Are older applicants less likely to be invited to a job interview? – an experimental study on ageism

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Structured abstract

Purpose: The main goal of this paper is to test whether older Hungarian women face age discrimination in the job market. The theoretical framework of this paper measures the level of discrimination and highlights that age discrimination leads to a waste of human resources.

Methodology: Two pairs of fictitious C.V.s were created; each pair included a younger (34 years old) and an older woman (60 years old) with an age difference of 26 years. One pair was designed for office assistant positions, the other for economic analyst positions. The contents of the C.V.s with photos were entirely fabricated except for active email addresses and phone numbers to allow responses to be tracked. LinkedIn accounts were also created for the analysts. Applications were sent over a four-month period from November 2019. The rate of invitation to interviews was analysed with mathematical statistical methods and a small probability model.

Findings: The younger job seekers were invited to interviews about 2.2 times more often than the older ones. Based on the authors' probability model, employers evaluate the skills of older applicants at only 45 - 67% of their actual skills.

Research limitations: The experiment had to be stopped due to the Covid-19 lockdown as there were no new job postings.

Originality: The experiment demonstrates that age discrimination exists in Hungary. In addition to traditional audit job applications through H.R. portals, we used LinkedIn too. The small probability model applies an old framework in a new environment.

Keywords: againg society, job advertisements, audit job application, CV homogenisation, measuring age discrimination

Introduction

In most European countries the share of older workers had dropped significantly by the beginning of the last third of the 20th century, when the employment rate was on average below

40 % in the 55-59-year age group (Eurostat). In Western European countries the employment rate of older people in the job market started to increase from the beginning of the 2000s. In the former Eastern Bloc countries, the same process didn't start until the following decade, in the early years of the 2010s. This finally led to an increase in the employment rate of the older population throughout Europe: more than 70% of the people aged 55-59, around 45% of the 60-64 age group, and almost 10% of people aged 65 or above were employed in 2019. The situation in Hungary follows the E.U. average, with an occasional 1-2 percentage point difference up or down. The main reasons behind this employment rate increase are those measures taken by European governments in response to the ageing of their populations and the rising willingness and ability to keep working later in life due to increased life expectancy (Eichhorst *et al.*, 2014; Hofäcker and Radl, 2016; Van Dalen *et al.*, 2009)

In almost all European welfare states, as in Hungary, governments have usually tightened the rules for pay-as-you-go pension systems and it seems that this trend will continue (Gruber *et al.*, 2009). The main measures include continuous increasing of the retirement age, discontinuation of early retirement opportunities, and continuous shifts from the system of defined benefits to the system of defined contributions. At the same time, increasing life expectancy and years of good health lead older people to remain in or return to the job market willingly (Hudák *et al.*, 2015). As Button (2019) and Berde and Rigó (2020) pointed out, the decision to remain in the job market seems to be more effective if the decision is not forced but rather voluntary. The motto "live longer, work longer" has been popularised in OECD countries in an attempt to promote a longer voluntary stay in the labour market (Martin, 2018; Vodopivec and Dolenc, 2008).

Nonetheless, in most European countries, there are dichotomous views regarding a longer working life for older people (Naegele *et al.*, 2018). Governments are trying to push people towards working longer, but firms seem to prefer hiring younger applicants rather than older ones. People who are willing to work at a more advanced age but are repeatedly denied access to the job market tend to become self-employed out of necessity. As Perenyi *et al*. (2018) point out, when chosen involuntarily, self-employment comes with many hardships and financial disadvantages. They also argue that older people, in many cases, have no other work opportunities than starting small businesses, even if they would not do it otherwise. Or those who have been rejected several times may leave the job market.

Our experiment shows that despite the palpable need for older employees in the economy, Hungarian employers still discriminate against them when hiring. As of the writing of this paper, there are no specific laws prohibiting age discrimination in Hungary like the Age Discrimination in Employment Act in the U.S., first approved in 1967. However, age discrimination is also banned in Hungary, which, together with the prohibition of other forms of discrimination, is laid down in the law on Equal Treatment and the Promotion of Equal Opportunities, first passed in 2003 and amended several times since then. Despite this law, as our research clearly shows, age discrimination is still common in Hungarian job hiring processes.

Our results are based on data from our audit correspondence type study, which was conducted in the following way. We constructed two pairs of different CVs for fictitious women. In each pair we had an older and a younger applicant. The first pair of applicants applied for office assistant positions, and the second for economic analyst positions. In this paper, we analyse the callback rates for job interviews of these older-younger pairs. We have two approaches: we look at the differences between the callback rates and we calculate probabilities of acceptance. Age discrimination as observed in our experiment is evaluated using these methods.

This paper is organised as follows. In section 2 we give a summary of the literature on discrimination testing, accentuating age discrimination. The experimental design and the data collection process are discussed in section 3. In section 4, we summarise and analyse the results of our experiment and formally test our hypotheses. Section 5 contains a basic probability theory model. This model is used to quantify the level of discrimination we discovered in our experiment. Section 6 discusses the limitations of our research and contains our conclusions.

Related literature

Age discrimination is often related to gender discrimination, even if the direction of this relationship is sometimes a bit difficult to predict (Levy, 1988). Most researchers find that discrimination towards older women is slightly more severe than towards older men. Button (2019) argues that older women face greater age discrimination compared to men not only in the workplace but also in recruitment. Similar results can be found in Kurland (2001), Porter (2003), and Walker *et al.* (2007). In an experimental setting similar to ours, Carlsson and Eriksson (2019) sent out applications for jobs not requiring higher education using fabricated C.V.s for men and women. They found that younger women had a higher callback rate than younger men, but around the age of 50 the callback rate for women became lower than that for men. By using similar methods, Neumark *et al.* (2019) also find that older women are more disadvantaged than their male age peers. Burn *et al.* (2020) point out that as women tend to have a longer lifespan than men, the lower chances of finding a job at an older age particularly increases the danger of their impoverishment.

Women, especially older women, are at a disadvantage in the labour market due to prevalent stereotypes (Bednarska-Wnuk and Syper-Jędrzejak, 2015). One such stereotype is the connection between physical appearance and hireability, since a woman's appearance tends to be more salient, which could put older women at an even greater disadvantage. Nickson *et al.* (2012) discuss that beauty is a well-established criterion of hireability. They also point out that according to their study, an appealing physical appearance is more important than some technical skills in the retail sector. Some unwanted physical characteristics such as obesity might have an effect similar to age discrimination. Van Amsterdam and Van Eck (2019) describe the efforts overweight employees should make to compensate for negative judgements made by their co-workers and customers. As older people tend to weigh more than their younger counterparts, more older people might need to make these extra efforts.

Ageing is a natural process which people experience over the average lifespan. However, in societies with pronounced age discrimination, this natural process is made more onerous. The two main forms of age discrimination are statistical discrimination, which can be based on real or assumed past experiences (Arrow, 1973) and discrimination based on preferences or taste, also known as ageism (Becker, 1957). These two are strongly related to each other and often explain the conscious or subconscious negative attitudes of employers towards older workers. This attitude might be based on the assumption that older people are less productive, but for example Warr (1995) shows that although this might be true for some jobs that require heavy manual labour, in many other cases older people are capable of achieving comparable if not better productivity levels. Perek-Bialas and Turek (2012) discuss that the actual skills of older employees are taken into account less often by employers in the former Eastern Bloc than in Western Europe. Bednarska-Wnuk and Syper-Jędrzejak (2015) show that in Poland and many other European countries institutionalised ageism by employers is most often concurrent with hiring, human resource investment, promotion, and redundancy-related firing decisions.

Neumark and Song (2013) argue that evidence of age discrimination is usually less convincing than that of gender discrimination even though ageism is at least as harmful as other types of workplace discrimination. Methodologically, testing for age discrimination is not considerably more difficult than testing for racial or gender discrimination. Riach and Rich (1991), Bertrand and Mullainathan (2004), and Simonovits (2012) discuss in detail that testing for any type of discrimination in the labour market by sending out crafted CVs is a widely recognised and used method. Simonovits (2012) and Morton and Tucker (2014) summarise the ethical dilemmas regarding this method and emphasise that the CVs must be shaped in a way that they are as homogeneous as possible, except of course for the characteristic in question.

Regarding our experiment, as the CVs describe fictive applicants, sending them for actual job postings might be considered unethical as it would mislead the targeted firms. Through our experimental design we ensured that the process caused only a limited extra burden to the firms, as our experiment did not have a second phase when actors would have been hired to play the roles of the interviewees. Fasbender and Wang (2017) show that the first phase of such experiments on its own can provide reliable and useful data.

Testing for age discrimination using the audit correspondence method started rather late with the paper of Jowell and Prescott-Clarke (1970). Nowadays, due to changes in the economic environment, this method is more widely used and accepted as a tool to uncover any changes in how employers think (Adamovic, 2020; van Dalen and Henkens, 2019).

The homogenisation of CVs could be more problematic in experiments testing for age discrimination than for those testing for racial or gender discrimination. The unpresented snapshot problem introduced by Heckman (1998) is present in every audit survey tested in pairs, but the bias is even larger if the pairs differ in age. A younger and an older person naturally have different experiences, life events, and work histories. This problem can be controlled by crafting the CVs appropriately, but the differences cannot be completely evened out. Employers use observable characteristics as a proxy for the unobservable productivity of the applicants (Arrow, 1973; Phelps, 1972). In our settings all observable characteristics are as close as possible, except for the age of the applicants. A more advanced age might be seen as a positive characteristic, as older people might have more experience, but it is more commonly seen as a negative one by those employers who consider older people to be less productive and less flexible.

One method to homogenise the CVs is to include the work histories of the applicants from only the past 10 years. In Riach and Rich (2010), the older applicant had work experience in an unrelated field, stayed at home with her children, then acquired a university degree, and finally started working in the related field. In the vignette method used in Mulders *et al.* (2018), the characteristics of the employees were randomly generated. This method does not eliminate differences in the C.V.s but generates random scenarios. Carlsson and Eriksson (2019) compared the method of providing only the last ten years' work histories and the approach ignoring the differences in the previous experience and no significant difference was reported in the responses of the employers. In our experiment, in accordance with Hungarian custom, we decided to include the complete work histories of the applicants while trying to make them as similar as possible. Additionally, we included some special traits for all applicants, further strengthening the idea that they have similar capabilities.

A crucial part in the harmonisation of the CVs is that the information given in them should not differ because the older and younger applicants are from different social classes (AAberg *et al.*, 2020; McGann *et al.*, 2016). Such a noticeable difference can have an unwanted effect on the measurement of ageism. For example, Holliday and Elfving-Hwang (2012) point out that it is common amongst middle-class older women to use several beauty regimens to maintain their social and labour market status. Discrimination, either positive or negative, can occur due to virtually any human characteristic, not only age. An example is physical attractiveness (Hosoda *et al.,* 2003), which is shown to have a positive effect in the job application process. This might be one reason why in most western countries it is becoming more and more common to exclude photos from CVs. However, in Hungary it is still a strong expectation that photos are included, and this is why we generated and included photos in our crafted CVs.

Experimental design

We imagined two pairs of fictitious women as applicants for jobs. We crafted their C.V.s, generated photos of them, and gave them real contact information: email addresses and phone numbers. We applied for office assistant positions with one pair and sent the applications of the other pair for economic analyst positions. The analyst position requires a broader set of skills. This choice of course means that we cannot investigate discrimination in many different professions as did Bowman *et al.* (2017). They chose to do interviews. Our method of analysis - crafting CVs - simply does not allow for focussing on many different professions or having too many variants of the CVs.

We also created a LinkedIn profile for the analysts. Everything in the CVs were completely fictitious, including the photos of the applicants, which were randomly generated and depicted non-existent women. The references given in the CVs were mainly non-existent, but realistic small businesses, and real larger firms that had gone out of business or been amalgamated. We included the names of real educational institutes. We sent the applications for job postings in Budapest, the capital city, mainly because this is where most positions open up in Hungary.

In Hungary, a CV with a photo of the applicant is usually expected for positions requiring secondary education or higher. The inclusion of photos is so important that CVs without photos are at a serious disadvantage at best, at worst they are simply rejected. Thus, we included photos of the applicants for every submission. We generated four photos in total, a different one for each candidate, which were used throughout the whole experiment. Therefore, it would have been quite difficult to change the characteristics of the applicants continuously and randomly, especially for the analyst positions, where we used LinkedIn. The CVs for the office assistant positions were sent for virtually every suitable job posting in Budapest on all major Hungarian job search websites. We sent the applications of the analysts using LinkedIn. For each posting, we sent the second CV of each pair one day after the first, minimising the chance that the recipients would realise the similarity of the two C.V.s.

We started sending out applications on 13 November 2019 and finished collecting data on 13 March 2020. We had sent 786 different applications in that timeframe. Originally, we planned to continue the data collection process for three more months, and intended to apply for about 300-350 more openings, but due to the onset of the Covid-19 pandemic in early 2020 no new job postings appeared. Despite that, our sample is large enough for proper statistical testing of our main hypothesis, which is that there is age discrimination in the Hungarian job market.

Before data collection started, we expected the difference between callback rates to be around 5-10 percentage points, potentially dissimilar in different groups. Given that we chose Wilcoxon, Mann-Whitney, and t-tests to be our main hypothesis testing tools, we estimated that to have safely high power, we needed around 500 observations in our groups (about 1000 in total). A total of 500 would be the ideal number, but we set the minimum to be around 300, which still resulted in a high enough power. Luckily, we managed to hit the 300 mark in our groups before restrictions forced us to stop. Had the pandemic not happened, we could have easily met our original goals in the additional three months we had available for data collection.

The younger applicants in both pairs were described as 34 years old, while the older applicants were 60. Thus, the resulting age gap between them was 26 years. We clearly indicated in the CVs that they both have two children. The younger applicants had spent six months on maternity leave twice, the last time being in 2015, which was meant to indicate to employers that they are not planning to have more children and that their children are already at least in kindergarten. The older applicants had five more years until they would reach the statutory retirement age.

We added a few extra elements to the CVs of the older applicants to eliminate some of the disadvantage due to their age. There is some debate in the literature on the necessary similarities of the CVs in order for the method to work; authors of such studies can only try to harmonise their CVs as best as they can. After reviewing 177 papers, Adamovic (2020) explicitly warns that for the CV construction method to work properly it is crucial that none of the C.V.s be better than any other. This is why we claimed that both the older analyst and older assistant had participated in four different training courses since 2010 to acquire more up-to-date skills, such as presentation and programming competencies. We even indicated that they participated in activities such as dancing. In order to bypass any possible issues related to children, we indicated that the younger applicants did have children who were already old enough to go to kindergarten. Both older and younger applicants for a given position had similar computer and language skills, and we clearly described that both analysts were familiar with modern programming languages.

The qualifications and experience of the older and younger applicants were similar for both positions. The numbers and types of their previous jobs were identical. This meant that the older applicants would have spent more time in their previous positions, including their current jobs. The women in each pair declared equal remuneration claims.

Hypotheses and results

We received responses by email and phone. A response was considered positive if the employers offered our candidate any options for a follow-up interview, and a response was negative if there was no reaction, or the candidate received a plain rejection. By the end, 7% out of the total 786 applications got a positive response. This positive callback rate is not particularly high. For example, Carlsson and Eriksson (2019) report an average of 8.7%, although in their experiment they focused on jobs that required at most a high school diploma. However, jobs at that level tend to have higher callback rates than jobs requiring higher education. Furthermore, while real applicants shape their CVs in a way to match the requirements of the postings and the employers, this was not possible in our case due to the huge number of applications, and the necessity to retain the homogenisation of the CVs.

If we split the results through the dimensions of age and position, we can see a more detailed picture (see Table 1). Assistants got 8.122% positive responses, 10.15% for the younger and 6.091% for the older applicant. In the case of the analysts, they received 5.867% positive responses, 9.184% for the younger and only 2.551% for the older job seeker. The younger applicants received 9.669% positive responses, while the older ones got only 4.326%.

Table 1. Positive responses by age and position

	Assistant	Analyst	Total
Younger	20 (10.150%)	18 (9.184%)	38 (9.669%)
Older	12 (6.091%)	5 (2.551%)	17 (4.326%)
Total positive responses	32 (8.122%)	23 (5.867%)	55 (6.997%)
Total applications	394	392	786

Our main hypothesis is that the positive response rate for older applicants is lower than that of the younger applicants. So, this hypothesis basically presumes the presence of age discrimination. Our secondary hypothesis is that the difference between the positive callback rates between the older and younger applicants is larger for the analysts than for the assistants. This means that older applicants are at a larger disadvantage in the analyst position. This hypothesis contradicts the unproved remark of Carlsson and Eriksson (2019), with which they assumed that age discrimination is lower in positions which require more education. However, in our scenario, the analysts are required to have more up-to-date skills than the assistants, which might tip the balance in favour of the younger applicants. We used both parametric and non-parametric tests to check the hypotheses.

Since both older and younger applicants applied for the exact same positions, we have the possibility of doing a within-group analysis to see if age affects the positive response rates for analysts and assistants separately. In addition, we can also perform a between-group analysis, where we can compare the callback rates between the two occupations. As the potential employers are not the same for each occupation, we might assume that the error terms in their decision processes are not correlated with each other. Thus, we can compare the percentages in Table 1 both row-wise and column-wise, totalling in six testable comparisons. By adding the test for the difference in the differences of the effect of age, we get seven tests in total.

We use a Wilcoxon signed-rank test on the complete sample to determine if the applicants' age influences the callback rate. This is a non-parametric test which deals with the potential correlation that might arise from the fact that our observations came pairwise from the same employers. Between the groups, when we investigate the potential differences between the two occupations, we use the non-parametric Mann-Whitney test.

Table 2 shows our results. In the complete sample, older applicants had a 5.543 percentage point lower callback rate. This is significant at any usual significance level (check the p values in the Table 2). Thus, based on this result we can state that older applicants might indeed face age discrimination. Therefore, according to our results, age discrimination exists for analysts, but we do not see any strong results supporting age discrimination for assistants. In the latter case, even if the difference is not significant, the lower callback rate for the older assistant could have indicated the presence of significant discrimination in a larger sample.

Table 2. Test results

Comparison	Test	Difference	Result
younger vs. older, complete sample 393 pairs	Wilcoxon	5.343 pp.	$z = 3.130$ $p = 0.0017$
younger vs. older, assistants 197 pairs		4.059 pp.	$z = 1.512$ $p = 0.1849$
younger vs. older, analysts 196 pairs		6.633 pp.	$z = 3.153$ $p = 0.0023$
assistant vs. analyst, complete sample 786 observations	Mann-Whitney	2.255 pp.	$z = 1.238$ $p = 0.2157$
assistant vs. analyst, younger 393 observations		0.966 pp.	$z = 0.3249$ $p = 0.7453$
assistant vs. analyst, older 393 observations		3.540 pp.	$z = 1.725$ $p = 0.0845$
Difference between the effect of age between positions 786 observations	t-test	2.574 pp.	$t = 0.7620$ $p = 0.4465$

The secondary hypothesis compares the difference in age discrimination between the two occupations. The reasoning behind this hypothesis is the idea that working as an assistant might require less of those skills that are often attributed to young workers (ability to use modern software packages, high level language skills, etc.).

Nothing guarantees that the candidates we created have similar chances of receiving a positive response in their respective markets. So, in short, we cannot use the comparison between occupations to determine whether assistants or analysts (being young or old) have a better chance of getting a job. However, the comparison might be meaningful for two reasons. Firstly, we can see that the positive callback rates are almost equal for the younger applicants in both occupations (the difference is 0.966 percentage points). If there is only a slight difference for the younger applicants, then it is reasonable to assume that any significant difference between the callback rates of the older applicants should be due to a stronger age discrimination in one of the occupations. So, this result might indicate that the secondary hypothesis is true. Secondly, even if the harmonisation of the CVs across occupations was not our goal, we tried to create realistic applicants for both occupations with roughly equal opportunities.

The most important result for the secondary hypothesis is in the last row of Table 2. There, we compare the differences in the callback rates of the younger and older applicants in both occupations. The estimated difference in the differences is 2.574 percentage points, which is not significant at any usual significance level. Over the complete sample, the 2.255 percentage point difference of the callback rates of the assistants and the analysts is not significant, and neither is the 0.966 percentage point difference when we only consider the younger applicants. But the 3.540 percentage point difference between the callback rates of the older assistants and the older analysts is weakly significant at the 10% level. This minor result and the large difference in positive responses for the analysts might be viewed as a weak verification of our secondary hypothesis. For a significant verification, we would most likely need a larger sample. However, based on the differences that we observed, we can conclude that highly skilled older applicants face greater age discrimination than moderately skilled older applicants, which confirms our secondary hypothesis.

Probabilities based on the callback rates

The process of hiring employees has two kinds of participant: employers and applicants. Employers form a heterogeneous group; they have different vacancies to fill, and they differ in the minimum requirements they look for in an applicant. Applicants differ in their respective capabilities to perform the job itself. We represent the capabilities of the applicants by a single nonnegative number, with a given domain. This number summarises all their abilities and skills that are relevant for the position. The higher this number is, the better the quality of the specific applicant is. Applicants send their CVs to the employers, thus signalling their capabilities. Employers evaluate the CVs and based on this evaluation they assign a number to every applicant indicating how well they fit into the requirements of the positions. We do not consider any possible issues with asymmetric information and biases or untrue statements in the CVs, so we assume that the CVs and their evaluations by the employers perfectly describe and signal the capabilities of the applicants. Employers decide whether to give a positive callback to each applicant based on how the evaluation of each CV relates to a given cutoff value. Employers are therefore heterogeneous in their respective cutoff values – the minimum capability they require. They give a positive response to applicants with a perceived capability higher or equal to the cutoff value, but if the capability is lower, then they give a negative response.

Applicants do not know the actual cutoff value determined by each employer, but they know the distribution of the cutoff values over a given support. We assume that this support is equal to the domain of the potential capabilities of the applicants. The probability that a given applicant receives a positive response is then simply the share of those employers who have a smaller or equal cutoff value than the capability of the applicant. Based on this, we can calculate, for any applicant with a given skill level, the probability of receiving a positive response.

Assume that there are two applicants, a younger and an older one, applying for the same positions. Their skill levels are the same; they only differ in age. They are applying for the same jobs; therefore, they face the same distribution of cutoff values. Our data on the rate of positive responses can be used as an estimation for the probability that an applicant gets a positive response. Let these probabilities be p_y and p_o, for the younger and older applicants, respectively. The simplest ways to find the level of discrimination would be to measure the difference between these numbers or to calculate their ratio. In the context of our model, the value of the difference $p_y - p_o$ tells us how much higher the probability would be that the younger applicant gets a positive response than the older applicant. In a similar manner, the ratio p_y/p_o tells us how many times more probable it would be that the younger applicant would get a positive response than the older applicant.

Let us normalise the domain of the skills of the applicants to be the interval $[0,1]$, where 0 depicts the worst possible applicant, and 1 the best imaginable. The distribution of the cutoff values of the employers is given by F, which is also defined on the interval $[0,1]$. At the best possible skill level, the probability of receiving a positive response is 1. Similarly, the worst applicant has a probability of 0. We focus on three distribution functions, uniform, inverted U-quadratic, and symmetric triangular distributions. These are all symmetric and relatively simple distributions, but it would also be possible to use any other, potentially non-symmetric distributions as well. The actual shape of the distribution can alter the results, but the general direction of our results is most likely robust across a set of reasonable distributions.

Our data can be used to get estimates for the values of p_y and p_o for both the assistants and the analysts, and across the complete sample. As the CVs of the older and younger applicants were crafted in a way that they signal similar skills, we can safely assume that the two candidates in both subsamples share the same skill level $s \in [0,1]$. Naturally, this number differs for analysts and assistants. If the skills are the same, then the probabilities should also be the same, as $p_y = F(s)$ and $p_o = F(s)$ must hold. However, we know from our data that p_y and p_o are in fact not the same. We proved that they differ across the complete sample for the analysts, and probably for the assistants as well. This means that we must add a way to account for age discrimination distorting the signalled skill level, since age is the only difference between the two applicants.

We propose two ways to account for the discrimination, an additive and a multiplicative added term. These calculations do not consist of complicated steps. Analogous techniques are widely used in probability calculus and the analysis of risky choices of consumers. Despite their simplicity, we are unaware of even similar calculations in the literature on discrimination. Our calculations are an attempt to show a possible application of the estimated callback rates and thus show why it is interesting to estimate the factor by which a younger applicant's chances of getting a positive response differ from those of an older applicant with the same characteristics. These calculations do not depend on the significance of the differences of the callback rates, they only use their values.

In the additive case, we decrease the signalled skill of the older applicant by a value $d \geq 0$. The probability of a positive response for the older applicant then becomes $p_o = F(s - d)$. In the multiplicative case, the signalled skill of the older applicant is multiplied by a factor $0 \leq r \leq 1$, decreasing it. The probability of a positive response for the older applicant then becomes $p_o = F(rs)$. By using the positive response probability of the younger applicant, we can find the values of d and r. We need to solve the system of equations $p_y = F(s)$, $p_o = F(s - d)$, and $p_o = F(rs)$. Solving it requires a few relatively simple steps yielding $d = F^{-1}(p_y) - F^{-1}(p_o)$ and $r = F^{-1}(p_o)/F^{-1}(p_y)$, where F^{-1} denotes the inverse of the distribution function F.

Results for the complete sample are in table 3a, for the analysts in table 3b, and for the assistants in table 3c. For better comparability, we also report the values of the additive discrimination d, in terms of the standard deviations of the chosen distributions.

Table 3. Estimated measures of discrimination

3a) Complete sample

$p_y = 0{,}0967$ $p_o = 0{,}0433$	d	d in terms of the std. dev.	r
uniform	0.0534	18.51%	0.4474
inv. U-quadratic	0.0669	29.92%	0.6523
symm. Triangular	0.0728	35.67%	0.6689

3b) Assistants

$p_y = 0{,}1015$ $p_o = 0{,}0609$	d	d in terms of the std. dev.	r
uniform	0.0406	14.07%	0.5999
inv. U-quadratic	0.0472	21.11%	0.7610
symm. Triangular	0.0508	24.88%	0.7746

3c) Analysts

$p_y = 0{,}0918$ $p_o = 0{,}0255$	d	d in terms of the std, dev.	r
uniform	0.0663	22.98%	0.2777
inv. U-quadratic	0.0917	41.01%	0.5097
symm. Triangular	0.1013	49.65%	0.5271

Based on the results in tables 3a, 3b, and 3c, the skills of older applicants are evaluated to be 0.05 – 0.07 smaller than what they are. We see similar patterns for both the assistants and the analysts. In the case of the assistants, the skills of the older applicants are devalued by 0.04 – 0.05, while in the case of the analysts this devaluation is 0.06 – 0.1, which are the largest values we estimated. If we compare the differences to the skill of the best possible candidate, 1, then we see that the discrimination depreciates the skills of older applicants by 4 – 10% of the perfect candidate. The numbers show an even starker contrast when expressed in terms of the standard deviations of the distributions. Age discrimination can shift the actual skills of older applicants down by 14 – 50% of the standard deviations of the chosen distributions.

Results based on the multiplicative method show the same pattern from a different point of view. The same skills when signalled by older applicants are assessed at only 45 – 67% of their evaluations when they are signalled by younger applicants. This also means that older applicants must signal skills that are 1.5 – 2.2 times the skills of a younger peer in order to have an equal chance of receiving a positive response. These numbers seem to be extremely high, especially given that we crafted CVs that describe applicants with almost the same skills. For assistants, we estimated that the skills of the older applicant are evaluated at 60 – 77% of the evaluation of the same skills of the younger applicant. In the case of the analysts however, the evaluation drops to 28 – 53%, which is shockingly low. This means that older analysts must signal skills that are 1.9 – 3.6 times the skills of a younger peer to have an equal chance of receiving a positive response.

Discussion

In our paper, we describe an experiment that measures age discrimination in the Hungarian job market for female applicants. Age discrimination in the job market is a serious social issue in ageing societies (including Hungary) irrespective of the gender of the applicants. When investigated as a whole, age discrimination does not differ too much between transition countries and Western European countries. However, in relation to the job market, especially for those near retirement age, age discrimination seems to be greater in transition countries (Rychtaříková, 2019).

Our experiment was conducted with hypothetical female job seekers. Two pairs of imaginary job seekers with similar skillsets were created. One pair was looking for economic analyst jobs, while the other pair was looking for office assistant jobs. The office assistant applicants responded to postings on job portals, while the economic analyst applicants searched on LinkedIn. Both pairs applied for jobs in Budapest as it is the largest job market hub in Hungary.

The two younger applicants were 34, while the older applicants were 60. Their ages obviously differ, but their CVs were otherwise homogenised within their categories. Despite this, the younger applicant was invited to substantially more interviews in both categories. We used two methods to show this difference. We looked at the callback rates as is mainly reported in the literature (Farber *et al.*, 2019). In addition, we came up with a simple method which we had not seen in the related literature in order to examine age discrimination from a different perspective. We believe that by calculating the probabilities of the applicants getting a positive callback, we can illustrate the extent of the observed age discrimination better than the pure callback rates. A 6-7% point difference in the callback rates might not seem very large, but our calculations show that this could mean that an equivalent younger applicant has a two to three times greater chance of getting a job interview.

Age discrimination against older applicants in the recruitment phase is extremely harmful to society at large as it leads to a waste of human resources. Senior citizens who are willing to work but are forced to leave the job market have only two options. Either they accept retirement, or they become self-employed out of necessity. In the first case they either need to prematurely rely upon their lifetime savings, or society needs to come up with the means to support them. Thus, instead of still contributing to society, they become financially dependent upon it. In the case of self-employment, older workers can keep working and contributing for a while, but under worse conditions, thus potentially hanging up their boots earlier than they would otherwise. The Golden Age Index (Hawksworth *et al.*, 2018) shows that the employment of seniors could lead to a 8-25% GDP growth in the OECD countries compared to their current employment habits.

Limitations

The main limitation of our research is the relatively low number of observations we made. Originally, we planned to continue the data collection process for three more months and send an estimated 300-350 more applications, but as the Covid-19 pandemic swept across Hungary there were virtually no new job postings for many months from March 2020. So, we had to end the data collection process early and analyse what we had.

A natural extension of our work is to look at male applicants as well. We decided to focus only on women because adding another control variable would have meant a significant increase in our efforts. As we already had our resources stretched to the limit and the gender of the participants (if it is kept the same in the pairs) is not the main question, we decided not to include men in this first step of our research. We chose to include female applicants because most of the literature seems to indicate that age discrimination in their case is more serious, although proving this difference between genders is not the aim of this paper.

Audit studies in their most common form usually consist of two parts. The first phase entails submitting job applications with crafted CVs, then in the second phase people are hired to physically attend the interviews posing as the people the CVs describe. However, hiring people to go to the interviews requires resources on a greater scale than what we had available, especially for the number of observations we had planned. Additionally, the literature (see e.g. Carlsson and Eriksson (2019)) seems to agree that the second phase does not contribute that much to the main results in such studies and hence we are not planning to include the second phase in any of our follow-up projects.

Finally, in this paper we only focussed on two positions. Another natural extension would be the inclusion of other positions, although it is important to keep in mind that adding too many might be counterproductive.

Conclusions

Our results seem to verify our main hypothesis that there is age discrimination in the Hungarian job market. For the analyst position, we estimated a significant 6.3 percentage point difference in the callback rates, benefitting the younger applicant. We only see a four percentage point difference for the assistants, but this difference is not significant, despite indicating the expected effect. As discussed earlier, the non-significance of this difference might be linked to the fact that we had much fewer observations than planned due to the pandemic. When the two sub-samples are combined, the pooled 5.3 percentage point difference is significant.

Our secondary hypothesis is that positions requiring a broader set of skills have a larger difference in callback rates due to age discrimination. So, in short, age discrimination is greater when filling positions which require more skills. Our results seem to support this hypothesis when we observe the differences between positions to have the predicted direction, even if the differences were not statistically significant for all tests. This lack of significance might again be directly linked to the limited number of observations.

With the help of several probability distributions, we estimated that younger participants were approximately 2.2 times as likely to get a positive callback than their older counterparts. We got these results from a simple probability model. Such models are widely used in other fields, yet we are unaware of even similar ones used in the literature on discrimination. The probabilistic measurement of the discrimination helps us to interpret and visualise the extra effort older people might have to make in order to be competitive in the job market and equalise their chances of being called back for an interview.

Our experiment clearly shows that there is significant age discrimination in a particular segment of the Hungarian job market (female analysts and office assistants). This discrimination harms both disadvantaged applicants and the economy as a whole. Thus, some effort should definitely be made to minimise the incidence of employers discriminating based on age.

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