Supplementary material

S1. Modelling retirement

Broadly speaking, the Austrian pension system differentiates between insurance periods (time spent in employment, unemployment, sick leave or parental leave) and contribution periods (mainly time spent in employment). Given the high take-up rate of early retirement, an accurate assessment of time spent in different labour market states and the distribution of these times between different population groups is essential in order to adequately model the timing of retirement, and, therefore, labour force participation at higher ages. In addition to regular old-age retirement, there are several types of early retirement options in the Austrian pension system. Eligibility for these early retirement schemes strongly depends on individual labour market careers, since in order to qualify for early retirement workers must meet minimum requirements for contributions (time spent in employment) and insurance periods (including replacement payments during parental leave or unemployment, see Table S.1).

In addition to modelling various pension types, our projections also account for previously enacted pension reforms that raised the minimum retirement age for regular and early retirement for women. While there are no legislative changes affecting men during our simulation period, the changes for women are pronounced. The minimum entry age for the regular old-age pension rises gradually from 60 to 65 from the 1964 birth cohort onwards, and the entry age for the long-term insured rule for women born in 1959 and later also rises gradually from 60 to 62. In contrast to the regular old-age pension and the long-term insured rule, the starting ages for the corridor pension and the heavy work pension remain unchanged over the entire period under review (62 years for the corridor pension and 60 years for the heavy work pension).

Table S.1 Entry conditions for different retirement schemes for women

	Min. insurance months	Min. retirement age	
		2022	2034
Old-age pension	180	60	65
Early ret. (long insurance)	540	60	62
Corridor pension	480	62	62
Heavy work pension	540 (120*)	60	60

Notes: * To qualify for the heavy work pension, 120 months of the 240 months before the pension is claimed must have been spent under "heavy work conditions" according to social security legislation.

In order to capture these changes in retirement rules, microDEMS distinguishes all of these pension types and implements current legislation concerning cohort-specific pension rules with respect to the minimum entry age and required contribution and insurance periods (Horvath et al., 2022) .

Given the strong age gradient in health (Horvath et al., 2022), harmonising retirement regulations between women and men is likely to lead to an increase in invalidity pension claims. MicroDEMS takes these effects into account by modelling early withdrawal from the labour market due to permanent invalidity depending on age, health status and education. A more detailed discussion of the harmonisation of retirement rules, its implementation in microDEMS and its effects on the size and composition of the Austrian labour force can be found in (Bittschi et al., 2024).

S2. Modelling health limitations

The Public Employment Service Austria (PES) collects health information for all unemployed persons who have either a statutory health impairment or a diagnosed illness that significantly restricts their ability to work. We combine these data with a dataset from the Austrian health insurance fund that includes information on the number of visits to medical practitioners, prescribed medications, periods of sick leave, hospitalisations and underlying diagnoses for the entire Austrian population.

Based on these two data sources, we estimate a probit regression model in which the presence of a health impairment according to the PES is explained by the health data, education level, age and gender of a person. This allows us to predict the probability of an individual in the population having a health impairment associated with a limited ability to work.

During the simulation, the probability of having a health impairment for each individual increases with age in accordance with these age-, education- and gender-specific proportions. These group-specific proportions remain unaltered throughout the simulations presented here.

Combining the abovementioned data sources with the administrative social insurance history data (ASSD) enables us to incorporate the measure of health limitations into our transition models to account for the impact of poor health on the probability of transitioning between different employment statuses.

Figure S.1 Share of people with health limitations by educational attainment
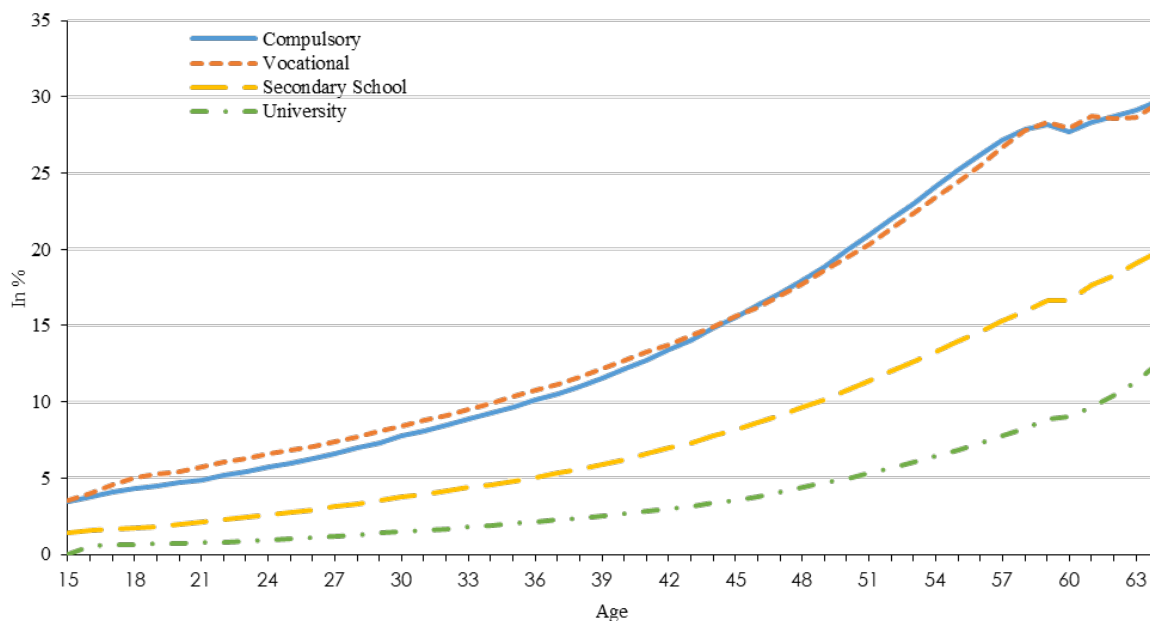
Note: Share of people with health limitations that are associated with a limited ability to work according to the definition of the Public Employment Service Austria (PES). The categories of highest completed education levels correspond to the definitions in the Austrian educational attainment register.

S3. Hazard regression tables

Table S.2 Hazard regressions for transitions between inactivity, unemployment and employment

	OLF to LF		UE to OLF		UE to EMP	
	Female	Male	Female	Male	Female	Male
Employment duration						
1 Quarter	1.228	1.500	1.417	1.386	3.938	4.446
2 Quarters	0.228	0.244	0.319	0.264	0.690	0.714
3 Quarters	0.167	0.188	0.247	0.243	0.536	0.520
4 Quarters	0.161	0.182	0.246	0.240	0.524	0.466
5-6 Quarters	0.137	0.165	0.286	0.299	0.593	0.578
7-8 Quarters	0.125	0.159	0.260	0.257	0.546	0.469
9-12 Quarters	0.104	0.119	0.188	0.201	0.407	0.360
13+ Quarters	0.101	0.138	0.190	0.193	0.438	0.360
Age (Base category: 25 or younger)						
25-29	3.586	3.395	0.924	0.792	0.949	1.043
30-39	3.150	3.600	0.932	0.752	0.883	1.025
40-49	2.986	3.125	0.935	0.787	0.843	0.943
50-54	2.200	2.200	1.300	0.864	0.776	0.849
55 or older	1.400	1.400	1.700	1.100	0.553	0.620
Level of education (Base category: compulsory)						
Apprentice	0.976	0.962	0.743	0.781	1.312	1.182
Intermediate vo-cational school	0.961	0.926	0.717	0.802	1.276	1.089
Secondary School	0.982	0.914	0.775	0.841	1.146	0.974
University	1.078	0.945	0.678	0.745	1.181	0.925
Has impaired health						
Yes	1.019	0.400	1.420	1.551	0.627	0.610
Age of youngest child (Base category: no child)						
<2	0.150	-	1.796	-	0.565	-
3-5	0.400	-	1.057	-	0.747	-
6-10	0.700	-	0.960	-	0.873	-
11-15	0.900	-	0.966	-	0.977	-
16 or older	1.000	-	0.995	-	1.033	-

Source: Own calculations. Hazard regressions based on administrative social security data (ASSD), unemployment insurance (PES) and health insurance (OeGK). Transitions between inactivity (OLF), active labour force participation (LF), unemployment (UE) and employment (EMP).

Table S.3 Hazard regressions for transitions from employment to unemployment by sector

	Production		Construction		Tourism		Market services		Public services	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Employment duration										
1 Quarter	0.815	1.062	0.741	0.901	0.781	0.925	1.154	1.885	0.798	1.249
2 Quarters	0.423	0.484	0.494	0.501	1.858	1.572	0.613	0.839	0.462	0.767
3 Quarters	0.408	0.609	1.121	1.142	0.756	0.740	0.496	0.839	0.462	1.063
4 Quarters	0.352	0.788	0.826	3.499	0.750	0.731	0.463	0.874	0.511	1.014
5-6 Quarters	0.195	0.207	0.270	0.291	0.257	0.286	0.275	0.300	0.190	0.263
7-8 Quarters	0.186	0.178	0.238	0.214	0.282	0.289	0.265	0.256	0.169	0.204
9-12 Quarters	0.174	0.191	0.227	0.455	0.241	0.249	0.228	0.242	0.156	0.204
13+ Quarters	0.160	0.123	0.188	0.182	0.203	0.173	0.203	0.158	0.146	0.135
Age (Base category: 25 or younger)										
25-29	0.866	0.758	0.871	0.983	1.033	1.027	0.938	0.945	0.938	0.907
30-39	0.671	0.563	0.756	0.955	1.037	1.066	0.797	0.865	0.845	0.872
40-49	0.467	0.376	0.571	0.920	1.041	1.034	0.583	0.702	0.592	0.590
50-54	0.380	0.310	0.497	0.922	1.106	1.077	0.479	0.670	0.489	0.558
55 or older	0.400	0.306	0.562	0.941	1.209	1.157	0.486	0.672	0.530	0.602
Level of education (Base category: compulsory)										
Apprentice	0.697	0.545	0.702	0.658	1.000	1.029	0.635	0.595	0.832	0.600
Intermediate vocational school	0.268	0.210	0.338	0.319	0.598	0.657	0.287	0.245	0.279	0.260
Secondary school	0.460	0.407	0.442	0.515	0.754	0.768	0.427	0.371	0.446	0.409
University	0.329	0.203	0.292	0.095	0.389	0.333	0.326	0.371	0.375	0.409
Has impaired health										
Yes	2.250	1.880	2.047	1.246	1.344	1.325	2.190	1.645	1.980	1.493
Age of youngest child (Base category: no child)										
<2	0.614	-	0.547	-	0.528	-	0.611	-	0.592	-
3-5	1.067	-	0.963	-	1.007	-	1.024	-	0.969	-
6-10	1.081	-	0.995	-	1.003	-	0.987	-	0.987	-
11-15	1.065	-	0.945	-	1.003	-	0.913	-	0.928	-
16 or older	0.981	-	0.898	-	0.978	-	0.855	-	0.867	-

Source: Own calculations. Hazard regressions based on administrative social security data (ASSD), unemployment insurance (PES) and health insurance (OeGK).

Table S.4 Hazard regressions for transitions from employment to inactivity by sector

	Production		Construction		Tourism		Market services		Public services	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Employment duration										
1 Quarter	5.161	4.043	4.411	1.962	3.333	2.375	2.433	2.441	2.497	2.860
2 Quarters	0.240	0.219	0.258	0.083	0.220	0.203	0.180	0.181	0.221	0.265
3 Quarters	0.218	0.148	0.270	0.106	0.288	0.250	0.151	0.160	0.150	0.152
4 Quarters	0.224	0.174	0.308	0.252	0.264	0.207	0.168	0.169	0.185	0.149
5-6 Quarters	0.312	0.086	0.326	0.053	0.327	0.194	0.201	0.094	0.205	0.106
7-8 Quarters	0.338	0.127	0.362	0.088	0.320	0.157	0.208	0.106	0.226	0.119
9-12 Quarters	0.315	0.114	0.376	0.115	0.321	0.143	0.197	0.105	0.221	0.080
13+ Quarters	0.254	0.098	0.312	0.089	0.272	0.140	0.168	0.083	0.200	0.098
Age (Base category: 25 or younger)										
25-29	0.312	0.414	0.363	0.498	0.456	0.613	0.477	0.532	0.477	0.485
30-39	0.293	0.259	0.348	0.369	0.392	0.516	0.475	0.414	0.507	0.377
40-49	0.158	0.182	0.199	0.290	0.257	0.400	0.308	0.326	0.350	0.258
50-54	0.158	0.177	0.199	0.224	0.257	0.338	0.308	0.280	0.350	0.206
55 or older	0.116	0.147	0.116	0.205	0.165	0.291	0.230	0.259	0.322	0.186
Level of education (Base category: compulsory)										
Apprentice	0.240	0.218	0.214	0.323	0.399	0.524	0.361	0.396	0.410	0.356
Intermediate vocational school	0.536	0.443	0.407	0.729	0.902	0.935	0.641	0.652	0.698	0.792
Secondary school	0.531	0.456	0.447	0.761	0.812	0.856	0.653	0.687	0.728	0.846
University	0.574	0.438	0.520	0.647	1.042	0.930	0.704	0.687	0.748	0.846
Has impaired health										
Yes	1.279	1.788	1.323	1.973	1.266	1.543	1.430	1.740	1.450	1.386
Age of youngest child (Base category: no child)										
<2	1.880	-	1.640	-	0.870	-	1.722	-	1.673	-
3-5	0.933	-	0.896	-	0.791	-	0.932	-	0.962	-
6-10	0.607	-	0.550	-	0.637	-	0.671	-	0.713	-
11-15	0.606	-	0.507	-	0.617	-	0.668	-	0.684	-
16 or older	0.744	-	0.585	-	0.632	-	0.712	-	0.771	-

Source: Own calculations. Hazard regressions based on administrative social security data (ASSD), unemployment insurance (PES) and health insurance (OeGK).

Table S.5 Hazard regressions for labour market transitions of self-employed

	SELF to EMP		SELF to UE		SELF to OLF		EMP to SELF	
	Female	Male	Female	Male	Female	Male	Female	Male
Employment duration								
1 Quarter	1.089	1.283	1.276	0.933	0.929	0.986	0.008	0.025
2 Quarters	0.324	0.383	0.088	0.058	0.077	0.062	0.001	0.002
3 Quarters	0.274	0.394	0.096	0.070	0.065	0.067	0.001	0.001
4 Quarters	0.229	0.281	0.137	0.091	0.081	0.082	0.001	0.002
5-6 Quarters	0.133	0.119	0.089	0.059	0.049	0.037	0.001	0.001
7-8 Quarters	0.110	0.103	0.064	0.044	0.038	0.028	0.001	0.001
9-12 Quarters	0.102	0.105	0.083	0.053	0.047	0.039	0.001	0.001
13+ Quarters	0.076	0.075	0.057	0.041	0.032	0.025	0.000	0.001
Age (Base category: 25 or younger)								
25-29	0.804	0.774	0.650	0.521	0.942	0.997	2.645	1.715
30-39	0.641	0.605	0.507	0.310	0.741	0.831	5.745	3.218
40-49	0.437	0.390	0.239	0.197	0.607	0.693	6.626	3.800
50-54	0.327	0.297	0.181	0.183	0.479	0.712	6.712	3.370
55 or older	0.208	0.232	0.181	0.183	0.518	0.811	6.101	3.316
Level of education (Base category: compulsory)								
Apprentice	0.962	0.977	0.573	0.493	0.666	0.625	1.629	1.650
Intermediate vocational school	0.986	0.967	0.527	0.630	0.252	0.183	2.805	4.494
Secondary school	1.222	1.136	0.611	0.650	0.487	0.414	2.534	2.835
University	1.724	1.136	0.499	0.650	0.302	0.414	4.811	2.835
Has impaired health								
Yes	1.000	1.000	1.000	1.000	1.000	1.000	0.352	0.483
Age of youngest child (Base category: no child)								
<2	2.006	-	0.836	-	0.790	-	0.770	-
3-5	0.854	-	0.808	-	0.697	-	0.907	-
6-10	1.002	-	0.713	-	0.854	-	1.028	-
11-15	0.942	-	0.636	-	0.831	-	0.989	-
16 or older	0.904	-	0.631	-	0.716	-	1.030	-

Source: Own calculations. Hazard regressions based on administrative social security data (ASSD), unemployment insurance (PES) and health insurance (OeGK). Transitions between self-employment (SELF), employment (EMP), unemployment (UE) and inactivity (OLF).

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