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ADJUSTMENT AND EARLY RETIREMENT INTENTIONS OF THE OLDER WORKERS IN THE CROATIAN PUBLIC SECTOR

Abstract

Croatian population and, consequently, Croatian labour force is rapidly ageing. With ageing comes the change in abilities e.g. decreasing productivity and declining cognitive ability. In the modern world, new applications of technologies transform requirements of jobs, thus workers have to adjust to those novelties. The problem is that older workers are 'digital immigrants' who started using a Personal Computer (PC) later in their lives, often during employment, so they had to change their approach to work i.e., they had to adjust to different requirements of today's jobs. Required adjustments accompanied by decreasing abilities may lead to early retirement. The authors have investigated the influence of 1) the need to adjust to the requirements of today's jobs (approximated by requirements to use a PC) and 2) the ability to adjust to the requirements of today's jobs (approximated by ratings of PC skills) on early retirement intentions of population aged 50+ employed in the Croatian public sector. A logistic regression model in the context of complex samples was created by the authors, whereby both analysed variables were found to be related to the early retirement intentions. Finally, those who were required to use a PC and thus to adjust to changes were more likely to want to retire early than employees who did not have the same obligation. Those with low PC skills, i.e. employees whose ability to adjust was low, were also more likely to retire early than those who have adjusted better.

Keywords: Population ageing, older workers, early retirement, Personal Computer (PC) related requirements and skills, public sector, early retirement intentions and decisions

1. Introduction

According to the United Nations estimates (United Nations, 2019)[1], out of 201 regions, subregions, countries and areas in the world, in 2020, the Republic of Croatia will have the tenth oldest population in the world, i.e. 21.25% of its population will be aged 65+ (for comparison, Japan will have the highest ratio of 28.4%, the United Arab Emirates the lowest 1.26%, and the world average will be 9.33%). Actually, those values are the reflection of long-lasting demographic trends in Croatia.

Consequently, the Croatian labour force is also ageing. Thus, the percentage of workers aged 50+ in Croatia was 29% on March 31, 2017 as calculated with the data by the Croatian Bureau of Statistics (2018)[2]. Such ageing labour force, inevitably, experiences changes in their abilities, such as decreasing productivity and declining cognitive ability.

In the meantime, new applications of technology are rapidly evolving and expanding, and thus being increasingly introduced in various jobs. In those terms, the introduction of PCs (Personal Computers), linked to computerization, remains one of the major changes for older workers. It is mainly because those older workers have entered the labour force prior to or at one of the early stages of PC development and utilisation. Hence, for older workers, who have started using PCs later in life, all changes related to PC are much more challenging than for younger workers who have started using PCs at an earlier age.

To put it briefly, the problem is that older workers have to adjust to the new job-related requirements, while, at the same time, their abilities to do that are decreasing. For that reason, older workers who find it more difficult to adjust to those requirements may want to retire earlier.

These requirements-related issues have motivated the authors to investigate the influence of: 1) the need to adjust to the requirements of today's jobs (approximated by the job requirement to use a PC) and 2) the ability to adjust to the requirements of today's jobs (approximated by ratings of PC skills) on early retirement intentions.

Because of the large number of employees in the Croatian public sector, the research in this paper was focused on population aged 50+ employed within the public sector in Croatia. For that purpose, the authors used designated data sets originating from the Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 6, data set (Börsch-Supan, 2018[3]; Börsch-Supan et al., 2013; Malter, Börsch-Supan, 2017[4]; Orso et al., 2017[5]).

The aim was to investigate how early retirement intentions are impacted by obligations to adjust to the requirements of today's jobs that were approximated by the job requirement to use a PC and the ability to adjust to the requirements of today's jobs that were approximated by ratings of PC skills. To perform the research, the authors have created logistic regression model in the context of complex samples.

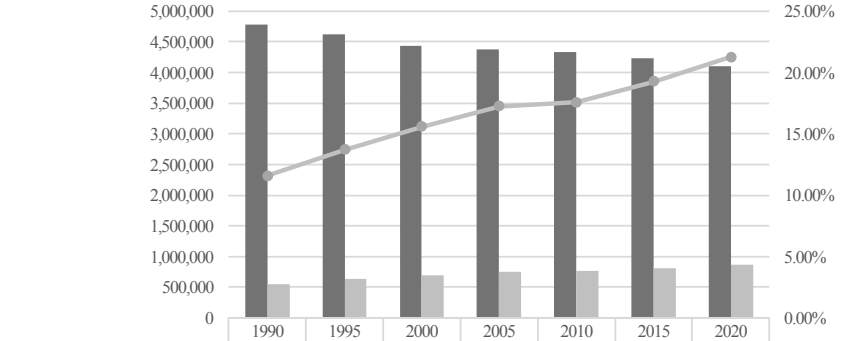
2. Conceptual framework

With the purpose of establishing the comprehensive conceptual framework, the authors have considered and elaborated the following: 1) main trends of population ageing in Croatia, 2) age-related decrease of productivity potential and decline of performance measures, 3) PC requirements and PC skills for population aged 50+, as their adjustments to today's jobs, and 4) key statistical figures on old age pensions and early retirement pensions.

2.1 Main trends of population ageing in Croatia

Population ageing in Croatia in the last 30 years is shown in Figure 1. All of the data were based on the same source, United Nations (2019)[1], with the numerical scale for population-related trends shown on the left vertical axis (L) and the percentage scale for %-population-related trend shown on the right vertical axis (R).

Figure 1 Total Population, Population aged 65+ and % of Population aged 65+ in Croatia in the period 1990-2020



	1990	1995	2000	2005	2010	2015	2020
Total population (L)	4,776,370	4,616,763	4,428,075	4,378,066	4,328,163	4,232,874	4,105,268
Population aged 65+ (L)	552,899	631,820	689,264	755,105	760,038	814,657	872,462
% Population aged 65+ (R)	11.58%	13.69%	15.57%	17.25%	17.56%	19.25%	21.25%

Source: Created by the authors, based on the United Nations, 2019[1]

Based on the numerical data from Figure 1, three demographic trends in Croatia over the last 30 years were identified as:

1) continuous decrease of total population
2) continuous increase of population aged 65+
3) continuous increase of percentage of population aged 65+.

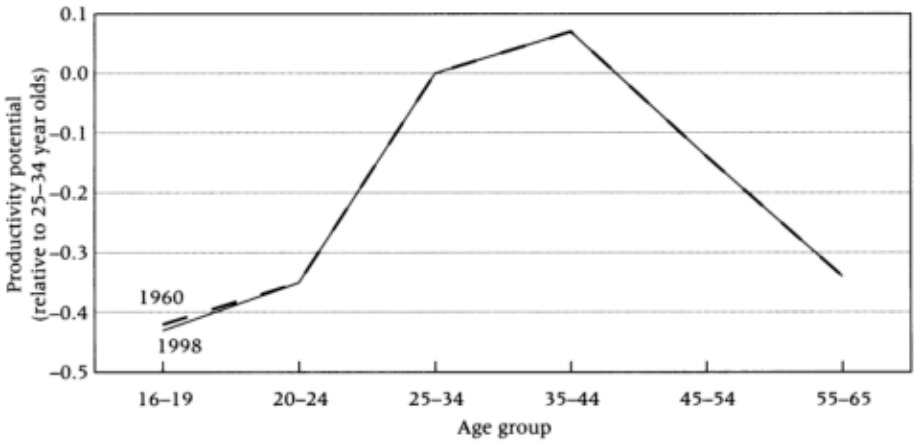
In those terms, both continuous decrease of total population and continuous increase of population aged 65+, consequently contribute to continuous increase of the percentage of population aged 65+. Such population ageing figures for Croatia within this 30-year period were primarily results of fertility decline, emigration and increased longevity (Biljan-August, Štambuk, 2005; Hinek, et al., 2019); however, these were irrelevant in the context of this paper.

2.2 Age-related decrease of productivity potential and decline of performance

Population ageing inevitably leads to the ageing of the labour force. An ageing labour force is prone to changes in productivity and changes in cognitive abilities that happen with ageing.

In that regard, changes in productivity can be observed from the index of productivity potential by age groups, as shown in Figure 2.

Figure 2 Productivity potential index by age, based on US data on job abilities, 1960 and 1998

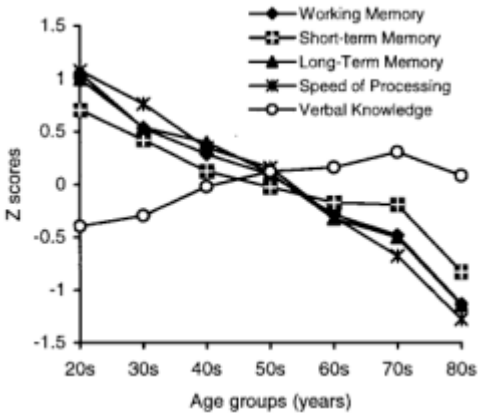


Source: Skirbekk, 2008

According to Figure 2, the pivotal age group were the 25-34 year olds, with the value of productivity potential index at the pivotal 0.0. Expectedly, the lowest value of this index was for the age group 16-19 at -0.43. Consequently, from this age group onwards, individuals start to learn and develop job-related skills as well as to gain work experience, therefore the value of this index is continually increasing until it peaks in the age group 35-44 at 0.07. However, from the next age group onwards, i.e. from the age group 45-54, the value of this index is continually decreasing to the extremely low value, namely the one for the age group 55-65 at -0.34. Even though a certain decrease of productivity potential was expected and inevitable with age, based solely on research findings by Skirbekk (2008), such significant decrease of productivity potential was not explicable per se.

This decrease of productivity potential could be the result of age-related changes in cognitive abilities in the broadest sense, which can affect individuals from the older age groups i.e. 45-54 and 55-65. This is in line with the research by Park et al. (2002). That extensive research considered various types of cognitive measures i.e. memory-related, processing-related and verbal-related, across the lifespan of an individual, measured in ten-year age groups from the twenties to the eighties and scored with z score ranging from -1.5 to 1.5. However, in the specific context of this paper, the most relevant z scores were the composite ones, i.e. scores of the average of all sub-measures that form five measures (Working Memory, Short-Term Memory, Long-Term Memory, Speed of Processing and Verbal Knowledge), as shown in Figure 3.

Figure 3 Composite view of life span performance measures



Source: Park et al., 2002

The five performance measures included in Figure 3 were associated with cognitive ageing i.e. age-related cognitive decline. This especially goes for four of these measures (Working Memory, Short-Term Memory, Long-Term Memory and Speed of Processing). The fifth (Verbal Knowledge) is an exception, since it, according to Park et al. (2002), actually mostly increases during the lifetime i.e. into people's seventies.

Age-related cognitive decline of these four out of five performance measures can also be related to the productivity potential index mentioned above, since they both decrease with age. In that regard, such (quite inevitably) decreasing values for productivity potential index and performance measures i.e. their combination, can have multifaceted consequences in both private and working life of an individual.

2.3 PC requirements and PC skills for population aged 50+ as adjustment to today's jobs

Modern working life, i.e. today's jobs, either implicitly or more explicitly require cognitive skills related to PCs i.e. PC skills. Still, in the context of this paper, the authors have taken into account PC skills of Croatian population aged 50+, since they are actually digital immigrants "who were not born into the digital world but have, at some later point in our [authors' remark: their] lives, become fascinated by and adopted many or most aspects of the new technology" (Prensky, 2001). Since they were born before the technological era, i.e. before 1980, they "had to learn to adjust to technology" according to Zenios & Ioannou (2018). Therefore, for the purposes of the approximation of: 1) the obligation to adjust to requirements of today's jobs and 2) the ability to adjust to requirements of today's jobs, for Croatian population aged 50+ whose productivity, theoretically grounded, was expected to decrease, according to the index of its potential for related age groups, the authors have selected these two variables: 1) job requirement to use a PC (personally answered by individuals aged 50+) was considered as the approximation of the obligation to adjust to the today's jobs, and 2) PC skills (personally rated by individuals aged 50+) were considered as the approximation of the ability to adjust to today's jobs.

Thus, four out of five performance measures listed (Working Memory, Short-Term Memory, Long-Term Memory and Speed of Processing) are those performance measures that can also be associated with the individual's usage of PCs. In that specific regard, the remaining performance measure (Verbal Knowledge) is less important for PC usage, since the majority of modern operating systems and various applications associated with them have an intuitive Graphical User Interface (GUI) and/or comprehensible text options and menus, which makes them user-friendly regardless of the level of Verbal Knowledge of the user.

Moreover, PCs are needed to do numerous jobs worldwide. In that regard, certain jobs require low(er) level of PC skills such as the most basic usage of simple applications, whilst some specific jobs require high(er) level of PC skills such as programming of complex applications. As previously elaborated, individuals aged 50+ have specific issues regarding PCs and PC skills, since they had to adjust to them in the course of their personal and/or working lives.

To investigate PC requirements placed on employees aged 50+ and their PC skills, the authors have utilised the available designated data, taken from the relevant data set SHARE Wave 6 (Börsch-Supan, 2018[3]; Börsch-Supan et al., 2013; Malter, Börsch-Supan, 2017[4]; Orso et al., 2017[5]).

In order to get representative distribution of all answers to the survey questions, the authors have performed probability weighting using calibrated cross-sectional individual weights, for each of the selected countries, as shown in Table 1, Table 2, Table 4 and Table 5. In those terms, the selected countries were those for which it was possible to obtain the resulting values. The selected countries are the same as the 13 countries presented in all the tables containing countries: Austria, Belgium, Croatia, Czechia, France, Greece, Israel, Italy, Poland, Portugal, Slovenia, Spain and Sweden.

Besides, all the percentages in Table 1, Table 2, Table 4 and Table 5 were calculated based on assessments by

population aged 50+, from the data by Börsch-Supan (2018)[3]. Table 1 and Table 4 contain percentages of two possible answers related to whether PCs were required in certain jobs. Similarly, Table 2 and Table 5 contain percentages of six possible ratings related to PC skills.

The authors have grouped ratings of PC skills as follows: Excellent, Very Good and Good have been grouped as High PC skills, while ratings Fair, Poor and (I) Never Used (a computer) have been grouped as Low PC skills. These two groups were used to enhance the appearance and to provide a more detailed summary of Table 2 and Table 5, as well as in the model that was created by the authors (in chapters 4. Data and methodology and 5. Results and discussion).

Accordingly, Table 1 contains the relative distribution of the requirement to use a PC in jobs of employed population aged 50+, shown jointly for the private sector and the public sector.

Table 1 PC required in jobs of employed population aged 50+, selected countries, weighted data

PC required	Yes	No
Country		
Austria	66.79%	33.21%
Belgium	76.61%	23.39%
Croatia	59.33%	40.67%
Czechia	63.40%	36.60%
France	70.10%	29.90%
Greece	45.52%	54.48%
Israel	70.74%	29.26%
Italy	60.31%	39.69%
Poland	45.78%	54.22%
Portugal	40.45%	59.55%
Slovenia	67.27%	32.73%
Spain	44.68%	55.32%
Sweden	98.35%	1.65%

Note: Weighted by calibrated cross-sectional individual weights

Source: Created by the authors, based on Börsch-Supan, 2018[3]

Based on the data from Table 1, it can be observed that regarding whether PC was required in jobs of population aged 50+ employed in both the private and public sectors, Sweden had the maximum 98.35%, Portugal had the minimum 40.45%, while Croatia with 59.33% was 39.02pp worse than Sweden and 18.88pp better than Portugal, thus ranking as the 9th among 13 selected countries.

Additionally, Table 2 shows relative distribution of ratings of PC skills of employed population aged 50+, jointly for the private sector and the public sector.

Table 2 PC skills of employed population aged 50+, selected countries, weighted data

	PC Skills							Grouped PC skills	
Country	**Excellent**	**Very Good**	**Good**	**Fair**	**Poor**	**Never Used**	**TOTAL**	**High**	**Low**
Austria	6.87%	22.74%	28.38%	23.16%	10.99%	7.86%	100.00%	57.99%	42.01%
Belgium	9.34%	18.67%	33.94%	24.92%	10.23%	2.90%	100.00%	61.95%	38.05%
Croatia	13.98%	18.99%	20.97%	18.83%	11.31%	15.92%	100.00%	53.94%	46.06%
Czechia	5.12%	18.60%	29.09%	24.09%	14.60%	8.50%	100.00%	52.81%	47.19%
France	6.88%	10.73%	30.29%	30.26%	16.61%	5.23%	100.00%	47.90%	52.10%
Greece	8.07%	19.12%	23.13%	18.27%	14.55%	16.86%	100.00%	50.32%	49.68%
Israel	14.63%	22.00%	34.14%	17.32%	5.46%	6.45%	100.00%	70.77%	29.23%
Italy	7.85%	16.43%	32.36%	19.59%	10.34%	13.43%	100.00%	56.64%	43.36%
Poland	2.67%	13.12%	26.64%	14.69%	20.71%	22.17%	100.00%	42.43%	57.57%
Portugal	0.79%	6.73%	19.20%	25.28%	22.43%	25.57%	100.00%	26.72%	73.28%
Slovenia	10.15%	12.40%	41.23%	16.23%	9.66%	10.33%	100.00%	63.78%	36.22%
Spain	5.04%	7.50%	25.03%	33.00%	19.96%	9.47%	100.00%	37.57%	62.43%
Sweden	20.32%	32.71%	31.19%	11.79%	2.34%	1.65%	100.00%	84.22%	15.78%

Notes: Weighted by calibrated cross-sectional individual weights, High = Excellent, Very Good, Good, Low = Fair, Poor, (I) Never Used (a computer)

Source: Created by the authors, based on Börsch-Supan, 2018[3]

According to Table 2, when it comes to the subjective assessment of own PC skills as excellent among population aged 50+ employed in both, the private and public sectors, Sweden had the maximum 20.32%, Portugal had the minimum 0.79%, while Croatia with 13.98% was 6.34pp worse than Sweden and 13.19pp better than Portugal, thus ranking as the 3rd among 13 selected countries. Yet, when High PC skills are taken into consideration, once again, Sweden had the maximum 84.22%, Portugal had the minimum 26.72%, while Croatia with 53.94% was 30.28pp worse than Sweden and 27.22pp better than Portugal, thus ranking as the 7th among 13 selected countries.

However, at this specific point, the authors have decided to focus the research of these matters exclusively on the population aged 50+ employed in the public sector in all selected countries, especially Croatia. The rationale behind that decision was the fact that Croatia has a large number of employees in public sector as can be seen in Table 3.

Table 3 Number (absolute and relative) of employees in Croatian public sector on December 31, 2018

Groups of employees in Croatian public sector	Number of employees
Government bodies	35,343
Ministry of the interior / internal affairs	24,852
Ministry of defence	16,881
Public services	169,487
Simultaneously employee in two or more of the above	2,175
Units of local and regional self-government	14,058
Total number of employees in Croatian public sector (1)	**262,796**
Croatian Bureau of Statistics	**Number of employed**
Total number of employed in Croatia as per Croatian Bureau of Statistics (2)	**1,405,973**
=(1)/(2)=higher estimated % of employed in Croatian public sector	18.69%
Croatian pension insurance system	**Number of insurees**
Total number of insurees in Croatia as per Croatian Pension Insurance Institute (3)	**1,506,912**
=(1)/(3))=lower estimated % of employed in Croatian public sector	17.44%

Source: Created by the authors, based on data from the Ministry of Public Administration 2019a[6]; Ministry of Public Administration 2019b[7]; Government of the Republic of Croatia (2019)[8]; Croatian Bureau of Statistics, 2019[9]; Croatian Pension Insurance Institute, 2019a[10]

According to the data from Table 3, on December 31, 2018 the Croatian public sector accounted for at least 262,796 employees i.e. minimally approximately between 17% and 19% of the total employed population were employed in it. However, according to the project by the Croatian Institute of Public Finance (2010)[11], and the related research by Bejaković et al. (2011) with further analysis, this number of employees in the Croatian public sector could only be larger. The main reason can be found in those two researches i.e. in the methodology that they have used and in the analysis that they have performed. In brief, for the year 2008, they have calculated a total of 388,222 of employees in the Croatian public sector, with a steady increase over three consecutive years, from 2006 to 2008. Since the calculation of new(er) comparable Croatian public sector-related data would require a new research project, by taking everything previously mentioned into account, the authors of this paper have decided to put the Croatian public sector in the focus of their research, as discussed below.

In accordance with this, Table 4 contains the relative distribution of the requirement to use PC in jobs of employed population aged 50+, shown only for the public sector.

Table 4 PC required in jobs of population employed in public sector aged 50+, selected countries, weighted data

PC required	Yes	No
Country		
Austria	87.92%	12.08%
Belgium	80.97%	19.03%
Croatia	66.66%	33.34%
Czechia	72.81%	27.19%
France	83.43%	16.57%
Greece	68.80%	31.20%
Israel	83.87%	16.13%
Italy	70.00%	30.00%
Poland	66.50%	33.50%
Portugal	70.63%	29.37%
Slovenia	72.21%	27.79%
Spain	71.09%	28.91%
Sweden	97.36%	2.64%

Note: Weighted by calibrated cross-sectional individual weights

Source: Created by the authors, based on Börsch-Supan, 2018[3]

Based on the data from Table 4, it can be seen that concerning whether PC is required in jobs of population aged 50+ employed in the public sector, Sweden had the maximum 97.36%, Poland had the minimum 66.50%, while Croatia with 66.66% was 30.70pp worse than Sweden and only 0.16pp better than Poland, thus ranking as the 12th among 13 selected countries.

Finally, Table 5 contains relative distribution of ratings of the PC skills of employed population aged 50+, only for the public sector.

Table 5 PC skills of population employed in public sector aged 50+, selected countries, weighted data

	PC Skills							Grouped PC skills	
Country	**Excellent**	**Very Good**	**Good**	**Fair**	**Poor**	**Never Used**	**TOTAL**	**High**	**Low**
Austria	11.31%	26.26%	37.08%	13.54%	8.63%	3.18%	100.00%	74.65%	25.35%
Belgium	9.07%	17.80%	40.20%	23.05%	9.12%	0.76%	100.00%	67.07%	32.93%
Croatia	13.47%	23.82%	21.46%	19.84%	9.62%	11.79%	100.00%	58.75%	41.25%
Czechia	8.98%	17.37%	23.66%	33.97%	9.62%	6.40%	100.00%	50.01%	49.99%
France	4.09%	17.06%	35.64%	31.10%	11.61%	0.50%	100.00%	56.79%	43.21%
Greece	14.53%	28.38%	32.60%	9.23%	8.68%	6.58%	100.00%	75.51%	24.49%
Israel	3.11%	21.47%	59.97%	12.02%	2.37%	1.06%	100.00%	84.55%	15.45%
Italy	9.76%	16.89%	36.95%	21.86%	7.58%	6.96%	100.00%	63.60%	36.40%
Poland	4.23%	13.02%	33.34%	14.94%	22.55%	11.92%	100.00%	50.59%	49.41%
Portugal	1.05%	20.94%	23.43%	43.66%	9.07%	1.85%	100.00%	45.42%	54.58%
Slovenia	12.41%	17.79%	46.15%	9.27%	6.32%	8.06%	100.00%	76.35%	23.65%
Spain	2.10%	13.88%	35.24%	27.69%	18.82%	2.27%	100.00%	51.22%	48.78%
Sweden	14.59%	25.25%	38.63%	18.89%	0.00%	2.64%	100.00%	78.47%	21.53%

Notes: Weighted by calibrated cross-sectional individual weights
High = Excellent, Very Good, Good
Low = Fair, Poor, (I) Never Used (a computer)

Source: Created by the authors, based on Börsch-Supan, 2018[3]

According to Table 5, when it comes to the subjective assessment of own PC skills as excellent among population aged 50+ employed in the public sector, Sweden had the maximum 14.59%, Portugal had the minimum 1.05%, while Croatia with 13.47% was only 1.12pp worse than Sweden and 12.42pp better than Portugal, thus ranking as the 3rd among 13 selected countries. However, when High PC skills are taken in account, Israel had the maximum 84.55% and Portugal again the minimum 45.42%, while Croatia with 58.75% was 25.80pp worse than Israel and 13.33pp better than Portugal, thus ranking as the 8th among 13 selected countries.

Altogether, based on the data from Table 1, Table 2, Table 4 and Table 5 it is possible to see that Croatia was nowhere near the best ones among 13 selected countries. Still, in 12 selected countries (except Sweden), as it can be observed from Table 1 and Table 4, PC was more required in jobs of population aged 50+ employed in, singly, the public sector, than in, jointly, the private sector and the public sector. In 11 selected countries (except Czechia and Sweden), as it can be seen from Table 2 and Table 5, High PC skills were more prevalent in jobs of population aged 50+ employed in, singly, the public sector, than in, jointly, the private sector and the public sector.

With changing job requirements, employees are obligated to adjust to them. Yet, with ageing, there is a decrease in employees' abilities such as productivity potential and a decline of some cognitive measures. Therefore, it is more difficult for them to adjust to those changing job requirements. Due to difficulties related to adjustment to changes in job requirements, some employees may want to leave the labour force. Since the previously elaborated decreasing productivity and declining abilities and the related difficulties arise near the age of early retirement, employees may want to retire early to leave the labour force and to have a permanent, yet smaller, source of income.

2.4 Key statistical figures on old-age pensions and early retirement pensions

Due to the population ageing, the ratio between the number of employed and the number of retired people in Croatia, as of March 31, 2019 (at the end of the first quarter of 2019), was as low as 1:1.23 (Croatian Pension Insurance Institute, 2019b)[12]. A clear majority of pensions, more than two-thirds of them (70.32%) were old-age pensions, while approximately one-fourth of old-age pensions (24.41%) were early retirement pensions.

In addition, in 2012, Eurostat conducted a labour force survey (LFS), including the special *ad hoc* module (AHM) called Transition from work to retirement (Eurostat, 2016)[13]. Since then, neither Eurostat nor the European Commission has repeated the same or similar research regarding retirement. The data from the module above, specifically the ones on early retirement (Eurostat, 2019a)[14] and old-age pensions (Eurostat, 2019b)[15], which include exclusively individuals aged 50 to 69 originating from 28 European Union countries, are jointly presented in Table 6.

Table 6 Individuals aged 50 to 69 who receive old-age pension, Early retirement among individuals who receive old-age pension

Country	Individuals who receive old-age pension	Early retirement among individuals who receive old-age pension
Austria	33.8%	58.5%
Belgium	25.8%	45.7%
Bulgaria	39.8%	5.2%
Croatia	28.2%	55.8%
Cyprus	27.2%	21.1%
Czechia	42.0%	53.0%
Denmark	32.4%	12.1%
Estonia	37.9%	10.9%
Finland	32.1%	26.4%
France	36.0%	43.7%
Germany	22.4%	11.8%
Greece	40.2%	52.2%
Hungary	32.3%	42.4%
Ireland	21.8%	68.4%
Italy	36.4%	73.5%
Latvia	39.1%	35.1%
Lithuania	32.1%	19.1%
Luxembourg	31.9%	43.6%
Malta	39.6%	33.6%
Netherlands	19.9%	55.9%
Poland	38.6%	44.2%
Portugal	27.6%	57.3%
Romania	41.7%	21.5%
Slovakia	33.3%	28.0%
Slovenia	41.3%	39.6%
Spain	19.9%	59.3%
Sweden	35.7%	46.0%
United Kingdom	41.8%	23.1%
European Union - 28 countries	32.4%	41.2%

Source: Created by the authors, based on Eurostat, 2019a[14], Eurostat, 2019b[15]

From data in Table 6, the following can be concluded and calculated:

1) As for individuals aged 50-69 who receive old-age pension, Czechia had the maximum 42.0%, Spain had the minimum 19.9%, while Croatia with 28.2% was 4.2pp better than the average of EU-28, which was 32.4%. Yet, these data are not completely comparable, due to the differences among countries in statutory retirement age regarding old-age pension.
2) Concerning early retirement among the individuals aged 50-69 who receive old-age pension, Italy had the maximum 73.5%, Greece had the minimum 11.8%, while Croatia with (rather high) 55.8% was 6.8pp worse than the average of EU-28, which was 49.0%. Since, herein, pensioners aged 50 to 69 were taken into account, there were, once again, some issues with the data comparison within individual countries. On the one hand, all individuals who retire between the age of 50 and the statutory retirement age (maximum 65) are, automatically classified as taking early retirement. On the other hand, in the age group 50 to 69 there is a small percentage of individuals who receive old-age pension, since most individuals who receive it are aged over 69.

Still, the previously mentioned statistical data on Croatian pensions from 2019 officially confirm the ongoing existence of early retirement in Croatia.

3. *Review of previous research (theoretical framework)*

In addition to previous research used to establish the conceptual framework above, the authors have used supplementary previous research to establish the equally comprehensive theoretical framework.

Although the literature on retirement decisions is extensive, there are not many papers dealing with the impact of technological skills, particularly PC skills on retirement intentions as well as choices. Researchers who were investigating early retirement in Croatia such as Fellmann and Möllers (2009), Baloković (2011), Pološki Vokić and Grgurić (2011), Bađun and Smolić (2018), Galić et al. (2019) had not explored the relationship between computer skills and retirement.

Bartel and Sicherman (1993) researched the influence of technological change on retirement. Their first important finding was that people who work in industries with fast technological change retire later if provided with on-the job training. Furthermore, they found that unexpected change in the progression of technological change, which leads to the depreciation of human capital, consequently contributes to early retirement.

Research of Ahituv and Zeira (2010) was in line with previous research. They found that technical change leads to the erosion of human capital i.e. the erosion effect and consequently to early retirement. The opposite effect was the so-called wage effect, which can be explained as follows: since aggregate technical change leads to better wages, sector-related technical change tends to decrease early retirement.

Friedberg (2003) explored the connection between retirement and computer usage. Consequently, this author found that older workers kept pace with younger workers regarding computer use, except for those jobs that were computerized recently and quickly, so, this author's research shows that the impending retirement affects computer use. On the other hand, changes in needed skills influence the retirement decision. It was found in this study that employees who use computers were more likely to continue working than those who do not use computers.

Schleife (2006) focuses on male employees in Germany and investigates the determinants of computer use and the influence of computer use on the employment status i.e. retirement decision. This author found that it was less likely for older workers between 55 and 64 to use computers in comparison to younger workers. The author did not find evidence to uphold the hypothesis that older workers who use computers were more likely to work until statutory retirement age (that is, not to take early retirement), compared to younger workers.

Biagi et al. (2013) separated computer use into two variables: using PC at work and PC literacy. Research focused on male workers in Italy aged be-

tween 47 and 60. These authors investigated the relationship of computer variables and employment transitions to retirement or to unemployment. They found that the merged effect of using computers and being computer literate decreases the probability of transit from employment.

Cavapozzi et al. (2015) complemented the previous research and studied the effect of using PC at work and PC literacy on job satisfaction and retirement intentions. Workers aged between 50 and 60 from several European countries have been observed and analysis was made separately for male and females and for white-collar and blue–collar employees. These authors concluded that PC literacy and using computers at work was negatively related to job satisfaction and intention to retire early, especially for white-collar employees.

4. Data and methodology

For this research, the authors have mainly used micro data from the previously mentioned source i.e. The Survey of Health, Ageing and Retirement in Europe (SHARE). SHARE was developed by considering the context of population ageing. It is a multidisciplinary, nationally representative survey designed to provide cross-sectional and longitudinal data on primarily the health, employment and social conditions of population aged 50 years and over, from numerous European countries and Israel (Börsch-Supan, 2018[3]; Orso et al., 2017[5]).

On the whole, SHARE was largely based on the US Health and Retirement Study (HRS) and the English Longitudinal Study of Ageing (ELSA). Therefore, the main principles behind including particular questions in the SHARE survey were their multidisciplinary as well as cross-national and longitudinal nature (Börsch-Supan, 2018[3]; Malter, Börsch-Supan, 2017[4]).

The authors have used data from SHARE Wave 6, because that was when Croatia joined the SHARE survey, therefore no previous data on the country was available for analysis. All the data in the survey were collected by using Computer-Assisted Personal Interviewing (CAPI). To collect data, interviewers conducted personal interviews using a laptop computer with CAPI software installed. The survey was conducted in 2015, yet the results are still being released gradually.

For Croatia, a single-stage SHARE survey design with cluster sampling across six strata was used. A subpopulation consisting of population employed in public sector aged 50+ in Croatia was used. Clusters were sampled without replacement.

The authors have created a logistic regression model, in the context of complex samples. Calibrated cross-sectional individual weights were used as the sampling weights, while singleton strata were treated as missing values. Taylor linearization was used for estimating standard errors.

Wanting early retirement, with values Yes and No, was the dependent variable in this model. The authors have used these variables: requirement to use a computer (Yes and No) and PC skills (their ratings grouped as High PC skills and Low PC skills, as explained) as independent variables, used as approximations for the obligation to adjust to the requirements of today's jobs and the ability to adjust to those requirements.

Additional control variables were as follows: gender, collar (white collar, blue collar; acquired from the International Standard Classification of Occupations i.e. ISCO code), age (age in the year of the interview), age squared, years of education, having children (yes, no; calculated from the variable 'number of children'), numeracy (test of mathematical and numerical skills - 5 levels, grouped in three levels: poor, medium and good), fluency (test of verbal fluency), self-assessed health (comprised in two categories: 'bad' - includes fair and poor, and the other category 'good' includes good, very good and excellent) and sector (primary, secondary, tertiary; taken from Statistical Classification of Economic Activities, NACE rev. 1.1). This choice of control variables was influenced by Cavapozzi et al. (2015), but the authors have adjusted it to the specific context of this research.

Characteristics of all the variables weighted by calibrated cross-sectional individual weights for the population aged 50+ employed in the public sector in Croatia are shown in Table 7.

Table 7 Characteristics of the variables for the population aged 50+ employed in the public sector in Croatia, weighted data

Variable	Values	%
Wanting early retirement	No	70.88%
	Yes	29.12%
Current job requires using a computer	No	33.34%
	Yes	66.66%
PC Skills	High	58.74%
	Low	41.26%
Gender	Female	47.78%
	Male	52.22%
Collar	White collar	74.46%
	Blue collar	25.54%
Having children	No	14.21%
	Yes	85.79%
Numeracy	Poor	6.12%
	Medium	40.65%
	Good	53.23%
Health	Good	74.52%
	Bad	25.48%
Sector	Primary	8.20%
	Secondary	16.33%
	Tertiary	75.47%
Variable	**Mean (Std. error)**	
Age (years)	56.51 (0.289)	
Education (years)	12.84 (0.232)	
Fluency score	21.78 (0.556)	

Notes:
Taylor linearized standard error is in parenthesis.
Weighted by calibrated cross-sectional individual weights.

Source: Created by the authors, based on Börsch-Supan, 2018[3]; Orso et al., 2017[5]

5. Results and discussion

A logistic regression model, in the context of complex samples, for the researched variable 'wanting early retirement' was created by the authors of this paper for the population aged 50+ employed in the public sector in Croatia, and results are shown in Table 8.

Table 8 Results of the logistic regression model for wanting to retire early of the Croatian population aged 50+ employed in the public sector

Variables	Values	Coef. (Std. error)
Current job requires using a computer	Yes	1.839**
		-0.741
PC skills	Low	1.202**
		-0.573
Gender	Male	-0.287
		-0.477
Collar	Blue	2.067***
		-0.778
Age	Years	-3.373
		-2.131
Age squared	Years squared	0.0294
		-0.0186
Education	Years	0.0694
		-0.0862
Having children	Yes	1.832
		-1.308
Numeracy	Medium	0.232
		-1.446
	Good	-0.467
		-1.444
Fluency	Fluency score	0.00156
		-0.0388
Health	Bad	1.105**
		-0.462
Sector	Secondary	-0.951
		-0.859
	Tertiary	-1.622**
		-0.818
Constant		91.97
		-60.96
F		1.995
p		[0.0174]

Notes: Taylor linearized standard errors are in parenthesis.
The p-values of the F-test is in brackets.
*p<0.1; **p<0.05; ***p<0.01
Dependent variable: Wanting early retirement
PC skills: reference category - high
Collar: reference category - white collar
Health: reference category - good
Numeracy: reference category - poor
Sector: reference category - primary sector

Source: Created by the authors, based on Börsch-Supan, 2018[3]; Orso et al., 2017[5]

The requirement to use a computer has an influence on wanting early retirement; those who have to use a computer are more likely to want to retire early than those who do not have to use a computer. This shows that an obligation to adjust to today's jobs positively influences the desire to retire early.

PC skills, or rather lack of them, have a significant impact on the desire for early retirement. Those with Low PC skills are more likely to want to leave labour force than those with High PC skills. It can be seen that a lower ability to adjust to requirements of modern jobs encourages employees to seek earlier retirement.

Certain control variables (collar, sector and health) were also found to be significant, but they were outside of the scope of this research. It was expected that blue collars would want to retire before white collars, therefore it was also expected that blue collars were more inclined to early retirement than white collars. This is primarily because of the nature of their jobs, which are more physically demanding. Thus, the results that show that blue collars are more likely to want to stop working are in line with the expectations. The same holds for sectors grouping, where it can be seen that those who were employed in the tertiary sector were less likely to have early retirement intentions than those who were employed in the primary sector. That could also be attributed to the nature of their jobs, where jobs in the tertiary sector are in general less physically demanding.

Bad health is known to be a factor with great influence on early retirement (for instance, Karpansalo et al., 2004; de Wind et al., 2013), so the results in the model showing that employees with bad health were more likely to seek early retirement were as expected.

The remaining control variables: gender, age, age squared, education, having children, numeracy, and fluency, were not significant in the model.

6. Conclusion

Technological advancements have altered the requirements for today's jobs. To keep pace with the new, modern working life, workers have to adjust to the changes. Thus, the authors have investigated how the changes and ability to adjust affect retirement intentions. Since older workers are digital immigrants who started using computers during their working life and had to, at some point, change the way of work, i.e. they had to adjust to the altered conditions of today's jobs, the authors have used the requirement to use a PC in job as an approximation for the obligation to adjust to the requirements of today's jobs and PC skills as the ability to the adjust to those requirements. Moreover, the authors have focused on employees in the public sector in Croatia aged 50+. In order to investigate the influence of the discussed variables on early retirement intentions, the authors have created the logistic regression model within the context of complex samples.

It was found that both of those variables of interest were related to the retirement intentions. The requirement to use a computer was positively related to the intention of early retirement i.e. those who had to use a PC at work were more likely to seek early retirement, which shows that changed conditions motivate employees to leave labour force and retire earlier. The level of PC skills was also connected to retirement intentions. For workers with Low PC skills the probability of the intention to retire early was greater than for those with High PC skills, which shows that the (in)ability to adjust to the today's jobs is important for wanting to leave labour force.

Obviously, technological changes are inevitable and necessary; thus, stopping computerisation would lead to deterioration and decrease of competitiveness. The way to act in order to reduce early retirement is to actively work on ICT upskilling, i.e. on organizing adequate training regarding PC skills.

This is also a message to the policy makers, since workers, especially older workers need to be provided with training in order to adjust to the new job requirements and to be able to use new technology and meet those job requirements. Trained workers, who can adjust to the requirements, would be less inclined toward early retirement, which would eventually: lower the proportion of the early retired among those who receive pensions, shorten the duration of being retired as well as of receiving the pension, and increase payments into the pension system that would reduce the pressure on pension funds and the country's budget. Policy makers should promote active policies toward the labour market aimed at providing adequate training to older workers whose cognitive abilities are generally decreasing with age.

This study has researched the influence of the obligation and the ability to adjust to today's jobs on retirement intentions of older workers in the public sector. When the time comes to make a retirement decision, it does not have to be the same as the earlier retirement intention. For this reason, for further research the authors suggest to explore the influence of the factors listed above on retirement decisions.

This research has its limitations. Retirement intentions and decisions are not always a deliberate choice of employees; rather, they can also be influenced by external circumstances. In that regard, changes or even an announcement of changes in conditions for retirement and early retirement, penalisation for early retirement and additional benefits for remaining employed longer than necessary (where it is allowed) are examples of such external circumstances that have not been included in this research.

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Prilagodba i namjere prijevremenog umirovljenja starijih radnika u hrvatskom javnom sektoru

Sažetak

Hrvatsko stanovništvo te, posljedično, hrvatska radna snaga ubrzano stari. Sa staranjem dolazi do promjene u sposobnostima npr. smanjenja produktivnosti i opadanja kognitivnih sposobnosti. U modernom svijetu, nove primjene tehnologija preobražavaju zahtjeve poslova, stoga se radnici moraju prilagoditi na te novine. Problem je što su stariji radnici digitalni imigranti i počeli su koristi osobna računala kasnije tijekom života, često tijekom zaposlenja, stoga su oni morali promijeniti svoj pristup poslu tj. morali su se prilagoditi različitim zahtjevima današnjih poslova. Tražene prilagodbe zajedno uz, istovremeno, smanjene sposobnosti, mogle bi dovesti do prijevremenog umirovljenja. Autori su istražili utjecaj 1) obvezu prilagodbe zahtjevima današnjih poslova (aproksimiranu zahtjevom za korištenje osobnih računala) i 2) sposobnosti prilagodbe na današnje poslove (aproksimirane procjenama vještina vezanim uz osobna računala), na namjere povezane s prijevremenim umirovljenjem zaposlenih starijih 50 i više godina u hrvatskom javnog sektoru. Logistički regresijski model u kontekstu složenih uzoraka je kreiran od strane autora ovog rada, pri čemu je za obje analizirane varijable pronađeno da su vezane s namjerama povezanim s prijevremenim umirovljenjem. Zaključno, oni od kojih se zahtijevalo da koriste osobna računala te su zbog toga bili u obvezi prilagoditi se promjenama, imali su veću vjerojatnost želje za prijevremenim umirovljenjem, u odnosu na one koji nisu imali tu istu obvezu. Oni s nižom procjenom vještina vezanih uz osobna računala, odnosno za one čija je sposobnost prilagodbe bila niska, su također imali veću vjerojatnost da će se prijevremeno umiroviti u odnosu na one koji su se prilagodili bolje.

Ključne riječi: starenje stanovništva, stariji radnici, prijevremeno umirovljenje, zahtjevi i vještine vezane uz osobna računala, javni sektor, namjere i odluke povezane s prijevremenim umirovljenjem