How is health associated with employment during later working life in Croatia?

ŠIME SMOLIĆ, PhD*
IVAN ČIPIN, PhD*
PETRA MEĐIMUREC, PhD*

Article**
JEL: I12, J14, J21
https://doi.org/10.3326/pse.44.1.3

* The authors would like to thank the two anonymous referees for helpful comments on the paper. The paper uses data from SHARE Wave 6 see (Börsch-Supan et al., 2013) for methodological details. The SHARE data collection has been primarily funded by the European Commission through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812) and FP7 (SHARE-PREP: N°211909, SHARE-LEAP: N°227822, SHARE M4: N°261982). Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C) and from various national funding sources is gratefully acknowledged (see www.share-project.org for more details). This research was also funded by the Croatian Science foundation under the project IP-01-2018-2497.

** Received: June 1, 2019
Accepted: October 31, 2019

Šime SMOLIĆ
Faculty of Economics & Business, University of Zagreb, Trg J. F. Kennedyja 6, 10000 Zagreb, Croatia
e-mail: ssmolic@efzg.hr
ORCiD: 0000-0003-0920-8046

Ivan ČIPIN
Faculty of Economics & Business, University of Zagreb, Trg J. F. Kennedyja 6, 10000 Zagreb, Croatia
e-mail: icipin@efzg.hr
ORCiD: 0000-0002-5624-0359

Petra MEĐIMUREC
Faculty of Economics & Business, University of Zagreb, Trg J. F. Kennedyja 6, 10000 Zagreb, Croatia
e-mail: pmedimurec@efzg.hr
ORCiD: 0000-0003-2616-2457

PUBLIC SECTOR ECONOMICS
44 (1) 99-116 (2020)

Abstract

This paper investigates how self-rated health (SRH), as a measure of general health, is associated with employment during later working life in Croatia. Using data from Wave 6 of the Survey of Health, Ageing and Retirement in Europe (SHARE), we estimate logistic regression models and study whether and to what extent the effects of SRH change with the inclusion of objective health measures. Worse SRH significantly decreases the probability of employment, but this effect becomes insignificant after account is taken of the objective health-related variables. This suggests that in Croatia, SRH and (a combination of) objective health indicators behave as substitutes, and either SRH or objective health measures can be adopted for the study of labour market participation. As worse health lowers the probability of employment during later working life in Croatia, in order to improve the working capacity of older adults, policymakers should strive for more efficient health promotion strategies and public health initiatives.

Keywords: (non-)employment, health, later working life, SHARE, Croatia

1 INTRODUCTION

Trends in population ageing can arguably be attributed to increases in life expectancy and low fertility. As in many other central and eastern European countries, population ageing in Croatia is further exacerbated by high rates of emigration. According to Eurostat (2019a), Croatia is likely to lose more than 15% of its population by the middle of the century. The ageing of the population, compounding the decline in total population, is shrinking the available workforce and manifesting in the form of major labour shortages in Croatia (European Commission, 2019). Therefore, older workers' labour market transitions, and (early) retirement decisions especially (see Bađun and Smolić, 2018), have become an important, if not a central matter of public debate.

To mitigate the effects of population ageing, and to ensure sufficient resources are available for retirement, policymakers are actively seeking ways to extend people's working lives. This, however, raises the issue of whether older individuals are able to supply labour given their health and social conditions. On the other hand, (early) retirees who left the labour market earlier than desired, at least with respect to their health and socio-demographics, might represent an "unused work capacity" (Brugiavini, Croda and Mariuzzo, 2005).

In 2018, the employment rate of older workers (ages 55 to 64) in Croatia was 42.5%, the lowest within the EU (Eurostat, 2019b), and did not meet the Stockholm target of 50% (European Commission, 2011). The employment rate of people aged 50 to 64 in Croatia was, at 51.6% in 2018, the second lowest in the EU, with only Greece behind (Eurostat, 2019b). During the last decade, employment rates of people in their later working lives, at ages 50 to 64 and ages 55 to 64, have fluctuated around 50% and 40% respectively (Eurostat, 2019b). This indicates that a significant fraction of the workforce in Croatia exits the labour market

PUBLIC SECTOR ECONOMICS 44 (1) 99-116 (2020)

before reaching the statutory retirement age. Research has explored several possible reasons, including the economic transition (Tomić, 2014), low working-life quality among older employees (Galić, Parmač Kovačić and Vehovec, 2019), and an institutional setting favouring early retirement (Baloković, 2011; Bejaković, 2016). However, research relating health to older workers' employment in Croatia remains limited, with existing studies on the health-employment relationship (Bubaš, Miloš and Delić-Brkljačić, 2008; Ecimović Nemarnik and Macan, 2018) mainly focusing on the effects of occupational diseases, while the issue of older workers in general attracts little attention among policymakers in Croatia (Goić, 2017). A major knowledge gap in this field thus relates to how general health affects older people's (non-)employment in Croatia.

This paper uses data from the Survey of Health, Ageing and Retirement in Europe (SHARE) to address this knowledge gap. Our main goal is to investigate how self-rated health (SRH), as a measure of general health, is associated with employment during later working life (ages 50 to 64) in Croatia. Prior research has included SRH as a single health-related predictor of labour market participation among older adults in Croatia (Ostrovidov Jakšić and Jakšić, 2019), but one problem with such an approach is that SRH may be endogenous with respect to labour market participation. For example, people may use poor health conditions to validate their non-participation (Bound, 1991). To circumvent this problem, some authors (Dwyer and Mitchell, 1999; Cai and Kalb, 2006; Blundell et al., 2017) have used objective health measures to instrument SRH. Other authors (Kalwij and Vermeulen, 2008), however, argue that SRH is endogenous due to omitted objective-health indicators, and suggest including them as controls, assuming that SRH offers additional health information that might not be captured by the objective health indicators. If this is the case, then both SRH and more objective measures of health will have an impact on labour market participation (Kalwij and Vermeulen, 2008). SHARE builds a comprehensive and multidisciplinary database including a wide range of health indicators, allowing one to consider several dimensions of health simultaneously, and to treat the endogeneity of SRH as an omitted variables issue. In this study, we assess the relative importance of the effects of different health indicators on labour supply decisions during later working life in Croatia, and we focus on the effects of SRH in an effort to understand how they change when one takes account of the more objective health measures. We examine whether SRH keeps its independent effect on later-life employment after the inclusion of other health-related variables, or whether SRH loses its significance when controlling for objective health indicators.

Our paper beyond this point is organized as follows. We procced to review pertinent literature on the relationship between health and labour market outcomes. We next describe our data and methods, and report the results. The final section concludes, with a policy-oriented discussion of our findings.

PUBLIC SECTOR ECONOMICS
44 (1) 99-116 (2020)

2 A LITERATURE REVIEW

We approach health as a component of human capital, and we relate it to individuals' labour market positions within this framework. Enhancements to physical and emotional health can be thought of as investments in human capital (Becker, 1962). In his well-known paper, Grossman (1972) uses the theory of human capital to explain the commodity-like demand for "good health" and health care. His model assumes that every individual is endowed with an initial health capital stock that depreciates with age although individuals can augment their human capital stock through investments, for example, by purchasing extra health services, adding more years of formal schooling, and on-the-job training (Grossman, 2000; 2008).

Country-specific (e.g. Cai and Kalb, 2006; Leung and Wong, 2002) as well as cross-national comparative (e.g. Brugiavini, Croda and Mariuzzo, 2005; Alavinia and Burdorf, 2008; Kalwij and Vermeulen, 2008; Bambra and Eikemo, 2008; Trevisan and Zantomino, 2016; Reeuwijk et al., 2017) studies show that subjective and objective health indicators are both important determinants of labour market decisions. SRH is considered a subjective health indicator. It is a very informative measure of health in general (Idler and Benyamini, 1997), and it successfully predicts morbidity, disability and mortality among the elderly (Jylhä, 2009). While SRH is widely used in studies on determinants of labour force participation, there are several issues associated with this variable. For example, Bound (1991) argues that people who are outside of the workforce may use their health-related limitations or report poor health to justify their non-participation. Moreover, as health is a form of human capital, and because people can invest in their own health, health production should be jointly determined by labour supply and consumption, and it may depend upon unobserved individual characteristics like preference parameters (Cai and Kalb, 2006). Objective health indicators, on the other hand, provide information on, for example, biomarkers, like grip strength or body mass index (BMI), whether or not a person has ever been diagnosed with a certain disease, or whether or not a person shows symptoms of either physical or mental health conditions (e.g. Cai and Kalb, 2006:246; Kalwij and Vermeulen, 2008:627). Some authors use objective health measures as an instrument for SRH (Blundell et al., 2017). Others (Kalwij and Vermeulen, 2008), however, argue that objective health indicators should be used in tandem with SRH because different health indicators may reflect different dimensions of health. A systematic review of literature on health measurements and biases is provided extensively in Barnay (2016).

In a study of Australian workers (aged 15 to 49 and 50 to 64), Cai and Kalb (2006) find that better health increases the probability of labour market participation. Their measure of health comprises SRH, five chronic health conditions, and a self-constructed measure of major injury. A study using the Household, Income and Labour Dynamics in Australia (HILDA) panel data confirms this finding, but stresses education as another important determinant of labour market participation (Laplagne, Glover and Shomos, 2007). This is in line with findings

PUBLIC SECTOR ECONOMICS 44 (1) 99-116 (2020)

suggesting that highly educated people are more efficient producers of health (Lleras-Muney, 2005), and that schooling displays a productive efficiency effect (Grossman, 2008). Health is also found to be a significant determinant of employment, but not vice versa, in a large cross-sectional study on the Hong Kong population (Leung and Wong, 2002). Maurer, Klein and Vella (2011) find that ill health and poor functioning increase the odds of deciding to exit the labour market among older men in the US.

Many studies have employed cross-sectional or panel datasets provided by SHARE to explore the relationship between health and labour market outcomes (e.g. Alavinia and Burdorf, 2008, Kalwij and Vermeulen, 2008, Trevisan and Zantomino, 2016, Reeuwijk et al., 2017). One of them (Alavinia and Burdorf, 2008:42) concludes that "…poor SRH (of Europeans aged 50 to 64) is associated with non-participation in the labour force due to early retirement, [with] being unemployed or being a homemaker". The same study relates these labour market outcomes to several chronic health conditions, like stroke, diabetes, and musculoskeletal disease. But even though disability and economic inactivity appear to be associated closely in many European countries, with disability benefits exceeding unemployment benefits (Haveman, 2000), one SHARE-based study reports a rather high frequency of retirees with no health limitations (Brugiavini, Croda and Mariuzzo, 2005).

While poor health is a strong push factor out of the labour force, welfare regimes differ greatly with respect to the absolute risk of early retirement or economic inactivity. In a study of sixteen European countries, Trevisan and Zantomino (2016) report a twofold increase in the odds of leaving the labour market if older workers have experienced acute health shocks. Reeuwijk et al. (2017) report that poor SRH among older workers in Europe increases the risk of labour market exit, but the effect varies across welfare state regimes. Kalwij and Vermeulen (2008) also make use of multiple health indicators available within the SHARE database. The authors investigate how health is associated with labour market participation of older adults in 11 European countries, and treat the endogeneity of SRH as an omitted variables issue. Severe and mild chronic health conditions, functional limitations, grip strength, BMI, and a measure of mental health enter their analysis as objective health variables. Their findings indicate that SRH is a fairly reliable measure of health in some countries, while in other countries, both subjective (SRH) and objective health measures have their own impacts on labour market participation at older ages. This paper examines the case of Croatia: how does SRH relate to labour market participation in Croatia – does it retain its independent effect after the inclusion of objective health measures or do objective health measures fully account for the relationship between SRH and employment during later working life?

3 METHODS

Our research draws Wave 6 data from the SHARE database (Börsch-Supan, 2019). SHARE is a cross-national, multidisciplinary panel study designed to collect detailed information on the health, socio-economics, and the family and social networks of older Europeans. The SHARE dataset includes respondents aged 50 or over, and their partners of any age. SHARE is based on probability samples, and it is representative of community-dwelling older adults. The data are collected by means of computer-assisted face-to-face interviews. Croatia first joined SHARE for Wave 6, with the fieldwork running from June to November 2015 (for more details see Malter and Börsch-Supan, 2017). The current analysis is restricted to Croatian SHARE Wave 6 respondents aged 50 to 64 at the time of the interview. The resultant sample numbers 1287 observations (around 51.6% of the total Croatian SHARE Wave 6 sample).

We use STATA 15 (StataCorp, 2017) for data processing and statistical analysis. All STATA logs (i.e. annotated STATA outputs) are available from the authors upon request.

3.1 VARIABLES

We derive the dependent variable from the question on respondents' current job situation. The original answer scale comprises six categories: retired, employed (or self-employed, including working for family business), unemployed, permanently sick or disabled, homemaker, and other. We dichotomize these values, distinguishing between employment and all other categories. According to some authors (e.g. Kalwij and Vermeulen, 2008), non-employment within the 50 to 64 age range can be equated to some sort of pre-retirement. Our outcome is thus binary, denoting whether the respondents work or do not work.

To take into account the multi-dimensional nature of health (Kalwij and Vermeulen, 2008), we introduce several health-related explanatory variables. We measure subjective (self-rated) health with a scale variable ranging from 1 (excellent SRH) to 5 (poor SRH). We centre this variable around 3 (good SRH) for ease of interpretation.[1] We supplement SRH with a range of more objective health indicators. We consider the following:

a) Number of chronic conditions. SHARE offers a list of more than twenty chronic conditions to all respondents. Respondents use this list to choose chronic conditions they themselves were ever diagnosed with. Their answers are summed into a single variable, which is readily available within the SHARE database.

[1] Different studies operationalize SRH in different ways. Many authors opt for a dichotomized scale (e.g. Desesquelles, Egidi and Salvatore, 2009; Giatti, Barreto and César, 2010; Zajacova and Dowd, 2011). Our conclusions do not change substantially if using a binary SRH variable (we re-ran our analyses using both very good or excellent SRH versus good or worse SRH, and poor or fair SRH versus good or better SRH; results not shown, but available from the authors upon request).

PUBLIC SECTOR ECONOMICS 44 (1) 99-116 (2020)

b) Number of limitations with (instrumental) activities of daily living, (I) ADLs. SHARE asks whether, "because of physical, mental, emotional or memory problems", respondents had "any difficulty" (yes or no) with ADLs – activities of daily living (such as dressing, walking across a room or eating), or with IADLs – instrumental activities of daily living (such as preparing a hot meal, shopping for groceries or taking medications). We combine the counts of ADL and IADL limitations into a single scale ranging from 0 to 15 (number of items with reported difficulty). A combined measure of ADL and IADL disability is suggested by research (e.g. Spector and Fleishman, 1998; LaPlante, 2010).
c) Number of depression symptoms. This variable indicates respondents' scores on a EURO-Depression scale. This scale was developed to assess late-life depression in Europe (Castro-Costa et al., 2007) and it ranges from 0 to 12 self-reported symptoms (such as feelings of guilt, loss of appetite or tearfulness).
d) Grip strength. Grip strength is recognized as an important factor to measure as people age: it is a strong predictor of disability, morbidity, frailty and mortality (e.g. Andersen-Ranberg et al., 2009). SHARE includes a variable on maximum grip strength from two dynamometer measurements on each hand. To account for male-female differences, we create a variable with gender-specific grip-strength quantiles. We choose to do so instead of using a (group-centred) continuous grip strength variable so that we can retain respondents with missing values (more than 7% of our age-restricted sample) under "unknown" (a separate category).
e) Body mass index (BMI). Centred around 25, a threshold for becoming overweight (WHO, 2000; Nuttall, 2015).

We also considered two variables on health-related behavioural risks: drinking and smoking. The drinking variable measured units of alcoholic beverage during the last seven days, while the smoking variable referred to the average amount of cigarettes the respondent smokes per day. Both variables ranged from 0 to 60 in our age-restricted sample. In our univariate analyses, we found no significant effect of smoking, and a positive effect of drinking on employment. Such a "reverse causality" effect is not uncommon in epidemiological research (Rothman and Greenland, 2005; Sieminska et al., 2008; Balsa et al., 2008), as people with poor health may be more likely to refrain from substance abuse. For this reason, we decide to leave these variables out of our models.

The analysis controls for age (and age squared), gender, the age-gender interaction, living arrangements (living with partner, living alone or living with others with no partner in a household), the number of children[2] and education (low,

[2] Note that each SHARE household designates only one of its members as a family respondent. The family respondent (alone) answers questions about children. To provide scope for an individual-level analysis, we copied the data provided by the family respondent to the partner within the same household.

medium, high, based on the ISCED 2011 classification of country-specific educational categories collected by SHARE).

3.2 MODELS

Since our dependent variable is binary, we use logistic regression models to assess the health-employment nexus among older adults in Croatia. Before fitting the models, we exclude 39 respondents with a missing value on employment status or one of the explanatory variables (with the exception of grip strength, see previous section). We build the models in a stepwise manner to understand better how the effect of SRH changes with the inclusion of other health-related variables. We first estimate the baseline, SRH-only model (Model 1), and then add a series of more objective health indicators (Model 2). Our regression models are not weighted, but we account for clustering at the household level. It is important to recognize that our observations are not independent because research shows that partners tend to coordinate their work/retirement decisions (Gustman and Steinmeier, 2001; Ozawa and Lum, 2005; Bađun and Smolić, 2018).

We use two statistics to interpret our results. We first present odds ratios, the exponentiations of logit coefficients. A positive logit coefficient corresponds to an odds ratio greater than 1, while a negative logit coefficient corresponds to an odds ratio lower than 1. In our case, the odds ratios show how the odds of employment, compared with non-employment, change with a one-unit increase in the explanatory variable (holding all other explanatory variables constant). We supplement odds ratios with estimates of expected differences in employment probabilities (i.e. average marginal effects) associated with each health-related explanatory variable in our two models.

4 EMPIRICAL FINDINGS

We first present descriptive statistics. Table 1 shows means or percent shares, as appropriate, by employment status, for all variables in our analysis. Overall, 35% of the respondents in our sample are employed and 65% are not employed. Our respondents are, on average, 57.87 years old, and there are more women than there are men in our sample. Most of the respondents live with their partners, in two-person households, and report an average of 1.90 children. Note large differences in educational attainment by employment status. As for health, the average SRH score in our sample is 3.05, with employed respondents scoring lower (i.e. reporting better health) than not employed respondents. As compared to their not employed counterparts, employed respondents in our sample also report fewer chronic conditions, (I)ADLs, and depression symptoms, their average grip strength is higher and their BMI is lower.

Table 1
Descriptive statistics

Variable	Non-missing N[a]		Mean (standard deviation) or percent share[a]		
	Employed	Not employed	Employed	Not employed	All respondents
Age	451	831	56.28 (3.50)	58.74 (3.81)	57.87 (3.88)
Gender	451	831			
Female (%)			48.56	61.37	56.86
Male (%)			51.44	38.63	43.14
Living arrangements	451	831			
Lives with partner (%)			86.92	81.47	83.39
Lives alone (%)			8.87	10.35	9.83
Lives with others (%)			4.21	8.18	6.79
Children	450	831	1.77 (0.88)	1.97 (1.02)	1.90 (0.98)
Education	451	830			
Low (%)			9.76	33.37	25.06
Medium (%)			62.97	57.47	59.41
High (%)			27.27	9.16	15.53
SRH	451	831	2.60 (1.06)	3.30 (1.18)	3.05 (1.18)
Chronic conditions	451	831	0.86 (1.03)	1.71 (1.53)	1.41 (1.44)
(I)ADLs	451	831	0.05 (0.29)	0.42 (1.72)	0.29 (1.40)
Depression symptoms	446	821	1.69 (1.90)	2.64 (2.38)	2.30 (2.27)
Grip strength	421	773	40.04 (12.29)	35.90 (11.77)	37.36 (12.11)
BMI	444	819	26.64 (4.04)	27.65 (4.71)	27.29 (4.51)

[a] *Unweighted figures.*

Source: Authors' calculations based on SHARE Wave 6 data.

Odds ratio estimates from a series of logistic regression models appear in Table 2. The first column reports univariate odds ratios (results from single-predictor models, estimated one by one). The key takeaway from this exercise is that all variables relate to the odds of employment; each health-related variable is found to be highly significant (with p-values less than 0.001) except for grip strength ($p < 0.10$).

Let us next look at Model 1. This model includes the full set of controls and SRH as a single measure of health. We allow for non-linear age effects (we include age squared) and include an interaction with gender to control for the gender-specific

labour supply behaviour of older adults. The odds ratio associated with SRH ($p < 0.001$) indicates that the odds of employment decrease by 31.6% for a unit increase in SRH. This means that the likelihood of employment drops as subjective health worsens (i.e. as the SRH score increases). In addition to the odds ratio, we interpret this finding in terms of the average marginal effect. The first column in Table 3 shows the estimated change in the probability of employment associated with a one-step change in SRH: a unit drop in SRH reduces the probability of employment by 6.5 percentage points.

In Model 2, we introduce more objective health indicators in addition to SRH. We find no direct evidence of the endogeneity of SRH due to omitted objective health indicators: SRH loses its significance once additional, more objective health measures are controlled for. The initially highly significant and substantial effect of SRH becomes insignificant in Model 2. As shown in Table 3, the estimated drop in the probability of employment associated with a unit worsening in health fell from 6.5 percentage points ($p < 0.001$) in Model 1 to 1.6 percentage points ($p = 0.195$) in Model 2.

Table 2

Odds ratio estimates from logistic regression models

Variables (ref. denotes base levels for factors)	**Univariate ORs**	**Model 1**	**Model 2**
Age[a]	0.837 ***	1.215	1.205
Age squared		0.977 ***	0.977 ***
Gender			
Male	ref.	ref.	ref.
Female	0.585 ***	1.973	1.842
Age-gender interaction			
Age x female		0.734 *	0.740 *
Age squared x female		1.015	1.016
Living arrangements			
Lives with partner	ref.	ref.	ref.
Lives alone	0.817	0.735	0.707
Lives with others	0.501 **	0.467 **	0.536 **
Children	0.811 ***	0.810 ***	0.825 **
Education			
Low	0.267 ***	0.401 ***	0.412 ***
Medium	ref.	ref.	ref.
High	2.641 ***	3.259 ***	3.527 ***
SRH[b]	0.590 ***	0.684 ***	0.905
Chronic conditions	0.582 ***		0.719 ***
(I)ADLs	0.552 ***		0.814 **

PUBLIC SECTOR ECONOMICS 44 (1) 99-116 (2020)

Variables (ref. denotes base levels for factors)	Univariate ORs	Model 1	Model 2
Depression symptoms	0.812 ***		0.934 *
Grip strength[c]			
First (quintile)	0.702 *		1.106
Second (quintile)	0.852		0.982
Third (quintile)	ref.		ref.
Fourth (quintile)	1.236		1.036
Fifth	1.467 *		1.175
BMI[d]	0.946 ***		0.968 *
Constant		1.291	2.262
N	1248	1248	1248
Clusters in sample	868	868	868
Wald Chi squared		225.03 ***	252.34 ***

** p < 0.10, ** p < 0.05, *** p < 0.01. [a] Values are centred around age 50. [b] Values are centred around 3 (good SRH). [c] Observations with missing data on grip strength are included as a separate category; however, we do not report the associated odds ratio (it is insignificant). [d] Values are centred around BMI of 25 (cut-off for overweight).*

Source: Authors' calculations based on SHARE Wave 6 data.

In Model 2, only objective health indicators show a significant relationship with labour market participation of older adults in Croatia. For example, with each additional chronic condition, the odds of employment decrease by 28.1% (see Table 2). This translates to a 5.4 percentage-point decrease in the probability of employment for each additional chronic condition (see Table 3).

Table 3

Average marginal effects associated with health-related variables

Variables	Model 1	Model 2
SRH	−0.065 ***	−0.016
Chronic conditions		−0.054 ***
(I)ADLs		−0.034 **
Depression symptoms		−0.011 *
Grip strength (quintile)[a]		
First		0.017
Second		−0.003
Third		ref.
Fourth		0.006
Fifth		0.027
BMI		−0.005 *

** p < 0.10, ** p < 0.05, *** p < 0.01. [a] Average marginal effect for factor levels is the discrete change from the base level (ref.).*

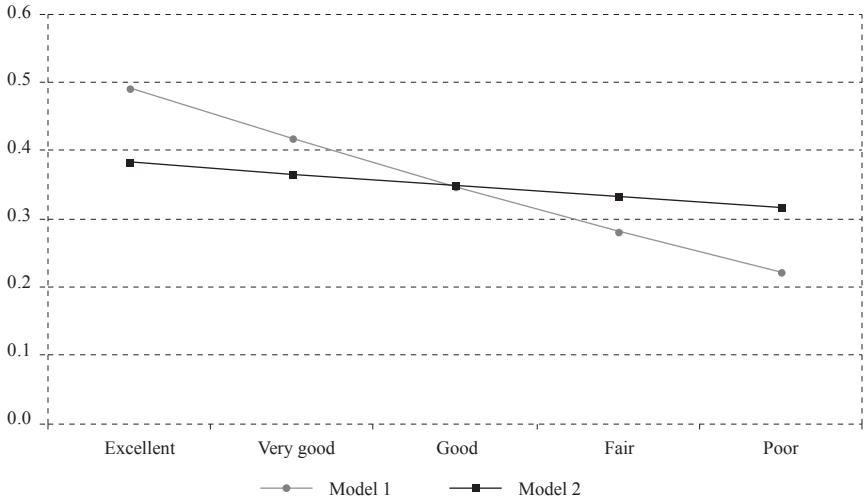
Source: Authors' calculations based on SHARE Wave 6 data.

These findings suggest that in Croatia, SRH strongly correlates with objective health indicators. Our additional analyses reveal that this is indeed the case (results available upon request); SRH seems to be associated with all of the considered objective health indicators (p-values are below 0.001 for chronic conditions, (I) ADLs and depression symptoms, and $p < 0.10$ for grip strength and BMI).

In Figure 1, we compare the estimated probabilities of employment by SRH values for the two model specifications. Note that in Model 2, however, objective health indicators take on the role of SRH, which is only significant in Model 1.

Figure 1

Estimated probabilities of employment by SRH

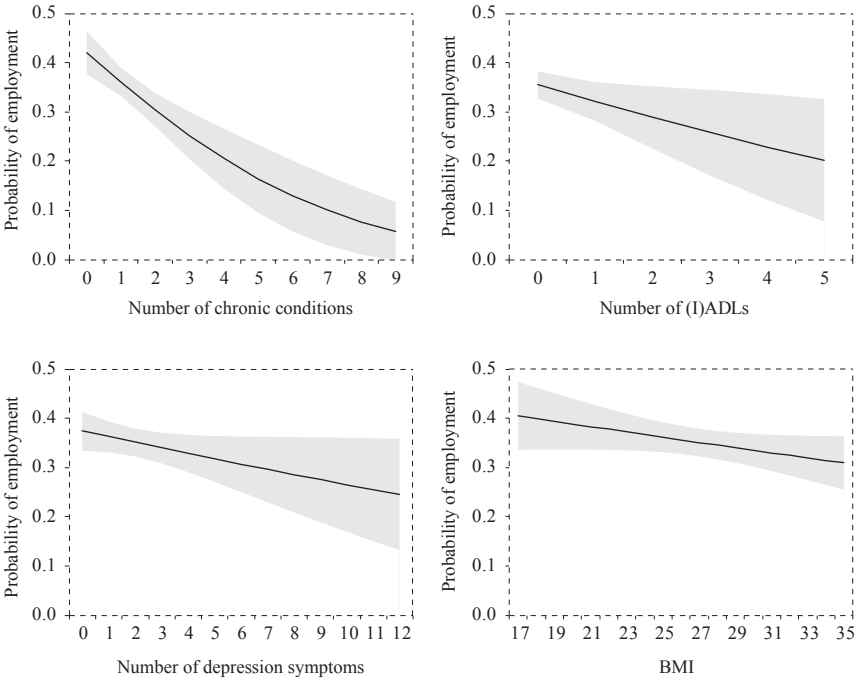


Source: Authors.

The four graphs in Figure 2 show how probabilities of employment are estimated to change with objective health indicators that are found to be (at least marginally) significant in Model 2. The y-axes are set to be equidistant for ease of comparison.

FIGURE 2

Estimated probabilities of employment by objective health indicators



Source: Authors.

5 CONCLUSION

In this paper, we aimed to identify how general health associates with employment during later working life in Croatia. Using a novel dataset from the SHARE study, we refined the existing evidence on the relationship between health and labour market outcomes among older adults in Croatia. The SHARE data allowed us to consider SRH along with a set of objective health variables, and to test whether both have independent effects on later-life employment in Croatia, or whether they can function as substitutes. We first estimated an SRH-only model, and then added objective health indicators in a second specification. We found that SRH loses its significance after controlling for additional (more objective) health measures. As objective health indicators took over the role of SRH in the latter specification, we can conclude that in Croatia, SRH can successfully act as a single health measure in labour market participation equations, or one can choose to use a combination of objective health indicators instead (Kalwij and Vermeulen, 2008). Ill health, either in terms of subjective (SRH) or objective indicators, is found to reduce the probability of employment during later working life in Croatia.

The labour market in Croatia is signalling serious workforce shortages in many sectors, with population ageing as a major contributor. While employment rates at ages below 50 come close to the EU average, employment rates of older adults in Croatia are considerably below the EU average. Therefore, unless Croatia

permits unrestricted immigration, one possible option in the medium run is to push for an increase in the number of older people in employment. But older adults' health might turn up as an obstacle to this policy option, and our findings support this assumption.

We expressed our findings in terms of average marginal effects to provide tangible ground for policy action, because encouraging active work in older age is crucial for countries experiencing population decline. As Brugiavini, Croda and Mariuzzo (2005) point out, the generosity of the pension system can push healthy-enough individuals out of the labour force. However, the relationship between health and labour market participation of older adults should not be overlooked when planning for pension, labour market, or healthcare system reforms. The scope of policy intervention could very much hinge on our understanding of how health affects older workers' ability to supply labour. With pension and health systems under great pressure, policymakers need to find adequate means of making people economically productive for longer. Deteriorating health gives rise to early exits from the workforce. We thus must find appropriate health intervention mechanisms to improve the working capacity of current and future cohorts of workers. These interventions should strive to more efficiently avert and treat long-term illnesses.

One limitation of our study is its cross-sectional design. Longitudinal SHARE data for Croatia will only become available in the following years, and we need such data to trace the effects of changes in health on corresponding changes in labour market status. Further research with additional panel waves will allow us to address questions of causal inference (and ordering) between health and older adults' labour market behaviour in Croatia.

Disclosure statement

No potential conflict of interest was reported by the authors.

REFERENCES

1. Alavinia, S. M. and Burdorf, A., 2008. Unemployment and retirement and ill-health: a cross-sectional analysis across European countries. *International Archives of Occupational and Environmental Health*, 82(1), pp. 39-45. https://doi.org/10.1007/s00420-008-0304-6
2. Andersen-Ranberg, K. [et al.], 2009. Cross-national differences in grip strength among 50+ year-old Europeans: results from the SHARE study. *European Journal of Ageing*, 6(3), pp. 227-236. https://doi.org/10.1007/s10433-009-0128-6
3. Bađun, M. and Smolić, Š., 2018. Predictors of Early Retirement Intentions in Croatia. *Društvena istraživanja*, 27(4), pp. 671-690. https://doi.org/10.5559/di.27.4.05
4. Baloković, S., 2011. Prijevremeno umirovljenje u Republici Hrvatskoj. *Revija za socijalnu politiku*, 18(1), pp. 61-76. https://doi.org/10.3935/rsp.v1i1.976
5. Balsa, A. I. [et al.], Alcohol Consumption and Health Among Elders. *The Gerontologist*, 48(5), pp. 622-636. https://doi.org/10.1093/geront/48.5.622
6. Bambra, C. and Eikemo, T. A., 2008. Welfare state regimes, unemployment and health: a comparative study of the relationship between unemployment and self-reported health in 23 European countries. *Journal of Epidemiology & Community Health*, 63(2), pp. 92-98. https://doi.org/10.1136/jech.2008.077354
7. Barnay, T., 2016. Health, Work and Working Conditions: A Review of the European Economic Literature. *European Journal of Health Economics*, 17(6), pp. 693-709. https://doi.org/10.1007/s10198-015-0715-8
8. Becker, G. S., 1962. Investment in Human Capital: A Theoretical Analysis. *Journal of Political Economy*, 70(5, Part 2), pp. 9-49.
9. Bejaković, P., 2016. Demografsko starenje i mjere za zadržavanje starijih osoba u svijetu rada. In: A. Akrap, I. Čipin and M. Strmota, eds. *Znanstveni skup „Demografija u Hrvatskoj", Zbornik radova*. Zagreb: Ekonomski fakultet – Zagreb, pp. 367-390.
10. Blundell, R. [et al], 2017. The Impact of Health on Labor Supply Near Retirement. *Working paper*, 2017-364.
11. Börsch-Supan, A. [et al.], 2013. Data Resource Profile: The Survey of Health, Ageing and Retirement in Europe (SHARE). *International Journal of Epidemiology*, 42(4), pp. 992-1001. https://doi.org/10.1093/ije/dyt088
12. Börsch-Supan, A., 2019. Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 6. Release version: 7.0.0. Munich: SHARE-ERIC. Data set. https://doi.org/10.1007/978-981-287-080-3_243-1
13. Bound, J., 1991. Self-Reported Versus Objective Measures of Health in Retirement Models. *Journal of Human Resources*, 26(1), p. 106. https://doi.org/10.2307/145718
14. Brugiavini, A., Croda, E. and Mariuzzo, F., 2005. Labour Force Participation of the Elderly: Unused Capacity? In: A. Börsch-Supan [et al.], eds. *Health, ageing and retirement in Europe – First results from the Survey of Health, Ageing and Retirement in Europe*. Mannheim: Mannheim Research Institute

for the Economics of Aging (MEA). https://doi.org/10.1007/978-981-287-080-3_243-1

15. Bubaš, M., Miloš, M. and Delić–Brkljačić, D., 2008. Occupational Diseases, Working Ability and Employment Status in the Working Population of Croatia. *Collegium Antropologicum*, 32(3), pp. 677-680.
16. Cai, L. and Kalb, G., 2006. Health status and labour force participation: evidence from Australia. *Health Economics*, 15(3), pp. 241-261. https://doi.org/10.1002/hec.1053
17. Castro-Costa, E. [et al.], 2007. Prevalence of depressive symptoms and syndromes in later life in ten European countries: The SHARE study. *British Journal of Psychiatry*, 191(5), pp. 393-401. https://doi.org/10.1192/bjp.bp.107.036772
18. Desesquelles, A. F., Egidi, V. and Salvatore, M. A., 2009. Why do Italian people rate their health worse than French people do? An exploration of cross-country differentials of self-rated health. *Social Science & Medicine*, 68(6), pp. 1124-1128. https://doi.org/10.1016/j.socscimed.2008.12.037
19. Dwyer, D. S. and Mitchell, O. S., 1999. Health problems as determinants of retirement: Are self-rated measures endogenous? *Journal of Health Economics*, 18(2), pp. 173-193. https://doi.org/10.1016/s0167-6296(98)00034-4
20. Ecimović Nemarnik, R. and Macan, J., 2018. Employment status of workers with a diagnosed occupational disease in Croatia: a 10-year trend (2005-2014). *Archives of Industrial Hygiene and Toxicology*, 69(3), pp. 220-225. https://doi.org/10.2478/aiht-2018-69-3132
21. European Commission, 2011. *Employment in Europe*. Luxembourg: Publications Office of the European Union.
22. European Commission, 2019. *Labour market information – Croatia*. EURES – The European Job Mobility Portal.
23. Eurostat, 2019a. *Population projections*.
24. Eurostat, 2019b. *Employment rate of older workers, age group 55-64*.
25. Galić, Z., Parmač Kovačić, M. and Vehovec, M., 2019. Quality of Working Life among 50+ Employees across the EU: A Double Jeopardy for Croatian Older Workers. *Društvena istraživanja*, 28(1), pp. 69-87. https://doi.org/10.5559/di.28.1.04
26. Giatti, L., Barreto, S. M. and César, C. C., 2010. Unemployment and self-rated health: Neighborhood influence. *Social Science & Medicine*, 71(4), pp. 815-823. https://doi.org/10.1016/j.socscimed.2010.05.021
27. Goić, S., 2017. Employees older than 50 on Croatian labour market – need for a new approach. *Journal of Human Resource Management*, 20(2), pp. 1-11.
28. Grossman, M., 1972. On the Concept of Health Capital and the Demand for Health. *Journal of Political Economy*, 80(2), pp. 223-255.
29. Grossman, M., 2000. The human capital model. In: A. J. Culyer and J. P. Newhouse, eds. *Handbook of Health Economics*. Amsterdam: Elsevier.
30. Grossman, M., 2008. The Relationship Between Health and Schooling. *Eastern Economic Journal*, 34(3), pp. 281-292.

31. Gustman, A. L. and Steinmeier, T. L., 2001. Retirement and Wealth. *Social security bulletin*, 64(2), pp. 61-94.
32. Haveman, R., 2000. The economics of disability and disability policy. In: A. J. Culyer and J. P. Newhouse, eds. *Handbook of Health Economics*. Amsterdam: Elsevier.
33. Idler, E. L. and Benyamini, Y., 1997. Self-Rated Health and Mortality: A Review of Twenty-Seven Community Studies. *Journal of Health and Social Behavior*, 38(1), p. 21. https://doi.org/10.2307/2955359
34. Jylhä, M., 2009. What is self-rated health and why does it predict mortality? Towards a unified conceptual model. *Social Science & Medicine*, 69(3), pp. 307-316. https://doi.org/10.1016/j.socscimed.2009.05.013
35. Kalwij, A. and Vermeulen, F., 2008. Health and labour force participation of older people in Europe: What do objective health indicators add to the analysis? *Health Economics*, 17(5), pp. 619-638. https://doi.org/10.1002/hec.1285
36. Laplagne, P., Glover, M. and Shomos, A., 2007. *Effects of Health and Education on Labour Force Participation*. Melbourne: The Productivity Commission. https://doi.org/10.2139/ssrn.1018889
37. LaPlante, M. P., 2010. The Classic Measure of Disability in Activities of Daily Living Is Biased by Age but an Expanded IADL/ADL Measure Is Not. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 65B(6), pp. 720-732. https://doi.org/10.1093/geronb/gbp129
38. Leung, S.F. and Wong, C.T., 2002. *Health status and labor supply: interrelationship and determinants*. Hong Kong University of Science and Technology.
39. Lleras-Muney, A., 2005. The Relationship Between Education and Adult Mortality in the United States. *Review of Economic Studies*, (72), pp. 189-221. https://doi.org/10.1111/0034-6527.00329
40. Malter, F. and Börsch-Supan, A., 2017. *SHARE Wave 6: Panel innovations and collecting Dried Blood Spots*. Munich: Munich Center for the Economics of Aging (MEA).
41. Maurer, J., Klein, R. and Vella, F., 2011. Subjective Health Assessments and Active Labor Market Participation of Older Men: Evidence from a Semiparametric Binary Choice Model with Nonadditive Correlated Individual-specific Effects. *Review of Economics and Statistics*, 93(3), pp. 764-774. https://doi.org/10.1162/rest_a_00097
42. Nuttall F. Q., 2015. Body Mass Index: Obesity, BMI, and Health: A Critical Review. *Nutrition today*, 50(3), pp. 117-128. https://doi.org/10.1097/nt.0000000000000092
43. Ostrovidov Jakšić, A. and Jakšić, I., 2019. How to prolong labour market participation in the Republic of Croatia? *Public Sector Economics*, 43(1), pp. 79-108. https://doi.org/10.3326/pse.43.1.6
44. Ozawa, M. N. and Lum, T. Y., 2005. Men Who Work at Age 70 or Older. *Journal of Gerontological Social Work*, 45(4), pp. 41-63. https://doi.org/10.1300/j083v45n04_04

45. Reeuwijk, K. G. [et al.], 2017. The influence of poor health on competing exit routes from paid employment among older workers in 11 European countries. *Scandinavian Journal of Work, Environment & Health*, 43(1), pp. 24-33. https://doi.org/10.5271/sjweh.3601
46. Rothman, K. J. and Greenland, S., 2005. Causation and causal inference in epidemiology. *American journal of public health*, 95(S1), pp. S144-S150. https://doi.org/10.2105/ajph.2004.059204
47. Sieminska, A. [et al.], 2008. Patterns of motivations and ways of quitting smoking among Polish smokers: a questionnaire study. *BMC public health*, 8, p. 274. https://doi.org/10.1186/1471-2458-8-274
48. Spector, W. D. and Fleishman, J. A., 1998. Combining Activities of Daily Living with Instrumental Activities of Daily Living to Measure Functional Disability. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 53B(1), pp. S46-S57. https://doi.org/10.1093/geronb/53b.1.s46
49. StataCorp, 2017. *Stata Statistical Software: Release 15*. College Station, TX: StataCorp LLC: StataCorp. https://doi.org/10.7717/peerj.4598/supp-10
50. Tomić, I., 2014. Structural unemployment in Croatia – How important is the occupational mismatch? *Economic Research-Ekonomska Istraživanja*, 27(1), pp. 346.365. https://doi.org/10.1080/1331677x.2014.966969
51. Trevisan, E. and Zantomio, F., 2016. The impact of acute health shocks on the labour supply of older workers: Evidence from sixteen European countries. *Labour Economics*, 43, pp. 171.185. https://doi.org/10.1016/j.labeco.2016.04.002
52. WHO, 2000. *Obesity: Preventing and Managing the Global Epidemic*. Geneva: WHO.
53. Zajacova, A. and Dowd, J. B., 2011. Reliability of Self-rated Health in US Adults. *American Journal of Epidemiology*, 174(8), pp. 977.983. https://doi.org/10.1093/aje/kwr204