Too old for this job? Evidence from age requirements in job postings*

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Abstract

Using matched vacancy-worker data from Austria, I examine how age limits in job postings affect hiring outcomes. Before such requirements were outlawed in 2004, more than 30 percent of vacancies specified an upper age limit, usually between age 35 and 55. Age limits were more restrictive in occupations with faster skill change, suggesting that employers refrain from seeking older workers due to skill obsolescence. To assess the impact of removing age limits from job postings, I predict age requirements at the occupation-firm level and compare jobs with stronger versus weaker restrictions before and after the ban. Due to the removal of explicit age limits, jobs with stronger predicted maximum age requirements attracted older applicants and hired older workers, while vacancy filling duration, wages and job duration remained unaffected. I further show a shift in job ad wording from explicit age references toward more implicit age-related cues. These results suggest that employers hold overly pessimistic beliefs about older workers. Once explicit age limits disappear, a broader applicant pool emerges, prompting employers to revise their age-related beliefs.

JEL Classification: J63, J14, J23, J24, J68, J71

Keywords: Vacancies, age discrimination, screening and hiring

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1 Introduction

How much do age considerations influence the hiring choices of employers? Some recruiters may have strong biases against older workers, assuming they are less adaptable, overqualified, or more expensive to hire. Another concern might be that older workers are less productive because they cannot keep up with changing skill requirements. As a result, older jobseekers may face greater difficulty finding employment. In OECD countries, the share of workers aged 55 and over among the long-term unemployed (≥ 1 year) is approximately 12 percentage points higher than that of younger workers (Aitken et al., 2024).

This paper studies the scope of employers' age preferences using a large sample of job vacancies from Austria. Prior to 2004, recruiters commonly specified age limits in job advertisements, creating a unique setting to examine the degree of age restrictions. The analysis proceeds in two parts. First, I examine which age groups were most affected by age restrictions and document heterogeneity in age caps across employers and occupations. Second, I study the effects of the 2004 ban on discriminatory job postings on firms' hiring decisions. The analysis is based on vacancies reported between 2000 and 2010 to the Austrian public employment service AMS, which hosts the nationwide largest job board and also tracks a subset of applications made by registered jobseekers. For vacancies mediated by AMS, the data can be linked to administrative records on hired workers, allowing me to study changes in hiring outcomes around the introduction of the ban.

Before being outlawed, explicit age restrictions are widespread in Austrian job postings and often highly restrictive. About one third of vacancies specify an upper age limit, with most caps set between ages 40 and 55 and an average maximum age of 44. Vacancies targeting female workers are less likely to impose age limits, but if stated, those limits are stricter. Moreover, I find that age restrictions are particularly common in business and ICT occupations, whereas manual and service-related jobs impose fewer and weaker caps. Linking occupation-level age limits to measures of skill change reveals a strong negative relationship: occupations experiencing more rapid changes in skill requirements exhibit much lower age caps. This is consistent with the view that employers avoid hiring older workers because they expect their skill sets to be outdated. Finally, age limits are closely correlated with hiring results. Vacancies with stricter age requirements attract younger applicants and result in younger hires, even after accounting for firm and occupation differences. Overall, the observed patterns

suggest that revealed age limits meaningfully shape both applicant pools and hiring decisions.

In the second part, I analyze changes in hiring outcomes due to the ban on age requirements. As of July 2004, the Austrian law prohibits discriminatory language in job advertisements unless the worker's age constitutes an essential and decisive professional requirement. Although adoption of the new rules is initially slow, age limits almost completely disappear from vacancy listings within two years. To examine the ban's effect on hiring choices, I follow the approach by Card et al. (2024) and first predict employer preferences for every occupation-firm group using the data on age requirements prior to 2004. This allows me to compare jobs with stronger and weaker predicted age requirements before and after the ban in a difference-in-differences setting. Event study results show that the law has a significant and persistent effect on both the age of applicants and the age of hired workers. Comparing vacancies with a predicted maximum age restriction of at most 45 years to other job postings, the share of applicants above this age threshold rises by five percentage points, while the share of hires older than 45 years increases by two percentage points.

Moreover, I find evidence that, next to removing age limits, employers adjust the wording of job postings following the anti-discrimination law. Vacancies predicted to have stronger age restrictions are less likely to explicitly use the term young, but more likely to rely on paraphrases and attributes commonly associated with younger workers. These opposing effects largely offset each other, resulting in no statistically significant change in the overall intensity of age-related signaling.

While the ban affected the age distribution of applicants and hires, it did not lead to measurable changes in hiring efficiency or worker performance. To proxy worker productivity, I examine effects on earnings, job duration, and sickness absence among hired workers. None of these outcomes changes when comparing jobs with strong and weak age requirements before and after the ban. To assess potential increases in screening costs following the removal of age restrictions, I examine effects on vacancy filling duration, defined as the number of days between posting and filling a vacancy. As with worker productivity, I find no evidence of meaningful changes, suggesting that hiring efficiency was not adversely affected by the ban on explicit age limits in job postings.

My analysis adds to a number of previous studies that examine the prevalence and causes of age discrimination in the labor market. Most existing evidence is based on experimental audit studies, which use fictitious résumés with randomly assigned ages but otherwise comparable jobseeker characteristics to measure differences in callback

rates (Bendick Jr et al., 1997, 1999; Lahey, 2008b; Riach and Rich, 2010; Baert et al., 2016; Farber et al., 2017; Carlsson and Eriksson, 2019; Neumark et al., 2019a). Building on this literature, my study provides new evidence on how employers' explicit age restrictions shape both application behavior and hiring outcomes. Consistent with prior findings, I show that age requirements substantially affect workers beginning around age 40 and that these restrictions tend to be more stringent for female jobseekers.

Several studies have analyzed the impact of other anti-age discrimination laws (Neumark and Stock, 1999; Adams, 2004; Lahey, 2008a; Neumark et al., 2019b), showing increased retention rates but also negative or zero effects on hiring of older workers. My study focuses on an anti-discrimination law that specifically outlawed the use of discriminatory job postings. Because this practice was common in earlier years, I can contrast discriminating and non-discriminating employers and occupations and find that this ban does affect hiring of older workers.

Like this paper, a growing literature exploits vacancy data to study employer preferences. Multiple studies document strong gender preferences in job postings across several countries (Kuhn and Shen, 2012; Delgado Helleseter et al., 2020; Kuhn et al., 2020; Card et al., 2024). Delgado Helleseter et al. (2020) show that in Mexico and China, recruiters searching for female workers impose substantially stricter age restrictions. Because many jobs targeted at women require workers to be in their early twenties, the authors argue that these requirements may reflect employers' concerns about anticipated future parenthood. While I also find a relationship between age and gender preferences, this link is considerably weaker, suggesting that concerns about future parenthood are not the main driver of explicit age restrictions in the Austrian labor market.

Closest to my analysis are two recent papers which examine bans on gender preferences in job postings. Kuhn and Shen (2023) study the sudden removal of explicit gender requirements from a Chinese job board and find that it led to a large increase in applications from the previously excluded gender, ultimately resulting in more callbacks. Exploiting the introduction of the Austrian Equal Treatment Act, Card et al. (2024) show that the removal of gender preferences increased gender diversity while leaving firm survival, employment and wages unchanged. Jobs for which the authors predict a preference for female workers are more likely to hire male workers, and vice versa. Consistent with these findings, I show similar changes in the age composition of hired workers following the removal of age limits. Moreover, I extend the analysis by examining the initial impact on applications and how employers change the wording of

job ads in response to the ban.

Overall, my study shows that recruiters frequently set strict age limits, which are concentrated but not exclusive to specific occupations. Outlawing explicit age requirements leads to an increase in applications from older workers to previously discriminating jobs and improves their hiring prospects, without affecting worker productivity or screening costs. This indicates that banning discriminatory job ads is a low-cost policy intervention which does not lower hiring efficiency.

2 Institutional background and data

2.1 Legal setting

Like in many other countries, the Austrian Constitution guarantees the general principle of equality before the law. However, prior to 2004, no specific law prohibited age-based discrimination against jobseekers (Pöschl, 2012). Indeed, it was not unusual to refer to both gender and age in job advertisements. When reporting vacancies to the Austrian public employment agencies to be put on its job board, employers could specify a preferred gender and set minimum or maximum age requirements for applicants. Additionally, it was possible to list preferences for worker characteristics in the ad text.

Taking effect in July 2004, the Austrian *Equal Treatment Act* requires that workers in the workplace be treated equally regardless of ethnic origin, religion or belief, age, or sexual orientation. While this applies to all areas of the labor market, including working conditions, pay, promotion and dismissal, article 14 of the law explicitly prohibits discriminatory job advertisements. Employers must not publish job postings that disadvantage applicants based on the characteristics outlined above. Job ads must be formulated in a neutral and inclusive manner and may only refer to qualifications that are objectively required for the position. Posting discriminatory advertisements can lead to fines of up to 360 euros per violation. In addition, the Act provides other legal remedies against discrimination and established equality bodies to support victims and promote equal treatment.[1]

Despite the clear outlawing of discriminatory job postings, compliance with the law was low in the first months, as I will show in Section 4. Card et al. (2024) point out that many employers were initially unaware of the new Act. To increase awareness,

[1]For the complete text of the law (in German), see https://www.ris.bka.gv.at/eli/bgbl/I/2004/66.

the Ombud for Equal Treatment, a public agency which helped to enforce the anti-discrimination law, ran an information campaign in early 2005, warning employers and employment agencies about unlawful wording and informing them how to advertise jobs in an anti-discriminatory manner. In late 2005, the campaign was extended to editorial offices of newspapers, which at the time were the main publishers of job postings.

2.2 Data

The empirical analysis uses vacancy data from the Austrian Public Employment Service (AMS), which operates the largest job board in Austria. In recent years, this platform has covered approximately 50-60 percent of all vacancies nationwide.[2] The vacancy database contains various job characteristics, such as occupation, educational requirements, and age and gender restrictions. Beginning in 2002, the database additionally covers the full text of job advertisements, providing additional information on each vacancy. Moreover, the entry and removal dates of job postings are recorded. In the policy analysis, I use vacancy filling duration, i.e., the number of days between posting and removal, as a proxy for screening costs.

The public employment service also maintains records of a subset of applications made to vacancies in its database. To receive income support and job search assistance, unemployed workers must register at their local AMS office and actively search for employment. If jobseekers report their applications to caseworkers, or if caseworkers refer jobseekers to vacancies, these applications are recorded in the data. In the analysis, I use these records to assess the relationship between the age of applicants and the age requirements imposed by vacancies.

Importantly, the data also report whether an application was successful, which allows linking vacancies with hired workers. For the analysis of hiring outcomes, I use these linkages to merge the vacancies with employment spells in the Austrian Social Security Database (ASSD).[3] The data encompass all employment relations subject to social security contributions, excluding civil servants and self-employed workers.

Using the recorded birth year of workers, I compute their age at the start of each employment spell, which will be the main outcome in the subsequent policy analysis. Moreover, I measure earnings and job duration as proxies for worker productivity. The ASSD reports daily earnings for each worker-firm-spell on the annual level. In addition,

[2] Coverage is estimated from the annual firm-level vacancy survey conducted by Statistics Austria.
[3] Zweimüller et al. (2009) provide a comprehensive description of the database.

I use data on sick pay spells to proxy worker health, which are only available in the ASSD for sickness spells longer than six to eight weeks.[4]

For the descriptive analysis of age requirements, I use data on all vacancies posted in the years 2000 to 2010. The analysis of hiring outcomes is based on the subsample of job postings which can be linked to employment spells. This entails all vacancies for which an application recorded by AMS resulted in a hire, representing 23 percent of the initial sample.

Table A.1 in the appendix contrasts both samples with the universe of new employment spells in this period. It shows that sectoral employment shares are largely comparable across samples, although several clear differences stand out. Relative to all job starts, accommodation and food services as well as administrative and support services are overrepresented in the vacancy sample, and they also remain more prevalent in the linked vacancy-worker sample. By contrast, public administration, transport and storage, and professional services are underrepresented. Despite these sector differences, the age and gender of workers is remarkably similar between the universe of hires and the linked vacancy-worker sample. Slightly less than 50 percent of the workers are female, and their average age is 33 years, with a standard deviation of 11.

3 Descriptive analysis

In this section, I examine the extent of age requirements in job postings before the ban took effect. Using the rich set of vacancy characteristics in the Austrian database, I further show what distinguishes jobs that require young applicants.

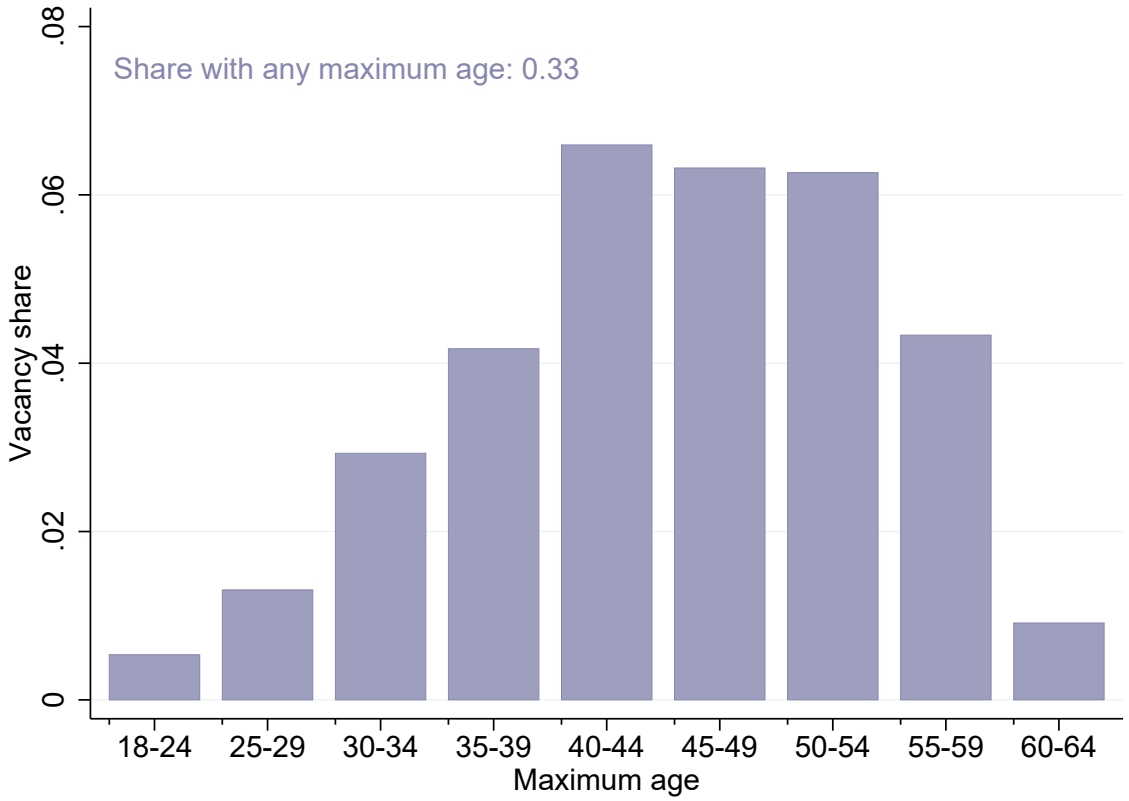
3.1 Distribution of age requirements

Before being outlawed, one third of all postings on the AMS job board state an upper bound for worker age. As shown by the frequency distribution in Figure 1, almost 60 percent of vacancies set the maximum between age 40 and 55, while only a fourth requires applicants to be younger than 40 years. On average, the maximum age requirement is 44 years. Minimum age limits are even more common, but they are not binding for most job applicants. Appendix Figure A.1 shows that half of vacancies impose a lower bound, typically at 19 or 20 years of age. Only seven percent of postings require

[4]Spells are only recorded when sick leave benefits are paid by the health insurance. During the first week of a sickness spell, these benefits are covered by employers.

workers to be older than 25. Given the low variability and limited relevance for most applicants, I focus the remainder of the analysis on maximum age requirements.

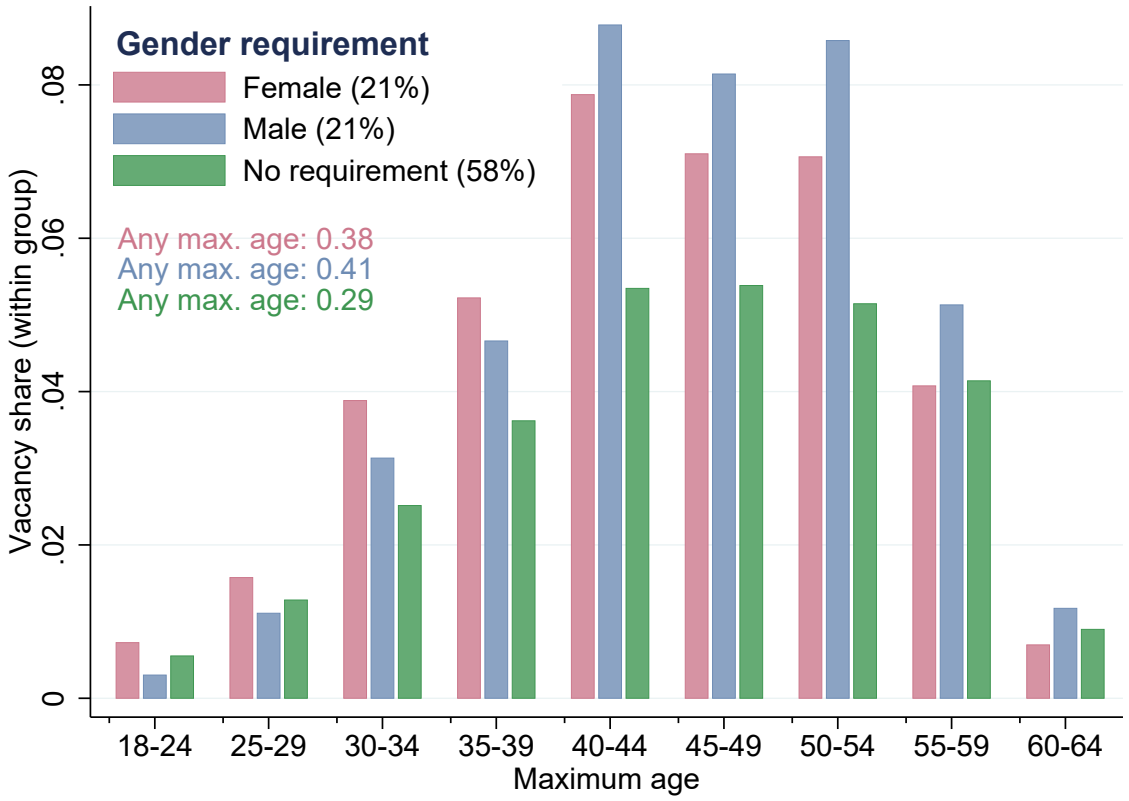
Figure 1: Frequencies of maximum age requirements



As mentioned in the previous section, Austrian job advertisements also commonly specified the applicant's gender alongside age requirements when this practice was still legal. Previous evidence from Delgado Helleseter et al. (2020) shows that the two requirements are highly correlated in China and Mexico, with employers increasingly seeking male workers as age limits rise. In the Austrian job board data, I also find evidence for such a correlation, but the differences are comparatively modest. Figure 2 shows the distribution of age requirements separately for job postings seeking female or male workers, as well as postings without a gender requirement. Overall, 42 percent of vacancies include such a requirement, and employers are equally likely to request female or male applicants. Vacancies targeting female workers are somewhat less likely to have an age upper bound but, if set, the age requirements are stricter. Among postings with age limits, 30 percent of female-targeting vacancies seek applicants below

age 40, compared with only 22 percent of male-targeting vacancies. On average, the maximum age limit is 44 years in male-targeting postings and 42.5 years in female-targeting postings.

Figure 2: Frequencies of maximum age × gender requirements



3.2 Job characteristics

To explore potential reasons for setting age limits, I examine how job postings with strong age limits differ from other vacancies. Table 1 summarizes job characteristics for postings without age restrictions and for postings with varying degrees of age limits: up to age 35, ages 36-50, and above age 50. These categories roughly correspond to the bottom quartile, the two middle quartiles, and the top quartile of the age-limit distribution, respectively.

About 20 percent of postings seek part-time workers, but this feature shows no clear association with age requirements. Vacancies with strong age limits are somewhat more

likely to be full-time positions, whereas those with weaker age restrictions are less likely to be full-time, compared with postings that do not specify any age limit. A clearer pattern emerges for education requirements. Job advertisements with medium to strong age limits often demand higher levels of education. Among vacancies targeting workers up to age 35, more than twice as many require at least higher secondary schooling or a university degree. Differences by firm size are less pronounced. Overall, firms with more than 100 employees more often specify a maximum age requirement, but there is no systematic pattern when comparing the strength of age restrictions.

Table 1: Job characteristics by age restriction

	Age restriction			
	≤ 35	36–50	> 50	None
Full-time	0.852	0.794	0.757	0.804
	(0.355)	(0.404)	(0.429)	(0.397)
Education:				
No/comp. school.	0.388	0.499	0.571	0.567
	(0.487)	(0.500)	(0.495)	(0.495)
Vocational training	0.499	0.441	0.384	0.381
	(0.500)	(0.496)	(0.486)	(0.486)
Higher school./university	0.113	0.060	0.045	0.052
	(0.316)	(0.237)	(0.208)	(0.221)
Firm size:				
Small firm (<10)	0.541	0.494	0.524	0.515
	(0.498)	(0.500)	(0.499)	(0.500)
Medium firm (10-100)	0.361	0.386	0.367	0.399
	(0.480)	(0.487)	(0.482)	(0.490)
Large firm (100+)	0.098	0.120	0.109	0.086
	(0.298)	(0.325)	(0.311)	(0.281)
Observations	79,352	172,860	56,772	614,298

Note: Table reports means with standard deviations in parentheses.

If older workers are perceived as less able to perform certain tasks, age limits may also vary across occupations. To illustrate this, I group the vacancies according to the 2-digit ISCO-08 occupational classification and rank the occupation groups by their

average age limits. The ranking incorporates both the incidence of any age requirements and the specific age limits. When no upper bound is listed, I assign a value of 65, the statutory retirement age for men at that time.

Table 2 shows the top and bottom 10 occupation groups, along with their average age requirements. Clerical, business and ICT-related occupations have the strongest maximum age restrictions, generally around age 40, and higher shares of job postings with any age limit. In contrast, manual, service, agricultural and care-related occupations exhibit the lowest share of age limits. If listed, the average age cap is five to eight years higher compared to the occupation groups with the strongest requirements. Overall, the ranking shows that age limits are much more common and more restrictive in white-collar and administrative roles than in manual and service professions.

Table 2: Occupation groups and maximum age limits (ISCO 2-digit level)

Maximum age	**Average (65 if none)**	**Share any**	**Average (if any)**
General and keyboard clerks	51.40	0.53	39.10
Business and administration associate professionals	52.59	0.54	42.15
Business and administration professionals	52.74	0.52	41.41
Information and communications technicians	52.90	0.48	39.71
Numerical and material recording clerks	53.01	0.53	42.22
Information and communications technology professionals	54.22	0.49	42.99
Science and engineering professionals	54.22	0.43	40.16
Sales workers	54.61	0.46	42.44
Administrative and commercial managers	54.72	0.50	44.43
Science and engineering associate professionals	55.86	0.42	43.04
...	...	...	...
Building and related trades workers, excluding electricians	59.44	0.30	46.57
Drivers and mobile plant operators	59.62	0.31	47.45
Legal, social, cultural and related associate professionals	60.32	0.22	44.02
Market-oriented skilled forestry, fishery and hunting workers	60.70	0.25	48.06
Teaching professionals	60.77	0.20	43.51
Cleaners and helpers	61.39	0.22	48.39
Food preparation assistants	61.55	0.19	47.29
Personal care workers	61.55	0.18	46.04
Agricultural, forestry and fishery labourers	61.61	0.20	48.29
Health professionals	61.96	0.18	48.21

To examine the link between age requirements and perceived skill obsolescence of older workers, I next compare occupation-level changes in skill demand. If new skill requirements emerge while previously relevant skills lose importance, employers may

be reluctant to hire older workers if they believe these workers are less able to keep pace with recent developments. Although workers can acquire skills on the job, the education and training of older workers may be outdated.

For this analysis, I merge external data on occupation-level skill changes by Deming and Noray (2020). Using US online vacancy data from 2007 to 2019, the study identifies about 15,000 unique skills in a large sample of almost 23 million job postings. Based on these data, Deming and Noray (2020) compute the share of vacancies in which each skill appears in the first and last year of their sample. To capture occupation-level skill changes, the absolute value of the difference in shares is computed for each skill s and then summed across skills within each occupation o:

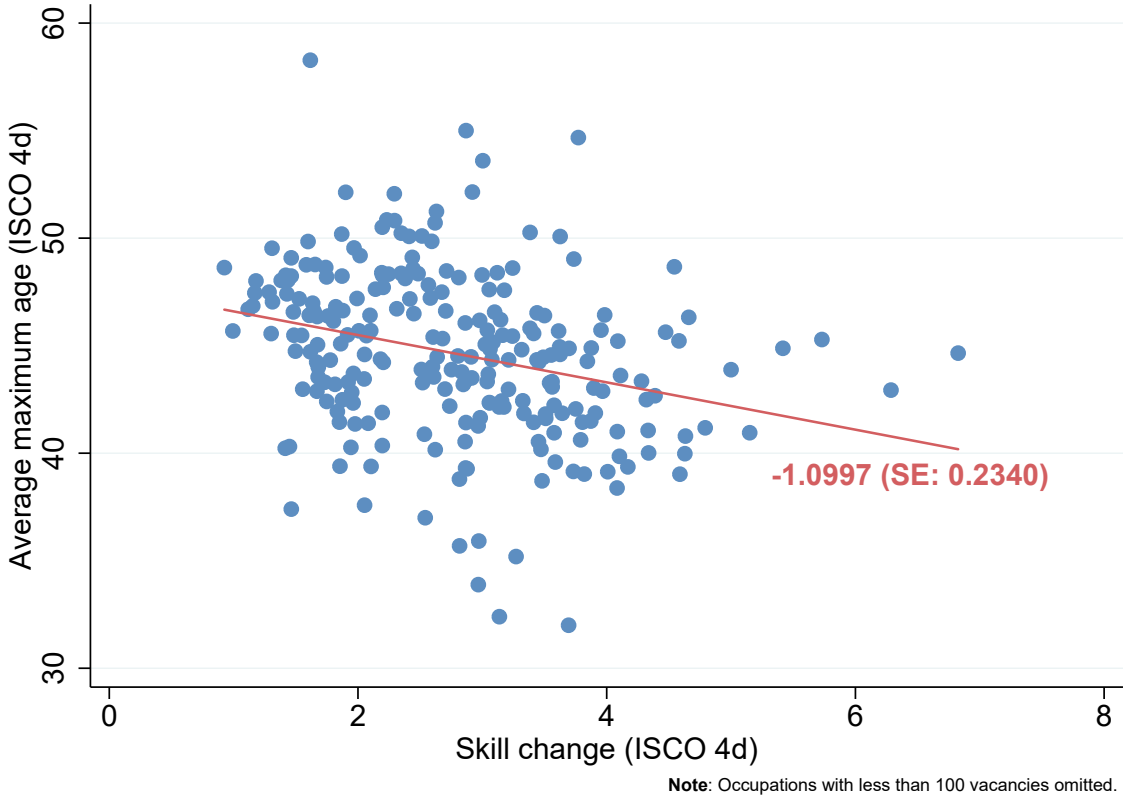
$$\text{SkillChange}_o = \sum_{s=1}^{S} Abs[\text{SkillShare}_{os}^{2019} - \text{SkillShare}_{os}^{2007}].$$

For the most detailed distinction of occupations, the authors use 6-digit SOC-2010 codes, which I map to vacancies in the Austrian database at the 4-digit ISCO-08 level.[5] High values of this measure reflect substantial changes in skill requirements, with strong increases in some skills and strong declines in others over time. On average, the vacancy-weighted skill change is approximately three, with a standard deviation of one.

Despite being derived from US vacancy data collected in later years, I assume that the measure reasonably captures occupation-specific changes in the Austrian labor market in the early 2000s. Skill demands are unlikely to differ substantially between two developed economies, and it is plausible that the skill trends observed between 2007 and 2019 had already begun earlier. If employers are concerned about skill obsolescence among older workers, age requirements should be stricter in occupations experiencing more rapid skill change, as older workers may be more likely to lack newly emerging skills or to possess skills that have become less relevant. To test this hypothesis, I compare skill changes to average maximum age requirements on the occupation level. Figure 3 shows that there is indeed a strong negative correlation. Employers hiring for occupations with a one-standard-deviation higher level of skill change set the maximum age cap approximately 1.1 years lower.

[5] In cases of non-unique mapping between the SOC and ISCO classifications, categories are weighted by their relative frequency in the vacancy data.

Figure 3: Skill change and average maximum age requirements (ISCO 4-digit level)

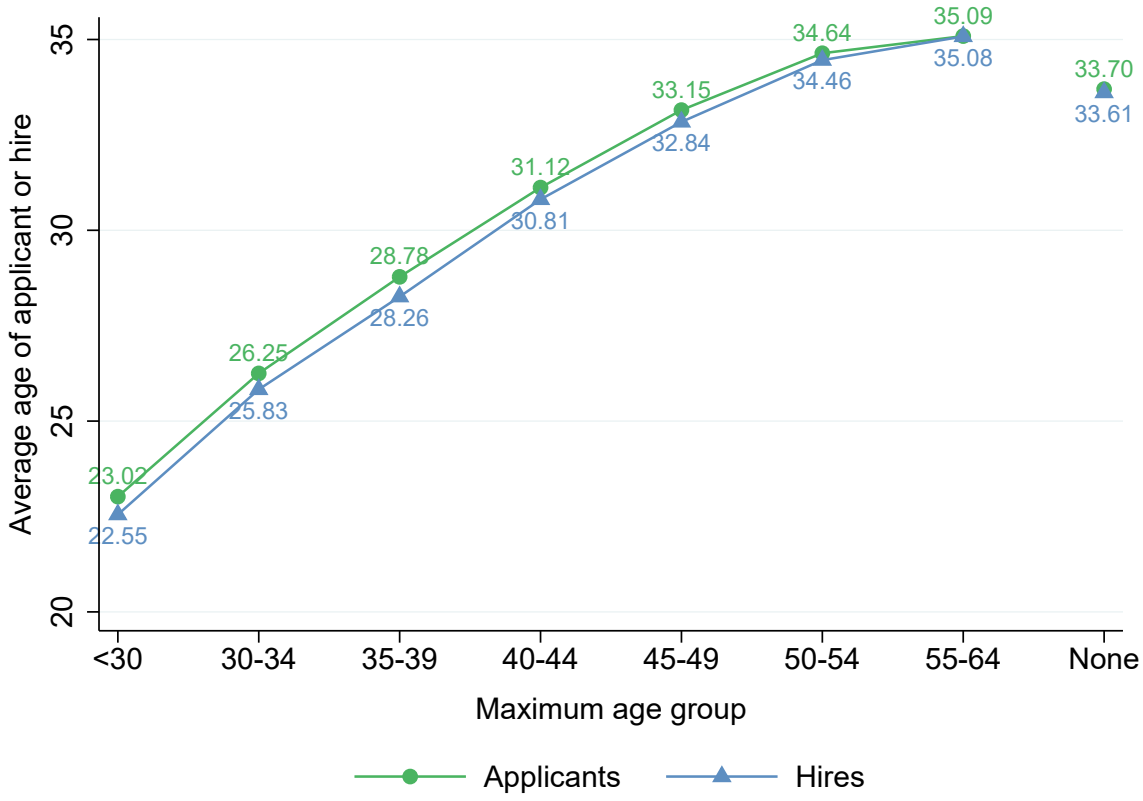


3.3 Applications and hiring

If listing maximum age requirements influences jobseekers, tighter age caps should drive down the age of applicants and ultimately lead to lower ages of hired workers. Before analyzing the impact of banning age restrictions in the next section, I descriptively examine the relationship between age caps and these outcomes. The analysis in the remainder of the paper is based on the subsample of vacancies for which the hired worker can be observed.

Figure 4 plots the average age of applicants and hires for vacancies with different strengths of age limits, revealing a strong correlation with both outcomes of similar magnitude. While the average age of applicants and hires is just 23 for vacancies targeting workers aged 30 years or younger, the averages increase to about 34 years in job ads with weak or no stated age requirements. Across all age-cap groups, the mean age of applicants is only slightly higher than that of hired workers.

Figure 4: Age of applicants and hires by maximum age groups



To examine the impact of correlated firm- and occupation-specific age differences, I next regress both outcomes on the vacancies' age requirement and include firm and occupation fixed-effects. Again, I set the age cap to 65 if no requirement is listed in the job posting. As shown in Table 3, decreasing the age limit by one year is associated with applicants and also hires who are on average 0.15 years younger. Accounting for differences across occupations and firms reduces the coefficient for hires to 0.12, while leaving the effect for applicants unchanged. This indicates that the correlation between age limits and age outcomes is relatively robust: vacancies with age requirements attract younger applicants, which partially translates into younger hires.

Table 3: Regressions of applicants and hires' age on maximum age limit

Outcome: Average age of applicant	(1)	(2)	(3)
Maximum age (65 if none)	0.153***	0.146***	0.153***
	(0.001)	(0.001)	(0.001)
Constant	24.175***	24.537***	24.137***
	(0.039)	(0.038)	(0.048)
Outcome: Age of hire	(1)	(2)	(3)
Maximum age (65 if none)	0.159***	0.138***	0.124***
	(0.002)	(0.002)	(0.003)
Constant	23.626***	24.873***	25.646***
	(0.118)	(0.118)	(0.160)
Occupation fixed-effects		✓	✓
Firm fixed-effects			✓

Note: 198,791 vacancy observations. * p<0.10, ** p<0.05, *** p<0.01

4 Policy analysis

4.1 Empirical strategy

This section examines how the ban on age requirements in job postings influenced the eventual age of applicants and hires, along with other hiring outcomes. Because all job postings were equally affected by the ban, I follow the strategy of Card et al. (2024) and distinguish jobs by their predicted extent of discrimination. This approach rests on the idea that jobs which would have discriminated more in the absence of the law should be more affected by the ban. Instead, jobs for which age restrictions are rarely used can be viewed as a control group, since age requirements would not be listed even in the absence of the ban. This allows me to classify the degree of age limits even after the law took effect, when these limits could not be expressed any longer. Here, I assume that employers' preferences for worker age are not affected by the anti-discrimination law, but only their ability to state them openly. Otherwise, the prediction accuracy would change with the treatment.

As in Card et al. (2024), I predict a job's age requirements using the leave-out mean of its occupation-firm group. This accounts for the fact that age requirements vary

widely across occupations, as shown in the previous section, and are also shaped by employer choices. For each job advertised in the year before the ban, I first compute the difference between the maximum age requirement and age 65.[6] If no age preference is listed, I set the difference to zero. The resulting index captures the intensity of age discrimination, taking values from zero in the absence of age restrictions up to 47 when the stated maximum age is 18 years. In a second step, leave-out means of this index are constructed for each 3-digit occupation group within each firm.[7] Next to the age discrimination index, I additionally define binary variables, which indicate whether a job has an age limit below a given age threshold τ. The respective leave-out means then reflect the share of advertisements with age restrictions below age τ.

Using the sample of job postings in the years before the ban, I estimate a strong correlation of about 0.7 between the actual degree of discrimination and the occupation- and firm-specific leave-out mean. This shows that preferences for the age of workers are relatively stable within these cells. Grouping jobs based on their predicted age requirement, I then use a difference-in-differences framework to identify the impact of removing references to worker age in job postings. Specifically, I estimate for hiring outcome y_i of vacancy i the following equation:

$$y_i = \beta_0 + \beta_1 A_i + \beta_2 A_i \times D_i + \psi_k + \kappa_o + \lambda_t + \varepsilon_i, \tag{1}$$

A_i denotes the leave-out mean of the age discrimination index or an age-threshold indicator (as defined above), and dummy variable D_i indicates whether the ad was listed in the post-period. Moreover, the regression includes firm (ψ_k), occupation (κ_o) and year (λ_t) fixed-effects. The main coefficient of interest is β_2, capturing how the before-after change differs between vacancies with high versus low predicted age limits. In this setting, the common trends assumption implies that, in the absence of the Equal Treatment Act, the evolution of the outcome variable would not have differed by predicted age limits.

To illustrate the timing of effects, I further estimate an event-study design:

$$y_i = \beta_0 + \sum_{\substack{y=2000 \\ y \neq 2004}}^{2010} \beta_{1y} A_i \times I(year = y)i + \psi_k + \kappa_o + \lambda_t + \varepsilon_i \tag{2}$$

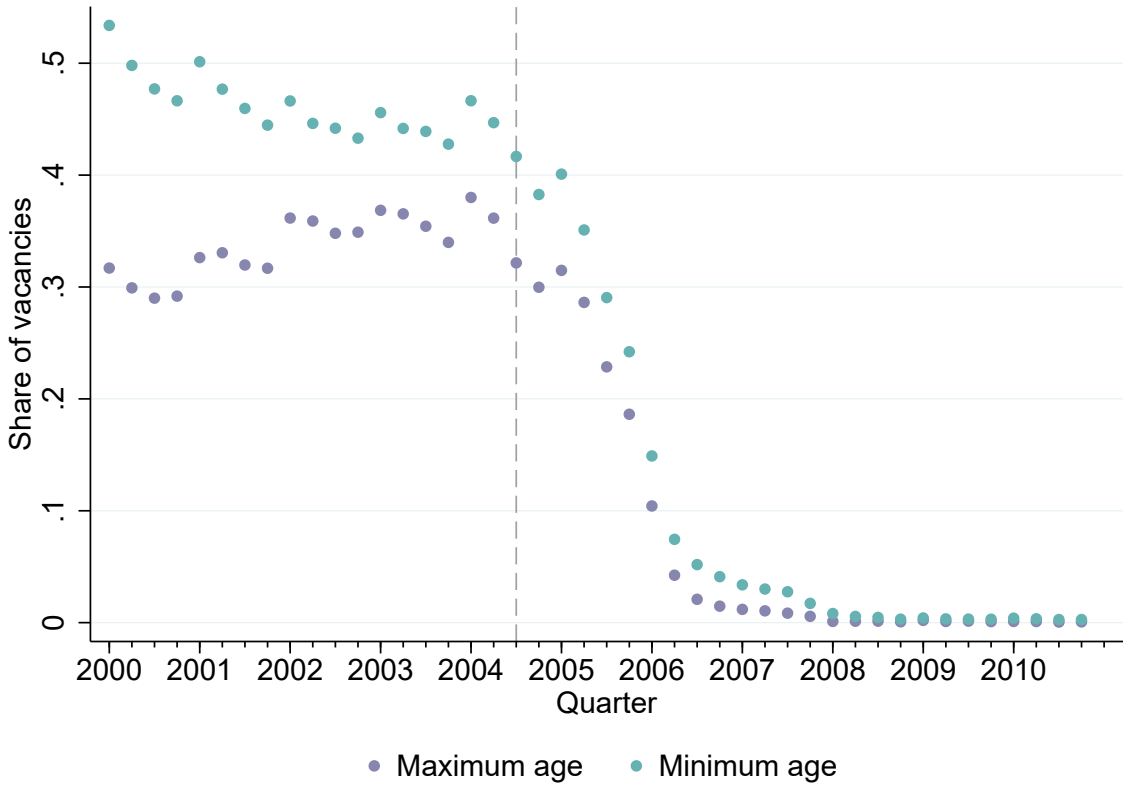
[6] During the period of observation, the statutory retirement age in Austria was 65 for men and 60 for women.

[7] The AMS 3-digit grouping distinguishes about 260 occupations in the estimation sample.

This specification resembles the difference-in-differences model in Equation (1), apart from replacing the single post-adoption interaction with a full set of interactions between A_i and calendar-year indicators, with 2004 omitted as the reference year.

As explained in Section 2.1, the Equal Treatment Act came into effect in July 2004, but many employers did not immediately adapt to the new regulations. This is evident in the AMS vacancy database, where many job postings continue to state age limits in later periods. Figure 5 depicts the share of vacancies with maximum and minimum age requirements by quarter of vacancy entry. Postings with maximum age caps exhibit a moderate upward trend in the years preceding the ban and begin to decline thereafter. However, this decline is gradual. By the first quarter of 2006, the share had dropped to 10 percent, and by 2007 age limits had vanished almost entirely.

Figure 5: Changes in share of vacancies with age requirements



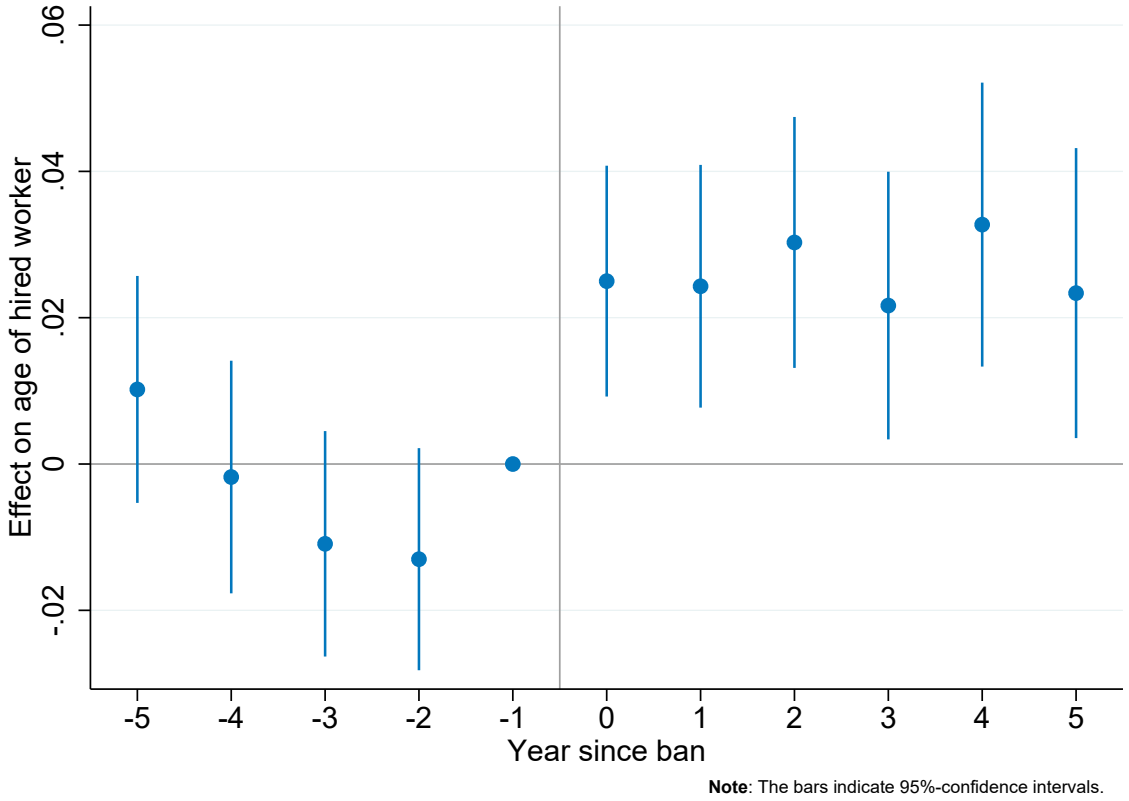
4.2 Age of applicants and hires

If age restrictions in job postings affect jobseeker behavior, the banning of such explicit restrictions should lead to an older pool of job applicants and, in turn, older hires among vacancies that would otherwise have listed age limits. To test this hypothesis, I compare the average age of hires by the vacancies' predicted degree of maximum age requirements, in each year relative to the enactment of the law. Figure 6 plots the corresponding results of the event study specification outlined in Equation (2). Prior to the ban, differences by predicted age requirement are relatively stable across years. Since 2005, hired workers are consistently older in vacancies with stronger predicted age limits. Jobs with a one-year stronger age requirement hire workers who are, on average, 0.02 to 0.03 years older relative to the pre-ban period. Considering that many jobs require workers to be 40 years or younger, which corresponds to a difference of 25 years from the statutory retirement age, the point estimate reflects non-negligible changes for firms with strong age caps.

If the increase in age is driven by a larger number of older applicants, the reform effect should also be reflected in the average age of applying jobseekers. Following the difference-in-differences framework of Equation (1), I estimate the impact of the ban on both the application stage and the hiring stage. Table 4 shows that, for the age of hired workers, the coefficient on the interaction between the post-period indicator and the predicted maximum age requirement is 0.028. This estimate closely mirrors the average of the event-study coefficients in the pre-ban years, as depicted in Figure 6. For the average applicant age, I find a point estimate on the interaction term of 0.05, showing that the positive age effect is about 80 percent stronger for applicants than for eventual hires. In other words, removing age requirements from job postings leads to an increase in older applicants for jobs that previously restricted access, which *partially* translates into an increase in the age of hired workers.

Next to the average age of workers, I also consider the probability of hiring above a given age threshold as an outcome. While the ban increases the average age of hires for affected vacancies, these increases do not necessarily stem from workers who would have exceeded the stated age limit when age requirements were still permitted. To examine this margin, I predict for each vacancy the probability of having age limits above a given age limit and then analyze the impact of the ban on getting applicants or hiring workers who are younger than this threshold. Figure 7 plots the estimates for five maximum age thresholds, ranging from 35 to 55. Except for the highest age

Figure 6: Impact of the ban on the average age of hired workers



threshold, the estimated effects are positive and sizable. The stronger the predicted age requirement, the larger the increase in the probability that an applicant or hire is younger than the corresponding age cap. In all cases, the applicant effect exceeds the hire effect by a factor of 1.5 to 2. For vacancies with the strongest predicted age requirements (35 years or younger), the estimated increase in the probability of being below the threshold is 13 percentage points for applicants and 8 percentage points for hires.

As shown in Section 3, vacancies posted before 2004 also routinely stated gender requirements, and age requirements tended to be stricter when employers were seeking female applicants. To analyze whether the age effects of the ban differ by gender preferences, I follow Card et al. (2024) and predict gender requirements using the same firm and occupation groups as in the prediction of age requirements. Table 5 reports the results of the difference-in-differences estimation separately for three samples: job postings with a predicted preference for female workers, those with a predicted prefer-

Table 4: Impact of the ban on the average age of applicants and hires

	Application stage	**Hiring stage**
	Average age of applicants	Age of hired worker
$I(Year > 2004) \times$ Pred. max. age	0.050***	0.028***
	(0.003)	(0.004)
Pred. max. age	-0.073***	-0.063***
	(0.003)	(0.004)
$I(Year > 2004)$	0.886***	0.996***
	(0.034)	(0.052)
Constant	33.427***	33.028***
	(0.025)	(0.039)

Note: 343,145 observations. All regressions include firm and occupation (3-digit) fixed-effects.
* p<0.10, ** p<0.05, *** p<0.01

ence for male workers, and postings for which employers are predicted to be indifferent with respect to gender. In all three groups, I find positive age effects due to the ban but the effect size is about 50 percent smaller among vacancies with a predicted preference for female workers.

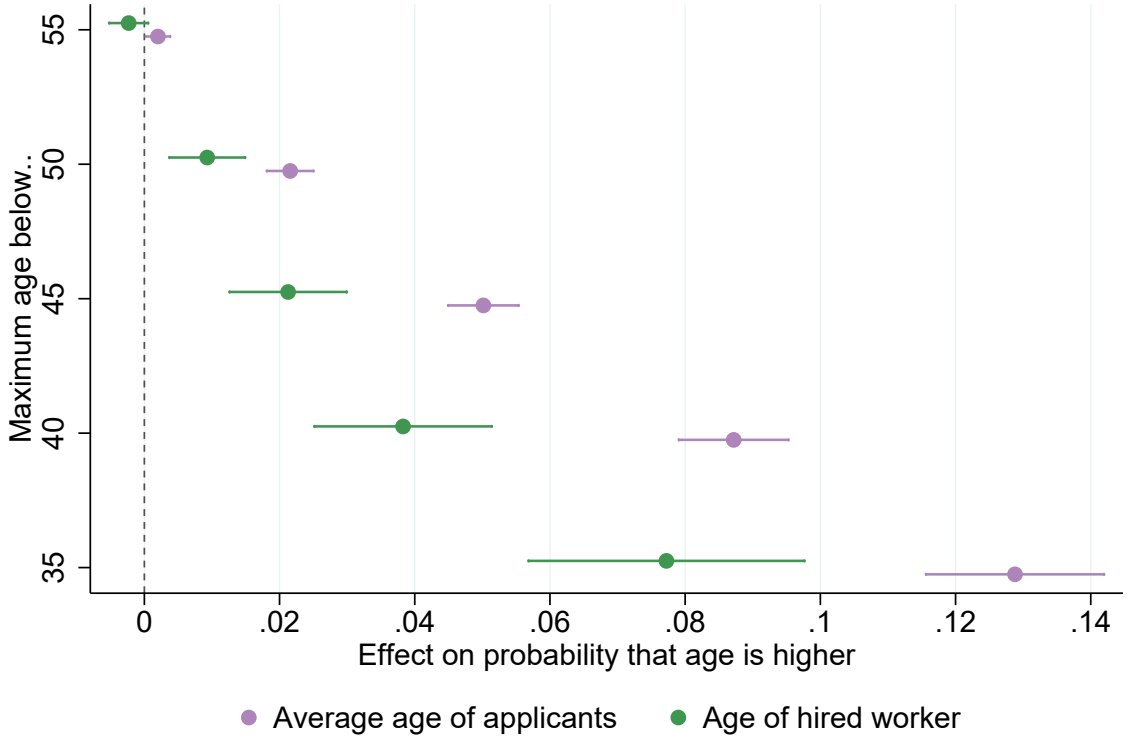
4.3 Ageist language in job postings

Beyond explicit age requirements, employers may also implicitly signal preferred age ranges through the language used in job advertisements. For example, age preferences may be conveyed by using attributes commonly associated with younger workers, such as *dynamic* or energetic. Another approach is to describe the company or its workforce as *young* or *young in spirit*, rather than referring directly to worker age.

The Equal Treatment Act might also affect these indirect signals, but it is unclear whether it reduces or increases the use of ageist language. On the one hand, employers with a strong preference to deter applications from older workers might use signals in the ad text as a substitute for stating explicit age ranges. On the other hand, the law requires that jobs are advertised in a neutral and inclusive manner, which may also make the use of suggestive language subject to legal challenge.

To estimate the impact of the reform on the use of specific terms, I use data on the ad texts in the AMS vacancy database, which are available for jobs posted in the years

Figure 7: Impact of the ban on applicants and hires above age threshold



Note: The bars indicate 95%-confidence intervals. Application shares in the pre-ban period: 0.42 (≥ 35), 0.28 (≥ 40), 0.17 (≥ 45), 0.08 (≥ 50) and 0.02 (≥ 55). Hiring shares in the pre-ban period: 0.41 (≥ 35), 0.28 (≥ 40), 0.16 (≥ 45), 0.08 (≥ 50) and 0.02 (≥ 55).

2002 to 2010. For each vacancy, I compute the frequency with which a given keyword appears in the advertisement text. To adjust for differences in text length, I normalize the keyword counts by the vacancy's total number of words. Figure 8 illustrates event-study estimates separately for the normalized number of matches to the term *young* and to a number of other terms that may signal a preference for younger workers.[8]

The left-hand graph shows that, in the text of job postings for which I predict stronger age restrictions, the use of the word young becomes gradually less common in the years following the ban. The normalized keyword count decreases by about 0.001×10^{-2} units for each one-year increase in the age requirement, which is a sizable effect relative to the sample mean of 0.07×10^{-2}. In contrast, I find a positive effect of similar magnitude for the use of paraphrases to describe a younger worker, as shown

[8]The (German) keywords include *dynamic* ('dynamisch'), *energetic* ('energetisch'), *high-energy* ('energiegeladen'), *innovative* ('innovativ'), *performance-oriented* ('leistungsbereit'), *resilient* ('belastbar') and *up-and-coming* ('aufstrebend').

Table 5: Impact of the ban on the average age of hires by gender requirement

	Gender requirement		
	Female	Indifferent	Male
$I(Year > 2004) \times$ Pred. max. age	0.017*	0.028***	0.031***
	(0.009)	(0.006)	(0.009)
Pred. max. age	-0.035***	-0.055***	-0.044***
	(0.011)	(0.006)	(0.010)
$I(Year > 2004)$	1.282***	1.017***	0.659***
	(0.120)	(0.071)	(0.126)
Constant	33.019***	32.644***	33.425***
	(0.105)	(0.053)	(0.100)
# vacancies	73,307	182,486	77,622

Note: All regressions include firm and occupation (3-digit) fixed-effects. * p<0.10, ** p<0.05, *** p<0.01

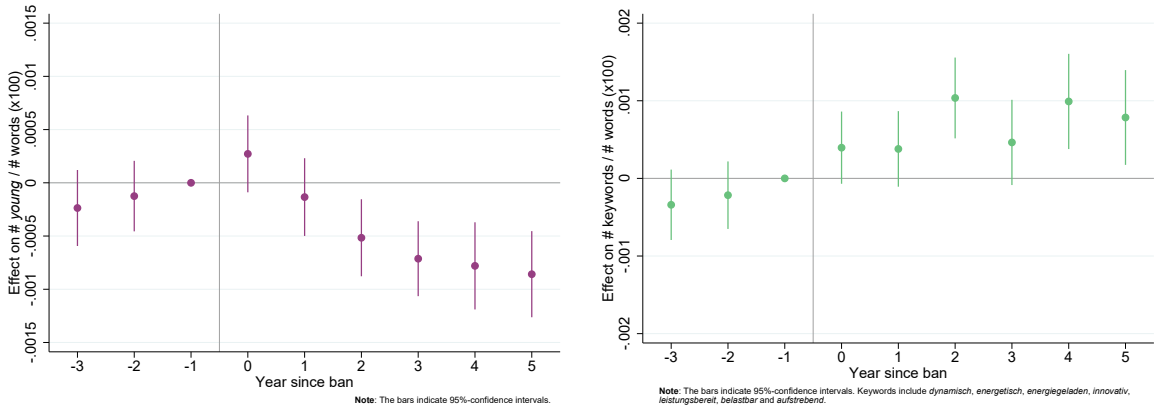
by the graph on the right-hand side. When both outcomes are considered together, the event study shows no statistically significant impact of the ban. Considering the sum of both word counts, the event study reveals no statistically significant effect of the ban because the opposing effects offset one another. Overall, these results suggest that the ban altered the language used in job advertisements without changing the overall intensity of age-related signaling. This pattern is consistent with employers adapting their wording to comply with the regulation while maintaining underlying preferences.

4.4 Worker productivity and screening costs

Many employers may avoid hiring older workers because they perceive them as less productive than younger workers. If these worries are justified and cannot be adequately assessed during the hiring process, average worker productivity may decline due to the ban, as the age of hires increases. To examine this, I estimate the effect of the ban on worker productivity using three proxies: daily earnings, job duration and sick days. For each outcome, I estimate again the event-study specification given by Equation (2). The estimated effects are reported in the first three panels of Figure 9.

If older workers are indeed less productive, or are perceived to be less productive, employers may offer lower wages. Using daily earnings of workers in the year of hire as outcome, I do not find evidence in support of this hypothesis. As shown in Panel 9a,

Figure 8: Impact of the ban on the use of age-related terms



(a) Outcome: Matches to *young*

(b) Outcome: Matches to young-synonyms

differences by the jobs' predicted degree of age restrictions remain stable over time and exhibit no structural break around the enactment of the ban. In addition, workers with lower productivity may be more likely to separate if they do not match job requirements well. Panel 9b shows the effects of the ban on the probability of staying at least one year with the new employer. As for earnings, I estimate that job duration of hires does not change due to the ban.

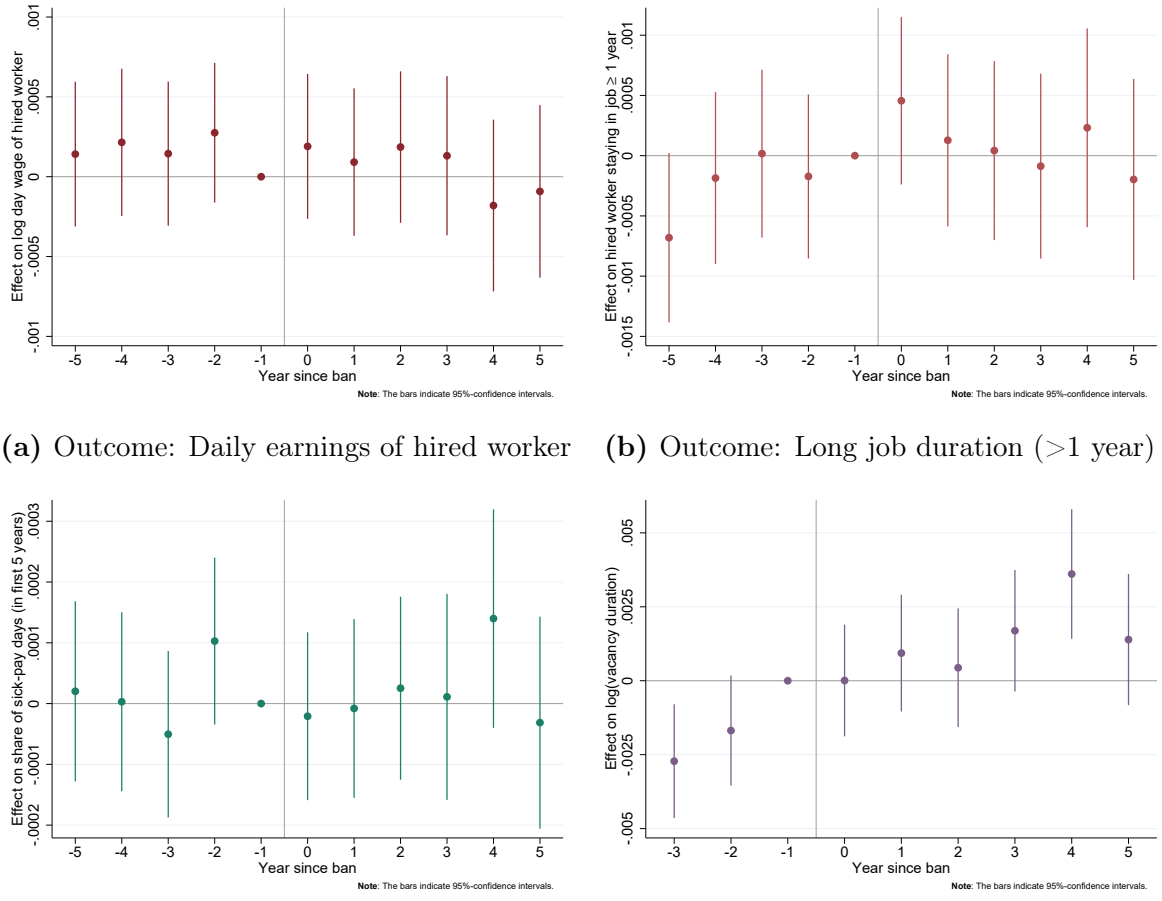
Another potential concern when hiring older workers is that they may be in poorer health, which can result in longer periods of sickness-related absence. To test this, I use health-insurance data on sickness pay spells, which are available for long absence of at least 6 weeks.[9] The outcome is defined as the cumulative number of days a worker receives sickness pay during the first five years of employment. Consistent with the results for the other productivity measures, I do not observe ban-related changes in sickness days. The event-study estimates presented in Panel 9c are close to zero and statistically insignificant in all years.

Even if worker productivity remains unchanged, the Equal Treatment Act may increase employers' recruitment costs and effort. Because explicit age limits in job postings are outlawed, recruiters cannot use this feature anymore to preemptively discourage applications from older jobseekers. To process these additional applications,

[9]Sickness pay for short-term absences is covered by the employer and is therefore not recorded in the social security database. During the first year of employment, employers are required to cover sickness pay for up to six weeks. From the second year onward, this period increases to eight weeks and remains at that duration through the fifteenth year of employment.

recruiters require more time, which may delay hiring. Although direct measures of screening costs are unavailable, I observe the vacancy filling duration, which is defined as the time between a vacancy being posted and recorded as filled in the database.[10] The last panel of Figure 9 presents the corresponding event-study graph, which again shows mostly statistically insignificant differences relative to the base year. The graph exhibits a gradual increase, but this pattern is already present in the pre-ban period. Consequently, the positive differences observed in later years are more likely driven by diverging trends across jobs with different degrees of age restrictions rather than by the law itself.

Figure 9: Impact of the ban on screening costs and worker productivity



(a) Outcome: Daily earnings of hired worker

(b) Outcome: Long job duration (>1 year)

(c) Outcome: Long-term sickness days

(d) Outcome: Vacancy filling duration

Taken together, the results indicate that banning age restrictions increases the hiring

[10] Unlike most private job boards, AMS caseworkers regularly check with employers and jobseekers to confirm whether a vacancy has been filled.

chances of older workers in previously discriminating jobs, without negative effects on worker productivity or recruitment efficiency. This suggests that many employers are initially too pessimistic about the hiring prospects of older workers. Due to the Equal Treatment Act, it is not possible anymore to exclude those applicants from the start, which raises the average age of applicants in affected vacancies. Exposure to this broader applicant pool appears to correct employers' prior beliefs, as hiring outcomes do not deteriorate despite the higher average age.

5 Conclusion

Ageing workforces and rising retirement ages have increased attention to the labor market integration of older workers, who often stay much longer unemployed than younger jobseekers. One potential explanation is that employers refrain from hiring older workers because they expect lower performance due to reduced effort or outdated skills. To study employer preferences, I analyze a large sample of job postings from the vacancy database of the Austrian public employment service. Prior to the introduction of the Equal Treatment Act in 2004, employers were legally permitted to state age requirements in job postings, and this practice was widespread.

My analysis shows that, prior to 2004, one third of job advertisements specify a maximum age, typically requiring applicants to be no older than 40 to 50 years. These requirements are particularly common in white-collar occupations and in those with more rapid changes in skill demand, suggesting that employers frequently associate age with skill obsolescence. Linking the job postings to hiring outcomes, I find that vacancies with stricter age caps attract younger applicant pools and ultimately hire much younger workers. This relationship remains strong even after accounting for firm and occupation fixed-effects, which highlights the importance of age requirements as an active screening device.

In addition, the analysis shows that the ban on discriminatory job postings was effective in reducing age discrimination. To identify the impact of the ban, I group vacancies by their anticipated extent of age restrictions, as predicted by observed age limits before the ban within the same firm and occupation. This enables a difference-in-differences comparison of applications and hiring outcomes across jobs with high versus low predicted age limits before and after the ban. I find that previously restrictive jobs received relatively more applications from older workers and, to a lesser extent,

also hired workers of older age. Despite this age effect, there is no evidence of adverse productivity effects, as earnings, job tenure and sickness absence remained unchanged. Likewise, vacancy filling times do not increase, suggesting that the removal of age restrictions did not substantially raise recruiters' screening costs. While employers partially substitute toward more implicit age-related language in job ads, the overall intensity of age signaling in ad texts does not increase.

From a policy perspective, the findings indicate that bans on age-discriminatory job advertising are an important tool to meaningfully improve labor market access for older workers without imposing efficiency costs on firms. This is consistent with previous evidence on the ban on gender preferences in job postings (Kuhn and Shen, 2023; Card et al., 2024). Clear guidelines on non-discriminatory job ads can be implemented and enforced at low cost. In contrast, age discrimination beyond job postings is difficult to identify, as jobseekers would need to demonstrate that recruitment decisions were based on age considerations. At the same time, the analysis reveals that many employers set very strict age requirements when allowed to do so. The fact that they do not even consider applications from older workers suggests that the overall extent of hiring discrimination is substantially larger, as recruiters may continue to screen out older applicants at later stages of the hiring process.

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Appendix

Table A.1: Comparison of estimation samples

	All job starts	Vacancy sample	Vacancy-worker sample
Female	0.46		0.48
	(0.50)		(0.50)
Age	32.71		33.61
	(10.75)		(10.77)
Sector:			
Retail/Wholesale	0.16	0.16	0.19
	(0.37)	(0.36)	(0.39)
Admin./support service	0.11	0.16	0.14
	(0.31)	(0.37)	(0.35)
Accom./Food	0.13	0.30	0.22
	(0.34)	(0.46)	(0.42)
Manufacturing	0.12	0.10	0.12
	(0.32)	(0.30)	(0.32)
Construction	0.09	0.07	0.08
	(0.29)	(0.25)	(0.28)
Health/Social	0.06	0.04	0.05
	(0.23)	(0.18)	(0.21)
Public admin.	0.06	0.01	0.02
	(0.24)	(0.12)	(0.14)
Transport/Storage	0.06	0.03	0.04
	(0.23)	(0.18)	(0.20)
Prof./Scient./Techn.	0.06	0.03	0.04
	(0.23)	(0.16)	(0.18)
Other	0.16	0.11	0.11
	(0.36)	(0.31)	(0.31)
Observations	8,691,827	2,337,333	535,746

Note: This table reports means with standard deviations in parentheses. The first sample includes all new employment spells. The second sample includes all vacancies on the AMS database, and the third sample includes jobs mediated by AMS. All samples cover the years 2000 to 2010.

Figure A.1: Frequencies of minimum age requirements

