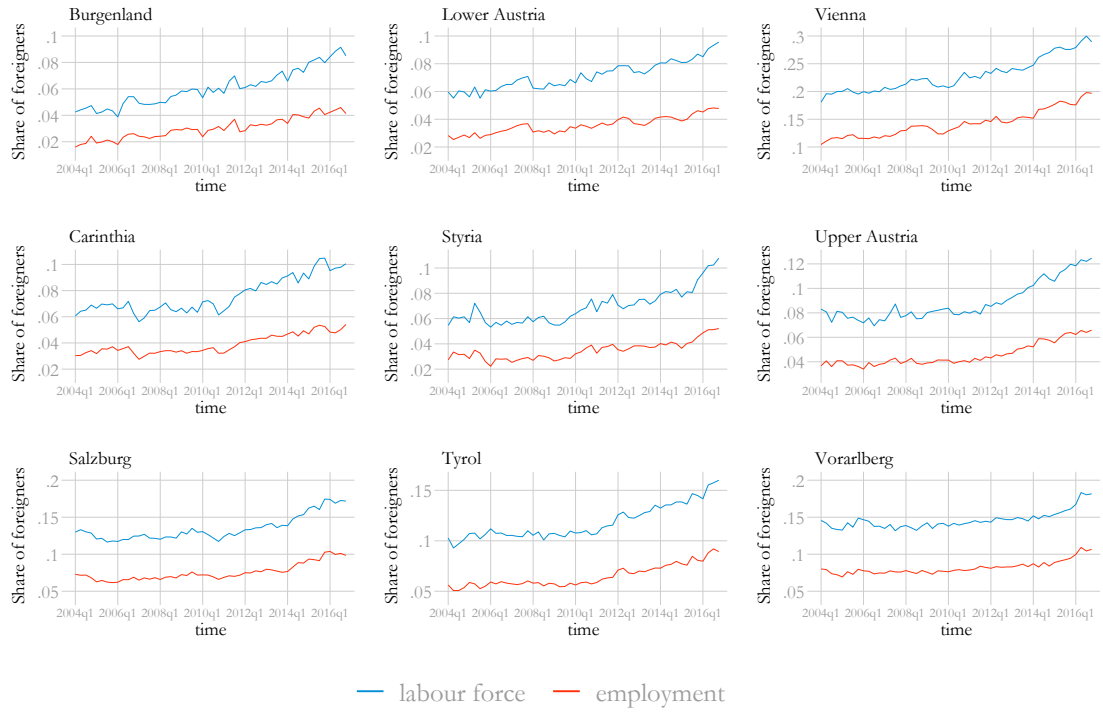
## Appendix B. Additional Figures and Tables

Figure B.1: Job findings rates, by estimation method.



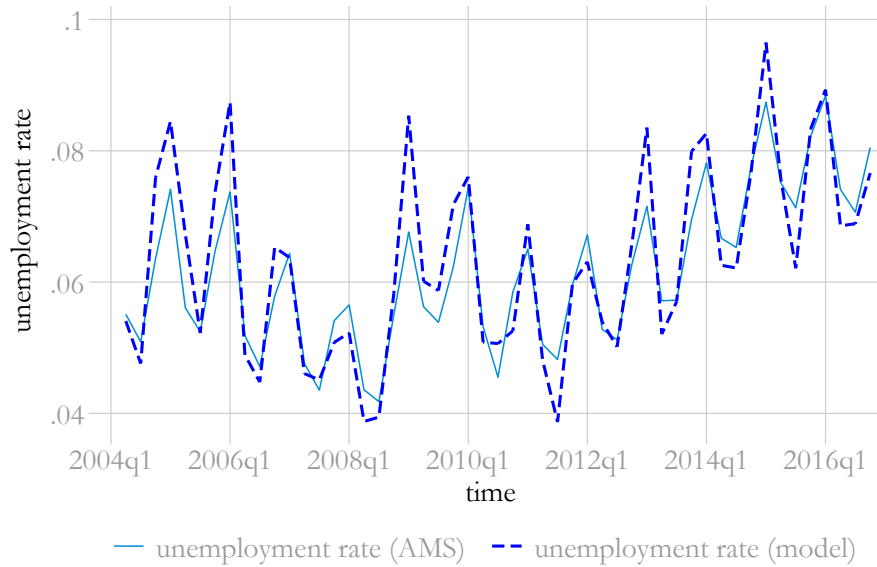
*Notes:* The graph plots the estimated job finding rates for the whole of Austria. The top line, AMS, is based on the approach by [Shimer \(2012\)](#), which we use here. The bottom line, AKE, is derived from an analysis of labour market flows ([Christl, 2020](#)).

Figure B.2: Share of foreign workers, Austria, 2004–2016.



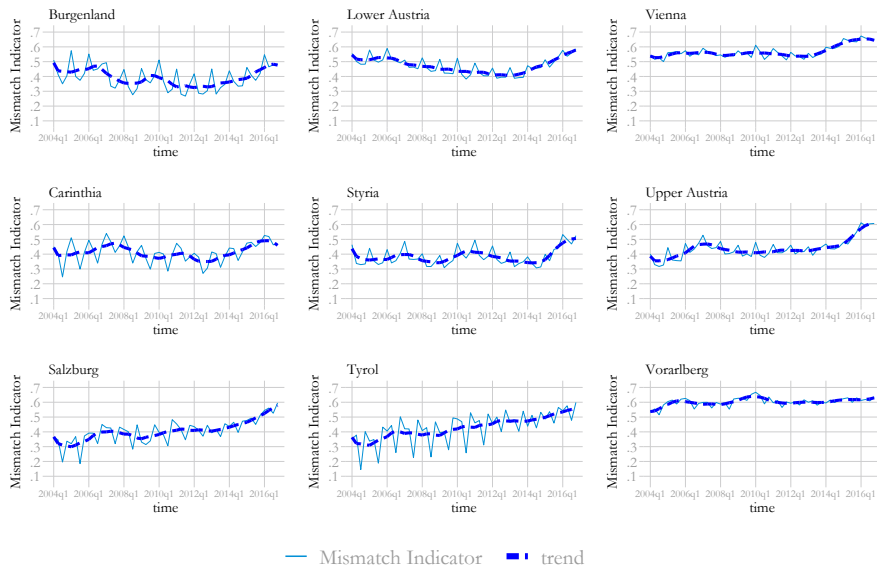
Notes: Own calculations, based on quarterly data from 2004 to 2016 from [Statistik Austria \(2020\)](#).

Figure B.3: Model prediction of the unemployment rate, 2004–2016.



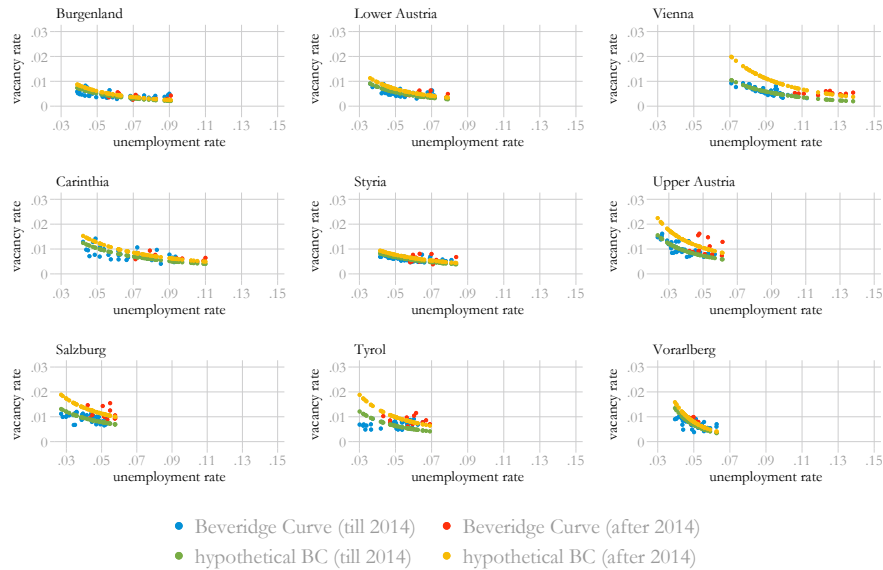
*Notes:* The graph plots the estimated unemployment rate for the whole of Austria and compares it with the unemployment rate observed in the data.

Figure B.4: Mismatch indicators, by region, 2004–2016.



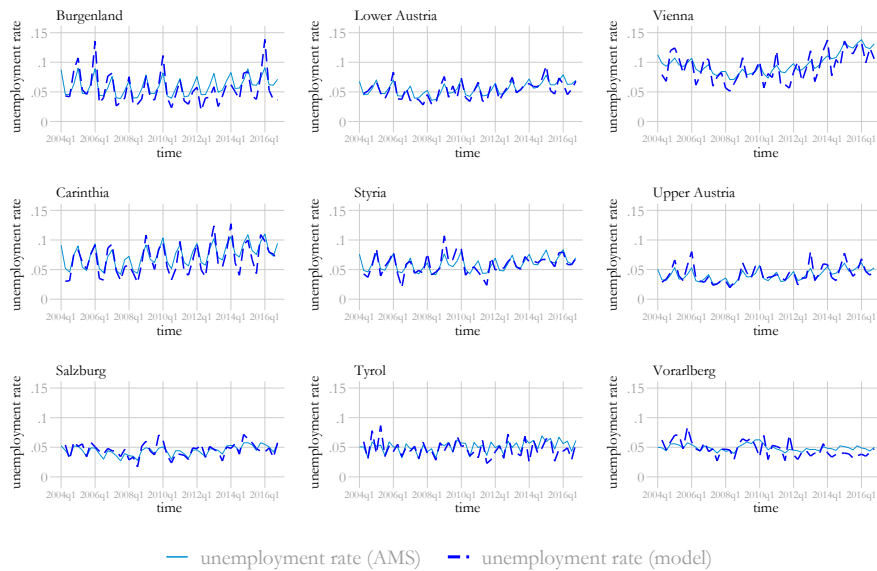
*Notes:* Own calculations, based on quarterly data from 2004 to 2016 from ([Statistik Austria, 2020](#)). The trend is derived by a locally weighted smoothing.

Figure B.5: Beveridge curve, by region, 2004–2016.



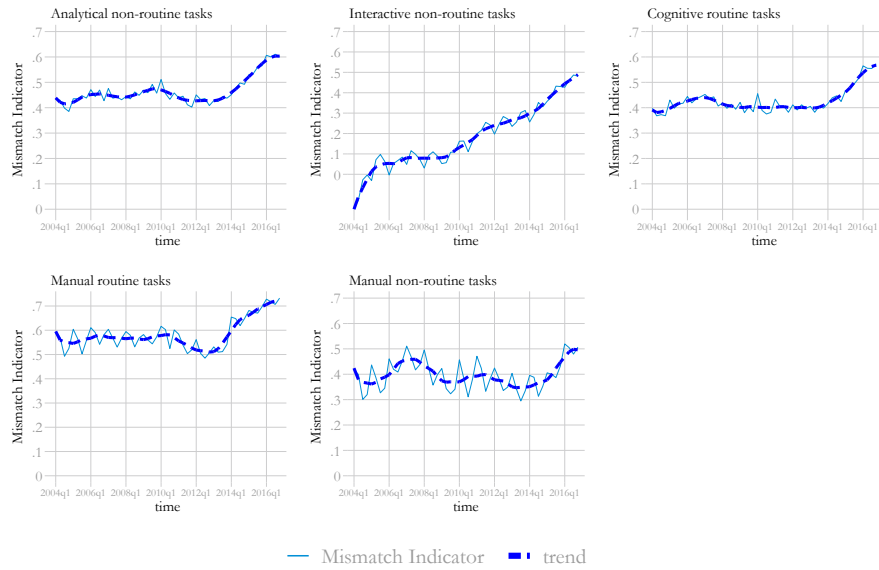
*Notes:* The hypothetical Beveridge curves are calculated using the average matching efficiency before 2014 and after 2014.

Figure B.6: Model prediction of the unemployment rate, by regions.



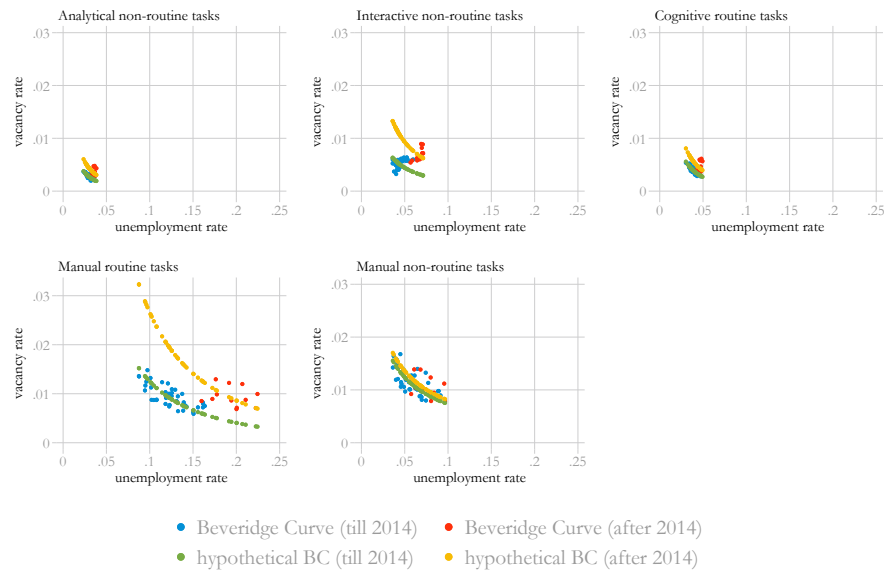
*Notes:* The graph plots the estimated unemployment rate for the Austrian regions and compares it with the unemployment rate observed in the data.

Figure B.7: Mismatch indicator, by skill level, 2004–2016.



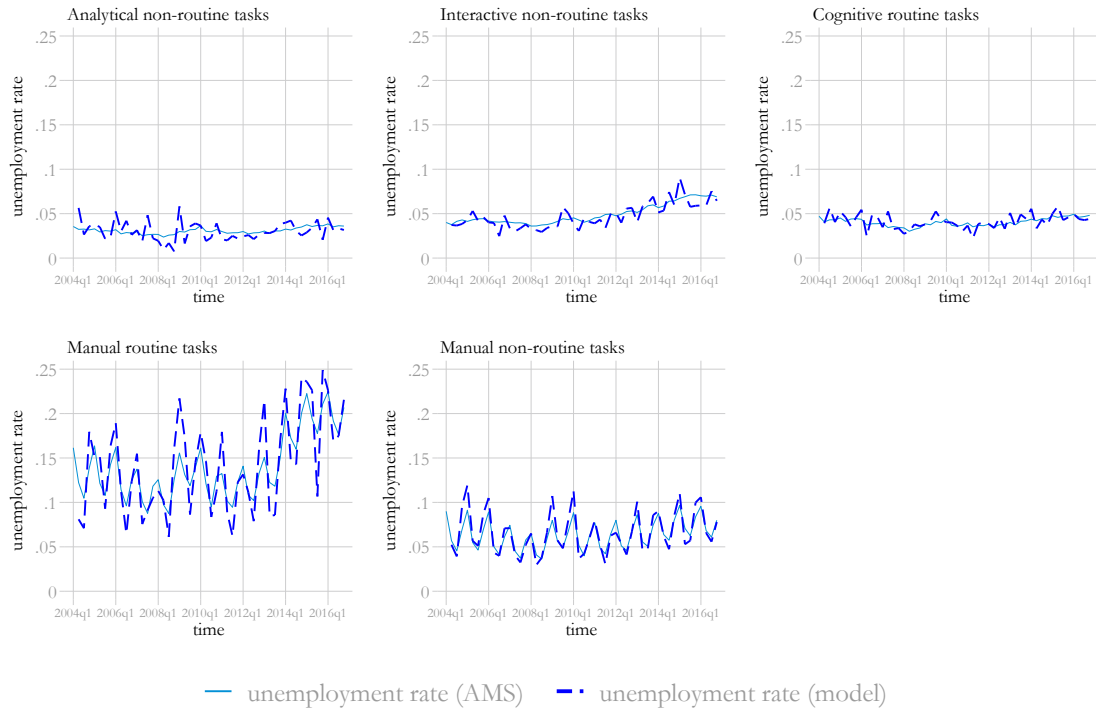
*Notes:* Own calculations, based on quarterly data from 2004 to 2016 from [Statistik Austria \(2020\)](#). The trend is obtained from locally weighted smoothing.

Figure B.8: Beveridge curves, by skill level, 2004–2016.



*Notes:* The hypothetical Beveridge curves are calculated using the average matching efficiency before 2014 and after 2014.

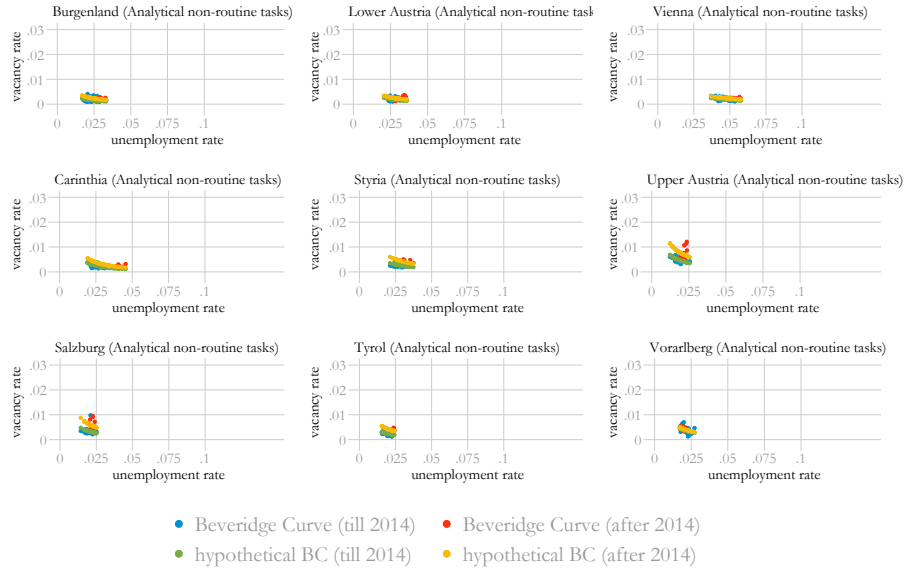
Figure B.9: Model prediction of the unemployment rate, by skill level.



*Notes:* The graph plots the estimated unemployment rate by skill level and compares it with the unemployment rate observed in the data.

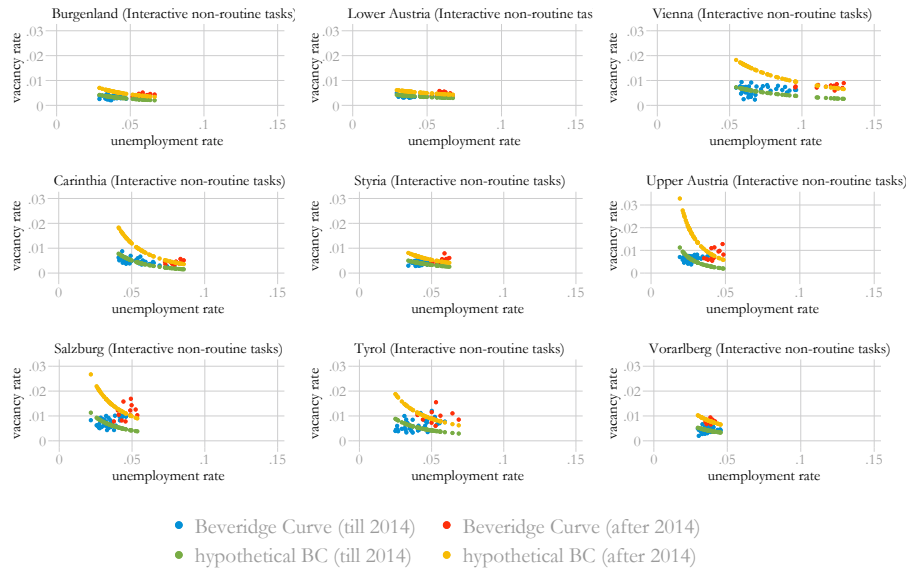


Figure B.10: Beveridge curves — analytical non-routine tasks.



*Notes:* The hypothetical Beveridge curves are estimated with the average matching efficiency before 2014 and after 2014.

Figure B.11: Beveridge curves — interactive non-routine tasks



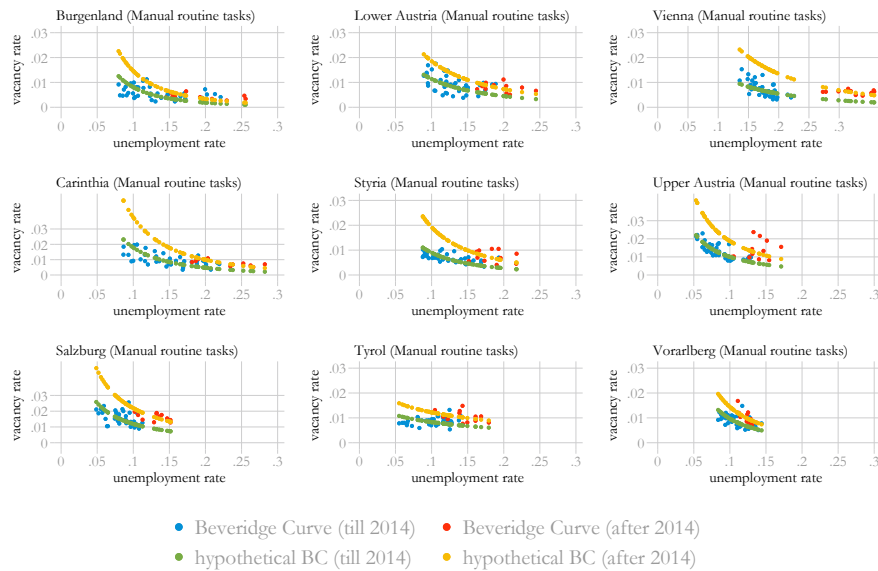
*Notes:* The hypothetical Beveridge curves are estimated with the average matching efficiency before 2014 and after 2014.

Figure B.12: Beveridge curves — cognitive routine tasks.



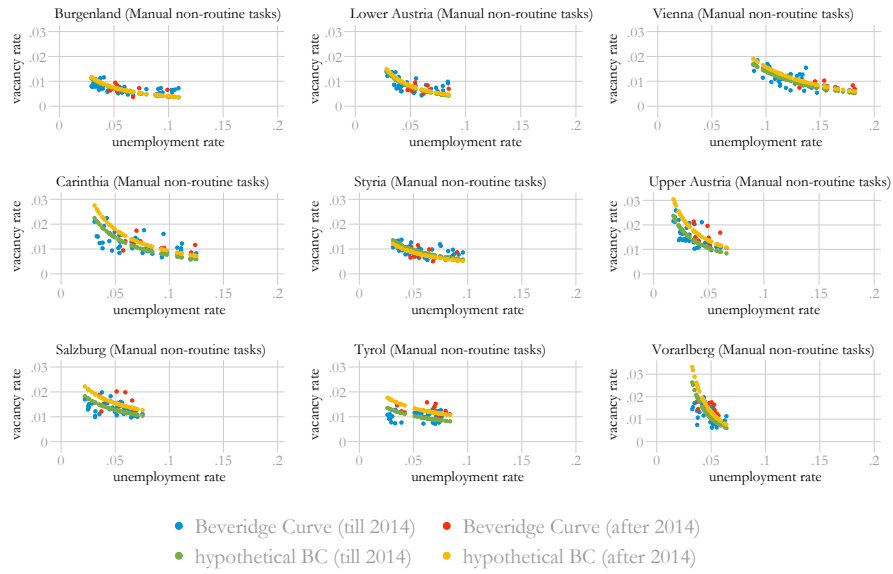
*Notes:* The hypothetical Beveridge curves are estimated with the average matching efficiency before 2014 and after 2014.

Figure B.13: Beveridge curves — manual routine tasks.



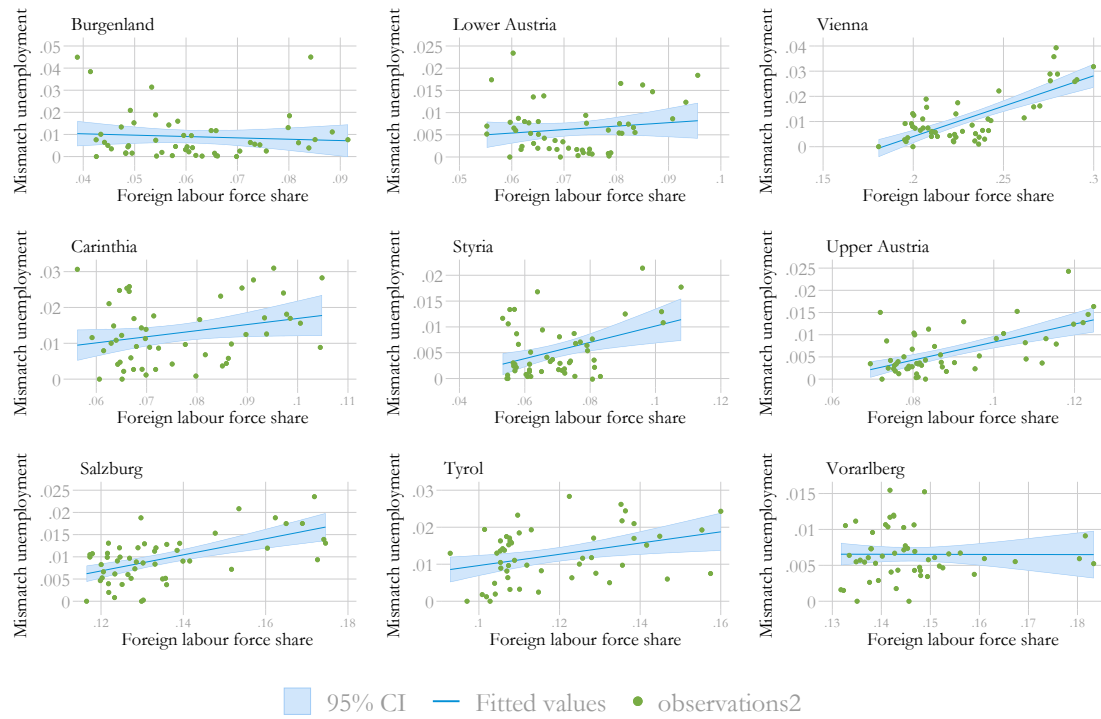
*Notes:* The hypothetical Beveridge curves are estimated with the average matching efficiency before 2014 and after 2014.

Figure B.14: Beveridge curves — manual non-routine tasks.



*Notes:* The hypothetical Beveridge curves are estimated with the average matching efficiency before 2014 and after 2014.

Figure B.15: Foreign labour force vs. Mismatch unemployment.



Notes: Own calculations, based on quarterly data from 2004 to 2016 from [Statistik Austria \(2020\)](#).

Table B.1: Summary statistics by region.

Variable	Mean	Std. Dev.	Min.	Max.	N
Burgenland					
unemployment rate	0.06	0.016	0.039	0.091	52
vacancy rate	0.004	0.001	0.003	0.008	52
job finding rate	0.203	0.062	0.084	0.37	51
separation rate	0.012	0.025	-0.035	0.055	51
tightness	14.758	6.491	5.279	30.332	52
Lower Austria					
unemployment rate	0.055	0.011	0.036	0.079	52
vacancy rate	0.005	0.002	0.003	0.009	52
job finding rate	0.2	0.056	0.094	0.363	51
separation rate	0.011	0.015	-0.021	0.031	51
tightness	11.188	4.465	3.991	21.775	52
Vienna					
unemployment rate	0.098	0.017	0.071	0.138	52
vacancy rate	0.006	0.002	0.003	0.01	52
job finding rate	0.183	0.043	0.113	0.301	51
separation rate	0.02	0.011	-0.001	0.041	51
tightness	17.891	6.81	7.138	34.947	52
Carinthia					
unemployment rate	0.074	0.019	0.042	0.11	52
vacancy rate	0.007	0.002	0.004	0.014	52
job finding rate	0.187	0.064	0.096	0.388	51
separation rate	0.015	0.027	-0.035	0.064	51
tightness	11.297	5.309	3.267	23.017	52
Styria					
unemployment rate	0.059	0.012	0.041	0.084	52
vacancy rate	0.006	0.001	0.004	0.008	52
job finding rate	0.194	0.054	0.107	0.405	51
separation rate	0.012	0.018	-0.023	0.038	51
tightness	10.344	3.58	5.333	19.761	52
Upper Austria					
unemployment rate	0.041	0.01	0.024	0.061	52
vacancy rate	0.01	0.003	0.007	0.016	52
job finding rate	0.28	0.086	0.1	0.497	51
separation rate	0.011	0.012	-0.015	0.027	51
tightness	4.257	1.657	1.593	8.306	52
Salzburg					
unemployment rate	0.044	0.008	0.027	0.058	52
vacancy rate	0.01	0.002	0.007	0.015	52
job finding rate	0.249	0.069	0.124	0.436	51
separation rate	0.011	0.012	-0.003	0.039	51
tightness	4.647	1.355	2.408	7.872	52

*Notes:* Data on registered unemployed and vacancies obtained from [AMS Österreich \(2020\)](#); job-finding rate and separation rate obtained from [Statistik Austria \(2020\)](#).

Table B.1: Summary statistics by region (cont.)

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>	<b>N</b>
Tyrol					
unemployment rate	0.051	0.01	0.03	0.069	52
vacancy rate	0.007	0.002	0.005	0.012	52
job finding rate	0.21	0.071	0.089	0.424	51
separation rate	0.012	0.02	-0.015	0.054	51
tightness	7.308	1.894	4.081	11.629	52
Vorarlberg					
unemployment rate	0.049	0.005	0.04	0.063	52
vacancy rate	0.008	0.002	0.004	0.011	52
job finding rate	0.234	0.053	0.101	0.353	51
separation rate	0.012	0.007	0.001	0.033	51
tightness	6.77	2.357	3.917	13.211	52

*Notes:* Data on registered unemployed and vacancies obtained from [AMS Österreich \(2020\)](#); job-finding rate and separation rate obtained from [Statistik Austria \(2020\)](#).

Table B.2: Summary statistics by skill level.

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>	<b>N</b>
analytical non-routine tasks					
unemployment rate	0.031	0.004	0.024	0.038	52
vacancy rate	0.003	0.001	0.002	0.005	52
job finding rate	0.21	0.059	0.1	0.377	51
separation rate	0.007	0.003	-0.003	0.013	51
tightness	10.652	2.28	6.428	17.064	52
interactive non-routine tasks					
unemployment rate	0.049	0.011	0.036	0.071	52
vacancy rate	0.006	0.001	0.003	0.009	52
job finding rate	0.279	0.065	0.174	0.422	51
separation rate	0.015	0.004	0.006	0.023	51
tightness	8.782	1.421	6.063	12.375	52
cognitive routine tasks					
unemployment rate	0.04	0.005	0.03	0.049	52
vacancy rate	0.004	0.001	0.003	0.006	52
job finding rate	0.224	0.05	0.14	0.325	51
separation rate	0.009	0.004	-0.002	0.015	51
tightness	10.223	2.431	5.631	16.765	52
manual routine tasks					
unemployment rate	0.141	0.037	0.088	0.224	52
vacancy rate	0.009	0.002	0.006	0.015	52
job finding rate	0.131	0.034	0.074	0.211	51
separation rate	0.022	0.034	-0.035	0.082	51
tightness	15.952	6.165	6.435	31.442	52
manual non-routine tasks					
unemployment rate	0.064	0.017	0.036	0.097	52
vacancy rate	0.011	0.002	0.008	0.017	52
job finding rate	0.219	0.056	0.127	0.368	51
separation rate	0.014	0.025	-0.033	0.048	51
tightness	6.183	2.507	2.273	12.294	52

*Notes:* Data on registered unemployed and vacancies obtained from [AMS Österreich \(2020\)](#); job-finding rate and separation rate obtained from [Statistik Austria \(2020\)](#).

Table B.3: Calibration parameters and predicted parameters (averages).

	CD-elasticity $\alpha$	Mismatch Indicator (MI) $1 - A_t$	Fixed MI $1 - A^*$	Mismatch unemp. $u^{mm}$
Analytical non-routine tasks	0.431	0.466	0.442	0.30%
Interactive non-routine tasks	0.500	0.180	0.117	1.20%
Cognitive routine tasks	0.422	0.427	0.407	0.30%
Manual routine tasks	0.446	0.584	0.555	2.55%
Manual non-routine tasks	0.613	0.398	0.391	0.81%
Austria	0.521	0.422	0.404	0.78%
Burgenland	0.426	0.385	0.394	0.61%
Carinthia	0.423	0.462	0.473	0.63%
Lower Austria	0.318	0.549	0.568	1.12%
Salzburg	0.494	0.402	0.415	1.29%
Styria	0.514	0.376	0.386	0.53%
Tyrol	0.516	0.417	0.440	0.61%
Upper Austria	0.567	0.379	0.405	0.95%
Vienna	0.458	0.404	0.429	1.24%
Vorarlberg	0.265	0.598	0.602	0.65%

*Notes:*  $\alpha$  is the estimated elasticity used for the Cobb-Douglas matching function. MI is the average estimated Mismatch Indicator, Fixed MI is the average mismatch indicator before 2014. Mismatch unemployment is the estimated average mismatch unemployment (model outcome).



Table B.4: Classification of occupations

ISCO-08	class	task category	description
111	1	analytical non-routine tasks	Legislators and senior officials
112	1	analytical non-routine tasks	Managing directors and chief executives
121	1	analytical non-routine tasks	Business services and administration managers
122	1	analytical non-routine tasks	Sales, marketing and development managers
131	1	analytical non-routine tasks	Production managers in agriculture, forestry and fisheries
132	1	analytical non-routine tasks	Manufacturing, mining, construction, and distribution managers
133	1	analytical non-routine tasks	Information and communications technology service managers
134	1	analytical non-routine tasks	Professional services managers
141	1	analytical non-routine tasks	Hotel and restaurant managers
143	1	analytical non-routine tasks	Other services managers
211	1	analytical non-routine tasks	Physical and earth science professionals
212	1	analytical non-routine tasks	Mathematicians, actuaries and statisticians
213	1	analytical non-routine tasks	Life science professionals
214	1	analytical non-routine tasks	Engineering professionals (excluding electrotechnology)
215	1	analytical non-routine tasks	Electrotechnology engineers
216	1	analytical non-routine tasks	Architects, planners, surveyors and designers
221	1	analytical non-routine tasks	Medical doctors
222	1	analytical non-routine tasks	Nursing and midwifery professionals
225	1	analytical non-routine tasks	Veterinarians
226	1	analytical non-routine tasks	Other health professionals
231	1	analytical non-routine tasks	University and higher education teachers
232	2	interactive non-routine tasks	Vocational education teachers
233	2	interactive non-routine tasks	Secondary education teachers
234	2	interactive non-routine tasks	Primary school and early childhood teachers
235	2	interactive non-routine tasks	Other teaching professionals
241	1	analytical non-routine tasks	Finance professionals
242	1	analytical non-routine tasks	Administration professionals
243	1	analytical non-routine tasks	Sales, marketing and public relations professionals
251	1	analytical non-routine tasks	Software and applications developers and analysts
252	1	analytical non-routine tasks	Database and network professionals
261	1	analytical non-routine tasks	Legal professionals
262	1	analytical non-routine tasks	Librarians, archivists and curators
263	1	analytical non-routine tasks	Social and religious professionals
264	1	analytical non-routine tasks	Authors, journalists and linguists
265	1	analytical non-routine tasks	Creative and performing artists
311	3	cognitive routine tasks	Physical and engineering science technicians
312	1	analytical non-routine tasks	Mining, manufacturing and construction supervisors
313	3	cognitive routine tasks	Process control technicians
314	3	cognitive routine tasks	Life science technicians and related associate professionals
315	5	manual non-routine tasks	Ship and aircraft controllers and technicians
321	3	cognitive routine tasks	Medical and pharmaceutical technicians
322	3	cognitive routine tasks	Nursing and midwifery associate professionals
325	3	cognitive routine tasks	Other health associate professionals
331	3	cognitive routine tasks	Financial and mathematical associate professionals
332	2	interactive non-routine tasks	Sales and purchasing agents and brokers
333	3	cognitive routine tasks	Business services agents
334	3	cognitive routine tasks	Administrative and specialized secretaries
335	3	cognitive routine tasks	Regulatory government associate professionals
341	2	interactive non-routine tasks	Legal, social and religious associate professionals
342	2	interactive non-routine tasks	Sports and fitness workers
343	2	interactive non-routine tasks	Artistic, cultural and culinary associate professionals
351	3	cognitive routine tasks	Information and communications technology operations and user support technicians
352	3	cognitive routine tasks	Telecommunications and broadcasting technicians
411	3	cognitive routine tasks	General office clerks
412	3	cognitive routine tasks	Secretaries (general)
413	3	cognitive routine tasks	Keyboard operators
421	2	interactive non-routine tasks	Tellers, money collectors and related clerks
422	2	interactive non-routine tasks	Client information workers
431	3	cognitive routine tasks	Numerical clerks

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Table B.4 – continued from previous page.

ISCO-08	class	task category	description
432	3	cognitive routine tasks	Material-recording and transport clerks
441	3	cognitive routine tasks	Other clerical support workers
511	5	manual non-routine tasks	Travel attendants, conductors and guides
512	5	manual non-routine tasks	Cooks
513	5	manual non-routine tasks	Waiters and bartenders
514	5	manual non-routine tasks	Hairdressers, beauticians and related workers
515	5	manual non-routine tasks	Building and housekeeping supervisors
516	5	manual non-routine tasks	Other personal services workers
521	2	interactive non-routine tasks	Street and market salespersons
522	2	interactive non-routine tasks	Shop salespersons
523	2	interactive non-routine tasks	Cashiers and ticket clerks
524	2	interactive non-routine tasks	Other sales workers
531	2	interactive non-routine tasks	Child care workers and teachers' aides
532	5	manual non-routine tasks	Personal care workers in health services
541	5	manual non-routine tasks	Protective services workers
611	5	manual non-routine tasks	Market gardeners and crop growers
612	5	manual non-routine tasks	Animal producers
613	5	manual non-routine tasks	Mixed crop and animal producers
621	5	manual non-routine tasks	Forestry and related workers
622	5	manual non-routine tasks	Fishery workers, hunters and trappers
711	5	manual non-routine tasks	Building frame and related trades workers
712	5	manual non-routine tasks	Building finishers and related trades workers
713	5	manual non-routine tasks	Painters, building structure cleaners and related trades workers
721	5	manual non-routine tasks	Sheet and structural metal workers, molders and welders, and related workers
722	5	manual non-routine tasks	Blacksmiths, toolmakers and related trades workers
723	5	manual non-routine tasks	Machinery mechanics and repairers
731	5	manual non-routine tasks	Handicraft workers
732	5	manual non-routine tasks	Printing trades workers
741	5	manual non-routine tasks	Electrical equipment installers and repairers
742	5	manual non-routine tasks	Electronics and telecommunications installers and repairers
751	5	manual non-routine tasks	Food processing and related trades workers
752	5	manual non-routine tasks	Wood treaters, cabinet-makers and related trades workers
753	5	manual non-routine tasks	Garment and related trades workers
754	4	manual routine tasks	Other craft and related workers
811	4	manual routine tasks	Mining and mineral processing plant operators
812	4	manual routine tasks	Metal processing and finishing plant operators
813	4	manual routine tasks	Chemical and photographic products plant and machine operators
814	4	manual routine tasks	Rubber, plastic and paper products machine operators
815	4	manual routine tasks	Textile, fur and leather products machine operators
816	4	manual routine tasks	Food and related products machine operators
817	4	manual routine tasks	Wood processing and papermaking plant operators
818	4	manual routine tasks	Other stationary plant and machine operators
821	4	manual routine tasks	Assemblers
831	5	manual non-routine tasks	Locomotive engine drivers and related workers
832	5	manual non-routine tasks	Car, van and motorcycle drivers
833	5	manual non-routine tasks	Heavy truck and bus drivers
834	4	manual routine tasks	Mobile plant operators
835	4	manual routine tasks	Ships' deck crews and related workers
911	4	manual routine tasks	Domestic, hotel and office cleaners and helpers
912	4	manual routine tasks	Vehicle, window, laundry and other hand cleaning workers
921	4	manual routine tasks	Agricultural, forestry and fishery labourers
931	4	manual routine tasks	Mining and construction labourers
932	4	manual routine tasks	Manufacturing labourers
933	4	manual routine tasks	Transport and storage labourers
941	4	manual routine tasks	Food preparation assistants
951	4	manual routine tasks	Street and related service workers
961	4	manual routine tasks	Street vendors (excluding food)
962	4	manual routine tasks	Other elementary workers

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