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In search of the egalitarian syndrome: cultural inertia in Croatia?

IVAN BURIĆ, Ph.D.*
ALEKSANDAR ŠTULHOFER, Ph.D.*

Article**
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Abstract

In 1970, Josip Županov presented his Egalitarian Syndrome Theory (EST) to account for the country's suboptimal socioeconomic development. The theory was operationalized only recently (Štulhofer and Burić, 2015), which enabled an assessment of the persistence of egalitarian syndrome, as well as the testing of its hypothesized (negative) association with indicators of social development. Using data from a 2015 national probability survey, this study aimed to provide additional validation of the multidimensional measure of the egalitarian syndrome, including age and gender invariance testing, as well as to explore the hypothesized negative association with county-level development indices. The findings support Županov's theoretical assumptions. Rural vs. urban residence, education and occupation, but not participants' age, were significant predictors of the support for egalitarian syndrome. Significant negative associations were observed between the acceptance of values associated with the egalitarian syndrome and county-level development and competitiveness scores, GDP and early entrepreneurial activity. Although our study was not designed to test the causal relationship between radical egalitarianism and socioeconomic development, the findings suggest that the widespread prevalence of the egalitarian syndrome may be a problem for the country's socio-economic development.

Keywords: Egalitarian syndrome, Županov, scale construction and validation, cultural inertia, socioeconomic development

Values are a long lasting phenomena: they come into being slowly and slowly they disappear.
Županov, 1993:192

1 INTRODUCTION

It seems that Croatian sociologists share the view that the Josip Županov's Egalitarian Syndrome Theory (EST) is the most important theoretical concept to have been locally developed (Fanuko, 2011; Lalić, 2005; Sekulić and Šporer, 2005). Županov developed the EST at the end of the 1960s and then for the next thirty years systematically used it in his analyses of first Yugoslav and then Croatian society.[1] The theory is based on the proposition that Yugoslav society at the end of the 20th century and Croatian society at the beginning of the new millennium inherited a particular socio-cultural pattern of pre-modern peasant societies that prevented effective social and economic development. Županov called this pattern the egalitarian syndrome and conceptualised it as a "cluster of cognitive perspectives, ethical principles, social norms and collective viewpoints" (Županov, 1977:46).

[1] Županov first systematically presented the basic propositions of the EST in the paper "Egalitarizam i industrijalizam" published the journal *Naše teme* (Županov, 1970). He continued to use the theoretical model during his entire scholarly career. See for instance *Sociologija i samoupravljanje* (1977), *Marginalije o društvenoj krizi* (1983), *Poslije potopa* (1995), *Od komunističkog pakla do divljeg kapitalizma* (2002).

This cluster consists of seven dimensions, or rather, seven different manifestations of egalitarian stances, values or perspectives (Županov, 1970). He calls the first dimension of the egalitarian syndrome the *perspective of finite good*. This is the cognitive component of the egalitarian syndrome for it directs national policy toward an egalitarian distribution of social wealth. The second dimension is the *redistributive ethic*, which is derived from the moral obligation characteristic of pre-industrial societies that enjoins the (re)distribution of wealth, for social differences to be as small as possible. Dimension number three is the *norm of egalitarian distribution.* The norm prohibits marked income differences by restricting high earnings. The fourth dimension of the egalitarian syndrome is the *anti-entrepreneurial obsession*. It is expressed in the negative attitude to private entrepreneurship and consists of three sub-dimensions: *the enrichment phobia, the state ownership complex* and *the anti-entrepreneurial sentiment*. The fifth dimension is anti-professionalism. It implies a negative attitude to professional knowledge and autonomous professional standards. Županov calls the sixth dimension of the EST *intellectual levelling*, and it consists of *anti-entrepreneurship, anti-innovativeness* and *anti-creativity*. The seventh and final dimension is *anti-intellectualism* or a negative attitude to intellectual work as such (Županov, 1970; 1977; 1983).

Županov had the idea that the composite of these dimensions slowed down the development of Yugoslav society and/or reduced the scope of modernising changes. Later, in post-socialist Croatian society, it was responsible for a series of transitional problems and deviations in socio-economic development.

Accepting Županov's theory as one of medium range, and prompted by criticism that Županov failed to verify his model empirically (cf. Dolenec, 2014), in an earlier paper the authors presented an operationalisation of the EST and offered two versions of a composite indicator of the egalitarian syndrome (Štulhofer and Burić, 2015).[2]

Carried out in a large-scale student sample, the analyses confirmed the possibility of operationalising the egalitarian syndrome as a higher order latent construct. According to the findings, Županov's original model, with its seven dimensions, needed reducing to a 5-dimensional model to achieve a good fit to the data (Štulhofer and Burić, 2015).

Our intention to offer a valid measure of egalitarian syndrome, suitable for use in a wide range of social science projects, required additional research. It was important to validate the two egalitarian syndrome scales (SEMA-27 and SEMA-15) in a population-based sample and to offer some empirical support for Županov's claim of the persistence and effects of the egalitarian syndrome in contemporary Croatian society.

[2] In the paper we provided a longer (27-item) and shorter (15-item) version of the egalitarian syndrome scale (SEMA), a measure to be used in a wide range of social research studies.

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It is well known that the demise of communism did not result in Županov giving up on his theory. Instead, he applied it to an analysis of the process of post-communist transition (Županov, 1995; 2002). Several of his insights of that time seem relevant for the current situation as well. This is the case, for example, with the concept of *political capitalism* (Županov, 2002). In this concept Županov refers to some of the more important aberrations of the transition, such as the connection of political and economic elites (political clientelism) and politically motivated state paternalism, resulting in the state having too great a share in GDP.[3] Some of the propositions of political capitalism, as seen by Županov, largely refer to some of the key problems that Croatian society is currently facing. If his core concept at least partially explains some of the outcomes of transition, then we can probably use it to tackle current phenomena, such as the irrationality of territorial organisation, wide-spread corruption and the "jobs for the boys" system, hypertrophy of state institutions and agencies, excessive dependence of citizens on state transfers (and, consequently, exaggerated government spending) and so on.

There are several other salient places in Županov's engagement with transitional problems that make the EST still relevant or, at least, worthy of a scholarly update. For example, Županov dealt with the topic of flexibility of work and the attitude of citizens of Croatia to the EU and its values (see Županov, 2002). Disputes about the need for the labour market to be more flexible and for corresponding changes in labour legislation have for several years been a component part of the many discussions and analyses of the desirable directions for social development[4]. If we set aside the doubt as to whether the labour market reform described is really necessary, one relevant research question would be the assessment of the extent to which the existing socio-cultural context works as a barrier to the adjustment to the local and global dynamics of labour market and labour relations.

It would also be interesting to verify Županov's proposition that social crisis radicalises egalitarianism (Županov, 1983:60).[5] At the time of writing, it seems as if

[3] Because of the theme and the tone of the many discussions of the dominant Croatian economic problems, it seems that Županov's claim that "in our business organisations there is an inbuilt state orientation" is still relevant (Županov, 1983:66).

[4] We might recall just the volume of debate that in both the public and academic circles in 2014 was set off by the government initiative to introduce outsourcing in state institutions.

[5] Dolenec criticises Županov's theory as an attack on social solidarity and equality (Dolenec, 2014). However, the theory of the egalitarian syndrome is not a general theory of egalitarianism and, accordingly, not a critique of the idea of egalitarianism. It is important to note that from the start Županov clearly distinguished egalitarianism of positions or chances (an equal start in the competition for social positions) from egalitarianism of rewards (Županov, 1970:33), pointing that the latter is the focal point of the egalitarian syndrome. Furthermore, even the egalitarianism of position was not the ideal solution for Županov. Drawing attention to its inherent conservatism, for poverty is often interpreted as a personal failure (Županov, 1970, pp. 35-37), he supported it primarily for its stabilising role – unlike egalitarianism of rewards, which he found radical and theoretically conflictive (pl. 34). For Županov then the egalitarian syndrome is radical egalitarianism (Županov, 1994), comparable with Scanlon's interpretation of *substantial egalitarianism* that assumes equality of "lives and fates" (Scanlon, 1997:1), or Frankfurt's definition of *economic egalitarianism* as "a doctrine according to which it is desirable that everyone has an equal quantity of money and wealth" (Frankfurt, 2015:6). Although he was not concerned with the normative, for he rejected the idea of engaged (prescriptive) sociology, Županov was very sensitive to social inequalities, particularly where the inequalities that arose and grew in the 1990s were concerned (Županov, 1995; 2002; 2011). One can object that the understanding of egali-

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Croatia is beginning to emerge from the several years of crisis that was manifested in a deterioration of most social indicators, as well as by an increase in social inequality.[6] Are the effects of the social crisis and a high level of social openness – enhanced by membership in the EU – reflected in the strengthening of egalitarian values? The answer to this question is closely connected to the fundamental proposition of the EST, according to which value systems can work as barriers to or generators of social development.

Acceding to Županov's paradigmatic point of departure in the consideration of social development, compatible to Swidler's (1986) interpretation of culture as a toolbox for individual and collective action[7], we would like to encourage (and assist) future assessments of the role of culture in Croatian socio-economic development.

1.1 STUDY AIMS AND HYPOTHESES

This paper has two interlinked objectives. As we have already mentioned, the first objective is to provide further validation of the complex measure of the egalitarian syndrome. Building upon the validation presented in our previous paper (cf. Štulhofer and Burić, 2015), here we use a probability-based general population sample to replicate confirmatory factor analysis carried out in a student sample. We also analyse age and gender invariance of the model.[8]

The second goal relates to the analysis of the possible persistence of the egalitarian syndrome in contemporary Croatian society. Taking our departure from Županov's theses about the persistence (i.e., resistance to change) of the egalitarian system in the post-socialist period (Županov, 1993; 2011), we test out in the paper the two following hypotheses: (1) the cultural inertia or persistence of the

tarianism in contemporary moral philosophy has gone far beyond the simple dichotomy that Županov used; for example, the concept of egalitarianism in the works of Rawls (1971), Scanlon (1997), Walzer (1983), Sen (1992) or Dworkin (1981a, 1981b) differ substantially. This pluralism of ideas about egalitarianism, as well as Županov's strong criticism of rising social inequalities during post-communist transition, points to the erroneousness of dismissing the EST as egalitarianism's executioner. Egalitarianisms, like roses, have different scents. Or sometimes have none. The pluralism of the conceptualization of egalitarianism leads to the following question: what does SEMA actually measure? At first glance, the question is trivial as, strictly methodologically speaking, the measure indicates the five dimensions shown in figures 1 and 2. However, in a practical sense (i.e., thinking of possible social consequences of the egalitarian syndrome), the questions seem highly relevant. Taking into account the findings related to internal and external validity of the SEMA subdimensions the core values of the egalitarian syndrome are primarily the norm of egalitarian distribution and the anti-entrepreneurial sentiment.

[6] According to the 2007 CBS data, Gini coefficient of income inequality was 0.28 and the relative risk of poverty gap was 24.9%. At the end of the crisis, in 2014, the Gini coefficient had risen to 0.30 and the relative risk of poverty gap to 27.9%/(cf. http://www.dzs.hr/Hrv_Eng/publication/2015/14-01-01_01_2015.htm and http://www.dzs.hr/hrv/publication/2009/14-1-2_1h2009.htm).

[7] This seems to be indicated by Fanuko when he argues that in his later works Županov seemed to be forging a more general sociological paradigm. Fanuko says that Županov "abandoned the relatively firm framework of industrial sociology and set out on the adventure of analysing the global social system from the standpoint of cultural sociology. According to his own admission, he abandoned the Marxist analysis that stressed change and social conflict for the sake of theorising about a society based on a continuity of the cultural tradition" (Fanuko, 2011:132).

[8] It should be noted that without confirming model invariance, the second study aim can not be achieved. Without the empirical confirmation that the measure developed is equally good in measuring the phenomenon (the egalitarian syndrome) in different age groups, the assessment of cultural persistence of the phenomenon, which involves comparisons among different age cohorts, would be impossible to carry out.

egalitarian syndrome hypothesis, and (2) the hypothesis about negative consequences of the egalitarian syndrome.

We can define cultural inertia or the persistence of inherited cultural patterns (values, standards, collective habits, etc.) as long-lasting effects of a specific cultural pattern (Zarate, Shaw, Marquez and Biagas, 2012). Such resistance to change is usually counter-productive, for the inherited cultural tools often perform sub-optimally in new circumstances. Županov considered the complex of values he called the egalitarian syndrome an inherited and persisting cultural barrier to social and economic development.

(1) *The cultural inertia or persistence of the egalitarian syndrome hypothesis.* In absence of longitudinal data, the hypothesis can only (and with serious limitations) be tested by treating respondents of different ages as representing different generations (ignoring the distinction between age and cohort effects). Positive correlation between age and the egalitarian syndrome scale scores would indicate the presence of cultural inertia. Since the educational and income structures of the population have changed considerably since 1970, testing of the above correlation requires controlling for education and income levels. Considering the greater personal benefit to be obtained from the acceptance of egalitarian norms, a higher acceptance of values associated with the egalitarian syndrome should be expected among participants with lower socio-economic status.

(2) *Possible consequences of the egalitarian syndrome hypothesis.* In accordance with Županov's understanding of the negative consequences of the egalitarian syndrome, we expect a negative correlation between county development indicators and the average acceptance of the egalitarian syndrome at county level.

2 METHOD

2.1 SAMPLE AND PROCEDURE

The analyses presented in this paper were carried out using a national probability-based sample of 1,000 respondents aged 15-88 years. The survey was the standard monthly omnibus research conducted by the *Ipsos* market research and public opinion agency. Two-stage stratified sampling design was used. At stage one, stratification by six regions, defined as sets of counties[9], was employed. At the second stage, the sample was stratified by settlement size.[10] In choice of settlement in which the research was carried out, the primary sampling units of choice, in each stratum the probability proportional to size sampling method was used,

[9] The following regions were defined: Zagreb and surrounds (Zagreb City and Zagrebačka County), Northern Croatia (Krapinsko-zagorska, Varaždinska, Koprivničko-križevačka, Bjelovarsko-bilogorska, Virovitičko-podravska and Međimurska counties), Slavonia (Požeško-slavonska, Brodsko-posavska, Osječko-baranjska and Vukovarsko-srijemska counties) Lika and Banovina (Sisačko-moslavačka, Karlovačka and Ličko-senjska counties), Istria, Hrvatsko primorje and Gorski kotar (Istarska and Primorsko-goranska counties), Dalmatia (Zadarsko-kninska, Šibenska, Splitsko-dalmatinska and Dubrovačko-neretvanska counties).

[10] Four categories were constructed: settlements with populations up to 2,000; from 2,001 to 10,000; from 10,001 to 100,000 and populations of over 100,000.

meaning that the likelihood of the choice of a unit (an individual settlement) corresponded to its size (population above the age of 15). Household selection was based on random selection of addresses using the random starting point method, followed by random selection of households relative to the chosen address (the random walk method).

Post-hoc weighting was applied to correct for differences in core sociodemographic characteristics (age, education, and the proportion of urban vs. rural inhabitants) between the sample and national population. Taking into account the sampling design and the size of county-level sub-samples[11], our sample can be considered representative of the national but not county populations.

Women constituted a slight majority in the sample (52%). Participants older than 50 were the largest age group (44%), followed by men and women between 30 and 40 years of age (32%). About a quarter of the sample (24%) were participants below the age of 30. With respect to education, participants with a secondary school constituted a majority (54%). Somewhat fewer than a third of participants (30%) reported partial or completed primary education, while 17% had a college or university education. Comparable proportions of the surveyed individuals were living in small (up to 2,000 inhabitants) and medium-sized settlements (2,000-10,000 inhabitants), 39% and 35% of the sample, respectively. In total, 64% of participants were residing in urban settlements.

2.2 MEASURES

According to the operationalisation presented in our earlier study (cf. appendix in Štulhofer and Burić, 2015), measurement of the egalitarian syndrome included 27 items that cover the seven original dimensions (Županov, 1970).

To explore convergent validity of the two versions of the egalitarian syndrome scale (SEMA-27 and SEMA-15) we used a short version of the risk aversion scale developed by Carter and Yeqing (2005). The scale had satisfactory reliability in this study (Cronbach's $\alpha = 0.83$).

The analyses included the following sociodemographic indicators: gender, age, place of residence (rural, settlements up to 2,000 inhabitants, vs. urban, settlements with more than 2,000 inhabitants), occupation,[12] educational level (ranging from partial primary education to post-graduate degrees) and personal income in the preceding month (from no earnings to 12,000 kn or more). Because of negative

[11] The size of county sub-samples ranged from 18 (Ličko-senjska County) to 182 participants (Zagreb City). The average sample size at the county level was 30 (SD = 15.1).

[12] The occupation indicator consisted of the following eight categories: 1 – independent professionals (private practice lawyers, dentists and physicians with private practices, freelance artists, etc.); 2 – experts and intellectuals (teachers, engineers, state-employed physicians, etc.); 3 – senior management, senior supervisors, directors (public or private sector); 4 – middle management (public or private sector); 5 – clerks; 6 – skilled manual workers; 7 – unskilled and low-skilled workers; 8 – farmers and fishermen. For analytical purposes, we collapsed categories 1-3, 4 and 5, and 7 and 8. Category 6 (skilled manual workers), the most populous one, was reference category.

skew and multimodality, education and income were transformed into categorical variables (education was categorized into terciles and income into quartiles).

To assess possible consequences of the egalitarian syndrome we calculated the average SEMA-27 score by county. For the indicators of regional development, we used county GDP, 2000-2013 difference in county GDP, the Development Index (DI) and the Index of Regional Competitiveness (IRC). To assess the development of local and regional self-governments, the DI was developed by the Ministry of Regional Development and EU Funds.[13] The composite indicator is calculated as the weighted average of several fundamental social and economic indicators. Based on a conceptualisation of the World Economic Forum, which defines competitiveness as a set of institutions, policies and factors that determine the level of productivity in a given country, as well as on the EU definition of regional competitiveness as the ability to create an attractive and sustainable living and business environment[14], the IRC was constructed by the National Competitiveness Council. The IRC scores, expressed in the form of rankings, are available at county level. Finally, we used the TEA (total early-stage entrepreneurial activity) indicator developed by the Global Entrepreneurship Monitor (GEM) project, in which Croatia participates since 2002 (Singer, Šarlija, Pfeifer and Oberman Peterka, 2016).[15] The TEA measures early entrepreneurial activity expressed as the proportion of novice entrepreneurs (defined as individuals who started their business not more than three months before the survey) and new entrepreneurs (those who have been paying out salaries and wages for more than three but fewer than 42 months) in the population of 18-64 year-olds. In the analyses presented here, we used the 2014 and 2015 TEA county-level scores.

2.3 STATISTICAL ANALYSIS

The multidimensional model of egalitarian syndrome, developed using a student sample (Štulhofer and Burić, 2015), is replicated here using the identical approach (confirmatory factor analysis with maximum likelihood (ML) estimator). The strength of confirmatory factor analysis lies in its ability to fit a theoretically defined model to empirical data by taking into account measurement error (Byrne, 2009; Hair, Black, Babin and Anderson, 2009; Milas, 2009).

In line with advances in the interpretation of goodness of fit indicators in structural equation modelling (Byrne, 2009; Hair et al., 2009; Hu and Benter, 1999), we use the following criteria, recommended by Kline (2010), when assessing model fit:

(1) SMRM (Standardized root mean square residual) value, a measure of absolute fit, should be equal to or less than 0.05;

[13] See: https://razvoj.gov.hr/o-ministarstvu/regionalni-razvoj/indeks-razvijenosti/112 (February 25, 2016). The DI county scores are available at: https://goo.gl/wWvbsr.
[14] More methodological details can be found at: http://www.konkurentnost.hr/Default.aspx?sec=93.
[15] See: http://www.gemhrvatska.org/.

(2) RMSEA (Root mean square error of approximation) value, a measure of parsimoniousness, should be equal to or less than 0.05;
(3) CFI (comparative fit index) value, a measure of incremental fit (the model of interest is usually compared with the independence model, in which latent variables are unrelated), should be as close as possible to or greater than 0.95.

The model's gender and age invariance is tested using two multi-group analyses that enable a comparison between the model in which all relations among the included variables are fixed across groups (men/women; younger/older participants) and the model that in which relations among variables are determined by collected data. If a difference in fit of these two models is statistically significant (using the Sattora-Bentler test), the assumption of invariance is rejected.

Convergent validity of the egalitarian syndrome scale is tested by correlating the scale scores with the composite indicator of risk aversion (Carter and Yeqing, 2005). In the assessment of the cultural inertia hypothesis, multivariate linear regression analysis was used. Possible consequences of the egalitarian syndrome were explored by zero-order and rank-order correlation analyses.

All analyses were carried out using the IBM-SPSS 22 and AMOS 22 statistical software packages.

3 RESULTS

3.1 CONFIRMATORY TESTING OF THE EGALITARIAN SYNDROME

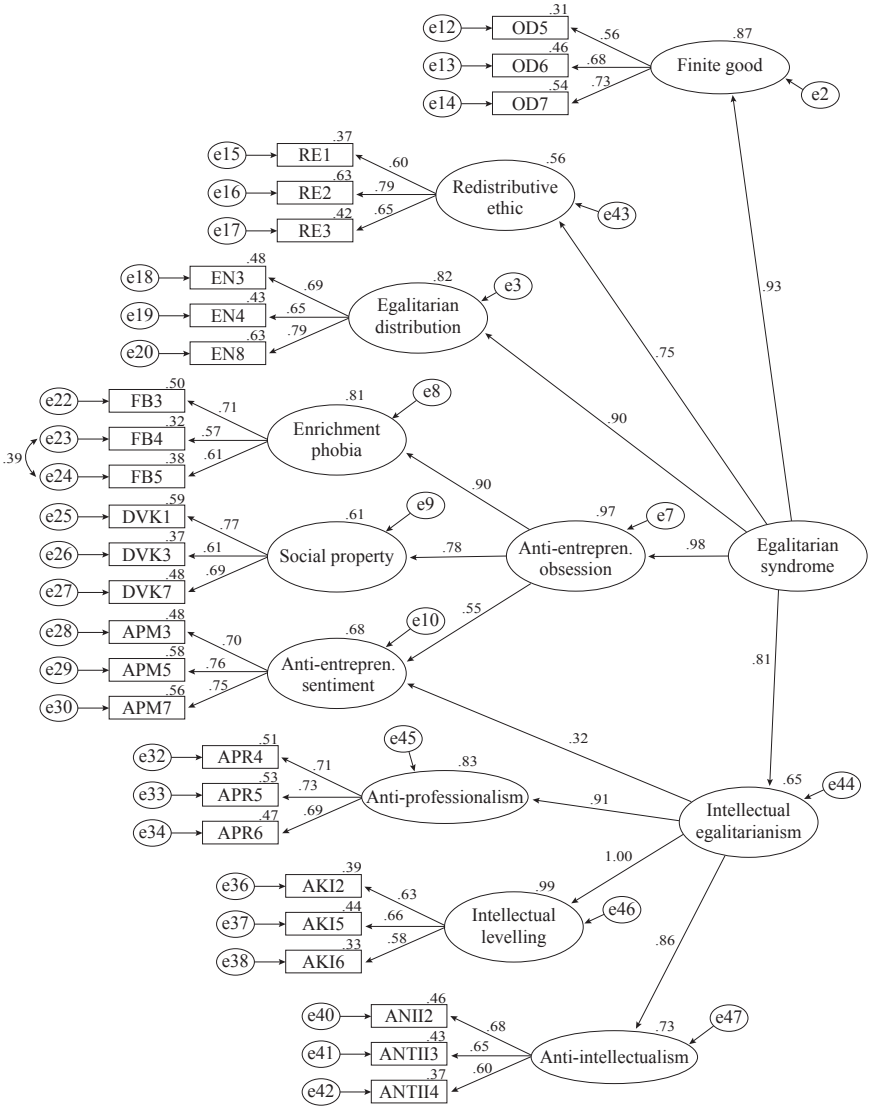
An attempt to replicate the 27-item version of multilevel egalitarian syndrome model (Model A; cf. figure 1) resulted in an acceptable fit to data (Hooper, Coughlan and Mullen, 2008.): $\chi^2_{(311)} = 1190$; SRMR = 0.05; RMSEA = 0.05 (90% CI /confidence interval/ = 0.05 – 0.06); CFI = 0.92. In comparison with the testing of the same model in a student sample (Štulhofer and Burić, 2015), the saturations of five lower-order latent dimensions with a higher-order latent dimension (the egalitarian syndrome) are markedly higher in this general population sample and range from 0.75 to 0.98.

In an effort to develop a shorter composite scale of the egalitarian syndrome scale, next we tested the re-specified model (Model B) with only 15 items (figure 2). As in the previous case, this reduced model also indicated an acceptable fit: $\chi^2_{(84)} = 395$; SRMR = 0.04; RMSEA = 0.06 (90% IP = 0.06 – 0.07); CFI = 0.94. Saturations of the first-order constructs with the second-order construct were comparable with those observed in model A.

In the next step, we carried out two multi-group confirmatory analyses of the 15-item model (Model B) to test gender and age invariance. No significant gender differences were found either in the measurement ($\Delta\chi^2 = 6.3$; $\Delta df = 11$; $p > 0.85$) or in the structural part of the model ($\Delta\chi^2 = 12.3$; $\Delta df = 16$; $p > 0.72$).

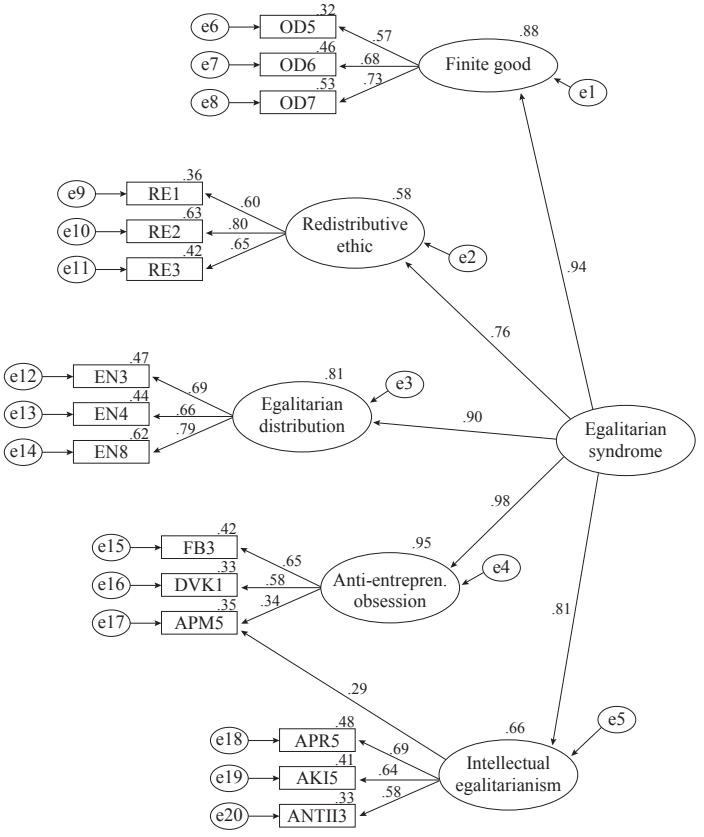
Figure 1

Confirmatory model of the egalitarian syndrome (Model A)



Age invariance was tested by dividing the sample in two large groups that were socialized in different political and economic systems (socialist and centrally-planned system vs. democratic and market-oriented system). The first group consisted of persons aged 60 years and older, while the second group included participants who were born after the collapse of the socialist system (1989), i.e., individuals aged 15-27 years. Again, the group comparison analysis did not ascertain statistically significant differences either in the measurement ($\Delta\chi^2 = 9.9$; $\Delta df = 11$; $p > 0.53$) or the structural part of the model ($\Delta\chi^2 = 16.1$; $\Delta df = 16$; $p > 0.44$), confirming that the model measures the egalitarian syndrome equally well in generations socialized in substantially different political and socioeconomic conditions.

FIGURE 2
Respecified model of the egalitarian syndrome (Model B)



3.2 VALIDATION OF THE EGALITARIAN SYNDROME SCALE

Convergent validity of the egalitarian syndrome scale was tested by exploring its association with risk aversion. First we developed two egalitarian syndrome scales – the longer (SEMA-27) and the shorter version (SEMA-15)[16] – by aggregating values of the items included in Models A and B.[17] Aggregated values were divided by the number of items included to obtain scales ranging from 1 to 5. As expected, both scales statistically significantly correlated with risk aversion ($r_{SEMA\text{-}27} = 0.37$, $p < 0.001$; $r_{SEMA\text{-}15} = 0.35$, $p < 0.001$), with higher acceptance of the egalitarian syndrome being associated with higher risk aversion.

3.3 ACCEPTANCE OF VALUES ASSOCIATED WITH THE EGALITARIAN SYNDROME

In the whole sample, the average SEMA-27 score was 3.87 (SD = 0.69; median value = 3.89). Considering the theoretical range of the scale (1-5), where 1 indicates complete rejection and 5 complete acceptance of the egalitarian syndrome,

[16] For a list of the SEMA-27 and SEMA-15 items see the appendix in Štulhofer and Burić (2015).
[17] Bearing in mind these are nested models, the high correlation between the longer and shorter versions of the scale (r = -0.97) was expected.

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the average score points to a dominant acceptance of the egalitarian syndrome. After omitting the extreme values (1 and 5), the national average remained almost unchanged (3.84). Almost a fifth (18%) of respondents were characterised by a result greater than or equal to one standard deviation above the average, which we consider a strong acceptance of values associated with the egalitarian syndrome.

The average scores of the five lower-level dimensions of SEMA-27 varied from 4.06 (SD = 0.69) in the case of the anti-entrepreneurial obsession to 3.68 (SD = 0.95) in the case of the finite good perspective. The anti-entrepreneurial obsession, the norm of egalitarian distribution (M = 3.97, SD = 0.98) and intellectual egalitarianism (M = 3.74, SD = -0.76) were the three most accepted dimensions of the egalitarian syndrome.

At county level, the highest average SEMA-27 scores were found in the Brod-Posavina (4.60), Lika-Senj (4.56) and Bjelovar-Bilogora (4.38) counties. The three counties characterized by the lowest acceptance of the egalitarian syndrome were the Međimurje (3.45), Istria (3.61) and Sisak-Moslavina (3.64) counties.

3.4 TESTING THE CULTURAL INERTIA HYPOTHESIS

A bivariate test of the persistence of the egalitarian syndrome resulted in a small but significant correlation between the SEMA-27 scores and age ($r = 0.12$; $p < 0.001$). To control for possible confounders, multivariate regression analysis was carried out with SEMA-27 as the dependent variable (table 1). Independent variables were gender, age, urban vs. rural dwelling, education, personal income, and occupation (represented by three dummy variables). Since current occupation was asked for, the last indicator reduced sample size by omitted the unemployed, retired and those in school. To explore if age has an indirect influence on the dependent variable, we also tested moderating effect of age, linear and quadratic, on the association between education and SEMA-27 (not shown in the table). The age and education interaction term was built using mean-centred variables.

As shown in table 1, education and urban residence were significantly and negatively correlated with the criterion. In addition, higher-status occupations were positively associated with the outcome, as professionals, upper middle management and clerks reported significantly lower levels of egalitarian syndrome than skilled manual workers. Moderation effect of age was not confirmed. All effect sizes were small ($\beta = -0.10 – -0.19$) and the regression model explained only 13% of variance in the acceptance of the egalitarian syndrome.

To rule out the possibility of a discontinuous relationship between age and the egalitarian syndrome, an additional test was carried out using multivariate logistic regression analysis. Dependent variable was group membership (0 = individuals aged 60 years or older; 1 = individuals aged up to 30 years). Occupation, rural vs. urban dwelling, education, income and SEMA-27 were entered in the model as independent variables. Confirming the robustness of the above reported findings,

the odds of belonging to one of the two contrasted age groups were not significantly associated with the SEMA-27 scores ($p > 0.08$).

Table 1

Socio-demographic predictors/correlates of the acceptance of the egalitarian syndrome (dependent variable = SEMA-27)

	***N* = 662**
	B/β SE[a]
Gender	-0.01 / -0.01 (0.05)
Age	0.00 / 0.03 (0.00)
Residence	
Rural residence (*reference value*)	/
Urban residence	-0.13 / -0.10* (0.05)
Education	
1st tercile (least educated; *reference value)*	/
2nd tercile	-0.21 / -0.16* (0.09)
3rd tercile (best educated)	-0.26 / -0.15* (0.12)
Income	
1st quartile (lowest income levels; *reference value*)	/
2nd quartile	-0.07 / -0.05 (0.08)
3rd quartile	-0.10 / -0.07 (0.08)
4th quartile (highest income levels)	-0.08 / -0.05 (0.09)
Occupation	
Experts and senior management	-0.46 / -0.19*** (0.12)
Middle management and white collar workers	-0.19 / -0.11* (0.07)
Skilled workers (*reference value*)	/
Unskilled workers and farmers	0.05 / 0.03 (0.09)
Adjusted R^2	0.13

[a] *SE = standard error.*

** $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.*

3.5 POSSIBLE CONSEQUENCES OF THE EGALITARIAN SYNDROME PERSISTENCE

To address the hypothesized negative association between the egalitarian syndrome and socioeconomic development at county level we inspected correlations between the SEMA-27 average county values and several indicators of county development levels (per capita GDP, GDP change 2000-2013, the Development Index, the Index of Regional Competitiveness and the 2014 and 2015 TEA index). Bearing in mind the socio-economic specificity of the capital, the analysis was carried with (n = 21) and without the city of Zagreb (n = 20).

As is seen in table 2, the acceptance of the egalitarian syndrome was significantly correlated with all county development indicators. The direction of these associations was as hypothesized: higher SEMA-27 scores corresponded to lower SI and TEA 2014 and 2015 scores, a lower competitiveness ranking, lower county GDP and weaker GDP growth. Effect sizes varied from small to moderate. To provide a more detail insight, we explored the correlations between the five dimensions of the empirically revised egalitarian syndrome model and the DI, IRC, and TEA 2015 scores (not presented in tables). Overall, the strongest associations were found with anti-entrepreneurial obsession (r = -0.39 – 0.62), the norm of egalitarian distribution (r = -0.41 – -0.50) and intellectual egalitarianism (r = 0.24 – 0.26).

Table 2

Associations between the acceptance of egalitarian syndrome (SEMA-27) and the selected indicators of county-level development

	SEMA-27	**(A)**	**(B)**	**(C)**	**(D)**	**(E)**	**(F)**
	r not including the City of Zagreb (*r* including the City of Zagreb)						
SEMA-27	1	-0.34 (-0.30)	0.39 (0.34)	-0.27 (-0.11)	-0.19 (-0.14)	-0.31 (-0.31)	-0.36 (-0.34)
(A) County-level development index (2013)		1	-0.79 (-0.82)	0.65 (0.67)	0.84 (0.86)	0.31 (0.31)	0.43 (0.43)
(B) County-level index of competitiveness (2013)*			1	-0.66 (-0.70)	-0.67 (-0.74)	-0.59 (-0.58)	-0.36 (-0.39)
(C) County GDP (2013)				1	0.63 (0.85)	0.19 (0.15)	0.41 (0.25)
(D) County-level GDP changes (2000-2013)					1	0.18 (0.27)	0.09 (0.35)
(E) County-level TEA[a] (2014)						1	0.34 (0.35)
(F) County-level TEA[a] (2015)							1

Note: The analysis includes the total population of counties (p-values are not applicable).

[a] *Index of early entrepreneurial activity.*

** Spearman's rank correlation coefficients; other values represent zero-order correlation coefficients.*

4 DISCUSSION

This study successfully replicated the multi-dimensional model of egalitarian syndrome constructed using a student sample (Štulhofer and Burić, 2015). The findings provide strong empirical support for Županov's theoretical contribution. As hypothesized, the egalitarian syndrome appears to be a multi-dimensional sociocultural phenomenon. Furthermore, we established gender and age invariance of both versions of the egalitarian syndrome scale (SEMA-27 and SEMA-15), which is a precondition for their use across different social groups, and explored the scales' convergence validity.

The presented analyses offer at least two important insights. First, we found a wide-spread acceptance of values associated with the egalitarian syndrome among the majority of participants in a nationally representative sample. Second, belonging to a specific age cohort failed to predict the level of acceptance of the egalitarian syndrome, point to cultural inertia or persistence of this sociocultural phenomenon. It was education, occupation (social status) and urban residence that partially explained the distribution of the egalitarian syndrome.

It should be noted that the absence of significant multivariate association between age and SEMA-27 is consistent with the cultural inertia hypothesis. The fact that the acceptance of values associated with the syndrome was similar in different generations, and that the differences in acceptance were related to the effects of (in part trans-generational) socialisation in rural communities, education and professional socialisation,[18] strongly suggests the persistence of the egalitarian syndrome. It is possible that social and economic changes during the 1990s had differential, generation-specific, influence on radical egalitarian values, wiping out the hypothesized differences between younger and older age cohorts. The acceptance of the egalitarian syndrome might thus have increased among the younger generations (as a reaction to the rising uncertainty and the well-publicized irregularities in the privatization process) and simultaneously decreased in the older generations (in accordance with the dominant enthusiasm with democracy and new market values).

Bearing in mind Županov's contention that the germ of the egalitarian syndrome should be sought in agrarian societies, characterized by scarcity and low levels of economic development (Županov, 1970; 1977), we can look at the individual-level predictors as micro markers of a degree of (structural) distance from the traditional agrarian community. Accordingly, one of the next steps in the analysis of the persistence of egalitarian syndrome should be directed toward social categories with the highest SEMA scores. To better understand the social mechanism underlying the egalitarian syndrome, it would be worthwhile testing how the post-socialist transition processes and the related social costs have regenerated or intensified the syndrome[19].

[18] Because of the lack of appropriate indicators, this study can not answer the question whether the effect of occupational status is due to professional or class socialisation (habitus).

[19] Županov also indicated this line of research when he hypothesized about the radicalization of the syndrome in the period of economic stagnation (Županov, 1983:60).

Although at first sight problematic, the fact that the socio-demographic characteristics of the research subjects have explained a little more than a tenth of the variance in egalitarian syndrome is in accord with the thesis that we are dealing with a cultural phenomenon that cannot be fully explained by individual experiences or interests.[20] The egalitarian syndrome, as Županov described it, is primarily a collective feature, or, to put in more contemporary terms, a value set generated by structural characteristics typical of Croatian society at a lower level of modern development (e.g., the predominance of rural and uneducated population). In this sense, future research should focus on community-level or contextual indicators in predicting the acceptance of radical egalitarianism.

Although fragmentary and lacking in robustness, the findings related to the second hypothesis tend to support Županov's focus on negative links between the acceptance of values associated with the egalitarian syndrome and socioeconomic development.

Županov's central thesis that the egalitarian syndrome is a sociocultural brake on development is backed up by the findings that county-level development indicators were negatively correlated with the egalitarian syndrome. Given the central place that anti-entrepreneurial sentiments, redistribution ethic and anti-intellectualism have in the syndrome, the relationship is hardly surprising. If persistent, these sets of values will continue to impede entrepreneurial activity and, consequently, growth. This is in line with the GEM 2015 study findings that showed that Croatia was in 54th place out of the 60 countries according to the perception of social status of the entrepreneur (Singer et al., 2016). Also suggestive is the conclusion of GEM analyses carried out between 2002 and 2011: in terms of entrepreneurial activity, Croatia is lagging behind other, similarly developed, countries. The Eurobarometer study carried out in autumn 2015 showed that over a half of the EU citizens were in favour of stimulating private investment with public money – compared to less than a half of Croatian citizens.[21]

In the article "Egalitarianism and Industrialism" (Županov, 1970; 1977), Županov devoted a fair amount of attention to low levels of innovativeness and creativity at the time that he saw as factors of social inefficiency.[22] Insights into national innovation and creativity levels are not, it would seem, very much different at the beginning of the twenty first century. According to a 2015 study into global innovativeness, Croatia was ranked 40th among 141 countries, listed behind all the countries of Western Europe and many of Eastern European countries[23].

[20] We owe this insight to one of the anonymous reviewers.
[21] Available at: http://ec.europa.eu/croatia/news/docs/2016/20160229_eb-84-nr-croatia.pdf (February 29, 2016).
[22] Using more contemporary terms, Županov's discussion also touches on the issues related to social capital.
[23] Available at: https://www.globalinnovationindex.org/userfiles/file/reportpdf/gii-full-report-2015-v6.pdf (March 1, 2016).

4.1 THE DIRECTION OF CORRELATION

Strictly methodologically speaking, our findings did not confirm but rather failed to reject the hypothesis of cultural inertia or the persistence of egalitarian syndrome. True confirmation of the hypothesis would require a comparison with an earlier dataset completed in the communist era. Unfortunately, no such data seem to exist (Bernik, 1990). Hence, this study's results can be interpreted in two ways. They may be taken to indicate the persistence of the egalitarian syndrome or, alternatively, they may be used to argue that the egalitarian syndrome is a consequence (and not the cause) of the post-communist transition, which included the 1991-1995 war, and the associated social costs. Although both interpretations are compatible with our findings, the plausibility of the second interpretation seems dependent on its ability to explain how could various models of development (based on different variants of planned and market-oriented economy) that Croatia experienced in the past 50 and more years produce a more or less identical sociocultural toolbox for everyday existence. Put differently, if inadequate socio-economic development is the cause rather than the consequence of the egalitarian syndrome, substantial similarities (i.e., a considerable overlap) is to be expected between the two models of development. Otherwise, it would be hard to explain how Županov was able to describe the phenomenon decades before it was supposedly generated.

The authors of this paper are in favour of a specific combination of the rival interpretations. Although we have no evidence to support the hypothetical scenario that follows, we find it a theoretically plausible and to a certain extent verifiable narration. For example, fragmentary verification might be attempted through retrospective analyses of the reaction to social costs of post-communist transition (Štulhofer, 2000). The egalitarian syndrome, inherited from pre-modern agrarian communities (Županov, 1980), was enthroned by the communist party as the dominant social value, partially as it was fully compatible with the socialist equality of all credo and in part because it was a useful tool for eliminating political competition.[24] In such context, the acceptance of egalitarian syndrome was functional, a useful set of values to navigate in daily life. When socialism collapsed and Croatian society was turned into a democratic, market-oriented system, the acceptance of radical egalitarianism come under pressure. Under changed social conditions, the old values were not capable of directing and facilitating everyday actions. It seems logical that the changed "rules of the social game" required a new set of values – a new toolbox (Swidler, 1986). However, before these new cultural tools could replace the old, high costs of post-communist transition (amplified by the war-related destruction and losses) and the perpetuation of political control over public resources and economic activities reinvigorated the old mores.[25] Before a

[24] For example, independent and critical experts and intellectuals were often accused as "technocrats".

[25] The role of state and political elites has been recently explored by Nistotskaya, Charron and Lapuente (2015). They provide a robust empirical assessment of the relationship between the quality of institutional framework (operationalized as the perceived quality of government) and small and medium-sized entrepreneurial activity in 172 regions of the EU.

new toolbox was tested in practice, we went back to the old and familiar one.[26] According to this hypothetical narrative, the acceptance of the egalitarian syndrome observed in this study may be both the cause and the consequence of the country's suboptimal development. Irrespective of which of these two scenarios is the more realistic, we find Županov's emphasis on the linkage between socioeconomic development and cultural patterns highly relevant for both.

4.2 STUDY LIMITATIONS

This study's findings need to be balanced against several methodological limitations. First, cross-sectional nature of the study makes any causal inferences impossible. Second, our treatment of participants of different age as representatives of different age cohorts or generations is substantially inferior to the dynamic comparison of age cohorts (using repeated cross-sectional data) or to longitudinal panel assessment of change. Unlike these, our approach can not tease apart the effects of ageing, generation-specific culture or cultural changes in general. Third, our analysis failed to take into account the social context in which individuals act. As already mentioned, the characteristics of local communities and social groups might be stronger predictors of the acceptance of egalitarian syndrome than individual characteristics. Future studies should explore the extent to which local characteristics (e.g., the proportion of individuals living in rural settlements, the proportion of highly educated individuals and social mobility rates) predict the acceptance of values associated with the egalitarian syndrome, compared to individual characteristics. Multilevel regression modelling would be the ideal analytic approach to this issue.

Another important restriction pertains to correlations between the acceptance of egalitarian syndrome and the regional development indices. Non-representativeness and small size of county-level subsamples reduced validity and reliability of the analysis. Finally, although certainly not least important, our study omitted several important constructs – such as social solidarity, trust and the norm of reciprocity – which would enable an assessment of the potentially critical link between the egalitarian syndrome and cooperativeness.

5 CONCLUSIONS

Adding to our previous study, we have offered the first systematic operationalisation of Županov's theory and provided evidence suggesting that the egalitarian syndrome remains a phenomenon relevant for the county's socioeconomic development. The multivariate findings presented here confirm Županov's sociological imagination, as well as his empirically-informed theory building skills. In addition, the assessment of the relationship between the egalitarian syndrome and the

[26] Here we are approaching Sztompka's concept of civilizational incompetence (Sztompka, 2000), which is defined as a set of socio-cultural barriers that slowed down the adaptation of the citizens in the former socialist countries to new economic and social circumstances created by the demise of communism. This kind of cultural wall, erected and internalized during the communist era, contains rules, norms, values, habits and symbols, which are for the most part dysfunctional in a post-communist setting.

five county-level development indicators offer some empirical support to Županov's claims that the egalitarian syndrome is an obstacle to societal development. In our view, unresolved issues, such as the question about the direction of association between the syndrome and development, do not diminish the relevance of the Županov's medium-range theory.

In contrast to normative approach, which in our opinion marks the most recent critique of the Županov's theory (Dolenec, 2014), we advocate empirical assessment. Equipped with the proposed measures of the egalitarian syndrome, future studies can explore if the acceptance of values associated with the egalitarian syndrome is systematically linked with developmentally problematic phenomena (e.g., corruption, infringement of norms or a short radius of trust; Delhey, Newton and Weizel, 2011) or with the phenomena that favour development, such as cooperativeness, social capital, civic engagement and respect for norms.

The proposed egalitarian syndrome scales, SEMA-27 and SEMA-15, enable rigorous analysis of the cultural determinants of socioeconomic development in Croatia. Although SEMA-15, being a relatively brief measure, seems usable in general social research, we would like to remind the reader of the useful and still underutilized strategy of planned missing data. The practice enables a reduction of the number of items to be included in the questionnaire (Graham, 2009) by generating missing values which can be relatively straightforwardly imputed using FIML (full information maximum likelihood) method in statistical software packages that support structural modelling (Allison, 2003; Arbuckle, 2013).[27] For example, if the 3-form design is employed (cf. Graham, Taylor, Olchowski and Allision, 2006), only 21 of the SEMA-27 items would need to be included in the questionnaire. In the case of SEMA-15, the number of items would be reduced to 12.

Finally, we would like to propose three broad lines of research in which the use of the proposed scales might be beneficial. We base our proposal on firm belief that the EST represents a theoretical construct that has successfully integrated the structure-action dichotomy. Consequently, one possible research direction would focus on the analysis of social capital and socioeconomic behaviour by investigating associations between the egalitarian syndrome and trust, cooperativeness, civic engagement, and corruption. Another direction would be research into links between the egalitarian syndrome and political preferences, political ideologies, understanding of social justice, perception of good governance and participation in various types of political activities. The third direction would be related to the market economy and entrepreneurial activity. It may be worthwhile to further explore associations between the acceptance of radical egalitarianism, attitudes toward market institutions and participation in various economic activities.

[27] It should be noted that the outcome of planned missingness are values that are missing completely at random.

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The ultimate answer to the question of whether Županov's theory, developed more than forty years ago, can assist us in understanding contemporary socioeconomic development in this country will be primarily empirical. New theoretical explications, even revisions, will likely also be needed and will follow after more empirical work becomes available. To provide answers to *how* the egalitarian syndrome affects socioeconomic development, if at all, these conceptual additions will have to elucidate at least some of the causal mechanisms (Hedström, 2005) that underlie the relationship.

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The impact of population aging on public finance in the European Union

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Abstract

Population aging is a process that shapes the economic environment in most of the developed economies. Thus, understanding the dynamics between public finance and the demographic variables enables policy-makers to adapt and to ameliorate their medium-term budgetary frameworks. The aim of this paper is to examine the fiscal implications of the demographic shift using panel data on 25 EU countries in the period from 1995 until 2014. In order to qualify the findings of previous literature, this paper considers the demographic variables as endogenous and applies the system GMM estimator to obtain the elasticity of several public finance categories with respect to population aging. The results indicate significant and positive impacts of the elderly share on expenditure for pensions and social protection. The higher positive impact on overall public expenditure compared with total government revenue confirms the negative effect of population aging on budget balance. An increase in the young population has a significant impact only on health expenditure.

Keywords: population aging, demographic transition, public finance, system GMM

1 INTRODUCTION

Although the Great Financial Crisis[1] has had a significant impact on the global economy, it is the demographic transition that is still one of the biggest challenges facing the European Union (EU) and other developed countries. The baby boom, which in Europe occurred between 1950 and 1970, and the subsequent decline in the fertility rates with an increase in longevity, implicitly indicated significant changes in the total population with respect to its age structure. Consequently, public budgets and other macroeconomic variables are already affected with this structural shift of population. The economic crisis emphasized the importance of fiscal policy in preventing and restraining short-term fluctuations, but the impact of the demographic shift on public finance is less discussed. In the coming decades, the demographic transition will re-shape the economic environment in both developed and developing countries.

Concerning public budgets, demographic changes will modify the structure and the size of public expenditures and revenues. In order to sustain the current welfare-state models in Europe, economic agents must be prepared for long-term reforms in their legislative and taxation systems. With the ever-growing elderly part of population, the current and future labor force could expect increases in their income and indirect taxes, such as value added tax (VAT) and duties. Also, in order to finance pension benefits, the taxation of capital (i.e., tax on capital income, tax on dividends and tax on real estate) will gain in importance. Overall, the extent to which labor and capital are taxed may change in the future with demographic transition.

The most obvious change in public expenditures is predicted in age-related expenditures, such as pensions, medical care and long-term care. Indirectly, the increase

[1] The economic crisis that started in 2008 following the Lehman Brothers bankruptcy filing.

of elderly population influences other budgetary categories such as expenditures for education. It is expected that the increase in the elderly cohort, by decreasing the pupil-to-teacher ratio, will bring into consideration the efficiency of allocating the current level of expenditures for education. Ultimately, public investments can be affected if resource allocation dilemma arises between investments and social protection expenditures. On the other hand, the size and the structure of budget revenues are unlikely to remain equal over the course of time as the population becomes older. The revenues accumulated through the value added tax are affected by changes in aggregate consumer behavior and the revenues from personal income tax are influenced as a result of the shifts in the labor market.

The aim of this paper is to estimate the influence of demographic aging on public finance in 25 EU member states[2] with time observations from 1995 to 2014. We use 4-year intervals to obtain medium-term dynamics corrected for short-run economic fluctuations. The static empirical model used in Callen, Batini and Spatafora (2004), and Yoon, Kim and Lee (2014) is expanded by the introduction of lagged dependent variables and more control variables. Previous studies which included demographic variables considered demographic changes as exogenous, denying the plausible reverse causality in the medium-run between fiscal and demographic variables. Thus, we introduce demographic variables as endogenous in the model. Employing a robust one-step system-GMM estimator, we find evidence of the positive effect of the elderly share on old-age pension expenditure, social protection expenditure, overall government expenditure and revenue. The overall impact on the budget balance is negative as influence is higher in case of government expenditure. On the other hand, the rise in the young population has a significant, and positive, impact only on health expenditure.

The main research question is whether population aging has an impact on certain categories of the public budget, as well as the overall budget balance, in light of the endogenization of demographic variables. The research hypothesis predicts a positive impact of population aging on all fiscal variables, thus following the results of the previous literature, but with more accurate estimates given by the introduction of an enhanced methodology.

The remainder of the paper is organized as follows. Section 2 presents demographic trends and projections in selected EU countries, while fiscal expenditure projections are the subject of section 3. Section 4 reports an overview of the theoretical framework that establishes general equilibrium with the demographic component included. Section 5 provides empirical findings from previous literature investigating the impact of population aging on public finance and the economy. Section 6 contains empirical analysis with the methodology elaborated in subsection 6.1, whereas subsection 6.2 describes the data. Subsection 6.3 presents empirical model and results. Section 7 concludes.

[2] Belgium, Bulgaria, Czech Republic, Denmark, Germany, Estonia, Ireland, Latvia, Lithuania, Sweden, Finland, United Kingdom, Romania, Croatia, Slovenia, Slovakia, Poland, Hungary, Cyprus, Italy, Austria, France, Spain, Portugal, Netherlands.

2 DEMOGRAPHIC PROJECTIONS AND TRENDS

As in other developed countries, the population of the EU has experienced changes in the age structure, with an increasing proportion of elderly population accompanied by a decrease in youth population. However, contemporaneous population aging is the outcome of changes in fertility, mortality and migration that occurred in the past. Therefore, this section will present projections of fundamental demographic determinants that cause the population aging. In addition to that, the projections of indicators considered to be result of past demographic shifts are also displayed.

In 2014, Eurostat published its demographic projections EUROPOP13 for the period 2013-2060, based on the dynamics of key demographic variables: fertility rate, life expectancy and migration flows. The methodology followed "the convergence approach", which assumes that the demographic determinants across all countries of the EU converge in the long run. Total population of the EU is expected to increase from 507 million in 2013 to 523 million in 2060, reaching its peak in 2050 with 526 million inhabitants. However, population growth is different among EU countries as approximately half of them will have lower populations in 2060 than in 2013, whereas other half will experience population growth. The total fertility rate (TFR) indicates the average number of children born to a woman if she lives to the end of her fertile years and bears children according to the age-specific fertility rates in a given year. It is projected to increase in almost all member states, with the exception of France, Sweden and Ireland where it is expected to decrease, whereas in the UK it will remain unchanged. On the aggregate level, the average TFR will rise from 1.59 in 2013 to 1.76 in 2060, which is well below the natural replacement rate of 2.1.

Life expectancy at birth is projected to increase for both males and females over the period 2013-2060 in all member states, with the largest rise in the countries that had the lowest expectancy in 2013 (the Baltic countries, Romania, Bulgaria and Hungary). In the EU as a whole, life expectancy for males will increase from 77.6 years in 2013 to 84 years in 2060, while women are expected to live 89.1 years in 2060, whereas in 2013 life expectancy at birth for females was 83.1 years. However, life expectancy trends are subject of debate among demographers as future medical breakthroughs, changes in social behavior (prevention of obesity and decrease in smoking rates) and the long-term impact of public health programs may influence the realization of current projections. Thus, it is argued that the budgetary impact of population aging may be underestimated.

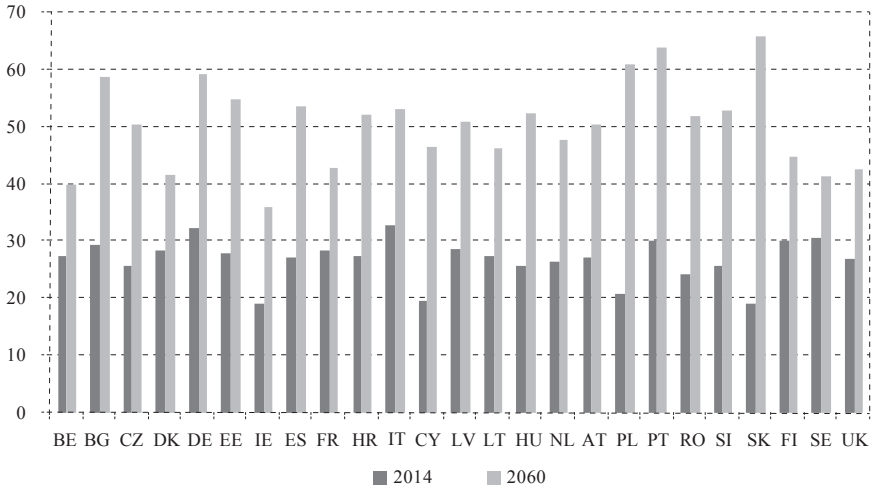
As in previous years, it is expected that the EU will maintain positive net migration flows until 2060. The number of immigrants will increase from 874 000 in 2013 to 1.07 million in 2060 reaching its peak in 2040. Among the EU countries, it is expected that Spain, Italy, UK and Germany will account for the bulk of overall immigration flows in the EU. However, it is important to note that migration flows are highly prone to changes in economic and political situations and therefore are difficult to predict. Optimistic economic projections made in 2013, as

well as the omission of the massive political immigration from the Middle East and Africa caused by conflicts, may result in underestimated figures for both immigration and emigration. In 2013, when Eurostat compiled population projections for the next 50 years, it is highly unlikely that the massive refugee crisis from Syria and other Middle Eastern countries to Europe in 2015 was accounted for. Moreover, migration among EU countries due to asymmetric economic shocks should also be taken in consideration. The economic crisis that started in 2009 resulted in emigration flows from Central and Eastern European as well as Mediterranean countries towards Northern countries of the EU.

The total fertility rate, life expectancy at birth and net migration flows are key demographic indicators and are considered to be the main drivers of population aging. However, the outcome of population aging is captured by dependency ratios, which will be the main subject of this research. While changes in the fertility rate and life expectancy exert influence on economies with lags of several decades, variations in dependency ratios have a more contemporaneous effect on an economy.

Figure 1

Old-age dependency ratio projections (in %)



Source: Eurostat (EUROPOP13).

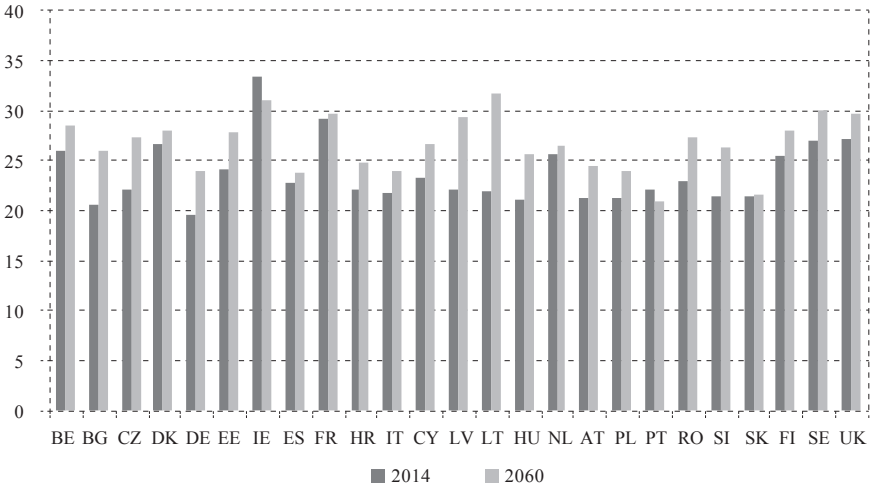
The old-age dependency ratio (henceforth OADR) is the ratio of the population aged 65 or above relative to the population aged 15-64. Figure 1 presents projections of the OADRs for 2014 and 2060. According to projections for selected countries, an average increase of 92.89% over the period 2014-2060 is expected. In 2014, the average OADR was 26.7 and it is expected to increase to 50.4 in 2016, meaning that for every person aged 65 or over there will be approximately two working-age persons. Slovakia will experience the highest growth of 268.84%, as its OADR in 2060 is projected to be 65.9. This implies that for every person older than 65 there will be only 1.51 working-age persons in Slovakia. On the

other hand, Sweden will face the lowest increase among observed countries, projected to be 35.29%.

Young-age dependency ratio (henceforth YADR) is the ratio of the population aged 0-14 relative to the population aged 15-64. As can be seen in figure 2, all countries will experience an average increase of 13.32% in the YADR, with the exception of Portugal and Ireland where decreases of 5.5% and 7.13% respectively will occur. On the aggregate level, the average YADR is expected to rise from 23.72 in 2014 to 26.68 in 2060, which means that YADR will roughly remain constant as there will be approximately four working age persons to every member of the 0-14 cohort over the whole period.

Figure 2

Youth-age dependency ratio projections (in %)



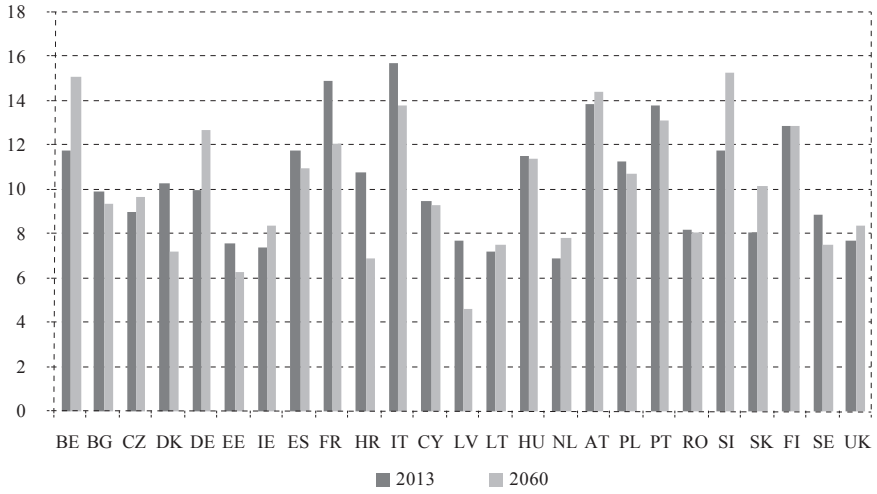
Source: Eurostat (EUROPOP13).

3 FISCAL EXPENDITURE PROJECTIONS

The European Commission (2015) made budgetary projections for health and pension system expenditures based on the EUROPOP2013 demographic projections, which were presented in the previous section. The projections for level of gross public pension expenditure as a percentage of GDP can be seen in figure 3. On the aggregate level, public pension expenditures will increase from an average of 10.34% in 2013 to 10.47% in 2060. However, there are large differences among countries as half of them will face an increase in public pension expenditure, while in the others it will decrease or remain stable. The highest increase will occur in Ireland and Lithuania (35.14% and 30.56% respectively), the largest fall in public pension expenditure over the 2013-2060 period is expected in Latvia and Croatia, with decreases of 29.87% and 27.78% respectively. However, it should be noted that in these two countries, the evolution of public pension expenditure is a result of changes in public pension system parameters rather than demographic factors.

FIGURE 3

Public pension expenditure projections (% of GDP)



Source: European Commission (2015).

The counterintuitive evolution of public pension expenditure in the period 2013-2060 can be explained by the decomposition in four drivers: dependency ratio effect, coverage ratio effect, benefit ratio effect and labor market effects. According to the European Commission (2015), increase in the OADR is the main driver of increase in the level of public pension expenditure and its contribution is larger than the total change over 2013-2060. It is estimated that on the aggregate EU level, the dependency ratio effect increases public pension expenditure by 7.2 percentage points of GDP.

However, the negative effect induced by increase in the OADR is almost completely offset by the other three drivers. Coverage ratio is defined as the number of all pension benefit recipients of a population older than 65 years. In all countries, with the exception of Sweden, a decrease in the coverage ratio is predicted. Reduction in the coverage ratio is mainly attributed to several reforms in public pension schemes across the member states. These reforms took the form of increasing the statutory retirement age, stricter eligibility criteria for early retirement pensions and providing incentives to stay longer in the labor market. The labor market effect exerts a negative impact on public pension expenditure because of the measures aimed at increasing labor supply, which improves the sustainability of public pension systems. Finally, the benefit ratio effect is calculated as the ratio of average pension and average wage, and it reflects the generosity of pension systems. Measures like price indexation decrease the benefit ratio effect, and in all countries of the EU, the benefit ratio effect will decrease the level of pension expenditure in the period 2013-2060.

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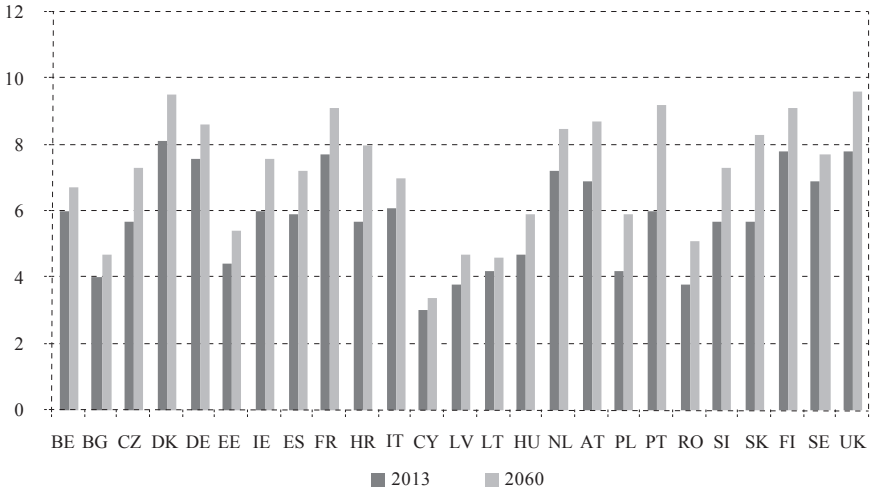
After public pension expenditure, population aging is expected to be manifested in health care expenditure (henceforth HCE) as the elderly population is a relatively larger user of health services than the younger population. However, the level of HCE depends on the supply and demand for medical goods and services. The demand side is represented by the demographic structure and health status of the population and the level of individual and aggregate income, while the supply side is determined by technological progress, accessibility of medical services and institutional framework. The European Commission's (2015) projections for HCE were created in several scenarios simulating different changes in the above mentioned supply and demand determinants.

The demographic scenario captures exclusively the population aging effect on HCE. However, it assumes that per capita spending grows in line with GDP per capita which may underestimate the level of expenditures. Thus, figure 4 presents health care expenditure projections in the "income elasticity scenario" which assumes income elasticity higher than 1 implying that health care is a luxury good. In figure 4 the evolution of HCE over the period 2013-2060 in the income elasticity scenario can be seen. According to the projections, health expenditure is expected to increase in all countries from 2013 to 2060, with an average rise of 24.07%. Portugal and Slovakia are projected to face the highest growth of HCE, amounting to 53.33% and 45.61% respectively. On the other hand, the smallest increase is projected in Lithuania where health care expenditures will rise 9.52%.

FIGURE 4

Health care expenditure projections (income elasticity scenario), % of GDP



Source: European Commission (2015).

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4 THEORETICAL FRAMEWORK

The demographic component was first introduced in the fiscal policy model created by Auerbach and Kotlikoff (1987) who built an overlapping generations (henceforth OLG) model in a dynamic general equilibrium framework for a closed economy. In the modification of the previous model, Auerbach and Kotlikoff (1989) introduced international trade, bequest behavior, technological change and government consumption expenditures depending on the age structure of the population. More recently, many authors simulated general equilibrium models with country-specific parameters based on a small open economy OLG model (Börsch-Supan et al., 2006; Jimeno et al., 2008; Kudrna et al., 2015). In the following paragraphs, a short description of the OLG model for a small open economy is provided.

The economy is characterized by four agents: households, firms, government and international sector. The household sector consists of 75 overlapping generations with children aged 1-20 and adults aged 21-75. Every year, a new-born generation replaces the last dying generation. At the age of 21, a child becomes an adult independent of parental support, and becomes a parent with an exogenously given number of children. A parent supports children from the age of 21 until 41. The individuals in an age cohort have identical preferences and have perfect foresight. Life-time utility function of an adult is the sum of his utility based on the current and the future values of consumption and leisure, his children's utility and legacy per child (bequest motives) distributed equally among children in the last year of life. Maximization of the life-time utility of an adult with the life-time budget constraint results in optimal values of consumption, leisure and bequest motives. Firms are represented with single production sector operating in a perfectly competitive economy. The production is represented by a Cobb-Douglas production function with constant returns-to-scale and homogenous labor input and capital. Firms optimize their profit function by minimizing the costs of labor and capital whose prices are established on primary input markets.

The government consists of the fiscal authority and the social security system. Fiscal authority is represented with four categories of public expenditures, one of which is not age-related (such as national defense) while the other three categories are aimed at three age cohorts, 1-24, 25-64, and 65 and over. The social security system operates with a balanced budget and involves social benefits funded by payroll taxes. Government's inter-temporal budget constraint requires that the present value of government expenditure and public debt equals the present value of tax receipts.

The open economy assumption considers wages and interest rates to be given in the international environment and therefore exogenous. Also, it allows for the difference between an economy's assets and domestic capital stock. If domestic capital stock is lower than an economy's assets, the country is net borrower, which is manifested negatively in its current account. However, Miles (1999) considers an endogenous interest rate in a small open economy as population aging affects nearly all the developed countries.

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General equilibrium is established when all economic agents behave consistently with the current and the future market-clearing prices. Economic agents have perfect foresight, which introduces a correlation between future economic developments and the present conditions of economy. Households optimize labor supply and consumption, while firms make investment decisions based on future behavior of wages and interest rates. Government consumption must satisfy the intertemporal budget constraint.

A different theoretical framework is proposed by Blanchard (1985) who introduces a general equilibrium framework with market imperfections. Its advantage is the inclusion of a less crude demographic structure and consideration of the notion of uncertainty in the expected duration of life, which enables incorporating markets for life annuities. However, its drawback is the assumption of an equal propensity to consume out of cross-generational wealth while omitting the differences in asset ownership across generations induced by differences in inheritance. Empirical studies such as those of Heijdra and Romp (2009) and De la Croix et al. (2013) follow the tradition of Blanchard's model.

5 LITERATURE OVERVIEW

5.1 EMPIRICAL EVIDENCE ON MACROECONOMIC VARIABLES

Apart from the impact on public finance, which will be in the focus of this paper, an increase in the elderly share influences other macroeconomic variables such as GDP per capita, through labor market and savings, and inflation. The correlation between economic growth and population aging is a subject of debate among economists, as empirical evidence depends on the examined growth model (exogenous vs. endogenous) and other behavioral and accounting effects. Prettner (1995) using the endogenous growth model of Romer (1990) finds a beneficial influence of population aging on per capita output growth, whereas in Jones' (1995) framework of semi-endogenous growth model it depends on changes in fertility and mortality.

Hviding and Mérette (1998) detect a negative impact using an exogenous growth model while Fougère and Mérette (1999) extend previous research using an endogenous growth model and find a positive influence on economic growth through increased investment in human capital. Bloom et al. (2011) claim that population aging "poses challenges that are formidable, but not insurmountable". They distinguish between accounting effects, where age-specific behavior with respect to savings and labor supply is immovable, and behavioral effects where the pattern of consumption, saving and labor participation changes with the demographic transition. In the former case, a small decline in income per capita growth is foreseen in the OECD countries as a fall in labor supply per capita occurs. However, taking into account behavioral effects that increase working life and savings, adverse effects of population aging can be tempered. Unclear effects of population aging due to behavioral changes are confirmed in research by Börsch-Supan et al. (2014). Furthermore, Bussolo et al. (2015) provide extensive research into the

main drivers and consequences of the aging process in Europe and Central Asia. The key conclusions are differentiation among various drivers of aging in the world with a decline in the fertility rate being the main factor behind aging in Europe and Central Asia. Also, they point out the opportunities that aging might have for the economy through behavioral changes of firms and workers with the final outcome being more optimistic compared to the more "apocalyptic" economic consequences of population aging.

Furthermore, inflationary implications of an increase in the elderly share are not unanimously determined as Bullard et al. (2012) and Shirakawa (2012) contend that older cohorts prefer higher rate of savings and low steady-state rate of inflation, while Juselius and Takáts (2015) provide empirical evidence of inflationary pressures connected with a larger share of young and old dependent cohorts. Katagiri et al. (2014) separate the final effect of aging on inflation with respect to forces causing the demographic process. Population aging is deflationary if it is induced by an increase in longevity while it is inflationary if it stems from a drop in the birth rate.

5.2 EMPIRICAL EVIDENCE ON FISCAL IMPACT

To the best of the author's knowledge, one of the first studies addressing the issue is that of Auerbach and Kotlikoff (1985). Testing the implications of demographic transition in the case of United States, they predict dramatic hikes in the payroll tax, substantial improvement in the social security system and radical cuts in benefits. Auerbach et al. (1989) arrive at similar conclusions improving their previous model with an open-economy assumption in an investigation of the impact of aging in Japan, Germany, Sweden and the United States. Yashiro et al. (1997) create a general equilibrium model for Japan in order to capture the fiscal implications of demographic aging and propose reforms to mitigate adverse effects. Their results correspond to the theoretical framework as the adverse effect on the public budgets is confirmed. Díaz-Giménez and Díaz-Saavedra (2009) compute a calibrated OLG model for Spanish economy and arrived at the conclusion that the public pension system is unsustainable under the predicted demographic developments.

Kudrna et al. (2015) develop a small open economy, the OLG model with non-stationary demographic paths for Australia. As a result of increases in age-related expenditure, they predict significant adjustments in other government expenditures and taxes to offset the effect of a demographic shift. More interestingly, increases in fertility and immigration are excluded as possible solutions to the fiscal challenges. King and Jackson (2000) in their empirical research for Canada conclude that population aging alone will not pose major challenges to the public finance. However, they stress the importance of government debt reduction in the short-term, which would enable more room-to-maneuver in the long run.

As for the literature investigating the impact of an aging population on specific categories of public expenditure, the most represented is the area of health eco-

nomics. Chawla et al. (1998) conduct a multivariate analysis of health expenditures on annual data for Poland spanning the years from 1960 until 1995. They find a positive and weak correlation between a population aged over 65 and health expenditures. Di Matteo and Di Matteo (1998) using a pooled OLS regression for Canada's provinces suggest that an increase in the proportion of the population over 65 will add on average about 1.3% per year to the real per capita provincial government health expenditures. Di Matteo (2005) expands the previous research by introducing state-level data for the US along with province-level data for Canada. The results confirm the positive impact of an increase in the elderly share in models without time variables. However, when the model includes time variables, which are used as proxy for technological change, a relatively smaller proportion of health expenditures is explained by the age distribution of the population and income per capita.

Prieto and Lago-Peñas (2010) argue that the model specification and econometric technique affect results for determinants of health expenditures. Analyzing data for 17 Spanish regions for the period 1992-2005 and using the OLS regression and fixed effects, they find evidence of positive impact of elderly population on health expenditures. However, they raise concerns over multicollinearity bias when many age cohorts are included. Martín et al. (2011) review the literature on health care expenditure for the period 1998 to 2007. In their sample of 20 studies included, six of them emphasize population aging as the key determinant. However, they concluded that there is no solid empirical evidence in favor of attributing population aging as one of the principal determinants, whereas technological advances, closeness to death and territorial decentralization arise as important factors in explaining development of health care expenditures. Xu et al. (2011) investigate health care expenditure determinants in 143 countries divided into income groups over the period 1995 to 2008. They estimate a static model using fixed effects and a dynamic model with system-GMM estimator. In the static model, an increase in the elderly share has a positive impact only in lower-middle income countries. On the other hand, in the dynamic model for any income group, elasticity of population aging is insignificant.

Lusky and Weinblatt (1998) run the OLS regression for 127 countries to estimate the fiscal pressures of demographic shifts. They find that the share of elderly population has a positive and significant effect on the share of government health expenditure in GDP, while increases in both young and elderly populations increase social welfare expenditure. Labrador and Angona (2003) use a one-step first-difference GMM estimator to test median voter theory on a sample of 26 OECD countries over the period 1970-1997. They confirm the negative elasticity of the elderly share on public services and housing. On the other hand, they conclude there is a positive impact of an increase in the elderly share on social security and health expenditures. The increase in the younger population positively affects health and education expenditures, while reducing military and other expenditures.

Callen, Batini and Spatafora (2004) investigate the impact of demographic aging on several economic performance indicators, among other things, budget balance-to-GDP ratio. They detect a negative correlation between the increase in the share of the elderly population and the budget balance for a sample of 115 countries over the 1960-2000 period using panel fixed-effects regression. Yoon, Kim and Lee (2014) in their analysis for OECD countries and Japan confirm the overall negative impact of demographic aging on budgetary balance since the positive impact of the increase in the elderly share on public expenditures is higher than the positive impact on public revenues. Hondroyiannis and Papapetrou (2008) examine the data for Greece over the period 1960 to 1995 using a vector error correction model and present empirical findings in favor of the long-run positive effect of the aging process on public debt and expenditure, while decreasing the tax revenues. However, Chen (2004) provides evidence in favor of a weak and negative influence of population aging on the budget balance only in the developing countries, while in the developed countries an increase in the elderly population tends to decrease the budget deficit.

6 EMPIRICAL ANALYSIS

6.1 DATA

The sample covers 25 EU member states, Greece, Luxembourg and Malta excluded. Greece is omitted due to the scarce statistical data on public finance and the economic depression. Luxembourg and Malta are not included because of their small populations. Time observations go from 1995 to 2014 with averaged 4-year intervals so the final dataset has 5 time observations. In this manner, the empirical results represent the medium-term dynamics corrected for short-term fluctuations. The overall dataset is unbalanced, with the number of observations ranging from 107 to 125, considering the differences in the length of time-series data among the variables.

Dependent variables are the total public expenditure and revenues, and the size of age-related expenditure categories (pension expenditure, health care expenditure and social protection expenditure[3]). All fiscal variables are expressed as share-of-GDP ratio to account for heterogeneity of levels among the countries. On the right hand side, key standardized coefficients are estimated for the demographic variables, old-age dependency ratio and young age dependency ratio. OADR and YADR are measured as percentages since they are calculated as ratio of two shares. An increase in either of the two variables indicates a rise in the youth or elderly population with respect to the working share.

Other control variables are real labor productivity, unemployment rate, government efficiency, trade openness and crude net migration rate. Trade openness is expressed as the percentage of trade imports and exports in GDP and represents

[3] Social protection expenditure can be divided by function into different categories: old age, sickness and disability, survivors, family and children, unemployment, housing and R&D social protection.

the influence of international trade on a country's economic environment. Rodrik (1998) points out a positive correlation between trade openness and the size of governments, as government spending reduces an economy's external risk.

Economic determinants of fiscal variables are included through real labor productivity per person and the unemployment rate. The former is measured as a base index with base year 2010, and in per person terms. The latter is the share of unemployed over labor force in percentages. Real labor productivity has been included due to its connectivity with GDP per capita and to test whether the productivity growth really is the most significant determinant of health care expenditures. The unemployment rate controls for the economic cycle effects on the public finance.

Crude net migration rate is the difference between the number of immigrants and emigrants with respect to the average size of the population in a given year. It is measured in percentage points with a positive value representing net inflow in the country. The reason for its inclusion in the research is to demystify the effect of migration on certain public finance categories and to test the conclusions of previous literature which suggest migration might be a solution for population aging.

Institutional differences among a wide range of EU countries are controlled with the estimate of government effectiveness. Government effectiveness is one of the six dimensions in World Governance Indicator (WGI) available in the Data Bank (World Bank). It captures perceptions of quality of civil and public services and the level of government's autonomy from political pressures. Also, the quality of policy-making and credibility for implementation of policies are included. Estimates present a country's score on the overall governance indicator in units of a standard normal distribution spanning from -2.5 to 2.5.

Table 1

Summary statistics

Variable	Mean	St. dev.	Min.	Max.	Observations
Public expenditure	45.13	6.43	32.60	60.35	121
Health expenditure	5.75	1.60	1.73	8.63	121
Pension expenditure	7.89	2.51	2.60	13.75	107
Soc. protection expenditure	16.12	4.24	7.60	24.75	121
Public revenues	42.17	6.63	29.90	57.65	124
OADR	23.24	3.66	15.95	32.28	124
YDR	25.38	3.73	19.08	37.93	124
Real labor productivity	91.42	13.30	47.85	109.25	123
Unemployment	9.16	3.77	3.68	24.20	120
Government effectiveness	1.15	0.66	-0.62	2.25	125
Trade openness	99.24	37.47	45.19	209.08	125
Net migration	1.14	4.89	-11.78	20.55	125

Source: Author's calculations.

All variables, except for trade openness and government effectiveness, are downloaded from the Eurostat database. Trade openness and government effectiveness are available in the World Bank Data Bank. In further analysis, most of the variables will remain in percentages to facilitate the interpretation of standardized coefficients, since it does not make sense to take logarithms of percentages. Real labor productivity and estimates of government effectiveness are later converted to natural logarithms. The summary of descriptive statistics for the variables is available in table 1.

6.2 METHODOLOGY

Since it is reasonable to assume that public expenditure and revenues are persistent after controlling for business cycles, as they depend highly on their values in the previous period, the dynamic panel model is preferred over the static model. The persistence of fiscal variables can be explained by the relative stability of major expenditure and revenue categories. It is unlikely that public expenditure categories such as pensions and health care will experience major changes in the short and medium run. Also, public revenues based on the value added tax and income tax revenues depend directly on the wages and overall economic activity, which are proven to be highly persistent. Employing the static model, the valuable information emanating from the lagged value of dependent value is neglected, while the dynamic model allows for the modeling of a partial adjustment mechanism. Moreover, including lagged values of dependent variable on the right hand side of the equation may be crucial for obtaining consistent estimates of other parameters even though the autoregressive coefficient is not of direct interest (Bond, 2002). The linear dynamic model takes the form of:

$$y_{i,t} = \mu + \gamma y_{i,t\text{-}1} + \beta x_{i,t} + \alpha_i + \varepsilon_{i,t} \tag{1}$$

where i denotes number of each observation ($i = 1,\ldots,N$) and t denotes time periods ($t = 1,\ldots,T$). The dependent and independent variables are represented by y and x, and β is a vector of parameters of interest. It is assumed that errors ε are identically and independently distributed over time and individuals with mean value 0 and constant variance. The parameters α_i are unobserved individual-specific time-invariant effect which allows for heterogeneity across the individuals. Since the lagged value of the dependent variable $y_{i,t\text{-}1}$ is serially correlated with α_i, the ordinary least squares (OLS) estimator is biased and inconsistent even when N tends to infinity and T is kept fixed (Nickell, 1981). By taking the first differences, the individual-specific effects are eliminated from the equation, which gives:

$$y_{i,t} - y_{i,t\text{-}1} = \gamma (y_{i,t\text{-}1} - y_{i,t\text{-}2}) + \beta (x_{i,t} - x_{i,t\text{-}1}) + (\varepsilon_{i,t} - \varepsilon_{i,t\text{-}1}) \tag{2}$$

However, the OLS method would still produce inconsistent estimates because the autoregressive term and disturbance measurement, which is now a first-order moving average (MA) process, are serially correlated through $y_{i,t\text{-}1}$ and $\varepsilon_{i,t\text{-}1}$. Anderson and Hsiao (1981) were the first to propose the estimation technique for dynamic

models, where the term $(y_{i,t-1} - y_{i,t-2})$ is instrumented either with the second lag of level $(y_{i,t-2})$ or the second difference of the dependent variable $(y_{i,t-2} - y_{i,t-3})$. The two-stage-least-squares (2SLS) estimator obtained is unbiased as the instruments are correlated with $y_{i,t-1} - y_{i,t-2}$ but uncorrelated with the disturbance term in (2). However, using the second lag of level has the advantage over differences as it requires only two time periods, unlike the other instrument which requires at least three time periods. Moreover, Arellano (1989) shows that using lagged values is preferable because it does not induce a singularity problem and results in smaller variance in parameter values.

In this paper we employ the generalized method of moments (GMM) estimator, developed by Holtz-Eakin et al. (1988), later fashioned and improved by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). These estimators are designed for dynamic models with datasets where *T* is fixed and *N* tends to infinity, and they also address the problem of endogeneity of explanatory variables. Arellano and Bond (1991) argue that the first-difference GMM estimator is more efficient than the Anderson-Hsiao estimator due to the fact that it exploits additional restrictions on the covariance between regressors and the error term (moment restrictions). It is important to emphasize the initial assumption of no serial correlation in the errors. To demonstrate the mechanism of first-difference GMM estimator, let us observe the relationship (2) in t=3 as the first period:

$$y_{i,t-3} - y_{i,t-2} = \gamma\,(y_{i,t-2} - y_{i,t-1}) + \beta\,(x_{i,t-3} - x_{i,t-2}) + (\varepsilon_{i,t-3} - \varepsilon_{i,t-2}) \qquad (3)$$

where y_{i1} is a valid instrument as it is correlated with $(y_{i,t-2} - y_{i,t-1})$ and not interrelated with $(\varepsilon_{i,t-3} - \varepsilon_{i,t-2})$. Following the same logic for the period t=4, we can use both $y_{i,2}$ and $y_{i,1}$ as instruments. If we further expand, it can be observed that at *T*, all valid instruments for $(y_{i,t-2} - y_{i,t-1})$ are the lagged values of dependent variable in levels $(y_{i1}, y_{i2}, \ldots, y_{T-2})$.

In this paper we use the system-GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998) because of its high efficiency compared to the first-difference GMM, as lagged levels are poor instruments for the differences in the first-difference GMM estimator if the variables are highly persistent. System-GMM estimator imposes additional restrictions on the initial conditions process, which allows the introduction of more moment conditions. In the end, it creates a system of two equations – an equation in levels where lagged differences are valid instruments and an equation in first differences with lagged values as instruments.

We choose to use the one-step system-GMM instead of the two-step version, due to the fact that the asymptotic standard errors of two-step system-GMM are severely downward biased in the case of heteroskedasticity across individuals or non-normality (Blundell and Bond, 1998). Even though Windmeijer (2005)

suggested variance correction, which leads to more precise inference, Monte Carlo simulations show a small efficiency gain in using a two-step system-GMM over a one-step version (Bond et al., 2001; and Soto, 2009). In addition, we present robust standard errors which are consistent in the case of heteroskedasticity and autocorrelation within panels. The final specification of dynamic model estimated with a one-step system-GMM will be the subject of several robustness checks.

Arellano and Bond (1991) proposed m_1 and m_2 statistic which test for the first-order and second-order serial correlation in the residuals. We can expect the presence of a first-order serial correlation in the error term; however the GMM estimator is consistent if there is no second-order serial correlation in the error term of the first-differenced equation. Hence, a model is well-specified if the null hypothesis is rejected for m_1 and not-rejected for m_2.

Since the Sargan (1958) test statistic is not robust in case of heteroskedasticity, the Hansen (1982) J-test statistic of over-identifying restrictions will assess the validity of the instruments. If Hansen's test indicates non-rejection of the null hypothesis, moment conditions are valid and the crucial assumption of GMM that all instruments are exogenous is satisfied. However, the Hansen test tends to become weak as the number of moment conditions grows, which gives rise to the problem of instrument proliferation, a topic expanded in the following section.

6.3 EMPIRICAL MODEL AND RESULTS

In order to examine the impact of demographic transition on the fiscal variables, an empirical model similar to the one specified by Callen, Batini and Spatafora (2004) and later replicated in Yoon, Kim and Lee (2014) is used. The model specification is:

$$Y_{i,t} = \alpha_i + \gamma Y_{i,t-1} + \beta Demo_{i,t} + \delta Z_{i,t} + \varepsilon_{i,t} \quad (4)$$

with Y representing one of the fiscal variables and their lagged values, *Demo* is the set of demographic variables capturing population aging and Z is the matrix of control variables. Variable ε is the disturbance term, assumed to be independently and identically distributed with mean value 0 and constant variance. Subscripts i and t denote the country and the time period, respectively. All variables are expressed in percentages, except for real labor productivity and government effectiveness, which are denoted in logarithms.

Inclusion of lagged dependent variable enables us to differentiate between medium-term effects and long-run effects and allows for convergence among countries in shares of specific categories in total expenditure and overall size of public expenditure in GDP. Rewriting equation (4) yields:

$$\Delta Y_{i,t} = \alpha_i + (\gamma - 1) Y_{i,t-1} + \beta Demo_{i,t} + \delta Z_{i,t} + \varepsilon_{i,t} \quad (5)$$

In equation (5), conditional convergence is observed through the coefficient on the lagged dependent variable. If γ is smaller than one, conditional convergence among countries occurs as those countries closer to their steady state levels of public expenditure experience a decrease in the public expenditure growth rate. In all empirical models, the autoregressive coefficient γ is smaller than 0, therefore conditional convergence is confirmed. Furthermore, equation (5) enables the separation of medium-run effects from long-run effects. While medium-run impact is captured by coefficient β, the long-run impact is calculated as $\beta/(1-\gamma)$. This implies that the greater the parameter of persistence (γ), the higher is the long-run effect of the explicative variable on left-hand side variable.

In the process of estimating the dynamic model with system GMM estimator, it is important to address the issue of the endogeneity of explanatory variables, since misspecification will produce biased and inconsistent estimates. One example is the correlation of an autoregressive term with a measurement error, thus the lagged dependent variable is considered to be predetermined. Predetermination implies that the current error term is not correlated with present and past values of the variable, but allows for correlation with future values. In the case of predetermined variables, valid instruments for difference equation are levels dated t-1 and further, while for level equation contemporaneous differences.

Except for the autoregressive term, all explanatory variables will be treated as endogenous. Hence, valid instruments for the difference equation are levels dated from t-2 onwards, whereas differences in t-1 are valid instruments for level equation. Since the unit of time in the panel dataset is a 4-year average, it is reasonable to assume reverse causality between explanatory and explained variables. While considering economic control variables as endogenous is not an issue, since there is simultaneity even in the shorter period than 4 years with explained variable, special attention is given to justification of considering demographic variables as endogenous in the model.

Most of the literature that has investigated the impact of demographic variables on economic variables, or included them as control variables to account for demographic trends, has considered dependency ratios as exogenous. While this assumption may hold if the time dimension consists of consecutive years or quarters, in the medium-run framework it may lead to unreliable estimates. Let us observe two such examples.

Firstly, a government decides to increase the birth rate and it implements a package of policies aimed at providing birth incentives. Such policies are manifested through increase in social protection expenditure (specifically family and child benefits) or public education expenditure. As a response, couples that otherwise would not decide to raise another child, due to the relative decrease in the child raising cost, change their minds. While these measures might not increase the

birth rate in the first year, improvement is possible in the second or third year, which is still in the 4-year interval used in this research.

Secondly, net migration affects both OADR and YADR. Due to economic or political reasons, a country experiences net emigration with emigrants mostly in the fertile age. This reduces both dependency ratios instantaneously in the origin country (since the relative size of elderly and young population increases) and there are consequent changes in the destination country.

The endogeneity of demographic variables was already pointed out by Klein (1990), who argued that, in short-run cyclical models, demographic variables may be roughly considered exogenous, but otherwise it is a poor assumption. Furthermore, he stresses the necessity of including demographic variables in the endogenous category for further research. Unfortunately, most empirical work to date has not followed this recommendation.

It is well known that the first-differenced and system GMM estimators produce instruments which may overfit instrumented variables. As a consequence, estimated coefficients are biased towards the fixed effects estimator and OLS (Roodman, 2009). One of the indicators of instrument proliferation is the perfect p-value of 1 for the Hansen statistic. To overcome instrument proliferation, we employ command *collapse* which reduces the number of moment conditions, resulting in one instrument for each lag distance and 0 as substitution for missing values.

All estimations are computed in econometric software Stata 14.1 using the command *xtabond2* created by Roodman (2009).

Before proceeding with the empirical findings, one should stress that the results may depend on the econometric technique used in data examination. Nagarajan et al. (2016) provide a vast survey of theoretical and empirical studies examining the impact of an aging population on economic growth, with public finance as one of the three channels between population aging and growth. According to their results, the most frequent econometric methods, such as OLS, simulation and panel data, are likely to lead to negative correlation. On the other hand, the use of a dynamic generalized method of moments and other methods more likely generates a positive or no effect.

Results of model estimations are summarized in tables 2, 3, 4, 5 and 6. The fixed effects estimator produces a downward-biased estimate of the autoregressive coefficient while OLS generates an upward bias. A consistent estimate of the autoregressive term in dynamic models estimated with system-GMM should lie between FE and OLS. Therefore, we report the results using all methods. Hausman test checks appropriateness of the random-effects estimator. If the null hypothesis is rejected, as in all our models, the fixed effects estimator is more suitable. The main results are obtained using system-GMM estimator, hence they will be interpreted.

Table 2

Estimates of the old-age pension expenditure dynamic model

	FE	Pooled-OLS	System GMM
Lagged dependent variable	**0.521*****	**0.908*****	**0.835*****
	(0.099)	(0.072)	(0.157)
Old-age dependency ratio	**0.277*****	0.049	**0.174*****
	(0.052)	(0.048)	(0.050)
Young-age dependency ratio	0.009	0.015	0.103
	(0.060)	(0.058)	(0.064)
Log (Government effectiveness)	**-0.902****	-0.263	-0.182
	(0.351)	(0.286)	(0.488)
Log (Real labor productivity)	1.755	-0.319	2.381
	(1.435)	(3.336)	(2.100)
Unemployment	**0.107*****	-0.026	**0.093*****
	(0.028)	(0.062)	(0.034)
Trade openness	-0.009	-0.004	0.003
	(0.007)	(0.005)	(0.009)
Net migration	-0.016	0.016	**0.046****
	(0.019)	(0.037)	(0.021)
Constant	-10.715	1.613	**-17.140***
	(6.903)	(15.131)	(9.205)
Observations	80	80	80
Groups	24	24	24
R^2	0.742	0.909	–
Hausman test	27.62***	–	–
Instruments	–	–	32
m1 test	–	–	0.020
m2 test	–	–	0.472
Hansen test	–	–	0.945

*Notes: ***,** and * denote rejection of null hypothesis at 0.01, 0.05 and 0.1 respectively. Standard errors are in parentheses. R^2 is the coefficient of determination. Number of observations and groups is reported for all estimation methods, with addition to number of instruments for system-GMM. P-values of m1 and m2 test of first and second-order correlation are presented, as well as the p-value of Hansen test.*

Source: Author's calculations.

Estimation results for pension expenditure can be seen in table 2. Parameter estimate of the autoregressive term is significant and has a value relatively close to 1 which implies a strong persistence of pension expenditure. Among the explanatory variables, parameter estimates of OADR and unemployment are significant at the 0.01 level, whereas the standardized coefficient of migration is significant at the 0.05 level.

OADR is expectedly the biggest determinant of pension care expenditure both in the medium run and the long run. In the medium run, a one-percentage point increase of OADR raises pension care expenditureby 0.17 percentage points while in the long-run this parameter rises up to 1.04. Unemployment has a positive impact on pension expenditure as a higher unemployment rate gives an incentive for

early retirement to eligible unemployed people. Those are primarily the oldest cohort of the unemployed with a relatively low possibility of finding jobs compared to the unemployed aged from 25 to 45. In the long run, the estimate of standardized coefficient is 0.555. Regarding migrant flows, a one unit increase in the crude migration rate is robust and positive with value 0.046.

Table 3
Estimates of the social protection expenditure dynamic model

	FE	Pooled-OLS	System GMM
Lagged dependent variable	0.138	**0.937*****	**0.721*****
	(0.110)	(0.040)	(0.091)
Old-age dependency ratio	**0.192****	0.035	**0.227****
	(0.094)	(0.055)	(0.098)
Young-age dependency ratio	-0.022	0.065	0.121
	(0.130)	(0.059)	(0.156)
Log (Government effectiveness)	**-1.622****	**-0.610***	0.539
	(0.690)	(0.341)	(1.020)
Log (Real labor productivity)	2.513	-6.611	4.206
	(2.749)	(4.210)	(3.353)
Unemployment	**0.228*****	-0.041	**0.143****
	(0.062)	(0.060)	(0.057)
Trade openness	-0.003	-0.004	0.006
	(0.015)	(0.005)	(0.013)
Net migration	-0.047	**0.124****	**0.102***
	(0.043)	(0.052)	(0.060)
Constant	-2.898	29.624	-24.856
	(13.710)	(19.239)	(16.283)
Observations	91	91	91
Groups	24	24	24
R^2	0.590	0.805	–
Hausman test	57.79***	–	–
Instruments	–	–	24
m1	–	–	0.047
m2	–	–	0.201
Hansen test	–	–	0.425

Note: See note on table 2.

Source: Author's calculations.

Table 3 contains results for a dynamic model of social protection expenditure. As in case of pension expenditure, the same explanatory variables – unemployment, net migration and OADR – are robust and they exert a positive impact on social protection expenditure. Since social protection expenditure is less persistent than pension expenditure, the long-term effect of significant variables is relatively smaller.

The medium-run impact of OADR is relatively high compared to table 2, bearing in mind that social protection expenditure comprises more categories available for the elderly population. The same reasoning is applicable to the migration rate, as

immigrants have a relatively higher number of benefits available. Negative influence of elderly population on social welfare confirms the findings of Lusky and Weinblatt (1998), and Labrador and Angona (2003). Changes in the young population do not significantly affect the level of social protection expenditure.

Table 4

Estimates of the health expenditure dynamic model

	FE	Pooled-OLS	System GMM
Lagged dependent variable	**0.551***** (0.120)	**1.041***** (0.054)	**0.858***** (0.127)
Old-age dependency ratio	0.049 (0.049)	0.005 (0.021)	0.046 (0.038)
Young-age dependency ratio	-0.018 (0.059)	**0.038*** (0.021)	**0.132**** (0.060)
Log (Government effectiveness)	-0.388 (0.322)	-0.094 (0.118)	-0.466 (0.653)
Log (Real labor productivity)	0.242 (1.256)	0.708 (1.574)	**2.939**** (1.468)
Unemployment	0.015 (0.028)	-0.029 (0.022)	-0.031 (0.045)
Trade openness	0.001 (0.007)	-0.0002 (0.002)	-0.005 (0.005)
Net migration	0.001 (0.020)	-0.009 (0.019)	-0.008 (0.026)
Constant	0.806 (6.276)	-3.926 (7.194)	**-15.722**** (7.137)
Observations	91	91	91
Groups	24	24	24
R^2	0.713	0.919	–
Hausman test	18.68**	–	–
Instruments	–	–	24
m1	–	–	0.051
m2	–	–	0.725
Hansen test	–	–	0.322

Note: See note on table 2.

Source: Author's calculations.

The results for HCE are reported in table 4. Significant determinants of health expenditure are YDR and real labor productivity, while an increase in the elderly share does not affect the level of HCE. A one-percent rise in productivity increases health care expenditure by 2.94 percentage points. The dominant effect of productivity on HCE is in accordance with previous literature attributing to productivity the role of main determinant of health expenditure developments. Counter-intuitively, the expenditure is not affected by the share of elderly population whereas an increase in young population raises it by 0.13 percentage point. The latter confirms U-curve representing relationship between HCE and age groups, as the expenditure for health care is higher for young population compared to the middle-aged population.

TABLE 5

Estimates of the total government expenditure dynamic model

	FE	Pooled-OLS	System GMM
Lagged dependent variable	0.011	**0.850*****	**0.519*****
	(0.112)	(0.051)	(0.120)
Old-age dependency ratio	**0.390***	0.026	**0.501****
	(0.217)	(0.097)	(0.208)
Young-age dependency ratio	-0.062	0.099	0.034
	(0.312)	(0.102)	(0.305)
Log (Government effectiveness)	**-3.607***	-0.662	1.967
	(1.606)	(0.572)	(2.251)
Log (Real labor productivity)	1.986	10.344	5.236
	(6.359)	(7.337)	(6.188)
Unemployment	**0.379****	-0.122	**0.315****
	(0.143)	(0.103)	(0.124)
Trade openness	-0.019	-0.003	0.004
	(0.035)	(0.009)	(0.028)
Net migration	-0.158	0.049	**0.319***
	(0.100)	(0.089)	(0.172)
Constant	27.032	-41.838	-18.788
	(31.747)	(33.334)	(31.378)
Observations	91	91	91
Groups	24	24	24
R^2	0.434	0.750	–
Hausman test	90.83***	–	–
Instruments	–	–	31
m1	–	–	0.027
m2	–	–	0.370
Hansen test	–	–	0.429

Note: See note on table 2.

Source: Author's calculations.

As can been seen from table 5, the overall characteristics of public expenditure model are similar to those of the pension model and the social protection model. However, the main difference is the degree of persistence captured by the parameter γ in the model which is in this model the lowest with the value estimate of 0.501. Thus, the long-term effect of relevant explicative variables is of relatively smaller magnitude. The parameter estimate for OADR is significant at the 0.05 level and positive. In the medium run, a one percentage point increase in OADR increases total public expenditure by 0.50 percentage points.

Coefficients for unemployment and net migration have values of 0.315 and 0.319 at the 0.05 level and 0.1 level respectively. Since parameter estimates of unemployment and net migration are positive and quite similar, a country that faces net emigration can offset the negative influence from medium-run unemployment. However, the parameter of YDR is insignificant, which implies that the rise of the youth population with respect to the working-age population does not produce any

upward or downward pressure on total government expenditure. In a similar manner, trade openness, labor productivity and estimate of government effectiveness are not significant determinants.

The results for total government revenue are displayed in table 6. The autoregressive coefficient with the value 0.757 is higher than in public expenditure which indicates a relatively larger degree of persistence. The impact of net migration and OADR is positive and significant at the 0.01 and 0.05 level respectively. An increase in the elderly population changes positively both public expenditure and public revenue. However, this impact is lower in the case of public revenues and thus overall change in the budget balance is negative, which confirms the results of Callen, Batini and Spatafora (2004), and Hondroyiannis and Papapetrou (2008). It should be noted that results for net migration hold if total population is held constant, since we do not introduce it in the models.

Table 6

Estimates of the total government revenue dynamic model

	FE	Pooled-OLS	System GMM
Lagged dependent variable	**0.213****	**0.933*****	**0.757*****
	(0.102)	(0.036)	(0.037)
Old-age dependency ratio	**0.281****	0.034	**0.326*****
	(0.119)	(0.082)	(0.082)
Young-age dependency ratio	-0.178	-0.009	0.134
	(0.132)	(0.080)	(0.162)
Log (Government effectiveness)	1.118	-0.520	1.177
	(0.893)	(0.421)	(0.936)
Log (Real labor productivity)	-4.283	2.071	4.277
	(3.473)	(5.777)	(3.346)
Unemployment	**0.171****	**-0.171****	0.012
	(0.074)	(0.075)	(0.057)
Trade openness	0.001	-0.005	0.003
	(0.019)	(0.006)	(0.015)
Net migration	0.078	0.035	**0.120****
	(0.054)	(0.071)	(0.050)
Constant	**48.781*****	-5.143	-20.824
	(18.402)	(25.492)	(16.669)
Observations	94	94	94
Groups	24	24	24
R^2	0.671	0.930	–
Hausman test	61.20***	–	–
Instruments	–	–	32
m1	–	–	0.013
m2	–	–	0.828
Hansen test	–	–	0.805

Note: See note on table 2.

Source: Author's calculations.

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7 CONCLUSION

Population aging is a demographic process characterized by a relative increase in the elderly population and longevity accompanied with a decrease in the fertility rate. The demographic projections for the EU made for the period 2013-2060 estimate a rise in total fertility rate but below the natural replacement rate, while a significant increase is expected for longevity of both men and women. As result, in the period from 2013 and 2060 old-age dependency ratio and young-age dependency ratio are expected to increase on average by 92.89% and 13.32% respectively. Budgetary projections of the demographic impact anticipate an increase of public health care expenditure in all countries by an average of 24.07% with respect to the level in 2013. On the other hand, a minor increase in the average pension expenditure is predicted as the main positive factor contributing its growth – increase in OADR – is offset by other components as a result of legislative reforms regarding the public pension system.

The exact impact of population aging on an economy is a subject of debate among economists since there is no unanimous opinion on how it affects GDP per capita, savings and inflation. Previous research, both overlapping generations (OLG) model simulations and other empirical work investigating the fiscal implications of demographic aging argue for a positive impact of aging on total public expenditure and the budget balance. This paper amends the findings of previous literature considering demographic variables endogenous, therefore allowing reverse causality with the fiscal variables.

The dataset consists of observations for 25 EU countries over the 1995-2014 period. In order to obtain the medium-run dynamics, we use a 4-year average resulting in 5 time observations. The dependent variables in the models are public revenues, the selected categories of government expenditure and its overall size. The explanatory variables are a set of demographic variables representing population aging and a group of control variables. Coefficient estimates for the old-age and the young-age dependency ratios are in the focus of this paper. The control variables are unemployment rate, real labor productivity, estimate of government effectiveness, trade openness and crude net migration rate. All right hand side variables, with the exception of the lagged dependent variable, are considered endogenous thus valid instruments are levels dated t-2 and further on.

The most appropriate estimation method for dynamic models, for datasets where T is small and N is large, is the Generalized Method of Moments. We employ the one-step system-GMM developed by Blundell and Bond (1998) for estimation of dynamic models. Final results report standard errors robust on any pattern of heteroskedasticity within individuals. Robustness of all results, which consists of testing for correlation in the residuals and validity of instruments, is satisfied.

The results for the impact of population aging on budget deficit and old-pension expenditures are in line with previous research, whereas they are at variance with

earlier results that consider the share of the elderly population to be a determinant of health care expenditures. They indicate a significant and positive influence of population aging on expenditure for the public pension system and overall social protection. Furthermore, since the positive impact on overall public expenditure is higher than on the total government revenues, the increase in the elderly share is negatively correlated with budget balance. On the other hand, increase in young population is significant only in the health expenditure dynamic model, where it exerts a positive impact, but substantially smaller that of real labor productivity, which is the main determinant of health expenditure. Concerning control variables, unemployment and net migration increase social protection expenditure, and pension expenditure as their subgroup, as well as the overall public expenditure. Net emigration caused by economic circumstances, characteristic of Central and Eastern Europe, might not have negative impact *per se* on public expenditure since it decreases the pressure on expenditures for pension and social protection.

In the process of determining medium-term budgetary frameworks, governments should bear in mind demographic developments. The empirical findings support the need for policy measures aimed at mitigating the impact of population aging. These policies can take the form of active labor market policies with the goal of increasing labor force participation and employment, or legislative reforms which delay entrance in retirement, through penalization of early retirement and stricter criteria for eligibility, and incentives for employment above the threshold age. On the methodological side, we emphasize the importance of considering demographic variables endogenous in economic models, since they are determined by present economic developments, among others public finance.

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Accumulating approach to the life-cycle pension model: practical advantages

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Abstract

In the present study, we make an effort to enhance the practical advantages of the life-cycle pension model. We observe that previous studies are based on a "switching" approach, that is, on the assumption that when a pension fund member reaches a certain age, his accumulated savings are fully switched to another fund with a lower risk profile; we suggest an "accumulating" approach, according to which, at the same age, the member's previously accumulated wealth continues to be invested in the same fund, while his new regular pension contributions start being directed to another (less risky) fund. We consider a hypothetical (average) Israeli employee, analyze two age-dependent life-cycle investment distributions of his pension savings, and perform a comparison between the two approaches to the life-cycle model by employing an estimation-based and a simulation-based technique. The results demonstrate that the "accumulating" approach provides: (i) higher estimated annualized real returns and real accumulated savings; (ii) significantly higher simulated mean and median values of real accumulated savings. Moreover, we document that, though the "accumulating" approach increases the standard deviation of total savings, it does not lead to critically low pension wealth levels even for relatively unfavorable sequences of financial assets' returns. Therefore, we conclude that the "accumulating" approach to the life-cycle model has a potential significantly to increase pension fund members' total accumulated wealth relatively to the common "switching" approach, without significantly increasing the members' risk.

Keywords: investment profitability and risk, life-cycle pension model, pension funds' investment policy, retirement savings

1 INTRODUCTION

The funding of pensions is an issue that has acquired particular relevance in recent years, due to the increased longevity of the population. The prime motivation behind instituting retirement savings plans is to generate adequate income for employees after retirement. The greatest risk for the participants, therefore, is that their retirement nest egg is insufficient to sustain a basic standard of living. The suitability of a retirement savings plan should then be assessed in terms of its ability to generate a minimum level of wealth to fund their basic needs.

A continuously increasing number of plan sponsors offer participants investment options that permit them to avoid investment decision-making. Among such innovations in the financial services marketplace are the life-cycle or target-date funds that have been promoted as a simple solution for retirement savers to be able to invest their savings with a hands-off approach. These funds are one of the most rapidly growing financial products of the last decade. They offer investors the opportunity to exploit time-varying investment rules, having a high allocation to risky assets (like stocks) when the participant is young and gradually switching to less volatile debt securities (like bonds and bills) as the retirement date approaches with the aim to reduce uncertainty in retirement outcomes (e.g., Viceira, 2008).

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The basic idea of a life-cycle investment model is that at the beginning of the accumulation phase it is easier for members to bear riskier investments while for members with fewer years to retirement, security of investment is more important than high returns. Those members who have been in the pension system for a longer period have large savings, so that every fall in the value results in significant losses in the total amount of expected savings. Therefore, within the framework of a life-cycle investment model, for members with a shorter period of accumulation it is recommended that assets be invested in financial instruments with a higher expected risk (for example, equity), which should bring higher long term returns, while for members with a longer period of accumulation it is recommended that assets be invested in financial instruments with lower expected risks (for example, government bonds). Life-cycle funds have gained favor with retirement plan investors in recent years, since they are supposed to offer the best of both worlds – robust portfolio growth in the early years and preservation of the accumulated wealth as the investor comes closer to retirement. Moreover, once enrolled, there is no need for the investors to keep constant watch over their investment strategy. Life-cycle investment strategies are also said to reduce the volatility of wealth outcomes making them desirable to investors who seek a reliable estimate of final pension a few years before retirement (e.g., Blake et al., 2001). On the other hand, some researchers note that these benefits come at a substantial cost to the investor – giving up the significant upside potential of wealth accumulation offered by more aggressive strategies (Booth and Yakoubov, 2000; Byrne et al., 2007).

All the previous studies dealing with the life-cycle model are based on a "switching" principle, or approach, that is, on the assumption that when a pension fund member reaches a certain age, his accumulated savings are fully switched to another fund with a lower risk profile, or in other words, redistributed in new proportions between the major asset classes. This approach has the advantage of enhancing investment security for members who are close to retirement, but on the other hand, does not allow them to benefit from the profit potential that could be associated with investing the considerable amounts of savings accumulated in stocks during the early years of their working career.

In this study, we suggest and analyze an "accumulating" approach to the life-cycle model, according to which at the time when a pension fund member reaches the predetermined age for a change in the proportions of his investments, his previously accumulated wealth continues to be invested in the same (relatively risky) fund and remains there until his retirement, while his new regular contributions are invested in a less risky fund, that is, distributed between the major asset classes in more conservative proportions. In this way, by the retirement date, the pension fund member has his savings invested in a number of pension funds characterized by decreasing risk profiles.

In order to analyze this accumulating approach to pension savings' investments, we consider a hypothetical Israeli employee who works for 40 years earning an aver-

age inflation-indexed salary for his age group and contributes a mandatory proportion of his gross salary to a pension fund that charges management fees at the average rates accepted in Israel. We suggest two age-dependent investment distributions of the employee's pension savings that are in the spirit of the life-cycle model, and perform a comparison between the two approaches to the life-cycle model by employing two alternative techniques: (i) for both approaches, based on historical returns and return volatilities of major asset classes and correlations between their returns, estimate the expected real returns, return volatilities and the employee's total accumulated savings at retirement; and (ii) perform 10,000 simulations of monthly returns for all the asset classes over the employee's working career by randomly drawing respective (for the given asset class) observations from our sample of real historical returns, and as a bottom line of each simulation, obtain the employee's real accumulated savings, according to both approaches.

The results of the analysis demonstrate the advantages of the accumulating approach. First, according to the estimation-based technique, for both investment distributions, the expected annualized real returns and real accumulated savings based on the accumulating approach are appreciably higher than those produced by the switching approach, while the differences in the expected annualized standard deviations are relatively moderate, resulting in significantly higher Sharpe ratios for the accumulating approach. Second, according to the simulation-based technique, when the accumulating approach to the life-cycle model is employed, the mean and the median values of real accumulated savings are significantly higher than those obtained according to the switching approach. Moreover, though the accumulating approach increases the volatility of pension portfolio returns, the value at risk analysis of the accumulated retirement savings' distributions allows us to conclude that it does not lead to critically low pension wealth levels even if relatively unfavorable sequences of financial assets' returns take place over the employee's working career. Thus, the results produced by both techniques are consistent and allow us to conclude that the accumulating approach to the life-cycle model has a potential significantly to increase pension fund members' total accumulated wealth relatively to the common switching approach, without significantly increasing the members' risk.

The rest of the paper is structured as follows. Section 2 briefly reviews the literature dealing with the characteristics and the advantages of the life-cycle pension model. In section 3, we define the accumulating principle of the life-cycle model and formulate our research hypothesis. In section 4, we describe our research methodology. Section 5 provides the empirical tests and the results. Section 6 concludes and provides a brief discussion.

2 LITERATURE REVIEW

According to modern financial theory, a diversified investment portfolio is a key to an efficient risk-return trade-off in the long run. The long-term portfolio returns strongly depend on strategic asset allocation, i.e. on the risk exposure of the in-

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vestment portfolio. This is especially true for retirement savings. Due to their long investment horizon, small differences in the average annual return will result in significant changes of the average financial wealth available at retirement.

The key intuition is that optimal portfolios for long-term investors may not be the same as for short-term investors, because of a different judgement of assets' riskiness, and because of the crucial role played by (non-tradable) human wealth in the investors' overall asset portfolio. The literature on strategic asset allocation provides numerous examples of cases where short-term asset allocation conflicts with longer term objectives, including selection of the risk-free asset, international portfolio diversification, and currency hedging strategies. The short-term volatility of a pension fund's return is not necessarily a good indicator of the pension risk in the case of a member who is at the beginning of his/her active working life and is still 30 years away from retirement. In general, no assurances can be given that competition in the short-term will result in long-term optimal asset allocation (Campbell and Viceira, 2002).

The modern financial theory has proposed that a suitable investment strategy for mitigating the risks in an individually funded system is to allocate assets in the portfolio according to the life-cycle profile of the individual, with exposure to risky assets decreasing over time toward a portfolio composed of less volatile assets at the point of retirement (e.g., Viceira, 2008). This investment strategy involves allocating a high proportion of one's assets to equities during the early period far away from the target date, and gradually shifting to more conservative assets, such as bonds and bills, as the target date draws nearer. It aims to minimize the risk associated with a sudden fall (e.g., because of a global or local financial crisis) in the value of the pension at the very moment when the person "needs" or has planned to start drawing a pension.

The basic idea is that at the beginning of entering the pension system it is easier for members to bear a risky investment because they have fewer accumulated funds, have more time to retirement and are more likely to reduce and compensate for any losses. On the other hand, at the end of the accumulation phase members prefer safer investments against returns, given the large amount of funds accumulated and the short term available to offset potential losses.

A vast body of research has tried to uncover reasons and to explain theoretically why an investor might choose to reduce his equity exposure as he ages. Gollier (2001), and Gollier and Zeckhauser (2002) derive the conditions under which the option to rebalance a portfolio in the future affects portfolio choice. Their results suggest that under specific assumptions about the structure of utility functions, the optimal portfolio share devoted to equity will decline with age. Campbell et al. (2001), and Campbell and Viceira (2002) develop numerical solutions to dynamic models that can be used to study optimal portfolio structure over the life-cycle if shocks to labor income follow specific stochastic processes and investors have

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power utility. Cocco et al. (2005) solve such a model in the presence of non-tradable labor income and borrowing constraints. They find that a life-cycle investment strategy that reduces the household's equity exposure as it ages may be optimal depending on the shape of the labor income profile. Kovacevic and Latkovic (2015) argue that the benefits of implementing life-cycle investments are clearly visible in the total expected amount of accumulated savings from the risk-return perspective. However, those benefits are partially diminished by the fact that the expected risk of a pension fund with the lowest risk profile is not substantially different from the expected risk of a pension fund with a medium risk profile, due to the lack of diversification of the former.

Fachinger and Mader (2007) suggest that decreasing equity exposure with age is the optimal strategy, regardless of the investor's risk preferences or particular life situation. They give two arguments to support this advice: (i) time diversification, and (ii) targeting for large liquidity needs in mid-life. Time diversification means that equity risk is decreased by long holding periods. Over longer periods of time, short-term stock market fluctuations are assumed to be less important. According to this argument, one can "diversify away" the riskiness of stocks simply by extending the holding period. Targeting for liquidity needs is based on the idea that when individuals save towards a specific goal, such as buying a house or paying college tuition fees, having higher equity exposure at the beginning of the savings period will lead to higher average returns. As the target date approaches, investors should decrease risk exposure to minimize the likelihood of missing their target.

Yet another argument supporting the idea of the life-cycle investments is based on savings plan members' risk aversion, which is expected to rise towards the end of the savings accumulation phase, when the pension payments phase begins. In such circumstances it is possible that the optimal structure of investment has a time-dependent dynamic. A number of studies show that the optimal investment strategy of a pension fund should be described with a life-cycle model that allows gradual adjustment of the allocation of a pension fund portfolio in time, i.e. continuous change in the ratio of investment in equity and bonds (e.g., Bagliano et al., 2009; Potocnjak and Vukorepa, 2012).

Gomes et al. (2008) compare popular default choices for defined contribution pension plans in terms of welfare costs. They compare the optimal path obtained through a utility model (unconstrained case) with a "stable value" fund (fully invested in bonds), two fixed portfolio strategies (with fixed proportions in equities of 50% and 60%, respectively) and a life-cycle investment strategy with a deterministic path that equals the optimal allocation in the unconstrained case for an individual with average risk aversion. They show that the life-cycle strategy is the one that results in the smallest welfare loss as compared to the unconstrained case, while at the other extreme, the case with no equity investment leads to significantly lower asset accumulation and consumption over the life cycle, particularly at retirement. Chai et al. (2009) also show that, in the optimal portfolio, equities

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are the preferred asset for young workers, with the optimal share of equities generally declining prior to retirement. In particular, they demonstrate that, when both hours of work and retirement ages are endogenous, the optimal share of equities still decreases with age, but equity fractions are considerably higher over the life cycle than reported in studies that do not allow endogenous retirement.

Viceira (2008) argues conceptually that an individual's total wealth is made up of his financial wealth and human capital, the latter element being measured as the present value of his future income from work. Therefore, changes in the relative importance of these two sources of wealth over the course of an individual's life justify the adoption of investment strategies in which the portfolio is gradually adjusted according to the worker's age (age-based strategies). At the beginning of the working life, it would be more appropriate to take risks in financial investment searching for higher returns. In this case, the human capital would act as an insurance mechanism since, assuming relatively constant labor income, this component may approximate to an implicit investment in bonds. During the approach to retirement age, the objective changes to one of safeguarding financial wealth by investing in safer instruments. In this line of argument, the design of investment strategies of this type also should take the heterogeneity of the members into account. For some workers, it would be more plausible to assume that labor income is uncertain and might therefore not be similar to an implicit holding in bonds.

There are many factors to consider in assessing optimal long-term investment from an individual investor's perspective (e.g., Larraín Rios, 2007). Mitchell and Turner (2010) discuss the importance of capturing human capital risk in models assessing pension performance. Other characteristics influencing optimal portfolios include habit formation, liquidity constraints and idiosyncratic labor income shocks (Bodie et al., 2009).

Antolin et al. (2010) argue that life-cycle strategies that maintain a constant exposure to equities during most of the accumulation period, switching swiftly to bonds in the last decade before retirement, produce better results and are easier to explain. They also observe that the length of the contribution period affects the ranking of the different investment strategies, with life-cycle strategies having a stronger positive impact the shorter the contribution period. Berstein et al. (2013) evaluate different life-cycle investment strategies for different types of workers. They calibrate a pension risk model for the Chilean economy, including measures of life-cycle income, human capital risk, investment and annuitization risks and document that affiliates can gain around 0.85 percentage points in terms of average replacement rates (ratio of the monthly pension payment to the worker's last wage before retirement) in return for an increase of 1 percentage point in risk, measured as standard deviation of replacement rates.

Bikker et al. (2012) examine the effect of pension plan participants' age distribution on the asset allocation of Dutch pension funds, and observe that the latter do take the

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average age of their participants into account. In line with the life-cycle model, a one-year higher average age of active participants leads to a significant and robust reduction in the strategic equity exposure by around 0.5 percentage point. Similarly, Inkmann and Shi (2015) document a negative relationship between the share of risky assets in Australian pension funds and the average fund members' age.

Horneff et al. (2008) compare different standardized payout strategies to show how people can optimize their retirement portfolios. They conclude that annuities are attractive as a stand-alone product when the retiree has sufficiently high risk aversion and lacks a bequest motive. Withdrawal plans dominate annuities for low/moderate risk preferences, because the retiree can gain by investing in the capital market. Chai et al. (2009) also introduce fixed and variable annuities in their model. They show that variable annuities generate higher levels of retirement income flows as compared to fixed annuities.

Governments are not comfortable giving recommendations on portfolio allocation. Although this reluctance is understandable, it is likely to result in individuals making suboptimal portfolio selections and ultimately receiving low levels of pensions in retirement. As documented by Campbell (2006), and Benartzi and Thaler (2007), when unable to make decisions, people tend to rely on simple heuristics that may end up being suboptimal.

3 RESEARCH HYPOTHESIS

Previous financial literature, as described in the previous section, theoretically and empirically demonstrates the advantages of the life-cycle approach to retirement savings' investments. However, all the studies dealing with the life-cycle model are based on the assumption that when a pension fund member reaches a certain age, his accumulated wealth is fully switched to another fund with a lower risk profile, that is, having a smaller proportion of assets invested in equity and a greater proportion of assets invested in bonds and bills. In other words, the whole amount of the member's pension savings is redistributed in new proportions between the major asset classes. This switching approach to the life-cycle model has a clear advantage of enhancing investment security for members who are close to retirement and definitely not willing to put their total, and considerable, wealth at risk. On the other hand, in order to get this enhanced security, the members have to sacrifice the significant profit potential associated with equity investments (e.g., Basu and Drew, 2009).

In this respect, we propose a kind of "golden mean" solution. We suggest an accumulating approach to the life-cycle model, in which at the time point when a pension fund member reaches the same (switching) age as above[1], his previously accumu-

[1] Obviously, the correct choice of a pension fund member's age when he switches between the funds with different risk profiles should be performed is a crucially important point in maximizing the member's final savings. Numerous researchers and pension planners have already analyzed and continue to analyze this matter, and there is probably no universal decision in this respect. However, the goal of our study is not to detect the ultimately correct age for the switch to take place, but rather to compare the performance of the standard "switching" approach to the life-cycle model with that of the "accumulating" approach we suggest, while keeping all the other factors, including the switching age, constant.

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lated wealth *continues* to be invested in the same fund, while his *new* regular pension contributions start being directed to another fund with a lower risk profile. In other words, the wealth accumulated prior to the switching date remains in the same (more risky) fund until the member's retirement, while his new contributions are distributed between the major asset classes in more conservative proportions. In such a way, at the retirement date, the member actually has his savings invested in a number of pension funds distinguished by their risk profile. These funds may be managed by the same or by different investment companies and their total number is equal to the number of times during the member's working career when the switch between the funds takes place. It should be noted that the accumulating approach does not make the operation of pension funds more complicated or more costly, compared to the switching one, since from each investment company's point of view, the number of funds distinguished by their risk profile it operates does not change and remains equal to the number of times when the switch between the funds is performed during the fund member's working career. The only thing that is changed is that each member's savings are invested in several pension funds and not just one fund. For the same reason, potentially, if a member decides to transfer his savings to another investment company with another investment distribution, the accumulating approach does not cause any additional difficulties.

We hypothesize that employing this accumulating approach to the life-cycle model may significantly increase the pension fund members' total accumulated wealth relatively to the common switching approach, without significantly increasing the risk. We test this hypothesis below.

4 DATA DESCRIPTION AND METHODOLOGY

Our study is based on the mandatory pension insurance system in Israel. The system operates according to the defined contribution where an employee and his employer make monthly contributions to the employee's pension account, which is managed by a pension fund operated by one of the private investment companies. The employee has a right to choose the pension fund and to transfer his savings to another fund as many times during his working career as he wants. The total wealth accumulated in the account by the employee's retirement date determines the amount of the monthly pension payments he receives after retirement.

Realizing the practical advantages of the life-cycle pension model, on February 17, 2015, the Israel Ministry of Finance passed a resolution obliging all the pension funds in Israel to use programs consistent with the life-cycle model as default options for their members, starting on January 1, 2016. This important decision is supposed to change the previous state of affairs, when the employees' pension savings were distributed between asset classes in constant (and quite conservative) proportions, to ensure continuous adjustment of asset allocations towards retirement, and therefore higher expected returns, at least for the majority of Israeli employees. Yet, the resolution directs all pension funds to adopt the standard switching approach to the life-cycle model, that is, at the end of each age span, to

transfer the whole amount of each employee's pension savings to another fund with a lower risk profile. In this context, the major goal of our study is to suggest, to test, and to discuss the accumulating approach to asset allocation, as a kind of "fine-tuning" for the life-cycle model.

For the purposes of our research, we analyze a hypothetical employee who is saving for retirement. The retirement age in Israel is 67 for men and 62 for women, so for the sake of convenience, we assume that the employee is a man, whose working career lasts 40 years, or 480 months (from the age of 27 till the age of 67). The employee earns an average gross salary for men workers in Israel. The employee's monthly salary changes with his age, according to the data reported by the Israel Central Bureau of Statistics for 2015, as shown in table 1.

Table 1

Average monthly gross salary for male workers in Israel, by age groups, according to the Israel Central Bureau of Statistics

Age group, years	Average monthly gross salary per worker, NIS
25-34	8,459 ± 436.3
35-44	12,950 ± 555.8
45-54	13,588 ± 781.6
55-64	13,904 ± 1,261.6
65+	9,777 ± 1,511.0

We assume that within each age group, the salary continuously grows by the same amount per year. For example, if for the age group 35-44, the reported monthly gross salary is 12,950±555.8 New Israeli Shekels (NIS)[2], then we assume that at the age of 35, the employee earns 12,950-555.8=12,394.2 NIS per month, while at the age of 44, he earns 12,590+555.8=13,145.8 NIS per month, the monthly salary y growing linearly during this 10-year period by 555.8/5=111.2 NIS per year. In addition, the employee's salary is inflation-indexed, that is, increases at the same rate as the Consumer Price Index (CPI)[3]. In other words, for each given age, the real (in terms of 2015) salary remains constant over time.

According to the regulation issued by the Israel Ministry of Finance, at the end of each month, the employee contributes 5.5% of his gross salary to his retirement savings account at a pension fund, while his employer contributes 6% of the employee's gross salary to the same account[4]. We assume that the pension fund charges management fees at the average rates that were employed in Israel in 2015, namely, 3.4% on the regular monthly contributions and 0.3% per year on the accumulated wealth.

[2] The official exchange rate for December 31, 2015 was 1 US Dollar=3.902 NIS.
[3] Average inflation rate in Israel over years 2000-2015 was 1.6036% per year (or 0.1327% per month).
[4] In practice, in addition to the 6% of the employee's gross salary, employers in Israel contribute 8.33% as a "compensation" component. But since the employee may withdraw this savings component after leaving a company, we choose not to consider this additional contribution in our analysis.

The employee's savings are invested by the pension fund in four major asset classes:

1) stocks,
2) corporate bonds,
3) government bonds,
4) pension-oriented (PO) bonds – a special category of Israeli government bonds sold only to pension funds and providing a fixed CPI-linked (real) annual yield of about 4.8%. Because of their relatively high, risk-free and inflation indexed yield, PO bonds are considered a privilege of the Israeli pension funds, and they are allowed to invest 30% of their total portfolio wealth in this category of bonds.

For our empirical analysis, we employ actual monthly returns for the four asset classes on the Tel Aviv Stock Exchange (TASE) over the years 2000-2015[5]. The benchmark indexes we use for the respective asset classes are as follows:

1) Stocks – we employ the TA-100 Index consisting of the 100 shares with the highest market capitalization. The composition of the index is updated twice a year.
2) Corporate bonds – we construct an equally-weighted portfolio of the two indexes:
   - Tel Bond-60 Index consisting of the 60 corporate bonds, fixed-interest and CPI-linked, with the highest market capitalization. As of December 31, 2015 the mean duration of the bonds making up the Index was 8.45 years. 48 out of 60 bonds had a high grade credit rating[6], while the rest of the 12 bonds had an upper medium grade credit rating.
   - Tel Bond-Shekel Index consisting of all corporate fixed-rate (unlinked) bonds. On December 31, 2015 the Index consisted of 84 bonds with a mean duration of 6.27 years. 42 out of 84 bonds had a high grade credit rating, 36 had an upper medium grade credit rating, and 6 had a lower medium grade credit rating.
3) Government bonds – we employ the Government Bonds General Index which includes all the government bonds traded on TASE. On December 31, 2015 the Index consisted of 13 CPI-linked and 18 unlinked bonds with mean duration of 7.18 years.

Table 2 comprises expected (average historical) annualized *real* returns and return volatilities (standard deviations) for the asset classes. It should be noted that real returns for stocks and corporate and government bonds are calculated by deducting actual monthly inflation rates from actual nominal monthly returns, while real annual return of 4.8% for PO bonds is provided by the definition of this asset class.

[5] This sampling period is chosen, as the official price and return data for all the asset classes are available on TASE website (www.tase.co.il) since 2000. Moreover, the use of these data may be justified by the fact that return and volatility rates we employ (reported in table 2) are comparable to (or perhaps slightly higher than) the respective rates usually reported for the developed markets over much longer periods (e.g., Dimson et al., 2014).

[6] According to Maalot credit rating agency estimates.

Table 2

Expected returns and return volatilities of major asset classes, annualized percent

Asset class	Expected real return	Expected standard deviation
Stocks	5.21	17.85
Corporate bonds	2.42	9.47
Government bonds	1.86	7.35
PO bonds	4.80	0.00

Table 3 reports the correlations between the returns of the four major asset classes. Since the returns of PO bonds are fixed and constant, they are uncorrelated with other asset classes' returns. The correlations between stock and bond returns are positive, but quite moderate, leaving some space for portfolio risk diversification.

Table 3

Correlations between the returns of major asset classes

Correlation coefficients	Stocks	Corporate bonds	Government bonds	PO bonds
Stocks	1	0.24	0.18	0
Corporate bonds	0.24	1	0.35	0
Government bonds	0.18	0.35	1	0
PO bonds	0	0	0	1

The employee's retirement savings are distributed between the asset classes in the spirit of the life-cycle model, that is, the proportion invested in stocks decreases with the employee's age, while the proportion invested in bonds, and especially in government bonds, simultaneously increases. We assume two alternative wealth distribution paths: the first one (MF investment distribution), presented in table 4, is based on age spans suggested by the Israel Ministry of Finance, while the second one (IC investment distribution), depicted in table 5, is consistent with the characteristics of a life-cycle pension fund proposed to the public since 2012 by one of the Israeli investment companies[7].

Table 4

Investment distribution between asset classes by employee's age suggested by the Israel Ministry of Finance (MF investment distribution), in %

Asset class	Proportion of total wealth invested, by employee's age		
	27-49	49-59	59-67
Stocks	40	25	0
Corporate bonds	20	25	30
Government bonds	10	20	40
PO bonds	30	30	30

[7] Note that in both investment distributions, the proportion of PO bonds remains similar (30%) for all age groups. As mentioned above, due to their relatively high, risk-free yield, these bonds are considered a privilege of the Israeli pension funds, so we may assume that the pension funds will hold them in the highest possible proportion, which is 30%.

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TABLE 5

Investment distribution between asset classes by employee's age, suggested by one of the investment companies (IC investment distribution), in %

Asset class	Proportion of total wealth invested, by employee's age							
	27-32	32-37	37-42	42-47	47-52	52-57	57-62	62-67
Stocks	48	45	40	37	25	15	9	1
Corporate bonds	16	17	18	20	24	25	26	29
Government bonds	6	8	12	13	21	30	35	40
PO bonds	30	30	30	30	30	30	30	30

In order to test our research hypothesis, for both investment distributions, we calculate the employee's retirement savings based on both accumulating and switching approaches to the life-cycle model. We perform our empirical analysis employing two alternative techniques:

First, we estimate the expected real returns, return volatilities and total accumulated savings based on historical returns and return volatilities of the asset classes and the correlations between their returns. That is, for each given investment portfolio in each given period, we calculate[8]:

$$R_p = \sum_i w_i R_i \quad (1)$$

$$\sigma_p^2 = \sum_{i,j} w_i w_j \sigma_i \sigma_j p_{ij} \quad (2)$$

where w_i represents the share of an asset class in the portfolio, R_i and σ_i are its expected return and expected volatility, respectively, and p_{ij} is the expected correlation between the *i*th and *j*th asset classes, and furthermore, estimate expected returns and volatilities for both approaches to the life-cycle model and for both investment distributions. The total real accumulated savings are estimated by employing the expected (average historical) real returns, recalculated to monthly terms, on the series of the employee's monthly pension contributions over his whole working career. The results are shown in subsection 5.2.

Second, we simulate monthly returns for the four asset classes over the employee's 40-year working career by randomly drawing respective (for the given asset class) observations from our sample of historical returns. We perform 10,000 simulations employing actual real monthly returns for each asset class[9]. As a bottom line of each simulation, we obtain the employee's real accumulated savings. The results are analyzed in subsection 5.3.

[8] This approach is similar to the one employed by Kovacevic and Latkovic (2015).

[9] For stocks and corporate and government bonds, real monthly returns are obtained by deducting actual monthly inflation rates from actual nominal monthly returns, while for PO bonds, real monthly returns are fixed at the level of 4.8% per year (0.3915% per month).

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5 RESULTS

5.1 ACCUMULATING VERSUS SWITCHING APPROACH: ASSET ALLOCATION BY THE EMPLOYEE'S AGE

First of all, we note that while with the traditional switching approach the asset allocation proportions for different age spans are straightforward and predefined at the beginning of the employee's working career, this is not the case for the accumulating approach, which is in the focus of our analysis. The older the employee, the greater the number of funds (distinguished by their risk levels) in which his savings are invested. The employee's pension contributions accumulated in relatively more risky funds continue to yield returns, which are not constant and may affect the proportions of asset classes in the employee's total investment portfolio.

Therefore, before proceeding to the analysis of the employee's accumulated savings, we take a closer look at the time trends of asset allocation proportions for both approaches. Tables 6 and 7 comprise proportions of the asset classes in the overall employee's investment portfolio, by his age (including the age of retirement), for MF and IC investment distributions, respectively.

TABLE 6

Age-dependent investment distribution between asset classes for the switching and accumulating approaches (MF investment distribution), in %

Panel A: Switching approach

Asset class	Proportion of total wealth invested at employee's age			
	27	**49**	**59**	**67**
Stocks	40	25	0	0
Corporate bonds	20	25	30	30
Government bonds	10	20	40	40
PO bonds	30	30	30	30

Panel B: Accumulating approach, based on return estimation

Asset class	Proportion of total wealth invested at employee's age			
	27	**49**	**59**	**67**
Stocks	40	40	37.8	30.5
Corporate bonds	20	20	21.1	23.3
Government bonds	10	10	11.1	16.2
PO bonds	30	30	30	30

Panel C: Accumulating approach, based on simulation

Asset class	Average (over 10,000 simulations) proportion of total wealth invested at employee's age			
	27	**49**	**59**	**67**
Stocks	40	40	37.7	30.4
Corporate bonds	20	20	21.3	23.4
Government bonds	10	10	11	16.2
PO bonds	30	30	30	30

Table 7

Age-dependent investment distribution between asset classes for the switching and accumulating approaches (IC investment distribution), in %

Panel A: Switching approach

Asset class	Proportion of total wealth invested at employee's age								
	27	**32**	**37**	**42**	**47**	**52**	**57**	**62**	**67**
Stocks	48	45	40	37	25	15	9	1	1
Corporate bonds	16	17	18	20	24	25	26	29	29
Government bonds	6	8	12	13	21	30	35	40	40
PO bonds	30	30	30	30	30	30	30	30	30

Panel B: Accumulating approach, based on return estimation

Asset class	Proportion of total wealth invested at employee's age								
	27	**32**	**37**	**42**	**47**	**52**	**57**	**62**	**67**
Stocks	48	48	47.2	45.6	44.2	40.1	35.3	28.4	26.1
Corporate bonds	16	16	16.3	16.8	17.2	19.2	21.6	24.7	25.5
Government bonds	6	6	6.5	7.6	8.6	10.7	13.1	16.9	18.4
PO bonds	30	30	30	30	30	30	30	30	30

Panel C: Accumulating approach, based on simulation

Asset class	Average (over 10,000 simulations) proportion of total wealth invested at employee's age								
	27	**32**	**37**	**42**	**47**	**52**	**57**	**62**	**67**
Stocks	48	48	47.3	45.7	44.4	40.4	35.8	29.2	26.5
Corporate bonds	16	16	16.3	16.8	17.1	19.1	21.4	24.4	25.4
Government bonds	6	6	6.4	7.5	8.5	10.5	12.8	16.4	18.1
PO bonds	30	30	30	30	30	30	30	30	30

A number of things may be noted in an analysis of the tables:

- Investment allocations for the switching approach in tables 6 and 7 are similar to those presented in tables 4 and 5, respectively. These proportions are defined by the Ministry of Finance and the investment company, respectively, and do not depend on the returns yielded by the assets in previous periods. At each switching age, the entire amount of the employee's savings is automatically transferred to another fund with a lower risk profile.
- At the beginning of the employee's working career, the allocation proportions according to the accumulating approach (for both techniques of asset return estimation) are similar to those according to the switching approach. The reason is that at the age of 27, the employee's savings are in any case invested only in one fund. Moreover, at the beginning of the second age span (49 for MF and 32 for IC investment distribution), the allocation proportions with the accumulating approach remain unchanged, since at this age, the entire amount of previously accumulated savings continues to be invested in the first (the most risky) fund.
- For the accumulating approach, the allocation proportions based on return estimation are quite close to the average allocation proportions based on simulation, which may be explained by the fact that the average expected

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returns employed in the estimation are based on the same historical sample of returns used for the simulation, as well as by the fact that PO bonds yielding fixed real returns make up a considerable (and constant) part of all the investment portfolios we are dealing with. The reason for the slight differences in the proportions is that the assets' historical returns are not exactly normally distributed.

- With the accumulating approach (for both techniques of asset return estimation), the proportions of the more risky asset (stocks) decrease and the proportions of the less risky assets (corporate and government bonds) increase with the employee's age. Yet, compared to the switching approach, the proportions of stocks held in accordance with the accumulating approach are higher, the differences increasing with the employee's age. For both approaches, the proportion of PO bonds remains constant (30%) throughout the employee's working career, since, notwithstanding the risk profile, all the age-dependent funds hold the maximal possible proportion of this privileged asset.
- With the accumulating approach (for both investment distributions and for both techniques of asset return estimation), asset allocations continuously change with the employee's age, and at age of 67 significantly differ from those set at age of 27, though the respective differences are smaller compared to those obtained with the switching approach. Therefore, both approaches preserve the major advantage of the life-cycle model over a "non-life-cycle" model (keeping the asset proportions constant for all ages), namely, the higher investment security for the employees who are close to retirement.[10]

5.2 ACCUMULATING VERSUS SWITCHING APPROACH: RETURNS AND SAVINGS ESTIMATION

As detailed in section 4, we perform a comparison between the two approaches to the life-cycle model employing two alternative techniques. First, based on historical returns, return volatilities and correlations of the asset classes, by equations (1) and (2), respectively, we estimate the expected real returns and return volatilities over the accumulation period. Furthermore, we estimate total real accumulated savings by applying the expected (average historical) real returns, recalculated to monthly terms, on the series of the employee's monthly pension contributions over his whole working career.

Tables 8 and 9 depict the estimated measures obtained according to both approaches, for MF and IC investment distributions, respectively.

[10] Though the goal of our study is not to advocate the life-cycle model in general, but rather to compare two potential approaches to the model, we have repeated our empirical analysis, using both investment distributions and both techniques of asset return estimation, for a pension fund that keeps all asset allocations constant throughout the employee's working career. The results (available upon request from the authors) demonstrate that employing this "non-life-cycle" model of investment distribution leads to significantly higher standard deviations of returns compared to those reported in tables 8 to 11 for the two approaches to the life-cycle model (for example, with MF investment distribution we obtain an estimated standard deviation of 9.29% and a simulated standard deviation of 1,312,581 NIS), the differences in the expected returns being much less dramatic.

Table 8

Estimated expected real returns, return volatilities and employee's total accumulated savings (MF investment distribution)

Asset allocation approach	Expected real return, annualized %	Expected standard deviation, annualized %	Expected real accumulated savings, NIS
Accumulating	4.18	5.76	1,129,749
Switching	3.82	5.43	1,018,440

Table 9

Estimated expected real returns, return volatilities and employee's total accumulated savings (IC investment distribution)

Asset allocation approach	Expected real return, annualized %	Expected standard deviation, annualized %	Expected real accumulated savings, NIS
Accumulating	4.16	5.61	1,112,605
Switching	3.79	5.32	987,805

First, as hypothesized, the expected annualized real returns based on the accumulating approach make up 4.18% (4.16%) with MF (IC) investment distribution, compared to 3.82% (3.79%) produced if the switching approach is adopted. These real expected returns transform to the employee's total real accumulated savings of 1,129,749 (1,112,605) NIS for the accumulating approach, compared to 1,018,440 (987,805) NIS for the switching approach. It is worth noting that if we assume a life annuity rate of 200[11], then the employee's replacement rate[12] according to the accumulating approach is expected to be 0.500 (0.493), which is quite an improvement relative to 0.451 (0.438) made up according to the switching approach.

Importantly, expected annualized standard deviations make up 5.76% (5.61%) for the accumulating approach and 5.43% (5.32%) for the switching approach. If we assume that the Bank of Israel annualized real rate of interest is 2.16%[13], then we obtain the Sharpe ratio of 0.36 (0.35) for the accumulating and 0.30 (0.30) for the switching approach, making up a difference of 20% (16.7%) between the risk-adjusted performance measures of the two approaches. Therefore, we may argue that though due to the higher proportions of the risky asset in the investment portfolio, the estimated volatility is higher if one decides to employ the accumulating approach, the differences in the expected standard deviations do not look dramatic. The reasons for these slight differences are the relatively moderate and gradually increasing differences between the two approaches in what concerns

[11] At the moment, the life annuity rates in Israel are about 180-190, but we may expect them to grow, at least moderately, following the life expectancy growth.

[12] Defined as a ratio of a pension fund's member monthly pension payment to his expected last salary.

[13] Over our sampling period of 2000 through 2015, the Bank of Israel average annualized nominal rate of interest was 3.7957%, while average annualized inflation rate in Israel was 1.6036%.

the proportions in which risky assets are held, as well as the constant (and equal) proportions in which PO bonds are held in both approaches. One more thing to note is that if we take a look at the portfolios' composition at investor age of 67, then, as clearly arises from tables 6 and 7, the portfolio constructed following the accumulating approach is more risky than that built following the switching approach. Yet, the major goal of our study is to look for potential ways of maximizing the total amount of the employee's savings *at* retirement, or in other words, ways of maximizing the risk-adjusted expected returns on his pension savings portfolio over his working career, and the accumulating approach is the one that allows us to make some progress in this direction. In order to ensure the employee's pension payments *after* retirement, certain steps may be taken for decreasing his retirement portfolio risk. Maximizing pension portfolio returns after retirement while keeping the risk level reasonably low is an interesting topic for further research.

5.3 ACCUMULATING VERSUS SWITCHING APPROACH: SIMULATION RESULTS

Our second technique of comparison between the two approaches to the life-cycle model is based on a simulation. As explained in section 4, for the employee's 40-year (480-month) working career, we perform 10,000 monthly return simulations by randomly drawing observations from our sample of historical real monthly returns[14]. These simulated returns determine the performance of the employee's pension investment portfolio, so that at the end of each simulation, we obtain the total amount of his real accumulated savings.

Tables 10 and 11 report, for MF and IC investment distributions, respectively, the mean, median and standard deviation of the employee's real accumulated savings over the sample of 10,000 asset return sequence simulations, employing both accumulating and switching approaches to asset allocation. In addition, the tables present the mean and median differences between the wealth accumulated according to each of the two approaches, and the t-statistics for the respective differences.

TABLE 10

Simulated employee's real accumulated savings (MF investment distribution)

Statistic	Accumulating approach	Switching approach	Difference (t-statistic)
Mean, NIS	1,142,714	1,029,120	***113,594 (23.15)
Median[a], NIS	1,113,358	1,007,567	***105,791 (22.36)
Standard deviation, NIS	914,124	847,963	

[a] We employ Wilcoxon/Mann-Whitney test for median equality.

*Asterisks denote two-tailed p-values: ***$p < 0.001$.*

[14] Alternatively, in order to preserve correlations between asset classes, we have performed 10,000 monthly return simulations by randomly drawing months, rather than individual observations, from our working sample, and subsequently employing real monthly return rates contemporaneously registered for all the asset classes during the respective months. The results, available upon request from the authors, are qualitatively similar to those reported and discussed in subsections 5.3 and 5.4.

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Table 11

Simulated employee's real accumulated savings (IC investment distribution)

Statistic	Accumulating approach	Switching approach	Difference (t-statistic)
Mean, NIS	1,114,581	997,792	***116,789 (24.81)
Median[a], NIS	1,093,267	984,187	***109,080 (24.12)
Standard deviation, NIS	905,358	846,837	

[a] *We employ Wilcoxon/Mann-Whitney test for median equality.*

*Asterisks denote two-tailed p-values: ***p < 0.001.*

The results in both tables corroborate our research hypothesis. As expected, when the accumulating approach to the life-cycle model is employed, suggesting that higher proportions of wealth are invested in stocks, the standard deviations of the total amounts of savings are higher, but on the other hand, and in a more pronounced way, for both investment distributions, the mean and the median values of real accumulated savings are also higher than those obtained according to the switching approach. These mean (median) differences make up 113,594 (105,791) NIS, according to MF investment distribution, and 116,789 (109,080) NIS, according to IC investment distribution, all the differences being highly statistically significant.

Thus, the results based on the simulation are consistent with those based on return estimation in what concerns the superiority of the accumulating approach. Moreover, the simulation technique allows us to establish that the differences in the accumulated savings between the two approaches are statistically significant, which implies that the relative advantage of the accumulating approach in terms of returns "outperforms" its relative disadvantage in terms of risk. Another observation arising from the simulation results is that the differences between the two approaches are slightly higher for IC investment distribution, suggesting that the relative advantages of the accumulating approach are more pronounced the more times asset redistribution takes places during the employee's career.

5.4 ACCUMULATING VERSUS SWITCHING APPROACH: THE EFFECT OF RISK

In previous subsections, we have shown that employing the accumulating approach to asset allocation leads to higher expected values and significantly higher simulated mean and median values of the accumulated retirement savings. Yet another result is that the standard deviation of these values increases as well. We have already established that the increase in the volatility is quite moderate, but because of the major importance of the risk component in any analysis concerned with pension savings, in this subsection we take a closer look at the downside potential of the employee's accumulated savings. Adopting the approach used by Scheuenstuhl et al. (2010), we calculate the following measures that deal with the issue of risk from different points of view:

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1) Value at risk of the accumulated savings distribution on a 95% confidence level ($VaR_{5\%}$): this risk-measure describes the result that could happen under very unfavorable circumstances. The measure represents the highest value of the accumulated savings achieved by the 500 (out of 10,000) worst scenarios. Thus, in 95% of the scenarios, the values of the accumulated savings are higher than this risk level. This risk-measure is directly computed by identifying the 5% percentile value of the empirical accumulated savings distribution, that is:

$$VaR_{5\%} = \inf \{x, P(AccSav < x) \geq 5\%\} \tag{3}$$

where: *AccSav* stands for the value of real accumulated savings at retirement.

It is worth noting that since we seek to maximize the value of the accumulated savings, with this specification of the value at risk, the higher the VaR the lower the risk.

2) Conditional value at risk of the accumulated savings distribution on a 95% confidence level ($CVaR_{5\%}$): this risk-measure provides the expected value of the accumulated savings in the 5% worst cases, that is:

$$CVaR_{5\%} = E[AccSav \mid AccSav < VaR_{5\%}] \tag{4}$$

Once again, since our goal is to maximize the value of the accumulated savings, we may note that a high $CVaR_{5\%}$ is better than a lower $CVaR_{5\%}$. Obviously, based on the definitions, $CVaR_{5\%} \leq VaR_{5\%}$ holds.

Tables 12 and 13 report these risk measures for MF and IC investment distributions, respectively.

Table 12
Simulated employee's real accumulated savings risk measures (MF investment distribution)

Statistic	Accumulating approach	Switching approach
$VaR_{5\%}$, NIS	879,391	876,832
$CVaR_{5\%}$, NIS	848,257	855,671

Table 13
Simulated employee's real accumulated savings risk measures (IC investment distribution)

Statistic	Accumulating approach	Switching approach
$VaR_{5\%}$, NIS	877,992	875,112
$CVaR_{5\%}$, NIS	844,374	853,648

The tables demonstrate that for both investment distributions, the values of $VaR_{5\%}$ are slightly higher if the accumulating approach is adopted. In fact, with MF (IC)

investment distribution, the accumulated savings values produced by the accumulating approach are higher for 95.87% (96.02%) of the simulations. This represents an important argument in favor of the accumulating approach, since it appears that though this approach increases the return volatility, investment scenarios resulting in savings values that are lower than those obtained according to the switching approach are relatively rare. Moreover, although, as might be expected, the values of $CVaR_{5\%}$ are lower if the accumulating approach is adopted, indicating that the latter performs worse in extremely unfavorable investment scenarios, the differences in the values of $CVaR_{5\%}$ between the two approaches are relatively small, suggesting that even in extremely unfavorable scenarios the accumulating approach, based on the asset allocations employed in our study, is not expected to result in a financial disaster for the employee.

Overall, the results presented in this subsection reinforce our conclusion that the disadvantage of the higher volatility of total savings does not detract from the major advantage of the accumulating approach, because of the significantly higher mean and median savings amounts it provides.

6 CONCLUSION AND DISCUSSION

In the present study, we analyze the life-cycle pension model, which is based on the idea that the exposure of pension fund members' portfolios to risky assets should be gradually decreased with the members' ages. We make an effort to enhance the model's practical advantages and suggest, instead of the standard switching approach, which is based on the assumption that when a pension fund member reaches certain age, his accumulated wealth is fully switched to another fund with a lower risk profile, the employment of an accumulating approach, according to which at the same time point as above, the member's previously accumulated wealth continues to be invested in the same fund, and only his new regular pension contributions start being directed to a less risky fund.

To empirically test the suggested approach, we consider a hypothetical (average) Israeli employee who works for 40 years earning an average inflation-indexed salary for his age group and contributes a mandatory proportion of his gross salary to a pension fund. We analyze two age-dependent life-cycle investment distributions of the employee's pension savings, and perform a comparison between the two approaches to the life-cycle model by employing an estimation-based and a simulation-based technique.

The results produced by the two techniques are consistent and demonstrate the advantages of the suggested accumulating approach. First, the expected annualized real returns and real accumulated savings based on the estimation are considerably higher if one adopts the accumulating instead of the switching approach, while the differences in the expected volatility levels between the two approaches are relatively moderate, resulting in significantly higher Sharpe ratios for the accumulating approach.

Furthermore, simulation results prove that when the accumulating approach to the life-cycle model is employed, the mean and the median values of real accumulated

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savings are significantly higher than those obtained according to the switching approach. Moreover, the value at risk analysis of the accumulated retirement savings' distributions allows us to conclude that, though the accumulating approach increases the standard deviation of total savings, it does not lead to critically low pension wealth levels even for relatively unfavorable sequences of financial assets' returns.

Generally speaking, the goal of this study was, obviously, not to criticize the life-cycle pension model, which has definitely proved its viability and has the clear advantage of enhancing investment security for the pension fund members who are close to retirement and definitely not willing to put their total, and considerable, wealth at risk. The goal was rather to minimize the model's relative disadvantage, which is that in order to benefit from the enhanced security of their pension savings, the members have to sacrifice a significant profit potential associated with equity investments. The accumulating approach we suggest allows a significant increase pension portfolios' returns, without a concomitantly significant increase in their risk, and therefore, we believe that the findings of our study may serve as a useful practical recommendation for both pension fund managers and policy makers dealing with pension systems.

After all, the major goal of any economist is to contribute, as far as possible, to the well-being of their country's citizens and to the efficiency of the world economy as a whole. In this respect, we hope that the results of our study have a potential of making at least a modest contribution. If public sector officials adopt the accumulating approach we suggest as a default approach to the life-cycle pension model[15], it may bring a number of important (and positive) consequences. The first and the most straightforward effect directly arises from the findings of our study, demonstrating that, all other things being equal, an employee whose pension savings are invested according to the accumulating approach is expected to be able to take advantage of higher pension payments after retirement. The higher replacement rate he is expected to enjoy may help him to go more smoothly through the transition from the category of employee to the category of pensioner.

Yet, there are also important potential indirect effects of adopting the accumulating approach. Since, as we have seen, it suggests investing a greater overall proportion of pension savings in stocks, adopting it may decrease the cost of capital for public companies and therefore enhance productive investments and create new working places. Moreover, higher pension payments may increase consumption and once again, stimulate the economy as a whole. Finally, adopting this approach may help to decrease the number of people whose retirement savings are not sufficient to ensure a deserved quality of life after retirement and who therefore stand in need of income transfers from working people. This result may be of serious help to the economic policy makers who are now heavily concerned with the problem of forced wealth redistribution when facing the reality of a continuously increasing life expectancy without increasing the retirement age.

[15] We have already taken a number of practical steps in order to promote our recommendations to the Israeli pension system.

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Tax harmonization in the European Union and the eurozone: a multilateral analysis of tax systems

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Abstract

This exploratory study takes a new look at the tax systems of countries in the Organisation of Economic Co-operation and Development (OECD). We measure a country's tax system using time-series cross-sectional data on tax collection variables as well as a cross-sectional metric assessing tax administration and enforcement. More specifically, we examine the countries' (i) overall tax burden, (ii) income tax reliance, and (iii) fiscal decentralization as well as some "non-rate" variables related to tax administration and enforcement. The purpose is to compare European Union (EU) member states and those countries in the eurozone with other OECD countries and over time in order to test (1) whether EU member states and eurozone countries have tax systems that are more similar to each other than to other countries, and (2) whether some tax harmonization is taking place – within the EU (eurozone) and other countries. The descriptive analysis and graphical representation, as well as first empirical tests, show that the tax systems of EU member states and eurozone countries are significantly different from other countries' tax systems. Yet, we do not find much tax harmonization in the EU (eurozone) countries over time. Future research might delve more into the question what drives harmonization with the intention of eventually formulating policy strategies.

Keywords: tax harmonization, tax burden, European Union, eurozone, fiscal decentralization, tax systems

1 INTRODUCTION

Tax policy management and harmonization have always been a topic of concern for the European Union and its member countries. The European debt crisis reinvigorated efforts within the EU to coordinate tax policies across the different member nations. Accordingly, the purpose of this research is to take a new look at the effects of past tax policy coordination in Europe. More specifically, we examine countries within the EU and countries that have joined the common currency system (the eurozone) and are evaluating whether these tax systems are more similar, or are becoming more similar, to each other than they are to the tax structures of other countries. In our analysis we use several dimensions that measure the overall tax burden, the importance of different types of taxes within the tax system, the decentralization of tax collection, the tax administration and enforcement. We focus on tax collection (in relationship to other economic measures) as well as administration and enforcement because in our opinion although both factors are important in the evaluation of a country's tax policy, academic research, especially in the economics literature, has been less focused on these particular aspects of tax systems. In the second part of the study, we attempt to isolate factors that impact tax system similarities and differences as well as tax system harmonization within the EU and in eurozone member countries, with the ultimate intention to formulate a number of tax policy strategies.

We base our analysis on the concept of fiscal competition, which suggests that governments – at any level – compete with each other for a tax base and on theo-

ries concerning the notion that (national) political culture affects "national styles of taxation". The tax competition theory suggests that countries will try to lower their effective tax rate below those of other countries in order to attract taxpayers, which speaks against the synchronization of different tax systems.[1] This anti-harmonization effect will be stronger for certain taxes than others and for certain countries than others, due to the relative mobility of the tax base. For example, it is easier for corporations to move their headquarters from one country to another than for individuals to leave their home country. Further, moving within the EU is generally easier than from EU to non-EU countries and vice-versa. Thus, we expect to see the effects of tax competition more for corporate income tax (and within the EU) and much less for real estate property taxes (and outside the EU). On the other hand, culture has been shown to impact accounting and tax systems, which would indicate that as countries' cultures change and move towards an understanding of global citizenship, tax systems will become more similar to each other as well. This concept also suggests that countries with similar histories and therefore similar cultures will have similar tax systems.

We gather the information for each country's tax system from the Organisation of Economic Co-operation and Development database. In the first part of the study, we compare the following tax system dimensions across the different countries and decades: *tax burden (years 1965-2012)*, *income tax reliance (years 1965-2012),* and *fiscal decentralization (years 1973-2012)*. For the *tax administration and enforcement* metrics only cross-sectional – no time-series – data are available. In addition to using descriptive metrics, such as correlation analysis, we also visualize which countries' systems are closest to each other.

In the second part of the study, we employ regression analysis to determine which factors affect the harmonization of tax systems within the EU and the eurozone compared to other OECD countries. We develop a harmonization metric by using the scaled absolute difference to the mean (of each tax system measure) as dependent variable and five-year increments as independent variables. The EU and eurozone membership for each country and year is measured using indicator variables. Interactions between EU and eurozone membership and the time variables measure whether harmonization is significantly different within the EU and the eurozone. Additional factors potentially impacting harmonization, such as common versus code law legal system, country size as well as economic and demographic controls, are also included as the regression model's explanatory variables.

Our study contributes to the current literature by taking a new look at how tax systems compare within the EU and with other non-EU countries' systems. We focus on tax collection variables, which allows us to examine a long time period

[1] Although tax competition theory focuses on tax policy (i.e., the political process of setting tax base and tax rates), the end goal of these strategies is to maximize government revenues, which is the product of total tax base x average tax rate for each individual tax. Thus, our variables are revenue-oriented and do not include more direct tax policy measures such as marginal or average tax rates and/or tax base. Additionally, the use of revenue metrics has the advantage that a large cross-sectional time-series dataset is available.

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and a relatively large dataset of different countries. However, we also take a look at a cross-sectional dataset of tax administration/enforcement metrics. We further examine a list of potential factors affecting the harmonization of tax policies within and outside the EU and include non-rate factors in our analysis.

The remainder of this paper is structured as follows: the next section provides background – including some literature review – and our research question. Section three describes the methodology and the data used for the study. Section four presents our results and section five concludes.

2 BACKGROUND AND RESEARCH QUESTIONS

Tax systems have been compared across and within countries by looking at tax burdens and tax mix across time and countries, the impact of culture on the development of tax systems as well as non-rate factors (e.g., Robinson and Slemrod, 2011; Richardson, 2007; Bach, Seidel and Teichmann, 2002). Researchers have found that tax systems vary significantly, that there is some indication of national culture affecting the development of different tax structures (Pippin et al., 2010), and that non-rate factors of tax systems, i.e. factors related to procedure and enforcement, can also have a significant economic impact (Robinson and Slemrod, 2011). Similarly, studies examining the conflicting effects of tax harmonization efforts versus tax competition are plentiful (e.g., Lamaanen, Simula and Torstila, 2012; Devereux, Lockwood and Redoano, 2008; Florin, 2010; Gravelle, 1986). Culture has also been found to be one of the explanatory factors in the development of national accounting systems (Roberts and Salter, 1999), as well as in the adoption of international accounting standards (IFRS) (Lasmin, 2012). The recent debt crisis in Europe has reinvigorated efforts within the EU to coordinate tax policies across the different member nations (e.g., van der Made, 2011; Tofan, 2011; Matei and Pirvu, 2010); one example of this is the proposal of the Common Consolidated Corporate Tax Base.

As stated above, the purpose of the study is to first analyze and demonstrate how (and which) countries' tax systems differ from each other. We select three tax-rate factors, each measuring a different aspect of tax collection/government revenues, to examine these differences and similarities. In addition, we also compare non-rate factors (Robinson and Slemrod, 2011). The three tax rate factors measure overall tax burden, income tax reliance, and fiscal decentralization. Overall tax burden is the primary indicator of most tax system comparisons. It is measured as tax revenues as a percentage of gross domestic product (GDP). While experts disagree on the progressivity of other taxes, such as levies on consumption and property, income taxes are generally designed to be progressive (Richardson, 2007; Robinson and Slemrod, 2011). Thus, for the tax system's second factor we focus on each country's reliance on income taxes to generate revenues as a proxy for progressivity. The variable is determined by dividing the tax revenues from income taxes into total tax revenues. The third tax rate variable focuses on the level of government responsible for tax collection. Tax policy makers who follow

the principle of subsidiarity believe that economic, political, and social issues should be dealt with at the most immediate level consistent with their resolution. According to this principle it is advantageous to handle taxes (and spending) at the local (or state) level because local authorities are more familiar with the community's needs, governments are more likely to be held accountable, and taxpayers are more likely to report and submit their taxes because of the reduced anonymity (e.g., Chu and Yang, 2012; Buser, 2011). However, as with the economies of scale argument, a central tax administration may have the advantage of reducing costs by handling a large volume of tax filings under one roof. That is, a centralized system, where decisions presumably are made by experts, may have the benefit of fewer errors in judgment and lower overall cost of collection. Additionally, it might be a means to reduce tax competition at the sub-national level. Historically, nations have adopted different strategies with some being more and some less centralized with regard to political decision making and government responsibilities. We expect that the level of government responsible for tax collection will vary depending on a country's historical, political, and cultural background.[2] Fiscal decentralization or centralization (with regard to the level of tax collection) is therefore another key characteristic of any tax system. Using these three tax system variables, tax burden, income tax reliance, and fiscal decentralization, we examine fiscal differences, similarities, and harmonization within and outside the EU. In addition to that, we also compare these "rate variables" with the non-rate tax system metrics described in the Robinson and Slemrod (2011) paper.[3]

Our research questions can therefore be summarized as follows:

1) Are taxes/tax systems within the EU and within the eurozone significantly different from other taxes/tax systems?
2) In what dimensions are tax systems within the EU and within the eurozone most similar?
3) Are countries within the EU and within the eurozone coordinating their tax systems over time? and
4) Is there a stronger tax system coordination within the EU and within the eurozone than in other countries?

Tax harmonization and coordination have been subject to various debates within the EU since the 1970s. The two main competing arguments are that tax competition leads to governments being more efficient, thus harmonization and consolidation of tax systems are not necessarily desirable. On the other hand, governments aiming at harmonization have to worry about an eroding tax base due to the infamous "race to the bottom". Two directives (from 1977 and 2006) concerning indirect taxation address the minimum VAT levy, currently 15%. Another directive

[2] UCLG – United Cities and Local Governments (2010) provide a detailed overview of fiscal decentralization in different world regions.

[3] Note that due to limitations related to data availability this study concentrates on the rate factors of the various tax systems. These datasets can be compiled for over 40 years while for non-rate factors we can only find a cross-section for the years 2006-2008. Hopefully, future research can expand the analysis using time-series information of non-rate tax system information.

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from 2003 deals with taxes on interest and royalties. Similarly, the creation of a common consolidated corporate income tax base (CCCBT) which should prevent companies from "tax haven shopping" by moving to the jurisdiction that offers the most tax incentives has been discussed at various occasions (Quéré, Trannoy and Wolff, 2014). We believe that in light of these discussions an analysis of the current status of tax harmonization within the EU and within the eurozone should be of interest to academics and policy makers. Therefore, in addition to the descriptive analysis comparing different dimensions of tax systems within and outside the EU (eurozone) and over time, this study also makes an attempt to explore what factors – other than EU and eurozone membership – affect tax system similarities/differences and fiscal coordination.

3 DATA AND METHODOLOGY

We gather the information for each country's tax system from the OECD database for all countries in the OECD and for the years 1965 through 2012. For the first part of the study we use descriptive statistics to analyze and compare the following tax system dimensions across the different countries and across time:

1) The country's total *tax burden* measured as the country's total tax revenue as a percentage of its gross domestic product (years 1965-2012).
2) The country's *income tax reliance* measured as the country's share of revenue collected from income taxes (at any level of government) as a percentage of its total tax revenues (years 1965-2012).
3) The country's *fiscal decentralization* measured as the country's share of revenue collected at the local and state level as a percentage of its total tax revenues (years 1973-2012).

Average values for each tax rate variable, year, and dataset (all countries, EU member countries, and eurozone countries) are presented in tables 1 through 3. The summary statistics suggest, and simple t-tests (not tabulated), confirm that EU member countries and countries in the eurozone have a higher tax burden, lower income tax reliance, and – depending on the year – marginally higher or lower fiscal decentralization than other countries.[4]

Table 1

Average tax burden, income tax reliance, and fiscal decentralization for all countries (years 1965-2012), in %

Year	Tax burden	Income tax reliance	Fiscal decentralization
1965	25.45	34.64	
1966	25.98	35.52	
1967	26.88	35.46	
1968	27.18	35.61	
1969	27.76	36.34	
1970	27.49	36.32	

[4] It is interesting to note that in the later years (starting in the 1990s) the EU and euro-zone countries appear to have more centralized tax collections which is due to the "new countries" (mostly former East bloc countries) within the Union.

Year	Tax burden	Income tax reliance	Fiscal decentralization
1971	28.00	36.76	
1972	27.68	36.82	
1973	27.82	37.41	28.91
1974	28.68	39.15	28.62
1975	29.35	37.11	33.00
1976	30.31	38.14	28.95
1977	31.03	38.25	29.39
1978	30.92	38.62	29.09
1979	30.84	38.98	28.71
1980	30.92	38.18	24.93
1981	31.62	38.12	24.53
1982	32.03	37.75	25.17
1983	32.19	37.75	25.62
1984	32.38	36.80	25.11
1985	32.51	36.89	26.11
1986	33.15	36.81	25.69
1987	33.62	36.29	25.60
1988	33.61	37.00	25.51
1989	33.45	37.43	23.40
1990	33.10	37.10	23.90
1991	33.57	35.84	24.08
1992	33.78	35.42	24.25
1993	34.27	35.01	24.61
1994	34.23	34.89	24.31
1995	34.58	33.98	22.44
1996	34.96	33.71	22.27
1997	34.94	34.17	22.26
1998	34.93	34.69	22.26
1999	35.21	34.24	22.58
2000	35.30	35.00	21.59
2001	34.84	34.63	21.87
2002	34.55	33.83	23.62
2003	34.48	33.46	23.90
2004	34.43	33.60	24.14
2005	35.02	34.35	24.14
2006	35.14	35.26	24.35
2007	35.20	35.93	24.49
2008	34.62	35.32	24.64
2009	33.78	33.48	25.31
2010	33.76	33.11	24.55
2011	34.12	33.52	24.97
2012	35.44	33.98	30.16

Notes: Countries in the sample – Australia (excluding year 2012), Austria, Belgium, Canada, Chile (starting 1990), Czech Republic (starting 1993), Denmark, Estonia (starting 1995), Finland, France, Germany, Greece, Hungary (starting 1991), Iceland (starting 1980), Ireland, Israel (starting 1995), Italy, Japan, Korea (starting 1972), Luxembourg, Mexico (starting 1980), Netherlands, New Zealand, Norway, Poland (starting 1991), Portugal, Slovak Republic (starting 1995), Slovenia (starting 1995), Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States. Tax burden is measured as total tax revenues as percentage of GDP; income tax reliance is measured as total revenues from income taxes as percentage of total tax revenues; fiscal decentralization is measured as total revenues collected at the local (municipal or county) and state level as percentage of total tax revenues (data only available after 1972).

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Table 2

Average tax burden, income tax reliance, and fiscal decentralization for EU countries (years 1965-2009), in %

Year	Tax burden	Income tax reliance	Fiscal decentralization
1965	30.48	27.80	
1966	31.05	28.13	
1967	31.66	28.01	
1968	31.90	28.14	
1969	32.05	29.39	
1970	30.73	29.18	
1971	31.63	29.27	
1972	32.19	29.97	
1973	32.74	34.64	32.27
1974	33.70	36.81	32.65
1975	34.47	35.88	31.29
1976	35.36	35.94	31.16
1977	36.09	36.56	31.84
1978	36.10	37.05	31.86
1979	36.01	36.74	31.70
1980	37.23	36.65	31.71
1981	36.01	34.90	30.69
1982	37.12	34.52	30.61
1983	37.98	34.04	30.55
1984	38.02	34.26	30.56
1985	38.20	34.60	30.81
1986	36.72	32.41	20.83
1987	37.12	32.63	20.56
1988	36.91	33.05	20.98
1989	36.28	33.55	15.81
1990	36.31	33.83	16.19
1991	36.51	33.91	15.72
1992	37.05	33.39	15.74
1993	37.50	33.51	16.14
1994	37.55	33.05	16.12
1995	38.83	33.52	13.72
1996	39.83	33.54	13.91
1997	39.85	34.11	14.41
1998	39.90	34.47	14.73
1999	40.29	34.44	14.82
2000	40.35	35.16	14.54
2001	39.66	34.80	14.28
2002	39.14	34.05	17.35
2003	38.93	33.33	17.88
2004	37.64	30.04	18.39
2005	38.07	30.27	18.58
2006	38.05	30.80	19.02
2007	38.17	31.42	19.13
2008	37.75	31.25	19.33

Year	Tax burden	Income tax reliance	Fiscal decentralization
2009	37.35	29.78	19.43
2010	37.19	29.18	17.97
2011	37.37	29.26	19.31
2012	38.17	30.20	21.60

Notes: Countries in the EU are Austria (joined 1995), Belgium, Czech Republic (joined 2004), Denmark (joined 1973), Estonia (joined 2004), Finland (joined 1995), France, Germany, Greece (joined 1981), Hungary (joined 2004), Ireland (joined 1973), Italy, Luxembourg, Netherlands, Poland (joined 2004), Portugal (joined 1986), Slovenia (joined 2004), Slovak Republic (joined 2004), Spain (joined 1986), Sweden (joined 1995), and United Kingdom (joined 1973). Tax burden is measured as total tax revenues as percentage of GDP; income tax reliance is measured as total revenues from income taxes as percentage of total tax revenues; fiscal decentralization is measured as total revenues collected at the local (municipal or county) and state level as percentage of total tax revenues (data only available after 1972).

Table 3

Average tax burden, income tax reliance, and fiscal decentralization for eurozone countries (years 1999-2012), in %

Year	Tax burden	Income tax reliance	Fiscal decentralization
1999	39.51	32.07	14.82
2000	39.47	32.72	14.54
2001	38.41	32.09	14.28
2002	38.10	31.44	17.35
2003	37.82	30.53	17.88
2004	37.59	30.33	18.39
2005	37.96	30.60	18.58
2006	38.17	31.05	19.02
2007	38.16	31.14	19.13
2008	37.77	30.96	19.33
2009	36.63	28.71	19.43
2010	36.84	28.40	17.97
2011	37.19	28.90	19.31
2012	37.76	29.47	21.60

Notes: Countries in the eurozone are Austria, Belgium, Finland, France, Germany, Greece (joined 2001), Ireland, Italy, Luxembourg, Netherlands, Portugal, Slovenia (joined 2007), Slovak Republic (joined 2009), and Spain. Tax burden is measured as total tax revenues as percentage of GDP; income tax reliance is measured as total revenues from income taxes as percentage of total tax revenues; and fiscal decentralization is measured as total revenues collected at the local (municipal or county) or state level as percentage of total tax revenues.

Of the three tax system variables, burden and income tax reliance are positively correlated for all OECD countries, and the sub-samples of all EU member countries and all eurozone countries. Tax burden and fiscal decentralization are not significantly correlated for all OECD countries, but negatively correlated for the sub-samples of EU countries as well as the sub-sample of eurozone countries. Income tax reliance and fiscal decentralization are positively related for all OECD countries, not significantly correlated in the case of the EU countries, but negatively correlated for the eurozone countries. On a yearly basis, the correlations coefficients between the three tax system variables are marginally or not significant.

The tax administration and enforcement measures were compiled from three OECD studies (Robinson and Slemrod, 2011; OECD, 2006; 2007; 2008) and not available across time. The Robinson and Slemrod (2011) measures are presented in table 4.

TABLE 4

Tax administration and enforcement measures (Robinson and Slemrod, 2011)

	Tax administration					Enforcement					
	Self- vs. third-party assessment of tax liability	Withholding (for number of income categories)	Withholding type (zero, non-cumulative, cumulative)	Reporting (for # of income categories) by 3rd parties	Matching of information (by use of taxpayer identification)	Collection (rating of power to enforce tax payment)	Verification (information access of tax officials)	Penalty (maximum penalty tax rate)	Coverage of enforcement (relative to country size)	Access to bank information of taxpayers	Dispersed responsibility (combined factor)
Australia	1	1	1	3	5	10	8	0.9	1.55	1	-0.664
Austria	0	3	2	2	2	10	8	2	1.44	0	-0.886
Belgium	0	5	1	4	4	9	6	2	2.54	0	-0.992
Canada	1	2	1	8	6	9	8	0.5	1.69	1	-0.100
Chile	1	4	2	8	4	5	8	3	0.36		
Czech R.	0	3	2	1	6	9	9	0.2	2.17	1	-0.774
Denmark	0	5	2	7	5	13	6	2	2.47	1	0.635
Estonia	1	3	2	4	5	10	5		2.23		
Finland	0	5	1	5	6	9	6	0.3	1.7	1	-0.415
France	0	0	0	9	1	9	6	0.8	3.12	1	-1.108
Germany	0	4	2	3	2	12	7		2.04	1	
Greece	0	9	1	9	3	12	9	2	1.94	1	0.761
Hungary	1	6	1	5	6	12	8	0.5	1.96	1	0.277
Iceland	0	5	1	7	5	8	8	0.25	0.5	1	-0.216
Ireland	1	5	2	6	4	9	8	1	2.43	1	0.246
Israel											
Italy	1	5	2	7	6	10	7	2	0.85	1	0.754
Japan	1	7	2	9	0	6	6	0.4	0.67	1	0.504
Korea	1	7	2	8	6	12	5	0.4	0.49	1	1.274
Luxembourg	0	4	2	2	5	9	3	0.4	2.91	0	-1.016
Mexico	1	9	2	10	5	12	5	0.75	0.49	1	1.701
Netherlands	0	5	2	4	5	9	7	2	2.81	1	-0.215
New Zealand	1	3	2	3	5	9	8	1.5	2.2	1	-0.231
Norway	0	1	1	5	6	11	5	0.6	2.01	1	-0.607
Poland	1	6	2	6	5	10	9		1.86	1	
Portugal	0	7	1	8	5	10	7		1.64	1	
Slovak R.	1	4	2	4	1	8	4	0.15	1.5	1	-0.213
Slovenia	0	7	1	7	4	9	7		1.8		
Spain	1	8	2	10	6	10	6	1.5	0.99	1	1.379
Sweden	0	3	1	6	5	11	4	0.2	1.68	1	-0.294
Switzerland	0	3	0	1	0	9	6		0.18	0	
Turkey	1	6	2	7	4	13	7	1	0.91	1	1.088
UK	1	9	2	8	4	8	6	1	2.21	1	0.807
United States	1	1	1	5	5	9	5	0.75	0.46	1	-0.425

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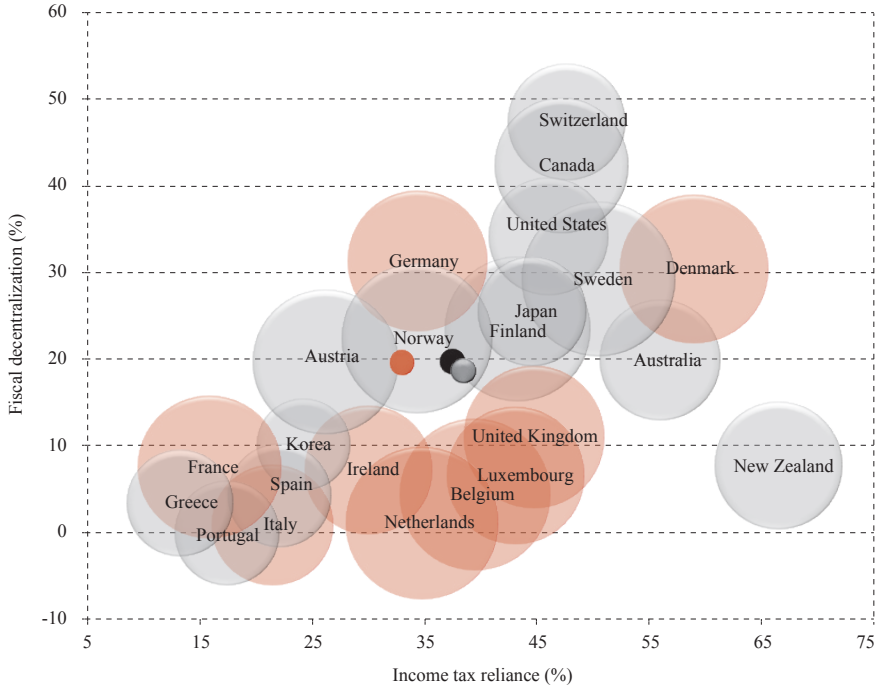
FIGURE 1

Tax burden, income tax reliance, and fiscal decentralization for EU and non-EU member countries in the year 1975



Notes: EU member countries are red; non-EU member countries are gray; overall mean (black), EU member country mean (red); and non-EU member country mean (gray) is presented as small circle. Size of the bubble represents tax burden (tax revenues as percentage of GDP); x-axis measures income tax reliance (tax revenues from income taxes as percentage of total revenues); y-axis measure fiscal decentralization (tax revenues collected at non-federal, i.e., local and state levels as percentage of total tax revenues).

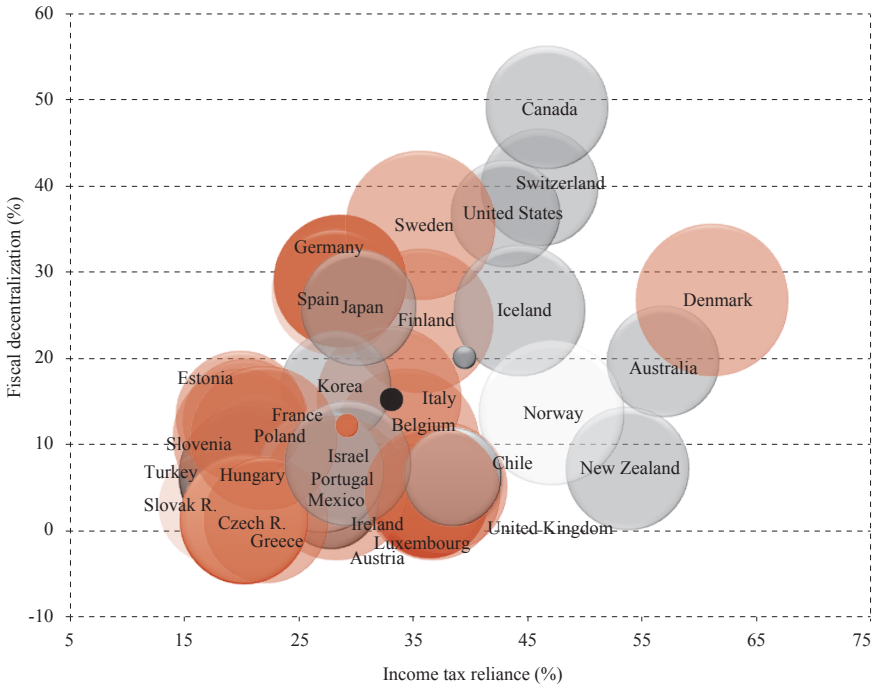
Figures 1 and 2 illustrate which countries are similar and different with regard to the three tax-rate factors for the years 1975 and 2010.[5] According to these graphs, EU countries do tend to cluster together – with Denmark and Germany being outliers or exceptions.

Of course, in addition to EU and eurozone membership, other factors also impact tax burden, tax composition, and fiscal decentralization. For example, prior research has shown that tax systems are significantly different in common law than in code law countries (Pippin et al., 2010). Similarly, Kenny and Winer (2006) suggest that the countries' tax systems are affected by different political regimes, such as capitalist versus socialist or democratic versus non-democratic. We therefore expect that countries that were members of the former Eastern bloc will

[5] Note that in 1975 the entire sample consisted of fewer non-EU and EU member countries. In the 1990s several countries joined the OECD increasing the total number of countries from 24 in 1965 to 34 in 1995. Some (but not all) of these countries eventually also joined the EU and the euro-zone.

FIGURE 2

Tax burden, income tax reliance, and fiscal decentralization for EU, eurozone, and non-EU countries in the year 2010



Notes: EU member countries are red; eurozone countries are dark red; non-EU member countries are gray; overall mean (black), EU member country mean (red); and non-EU member country mean (gray) is presented as small circle. Size of the bubble represents tax burden (tax revenues as percentage of GDP); x-axis measures income tax reliance (tax revenues from income taxes as percentage of total revenues); y-axis measure fiscal decentralization (tax revenues collected at non-federal, i.e., local and state levels as percentage of total tax revenues).

exhibit significant differences due their history during the Cold War as well as the economic challenges these new democracies were faced with in the 1990s and are still facing today. In order to control for these effects, we test the tax system differences using simple OLS regression models:

$$VAR_{it} = \beta_0 + \beta_1 EU_{it} + \beta_2 EURO_{it} + \beta_3 ANGLO_i + \beta_4 EAST_i + \beta_5 POP_{it} + \beta_6 GDP_{it} + \beta_7 YOUNG_{it} + \beta_8 OLD_{it} + \tau_t + \varepsilon_{it} \quad (1)$$

The dependent variable, $VAR_{i,t}$, is one of the three tax collection metrics, total tax revenues as percentage of GDP, income tax revenues as percentage of total tax revenues, or state and local tax revenues as percentage of total tax revenues, for each country *i* and year *t* in the sample. *EU*, *EURO*, *ANGLO*, and *EAST* are dummy variables equaling one for EU or eurozone membership, common law country, or former Eastern bloc countries respectively and zero otherwise. We control for demographic, economic and time effects. Total population of a country can be seen as

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a scale variable. For example, countries that have large populations tend to have more decentralized fiscal systems. Thus, we include *POP*, which is the natural log of the country's population. A country's gross domestic product per capita controls for the development level of the country. While European countries are relatively higher-income, there is still some variation, especially between East and West. In our model *GDP* measures GDP per capita (also logged). Further, we include *YOUNG* (*OLD*), which measures the percentage of the population under 15 (over 64). These demographic variables are used to control for the potential impact of demography, particularly the working age population and elderly population, on tax burden, tax composition and the level of decentralized public service delivery. Last, we include indicator variables, one for each year of data used in the sample (τ_t) to control for time effects. ε_{it} is the error term and is i.i.d.

As stated above, visual analysis and t-test results suggest significant differences between EU and non-EU members. However, a visual comparison of 1975 with 2010 does not imply that the tax systems of the EU countries have converged over time. In order to test whether tax systems have become more similar (or different) in each of the three tax rate dimensions (burden, income tax reliance, and decentralization), nine additional metrics were created using the following formula:

$$DIFF\_MEAN_{it} = (VAR_{it} - MEAN_t) / MEAN_t \quad (2)$$

$MEAN_t$ is the mean value for the respective variable for all countries, for EU member countries only, and for eurozone countries only for each year t in the sample. That is, for each of the three tax collection variables, "tax burden", "income tax reliance", and "fiscal decentralization", we compute three different averages: "overall mean", "mean of EU member countries", and "mean of eurozone countries." Then, for each metric (tax burden, income tax reliance, fiscal decentralization), for each country, and for each year in the sample, we compare the individual country value to the overall mean, the EU mean, and the eurozone mean for the respective year. The difference is scaled by the respective mean and taken as an absolute term. Summary statistics of the difference to means measures for all countries as well as the subgroups "EU members only" and "eurozone only" are presented in table 5.

A comparison of the measures in Panel A (all countries) with Panel B (EU member countries) and Panel C (eurozone countries) suggests that, on average, the differences to the mean for the tax burden and income tax reliance variables tend to be smaller when only considering EU member (eurozone) countries. However, in the case of fiscal decentralization, EU member (eurozone) countries are more different from the mean than the entire country group. This is true for all countries as well as the subgroup summary statistics, thus providing some support for the premise that the tax systems within the groups are more similar.

TABLE 5

Summary statistics for differences to mean variables

Panel A. All countries

Scaled absolute difference of…		Mean	Min.	Max.	Std. dev.
…tax burden to	overall mean	0.201	0.000	0.670	0.145
	mean of EU member countries	0.197	0.001	0.719	0.146
	mean of eurozone countries	0.177	0.000	0.599	0.128
…income tax reliance to	overall mean	0.267	0.000	0.990	0.188
	mean of EU member countries	0.298	0.000	1.480	0.232
	mean of eurozone countries	0.294	0.000	1.154	0.250
…fiscal decentralization to	overall mean	0.428	0.002	0.979	0.307
	mean of EU member countries	0.436	0.002	0.979	0.305
	mean of eurozone countries	0.494	0.028	0.933	0.313

Panel B. EU member countries

Scaled absolute difference of…		Mean	Min.	Max.	Std. dev.
…tax burden to	overall mean	0.180	0.001	0.476	0.125
	mean of EU member countries	0.134	0.001	0.391	0.084
	mean of eurozone countries	0.130	0.000	0.339	0.081
…income tax reliance to	overall mean	0.229	0.000	0.814	0.191
	mean of EU member countries	0.246	0.002	1.010	0.204
	mean of eurozone countries	0.232	0.001	1.154	0.206
…fiscal decentralization to	overall mean	0.515	0.044	0.882	0.288
	mean of EU member countries	0.532	0.033	0.890	0.282
	mean of eurozone countries	0.590	0.099	0.898	0.264

Panel C. Eurozone countries

Scaled absolute difference of…		Mean	Min.	Max.	Std. dev.
…tax burden to	overall mean	0.157	0.001	0.343	0.093
	mean of EU member countries	0.120	0.001	0.292	0.071
	mean of eurozone countries	0.121	0.000	0.272	0.070
…income tax reliance to	overall mean	0.180	0.000	0.477	0.123
	mean of EU member countries	0.169	0.002	0.476	0.108
	mean of eurozone countries	0.161	0.001	0.453	0.102
…fiscal decentralization to	overall mean	0.535	0.044	0.882	0.299
	mean of EU member countries	0.569	0.033	0.890	0.279
	mean of eurozone countries	0.590	0.099	0.898	0.264

Notes: Tax burden is measured as total tax revenues as percentage of GDP; income tax reliance is measured as revenues from income taxes as percentage of total tax revenues; and fiscal decentralization is measured as revenues collected at state or local government levels as percentage of total tax revenues. For each year in the sample, each country's value is compared to the mean value for the respective year. The difference is scaled by the mean and taken as an absolute term.

If countries' tax systems become more similar over time, the difference to the mean will decline over time. Nontabulated summary statistics of the difference to mean metrics for each country and each year individually suggest no significant difference across time with the exception of the year 1995 when several countries joined the OECD and the EU. In order to test across-time variation further, we

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employ regression analysis with a time benchmark dummy and interaction variables. First, we test how the country-specific, demographic, and economic factors affect the difference to the mean for each tax system variable:

$$DIFF\_MEAN_{it} = \beta_0 + \beta_1 EU_{it} + \beta_2 EURO_{it} + \beta_3 ANGLO_i + \beta_4 EAST_i + \beta_5 POP_{it} + \beta_6 GDP_{it} + \beta_7 YOUNG_{it} + \beta_8 OLD_{it} + \tau_t + \varepsilon_{it} \quad (3)$$

Next, we use simple t-tests to determine whether the difference to mean metrics are significantly different before and after certain time "benchmark" events, namely the period before/after 1992 and the period before/after 2004. One important event for EU countries was the ratification of the Maastricht Treaty in 1992. Among other things it led to the creation of the common currency (euro) and established the three pillars of the European Union, "European Community", "Common Foreign and Security Policy", and "Justice and Home Affairs." It also included a clause mandating all member countries to keep "sound fiscal policies" with countries' debt limited to 60% of GDP and annual deficits no greater than 3% of GDP. While we cannot assume that the European Union's requirement of "sound fiscal policy" directly changed member countries' tax systems, we believe that over time it could have led to a more harmonized system of collecting revenues. Thus, we separate the sample into the time period before and including the year of 1992 and the time period after 1992.

The single largest expansion of the European Union, in terms of territory, number of countries, and population took place in 2004 with Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia joining the community. These new member countries brought many challenges – some due to the fact that they were part of the former Eastern bloc. Member states anticipated and dealt with significant difficulties. Nonetheless, according to the European Commission the enlargement was a success (Vucheva, 2009). The new dynamic in the European Parliament and among member countries undoubtedly impacted each members' fiscal strategy. We therefore also compare the years before and after 2004.

$$\begin{aligned} DIFF\_MEAN_{it} = {} & \beta_0 + \beta_1 EU_{it} + \beta_2 EURO_{it} + \beta_3 ANGLO_i + \beta_4 EAST_i + \beta_5 POP_{it} \\ & + \beta_6 GDP_{it} + \beta_7 YOUNG_{it} + \beta_8 OLD_{it} + \beta_9 PERIOD1992 \\ & + \beta_{10} PERIOD2004 + \beta_{11} EU * PERIOD1992 \\ & + \beta_{12} EU * PERIOD2004 + \beta_{13} EURO * PERIOD2004 + \varepsilon_{it} \end{aligned} \quad (4)$$

PERIOD1992 (PERIOD2004) is an indicator variable for the time period before 1992 (2004) equaling 1 for the years after 1992 (2004) and zero otherwise. Note that the interaction of eurozone countries is only possible for the 2004 time dummy.

4 RESULTS

The regression results are presented in tables 6, 7, and 9. Table 8 shows the t-tests examining whether the difference to the mean variables is significantly distinct before or after 1992 and before and after 2004. The results for the tax system dependent variables (table 6, Panel A) confirm a significant difference of tax system variables for EU member countries as well as eurozone countries. Specifically, the tax burden is higher but income tax reliance and fiscal decentralization are lower for EU member countries. For eurozone countries, the signs are opposite for tax burden and fiscal decentralization – but not for income tax reliance (after controlling for EU membership). Common law countries, such as the UK and Australia, have higher income tax reliance and lower fiscal decentralization. For the countries from the former Eastern bloc it is the opposite. The size of the country (measured by the natural log of the population) and the percentage of younger people (under 15) are negatively related to tax burden but economic output per capita as well as the older (over 64) population are positively correlated.

For the non-rate tax system variables – the measures related to administration and enforcement (Robinson and Slemrod, 2011) – simple OLS regression analysis, shown in table 6 below, does not imply a significant difference between EU member (eurozone) countries and others. More important seems to be whether a country has a common law system or is a former Eastern bloc country. For example, according to the regression results, common law countries are more likely to employ a tax system of self-assessment & self-reporting of certain taxes, and allow tax officials more access to taxpayer information than non-Anglo countries. Former Eastern bloc countries, on the other hand, have lower dispersed responsibility and lower penalty rates. Also significant is GDP per capita which is negatively correlated with most non-rate tax system measures implying that richer countries have fewer administrative and enforcement tools – such as withholding of different types of taxes, penalties for non-compliance, or access to bank information – than countries with a lower average of GDP per capita. Although regression results do not suggest a relationship, Pearson correlation coefficients (nontabulated) are significant for the correlation between the EU (eurozone) dummy variable and the self-assessment indicator (negative) as well as the "coverage of enforcement" measure (positive). This implies that EU and eurozone countries might be less likely to allow taxpayers to self-assess their tax due and have more enforcement possibilities. It is important to note that due to a very limited sample size for non-rate tax system metrics (a set of 34 countries and no time-series information) any failure to find significant results could also be a problem of statistical power.

The results for regression model (3) are listed in table 7. The dependent variable in each model is the scaled absolute difference of the tax system variable to the respective group means (overall mean, EU country mean, and eurozone country mean).

The regression results suggest that EU membership and eurozone membership are generally significantly related to the difference to mean numbers even after controlling for code law/common law countries, former Eastern bloc countries as well

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as demographic and economic variables. Note that this applies to all three difference-to-mean metrics: difference to mean of all countries, difference to mean of EU countries only, and difference to mean of eurozone countries only. For example, we find that EU members' tax burdens are more similar to the mean tax burden of all countries but also more similar to the mean tax burden of EU countries and the mean tax burden of eurozone countries.

The impact of time effects was introduced with the two benchmark years, 1992 and 2004, to test if tax system harmonization occurred overall, within EU countries, and/or within eurozone countries after the Maastricht Treaty of 1992 and/or the biggest EU expansion in 2004. We used t-tests as well as regression model (4) to evaluate the difference to means before/after 1992 and before/after 2004. Table 8 (Panel A) illustrates that tax systems seem to converge with regard to the tax burden variable but that there is much less harmonization for income tax reliance and no convergence for fiscal decentralization. More specifically, the tax burdens converge for all countries as well as for the EU countries. Income tax reliance converges for all countries but not for the sub-sample of EU countries, and countries' fiscal decentralization does not become more similar over time. Note that for the subsample of eurozone countries there are no data before 1999.

Table 6

Panel A: OLS regression results for tax rate tax system variables

	Tax burden	Income tax reliance	Fiscal decentralization
Intercept	-73.921***	-1.457***	-2.428***
	(6.988)	(0.129)	(0.414)
EU membership	7.482***	-0.036***	-0.138***
	(0.434)	(0.008)	(0.020)
Eurozone membership	-3.217***	-0.065***	0.108***
	(0.670)	(0.011)	(0.026)
Common law (Anglo) country	-0.323	0.067***	-0.136***
	(0.505)	(0.008)	(0.019)
Former East bloc country	2.914***	0.038***	-0.066**
	(0.651)	(0.011)	(0.029)
Population (natural log)	-0.900***	-0.005**	0.042***
	(0.147)	(0.002)	(0.005)
GDP per capita (natural log)	10.807***	0.175***	0.302***
	(0.544)	(0.010)	(0.039)
Percentage of population under 15	-0.147**	0.428***	-2.799***
	(0.069)	(0.124)	(0.294)
Percentage of population over 64	0.366***	0.020	-4.306***
	(0.109)	(0.185)	(0.604)
Adjusted R-square	0.511	0.359	0.641
Overall F	22.750	12.870	13.27

*Notes: Tax burden is measured as total tax revenues as percentage of GDP; income tax reliance is measured as revenues from income taxes as percentage of total tax revenues; and fiscal decentralization is measured as revenues collected at state and local government levels as percentage of total tax revenues. All regression models include year dummies (not tabulated). Standard errors in parentheses; *, **, and *** indicate significance at the .1; .05; and .01 level respectively.*

Table 6

Panel B: OLS regression results for non-rate tax system variables

Dependent variables: tax administration factors of tax systems												
	Adj. R^2	**Intercept**	**EU membership**	**Eurozone membership**	**Common law (Anglo) country**	**Former East bloc country**	**Population (natural log)**	**GDP per capita (natural log)**	**Percentage of population under 25**	**Percentage of population over 64**	**Overall F**
Tax administration (combined factor)	0.11	112.182**	3.640	-0.688	0.459	-6.981	0.165	-7.922**	-0.434	-0.540	1.47
		(46.379)	(3.127)	(2.842)	(2.637)	(4.384)	(0.710)	(3.497)	(0.629)	(0.595)	
Self-/3rd party assessment of tax liability	0.51	5.969*	-0.103	-0.106	0.597***	0.108	0.081	-0.508*	-0.029	-0.031	5.11
		(3.344)	(0.225)	(0.205)	(0.190)	(0.316)	(0.051)	(0.252)	(0.045)	(0.043)	
Withholding (for # of income categories)	0.08	51.178**	1.546	0.098	-0.538	-3.068	-0.075	-3.746**	-0.252	-0.190	1.35
		(21.506)	(1.450)	(1.318)	(1.223)	(2.033)	(0.329)	(1.621)	(0.292)	(0.276)	
Withholding type (zero, non-, and cumulative)	-0.08	6.482	0.644	-0.298	0.008	-0.426	0.034	-0.328	-0.046	-0.087	0.69
		(6.042)	(0.407)	(0.370)	(0.344)	(0.571)	(0.093)	(0.456)	(0.082)	(0.077)	
Reporting (for # of categories) by 3rd parties	0.12	39.795*	0.475	0.111	-0.205	-3.093	0.246	-3.425*	-0.029	-0.002	1.55
		(22.625)	(1.526)	(1.386)	(1.287)	(2.139)	(0.346)	(1.706)	(0.307)	(0.290)	
Matching of info (by use of taxpayer ID)	-0.15	8.759	1.078	-0.493	0.597	-0.502	-0.120	0.086	-0.077	-0.229	0.49
		(17.802)	(1.200)	(1.091)	(1.012)	(1.683)	(0.273)	(1.342)	(0.241)	(0.228)	

Table 6
Panel B: Continued

Dependent variables: enforcement factors of tax systems plus overall factor "dispersed responsibility"

	Adj. R^2	Intercept	EU member-ship	Eurozone member-ship	Common law (Anglo) country	Former East bloc country	Population (natural log)	GDP per capita (natural log)	Percentage of population under 25	Percentage of population over 64	Overall F
Enforcement (combined factor)	-0.07	80.090**	1.379	0.690	1.828	-2.623	-0.623	-5.542**	0.021	0.137	0.79
		(33.307)	(2.154)	(2.059)	(1.673)	(3.477)	(0.499)	(2.548)	(0.413)	(0.400)	
Collection (power to enforce)	-0.14	1.179	1.546	-0.828	-1.217	-0.486	0.241	0.450	0.102	-0.038	0.50
		(17.954)	(1.211)	(1.100)	(1.021)	(1.697)	(0.275)	(1.354)	(0.243)	(0.230)	
Verification (info access of tax officials)	0.18	44.520***	-0.949	1.192	1.893**	-0.520	-0.279	-3.118***	-0.187	0.017	1.90
		(13.065)	(0.881)	(0.801)	(0.743)	(1.235)	(0.200)	(0.985)	(0.177)	(0.168)	
Penalty(maximum penalty rate)	0.18	15.843**	0.306	0.398	0.254	-1.466*	-0.090	-1.346**	-0.025	0.022	1.72
		(7.018)	(0.501)	(0.479)	(0.389)	(0.781)	(0.113)	(0.542)	(0.095)	(0.092)	
Coverage of enforcement	0.50	-9.513*	1.125***	0.054	0.520	0.677	-0.060	0.662	0.145*	0.090	4.94
		(5.371)	(0.362)	(0.329)	(0.305)	(0.508)	(0.082)	(0.405)	(0.073)	(0.069)	
Access to bank information of taxpayers	0.02	4.232	0.144	-0.198	0.204	-0.112	0.029	-0.373	0.004	0.009	1.09
		(3.509)	(0.240)	(0.230)	(0.186)	(0.380)	(0.054)	(0.266)	(0.046)	(0.045)	
Dispersed responsibility	0.41	19.802**	0.619	-0.667	-0.272	-2.114***	0.081	-1.500**	-0.146	-0.141	3.13
		(6.904)	(0.446)	(0.427)	(0.347)	(0.721)	(0.103)	(0.528)	(0.086)	(0.083)	

*Notes: The dependent variables are the individual tax administration and enforcement variables (Robinson and Slemrod, 2011); dispersed responsibility is the combined variable from Robinson and Slemrod (2011); the administration and enforcement measures are calculated by summing the first set of five metrics (tax administration) and the second set of five variables (enforcement). Standard errors in parentheses; *, **, and *** indicate significance at the .1; .05; and .01 level respectively.*

TABLE 7

OLS regression results for difference to overall mean, EU mean, and eurozone mean variables

	Absolute difference of countries' tax burden to tax burden…			Absolute difference of countries' income tax reliance to income tax reliance…			Absolute difference of countries' fiscal decentralization to fiscal decentralization…		
	Overall mean	EU countries mean	Eurozone countries mean	Overall mean	EU countries mean	Eurozone countries mean	Overall mean	EU countries mean	Eurozone countries mean
Intercept	-0.516***	0.278**	0.040	1.685***	0.784***	-1.611***	0.295	-2.479*	7.043*
	(0.164)	(0.139)	(0.165)	(0.242)	(0.285)	(0.345)	(0.738)	(1.285)	(3.569)
EU membership	-0.024**	-0.078***	-0.029**	-0.025*	-0.035**	0.031	0.137**	-0.470***	
	(0.010)	(0.008)	(0.015)	(0.014)	(0.017)	(0.031)	(0.054)	(0.094)	
Eurozone membership	0.007***	0.016	-0.015	-0.094***	-0.137***	-0.281***	0.061	0.280**	-0.518
	(0.013)	(0.011)	(0.013)	(0.020)	(0.023)	(0.028)	(0.069)	(0.120)	(0.209)
Common law (Anglo) country	-0.130	-0.068***	-0.009	0.042***	0.107***	-0.009	-0.124***	-0.208***	-0.005
	(0.010)	(0.008)	(0.014)	(0.014)	(0.017)	(0.028)	(0.043)	(0.076)	(0.147)
Former East bloc country	-0.106***	-0.094***	-0.037***	0.090***	0.115***	0.163***	-0.208**	-0.326**	-0.308**
	(0.014)	(0.011)	(0.012)	(0.020)	(0.024)	(0.026)	(0.081)	(0.140)	(0.147)
Population (natural log)	0.025***	0.026***	0.030***	-0.017***	-0.022***	-0.026***	-0.095***	0.009	0.005
	(0.003)	(0.002)	(0.003)	(0.004)	(0.005)	(0.007)	(0.013)	(0.023)	(0.035)
GDP per capita (natural log)	-0.002	-0.052***	-0.034***	-0.075***	0.027	0.239***	0.267***	0.370***	-0.358
	(0.013)	(0.011)	(0.014)	(0.019)	(0.022)	(0.029)	(0.069)	(0.119)	(0.350)
Percentage of population under 25	1.435***	0.985***	0.661***	-0.798***	-0.914***	0.275	0.841	-0.113	-8.017**
	(0.157)	(0.132)	(0.216)	(0.231)	(0.272)	(0.452)	(0.823)	(1.432)	(3.548)
Percentage of population over 64	0.774***	-0.476**	-0.704**	-1.129***	-1.485***	-0.626	-7.166***	-3.443	-5.281
	(0.235)	(0.198)	(0.272)	(0.345)	(0.406)	(0.569)	(1.560)	(2.714)	(6.217)
Adjusted R-square	0.285	0.485	0.419	0.113	0.188	0.356	0.311	0.285	0.120
Overall F	9.48	21.01	17.07	3.69	5.92	13.32	4.16	3.79	1.82

*Notes: Tax burden is measured as total tax revenues as percentage of GDP; income tax reliance is measured as revenues from income taxes as percentage of total tax revenues; and fiscal decentralization is measured as revenues collected at state and local government levels as percentage of total tax revenues. All regression models include year dummies (not tabulated). Standard errors in parentheses; *, **, and *** indicate significance at the .1; .05; and .01 level respectively.*

The results from the t-tests further suggest that the 2004 expansion did not impact tax system harmonization much. The tax burden variable (tax revenues in percent of GDP) converges for all countries in the sample and for the EU member countries. There appears to be no harmonization with regard to fiscal decentralization.

Table 8

Difference to mean measures

Panel A. Before and after 1992 (Maastricht Treaty)

		All countries	EU countries
Absolute difference of tax burden to tax burden mean	before 1992	0.230	0.206
	after 1992	0.182	0.167
	P-value	<.0001	0.001
Absolute difference of income tax reliance to income tax reliance mean	before 1992	0.278	0.226
	after 1992	0.257	0.227
	P-value	0.073	0.936
Absolute difference of fiscal decentralization to fiscal decentralization mean	before 1992	0.460	0.331
	after 1992	0.540	0.483
	P-value	0.013	0.003

Panel B. Before and after 2004 (largest expansion)

		All countries	EU countries	Eurozone countries
Absolute difference of tax burden to tax burden mean	before 2004	0.210	0.194	0.162
	after 2004	0.175	0.151	0.153
	P-value	0.000	0.000	0.538
Absolute difference of income tax reliance to income tax reliance mean	before 2004	0.266	0.221	0.186
	after 2004	0.265	0.239	0.176
	P-value	0.970	0.306	0.595
Absolute difference of fiscal decentralization to fiscal decentralization mean	before 2004	0.503	0.428	0.482
	after 2004	0.495	0.468	0.468
	P-value	0.850	0.447	0.841

Notes: Tax burden is measured as total tax revenues as percentage of GDP; income tax reliance is measured as revenues from income taxes as percentage of total tax revenues; and fiscal decentralization is measured as revenues collected at state and local government levels as percentage of total tax revenues. Fiscal decentralization data is not available for years 1972 and earlier. Euro-countries cannot be assessed for the time period before 1992.

The t-tests only examined whether some harmonization is taking place but not whether there is more cooperation within the EU (eurozone) than among other OECD countries in our sample. This is tested in regression model 4 with the results presented in table 9. The results confirm that the difference of country tax variable to the mean tax variable is lower for EU countries in the case of the tax burden and income tax reliance but not in the case of fiscal decentralization. The significantly negative correlation of the "later than 1992" dummy variable with the tax burden and with income tax reliance indicates that after the year 1992, on average, the difference between the country variable and the overall mean was less than before 1992. Again, this correlation was not significant for fiscal decen-

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tralization. After the year 2004, the absolute difference to the mean increased again for the burden and income tax reliance measures but decreased for fiscal decentralization. The coefficient estimates for interactions between the 1992 year and 2004 year and the EU dummy variables provide a mixed image of tax harmonization. For the tax burden measure and for the income tax reliance variable, the interaction of EU country and later than 1992 (later than 2004) time measure is positive (negative) which would indicate that at first, the difference to the mean decreases less for EU countries than for the entire country set as a whole but then, after 2004, this trend reverses. For the fiscal decentralization measure, the results are mostly not significant suggesting that tax system cooperation within the EU or eurozone is not significantly different (stronger *or* weaker).

Table 9

Tests for tax harmonization within EU and eurozone (OLS regression results)

	Dependent variable is the absolute difference of the countries...					
	...tax burden to overall tax burden mean		**...income tax reliance to overall income tax reliance mean**		**...fiscal decentralization to overall fiscal decentralization mean**	
	Parameter estimate	**Standard error**	**Parameter estimate**	**Standard error**	**Parameter estimate**	**Standard error**
Intercept	-0.585	0.133***	1.367	0.198***	0.375	0.634
EU membership	-0.038	0.012***	-0.078	0.018***	0.118	0.056**
Eurozone membership	-0.009	0.018	-0.050	0.027*	0.013	0.070
Common law (Anglo) country	-0.132	0.009***	0.040	0.014***	-0.119	0.037***
Former East bloc country	-0.100	0.013***	0.104	0.020***	-0.197	0.073***
Population (natural log)	0.025	0.003***	-0.014	0.004***	-0.093	0.013***
GDP per capita (natural log)	0.005	0.010	-0.058	0.015***	0.249	0.049***
Percentage of population under 25	1.387	0.154***	-0.689	0.228***	0.866	0.777
Percentage of population over 64	0.661	0.224***	-1.088	0.332***	-6.922	1.337***
Later than 1992	-0.024	0.013*	-0.034	0.019*	0.043	0.049
Later than 2004	0.030	0.016*	0.065	0.024**	-0.095	0.055*
Interaction of 1992 with EU	0.049	0.018***	0.076	0.027***	0.010	0.076
Interaction of 2004 with EU	-0.046	0.025***	0.042	0.037		
Interaction of 2004 with eurozone	0.016	0.027	-0.103	0.039***	0.122	0.082
Adjusted R-square	0.31		0.13		0.38	
Overall F	38.83		13.74		17.29	

*Notes: Tax burden is measured as total tax revenues as percentage of GDP; income tax reliance is measured as revenues from income taxes as percentage of total tax revenues; and fiscal decentralization is measured as revenues collected at state and local government levels as percentage of total tax revenues. *, **, and *** indicate significance at the .1; .05; and .01 level respectively.*

Nontabulated results using dependent variables with the absolute difference to the EU mean and the absolute difference to the eurozone mean also imply not much difference in cooperation within the EU (eurozone) than otherwise.

5 CONCLUSION

Tax systems can be assessed using a plethora of rate and non-rate variables. This study focuses on three rate variables measuring different aspects of tax collection as well as several non-rate measures related to administration and enforcement. The descriptive analysis, graphical representation, as well as t-tests indicate that tax systems within the EU and within the eurozone (even when controlling for EU membership) are significantly different from other countries' tax systems with regard to tax burden, income tax reliance, and fiscal decentralization. As one might expect, the tax burden in EU countries is significantly higher than in other OECD countries. Interestingly, countries in the eurozone have, on average, lower tax burdens than other EU countries that have not adopted the euro. Income tax reliance, which has sometimes been used as proxy of a tax system's general rate structure and progressivity (Robinson and Slemrod, 2011; Richardson, 2007), is lower in EU countries and even lower in eurozone countries. Similarly, there is less fiscal decentralization in the EU; again, the difference is not quite as high for countries in the eurozone as in countries that have joined the EU but have not adopted the euro. With regard to non-rate dimensions of tax systems, i.e., metrics related to tax administration and enforcement, the differences between EU countries and non-EU countries are not significant.

When analyzing the change of the tax system variables over time, one might expect some coordination of certain tax variables – especially within country groups that have a common currency system. Indeed, t-test results confirm overall tax system harmonization with regard to tax burden by comparing the difference to the means for each tax system variable using the benchmark years of 1992 (Maastricht Treaty) and 2004 (largest expansion of the European Union). For other variables not much cooperation can be detected. Moreover, tax system harmonization does not appear to be different (stronger or weaker) for EU member (eurozone) countries. This is noteworthy especially in the current political climate where many politicians are asking for more tax cooperation among EU (eurozone) member countries. The next task might therefore be to identify possible reasons for the lack of cooperation. One answer may lay in the analysis of non-rate factors related to administration and enforcement (Robinson and Slemrod, 2011). These variables measure how countries administer and enforce tax collection, with higher numbers generally implying more/better means to combat non-compliance or tax evasion. Unfortunately, for the non-rate tax system dimensions no time-series analysis is possible at this point. Of course, it would be interesting to compare and correlate changes in tax administration and enforcement with changes of other tax system variables. Future research may investigate whether a country's tax structure changes together with the administration of tax reporting and collection. Furthermore, a tax system index that combines non-rate and rate information might help with future analysis and comparisons. We therefore hope that this research will be extended to develop a more comprehensive tax system index that comprises the different aspects of taxes into one measure.

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Limits of a Post-Soviet State: How Informality Replaces, Renegotiates, and Reshapes Governance in Contemporary Ukraine

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A growing body of authors and increased literature in various disciplines such as anthropology, sociology, economy, human geography and law have been suggesting that unofficial, informal, diverse, underground or shadow economies are not necessarily the result of economic choice. Thus, to comprehend the phenomenon, there is a need to go beyond the usual capitalist framework that has influenced much research. It is obvious that the gains from economic exchanges are not exclusively material, and one should also take into consideration the "spiritual needs" that are being satisfied. Thus, it is not possible to measure the value of informality in material terms alone. In the study of post-socialist societies, unofficial production, non-registration of economic activities and/or corruption may be deemed the solution rather than the problem because such practices might be seen as the only way in which the state can be made to work. In a situation when public finance policy ignores needs of the public, such behaviour has enables these societies to survive.

Abel Polese is a senior researcher at Tallinn University and Dublin City University. His new book *Limits of a Post-Soviet State: How Informality Replaces, Renegotiates, and Reshapes Governance in Contemporary Ukraine* is an interesting and inspiring collection of his (sometimes with other authors) previously published and revised texts and now brought up to date on problems that characterise many post-Soviet societies with particular attention to Ukraine. As well as an introduction and concluding remarks, the book contains eight chapters that deal with many issues of informality: food and welfare in the observed society, an analysis of hospitability and the transformations of farmers' and second hand markets or bazaars.

In the foreword, Colin Williams explains that this book examines various relationships between the market, state and informal economy across post-Soviet society and shows that these relationships are different depending on the existing political, economic and social context. The outcome of the book is very rich and it clearly contributes to a better understanding of the complex relations between the state, the market and informality in observed society. Williams stresses that the book gives sound critiques of the quite familiar and accepted attitude that through economic development the former socialist society is being transformed into a formal economic market, so the newly accepted formal economic practice is just one of the systems that exist in post-Soviet societies.

In the Introduction, Polese states that this book is mostly about Ukraine, but it is surely relevant to more than this one single geographical area, because despite differences many things are familiar and common in the majority of post-Soviet societies. He asks what informality is and where it is present. The author thinks that informality might be a starting point, a mechanism that may be formalised and used to propose new formal rules. However, this formalisation of widespread informal practice is not the end of a story, rather, a transitional stage in a cycle that might bring informality back. While informality originates within existing formal rules and structures so as to complement them, it could be treated as a space be-

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tween two formal rules. There are probably two ways to limit informality in a system. The first, a quantitative approach, is based on a significant reduction of the volume of informal transactions, increasing regulation and reducing individuality and initiative. Even the most repressive, or controlling, state is not able to regulate and control citizens' lives the whole day long. Very soon, almost inevitably, such an approach causes overregulation, suffocates private initiative and seriously hinders economic or social development. The second, qualitative, approach tolerates or even encourages informal activities as long as they do not impair the way a system works. In such circumstances citizens can express and develop their creativity, initiative and entrepreneurial skills while working together with the state towards the achievement of common goals. Informality is not something merely economic or monetary but influences all aspects of a society, of a state and its governance. Almost a crucial question in the relation between informality and the state is the possible gap between what the state promises and gives or the gap between what the state symbolically represents and provides and what it delivers in reality. Success in limiting the forms and power of informality may not be measured by how much informality is present in a system but where informality is and how it is manifested.

Chapter one entitled "Informality and the (welfare) state" describes situations where informality de facto replaces the state for some services that the state should, but in fact, it does not provide. The text begins with debates on the role of the state, and its relationship with its citizens. Regarding the situation in the region observed, analysts have suggested two possible directions: one group of experts in transition predicted a convergence with Western European patterns, while the opposite school concluded that post-socialist states might create new paths and establish particular forms of economic growth, in which the state cannot or does not want to rule. While the state, during the socialist period, the provision of social welfare by both financing and regulating it, it has now withdrawn from these activities, and is incapable of creating an efficient regulatory framework in which non-state welfare providers could enter and legitimately take on the welfare functions that were previously in the state domain. Post-socialist countries have witnessed the underfinancing and institutional fragmentation of previously universal welfare states. This led to the privatisation of social protection, which encompasses the family, the market and the non-profit sector. In the absence of adequate markets and appropriate governance mechanisms people look to more diverse strategies of risk avoidance, primarily family solidarity and mutual help. Thus, informality is complementary to formality or is even replacing formal processes and structures. Where the welfare state does not function, welfare is diffused through informal channels, which leads to the creation of alternative structures and institutions of welfare, social justice and many other socio-economic functions that are underperformed or totally not-provided.

Chapter two and three deal with problems of border crossing using as its main example the small train – an *elektrichka* – that connects Odessa in Ukraine with

Chisinau in Moldova. As the train passes through the self-proclaimed semi-independent and very poor Transdnistrian Republic, it is also an ideal mechanism for smuggling and counterfeiting. The Transdnistrian is a miniature version of post-Soviet societies, including political struggles for power, corruption and ethno-political clashes, as well as the shadow economy and border problems. When the border itself is so unofficial, some people claim to represent the state and say that others do not, making it difficult to distinguish who is and who is not the state. There is a direct possible confrontation with the law, with decisions having to be made quickly as to whether certain things or practices are legal are not, in order to permit or forbid, or to define a price for actions, goods and/or favours. Smuggling as an illegal activity requires little physical effort but it implies high levels of stress; as a survival strategy it is socially acceptable for the traders and even for border officers. A "little" corruption of a border official may enable a fairer distribution of money and smuggling might be seen as a market factor that escapes the protectionist policy of local monopolists. In that way, thanks to the prevalence of smuggling, consumers have access to better quality goods, while merchants, despite unemployment, can still earn the money necessary for life. Border officers are also satisfied because they can receive some benefits and top up their meagre salaries. Finally, such activity is also important for the society because it supports the social structure and permits an extreme level of discontent and violence that could cause further unrest to be avoided. However, widespread unofficial behaviour can lead to corruption that very fast tears apart the social fabric, which is analysed in the next chapter.

An economic transaction may be regarded from different angles. Thus, chapter four explains that corruption can also be an indispensable lubricant for solving pointless and artificially created hindrances; for example, when a person needs document A to get document B, but cannot get B without having previously obtained A. Very often, in many societies, there is a conflict between legal and social norms, which becomes even more obvious when some illegal behaviour becomes acceptable to a majority of citizens. When there is uneven access to state resources, corruption and other forms of informal transactions or actions may be a mean to achieve a more equitable access to opportunities and resources. Whether such transactions are deemed bribes depends on the social norms and the internal rules of the administration. When speaking about corruption at the level of the state, people refer to those transactions as wrong and criticize them, but in private affairs (when talking of a teacher or a doctor), they treat a bribe merely as a sign of gratitude. The distinction between a bribe and a gift may become blurry and most anti-corruption regulations and strategies tend to ignore the existence of this grey area. Corruption, in situations when there is no provision of adequate public goods, may be the solution rather than the problem, just as informal practices might be seen as the only way in which a system can be made to work.

Discussing informality in the context of private and state initiatives, Polese and his co-author Thom Davies in chapter five explore the possibilities of integrating

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and/or supplementing state structures and mechanisms once they turn out to be not functioning effectively. While admitting that formal and informal activities can be viewed as a variegated spectrum, informal activity can be a means through which one can understand a wider context. Thus in chapter five informality is used as a way to improve the vulnerable status of citizens in the Chernobyl border area. The authors performed over one hundred semi-structured and informal interviews with various local stakeholders, primarily residents, but also with border guards, scrap collectors, gatekeepers, returnees, and local elites. This region confirms the structuralists' idea that informal economic practices are more present and important in economic systems where the state is unwilling or unable to protect its citizens against social risks. Because of the lack of alternative options, a number of people are forced into informal employment, and unregistered economic activities. The nuclear disaster of 1986 can be also used as a symbol of the demise of the Soviet Union – both in the way that the event itself contributed to the sudden implosion of the system's intrinsic vulnerability, but also as a sign that the Exclusion Zone has become a frozen microcosm of late-Soviet habitual life. Although radiation risk is invisible from the normal perspective, it is actually very dangerous with long lasting consequences. Chernobyl citizens face a "double exposure" from the combination of nuclear pollution and failed governance that does nothing (or at least insufficiently much) to alleviate their problem. Thus, they increasingly depend on informal mechanisms to improve their current adverse social and economic position. Informal methods are used to overcome various everyday problems, primarily through bribing the doctors to decide on a higher level of disability and paying the guards to allow hunting or collecting mushrooms in the forbidden region. Most of the citizens do not want to leave this region and their habitual way of life because they understand that the alternative is much worse and that they can endanger their informal or illegal survival tactics and social networks on which they depend so greatly. The authors conclude their analysis with the challenging question: "If the state retires from an area, or from providing a service, how can the coping mechanisms possibly be 'illegal'?"

The sixth chapter deals with the relationship between hospitality and informality with the goal of examining the changing role that food and drinks have in various situations and the different value they have obtained in the present social context. As they can be used to establish alliances, develop trust networks and/or enable a lasting relationship, in circumstances of fast economic transition an increased number of people try to redefine the complex process linked with hospitality. Hospitality's rationale may be caused by the fact that a relationship involving it should strengthen social ties and boost trust networks among individuals. Hospitality can enrich the host morally, before his friends and neighbours, guest, but also can be linked to expected potential reciprocity. Eating has two main symbolic denotations. The first one is mutual recognition of host and guest. By offering a meal the host is sending a message that the guest is welcome and is building a relationship of trust. The second meaning is linked to duty because in that way the host is realising his duties. Polese compares habits of hospitality in Batumi, the second largest city of

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Georgia and in Odessa in Ukraine. Odessa and Batumi are in a unique position because their climate allows the production of good wines, fruit and vegetables. They are relatively close to other countries like Armenia or Moldova, which enables imports of different products. In both cities hospitality and offered food create mutual dependence and gratitude, but also there is the possibility that the person will put his family in debt in a desire to provide the best food for his guests.

Located seven kilometres from the centre of Odessa on highway towards Ovidiopol there is huge bazaar properly called 7-oy km ("7th kilometre"), that is analysed through the lenses of the informal economy in the following chapter. The crucial question is the resistance of such a type of retail trade in the conditions of the ubiquity of supermarkets, which are also beginning to emerge in Ukraine. In spite of the many supermarkets, the bazaar has been able to occupy a niche in the everyday economic and social life of Odessans. This is not related only to the low-price level of the products; because in some cases prices might be higher (or there is a high chance of being ripped off), the conditions might be worse (the bazaar is far from the city, there are no trolleys, and as deals are transacted in the fields it is cold in the winter period). Bazaars obviously embody a desire to concentrate on values other than monetary ones and there are two main reasons why they have survived. First, the new demand in consumption has caused a transformation of bazaars, from a place where things happen to a cultural and economic space in which traditional values are preserved, social relationships are maintained and improved and finally, transactions that are not always necessarily monetarily oriented are performed. Second, originally a place where foods like meat, fruit, vegetables and subsistence goods were sold, bazaars are being transformed into places where everything can be found, like clothes and furniture as well as legal or illegal goods. The bazaar has responded to a change of environment by surviving as a two-fold institution. On the one hand it keeps values such as tradition, genuineness and socialisation, which mostly are not present in modern supermarkets. On the other hand, the bazaar also responds to the demand for cheap, sometimes illegal, or extra-legal goods. Despite the challenge of external influences and western style supermarkets that are threatening tradition and previous practices, the bazaars have successfully responded to a change of conditions and environment. Obviously, the bazaars are going to stay and continue to play an important role in the life of the citizens for a long period. The two final parts of the book are dedicated to future studies of informality and to concluding remarks. Research into informality has expanded has not yet reached its boundaries and is increasingly adopting a multi-disciplinary approach, drawing on urban studies, psychology, management, international relations and political sciences, in addition to the previously established relevance of economy, anthropology and sociology. Informal activities are likely to emerge when the gap between what the state provides and what the citizens demand is increasing. This usually leads to several possible outcomes. A new informal practice becomes complementary to a formal rule or reacts to the new instructions that cannot be complied with immediately by the population. Reasons for participation in the informal economy mostly depend on the fact that

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people themselves choose not to be part of a system they do not trust, or that they believe is bringing them more damage than benefits. There are multiple reasons for such an attitude, from the widespread corruption, high tax burden, lack of formal benefits and/or the opinion that the state does not feel the need and desire to intervene and help them. Citizens have the power to change policies not only by protesting but also by repeating the same actions in an unorganised and apparently casual way, a phenomenon that has been additionally demonstrated in the context of economic policies. Starting from the new approach, the author studies the empirical material through the prism of the Russian-Ukrainian language dynamics in Odessa and the competition from both a formal and informal perspective. In previous times in Odessa people spoke Russian. The nationalist mobilisation prompted a fast spread of civic pro-Ukrainian movements and Ukrainian feelings were expressed through and mediated by a number of channels. Today in the classrooms in Odessa the teacher greets pupils in Ukrainian then switches to Russian for technical information that is not part of the curriculum programme (asking pupils to stay silent). Once the class officially begins the teacher can switch back to Ukrainian and keep talking in Ukrainian until some students become noisy, or someone seems not to be understanding. Then again Russian will be used to establish a more direct, and fast, channel of communication. By massively denying the role of Russian in their everyday life and occupational obligations, teachers give the impression of satisfactorily complying with the requirements from the Government from Kiev. Official documents show that Ukrainian is widely spoken in Odessa, but a deeper insight into the linguistic dynamics exposes an informal mechanism that mediates between how things should be and how they really are. Odessans limit the use of Ukrainian in their daily life but display it in a way that does not challenge state instructions.

In the rather short concluding remarks, Polese underlines that informality is not a marginal phenomenon, but it is present everywhere in various and dynamic forms. An intention to eradicate or reduce informality, inevitably leads to the question "what does informality mean". The answer is complex, but without doubt informality has both positive and negative characteristics depending on the context. Regardless of what has been stated, one should not become an enthusiastic supporter of informality and in that way forget the role of formal mechanisms and formal governance that are used to give continuity to decisions beyond a single individual.

Briefly, this is a very interesting and useful collection of papers related to the informal economy, seeing the phenomenon from various points of view and accordingly suggestively contributing to the existing literature on the issue.

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