Financial Theory & Practice

1/2016

Vol. 40, No. 1 | pp. 1-155
March 2016 | Zagreb

UDC 336
ISSN 1846-887X

Institute of
Public Finance

Publisher
Institute of Public Finance, Smičiklasova 21, Zagreb, Croatia

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Financial Theory & Practice 1/2016

Reviewed scientific journal

Vol. 40, No. 1 | pp. 1-155 | March 2016 | Zagreb

Institute of
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Predicting gross wages of non-employed persons in Croatia

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Article**
JEL: J31, C21, C52
doi: 10.3326/fintp.40.1.1

* This work has been supported in part by the Croatian Science Foundation under project number UIP-2014-09-4096. The authors express gratitude to the reviewers, whose comments have motivated significant additions and upgrades to the basic version of the paper.
** Received: September 22, 2015
Accepted: January 7, 2016

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FINANCIAL THEORY AND PRACTICE
40 (1) 1-61 (2016)

Abstract

We present the findings of a study aimed at building a model for predicting wages of non-employed persons in Croatia. The predictions will be used in the calculation of marginal effective tax rate at the extensive margin and in labour supply modelling. The database used is 2012 "EU statistics on income and living conditions". The paper comprehensively explains the data source, variables, subgroups of employed and non-employed, and the results of the linear regression model, the Heckman selection model and the quantile regression model. The quality of predictions obtained by different models is compared and discussed.

Keywords: gross wages, estimation, prediction, unemployed, inactive, Heckman selection model, quantile regressions, Croatia

1 INTRODUCTION

This paper presents the findings of a study aimed at building a model for predicting gross wages of non-employed persons in Croatia, using "EU statistics on income and living conditions" (henceforth SILC) data. These wage predictions will be primarily used as inputs in further research: (a) for the calculation of marginal effective tax rate at the extensive margin (METREM), and (b) for the estimation of discrete choice labour supply models.

METREM measures the net benefit of a household occurring in a hypothetical situation, in which a non-employed person enters employment. The transition from non-employment to employment has a complex effect on household income; social benefits are typically reduced or extinguished, which decreases the gain obtained from employment. Furthermore, part of a gross wage is taxed away in terms of personal income tax and social insurance contributions. The traditional approach computes METREM for several "model family types" (e.g., a single person or a couple with one earner and two children aged 12 years).[1] Such an approach provides a good description of how the tax-benefit system affects household net income, but ignores the heterogeneity of family and personal characteristics in the population. To provide an accurate picture of the distribution of METREM, real datasets and *tax-benefit microsimulation models* should be used in estimation.[2]

EUROMOD is the tax-benefit microsimulation model for the European Union, which provides cross-country comparable measures of direct taxes and social insurance contributions liabilities. The model also provides cash benefit entitlements for the household population of EU member states (Figari et al., 2014). Beginning in 2016, EUROMOD will include the module for simulating the Croatian tax-benefit system. MICROMOD is the tax-benefit microsimulation model

[1] Carone et al. (2004) perform such calculations for OECD countries. Bejaković et al. (2012) calculate METREM for eight hypothetical family types in Croatia. The analysis indicated that some family types have very high METREM (near 100%), such as two-adult families, in which both adults are non-employed, and families with three or more children. For non-employed persons in these families "work does not pay" because the withdrawal of benefits is almost as high as the gain from the net wage.

[2] Such a model is proposed by Immervoll and O'Donoghue (2002), who calculate METREM using EUROMOD.

for Croatia, which will be based on EUROMOD and contain additional elements concerning local government benefits and labour supply estimation.[3]

For most countries, EUROMOD uses SILC data. SILC data for Croatia are based on the survey "Anketa o dohotku stanovništva", compiled since 2010 by the Croatian Bureau of Statistics (CBS) and used by CBS to calculate measures of poverty and living standards (CBS, 2013b).

The effects of the tax-benefit system on household income are evaluated using the microsimulation models of taxes and benefits. However, these models do not *per se* provide one of the key variables needed for the calculation of METREM – *the amount of gross wage that could be earned by a non-employed person who enters employment*. SILC contains information only on wages earned in the income reference period. For persons who have not been working in this period, data on wages are missing.

Wages of non-employed persons can be predicted from the wage equation, which describes the functional relationship between the wage and personal characteristics such as age, marital status, place of living, work experience and occupation. Industry of employment and job characteristics can also be added as independent variables. The wage equation is typically modelled within the linear regression model (LRM) and estimated using the sample of employed persons.[4]

However, such an approach, which uses only data on employed persons, is challenged by Heckman (1976, 1979), who introduces the concept of "sample selection problem". Namely, the wage equation coefficients obtained by the abovementioned model may be biased because the sample is not representative of the whole population. Heckman suggests a model that identifies and corrects the sample selection problem. This model consists of a wage equation and a participation equation, in which the latter estimates the probability of a person to be employed vs. non-employed. The random terms in the wage and participation equation represent unobservable characteristics influencing wage and probability of employment, respectively. If these random terms are correlated, the sample selection problem exists and wage equation parameters must be "corrected".

The Heckman selection model (HSM) has achieved huge popularity among researchers and is widely used in wage estimations. Two areas of application are most frequent: (a) prediction of wages of non-employed persons for labour supply modelling[5], and (b) estimation of the gender wage gap and other wage differen-

[3] MICROMOD will be developed in a project, "Application of Microsimulation Models in the Analysis of Taxes and Social Benefits in Croatia" (Institute of Public Finance). For more details, see: http://www.ijf.hr/eng/research/croatian-science-foundation-projects/1053/ammatsbc/1062/.

[4] The relevant studies for Croatia include Nestić et al. (2015) and Nestić (2005).

[5] A small excerpt of these studies includes van Soest (1995; for the Netherlands in 1987), Labeaga et al. (2008; for Spain in the late 1990s), Pacifico (2009; for Italy in 2002), Berger et al. (2011; for Luxembourg in 2004), Bičáková et al. (2011; for the Czech Republic in 2002), and Mojsoska-Blazevski et al. (2013; for Macedonia in 2011).

tials.[6] HSM has become a standard tool in wage estimation despite criticism and the emergence of alternative approaches for addressing the selection problem (Winship and Mare, 1992; Vella, 1998; Puhani, 2000).

In this study, we use several methods for gross wage estimation and prediction: LRM, HSM and quantile regression model. For HSM estimation, non-employed persons are partitioned into several distinctive groups. Results from different models are compared to reveal the advantages and weaknesses of different methods. The comparison is done by the analysis of residuals and density estimates of predicted wage distributions. Although SILC data for Croatia exist for several years, this study is the first comprehensive work to employ them. Therefore, our descriptions can be useful in promoting wider use of this valuable data source. During the research, we faced several methodological issues, most of them recurring in the literature. In this paper, suggestions are provided on how these problems can be addressed, but further research is needed to address them completely.

The structure of the paper is as follows. Section 2 is devoted to methodological issues. The first part describes LRM and HSM. Then, the formulas for gross wage prediction are derived. A discussion of specification issues in HSM follows. In the last part of this section, the mentioned methodological challenges are discussed. Section 3 first provides a description of the Croatian SILC and the variables constructed for use in regression models. A brief overview follows on the structure of working population based on SILC, which serves as an introduction into the procedure for shaping the subgroups of employed and non-employed persons. Descriptive analysis of the variables by subgroups is then presented. Section 4 analyses participation in employment and non-employment using the probit method. The prediction quality of probit models is assessed using classification tables and several measures of fit. The key results of the paper are found in section 5, which presents the estimates of the wage equation using LRM, quantile regressions model and HSM. Predictions from all of these models are compared for employed and non-employed persons. Section 6 discusses the results and concludes.

2 METHODS FOR WAGE ESTIMATION AND PREDICTION

2.1 LINEAR REGRESSION MODEL AND HECKMAN SELECTION MODEL

The standard approach in econometric modelling of wages assumes that the natural logarithm of wage, w_i, of each person i is linearly dependent on variables that describe C personal characteristics, which are summarised by $X_i = [1, x_{i1}, ..., x_{iC}]$. The relationship between w_i and X_i is called the *wage equation* and is written as follows:

$$w_i = X_i\alpha + \varepsilon_i \tag{1}$$

[6] See Paci and Reilly (2004; for Albania, Bosnia and Herzegovina, Bulgaria, Poland, Serbia, Tajikistan, Uzbekistan in the early 2000s), Pastore and Verashchagina (2008; for Belarus in 1996 and 2001), Khitarishvili (2009; for Georgia in 2000 and 2004), and Avlijaš et al. (2013; for Serbia, Montenegro and Macedonia in the mid-2000s).

where $\alpha = [\alpha_0, \alpha_1, ..., \alpha_C]$ is the set of coefficients common to the whole population. ε_i is the random term, which captures "unobservable characteristics", i.e., the part of wage that is not described by $X_i\alpha$; $\varepsilon_i \sim N(0, \sigma_{\varepsilon\varepsilon})$, i.e., ε_i is normally distributed with variance $\sigma_{\varepsilon\varepsilon}$, and the expected value of ε_i is $E(\varepsilon_i | X_i) = 0$.

By population, we mean all persons in a society, either employed or non-employed.[7] Because $E(\varepsilon_i | X_i) = 0$, the expected wage of a person i randomly drawn from population equals the following:

$$E(w_i | X_i) = X_i\alpha + E(\varepsilon_i | X_i) = X_i\alpha \tag{2}$$

In an attempt to estimate relationship (1), data on actual wages are typically used. Precisely for this reason, data on wages are usually available only for employed people, whereas they are missing for non-employed persons. Thus, the sample of I observations, $i = \{1, ..., I\}$, randomly drawn from the population can be sorted and divided into two parts: K employed persons, $i = \{1, ..., K\}$, and $I - K$ non-employed persons, $i = \{K + 1, ..., I\}$.

Let us assume that we know and correctly measure all of the elements of X_i, and, furthermore, that actual wages reflect, in general, true earning potential. The linear regression model (LRM), using the ordinary least squares method on subsample $i = \{1, ..., K\}$, will provide estimates $\tilde{\alpha} = f\{w_i, X_i; i = 1, ..., K\}$ of true coefficients α. Are estimates $\tilde{\alpha}$ unbiased? According to Heckman (1976, 1979), they may not be because the sample used in estimation, $i = \{1, ..., K\}$, covers only employed persons. Thus, information concerning non-employed persons, $i = \{K + 1, ..., I\}$, is excluded from estimation. As Heckman notes, the expected wage of employed person i, $i = 1, ..., K$, equals the following:

$$E(w_i | X_i, \text{employed}) = X_i\alpha + E(\varepsilon_i | \text{employed}) \tag{3}$$

which is different from $E(w_i | X_i) = X_i\alpha$ in equation (2). In equation (3), Heckman (1979) introduces the concept of "sample selection rule", which implies that the expected wage not only depends on X_i but also on how sample $i = \{1, ..., K\}$ is chosen. To obtain the proper estimates of α based on the available wage data, he proposes the following two-equation model:[8]

$$w_i = X_i\alpha + e_i \tag{4}$$

$$p_i = Z_i\beta + u_i \tag{5}$$

[7] Thus, a certain wage is attributed to everybody, and in this sense, wage w_i is a hypothetical construct, embodying human abilities and corresponding earning potential.

[8] In this presentation of the model, we follow Heckman (1979), with slight adaptation to our wage case. Heckman selection model is extensively used and studied. For textbook presentations, see e.g. Amemiya (1985), Verbeek (2004), Cameron and Trivedi (2005), and Green (2008). For critical reviews, see, e.g., Winship and Mare (1992), Vella (1998), Puhani (2000), Nicaise (2001), Bushway et al. (2007), and Breunig and Mercante (2010).

Equation (4) corresponds to the *wage equation* in (1); $\varepsilon_i \sim N(0, \sigma_{\varepsilon\varepsilon})$ is a random term analogous to ε_i. Equation (5) is the *participation equation*, which describes the relationship between $C + D$ personal characteristics, $Z_i = [1, x_{i1}, ..., x_{iC}, y_{i1}, ..., y_{iD}]$, and the person's employment or non-employment status. β is the set of common coefficients, and $u_i \sim N(0, \sigma_{uu})$ is a random term with variance σ_{uu}, having similar interpretation as e_i and ε_i. If $p_i \geq 0$, a person is employed; the person is non-employed if $p_i < 0$. Denote with $\sigma_e = (\sigma_{ee})^{1/2}$ and $\sigma_u = (\sigma_{uu})^{1/2}$ the standard deviations of e_i and u_i, respectively. The covariance and correlation terms are presented by σ_{eu} and $\rho_{eu} = \sigma_{eu} / (\sigma_e \sigma_u)$, respectively.

Recall the "sample selection rule" from equation (3). The person is employed if $p_i \geq 0$, i.e., if $u_i \geq -Z_i\beta$. Therefore, equation (3) is rewritten as follows:

$$E(w_i \mid X_i, u_i > -Z_i\beta) = X_i\alpha + E(\varepsilon_i \mid u_i > -Z_i\beta) \tag{6}$$

The term $E(\varepsilon_i \mid u_i > -Z_i\beta)$ is not equal to zero if there exists a correlation between unobservable characteristics e_i and u_i. Heckman (1979) obtains the value of $E(\varepsilon_i \mid u_i > -Z_i\beta)$, and equation becomes the following:

$$E(w_i \mid X_i, u_i > -Z_i\beta) = X_i\alpha + \frac{\sigma_{eu}}{\sigma_u}\frac{\phi(Z_i\beta)}{\Phi(Z_i\beta)} \tag{7}$$

where $\phi(\cdot)$ is the standard normal p.d.f. and $\Phi(\cdot)$ is the standard normal c.d.f., i.e., the probability that a person is employed. Commonly, ratio $\lambda_i = \phi(Z_i\beta) / \Phi(Z_i\beta)$ is called the "Heckman's lambda" for person i. λ_i are non-negative, monotonically decreasing and convex in $Z_i\beta$. Because $\sigma_{eu} = \rho_{eu}(\sigma_e \sigma_u)$, we have that $\sigma_{eu} / \sigma_u = \rho_{eu}\sigma_e = \Lambda$. If unobservable characteristics, represented by e_i and u_i are correlated, that will be reflected in $\rho_{eu} \neq 0$ ($\sigma_{eu} \neq 0$) and consequently in $\Lambda \neq 0$.

There are two ways to estimate HSM from equations (4) and (5): maximum likelihood and the "two-step procedure". For differences between these approaches, see, e.g., Verbeek (2004). We employ the maximum likelihood estimation using the Stata program "Heckman selection model (ML)" (command *heckman*), which provides us with estimates $\hat{\alpha}$, $\hat{\beta}$, $\hat{\rho}_{eu}$, $\hat{\sigma}_e$ and $\hat{\Lambda} = \hat{\rho}_{eu}\hat{\sigma}_e$ and with their standard errors (for more details, see section 5.4).

2.2 WAGE PREDICTION FORMULAS

The coefficients $\hat{\alpha}$ should be unbiased and consistent estimators of true coefficients α from equation (1). Following Breunig and Mercante (2010), we define three sets of wage predictions based on HSM:

(1) Unconditional predictions, applicable to the entire sample:

$$\hat{w}_i^{HUC} = X_i\hat{\alpha} \tag{8}$$

(2) Conditional predictions for employed only, defined as follows:

$$\hat{w}_i^{HCE} = X_i\hat{\alpha} + \hat{\Lambda}\frac{\phi(Z_i\hat{\beta})}{\Phi(Z_i\hat{\beta})} \tag{9}$$

(3) Conditional predictions for non-employed only, defined as follows:

$$\hat{w}_i^{HCN} = X_i\hat{\alpha} + \hat{\Lambda}\frac{-\phi(Z_i\hat{\beta})}{1-\Phi(Z_i\hat{\beta})} \tag{10}$$

We also use the wage predictions based on LRM, estimated for the subsample of employed persons, and applicable to the whole sample:

$$\hat{w}_i^{LRM} = X_i\hat{\alpha} \tag{11}$$

The correlation between unobservable characteristics in the participation and wage equations can be either positive ($\hat{\rho}_{eu} > 0 \Rightarrow \hat{\Lambda} > 0$) or negative ($\hat{\rho}_{eu} < 0 \Rightarrow \hat{\Lambda} < 0$). Both cases appear in the empirical literature.[9] If $\hat{\Lambda} < 0$, the predictions $\hat{w}_i^{HUC}$ from equation (8) will be generally greater than the predictions $\hat{w}_i^{LRM}$; furthermore, if $\hat{\Lambda} < 0$, predictions $\hat{w}_i^{HCN}$ from equation (10), obtained for non-employed persons, will be greater than the predictions $\hat{w}_i^{HUC}$ because $-\phi(Z_i\hat{\beta})/(1-\Phi(Z_i\hat{\beta}))$ is always non-positive.

2.3 SPECIFICATION ISSUES IN THE HECKMAN SELECTION MODEL

HSM requires proper specification of both participation and wage equation, i.e., the right choice of the characteristics in X_i and Z_i. Note that Z_i captures all elements of X_i and introduces D additional personal characteristics, y_{i1}, ..., y_{iD}. According to Verbeek (2004), economic arguments require that all elements of X_i are included into Z_i. Conversely, elements y_{i1}, ..., y_{iD} should capture only those characteristics that are not statistically or economically important in the wage equation.

Selecting the model variables for HSM represents a sensible task. If some important variable is omitted from the participation and wage equations, the correlation between error terms, σ_{eu}, will be incorrectly assessed, and the method will suggest misleading values of α. In choosing the variables, we follow the research of others (see references in footnotes 5 and 6) and create a comprehensive set of characteristics, given the availability of data in SILC (see section 3.2).

Section 2.1 speaks generally about the "population" and distinguishes between "employed" and "non-employed". In practice, it is necessary to define precisely what these groups represent. "Non-employed" are a heterogeneous group consist-

[9] Nicaise (2001) explains the phenomenon of negative Λ using the "crowding hypothesis" from labour economics theory. Namely, in periods of high unemployment, due to constraints on the demand side in the labour market, "individuals compete with each other by bidding down wages or by accepting jobs below their level of qualification". Thus, for example, in fear of becoming unemployed, persons with tertiary education may replace those with secondary education on jobs that commonly "belong" to the latter. This effect pushes the expected wage line (to be estimated for employed persons) below its "true" level; HSM should reveal the true line.

ing of individuals who have varying attachments to the labour market and different participation mechanisms. Correct specification of the participation equation requires that non-employed are divided into more homogeneous subgroups, such as unemployed, marginally employed, and the work-able inactive (Breunig and Mercante, 2010). In this study, working age persons are divided into *employed*, *unemployed*, *inactive* and other persons. A special procedure is created to form these subgroups (see section 3.4).

2.4 OTHER METHODOLOGICAL CHALLENGES

HSM is comprehensively used for predicting the wages of non-employed (see references in footnote 5). However, the predictive power and methodological issues concerning the general suitability of HSM for such a purpose have not been thoroughly investigated. One exception is Breunig and Mercante (2010), who conclude that LRM, which uses the subsample of employed persons, has greater predictive power than do HSM and several other selection models.[10]

Based on a literature review and our own investigation, we have identified several methodological issues related to predicting the wages of non-employed.[11] In this paper, we can provide only suggestions for the solutions to these problems; further research is needed to address them completely.

(1) Concerning interpretation of the results, Paci and Reilly (2004) note that the unconditional wage predictions, $\hat{w}_i^{HUC}$, do not represent "actual" wages that could be obtained at the market but rather the "wage offers" of persons randomly drawn from the population that are based on their personal characteristics. Therefore, we ask the following question: are the predictions $\hat{w}_i^{HUC}$ appropriate for use in the calculation of METREM?

Assuming that a non-employed person, who hypothetically enters employment, accepts the ongoing market wage, then the predictions $\hat{w}_i^{LRM}$ have more credibility than do $\hat{w}_i^{HUC}$ (or $\hat{w}_i^{HCN}$) because they reflect better the actual market wages.

(2) Both the HSM and simple wage equation models are concentrated on the "supply side", i.e., the personal characteristics that determine the supply of labour but neglect the "demand side" of the labour market, whose influence can be particularly important in recession periods (e.g., for Croatia in 2011).

The "demand side" can be partly incorporated into current models through the use of *occupation* variables, which may "transmit" the effects of low or high relative demand in particular areas on the wages.

[10] Breunig and Mercante (2010) claim that their paper is "the first to examine the question of the predictive power [of HSM] for the non-selected sample". In a thorough analysis for Australia, they employ HSM and several alternative selection models. They use longitudinal survey data, which enable them to analyse the persons who change their employment status over the period of several years and to compare the predicted wages for the periods of non-employment with actual wages obtained in employment.

[11] Some of these issues were suggested by our reviewers.

(3) Additional problems arise for models that address non-employed persons. Namely, wage predictions for non-employed imply the *ceteris paribus* assumption, according to which the hypothetically newly employed do not affect the overall wage setting mechanism. However, this assumption is obviously unwarranted; a large group of non-employed persons entering employment at a certain moment (given that the market can absorb them) would have a huge effect on all market wages.

In the calculation of METREM, an explicit assumption can be made, i.e., that the model analyses the *hypothetical* transition from non-employment to employment, in which *only one* person enters the market at a time. Such an event would have a negligible effect on the market wage.

(4) Both LRM and HSM consist of a single wage equation; for each variable, a single coefficient is estimated for all sample data. Thus, the partial effect of each variable on the wage is identical across the wage distribution. However, in reality, this assumption may not hold. Using LRM, Nestić (2005) finds for Croatia in 2003 that, controlled for various personal characteristics, the wage premium for employed in the widely defined public sector is 9%. However, the results of quantile regressions show that the premium for employees at the 10th percentile of wage distribution was 15%, for those at the 75th percentile 5%, and for those at the 90th percentile 0%. This evidence demonstrates that a "single" wage equation cannot capture different strengths of influences, particularly at the tails of a wage distribution.

Because we are specifically interested in low-potential wage earners (who are usually more likely to be non-employed), alternative approaches, such as quantile regressions, should be considered for predicting wages of non-employed (see section 5.3).

3 DATA, VARIABLES AND SUBSAMPLES

3.1 DATA SOURCE

The microdata used in this study come from the 2012 edition of Croatian SILC, which is compiled by the Croatian Bureau of Statistics (CBS) using data from the survey "Anketa o dohotku stanovništva" (ADS).[12]

SILC contains a rich set of variables describing demographic and socio-economic characteristics of persons. Because its primary role is the measurement of "income and living conditions", SILC offers a relatively detailed overview of different types of personal and household incomes.[13] However, compared with the Labour Force Survey (LFS), SILC is somewhat less detailed in respect to labour market variables. For example, SILC lacks data on the duration of unemployment or the type of ownership of the firm in which a person is employed.

[12] ADS was introduced in the Croatian statistical system in 2010 and is in line with EU regulations and Eurostat's methodology prescribed for the SILC surveys. For more details, see CBS (2013a, 2013b).
[13] For definitions of SILC variables, see Eurostat (2015).

An important feature of SILC is the "time discrepancy" in reference periods for different variables. Data on demographic characteristics and data on financial, social, and health situations refer to the date of the interview (DIN). Income data refer to the "income reference year" (IRY). Data on economic activity status are collected both for DIN and IRY. In our case, DIN is some date in 2012, and IRY is the entire year 2011.

The sample contains data for 5,838 households and 15,166 persons.[14] SILC contains sampling weights for each person in the sample, which enables the aggregation of sample data to the whole population level. These samples are used in all calculations and estimations in this paper.

3.2 VARIABLES ON PERSONAL CHARACTERISTICS AND INCOME

The description of variables considered in the analysis is shown in table A1 (appendix 2). The variables are divided into several categories: age, marital status, children, education, area of living, health, wage and income, employment, occupation and industry. In this subsection, we describe the main features of the variables, whereas the descriptive analysis of data follows in subsections 3.7, 4.1 and 5.1.

Age. The main variable (*ag_year*) refers to the age of a person in the middle of IRY (i.e., on 30 July 2011). Persons are also divided into four age groups (*ag_1525*, *ag_2540*, *ag_4055* and *ag_5565*).

Marital status. The variables describing marital status conform to formal rules and capture married (*ms_mard*), divorced (*ms_divo*) and widowed (*ms_widw*). A certain number of married persons do not live in households with their spouses, whereas a small number of divorced and widowed live with a partner in a household; these arrangements are not investigated further. However, for persons who claim the "never married" status, separate variables are created for those who live with a partner in a household (*ms_nmhp*) and for those who do not have a partner in a household (*ms_nmnp*).

Children. The children variables capture the numbers of own parents' children in three age groups: 0 to 2 years (*ch_p0002*), 3 to 6 years (*ch_p0306*) and 7 to 15 years (*ch_p0715)*. Under the assumption that the presence of other children in a household – not own parents' children but, for example, grandchildren and nephews – may affect the employment decision, an additional variable is introduced that represents the number of these children aged 0 to 15 years (*ch_o0015*).

Education. There are four basic educational variables relating to unfinished primary school (*ed_nopr*), finished primary school (*ed_prim*), secondary education (*ed_seco*) and tertiary education (*ed_tert*). Because the number of those with un-

[14] The sample used in this study is identical to the sample used in EUROMOD. For EUROMOD purposes, the original SILC 2012 sample is slightly changed; 33 non-respondent households and 18 children born in 2012 were excluded. For more details, see Urban and Bezeredi (2015).

finished primary school is quite small, a new variable (*ed_prnp*) joins them together with persons who have finished primary school.

Area of living. Detailed data on place of living are not available in SILC. However, SILC offers a variable that categorises the municipalities into three groups according to the number of inhabitants per square meter. Using these data, three variables are constructed (*ar_dens*, *ar_intr*, *ar_thin*), which are proxies for urban, semi-urban and rural areas, respectively.

Health. SILC contains several variables describing the self-perceived health status of a person. They are used to create the variables that denote persons with bad or very bad health (*hs_badh*) and persons whose usual activities are limited due to health problems (*hs_lima*).

Occupation. Occupational variables are based on the SILC variable, which refers to the main job of a currently employed person. This variable also registers occupation "held on the last main job" for people who currently do not have a job but have worked in the past. Therefore, for people who have never worked, information on occupation is not available. Among unemployed, and particularly among inactive, those who have never worked account for a high percentage. The use of occupational variables in such cases is not possible. Repercussions for the analysis will be discussed in section 3.5. Due to the relatively small number of persons in occupation "managers", they are joined with "professionals" (*oc_21*). For the same reason, persons in "armed forces occupations" are joined with "technicians and associate professionals" (*oc_30*).

Employment. Work experience (*we_yipw*) is measured as the number of years spent in paid work *before* the beginning of IRY. Another variable (*we_yopw*) represents the "inverse" of work experience, measuring the time out of work since the date when the first work experience was attained. See section 3.8 for a detailed analysis of these variables.

Several variables (*em_locs*, *em_locl*, *em_perj*, *em_mana*) describe the characteristics of the currently held job. "Agricultural household" (*em_agri*) denotes a household in which the primary source of market income comes from self-employment in agriculture.

Income and work. Gross wage captures earnings from employment paid in cash or near cash terms. To obtain the hourly gross wage, yearly gross wage is divided by the yearly number of working hours. Yearly working hours are obtained using information on months spent in work (during IRY) and usual number of work hours per week.

There are several variables capturing income obtained by the observed person's household. These variables cover a large portion of total household income, but the following items are excluded: (a) a person's own income from employment

and self-employment; (b) a person's own income from social insurance (unemployment and sickness benefits); and (c) social assistance benefits received by a person's household. In addition to usual cash incomes (*oi_a* to *oi_f*), one variable (*oi_g*) captures imputed rent from the use of a dwelling and serves as a proxy for the value of housing assets.

Industry. There are 21 industries overall according to NACE Rev. 2, but some industries are aggregated within SILC. Nestić et al. (2015, table D2b) use LFS to calculate the shares of employed persons by industry sector and the type of ownership in 2012. In sectors O, P and Q all persons are employed in the "narrower defined" public sector. Furthermore, in sectors D, E, H and R, the large majority of workers are employed by state-owned enterprises. One of the variables (*in_opq*) can serve as a proxy to employment in the "narrower defined" public sector.

3.3 STRUCTURE OF THE WORKING POPULATION BASED ON SILC

The working age population includes women aged 15 to 60 years and men aged 15 to 65 years. This definition is motivated by the fact that the statutory age for old-age retirement in 2011 is 60.25 (65) years for women (men). The lower limit of 15 years is the age when primary school is finished.

Table 1 presents the structure of the working age population, as defined above. This information is based on SILC questions about self-defined economic status, which is recorded at different time instances: (a) on DIN, and (b) in each month during IRY. The variables on activity status capture the person's own perception and are not comparable with LFS definitions of employment, unemployment, inactivity, and so forth. Henceforth, the quotation marks in the naming of activity statuses are used to signify that they are self-reported, and do not conform to usual economic and statistical definitions.

Section (a) of table 1 presents the structure according to economic status on DIN. For readers acquainted with the Croatian economy, a curious result is that there are 537 thousand "unemployed" persons. According to the Labour Force Survey (LFS), in 2012 there were approximately 300 thousand unemployed (year average), whereas the number of registered unemployed was 324 thousand (CBS, 2015). How many "unemployed" are unemployed when some of the LFS definitions apply? This number can be determined by checking the answers to several questions also available in SILC. Twenty-eight per cent of "unemployed" did not actively seek a job in the four weeks preceding the interview. Based solely on this fact, they would not be treated as unemployed, but rather as inactive. An additional 3% of the "unemployed" should not be treated as unemployed because they either (or both) worked at least 1 hour in the previous week and were not available for work in the subsequent 2 week period. Thus, the number of "unemployed" who comply with LFS definitions would be 370 thousand.

Section (b) of table 1 shows the structure based on the activity statuses during IRY for four groups of interest: "employed", "self-employed", "unemployed" and "persons

fulfilling domestic tasks and care responsibilities" (FDTCR). Figures show the total numbers of persons who report one of the mentioned statuses in at least one month in 2011. For example, 618 thousand persons were "unemployed" for one month or more. Each group is divided into three subgroups according to the number of months spent in the respective status. Thus, 86% of all "employed" were at work for all 12 months, whereas 67% of "unemployed" were out of work during the entire year.

Table 1

Structure of the working age population according to SILC 2012

	All		Women		Men	
	In thous.	%	In thous.	%	In thous.	%
Section (a) Current status in 2012						
All	2,591	100.0	1,250	100.0	1,341	100.0
"Employed"	1,196	46.2	565	45.2	631	47.0
"Self-employed"	139	5.4	40	3.2	99	7.4
"Unemployed"	537	20.7	271	21.7	266	19.8
"Pensioners"	308	11.9	112	9.0	195	14.6
"FDTCR"	109	4.2	108	8.6	1	0.1
"Unable to work"	21	0.8	7	0.6	14	1.0
"In education"	281	10.8	146	11.7	135	10.1
"Other inactive"	13	0.5	6	0.5	8	0.6
* *LFS unemployed*	370	14.3	176	14.1	194	14.5
Section (b) Status in 2011						
"Employed" for at least one month	1,293	100.0	611	100.0	682	100.0
12 months	1,110	85.9	524	85.7	587	86.0
7-11 months	72	5.6	34	5.5	39	5.7
1 to 6 months	110	8.5	53	8.8	57	8.3
"Self-employed" for at least one month	139	100.0	39	100.0	100	100.0
12 months	130	93.3	36	92.3	94	93.7
7-11 months	4	2.7	0	0.7	3	3.5
1 to 6 months	6	4.0	3	6.9	3	2.9
"Unemployed" for at least one month	617	100.0	307	100.0	310	100.0
12 months	414	67.1	212	68.9	202	65.2
7-11 months	90	14.6	45	14.5	45	14.6
1 to 6 months	113	18.4	51	16.6	62	20.1
"FDTCR" for at least one month	116	100.0	115	100.0	1	100.0
12 months	112	96.8	111	96.8	1	100.0
7-11 months	3	2.4	3	2.4	0	0.0
1 to 6 months	1	0.9	1	0.9	0	0.0

3.4 FORMING SUBSAMPLES OF EMPLOYED, UNEMPLOYED AND INACTIVE

This section describes a procedure that classifies SILC sample persons into one of three distinctive groups: *employed*, *unemployed* and *inactive*. We face two major problems here, both of them envisaged by the analysis in section 3.3. First, activity status is self-reported and for some persons does not correspond to the real one. Second, persons report their activity status in various time instances – on DIN and

in each month of IRY; for a significant number of persons, the status varies across the period (from January 2011 to DIN). Which time instance should be considered?

Concerning the latter issue, note that the working time-span of EUROMOD and MICROMOD is one year, i.e., these models consider incomes over the entire IRY. Therefore, the natural choice for definition of activity status is IRY and not DIN. Some persons change their status during IRY; in these cases, delineation rules must be provided. Concerning the issue of self-reported vs. real status, we use additional variables to determine the real status.

Our procedure is as follows. The starting sample, S0, captures the working age persons, defined as women aged 15 to 60 and men aged 15 to 65 years. Sample S1 is a subsample of S0 containing persons whose status was "employed", "self-employed", "unemployed" or "FDTCR" in at least one month during IRY. From sample S1, subsamples S2A and S2B are formed.

Subsample S2A consists of persons who were "employed" or "self-employed" for *9 months or more* in IRY. The members of S2A are then divided into two subgroups: (a) *employed* – containing persons whose prevalent status during IRY was "employed", and (b) *self-employed* – consisting of persons whose primary status was "self-employed".

Subsample S2B captures the remaining persons from S1 if their status is "unemployed" or/and "FDTCR" during IRY for at least one month. S2B is then divided into *unemployed* and *inactive* persons. *Unemployed* persons are members of S2B who satisfy any of the following conditions: (a) they are actively seeking a job on DIN, (b) they are not actively seeking a job on DIN, but have worked at least one month in IRY, or (c) they are "employed" or "self-employed" on DIN. *Inactive* persons are those members of S2B who do not belong to *unemployed*. The procedure used for forming of the subsamples of *employed*, *unemployed* and *inactive* is illustrated in figure A1 (appendix 3).

Note the following two features of the procedure:

(1) Persons are *unemployed* if they were "unemployed" or "FDTCR" even only one month during IRY. Furthermore, persons who worked during IRY (but not more than 8 months) can remain classified as *unemployed*. Table 5 shows the number of *unemployed* who have worked during part of the year.
(2) *Inactive* persons are those who (a) have not worked at all in IRY, (b) are out of work on DIN, and (c) were not actively seeking a job on DIN.

3.5 DIVISION INTO EXPERIENCED AND INEXPERIENCED

In comparison to the regular one-equation LRM, which contains the wage equation only, the Heckman selection model is much more complicated to build because it also introduces the selection equation. In choosing the variables for the selection equation, we adopted an exhaustive approach, including all possible

variables that were available in SILC that describe personal characteristics commonly included in estimations of this type (see section 3.2). One of these characteristics is occupation. The likelihood of employment of a person with a particular occupation depends upon the demand for and supply of this occupation in the labour market. The term "skill mismatch" describes the situation when the supply in a certain occupation is imbalanced with market demand. As Botrić (2009) shows for Croatia, occupations play a significant role in determining the risk of unemployment. Therefore, excluding occupation variables from the participation equation may lead to its misspecification.

The problem emerges because a portion of *unemployed* and *inactive* persons have never worked and hence lack information on occupation in SILC. For these persons, we cannot use occupation variables in the selection equation because they would be "perfect predictors" of non-employment. However, we have decided not to completely exclude from the analysis persons who have never worked. Therefore, *unemployed* and *inactive* are further divided into the subgroups *experienced* and *inexperienced*. *Experienced* are defined as persons who have previous work experience; these persons have either (a) worked before the beginning of IRY, i.e., for whom *we_yipw*>0, or (b) worked during IRY at least one month. *Inexperienced* are those *unemployed* and *inactive*, for which data on occupation do not exist. Thus, we obtain four subgroups: (a) *experienced unemployed*, (b) *inexperienced unemployed*, (c) *experienced inactive,* and (d) *inexperienced inactive*.

3.6 FINAL SUBSAMPLES

Table 2 presents the derivation of the research sample in terms of the number of sample observations. The total number of observations for *employed*, *unemployed* and *inactive* is 6,206, but the number is reduced to 5,877 after some observations are dropped from the analysis (see below).

TABLE 2
Derivation of the selected sample

Sample / Group	Observations	Final observations
S0	9,297	
S1:	6,727	
S2A:	4,136	
(a) *employed*	3,657	3,444
(b) *self-employed*	479	
S2B:	2,549	
(c) *unemployed:*	1,572	1,506
(c1) actively seeking a job on DIN	1,192	
(c2) not actively seeking a job on DIN, but have worked at least one month in IRY	263	
(c3) "employed" or "self-employed" on DIN	117	
(d) *inactive*	977	927
employed, *unemployed* and *inactive*	6,206	5,877

Thus, 329 observations are excluded; table 3 shows the summary. *Employed*, *experienced unemployed* and *experienced inactive* persons numbering 157 are excluded because they have no data on occupation. Next, we drop 38 observations without data on gross wage. Furthermore, 3 persons, whose gross hourly wage is below 5 HRK, are dropped from the sample.[15] Finally, we exclude 131 women who have newborn children and could potentially spend up to 12 months in maternity and parental leave during IRY.[16]

TABLE 3
Dropped observations

Type of person	Number of dropped observations					
	employed	***exp. unempl.***	***inexp. unempl.***	***exp. inactive***	***inexp. inactive***	***Total***
Without data on occupation	111	33	0	13	0	157
Without data on wage	38	0	0	0	0	38
With gross hourly wage below 5 HRK	3	0	0	0	0	3
Potential users of maternity and parental leave	61	22	11	21	16	131
Total	213	55	11	34	16	329

Table 4 presents the structure of the sample according to groups and subgroups. One-quarter of *unemployed* are *inexperienced unemployed*. Among *inactive*, the share of *inexperienced inactive* men is approximately one-third; the share of *inexperienced inactive* women is almost one-half.

TABLE 4
Subgroups of non-employed

	All		Women		Men	
	In thous.	**Share (%)**	**In thous.**	**Share (%)**	**In thous.**	**share (%)**
employed	1,071		485		586	
unemployed	427	100.0	196	100.0	231	100.0
experienced	324	75.9	148	75.6	176	76.2
inexperienced	103	24.1	48	24.4	55	23.8
inactive	225	100.0	169	100.0	56	100.0
experienced	122	54.2	87	51.5	35	62.4
inexperienced	103	45.8	82	48.5	21	37.6

It was indicated previously that the sample formation process enables some persons who have worked in IRY to enter the group of non-employed. It is therefore interesting to see the number of such people and the duration of their work. By definition, *inactive* persons are those who did not work at all in IRY. Additionally,

[15] We believe that these wages are misreported.
[16] SILC does not report data on months spent in maternity or parental leave. It only records the months spent in employment (which equals 12 for most *employed* mothers in the mentioned group). Therefore, we cannot calculate the months in which a person has earned a wage.

by definition, *inexperienced unemployed* are persons who have never worked. Therefore, table 5 shows the structure according to months spent in work only for *experienced unemployed*. Sixty-two per cent have been unemployed for the entire year; a further 29% have worked up to six months, and 9% worked 7 or 8 months.

Table 5

Months spent in work during 2011 for experienced unemployed

	All		Women		Men	
	In thous.	**Share (%)**	**In thous.**	**Share (%)**	**In thous.**	**Share (%)**
Unemployed experienced	324	100.0	148	100.0	176	100.0
0	201	61.8	91	61.5	109	62.1
1-3	43	13.3	20	13.5	23	13.0
4-6	51	15.6	24	16.0	27	15.3
7-8	30	9.3	13	9.0	17	9.6

3.7 AVERAGE CHARACTERISTICS OF EMPLOYED AND NON-EMPLOYED

Table A2 and table A3 (appendix 2) present the means and standard deviations of selected variables obtained for *employed* and four subgroups of non-employed, for women and men, respectively. Figure 1 provides an insight into differences among groups for several key characteristics: age, education, marital status, children, health, and area of living. In all of the graphs, subgroups are intentionally sorted in the following order: *employed*, *inexperienced unemployed*, *experienced unemployed*, *experienced inactive* and *inexperienced inactive*. A certain pattern can be observed for many variables, in which the mentioned groups are lying in an "employability spectrum"; adjacent groups on the graphs have similar personal characteristics.

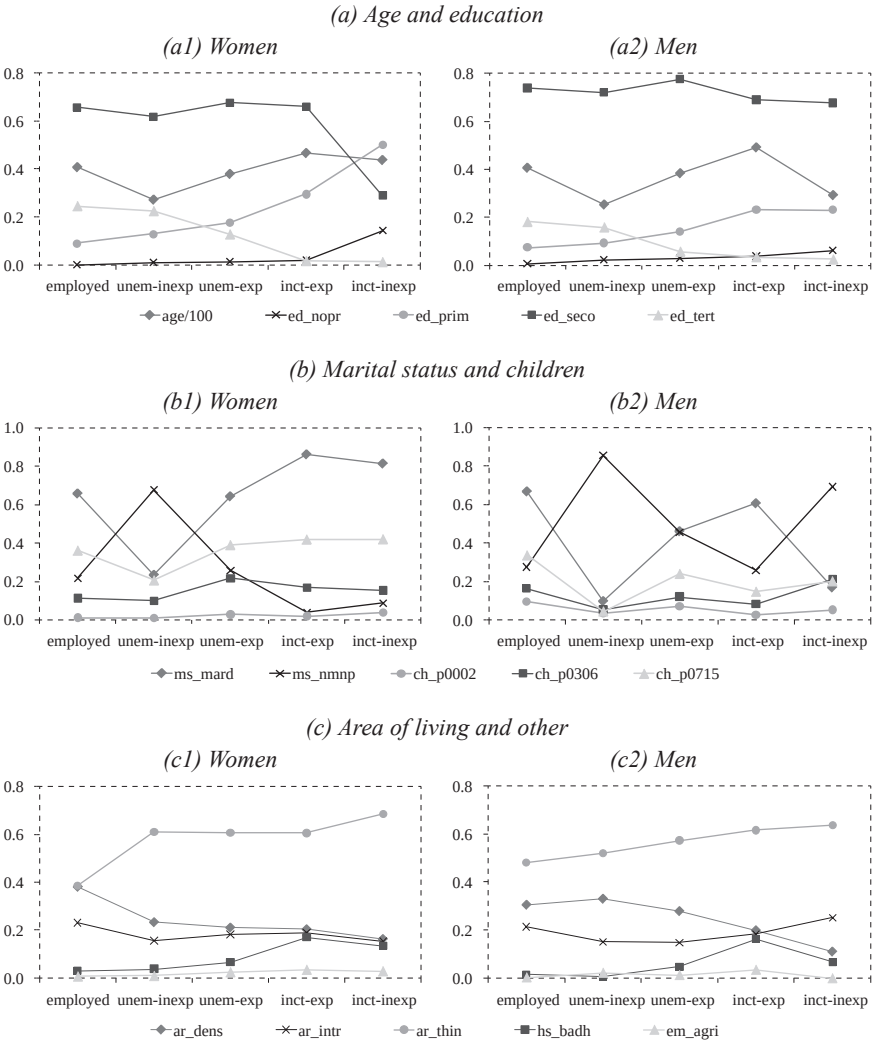
Age and education. As we move from left to right (figure 1a), the share of persons with primary education is increasing (*ed_prim*), whereas it is decreasing for tertiary education (*ed_tert*). The majority of persons have secondary education (*ed_seco*) and the share for women (men) is above 60% (70%). The exceptions are *inexperienced inactive* women, whose share in secondary educated is only 30%; for the same group, the share of tertiary educated is close to zero, and almost 70% of its members have a primary education or less. The youngest groups are *inexperienced unemployed* women and men (*age/100*). *Experienced unemployed* are of a similar average age as *employed*.

Marital status and children. Over 85% of *inactive* women are married (*ms_mard*), compared with 68% of *employed* and *experienced unemployed* women (figure 1b). *Inactive* and *experienced unemployed* women have somewhat more children aged 3 to 6 years than have *employed* and *inexperienced unemployed* women. *Inexperienced inactive* men and *inexperienced unemployed* women and men, are very similar in several respects; they are young people, mostly single, and still living in households with their parents.

Area of living. For women, there is a significant difference between *employed* and all other groups in terms of living area (figure 1c). Approximately 40% of *employed* women live in thinly populated areas (*ar_thin*) compared with over 60% of non-employed. A similar trend, but less pronounced, is observed for men. *Inactive* persons have a significantly higher average share of those with health problems than have *employed* and *unemployed* (*hs_badh*). Non-employed live more often in agricultural households than do *employed* (*em_agri*). For example, the share for *experienced inactive* men is 4%, compared with 0.3% for *employed* men.

Figure 1

Means of selected variables for different groups



Abbreviations: employed – employed; unem-inexp – inexperienced unemployed; unem-exp – experienced unemployed; inct-exp – experienced inactive; inct-inexp – inexperienced inactive.

3.8 "YEARS IN WORK" AND "YEARS OUT OF WORK"

Figure 2 shows scatter plots for the variables "years in work" (*we_yipw*) against age (*ag_year*) for the subgroups of *employed*, *experienced unemployed* and *experienced inactive* women and men. Each plot shows a quadratic polynomial fit of the data and the corresponding R2. A strong relationship between *we_yipw* and *ag_year* exists for *employed*, for which R2 is 0.75 for women and 0.88 for men. The correlation is also high for *experienced unemployed* but is lower than for *employed*; R2 for women and men are 0.56 and 0.66, respectively. *Experienced inactive* men are to some extent similar to *experienced unemployed*, with R2 of 0.46, but for *experienced inactive* women, the relationship is quite weak, with R2 of only 0.22.

FIGURE 2

"Years in work"

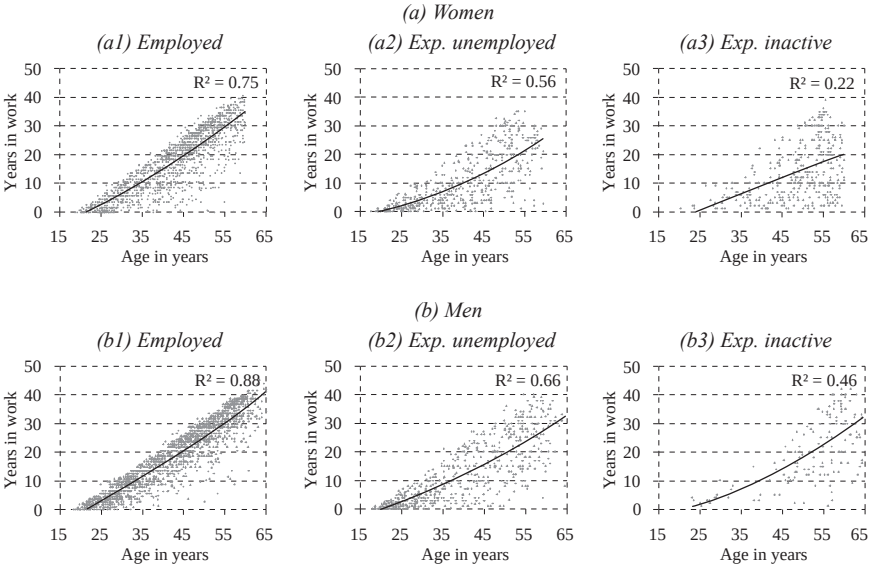
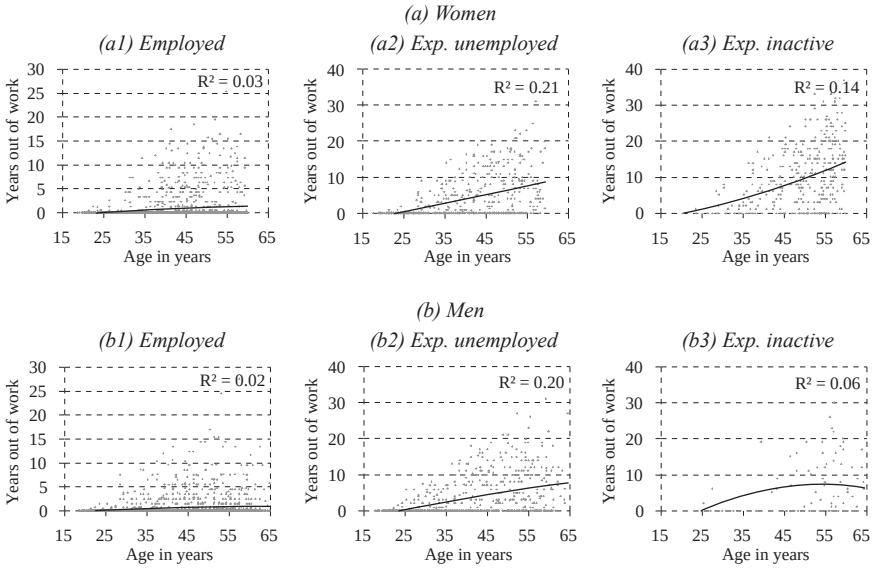


Figure 3 shows the same as figure 2, but for the variable "years out of work" (*we_yopw*). Recall that *we_yipw* and *we_yopw* stand in an inverse relationship. Accordingly, the correlations between *we_yopw* and *ag_year* show an opposite picture. For *employed*, R2 is close to zero, is approximately 0.2 for *experienced unemployed*, and is below 0.15 for *experienced inactive*.

The analysis based on figure 2 and figure 3 suggests that previous work experience is a very good predictor of current activity status. In other words, continuity of employment through the years – since the first job was taken – significantly increases the chances to be currently employed. Conversely, those who have worked little in the past, show much higher tendency to be non-employed in IRY.

FIGURE 3
"Years out of work"



Another point that can be made from this analysis is concerned with regression specifications. The presence of highly correlated regressors results in multicollinearity, which may cause inaccurate estimates of the coefficients and model instability. In our case, multicollinearity will emerge if we insert *we_yipw* and *ag_year* into the same equation because of their high correlation for *employed*, and to a somewhat lesser extent for *experienced unemployed*. The simplest cure for this problem would be to exclude one of the variables, either *we_yipw* or *ag_year*, from the models. However, both age and work experience appear to be important elements in explaining employment participation and wages. One means of keeping work experience in the models is to substitute the variable *we_yopw* for the variable *we_yipw*.

4 PARTICIPATION IN EMPLOYMENT AND NON-EMPLOYMENT

4.1 STRUCTURE OF EMPLOYED AND NON-EMPLOYED BY AGE, EDUCATION AND OCCUPATION

Figure 4, figure 5 and figure 6 show how age, education and occupation influence selection into employment and non-employment. Their review serves as an introduction to more formal analysis using probit models, presented in section 4.2.

The number of *employed* follows an inverted U-pattern (figure 4, graphs a1 and b1). The number is almost negligible under the age of 20. The number of employed women increases with age, and reaches the maximum for the age group 45 to 50 years. For men, the number of *employed* is relatively stable in the interval 25 to 50 years, but significantly falls above the age of 55; above the age of 60, there are few employed men. The number of *experienced unemployed* is relatively con-

stant in the interval 25-55 for both women and men; thereafter, it falls steeply. The numbers and shares of *experienced inactive* are significantly higher for women. The numbers of *inexperienced inactive* men are almost negligible. *Inexperienced unemployed* are primarily young people below the age of 30.

As seen previously, the prevalent education level is secondary (figure 5). Employment shares significantly increase with the level of education: 78% (84%) of women (men) with tertiary education are employed; conversely, among women (men) with primary education or less, only 28% (47%) are employed. Sixty-nine percent of *inexperienced inactive* women have primary or less education, whereas the same share for *employed* is only 9%.

Among women, the most frequent occupation is "service and sales workers" (figure 6, graph a1), whereas for men that category is "craft and related trades workers" (figure 6, graph b1). "Professionals and managers" have an employment share of over 90% for both women and men (figure 6, graphs a2 and b2). Women also have high employment shares in occupations "technicians and associate professionals" and "clerical support workers", but in all other occupations, their employment share is below 60% (figure 6, graph a2). The employment share is below 50% for men in "elementary occupations".

Figure 4

Structure of employed and non-employed by age

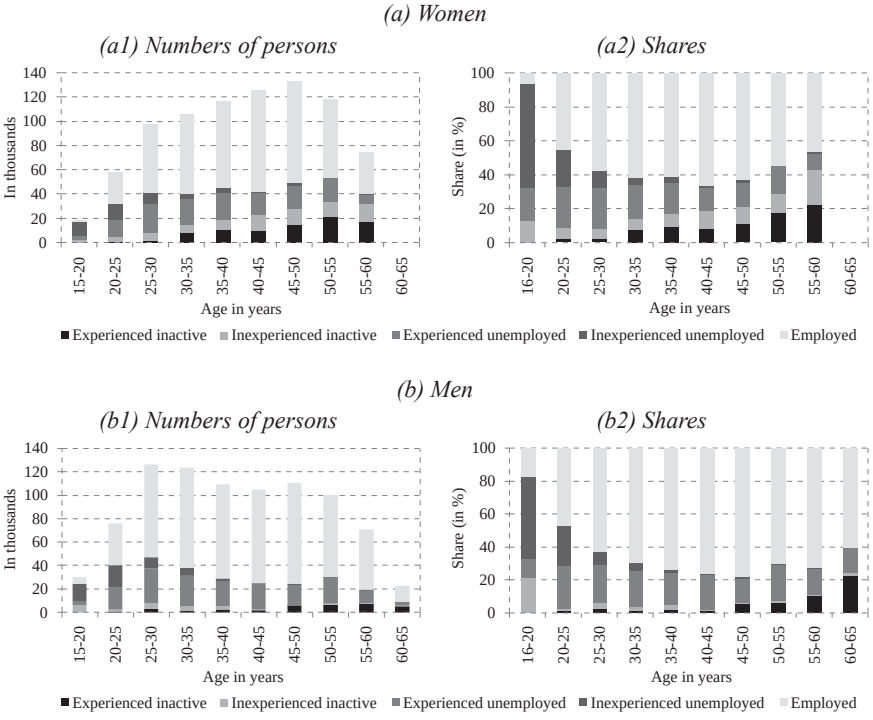


FIGURE 5

Structure of employed and non-employed by education

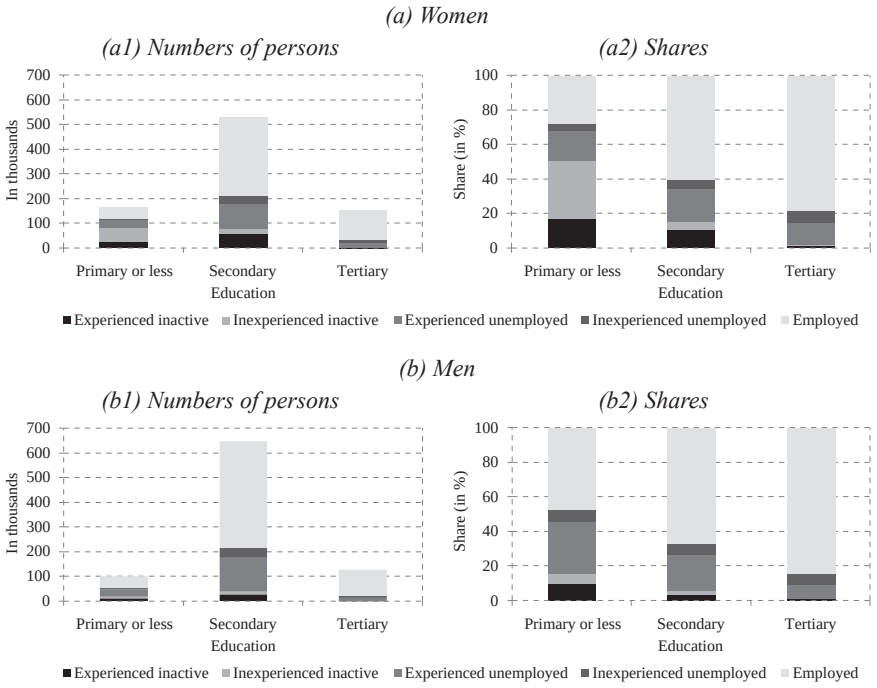
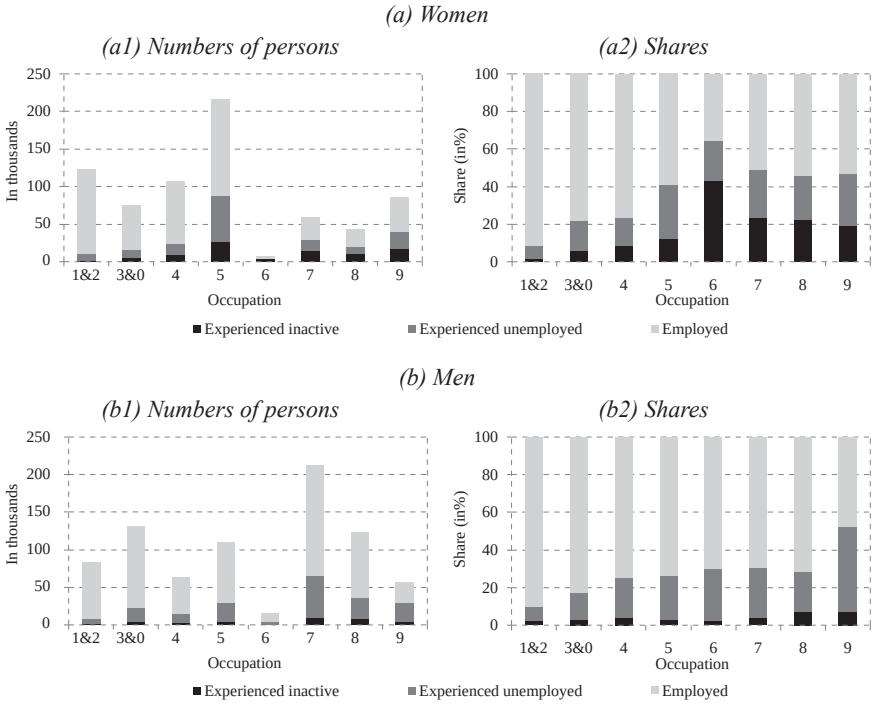


FIGURE 6

Structure of employed and non-employed by occupation



4.2 PROBIT MODEL ANALYSIS

In sections 3.7 and 4.1, descriptive statistics have indicated similarities and differences between *employed* and four groups of non-employed. In this section, the probit regression analysis is used to explore further the differences between various subgroups. Each of five subgroups is compared with one another, yielding 10 specifications each for women and men, which are shown in table 6.

The first four specifications (P1* to P4*) compare *employed* with the subgroups of non-employed. These specifications are relevant for further use as selection equations in HSM. The remaining six specifications (P5* to P10*) relate to the subgroups of non-employed between themselves. If these subgroups are different, they deserve separate analysis; otherwise, some of them could have been pooled together. In specifications P1*, P2* and P5*, which capture *employed*, *experienced unemployed* and *experienced inactive*, we use the "full" set of variables containing the variables on occupations because they are available for these groups of persons. In the remaining specifications, the "reduced" set of variables is used; they omit occupation variables and also "years out of work"; in particular, *inexperienced* have all zero values for *we_yopw*. The detailed results of probit regressions are presented in tables A4, A5, A6 and A7 (appendix 2).

TABLE 6
Probit specifications

Specification	"Positive" subgroup	"Negative" subgroup
P1*	*employed*	*experienced unemployed*
P2*	*employed*	*experienced inactive*
P3*	*employed*	*inexperienced unemployed*
P4*	*employed*	*inexperienced inactive*
P5*	*experienced unemployed*	*experienced inactive*
P6*	*experienced unemployed*	*inexperienced unemployed*
P7*	*experienced unemployed*	*inexperienced inactive*
P8*	*experienced inactive*	*inexperienced unemployed*
P9*	*experienced inactive*	*inexperienced inactive*
P10*	*inexperienced unemployed*	*inexperienced inactive*

Table 7 presents summary results for probit specifications involving *employed* persons, P1* to P4*. The detailed results of probit regressions are presented in table A4 and table A6 (appendix 2). Two standard measures of fit for probit models are presented ("Adjusted McFadden's pseudo R2" and "Adjusted count pseudo R2"), together with four additional indicators, also discussed in appendix 1.

Except for P2W and P3M, all models have relatively low values of ACPR2, particularly P1W (0.14) and P4M (0.09). The indicator $s_{0.5}^{NP}/n = 0.65$ for P1W implies that the probit model classifies 65% of *experienced unemployed* women as employed, whereas only 35% of these persons are correctly classified as non-employed. Conversely, $s_{0.5}^{PN}/p = 0.06$ indicates that only 6% of *employed* persons are

wrongly classified as non-employed. Recall that $s_{0.5}^{NP}/n$ = uses $\pi = 0.5$ as a cut-off probability point to classify a person as positive or negative.

Table 7

Measures of fit for probit models P1 to P4**

Spec.	AMFR2	ACPR2	$s_{0.5}^{PN}/p$	$s_{0.5}^{NP}/n$	s_{p}^{PN}/p	s_{p}^{NP}/n	p
P1W	0.20	0.14	0.06	0.65	0.25	0.26	0.77
P2W	0.39	0.33	0.03	0.49	0.16	0.17	0.85
P3W	0.31	0.22	0.02	0.63	0.20	0.15	0.91
P4W	0.33	0.26	0.04	0.53	0.18	0.21	0.86
P1M	0.17	0.18	0.04	0.68	0.28	0.30	0.77
P2M	0.31	0.16	0.01	0.71	0.16	0.23	0.94
P3M	0.35	0.25	0.01	0.63	0.20	0.14	0.91
P4M	0.27	0.09	0.00	0.87	0.20	0.17	0.97

Conversely, if $\pi = p$ is used as the cut-off probability point, the picture significantly changes (p represents the average probability of being employed in the overall sample). The indicator s_{p}^{NP}/n shows that 26% of *experienced unemployed* women are classified as employed; therefore, 74% of these women are correctly classified as non-employed. Additionally, indicator s_{p}^{PN}/p implies that 25% of *employed* women in P1W are classified as non-employed.

Thus, many groups overlap; some persons who have less-favourable personal characteristics are employed, and *vice versa*. This overlap manifests via the presence of unobservable characteristics, represented by the random term u_i (section 2). Relatively low values of AMFR2 and ACPR2 indicate that u_i plays an important role; in other words, we lack variables in the probit model that would better explain a participation mechanism.

Age variables (*ag_year* and *ag_ysqr*) are highly significant in all specifications, with positive and negative coefficients for *ag_year* and *ag_ysqr*, respectively. In P1* and P2*, which include the "years out of work" variables (*we_yopw*, *we_yosq*), these variables are highly significant and suggest a hyperbolic relationship; the likelihood of being currently non-employed increases with the length of period previously spent in non-employment.

Women and men living in thinly populated areas (*ar_thin*) and men living in "agricultural households" (*em_agri*) have a lower probability of being *employed*. Most "other income" types are not significant, except for family benefits (*oi_f*); the coefficient of family benefits is highly significant and negative for both women and men. In specification P1M, private transfers (*oi_c*) are negative and significant; one explanation is that *employed* men are net payers of transfers, simply because they have greater resources than non-employed. Health situation (*hs_badh*) is a very important factor in the selection process, as could be expected from section 3.7 (figure 1, graphs c1 and c2); all probit models indicate a significantly lower probability of employment for persons with health problems.

Concerning education and occupation variables in P1* and P2*, we have somewhat unforeseen results. For example, in P1W, the coefficient for tertiary education (*ed_tert*) is significant and negative, which is contrary to expectations (sections 3.7 and 4.1). The cause could be found in a high correlation with the "professionals and managers" variable (*oc_21*), whose coefficient is large, positive and significant in the same model. The majority of "professionals and managers" have tertiary education; because of multicollinearity, the model cannot properly estimate the effects of both variables. A similar but opposite situation can be seen in P2M, in which the coefficient for tertiary education is high and positive, but "professionals and managers" have a negative coefficient.

Proceeding with the analysis of specifications P5* to P10*, we again turn to measures of fit (the detailed results of probit regressions are presented in tables A4, A5, A6 and A7 (appendix 2)). The highest values of indicators AMFR2 and ACPR2 for both men and women are achieved for P8* specifications, which analyse *experienced inactive* vs. *inexperienced unemployed* subgroups. As seen in section 3.7, these two groups significantly differ in terms of age, marital status and education; these differences are confirmed by probit models.

The differences between *experienced unemployed* and *experienced inactive* are analysed with specification P5*. As probit models indicate, confirming the findings in section 3.7, the former group has better education and health. Additionally, widowed women and women with children are more likely to be inactive, rather than unemployed. For men, we find very low values of AMFR2 (0.11) and ACPR2 (0.05). According to indicator $s_{0.5}^{NP}/n$, 78% of negative are classified as positive, meaning that there is significant overlap between *experienced unemployed* and *experienced inactive* men.

Table 8

Measures of fit for probit models P5 to P10**

Spec.	AMFR2	ACPR2	$s_{0.5}^{PN}/p$	$s_{0.5}^{NP}/n$	s_{p}^{PN}/p	s_{p}^{NP}/n	p
P5W	0.17	0.29	0.16	0.43	0.32	0.23	0.63
P6W	0.18	0.27	0.07	0.50	0.24	0.27	0.76
P7W	0.18	0.32	0.16	0.40	0.21	0.30	0.64
P8W	0.55	0.73	0.04	0.20	0.09	0.14	0.65
P9W	0.10	0.38	0.31	0.30	0.32	0.28	0.51
P10W	0.41	0.62	0.21	0.10	0.15	0.14	0.37
P5M	0.11	0.05	0.03	0.78	0.25	0.24	0.83
P6M	0.25	0.29	0.09	0.42	0.25	0.19	0.76
P7M	0.18	0.10	0.01	0.81	0.26	0.12	0.89
P8M	0.55	0.74	0.14	0.08	0.13	0.10	0.39
P9M	0.36	0.68	0.11	0.14	0.17	0.13	0.62
P10M	0.12	0.18	0.06	0.65	0.27	0.19	0.72

Inexperienced inactive women represent a large group among women; therefore, it is interesting to analyse the differences between this and other groups of

non-employed, which is enabled by specifications P7W, P9W and P10W. Again, in line with the presentation in section 3.7, education is the most important factor (*ed_prnp*, *ed_tert*). Additionally, the likelihood of being *inexperienced inactive* is greater for women having a partner (*ms_mard*, *ms_nmhp*).

In summary, employed subgroups are significantly different from non-employed subgroups (specifications P1* to P4*). Several characteristics are identified that determine the likelihood of being employed vs. non-employed: age, education, occupation, years out of work, health status and family benefits. Among the non-employed themselves, the defined subgroups are significantly different, justifying their separate treatment (specifications P5* to P10*). Possible exceptions are *experienced inactive* and *experienced unemployed* men, who have relatively similar characteristics. Although all probit models are statistically significant, there is room for improvement, which would arrive from inclusion of additional variables such as region of living (which is not included in SILC).

5 ESTIMATION OF GROSS WAGES

5.1 GROSS WAGES IN SILC

Gross wage in SILC is obtained by grossing up net wage reported by surveyed persons. Imputation of personal income tax (PIT) and social insurance contributions (SIC), needed for net-to-gross conversion, is performed by CBS and considers all of the relevant factors that determine the amount of PIT (e.g., number of children, other dependents, and place of living).[17] Table 9 summarises the main indicators for gross monthly wage for different subgroups of *employed* persons.

Average monthly wage for *employed* persons equals 6,558 HRK, which is 16.5% below the official average monthly wage in 2011 (7,796 HRK), calculated for workers employed in legal entities (CBS, 2015). There could be more than one explanation for the relatively large discrepancy between the SILC and official data. First, unlike SILC data, the CBS indicator does not capture persons employed by self-employed persons (craftsmen, professionals, or small entrepreneurs in agriculture), who are likely to have lower average wages than will employees in legal entities. Second, and most importantly, SILC tends to underrepresent employees at the higher end of income distribution.[18] Third, SILC data will capture some "grey economy" wage payments, but the effect on the wage distribution is uncertain.

Table 9 indicates that gross wage increases with age and education. The average wage is higher in densely populated areas and for certain occupations such as "professionals and managers", "technicians and associate professionals" and

[17] Gross wage can be represented as the sum of net wage, PIT, surtax and employee's SIC. Surtax is a municipality tax determined as a percentage of PIT (this percentage varies by municipality from 0% to 18%). Employees' SIC are equal to 20% of gross wage.

[18] The analysis presented in the EUROMOD Country Report for Croatia (Urban and Bezeredi, 2015) compares wage distributions from SILC and Tax Administration. According to the Tax Administration data, 1.7% of employees have a gross wage above 300% of the official average gross wage, and their share in total gross wages is 9.7%. In SILC, the share of such employees is 0.6% and they obtain only 2.8% of total wage income.

"clerical support workers". The "raw gender gap", i.e., the difference between men and women's average gross wage, is approximately 14%.

Table 9
Mean monthly wage by groups

	All			Women			Men		
	Share (%)	**Mean monthly wage**	**St. err.**	**Share (%)**	**Mean monthly wage**	**St. err.**	**Share (%)**	**Mean monthly wage**	**St. err.**
Overall	100.0	6,558	76	100.0	6,080	112	100.0	6,955	100
Age in years									
16-25	18.9	5,608	133	17.1	5,339	200	20.5	5,794	175
25-40	28.2	6,445	155	28.2	5,907	216	28.3	6,891	212
40-55	31.0	6,569	136	34.3	6,006	193	28.2	7,138	189
55-64	21.9	7,504	165	20.4	7,058	273	23.1	7,832	202
Education									
Primary or less	8.7	4,604	126	9.4	3,885	118	8.1	5,307	194
Secondary	70.1	5,839	70	65.9	5,221	88	73.7	6,297	98
Tertiary	21.2	9,731	211	24.7	9,204	300	18.3	10,323	292
Area of living									
Densely	33.9	7,676	159	38.2	6,954	224	30.4	8,430	219
Intermediate	22.2	6,215	177	23.1	5,684	240	21.4	6,688	249
Thin	43.8	5,863	72	38.7	5,451	108	48.1	6,138	95
Occupation									
2&1	17.5	9,711	225	23.2	9,096	285	12.8	10,636	357
3	15.7	7,786	212	12.2	7,180	379	18.5	8,115	248
4	12.1	6,312	132	17.0	6,194	173	8.1	6,522	197
5	19.6	5,009	102	26.4	4,484	119	13.9	5,837	162
6	1.3	4,629	214	0.5	4,070	441	1.9	4,763	235
7	16.6	5,374	104	6.3	3,694	124	25.1	5,727	113
8	10.4	6,128	244	4.8	4,315	204	15.1	6,607	296
9	6.8	4,370	137	9.5	4,097	187	4.6	4,841	178

5.2 LRM REGRESSION ANALYSIS OF GROSS WAGES

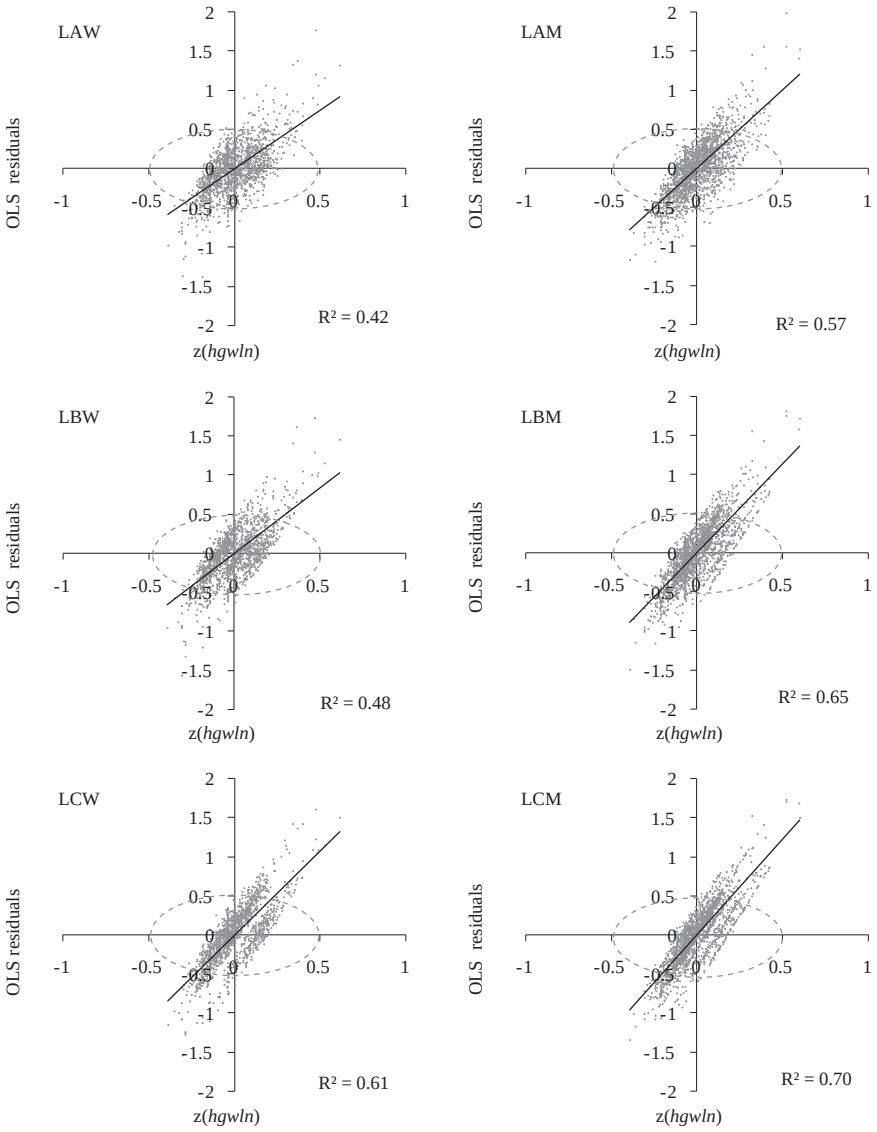
Section 3.2 presents the variables constructed using the SILC dataset. For some of these variables, data are available only for persons in employment. These variables address job characteristics (*em_locs*, *em_locl*, *em_perj*, *em_mana*) and industry of employment (e.g., *in_a*). An additional subset of variables has data for *employed* and *experienced* persons, but not for *inexperienced*; these subsets include "years out of work" variables (*we_yopw*, *we_yosq*) and occupation variables (e.g., *oc_21*).

If we were not interested in predicting wages of non-employed persons and if we had not considered the use of HSM, the natural step would be to use LRM and include all available variables into consideration. This is what specifications LA* do. However, in the current study, we must use those variables for which data are available both for *employed* and non-employed persons. Therefore, LBW and LBM specifications use all of the variables that have data for *employed*, *experi-*

enced unemployed and *experienced inactive*. Furthermore, specifications LC* contain only the variables that can be used for *inexperienced unemployed* and *inexperienced inactive*; occupation "years out of work" variables are excluded.

FIGURE 7

Residuals from LRM regressions



Abbreviations: LAW, LBW and LCW – LRM specifications for women; LAM, LBM and LCM – LRM specifications for men; z(hgwln) – standardised value of hgwln.

The results are presented in table A8 (appendix 2). Wage increases with age (*ag_year*); the quadratic term (*ag_ysqr*) is negative but not significant except in LCM. All specifications indicate a positive and statistically significant effect of living in urban areas (*ar_dens*). Married men have higher wages than men do in other marital statuses (*ms_mard*); additionally, men with small children (*ch_p0002*) have higher wages than others do. Persons with tertiary education (*ed_tert*) have significantly higher wages, which is confirmed by all models. The coefficients are smaller in LA* and LB* than in LC*; unlike LC*, the other two specifications contain occupation variables that take over the part of the positive influence of education. The variables describing job characteristics in LA* (*em_locs*, *em_locl*, *em_perj*, *em_mana*) are all highly significant.

From R2 statistics, we can see that the LA* specification has the greatest predictive power because it includes all of the relevant variables (R2 equals 0.55 for women and 0.44 for men). Conversely, LC* performs worst (R2 equals 0.38 for women and 0.31 for men) due to the lack of many important variables. The LB* specification is somewhere in between.

Figure 7 shows residuals from six LRM regressions presented in table A8, plotted against the standardised values of *hgwln*, denoted as z(*hgwln*). We note the same pattern in all six graphs: residuals, on average, increase with z(*hgwln*). The correlation between residuals and z(*hgwln*) is quite strong, as confirmed by R2s; it is lowest for LA*, and highest for LC* specifications. For smaller actual wages, the residuals tend to be negative, whereas they tend to be positive for higher actual wages. Because residuals are differences between actual and predicted wages, models tend to over-predict (under-predict) lower (higher) wages.

Let us further examine how successful LRM models are in prediction of gross wages. Graphs a1 and a2 of figure 8 show kernel density estimates of the distributions of actual sample wages of *employed* persons and predictions obtained by LA*, LB* and LC* models. The main conclusion is that all three LRM models fail to predict properly the correct number of persons at the right and the left tail of the wage distribution. This result is expected from the previous analysis of residuals. LA* fares slightly better in this respect than do the other two models. Graphs b1 and b2 of figure 8 show conditional expected values of predictions obtained by LA*, LB* and LC*.[19] Here, we can ascertain how much these predictions over- or under-estimate true wages for each level of actual gross wage. At the 5th percentile, the wage is over-predicted by more than 40%, whereas it is under-predicted by 30% at the 95th percentile.

[19] Kernel density estimates are obtained by the Stata program "Kernel density estimation" (command *kdensity*), using the Epanechikov kernel. Conditional expected values are obtained by the program "Local polynomial smoothing" (command *lpoly*), using the Epanechikov kernel and the 5th degree of polynomial.

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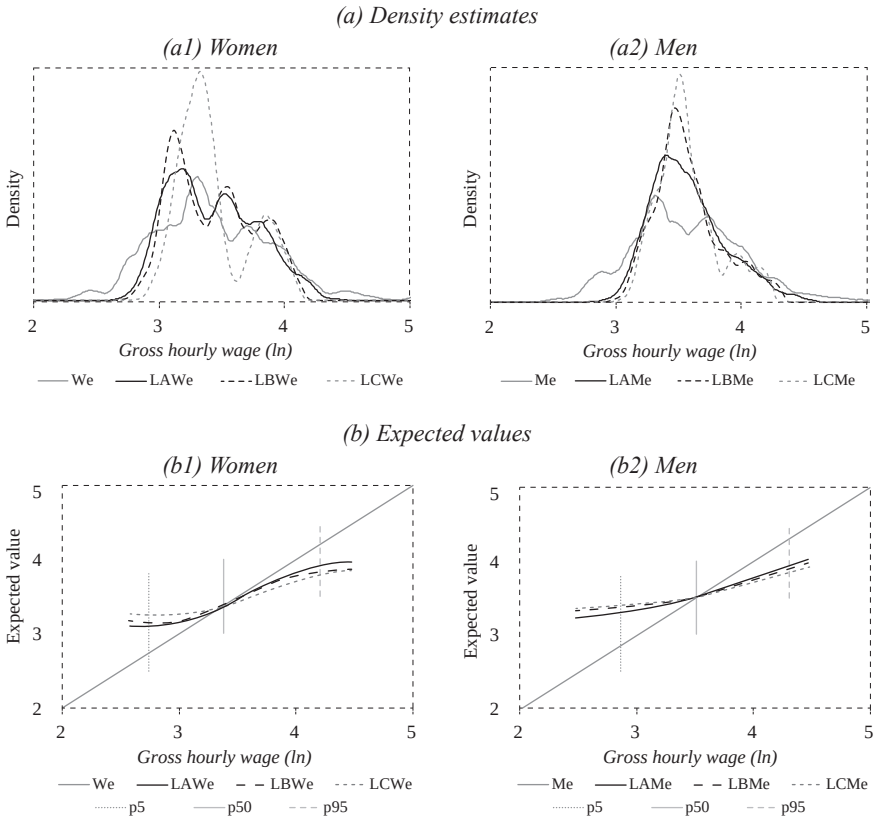
FIGURE 8

Gross wage predictions by LRM models



Abbreviations: We (Me) – actual wages of employed women (men); LAWe (LAMe) – wage predictions for employed women (men) based on LAW (LAM); LBWe (LBMe) – wage predictions for employed women (men) based on LBW (LBM); LCWe (LCMe) – wage predictions for employed women (men) based on LCW (LCM); p5, p50 and p95 – the 5th, 50th and 95th percentiles of actual wage distribution of employed, respectively.

5.3 QUANTILE REGRESSION ANALYSIS OF GROSS WAGES

The linear regression model, used in LA*, LB* and LC* specifications, provides us with a single coefficient for each variable in the wage equation; the set of these coefficients is denoted by $\tilde{\alpha}$ (recall section 2). For example, if the *k*th variable is tertiary education, $\tilde{\alpha}_k$ measures the effect on *hgwln* of having tertiary education compared with the benchmark education level (in our case, secondary education). This approach assumes that the effect of each variable is identical across the wage distribution. However, in reality, the influence of a certain variable on the wage may be different for persons with higher and lower incomes (see section 1 for reference to Nestić, 2005).

Therefore, we employed the quantile regressions model (QRM) to estimate the wage equations. Explanation of the method can be found in Cameron and Trivedi

(2005). For estimation, Stata program "Bootstrap quantile regression" was used (command *bsqreg*). One hundred bootstrap replications at each quantile are made to obtain standard errors of the coefficients. The specification contains the same variables as LA*. This part of the analysis does not use personal weights because the Stata program cannot properly calculate standard errors for QRM if sampling weights are used.[20]

Table A9 (appendix 2) presents the results of QRM for selected percentiles. For comparison, LRM results are shown in separate columns and represent LA* specifications, which are rerun without using the sampling weights. Note that the coefficients are slightly different from those obtained for LA* specifications in table A8.

The coefficients obtained by QRM change their magnitudes and statistical significance across different percentiles. Figure A2 (appendix 3) presents the QRM coefficients and their confidence intervals for several variables, estimated at the 5th, 10th, ..., 90th and 95th percentiles. They are compared with the LRM coefficients and their confidence intervals.

The QRM coefficients for tertiary education (*ed_tert*) increase with the percentiles. For women, the coefficients obtained at the 5th, 90th and 95th percentiles lie outside the LRM confidence interval. Living in densely populated areas (*ar_dens*) has different effects for women and men; the QRM coefficients decrease (increase) with percentiles for women (men). The positive effect of having a permanent job (*em_perj*) is much higher for low-wage than for high wage employed men; a similar trend, but less pronounced, can be observed for women. Industry sections O, P and Q fully belong to the public sector. For those employed in these sections, the "wage premium" is significantly higher for persons with lower wages, which conforms to the findings of Nestić (2005).

The results presented above indicate that the QRM-based model might be used to cure the problem of over-prediction (under-prediction) of wages at low (high) parts of wage distribution. Therefore, we perform an *ad hoc* exercise, using the QRM estimates to predict wages as follows.

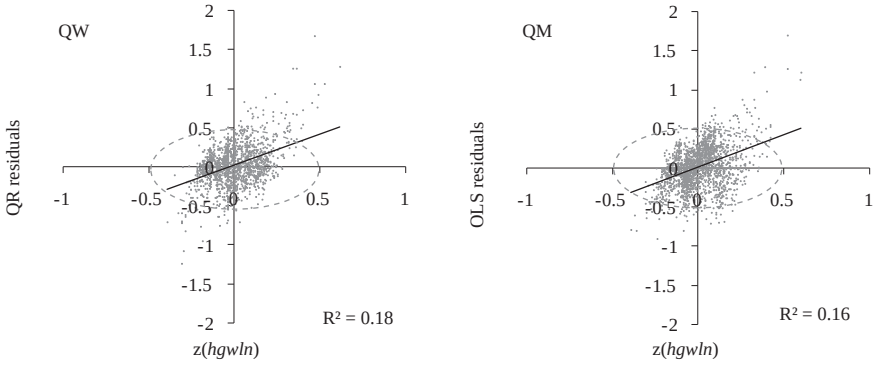
Denote with $\breve{\alpha}^q$ the set of QRM coefficients obtained at the q^{th} percentile. We focus only on the subsample of *employed* persons. The actual gross wage percentile of *employed* person *i* is denoted as q_i. The wage prediction for *employed* person *i* is obtained by application of the coefficients: (a) $\breve{\alpha}^{q=0.2}$, if $q_i \leq 0.2$, (b) $\breve{\alpha}^{q=0.5}$ if $0.2 < q_i < 0.8$, or (c) $\breve{\alpha}^{q=0.8}$, if $q_i > 0.8$.

New predictions and residuals are presented in figure 9. Again, there is a positive relationship between residuals and wages, but the problem appears much less severe than in the case of LRM models; namely, R2 is below 0.2 for both women and men.

[20] The effect of using sampling weights in this case is as though each observation is cloned *n* times, where *n* represents the sampling weight; a huge artificial population is obtained for which the standard errors appear negligibly small.

FIGURE 9

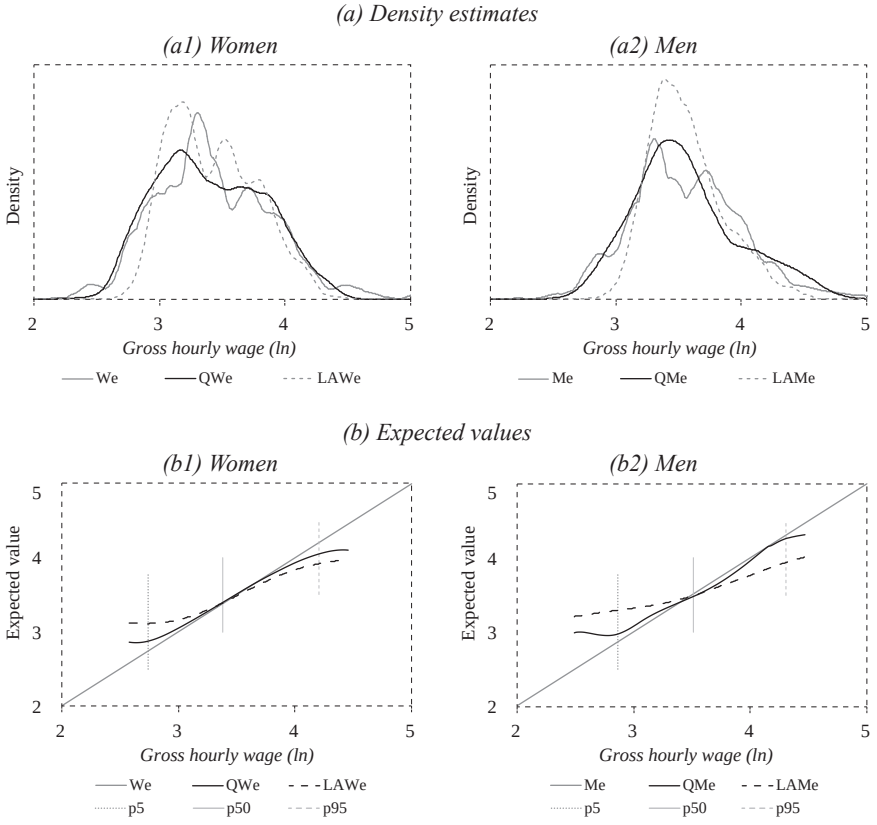
Residuals from QRM regressions



Abbreviations: QW (QM) – quantile regression models for women (men); z(hgwln) – standardised value of hgwln.

FIGURE 10

Gross wage predictions by quantile regression model



Abbreviations: We (Me) – actual wages of employed women (men); QWe (QMe) – wage predictions for employed women (men) based on QW (QM); LAWe (LAMe) – wage predictions for employed women (men) based on LAW (LAM); p5, p50 and p95 – the 5th, 50th and 95th percentiles of actual wage distribution of employed, respectively.

Graphs a1 and a2 of figure 10 show that the new model fits quite well the density of actual sample wages at the tails, significantly better than does LRM. Additional evidence of improvement is seen in graphs b1 and b2 of figure 10, in which for women the expected value of prediction lies very close to the line of equality, particularly at the bottom part of the wage distribution.

5.4 RESULTS OF THE HECKMAN SELECTION MODEL

Table 10 shows four specifications for HSM, which include *employed* and all subgroups of *unemployed* and *inactive* persons. Specifications H1* and H2* use the same variables for the wage equation as LB* does (section 5.2); the participation equations are equal to P1* and P2*, respectively (section 4.2). Conversely, specifications H3* and H4* use LC* specification variables for the wage equation; in participation equations, the variables from P3* and P4* are used, respectively. Following Verbeek's (2004) advice (section 2), all of the variables in wage equations are present in participation equations. Conversely, participation equations contain variables that are not included in wage equations: "other income" variables (*oi_a* to *oi_g*) and "agricultural household" variable (*em_agri*).[21]

TABLE 10

Heckman selection model specifications

Spec.	"Positive"	"Negative"	Participation equation as in:	Wage equation as in:
H1*	*employed*	*experienced unemployed*	P1*	LB*
H2*	*employed*	*experienced inactive*	P2*	LB*
H3*	*employed*	*inexperienced unemployed*	P3*	LC*
H4*	*employed*	*inexperienced inactive*	P4*	LC*

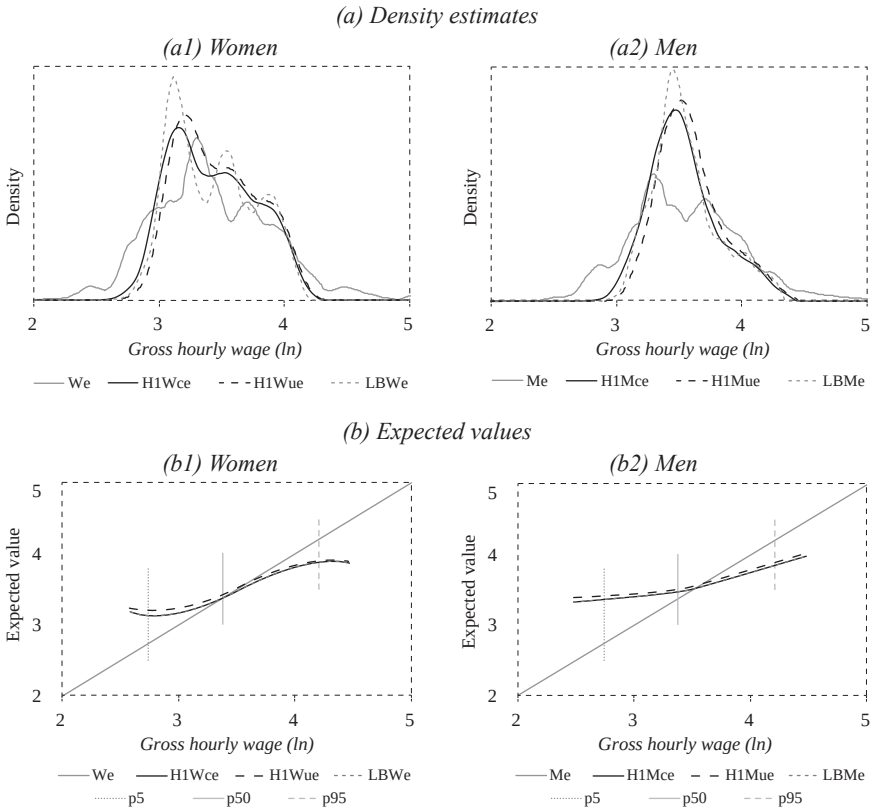
The results are presented in table A10 and table A11 (appendix 2). These tables consist of three parts. The first two parts contain coefficients and significance levels for the wage and participation equations. The third part contains various model indicators. *Sigma*, *rho* and *lambda* represent the estimates of coefficients $\hat{\sigma}_e$, $\hat{\rho}_{eu}$ and $\hat{\Lambda}$, respectively. */lnsigma* and */athrho* represent the estimate of the natural logarithm of σ_e and the estimate of the inverse hyperbolic tangent of ρ_{eu}; from these estimates, $\hat{\sigma}_e$ and $\hat{\rho}_{eu}$ are obtained by inversion. For *rho* and *lambda*, the Stata program does not obtain significance levels but only reports standard errors and confidence intervals. Therefore, for $\hat{\rho}_{eu}$ and $\hat{\Lambda}$, we assume the same significance level as for */athrho*. The presence of statistically significant $\hat{\rho}_{eu}$ manifests that the null hypothesis of no correlation between e_i and u_i cannot be rejected. At the 5% significance level, seven of eight specifications show the existence of such a correlation, i.e., that $\rho_{eu} \neq 0 \Rightarrow \Lambda \neq 0$. In H2M, $\hat{\Lambda}$ is significant only at the level of 0.15. In seven specifications, $\hat{\Lambda}$ is negative; it is positive only for H2W.

[21] Economic arguments tell us that these variables should not be included from wage equations, whereas regression analysis indicates their non-significance in wage equations.

As in section 2, the aim of HSM is to provide unbiased estimates of the wage equation coefficients, $\hat{\alpha}$. If $\rho_{eu} \neq 0$, coefficients $\hat{\alpha}$ will differ from coefficients $\tilde{\alpha}$, obtained by LRM. Therefore, for example, we can compare the wage equation coefficients obtained for H1W and H1M (table A10) with the coefficients $\tilde{\alpha}$, obtained for LBW and LBM (table A8), respectively. All of the coefficients that were significant in LRM are also significant in HSM. Comparing the magnitude of these coefficients, we note that the intercept increases – by 5.1% for women (H1W vs. LBW) and by 2.8% for men (H1M vs. LBM). The non-intercept coefficients are generally lower in HSM models (the exceptions are *ed_tert* for women and *ar_dens* for men).

FIGURE 11

*Gross wage predictions by the Heckman selection model – H1**



Abbreviations: We (Me) – actual wages of employed women (men); LBWe (LBMe) – wage predictions for employed women (men) based on LBW (LBM); H1Wce (H1Mce) – conditional wage predictions for employed women (men) based on H1W (H1M); H1Wue (H1Mue) – unconditional wage predictions for employed women (men) based on H1W (H1M). p5, p50 and p95 – the 5th, 50th and 95th percentiles of actual wage distribution of employed, respectively.

Figure 11 (graphs a1 and a2) shows the density estimates of predictions obtained by H1* models. Two sets of estimates are shown for HSM models: "conditional" and "unconditional" predictions, obtained according to equations (9) and (8), respectively. For comparison, graphs also show densities of actual wages of em-

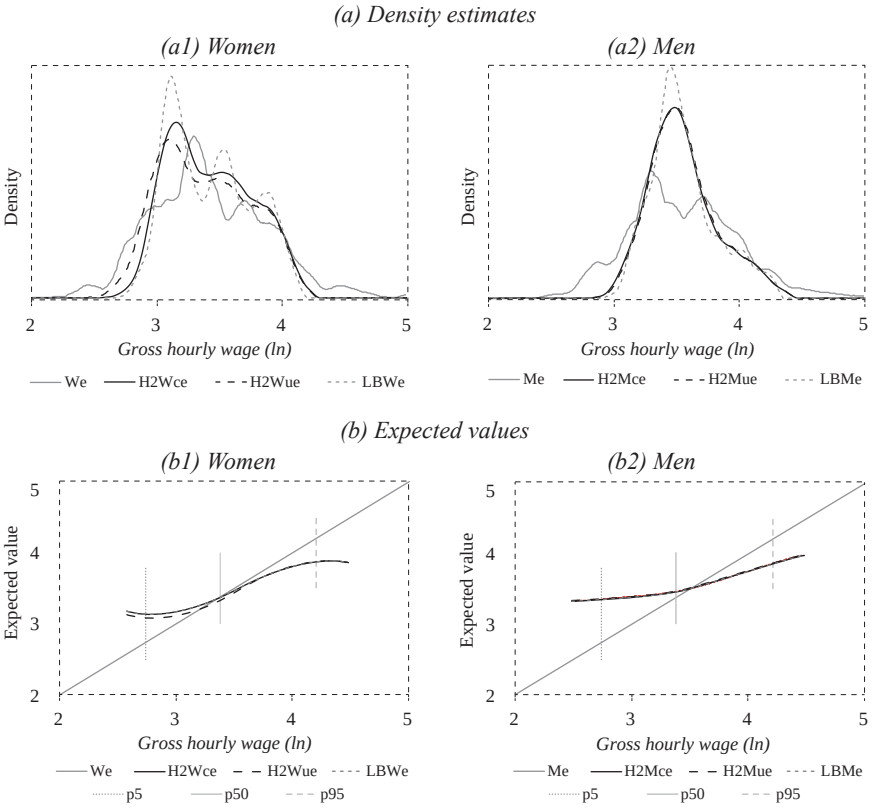
ployed and densities of LB*-based predictions. Conditional predictions are very similar to LB* predictions. Unconditional predictions are "scaled to the right" because $\hat{\Lambda}$ is negative for both women and men.

Consequently, expected values of conditional predictions overlap with those for LB* (figure 11, graphs b1 and b2). Expected values of unconditional predictions lie above those obtained for LB*.

Figure 12 shows the predictions based on H2* specifications. In H2W, $\hat{\Lambda}$ is positive; therefore, the density curve for unconditional predictions is situated to the left of the density curves obtained for conditional predictions and LBW (figure 12, graph a1). Additionally, expected values of unconditional predictions lie below those obtained for conditional predictions and LBW (figure 12, graph b1). In the case of H2M, $\hat{\Lambda}$ is negative but small and not statistically significant. Therefore, the density curves and expected values of conditional and unconditional predictions overlap.

Figure 12

*Gross wage predictions by the Heckman selection model – H2**



Abbreviations: We (Me) – actual wages of employed women (men); LBWe (LBMe) – wage predictions for employed women (men) based on LBW (LBM); H2Wce (H2Mce) – conditional wage predictions for employed women (men) based on H2W (H2M); H2Wue (H2Mue) – unconditional wage predictions for employed women (men) based on H2W (H2M). p5, p50 and p95 – the 5th, 50th and 95th percentiles of actual wage distribution of employed, respectively.

5.5 GROSS WAGE PREDICTIONS FOR NON-EMPLOYED

We now use the coefficient estimates of all models presented above to predict the wages of non-employed subgroups. Figure 13 shows the density estimates of wage predictions obtained by different models. The predictions based on LA*, LB*, LC* and Q* models are obtained for *experienced unemployed* persons. H1* and H2* predictions are obtained for *experienced unemployed* and *experienced inactive* persons, respectively.

In section 3.4, it was mentioned that a certain part of *experienced unemployed* persons have worked during IRY; for such persons, we have data on wages and show their distribution in figure 13.[22] Of course, these wages are not representative of all non-employed persons, but they can provide some illustration.

Making wage predictions for non-employed based on QRM is not fully straightforward. Specifically, we cannot use the same procedure as in section 5.3 because for non-employed persons, the quantiles q_i are unknown. Therefore, we first make "preliminary" wage predictions for non-employed, $\check{w}_i^0$, using the QRM coefficients $\check{\alpha}^{q=0.5}$. Denote with w_q the wage of an *employed* person at the q^{th} percentile. To obtain final predictions, we apply the following sets of QRM coefficients: (a) $\check{\alpha}^{q=0.2}$, if $\check{w}_i^0 \leq w_{q=0.2}$, (b) $\check{\alpha}^{q=0.5}$, if $w_{q=0.2} < \check{w}_i^0 \leq w_{q=0.8}$, or (c) $\check{\alpha}^{q=0.8}$, if $\check{w}_i^0 > w_{q=0.8}$.

Recall that LA* models include variables concerned with the current job characteristics, whose values are available for *employed* persons only. In making wage predictions for non-employed persons, we set the values of all of these variables to zero, which may be a reason why in figure 13 (graphs a1 and a2), LA*-based predictions for *experienced unemployed* show lower measures of central tendency than do those based on LB* and LC*. Q*-based predictions seem to provide better fit than do LRM models (graphs b1 and b2).

Figure 13 (graphs c1 and c2) presents the results for *experienced unemployed* made using H1*. Unconditional and conditional predictions are obtained using equations (8) and (10), respectively. There are large differences between LB*, unconditional and conditional H1*-based predictions, which are the consequence of the negative $\hat{\Lambda}$. The highest measures of central tendency are seen for unconditional H1*-based predictions, followed by conditional H1* and LB*-based predictions.

The case of H2M-based predictions for *experienced inactive* men is similar because of negative $\hat{\Lambda}$ (although not significant at usual levels) (figure 13, graph d2). Conversely, for H2W, the order of the three density curves is reversed. The modal values for unconditional H2W, conditional H2W and LBW-based predictions are 2.72, 2.90 and 3.05.

Figure 13 is illustrative and focuses only on *experienced* subgroups of non-employed. Table 11 and table 12 show the mean predicted values and standard errors

[22] Overall, 340 observations are used, 154 for women and 186 for men.

for all subgroups of non-employed and *employed* for all specifications. Within each subgroup, there are large differences in the means of predicted wages obtained by different models and indicators. For example, for *inexperienced inactive* women, the means range from 3.045 (QW) to 3.720 (LBW). In some cases, non-employed subgroups mean wage predictions are higher than the mean actual wage of actually *employed* persons. This situation specifically occurs for conditional predictions obtained by HSM models for inexperienced subgroups – H3* and H4*.

FIGURE 13

Predictions of gross wages for non-employed

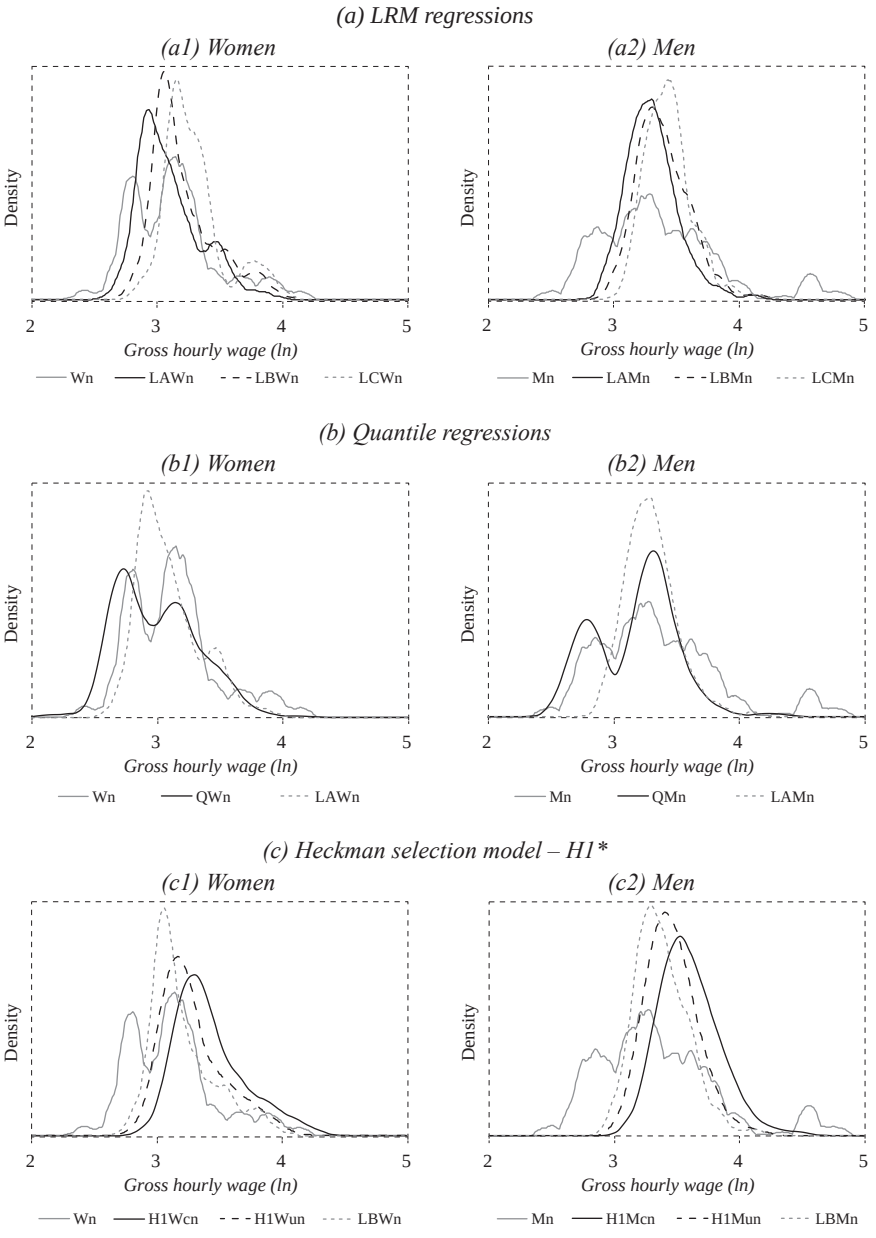
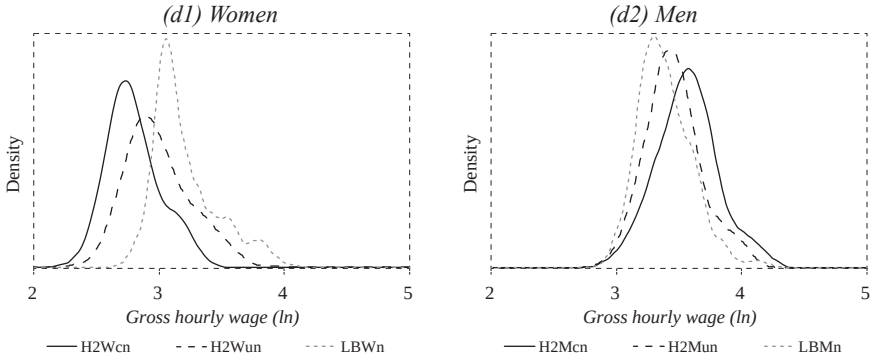


FIGURE 13 (continue)

Predictions of gross wages for non-employed

*(d) Heckman selection model – H2**



Abbreviations: Wn (Mn) – "pseudo-actual" wages of experienced unemployed women (men); LAWn (LAMn) – wage predictions for exp. unemployed women (men) based on LAW (LAM); LBWn (LBMn) – wage predictions for exp. unemployed women (men) based on LBW (LBM); LCWn (LCMn) – wage predictions for exp. unemployed women (men) based on LCW (LCM); QWn (QMn) – wage predictions for exp. unemployed women (men) based on QW (QM); H1Wcn (H1Mcn) – conditional wage predictions for exp. unemployed women (men) based on H1W (H1M); H1Wun (H1Mun) – unconditional wage predictions for exp. unemployed women (men) based on H1W (H1M); H2Wcn (H2Mcn) – conditional wage predictions for exp. inactive women (men) based on H2W (H2M); H2Wun (H2Mun) – unconditional wage predictions for exp. inactive women (men) based on H2W (H2M).

TABLE 11

Mean predicted gross wages for women

	employed		***experienced unemployed***		***experienced inactive***		***inexperienced unemployed***		***inexperienced inactive***	
	Mean	**St. err.**	**Mean**	**St. err.**	**Mean**	**St. err.**	**Mean**	**St. err.**	**Mean**	**St. err.**
LA	3.432	(0.011)	3.101	(0.013)	3.131	(0.016)	3.041	(0.021)	3.416	(0.033)
LB	3.432	(0.01)	3.210	(0.014)	3.210	(0.017)	3.186	(0.026)	3.720	(0.044)
LC	3.432	(0.009)	3.295	(0.013)	3.264	(0.012)	3.268	(0.026)	3.149	(0.011)
Q	3.407	(0.013)	3.003	(0.017)	2.982	(0.022)	2.912	(0.025)	3.045	(0.018)
H1c	3.431	(0.01)	3.429	(0.015)						
H2c	3.432	(0.01)			2.799	(0.013)				
H3c	3.431	(0.008)					3.684	(0.031)		
H4c	3.430	(0.009)							3.534	(0.015)
H1u	3.472	(0.009)	3.295	(0.013)						
H2u	3.396	(0.011)			2.999	(0.017)				
H3u	3.461	(0.008)					3.383	(0.024)		
H4u	3.472	(0.008)							3.296	(0.009)
actual	3.432	(0.015)	3.130	(0.033)						

Abbreviations: LA, LB and LC – wage predictions based on LAW, LBW and LCW models, respectively. Q – wage predictions based on the QW model. H1c, H2c, H3c and H4c – conditional wage predictions based on H1W, H2W, H3W and H4W, respectively. H1u, H2u, H3u and H4u – unconditional wage predictions based on H1W, H2W, H3W and H4W, respectively.

TABLE 12
Mean predicted gross wages for men

	employed		*experienced unemployed*		*experienced inactive*		*inexperienced unemployed*		*inexperienced inactive*	
	Mean	**St. err.**	**Mean**	**St. err.**	**Mean**	**St. err.**	**Mean**	**St. err.**	**Mean**	**St. err.**
LA	3.558	(0.008)	3.301	(0.009)	3.340	(0.02)	3.163	(0.013)	3.049	(0.017)
LB	3.558	(0.007)	3.391	(0.01)	3.426	(0.022)	3.270	(0.015)	3.145	(0.017)
LC	3.558	(0.007)	3.435	(0.009)	3.453	(0.016)	3.355	(0.02)	3.266	(0.024)
Q1	3.558	(0.012)	3.181	(0.015)	3.235	(0.03)	2.970	(0.026)	2.752	(0.022)
H1c	3.557	(0.007)	3.614	(0.011)						
H2c	3.558	(0.007)			3.569	(0.023)				
H3c	3.394	(0.007)					3.674	(0.028)		
H4c	3.558	(0.007)							3.644	(0.041)
H1u	3.601	(0.007)	3.472	(0.009)						
H2u	3.564	(0.007)			3.460	(0.021)				
H3u	3.428	(0.007)					3.368	(0.02)		
H4u	3.570	(0.007)							3.311	(0.022)
actual	3.558	(0.012)	3.328	(0.047)						

Abbreviations: LA, LB and LC – wage predictions based on LAM, LBM and LCM models, respectively. Q – wage predictions based on the QM model. H1c, H2c, H3c and H4c – conditional wage predictions based on H1M, H2M, H3M and H4M, respectively. H1u, H2u, H3u and H4u – unconditional wage predictions based on H1M, H2M, H3M and H4M, respectively.

The bottom rows of table 11 and table 12 show the means of actual wages (*hgwln*) for *employed*. They also present the means of actual wages for *experienced unemployed* who have worked during IRY (see footnote 21); these means are 3.130 and 3.328 for women and men, respectively. We can compare them with the means of conditional (unconditional) wage predictions based on H1W and H1M, which equalled 3.429 and 3.614 (3.295 and 3.472) for women and men, respectively. The conjecture arising from this comparison is that the use of HSM-based wage predictions, either unconditional or conditional, may lead us to significant over-prediction of wages of non-employed people. This over-prediction occurs when $\hat{\Lambda}$ is negative as in the majority of HSM specifications. Conversely, it seems much "easier to accept" HSM wage predictions when $\hat{\Lambda}$ is positive, the case which appears for *experienced inactive* women in the H2W specification.

6 CONCLUSION

Different micro-econometric models require information on wages of non-employed persons that could be earned by these persons if they were employed. Generally, such information does not exist in databases commonly used in empirical research, and these hypothetical wages must somehow be predicted from the available data.

This paper presents the findings of research devoted to wage predictions for selected subgroups of non-employed persons. The predictions will be used in future research, such as the calculation of METREM and in labour supply models. The database used is 2012 SILC for Croatia.

We have pursued two common methods in wage estimation – LRM and HSM. Our LRM results conform to usual findings; wage increases with education and work experience and depends on occupation, industry section and job characteristics. However, despite relatively high coefficients of determination, the results were not fully satisfactory because the residuals analysis has indicated that the models fail to predict the wages properly at the bottom and upper parts of wage distributions. Consequently, LRM over-predicts wages of low-wage earners, which are a focus of our future research. In an attempt to cure this problem, we introduced an *ad hoc* model that uses a quantile regression model. Such a model appears able to improve predictions significantly at the tails of the wage distribution, but further investigation is needed.

The use of HSM has indicated several difficulties. First, there is a general question whether HSM is appropriate for predicting wages of non-employed. According to Paci and Reilly (2004), HSM wage predictions do not reflect the wages that could actually be obtained in the market but rather the "wage offers" of persons based on their personal characteristics. Second, this problem is intensified in the case of negative correlation between random terms from participation and wage equations. In such cases, HSM predictions are generally higher than are those obtained by LRM. Statistically significant negative correlation occurs in most of our specifications.

Third, HSM is relatively complex to implement due to the existence of the participation equation and the assumptions required for correct estimation of the model. In modelling participation and wage equations, we have followed the usual recipes and included all of the common variables (that were available in SILC). Furthermore, non-employed are carefully divided into the subgroups of unemployed and inactive, which is another requirement for proper specification of the participation equation.

Thus, the study has left several questions open. However, the paper should provide a useful contribution for further investigation into predicting wages of non-employed persons and for the analysis of unemployment and inactivity in Croatia.

APPENDIX

APPENDIX 1: SELECTED MEASURES OF FIT FOR PROBIT MODEL

Various measures of fit are available for probit models (Veall and Zimmermann, 1992; Williams, 2015; UCLA, 2011). We use McFadden's pseudo R2, the Adjusted McFadden's pseudo R2, the Count pseudo R2 and the Adjusted count pseudo R2. McFadden's pseudo R2 is defined as follows:

$$\text{MFR2} = 1 - \frac{LL_M}{LL_0} \tag{A1}$$

where LL_M and LL_0 represent the log-likelihoods of the complete model and of the model that uses the intercept only, respectively. The Adjusted McFadden's pseudo R2 adjusts MFR2 for the number of regressors, H, plus one for the intercept, as follows:

$$\text{AMFR2} = 1 - \frac{LL_M - (H+1)}{LL_0} \tag{A2}$$

Because we use sampling weights whose average is approximately 300 in our estimations, LL_M and LL_0 are artificially inflated, and there is virtually no difference between MFR2 and AMFR2. Therefore, to produce the eligible estimate of AMFR2, we initially deflate LL_M and LL_0 by the mean of the sampling weights and then calculate AMFR2 using these deflated values.

The "Count pseudo R2" and the "Adjusted count pseudo R2" are based on the so-called classification tables, which are calculated as follows.

Assume that there are I persons in the sample, $i = \{1, ..., I\}$, of which K persons, $i = \{1, ..., K\}$, have the "positive" outcome, whereas $I-K$ persons, $i = \{K+1, ..., I\}$, have the "negative" outcome. For example, positive and negative outcomes can be *employed* and *experienced unemployed*, respectively.

The probit model calculates the estimate of the probability of each person i in the sample to have a positive outcome. This estimate, $\Phi(Z_i\hat{\beta})$, ranges from 0 to 1. If $\Phi(Z_i\hat{\beta}) \geq \pi$, i is classified as positive; otherwise, if $\Phi(Z_i\hat{\beta}) < \pi$, i is "classified as negative". We have four possibilities:

(a) Actual positive is classified as positive: if $i = \{1, ..., K\}$ and $\Phi(Z_i\hat{\beta}) \geq \pi$

(b) Actual positive is classified as negative: if $i = \{1, ..., K\}$ and $\Phi(Z_i\hat{\beta}) < \pi$

(c) Actual negative is classified as positive: if $i = \{K+1, ..., I\}$ and $\Phi(Z_i\hat{\beta}) \geq \pi$

(d) Actual negative is classified as negative: if $i = \{K+1, ..., I\}$ and $\Phi(Z_i\hat{\beta}) < \pi$

Let s_π^{PP}, s_π^{PN}, s_π^{NN} and s_π^{NP} denote the numbers of persons satisfying condition (a), (b), (c) and (d) in total number of persons, *I*. The following scheme is the *classification table*, containing the shares of persons falling into each of the four categories:

	Actual positive...	**Actual negative...**	**Total**
...classified as positive	s_π^{PP}	s_π^{NP}	$s_\pi^{PP} + s_\pi^{NP}$
...classified as negative	s_π^{PN}	s_π^{NN}	$s_\pi^{PN} + s_\pi^{NN}$
Total	$s_\pi^{PP} + s_\pi^{PN} = p$	$s_\pi^{NP} + s_\pi^{NN} = n$	$p + n = 1$

The number $s_\pi^{PP} + s_\pi^{NP}$ is the share of persons correctly classified by the model. Assuming that $\pi = 0.5$, we can obtain the Count pseudo R2 measure, as follows:

$$\text{CPR2} = s_{0.5}^{PP} + s_{0.5}^{NN} \tag{A3}$$

which represents the share of correctly classified in the total sample. The weakness of CPR2 is manifested in cases when one of the outcomes is much more frequent than is the other. For example, imagine the sample in which 90% of persons are employed and 10% are unemployed; the probit model yields the following results: $s_{0.5}^{PP} = 0.88$, $s_{0.5}^{NP} = 0.02$, $s_{0.5}^{PN} = 0.08$ and $s_{0.5}^{NN} = 0.02$. CPR2 would equal 0.9, which can be deemed very high, although the model has almost completely failed to classify the unemployed properly.

Therefore, "Adjusted count pseudo R2" is suggested and is obtained as follows:

$$\text{ACPR2} = \frac{s_{0.5}^{PP} + s_{0.5}^{NN} - \max(p,n)}{1 - \max(p,n)} \tag{A4}$$

ACPR2 corrects CPR2 by the share of persons with more frequent outcome. In our example, ACPR2=(0.9–0.9)/(1.0–0.9)=0, which better reflects the quality of the model.

Another interesting indicator is the ratio s_π^{NP} / n, which represents a share of incorrectly classified negative observations in the total number of negative observations. Similarly, s_π^{PN} / p can be defined. In calculating these indicators, we can choose $\pi = 0.5$, but such a choice may be too restrictive when s^N is relatively small. Namely, the probit model calculates coefficients $\hat{\beta}$, such that the mean of $\Phi(Z_i\hat{\beta})$ for all observations in the sample equals s^P. If the value $\pi = p$ is chosen, s_p^N / n measures the share of actual negative persons for whom $\Phi(Z_i\hat{\beta}) > p$, i.e., for whom the probability of employment is greater than the overall sample probability of employment.

APPENDIX 2: OTHER TABLES

TABLE A1

Variables and their descriptions

Variable	Description
Age	
ag_year	age in years, in the middle of IRY
ag_ysqr	*ag_year* squared / 100
ag_1525	[bin] aged 16-25 years
ag_2540	[bin] aged 25-40 years
ag_4055	[bin] aged 40-55 years
ag_5565	[bin] aged 55-65 years
Marital status	
ms_mard	[bin] married
ms_nmnp	[bin] never married, does not live with a partner in a household
ms_nmhp	[bin] never married, lives with a partner in a household
ms_divo	[bin] divorced
ms_widw	[bin] widowed
Children	
ch_p0002	number of own parent's children aged 0-2 years
ch_p0306	number of own parent's children aged 3-6 years
ch_p0715	number of own parent's children aged 7-15 years
ch_o0015	number of non-parent's children aged 0-15 years
Education	
ed_nopr	[bin] unfinished primary education
ed_prim	[bin] primary education
ed_seco	[bin] secondary education
ed_tert	[bin] tertiary education
ed_prnp	[bin] primary or unfinished primary education
Area of living	
ar_dens	[bin] inhabitant of densely populated areas
ar_intr	[bin] inhabitant of intermediately populated areas
ar_thin	[bin] inhabitant of thinly populated areas
Health	
hs_badh	[bin] bad or very bad health (self-perceived)
hs_lima	[cat] limitation in activities because of health problems (2 if "strongly limited"; 1 if "limited"; 0 if no limitation)
Wage and income	
hgw	a ratio between yearly gross employment income (gross wage; *bruto plaća*) and yearly working hours
hgwln	(ln) *hgw*
oi_a	(ln) employment and self-employment income (net), earned by other household members
oi_b	(ln) rental and capital income (net), obtained by a household
oi_c	(ln) private transfers received minus private transfers paid, by a household (note: for negative amounts, -ln(-amount) is obtained)
oi_d	(ln) pension income (net), received by other household members

Variable	Description
oi_e	(ln) unemployment and sickness benefits (net), received by other household members
oi_f	(ln) child benefits, maternity and parental leave benefits
oi_g	(ln) imputed rent, obtained by a household (net of interest on mortgage and actual rent paid)
Employment	
we_yipw	work experience: years spent in paid work before the beginning of IRY
we_yisq	*we_yipw* squared / 100
we_yopw	"years out of work": years in which person was not working, measured from the date when the first job was taken, until the beginning of IRY
we_yosq	*we_yopw* squared / 100
em_locs	[bin] works in enterprise local unit with up to 10 employees
em_locl	[bin] works in enterprise local unit with 50 or more employees
em_perj	[bin] has permanent job contract (as opposed to temporary contract)
em_mana	[bin] managerial position at work
em_agri	[bin] agricultural household, defined as a household in which more than 50% of employment/self-employment income is derived from self-employment income in agriculture
Occupation	(according to ISCO-08)
oc_0	[bin] armed forces occupations
oc_1	[bin] managers
oc_2	[bin] professionals
oc_3	[bin] technicians and associate professionals
oc_4	[bin] clerical support workers
oc_5	[bin] service and sales workers
oc_6	[bin] skilled agricultural, forestry and fishery workers
oc_7	[bin] craft and related trades workers
oc_8	[bin] plant and machine operators, and assemblers
oc_9	[bin] elementary occupations
oc_21	[bin] professionals and managers (*oc_2+oc_1*)
oc_30	[bin] technicians, associate professionals, and armed forces occupations (*oc_3+oc_0*)
Industry	(industry sections according to NACE Rev. 2)
in_a	[bin] employed in section A (agriculture, forestry and fishing)
in_bcde	[bin] employed in sections B (mining and quarrying), C (manufacturing), D (electricity, gas, steam and air conditioning supply), or E (water supply, sewerage, waste management and remediation activities)
in_f	[bin] employed in section F (construction)
in_g	[bin] employed in section G (wholesale and retail trade; repair of motor vehicles and motorcycles)
in_h	[bin] employed in section H (transportation and storage)
in_i	[bin] employed in section I (accommodation and food service activities)
in_j	[bin] employed in section J (information and communication)
in_k	[bin] employed in section K (financial and insurance activities)
in_lmn	[bin] employed in section L (real estate activities), M (professional, scientific and technical activities), or N (administrative and support service activities)

Variable	Description
in_o	[bin] employed in section O (public administration and defence; compulsory social security)
in_p	[bin] employed in section P (education)
in_q	[bin] employed in section Q (human health and social work activities)
in_rstu	[bin] employed in section R (arts, entertainment and recreation), S (other service activities), T (activities of households as employers; undifferentiated goods- and services-producing activities of households for own use), or U (activities of extraterritorial organisations and bodies)
in_gi	[bin] the sum of *in_g* and *in_i*
in_jk	[bin] the sum of *in_j*, *in_k*
in_opq	[bin] the sum of *in_o*, *in_p and* in_q

Notes: [bin] denotes binary variable; [cat] denotes categorical variable; and (ln) denotes the natural logarithm of the amount.

TABLE A2

Means and standard deviations of variables – women

	employed		*experienced unemployed*		*inexperienced unemployed*		*experienced inactive*		*inexperienced inactive*	
Variable	**Mean**	**S. d.**	**Mean**	**S. d.**	**Mean**	**S. d.**	**Mean**	**S. d.**	**Mean**	**S. d.**
ag_year	40.82	9.82	38.04	10.61	27.44	9.30	46.65	9.04	43.77	11.23
ms_mard	0.66	0.47	0.64	0.48	0.23	0.42	0.86	0.34	0.81	0.39
ms_nmnp	0.22	0.41	0.26	0.44	0.68	0.47	0.04	0.19	0.09	0.28
ms_nmhp	0.01	0.11	0.03	0.16	0.04	0.19	0.03	0.16	0.05	0.22
ms_divo	0.07	0.25	0.06	0.24	0.04	0.19	0.02	0.15	0.02	0.12
ms_widw	0.05	0.21	0.01	0.10	0.01	0.11	0.05	0.21	0.04	0.18
ch_p0002	0.01	0.11	0.03	0.18	0.01	0.10	0.02	0.17	0.04	0.21
ch_p0306	0.11	0.36	0.22	0.51	0.10	0.33	0.17	0.45	0.15	0.45
ch_p0715	0.36	0.68	0.39	0.69	0.21	0.53	0.42	0.72	0.42	0.77
ch_o0015	0.09	0.38	0.14	0.44	0.30	0.73	0.13	0.56	0.22	0.66
ed_nopr	0.00	0.04	0.01	0.12	0.01	0.11	0.02	0.14	0.15	0.35
ed_prim	0.09	0.29	0.18	0.38	0.13	0.34	0.30	0.46	0.50	0.50
ed_seco	0.66	0.47	0.68	0.47	0.62	0.49	0.66	0.47	0.29	0.45
ed_tert	0.25	0.43	0.13	0.34	0.23	0.42	0.02	0.14	0.02	0.12
ed_prnp	0.09	0.29	0.19	0.39	0.14	0.35	0.32	0.47	0.65	0.48
ar_dens	0.38	0.49	0.21	0.41	0.23	0.42	0.20	0.40	0.16	0.37
ar_intr	0.23	0.42	0.18	0.39	0.16	0.36	0.19	0.39	0.15	0.36
ar_thin	0.39	0.49	0.61	0.49	0.61	0.49	0.60	0.49	0.68	0.47
hs_badh	0.03	0.17	0.07	0.25	0.04	0.19	0.17	0.38	0.13	0.34
hs_lima	0.08	0.29	0.11	0.33	0.09	0.36	0.27	0.52	0.19	0.43
hgw	34.79	19.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
hgwln	3.43	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
oi_a	8.35	4.81	8.15	4.72	8.47	4.63	8.82	4.50	7.92	4.94
oi_b	0.97	2.70	0.62	2.26	0.48	1.97	0.96	2.70	0.38	1.74
oi_c	0.08	2.60	0.46	2.57	0.25	2.21	0.16	2.82	0.24	1.85
oi_d	3.73	4.98	4.08	5.04	3.73	4.92	3.56	4.91	4.06	5.06
oi_e	0.46	1.99	0.67	2.32	0.35	1.71	0.53	2.08	0.65	2.37
oi_f	1.36	3.14	3.54	4.31	3.10	4.23	3.01	4.26	3.26	4.35
oi_g	9.71	1.68	9.45	1.88	9.34	1.88	9.61	1.65	9.62	0.64
we_yipw	16.13	10.28	9.60	8.82	0.00	0.00	13.33	9.76	0.00	0.00
we_yopw	0.79	2.41	3.50	5.48	6.01	9.90	7.97	8.05	24.39	14.42
em_locs	0.26	0.44	0.11	0.31	0.07	0.26	0.00	0.00	0.00	0.00
em_locl	0.34	0.47	0.04	0.20	0.01	0.10	0.00	0.00	0.00	0.00
em_perj	0.88	0.32	0.33	0.47	0.03	0.16	0.62	0.49	0.01	0.09
em_mana	0.11	0.31	0.04	0.18	0.00	0.00	0.02	0.15	0.00	0.00
em_agri	0.01	0.09	0.03	0.16	0.01	0.10	0.04	0.18	0.03	0.17
oc_21	0.23	0.42	0.05	0.23	0.07	0.25	0.02	0.15	0.00	0.00
oc_30	0.12	0.33	0.08	0.27	0.00	0.00	0.05	0.22	0.00	0.00
oc_4	0.17	0.38	0.11	0.31	0.01	0.09	0.11	0.31	0.00	0.00
oc_5	0.26	0.44	0.42	0.49	0.10	0.30	0.31	0.46	0.01	0.09
oc_6	0.01	0.07	0.01	0.10	0.01	0.08	0.04	0.19	0.00	0.00
oc_7	0.06	0.24	0.10	0.30	0.01	0.10	0.16	0.37	0.01	0.11
oc_8	0.05	0.21	0.07	0.25	0.00	0.00	0.11	0.31	0.00	0.06
oc_9	0.09	0.29	0.16	0.37	0.01	0.12	0.19	0.39	0.00	0.00
in_a	0.01	0.12	0.01	0.08	0.00	0.06	0.00	0.00	0.00	0.00
in_bcde	0.17	0.38	0.04	0.20	0.01	0.10	0.00	0.00	0.00	0.00
in_f	0.01	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
in_gi	0.24	0.43	0.09	0.29	0.06	0.23	0.00	0.00	0.00	0.00
in_h	0.02	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
in_jk	0.06	0.23	0.01	0.07	0.00	0.00	0.00	0.00	0.00	0.00
in_lmn	0.06	0.24	0.05	0.22	0.03	0.16	0.00	0.00	0.00	0.00
in_opq	0.32	0.47	0.03	0.18	0.04	0.20	0.00	0.00	0.00	0.00
in_rstu	0.04	0.19	0.02	0.13	0.02	0.15	0.00	0.00	0.00	0.00

TABLE A3

Means and standard deviations of variables – men

	employed		*experienced unemployed*		*inexperienced unemployed*		*experienced inactive*		*inexperienced inactive*	
Variable	**Mean**	**S. d.**	**Mean**	**S. d.**	**Mean**	**S. d.**	**Mean**	**S. d.**	**Mean**	**S. d.**
ag_year	40.66	10.80	38.30	11.43	25.30	7.48	49.02	10.98	29.25	10.56
ms_mard	0.67	0.47	0.46	0.50	0.10	0.30	0.61	0.49	0.17	0.38
ms_nmnp	0.28	0.45	0.46	0.50	0.86	0.35	0.26	0.44	0.69	0.46
ms_nmhp	0.02	0.14	0.03	0.18	0.02	0.15	0.06	0.23	0.08	0.27
ms_divo	0.03	0.16	0.04	0.20	0.02	0.14	0.06	0.23	0.06	0.23
ms_widw	0.00	0.07	0.00	0.06	0.00	0.00	0.02	0.14	0.00	0.00
ch_p0002	0.10	0.30	0.07	0.27	0.04	0.18	0.03	0.16	0.05	0.23
ch_p0306	0.16	0.44	0.12	0.39	0.06	0.26	0.08	0.28	0.21	0.54
ch_p0715	0.34	0.67	0.24	0.58	0.05	0.24	0.15	0.48	0.20	0.64
ch_o0015	0.07	0.33	0.11	0.42	0.27	0.68	0.14	0.52	0.52	1.02
ed_nopr	0.01	0.08	0.03	0.17	0.02	0.15	0.04	0.19	0.06	0.24
ed_prim	0.07	0.26	0.14	0.35	0.09	0.29	0.23	0.42	0.23	0.42
ed_seco	0.74	0.44	0.77	0.42	0.72	0.45	0.69	0.46	0.68	0.47
ed_tert	0.18	0.39	0.06	0.23	0.16	0.36	0.03	0.18	0.03	0.16
ed_prnp	0.08	0.27	0.17	0.38	0.11	0.32	0.27	0.44	0.29	0.45
ar_dens	0.30	0.46	0.28	0.45	0.33	0.47	0.20	0.40	0.11	0.31
ar_intr	0.21	0.41	0.15	0.36	0.15	0.36	0.18	0.39	0.25	0.43
ar_thin	0.48	0.50	0.57	0.49	0.52	0.50	0.62	0.49	0.64	0.48
hs_badh	0.02	0.12	0.05	0.21	0.01	0.08	0.16	0.37	0.07	0.25
hs_lima	0.07	0.28	0.10	0.32	0.03	0.18	0.34	0.50	0.09	0.29
hgw	38.94	20.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
hgwln	3.56	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
oi_a	7.63	5.07	6.50	5.33	7.81	5.09	5.96	5.41	7.43	5.31
oi_b	0.86	2.56	0.55	2.09	0.97	2.75	0.82	2.56	0.18	1.29
oi_c	-0.24	1.98	0.48	2.76	0.18	2.77	0.04	1.75	-0.15	1.15
oi_d	3.20	4.77	3.92	4.96	5.19	5.12	3.39	4.62	4.43	5.14
oi_e	0.63	2.31	0.58	2.20	1.17	3.01	0.30	1.62	0.65	2.32
oi_f	2.05	3.81	2.55	4.06	2.09	3.72	2.31	3.89	2.98	4.41
oi_g	9.51	2.05	9.60	1.51	9.66	1.29	9.70	0.55	9.82	0.67
we_yipw	16.96	10.80	11.54	10.20	0.00	0.00	18.63	11.66	0.00	0.00
we_yopw	0.57	1.93	2.88	4.95	4.72	7.24	5.64	7.04	10.91	10.64
em_locs	0.18	0.39	0.07	0.26	0.03	0.17	0.00	0.00	0.00	0.00
em_locl	0.36	0.48	0.05	0.22	0.03	0.16	0.00	0.00	0.00	0.00
em_perj	0.90	0.29	0.35	0.48	0.01	0.10	0.64	0.48	0.00	0.00
em_mana	0.14	0.35	0.06	0.23	0.00	0.00	0.06	0.24	0.00	0.00
em_agri	0.00	0.06	0.01	0.11	0.02	0.15	0.04	0.18	0.00	0.00
oc_21	0.13	0.33	0.04	0.19	0.03	0.18	0.06	0.24	0.00	0.00
oc_30	0.19	0.39	0.11	0.31	0.01	0.11	0.11	0.31	0.00	0.00
oc_4	0.08	0.27	0.08	0.27	0.00	0.00	0.08	0.26	0.00	0.00
oc_5	0.14	0.35	0.14	0.35	0.04	0.19	0.11	0.31	0.01	0.12
oc_6	0.02	0.14	0.03	0.16	0.00	0.07	0.01	0.10	0.00	0.00
oc_7	0.25	0.43	0.31	0.46	0.05	0.21	0.27	0.45	0.00	0.00
oc_8	0.15	0.36	0.15	0.36	0.03	0.18	0.25	0.43	0.00	0.00
oc_9	0.05	0.21	0.15	0.35	0.01	0.08	0.11	0.32	0.00	0.00
in_a	0.04	0.19	0.00	0.07	0.00	0.07	0.00	0.00	0.00	0.00
in_bcde	0.30	0.46	0.06	0.24	0.03	0.18	0.00	0.00	0.00	0.00
in_f	0.11	0.32	0.03	0.17	0.02	0.12	0.00	0.00	0.00	0.00
in_gi	0.15	0.36	0.07	0.25	0.01	0.10	0.00	0.00	0.00	0.00
in_h	0.10	0.30	0.03	0.17	0.00	0.00	0.00	0.00	0.00	0.00
in_jk	0.05	0.21	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00
in_lmn	0.05	0.21	0.03	0.18	0.01	0.08	0.00	0.00	0.00	0.00
in_opq	0.14	0.35	0.01	0.12	0.01	0.09	0.00	0.00	0.00	0.00
in_rstu	0.02	0.12	0.01	0.10	0.00	0.06	0.00	0.00	0.00	0.00

TABLE A4

Results of probit models P1 to P5 for women

	P1W		P2W		P3W		P4W		P5W	
	Coeff.	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**
ag_year	**0.121**	(0)	0.098	(0.07)	**0.351**	(0)	**0.213**	(0)	-0.019	(0.74)
ag_ysqr	**-0.133**	(0)	**-0.161**	(0.01)	**-0.383**	(0)	**-0.274**	(0)	-0.033	(0.63)
ar_dens	0.147	(0.23)	0.154	(0.37)	-0.121	(0.56)	-0.040	(0.8)	-0.136	(0.52)
ar_thin	**-0.256**	(0.02)	-0.096	(0.49)	**-0.455**	(0.01)	**-0.522**	(0)	0.088	(0.58)
ms_mard	0.251	(0.1)	0.193	(0.48)	0.428	(0.05)	-0.215	(0.34)	-0.303	(0.28)
ms_nmhp	-0.090	(0.74)	**-1.047**	(0.03)	-0.143	(0.71)	**-0.822**	(0.01)	-0.619	(0.19)
ms_divo	0.084	(0.69)	**0.765**	(0.04)	0.039	(0.91)	0.507	(0.18)	0.460	(0.21)
ms_widw	**1.067**	(0)	0.343	(0.32)	0.485	(0.27)	0.302	(0.32)	**-0.962**	(0.02)
ch_p0002	-0.210	(0.44)	-0.145	(0.71)	0.437	(0.46)	0.039	(0.89)	-0.536	(0.09)
ch_p0306	**-0.256**	(0.03)	**-0.722**	(0)	-0.077	(0.69)	-0.225	(0.11)	-0.286	(0.09)
ch_p0715	0.047	(0.52)	-0.141	(0.09)	-0.138	(0.22)	-0.082	(0.33)	**-0.271**	(0.01)
ch_o0015	0.130	(0.23)	0.222	(0.08)	0.228	(0.07)	0.035	(0.72)	-0.009	(0.95)
ed_prnp	-0.218	(0.1)	-0.289	(0.07)	**-0.891**	(0)	**-1.387**	(0)	-0.006	(0.97)
ed_tert	**-0.403**	(0.01)	**0.782**	(0)	**-0.309**	(0.05)	**0.690**	(0)	**1.112**	(0)
hs_badh	**-0.457**	(0.01)	**-0.970**	(0)	**-0.668**	(0.01)	**-0.544**	(0)	**-0.403**	(0.03)
we_yopw	**-0.166**	(0)	**-0.209**	(0)					-0.031	(0.15)
we_yosq	**0.369**	(0.01)	**0.398**	(0)					0.006	(0.95)
oc_21	**0.981**	(0)	0.406	(0.15)					-0.395	(0.31)
oc_30	0.213	(0.19)	0.009	(0.97)					-0.062	(0.81)
oc_4	**0.301**	(0.02)	0.082	(0.6)					-0.142	(0.46)
oc_6	0.309	(0.45)	-0.564	(0.14)					**-1.143**	(0)
oc_7	0.004	(0.98)	**-0.481**	(0.01)					-0.304	(0.11)
oc_8	0.086	(0.61)	-0.173	(0.34)					-0.200	(0.32)
oc_9	0.034	(0.81)	0.176	(0.43)					-0.150	(0.44)
oi_a	0.004	(0.62)	-0.023	(0.07)	0.003	(0.82)	0.006	(0.6)	**-0.037**	(0.01)
oi_b	0.013	(0.43)	-0.041	(0.09)	0.028	(0.25)	0.030	(0.19)	-0.047	(0.05)
oi_c	-0.024	(0.14)	-0.025	(0.27)	-0.007	(0.78)	-0.033	(0.08)	0.015	(0.55)
oi_d	-0.003	(0.73)	0.013	(0.25)	0.011	(0.38)	0.003	(0.8)	-0.007	(0.59)
oi_e	-0.007	(0.69)	0.010	(0.67)	0.046	(0.16)	0.013	(0.49)	0.029	(0.26)
oi_f	**-0.071**	(0)	**-0.061**	(0)	**-0.065**	(0)	**-0.050**	(0)	0.019	(0.32)
oi_g	0.021	(0.37)	0.022	(0.61)	0.029	(0.33)	**-0.049**	(0.04)	-0.003	(0.94)
em_agri	-0.158	(0.6)	0.011	(0.97)	0.177	(0.6)	-0.401	(0.17)	-0.400	(0.21)
_cons	**-1.865**	(0.01)	0.597	(0.56)	**-5.777**	(0)	-1.368	(0.13)	**2.786**	(0.01)
Observations	2,034		1,880		1,699		1,883		860	
MFR2	0.229		0.435		0.360		0.357		0.225	
AMFR2	0.200		0.394		0.313		0.326		0.167	
CPR2	0.799		0.898		0.930		0.893		0.738	
ACPR2	0.142		0.326		0.221		0.257		0.290	
p	0.766		0.848		0.910		0.856		0.630	
n	0.234		0.152		0.090		0.144		0.370	
s(PP, 0.5)	0.717		0.820		0.897		0.824		0.529	
s(PN, 0.5)	0.049		0.028		0.014		0.031		0.102	
s(NN, 0.5)	0.083		0.078		0.034		0.068		0.209	
s(NP, 0.5)	0.151		0.074		0.056		0.076		0.161	
s(PN, 0.5) / p	0.064		0.033		0.015		0.036		0.162	
s(NP, 0.5) / n	0.647		0.488		0.625		0.528		0.435	
s(PP, p)	0.572		0.708		0.726		0.705		0.429	
s(PN, p)	0.194		0.140		0.185		0.151		0.202	
s(NN, p)	0.172		0.126		0.076		0.114		0.283	
s(NP, p)	0.062		0.026		0.014		0.031		0.086	
s(PN, p) / p	0.253		0.165		0.203		0.176		0.320	
s(NP, p) / n	0.264		0.173		0.153		0.214		0.234	

Notes: Specifications are explained in section 4.2 (table 6). Coefficients significant at the 5% level are marked as bold.

Abbreviations: coeff. – coefficient, sig. l. – significance level; see appendix 1 for explanation of the measures of fit. s(PP, 0.5) denotes $s^{PP}_{0.5}$ *(subsequent indicators are denoted analogously).*

TABLE A5

Results of probit models P6 to P10 for women

	P6W		P7W		P8W		P9W		P10W	
	Coeff.	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**
ag_year	**0.253**	(0)	**0.144**	(0)	**0.229**	(0)	**0.148**	(0.01)	0.000	(1)
ag_ysqr	**-0.264**	(0)	**-0.193**	(0)	-0.149	(0.12)	**-0.127**	(0.05)	-0.071	(0.35)
ar_dens	-0.184	(0.44)	-0.183	(0.38)	-0.332	(0.29)	0.058	(0.78)	0.336	(0.29)
ar_thin	-0.039	(0.84)	-0.099	(0.55)	**-0.562**	(0.04)	-0.093	(0.57)	0.250	(0.29)
ms_mard	0.393	(0.11)	-0.466	(0.06)	0.645	(0.11)	-0.254	(0.49)	**-0.810**	(0.01)
ms_nmhp	0.112	(0.76)	**-0.871**	(0.02)	**1.747**	(0)	-0.240	(0.65)	**-0.995**	(0.02)
ms_divo	-0.053	(0.9)	0.481	(0.22)	-0.755	(0.17)	0.025	(0.96)	0.682	(0.25)
ms_widw	-0.368	(0.47)	**-0.941**	(0.02)	0.233	(0.69)	0.021	(0.97)	-0.315	(0.62)
ch_p0002	0.302	(0.57)	-0.131	(0.62)	1.044	(0.06)	**0.742**	(0.05)	-0.451	(0.37)
ch_p0306	0.164	(0.39)	-0.027	(0.86)	0.470	(0.06)	0.265	(0.21)	-0.394	(0.13)
ch_p0715	-0.141	(0.38)	**-0.243**	(0.02)	0.108	(0.57)	0.077	(0.44)	-0.001	(1)
ch_o0015	0.160	(0.23)	-0.163	(0.17)	0.247	(0.3)	-0.118	(0.41)	-0.098	(0.4)
ed_prnp	**-0.565**	(0.01)	**-1.074**	(0)	-0.391	(0.14)	**-0.984**	(0)	**-0.751**	(0)
ed_tert	**-0.408**	(0.04)	0.509	(0.06)	**-1.164**	(0.01)	-0.189	(0.65)	**0.834**	(0.01)
hs_badh	-0.124	(0.68)	-0.078	(0.69)	0.312	(0.35)	0.291	(0.07)	0.215	(0.53)
we_yopw										
we_yosq										
oc_21										
oc_30										
oc_4										
oc_6										
oc_7										
oc_8										
oc_9										
oi_a	0.007	(0.65)	0.003	(0.82)	0.044	(0.08)	**0.032**	(0.02)	0.003	(0.89)
oi_b	0.006	(0.85)	-0.007	(0.77)	0.057	(0.12)	0.048	(0.08)	0.028	(0.42)
oi_c	0.006	(0.83)	0.014	(0.55)	-0.014	(0.69)	-0.021	(0.39)	0.019	(0.67)
oi_d	0.022	(0.12)	0.011	(0.36)	**0.045**	(0.05)	0.006	(0.64)	0.013	(0.48)
oi_e	0.055	(0.1)	0.029	(0.16)	0.018	(0.76)	0.004	(0.86)	0.016	(0.71)
oi_f	-0.008	(0.7)	0.028	(0.11)	-0.009	(0.81)	0.019	(0.36)	0.021	(0.39)
oi_g	0.042	(0.25)	**-0.067**	(0.04)	0.084	(0.07)	-0.037	(0.42)	**-0.371**	(0)
em_agri	**0.894**	(0.05)	-0.023	(0.95)	0.914	(0.12)	0.319	(0.33)	-0.404	(0.36)
_cons	**-4.978**	(0)	-0.586	(0.53)	**-7.406**	(0)	**-3.342**	(0.01)	**4.606**	(0)
Observations	679		863		525		709		528	
MFR2	0.248		0.222		0.619		0.146		0.478	
AMFR2	0.184		0.179		0.548		0.097		0.409	
CPR2	0.823		0.757		0.904		0.698		0.861	
ACPR2	0.274		0.318		0.729		0.379		0.622	
p	0.756		0.644		0.645		0.515		0.368	
n	0.244		0.356		0.355		0.485		0.632	
s(PP, 0.5)	0.701		0.544		0.620		0.358		0.291	
s(PN, 0.5)	0.055		0.100		0.026		0.157		0.078	
s(NN, 0.5)	0.122		0.213		0.284		0.341		0.570	
s(NP, 0.5)	0.122		0.143		0.071		0.145		0.061	
s(PN, 0.5) / p	0.073		0.155		0.040		0.305		0.211	
s(NP, 0.5) / n	0.500		0.401		0.199		0.298		0.097	
s(PP, p)	0.574		0.506		0.588		0.351		0.312	
s(PN, p)	0.182		0.138		0.057		0.164		0.056	
s(NN, p)	0.177		0.251		0.304		0.348		0.545	
s(NP, p)	0.067		0.105		0.051		0.138		0.087	
s(PN, p) / p	0.241		0.215		0.089		0.319		0.152	
s(NP, p) / n	0.273		0.295		0.143		0.284		0.137	

Notes: see notes and abbreviations for table A4.

TABLE A6

Results of probit models P1 to P5 for men

	P1M		P2M		P3M		P4M		P5M	
	Coeff.	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**
ag_year	**0.062**	(0.01)	**0.147**	(0)	**0.283**	(0)	**0.188**	(0)	0.060	(0.13)
ag_ysqr	**-0.058**	(0.04)	**-0.204**	(0)	**-0.289**	(0)	**-0.202**	(0)	**-0.121**	(0.01)
ar_dens	**-0.255**	(0.02)	0.053	(0.77)	**-0.422**	(0.02)	0.334	(0.18)	0.307	(0.18)
ar_thin	**-0.193**	(0.04)	0.017	(0.91)	-0.171	(0.28)	0.025	(0.9)	0.032	(0.86)
ms_mard	**0.366**	(0)	**0.370**	(0.04)	**0.552**	(0.01)	**0.985**	(0)	0.147	(0.48)
ms_nmhp	-0.016	(0.95)	**-0.711**	(0.05)	0.232	(0.42)	-0.081	(0.76)	-0.508	(0.19)
ms_divo	-0.163	(0.4)	0.240	(0.49)	-0.255	(0.51)	-0.058	(0.89)	0.403	(0.22)
ms_widw										
ch_p0002	**0.325**	(0.03)	0.557	(0.15)	0.517	(0.06)	0.177	(0.57)	0.215	(0.58)
ch_p0306	0.142	(0.2)	-0.029	(0.89)	-0.083	(0.62)	**-0.444**	(0.03)	-0.048	(0.83)
ch_p0715	**0.159**	(0.03)	0.230	(0.1)	0.013	(0.92)	**-0.313**	(0.03)	0.165	(0.38)
ch_o0015	0.105	(0.29)	0.156	(0.27)	0.125	(0.31)	**-0.289**	(0.04)	-0.012	(0.94)
ed_prnp	-0.074	(0.52)	-0.230	(0.12)	**-0.555**	(0)	**-0.698**	(0)	-0.121	(0.45)
ed_tert	0.250	(0.12)	**1.441**	(0)	-0.175	(0.25)	**0.563**	(0.05)	**0.777**	(0.05)
hs_badh	**-0.438**	(0.01)	**-1.189**	(0)	-0.214	(0.68)	**-1.357**	(0)	-0.407	(0.12)
we_yopw	**-0.200**	(0)	**-0.243**	(0)					-0.014	(0.59)
we_yosq	**0.506**	(0)	**0.605**	(0)					-0.002	(0.99)
oc_21	0.344	(0.1)	-0.674	(0.08)					-0.807	(0.06)
oc_30	0.079	(0.56)	-0.275	(0.22)					-0.135	(0.62)
oc_4	0.017	(0.91)	-0.165	(0.51)					-0.109	(0.7)
oc_6	0.224	(0.32)	**1.062**	(0.02)					0.552	(0.11)
oc_7	-0.129	(0.24)	-0.188	(0.33)					0.039	(0.86)
oc_8	-0.053	(0.67)	-0.386	(0.07)					-0.240	(0.31)
oc_9	**-0.559**	(0)	0.121	(0.64)					0.330	(0.2)
oi_a	0.005	(0.53)	0.021	(0.08)	0.012	(0.29)	0.000	(0.99)	0.011	(0.43)
oi_b	0.029	(0.07)	-0.001	(0.98)	-0.003	(0.9)	0.033	(0.42)	-0.022	(0.42)
oi_c	**-0.083**	(0)	-0.014	(0.59)	-0.023	(0.41)	0.025	(0.49)	**0.057**	(0)
oi_d	-0.002	(0.76)	0.015	(0.25)	**-0.023**	(0.04)	-0.017	(0.34)	0.014	(0.35)
oi_e	0.011	(0.45)	0.030	(0.33)	-0.012	(0.57)	0.020	(0.52)	0.031	(0.4)
oi_f	**-0.047**	(0)	**-0.053**	(0.01)	**-0.045**	(0.03)	-0.005	(0.85)	-0.024	(0.32)
oi_g	-0.032	(0.14)	**-0.116**	(0.01)	-0.020	(0.53)	-0.129	(0.17)	-0.092	(0.05)
em_agri	**-0.700**	(0.04)	**-1.383**	(0)	-0.628	(0.09)	-0.849	(0.56)	-0.598	(0.15)
_cons	-0.242	(0.64)	0.591	(0.46)	**-4.141**	(0)	-0.828	(0.25)	1.566	(0.09)
Observations	2,552		2,073		2,109		1,979		791	
MFR2	0.190		0.365		0.377		0.327		0.198	
AMFR2	0.171		0.307		0.347		0.268		0.114	
CPR2	0.811		0.953		0.936		0.969		0.843	
ACPR2	0.183		0.157		0.251		0.090		0.049	
p	0.769		0.944		0.914		0.965		0.835	
n	0.231		0.056		0.086		0.035		0.165	
s(PP, 0.5)	0.738		0.936		0.904		0.964		0.807	
s(PN, 0.5)	0.031		0.008		0.010		0.001		0.028	
s(NN, 0.5)	0.073		0.017		0.032		0.005		0.036	
s(NP, 0.5)	0.158		0.040		0.054		0.030		0.129	
s(PN, 0.5) / p	0.040		0.008		0.011		0.001		0.034	
s(NP, 0.5) / n	0.683		0.706		0.632		0.868		0.782	
s(PP, p)	0.552		0.791		0.735		0.770		0.625	
s(PN, p)	0.217		0.153		0.179		0.195		0.210	
s(NN, p)	0.163		0.043		0.074		0.029		0.126	
s(NP, p)	0.068		0.013		0.012		0.006		0.039	
s(PN, p) / p	0.282		0.162		0.196		0.202		0.251	
s(NP, p) / n	0.295		0.229		0.140		0.174		0.236	

Notes: see notes and abbreviations for table A4.

TABLE A7

Results of probit models P6 to P10 for men

	P6M		P7M		P8M		P9M		P10M	
	Coeff.	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**
ag_year	**0.240**	(0)	**0.173**	(0)	**0.137**	(0.04)	**0.223**	(0)	-0.022	(0.75)
ag_ysqr	**-0.237**	(0)	**-0.191**	(0)	-0.029	(0.74)	**-0.193**	(0.03)	-0.022	(0.83)
ar_dens	-0.061	(0.77)	**0.777**	(0.01)	-0.390	(0.43)	0.260	(0.61)	**1.196**	(0)
ar_thin	0.093	(0.62)	0.204	(0.38)	0.062	(0.89)	-0.223	(0.61)	0.287	(0.32)
ms_mard	0.218	(0.44)	**0.820**	(0.01)	0.042	(0.92)	**1.287**	(0.01)	**1.392**	(0.02)
ms_nmhp	0.019	(0.96)	-0.239	(0.55)	0.456	(0.46)	0.966	(0.12)	1.369	(0.08)
ms_divo	-0.202	(0.62)	0.122	(0.73)	-0.473	(0.41)	0.461	(0.4)	0.067	(0.91)
ms_widw										
ch_p0002	0.175	(0.6)	0.404	(0.47)	-0.261	(0.69)	1.183	(0.16)	-0.632	(0.24)
ch_p0306	-0.135	(0.54)	-0.513	(0.06)	0.113	(0.81)	-0.644	(0.09)	**-1.015**	(0.02)
ch_p0715	-0.042	(0.79)	**-0.528**	(0.02)	-0.090	(0.77)	**-0.968**	(0.01)	-0.599	(0.14)
ch_o0015	0.029	(0.84)	**-0.547**	(0)	-0.407	(0.17)	**-0.746**	(0)	**-0.377**	(0.01)
ed_prnp	-0.127	(0.49)	-0.392	(0.1)	-0.446	(0.22)	-0.361	(0.31)	-0.650	(0.07)
ed_tert	**-0.658**	(0)	0.518	(0.19)	**-1.338**	(0)	-0.527	(0.36)	**0.912**	(0.01)
hs_badh	0.168	(0.77)	-0.856	(0.08)	1.092	(0.09)	-0.927	(0.06)	**-1.704**	(0.02)
we_yopw										
we_yosq										
oc_21										
oc_30										
oc_4										
oc_6										
oc_7										
oc_8										
oc_9										
oi_a	0.008	(0.59)	-0.012	(0.59)	0.003	(0.94)	-0.043	(0.17)	-0.018	(0.57)
oi_b	-0.035	(0.13)	0.032	(0.53)	0.051	(0.25)	0.003	(0.96)	0.073	(0.13)
oi_c	0.009	(0.73)	0.075	(0.14)	-0.020	(0.53)	0.063	(0.42)	0.051	(0.27)
oi_d	-0.021	(0.11)	-0.016	(0.42)	**-0.072**	(0.01)	-0.050	(0.17)	0.023	(0.31)
oi_e	-0.008	(0.77)	0.045	(0.19)	-0.054	(0.46)	0.024	(0.7)	0.035	(0.42)
oi_f	0.000	(1)	0.057	(0.07)	-0.003	(0.95)	0.047	(0.47)	0.061	(0.1)
oi_g	0.023	(0.58)	-0.240	(0.2)	0.433	(0.12)	-0.098	(0.72)	-0.427	(0.05)
em_agri	-0.078	(0.83)			0.596	(0.18)				
_cons	**-4.398**	(0)	0.049	(0.98)	**-8.475**	(0)	-3.606	(0.21)	5.117	(0.05)
Observations	827		697		348		218		254	
MFR2	0.294		0.262		0.649		0.505		0.242	
AMFR2	0.249		0.181		0.555		0.359		0.121	
CPR2	0.830		0.904		0.897		0.878		0.773	
ACPR2	0.286		0.099		0.736		0.676		0.179	
p	0.762		0.894		0.388		0.624		0.724	
n	0.238		0.106		0.612		0.376		0.276	
s(PP, 0.5)	0.693		0.884		0.333		0.555		0.677	
s(PN, 0.5)	0.069		0.010		0.055		0.069		0.046	
s(NN, 0.5)	0.137		0.020		0.565		0.323		0.096	
s(NP, 0.5)	0.100		0.086		0.047		0.053		0.181	
s(PN, 0.5) / p	0.091		0.011		0.142		0.110		0.064	
s(NP, 0.5) / n	0.422		0.808		0.077		0.142		0.654	
s(PP, p)	0.574		0.658		0.338		0.520		0.526	
s(PN, p)	0.188		0.235		0.050		0.104		0.198	
s(NN, p)	0.193		0.093		0.551		0.327		0.223	
s(NP, p)	0.045		0.013		0.062		0.049		0.053	
s(PN, p) / p	0.246		0.263		0.129		0.167		0.273	
s(NP, p) / n	0.190		0.124		0.101		0.130		0.193	

Notes: see notes and abbreviations for table A4.

TABLE A8

LRM wage regressions (dependent variable is hgwln)

	LAW		LBW		LCW		LAM		LBM		LCM	
	Coeff.	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**
ag_year	0.011	(0.24)	0.017	(0.08)	0.019	(0.11)	0.011	(0.1)	**0.016**	(0.02)	**0.020**	(0)
ag_ysqr	-0.006	(0.59)	-0.011	(0.33)	-0.012	(0.39)	-0.009	(0.28)	-0.012	(0.13)	**-0.017**	(0.05)
ar_dens	**0.070**	(0.02)	**0.088**	(0.01)	**0.116**	(0)	**0.123**	(0)	**0.129**	(0)	**0.140**	(0)
ar_thin	0.003	(0.91)	-0.005	(0.86)	-0.002	(0.24)	-0.025	(0.29)	-0.048	(0.07)	**-0.060**	(0.03)
ms_mard	-0.011	(0.78)	0.014	(0.74)	**-0.047**	(0)	**0.076**	(0.01)	**0.087**	(0)	**0.072**	(0.02)
ms_nmhp	-0.057	(0.47)	-0.082	(0.35)	-0.108	(0.81)	-0.035	(0.6)	-0.029	(0.64)	-0.020	(0.78)
ms_divo	-0.049	(0.36)	-0.031	(0.57)	-0.046	(0.74)	-0.021	(0.67)	-0.016	(0.76)	-0.037	(0.51)
ms_widw	-0.081	(0.19)	-0.046	(0.5)	-0.100	(0.36)	-0.141	(0.18)				
ch_p0002	-0.050	(0.69)	-0.001	(0.99)	-0.011	(0.19)	**0.087**	(0.03)	**0.085**	(0.05)	**0.095**	(0.03)
ch_p0306	0.006	(0.86)	-0.003	(0.94)	0.004	(0.63)	-0.011	(0.69)	-0.009	(0.75)	-0.011	(0.73)
ch_p0715	-0.011	(0.53)	-0.018	(0.38)	-0.017	(0.48)	0.013	(0.43)	0.030	(0.12)	0.029	(0.16)
ed_prnp	**-0.076**	(0.02)	**-0.102**	(0)	-0.254	(0.23)	-0.052	(0.1)	**-0.082**	(0.01)	**-0.170**	(0)
ed_tert	**0.202**	(0)	**0.237**	(0)	**0.524**	(0)	**0.187**	(0)	**0.237**	(0)	**0.451**	(0)
hs_badh	-0.022	(0.66)	-0.028	(0.6)	-0.096	(0.47)	-0.044	(0.46)	-0.036	(0.53)	-0.066	(0.26)
we_yopw	**-0.019**	(0.02)	**-0.027**	(0)			0.002	(0.82)	-0.004	(0.64)		
we_yosq	0.112	(0.06)	**0.154**	(0.01)			-0.044	(0.36)	-0.030	(0.53)		
em_locs	**-0.125**	(0)					**-0.069**	(0.01)				
em_locl	**0.053**	(0.02)					**0.138**	(0)				
em_perj	**0.161**	(0)					**0.087**	(0.02)				
em_mana	**0.201**	(0)					**0.216**	(0)				
oc_21	**0.440**	(0)	**0.481**	(0)			**0.308**	(0)	**0.341**	(0)		
oc_30	**0.255**	(0)	**0.311**	(0)			**0.138**	(0)	**0.180**	(0)		
oc_4	**0.233**	(0)	**0.277**	(0)			**0.085**	(0.04)	**0.115**	(0)		
oc_6	-0.264	(0.09)	-0.225	(0.2)			-0.078	(0.25)	**-0.135**	(0.02)		
oc_7	**-0.171**	(0)	**-0.169**	(0)			0.028	(0.41)	-0.027	(0.38)		
oc_8	0.026	(0.68)	0.022	(0.64)			0.021	(0.58)	0.035	(0.36)		
oc_9	-0.053	(0.32)	-0.016	(0.71)			**-0.124**	(0.01)	**-0.150**	(0)		
in_a	0.088	(0.09)					0.017	(0.74)				
in_f	-0.012	(0.84)					-0.005	(0.88)				
in_gi	0.068	(0.18)					-0.028	(0.37)				
in_h	**0.157**	(0.02)					**0.178**	(0)				
in_jk	**0.208**	(0)					**0.142**	(0)				
in_lmn	0.080	(0.11)					-0.031	(0.44)				
in_opq	0.052	(0.21)					**0.115**	(0)				
in_rstu	**0.112**	(0.04)					-0.074	(0.22)				
_cons	**2.672**	(0)	**2.691**	(0)	**2.761**	(0)	**2.890**	(0)	**2.914**	(0)	**2.879**	(0)
Observations	1,527		1,527		1,527		1,917		1,917		1,917	
F	43.6		46.1		42.4		34.5		42.4		54.4	
R2	0.550		0.492		0.361		0.442		0.361		0.310	
Root MSE	0.317		0.335		0.375		0.333		0.355		0.368	

Notes: specifications are explained in section 5.2. Coefficients significant at the 5% level are marked as bold.

Abbreviations: coeff. – coefficient, sig. l. – significance level.

TABLE A9

Quantile regressions (dependent variable is hgwln)

	Women					Men				
	LAW'	**p10**	**p40**	**p60**	**p90**	**LAM'**	**p10**	**p40**	**p60**	**p90**
ag_year	**0.015**	*0.028*	0.007	0.009	**0.034**	0.008	0.008	*0.010*	0.005	-0.006
ag_ysqr	-0.010	*-0.030*	-0.001	-0.004	**-0.033**	-0.004	-0.007	-0.007	-0.001	0.012
ar_dens	**0.074**	**0.121**	**0.058**	**0.062**	0.055	**0.144**	*0.080*	**0.133**	**0.174**	**0.136**
ar_thin	-0.015	*0.055*	-0.036	-0.022	-0.035	-0.014	-0.026	-0.022	-0.008	0.001
ms_mard	*-0.055*	-0.024	-0.039	-0.054	**-0.155**	**0.057**	0.062	0.007	0.045	**0.104**
ms_nmhp	*-0.147*	-0.181	-0.203	-0.074	**-0.244**	-0.072	-0.051	-0.085	**-0.146**	-0.015
ms_divo	**-0.086**	-0.080	-0.044	-0.046	**-0.220**	-0.038	0.061	-0.081	-0.048	-0.113
ms_widw	-0.048	-0.075	-0.040	0.012	-0.072	*-0.181*	-0.211	-0.134	*-0.213*	**-0.266**
ch_p0002	-0.094	-0.149	-0.033	-0.050	-0.043	0.051	-0.068	0.044	0.080	**0.164**
ch_p0306	0.022	0.011	0.029	0.033	0.029	0.000	-0.033	0.002	0.011	-0.030
ch_p0715	-0.004	-0.023	-0.006	-0.006	0.004	0.018	0.004	0.024	0.017	0.003
ed_prnp	**-0.062**	-0.046	-0.053	**-0.091**	-0.080	-0.047	0.051	-0.017	-0.057	*-0.107*
ed_tert	**0.173**	**0.122**	**0.173**	**0.177**	**0.229**	**0.217**	**0.179**	**0.218**	**0.198**	**0.265**
hs_badh	-0.017	-0.018	0.033	0.009	-0.010	-0.073	-0.148	-0.100	-0.060	0.124
we_yopw	**-0.017**	-0.005	-0.013	**-0.018**	-0.021	-0.001	-0.008	-0.002	-0.007	0.010
we_yosq	0.087	0.062	0.056	0.068	0.093	-0.026	0.030	-0.045	0.014	-0.107
em_locs	**-0.104**	**-0.135**	**-0.098**	**-0.069**	**-0.074**	**-0.089**	**-0.131**	**-0.094**	-0.031	-0.024
em_locl	**0.046**	**0.087**	**0.036**	*0.042*	0.047	**0.117**	**0.078**	**0.122**	**0.137**	**0.132**
em_perj	**0.090**	**0.112**	**0.104**	**0.080**	0.055	**0.099**	**0.172**	**0.161**	**0.097**	0.048
em_mana	**0.197**	**0.172**	**0.164**	**0.183**	**0.308**	**0.199**	**0.201**	**0.220**	**0.212**	**0.216**
oc_21	**0.437**	**0.430**	**0.426**	**0.442**	**0.406**	**0.294**	**0.262**	**0.253**	**0.258**	**0.329**
oc_30	**0.252**	**0.163**	**0.245**	**0.291**	**0.295**	**0.134**	**0.156**	**0.108**	**0.122**	**0.194**
oc_4	**0.235**	**0.185**	**0.222**	**0.241**	**0.248**	0.036	0.037	0.042	0.013	0.010
oc_6	-0.135	-0.330	-0.073	-0.005	0.070	-0.058	-0.101	-0.048	-0.041	*-0.173*
oc_7	**-0.141**	-0.084	**-0.155**	**-0.138**	**-0.149**	0.041	0.048	**0.035**	0.031	0.055
oc_8	0.004	-0.006	-0.043	-0.013	0.034	0.019	0.011	-0.005	-0.012	0.075
oc_9	**-0.077**	-0.091	**-0.095**	-0.039	**-0.133**	**-0.105**	-0.088	-0.100	-0.072	**-0.165**
in_a	0.087	0.107	0.175	0.080	-0.059	0.024	0.064	*0.087*	0.017	0.016
in_f	0.013	**0.232**	0.013	-0.104	**-0.176**	0.004	0.002	0.048	-0.006	-0.014
in_gi	**0.067**	**0.125**	0.063	0.066	0.031	-0.029	0.011	-0.009	*-0.063*	-0.058
in_h	**0.171**	**0.224**	0.231	**0.217**	0.134	**0.176**	**0.158**	**0.203**	**0.171**	**0.215**
in_jk	**0.199**	**0.259**	**0.196**	**0.191**	**0.202**	**0.195**	**0.262**	**0.212**	**0.217**	0.102
in_lmn	*0.081*	**0.179**	0.037	*0.116*	0.135	-0.027	0.058	-0.014	-0.067	-0.018
in_opq	**0.090**	**0.204**	**0.141**	**0.075**	0.051	**0.142**	**0.226**	**0.190**	**0.161**	0.070
in_rstu	**0.121**	**0.260**	**0.146**	0.081	0.044	-0.054	0.048	0.030	*-0.128*	-0.022
_cons	**2.683**	**2.015**	**2.755**	**2.866**	**2.742**	**2.943**	**2.521**	**2.782**	**3.054**	**3.601**

Notes: specifications are explained in section 5.3. Coefficients significant at the 5% (10%) level are marked bold (italic).

Abbreviation: coeff. – coefficient; LAW' and LAM' – LRM estimates based on LAW and LAM, without using the sampling weights; p10, p40, p60 and p90 – estimates at the 10th, 40th, 60th and 90th percentile.

TABLE A10

Heckman selection model – H1 and H2 (dependent variable is hgwln)

	H1W		H1M		H2W		H2M	
Wage equation	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**
ag_year	0.010	(0.35)	0.013	(0.07)	**0.022**	(0.03)	**0.015**	(0.03)
ag_ysqr	-0.004	(0.75)	-0.009	(0.29)	-0.019	(0.11)	-0.010	(0.23)
ar_dens	**0.084**	(0.01)	**0.141**	(0)	**0.090**	(0.01)	**0.129**	(0)
ar_thin	0.011	(0.72)	-0.037	(0.16)	-0.012	(0.68)	-0.048	(0.07)
ms_mard	0.000	(0.99)	**0.069**	(0.02)	0.021	(0.63)	**0.083**	(0)
ms_nmhp	-0.078	(0.37)	-0.027	(0.67)	-0.141	(0.14)	-0.018	(0.78)
ms_divo	-0.029	(0.59)	-0.010	(0.85)	-0.007	(0.9)	-0.015	(0.76)
ms_widw	-0.082	(0.22)			-0.028	(0.67)		
ch_p0002	0.027	(0.83)	0.080	(0.07)	-0.040	(0.74)	**0.084**	(0.05)
ch_p0306	0.016	(0.69)	-0.011	(0.7)	-0.042	(0.3)	-0.007	(0.8)
ch_p0715	-0.014	(0.52)	0.028	(0.15)	-0.029	(0.16)	0.029	(0.12)
ed_prnp	**-0.089**	(0.01)	**-0.076**	(0.02)	**-0.124**	(0)	**-0.079**	(0.01)
ed_tert	**0.250**	(0)	**0.226**	(0)	**0.254**	(0)	**0.230**	(0)
hs_badh	-0.008	(0.88)	-0.004	(0.95)	-0.102	(0.07)	-0.009	(0.88)
we_yopw	-0.018	(0.06)	0.008	(0.37)	**-0.038**	(0)	0.000	(0.97)
we_yosq	**0.144**	(0.02)	-0.057	(0.28)	**0.108**	(0.04)	-0.036	(0.47)
oc_21	**0.437**	(0)	**0.329**	(0)	**0.490**	(0)	**0.345**	(0)
oc_30	**0.298**	(0)	**0.176**	(0)	**0.312**	(0)	**0.182**	(0)
oc_4	**0.259**	(0)	**0.115**	(0)	**0.281**	(0)	**0.116**	(0)
oc_6	-0.245	(0.17)	**-0.141**	(0.01)	-0.285	(0.09)	**-0.142**	(0.01)
oc_7	**-0.164**	(0)	-0.018	(0.57)	**-0.205**	(0)	-0.026	(0.39)
oc_8	0.017	(0.71)	0.040	(0.29)	0.012	(0.81)	0.039	(0.3)
oc_9	-0.021	(0.64)	**-0.113**	(0.02)	-0.003	(0.96)	**-0.152**	(0)
_cons	**2.883**	(0)	**3.044**	(0)	**2.595**	(0)	**2.946**	(0)
Participation eq.	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**
ag_year	**0.120**	(0)	**0.060**	(0.01)	0.092	(0.09)	**0.146**	(0)
ag_ysqr	**-0.132**	(0)	**-0.057**	(0.04)	**-0.150**	(0.02)	**-0.204**	(0)
ar_dens	0.140	(0.25)	**-0.234**	(0.03)	0.165	(0.31)	0.102	(0.61)
ar_thin	**-0.257**	(0.01)	-0.173	(0.06)	-0.110	(0.4)	0.051	(0.74)
ms_mard	0.208	(0.18)	**0.360**	(0)	0.260	(0.3)	**0.370**	(0.04)
ms_nmhp	-0.134	(0.63)	-0.013	(0.96)	**-0.994**	(0.04)	-0.700	(0.05)
ms_divo	0.043	(0.84)	-0.160	(0.41)	**0.688**	(0.04)	0.251	(0.46)
ms_widw	**1.064**	(0)			0.411	(0.22)		
ch_p0002	-0.217	(0.42)	**0.379**	(0.02)	-0.059	(0.88)	0.601	(0.13)
ch_p0306	-0.234	(0.05)	0.143	(0.19)	**-0.776**	(0)	-0.020	(0.93)
ch_p0715	0.059	(0.42)	**0.174**	(0.02)	**-0.187**	(0.02)	0.236	(0.09)
ch_o0015	0.133	(0.21)	0.135	(0.17)	0.055	(0.68)	0.183	(0.21)
ed_prnp	-0.225	(0.09)	-0.068	(0.54)	**-0.334**	(0.03)	-0.233	(0.12)
ed_tert	**-0.420**	(0.01)	0.233	(0.15)	**0.939**	(0)	**1.456**	(0)
hs_badh	**-0.451**	(0.01)	**-0.428**	(0.02)	**-0.946**	(0)	**-1.181**	(0)
we_yopw	**-0.163**	(0)	**-0.195**	(0)	**-0.214**	(0)	**-0.237**	(0)
we_yosq	**0.359**	(0.01)	**0.485**	(0)	**0.429**	(0)	**0.581**	(0)
oc_21	**0.941**	(0)	0.329	(0.11)	0.521	(0.09)	-0.658	(0.1)
oc_30	0.198	(0.23)	0.081	(0.55)	0.047	(0.84)	-0.237	(0.29)
oc_4	**0.268**	(0.04)	0.012	(0.94)	0.069	(0.65)	-0.156	(0.53)
oc_6	0.277	(0.48)	0.208	(0.34)	-0.575	(0.16)	**1.028**	(0.02)
oc_7	0.006	(0.97)	-0.117	(0.28)	**-0.498**	(0)	-0.149	(0.45)

	H1W		H1M		H2W		H2M	
Participation eq.	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**
oc_8	0.085	(0.61)	-0.024	(0.85)	-0.146	(0.4)	-0.335	(0.13)
oc_9	0.034	(0.81)	**-0.551**	(0)	0.149	(0.48)	0.172	(0.51)
oi_a	0.004	(0.67)	0.005	(0.51)	-0.014	(0.28)	0.021	(0.06)
oi_b	0.024	(0.21)	**0.033**	(0.03)	-0.036	(0.13)	0.002	(0.93)
oi_c	-0.023	(0.14)	**-0.078**	(0)	-0.010	(0.66)	-0.011	(0.66)
oi_d	-0.005	(0.57)	-0.006	(0.44)	0.018	(0.09)	0.014	(0.27)
oi_e	-0.008	(0.66)	0.010	(0.5)	0.018	(0.41)	0.031	(0.32)
oi_f	**-0.073**	(0)	**-0.058**	(0)	**-0.045**	(0.01)	**-0.062**	(0.01)
oi_g	0.026	(0.25)	-0.032	(0.12)	-0.001	(0.98)	**-0.110**	(0.01)
em_agri	-0.355	(0.22)	**-0.715**	(0.03)	0.424	(0.23)	**-1.398**	(0)
_cons	**-1.850**	(0.01)	-0.207	(0.68)	0.655	(0.52)	0.502	(0.53)
/lnsigma	**-1.075**	(0)	**-1.017**	(0)	**-1.059**	(0)	**-1.039**	(0)
/athrho	**-0.415**	(0.03)	**-0.393**	(0.01)	**0.799**	(0)	-0.242	(0.15)
sigma	**0.341**	(0)	**0.362**		**0.347**		**0.354**	
rho	**-0.393**		**-0.374**		**0.664**		-0.237	
lambda	**-0.134**		**-0.135**		**0.230**		-0.084	
Total obs.	2,034		2,552		1,880		2,073	
"Negative" obs.	507		635		353		156	

Notes: see notes for table A11.

TABLE A11

Heckman selection model – H3 and H4 (dependent variable is hgwln)

	H3W		H3M		H4W		H4M	
Wage eq.	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**
ag_year	-0.004	(0.73)	0.008	(0.33)	0.007	(0.54)	0.014	(0.07)
ag_ysqr	0.014	(0.32)	-0.004	(0.7)	0.004	(0.75)	-0.009	(0.28)
ar_dens	**0.121**	(0)	**0.149**	(0)	**0.119**	(0)	**0.135**	(0)
ar_thin	0.017	(0.6)	**-0.055**	(0.04)	0.027	(0.39)	**-0.061**	(0.03)
ms_mard	-0.059	(0.21)	0.058	(0.06)	-0.045	(0.34)	0.057	(0.07)
ms_nmhp	-0.093	(0.35)	-0.034	(0.62)	-0.065	(0.52)	-0.023	(0.74)
ms_divo	-0.044	(0.49)	-0.035	(0.55)	-0.061	(0.34)	-0.029	(0.62)
ms_widw	-0.109	(0.12)			-0.122	(0.08)		
ch_p0002	-0.030	(0.85)	0.081	(0.08)	-0.001	(1)	**0.089**	(0.05)
ch_p0306	0.002	(0.97)	-0.012	(0.71)	0.022	(0.57)	-0.007	(0.83)
ch_p0715	-0.009	(0.7)	0.032	(0.13)	-0.006	(0.8)	0.033	(0.11)
ed_prnp	**-0.220**	(0)	**-0.157**	(0)	**-0.116**	(0)	**-0.152**	(0)
ed_tert	**0.524**	(0)	**0.453**	(0)	**0.500**	(0)	**0.444**	(0)
hs_badh	-0.074	(0.21)	-0.063	(0.28)	-0.055	(0.36)	-0.015	(0.81)
_cons	**3.281**	(0)	**3.180**	(0)	**2.995**	(0)	**3.044**	(0)
Participation eq.	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**	**Coeff.**	**Sig. l.**
ag_year	**0.347**	(0)	**0.269**	(0)	**0.192**	(0)	**0.172**	(0)
ag_ysqr	**-0.374**	(0)	**-0.270**	(0)	**-0.245**	(0)	**-0.183**	(0)
ar_dens	-0.062	(0.75)	**-0.381**	(0.03)	-0.031	(0.84)	0.368	(0.12)
ar_thin	**-0.428**	(0.01)	-0.148	(0.33)	**-0.496**	(0)	0.094	(0.6)
ms_mard	0.357	(0.1)	**0.541**	(0.02)	-0.251	(0.21)	**1.017**	(0)
ms_nmhp	-0.091	(0.83)	0.249	(0.38)	**-0.797**	(0.01)	-0.127	(0.64)
ms_divo	-0.070	(0.83)	-0.223	(0.58)	0.486	(0.16)	0.012	(0.98)
ms_widw	0.565	(0.25)			0.350	(0.24)		
ch_p0002	0.613	(0.28)	**0.589**	(0.04)	0.012	(0.97)	0.410	(0.3)
ch_p0306	-0.123	(0.51)	-0.088	(0.57)	-0.169	(0.23)	**-0.433**	(0.03)
ch_p0715	-0.097	(0.4)	0.046	(0.71)	-0.037	(0.66)	-0.284	(0.07)
ch_o0015	0.178	(0.14)	0.120	(0.32)	0.030	(0.76)	**-0.289**	(0.03)
ed_prnp	**-0.977**	(0)	**-0.515**	(0)	**-1.367**	(0)	**-0.670**	(0)
ed_tert	**-0.472**	(0)	-0.235	(0.12)	**0.601**	(0.01)	0.482	(0.1)
hs_badh	**-0.664**	(0.01)	-0.282	(0.55)	**-0.520**	(0)	**-1.291**	(0)
oi_a	0.003	(0.81)	0.016	(0.16)	0.009	(0.4)	0.007	(0.74)
oi_b	0.051	(0.06)	0.007	(0.71)	**0.055**	(0.04)	0.055	(0.2)
oi_c	0.001	(0.97)	-0.015	(0.61)	-0.034	(0.07)	0.033	(0.28)
oi_d	0.010	(0.41)	**-0.028**	(0.01)	-0.002	(0.83)	-0.022	(0.2)
oi_e	0.022	(0.41)	-0.007	(0.75)	0.008	(0.65)	0.031	(0.34)
oi_f	**-0.077**	(0)	**-0.056**	(0.01)	**-0.061**	(0)	-0.020	(0.48)
oi_g	0.015	(0.63)	-0.011	(0.69)	-0.036	(0.11)	-0.070	(0.22)
em_agri	-0.222	(0.53)	**-0.748**	(0.04)	**-0.756**	(0)		
_cons	**-5.533**	(0)	**-4.025**	(0)	-1.179	(0.19)	-1.251	(0.3)
/lnsigma	**-0.952**	(0)	**-0.988**	(0)	**-0.947**	(0)	**-0.990**	(0)
/athrho	**-0.816**	(0)	**-0.506**	(0)	**-0.718**	(0)	**-0.658**	(0)
sigma	**0.386**		**0.372**		**0.388**		**0.372**	
rho	**-0.673**		**-0.467**		**-0.616**		**-0.577**	
lambda	**-0.260**		**-0.174**		**-0.239**		**-0.214**	
Total obs.	1,699		2,109		1,883		1,979	
"Negative" obs.	172		192		356		62	

Notes: specifications are explained in section 5.4 (table 10). Coefficients significant at the 5% level are marked as bold.

Abbreviations: coeff. – coefficient, sig. l. – significance level.

APPENDIX 3: OTHER FIGURES

FIGURE A1

Formation of subsamples

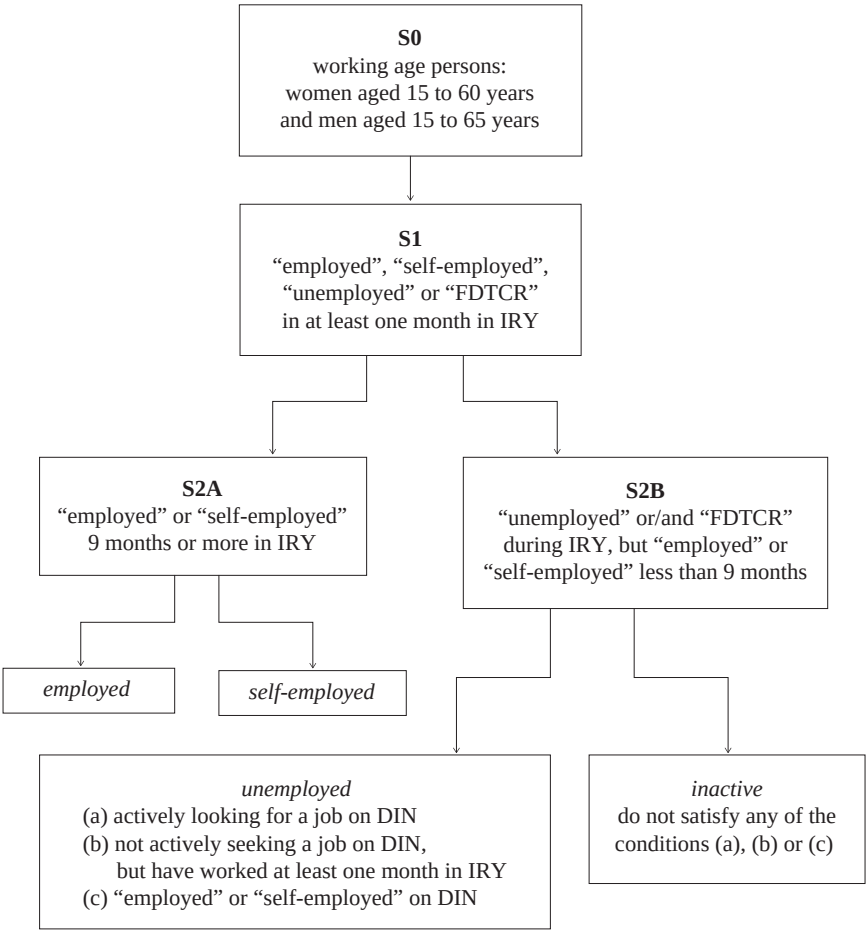
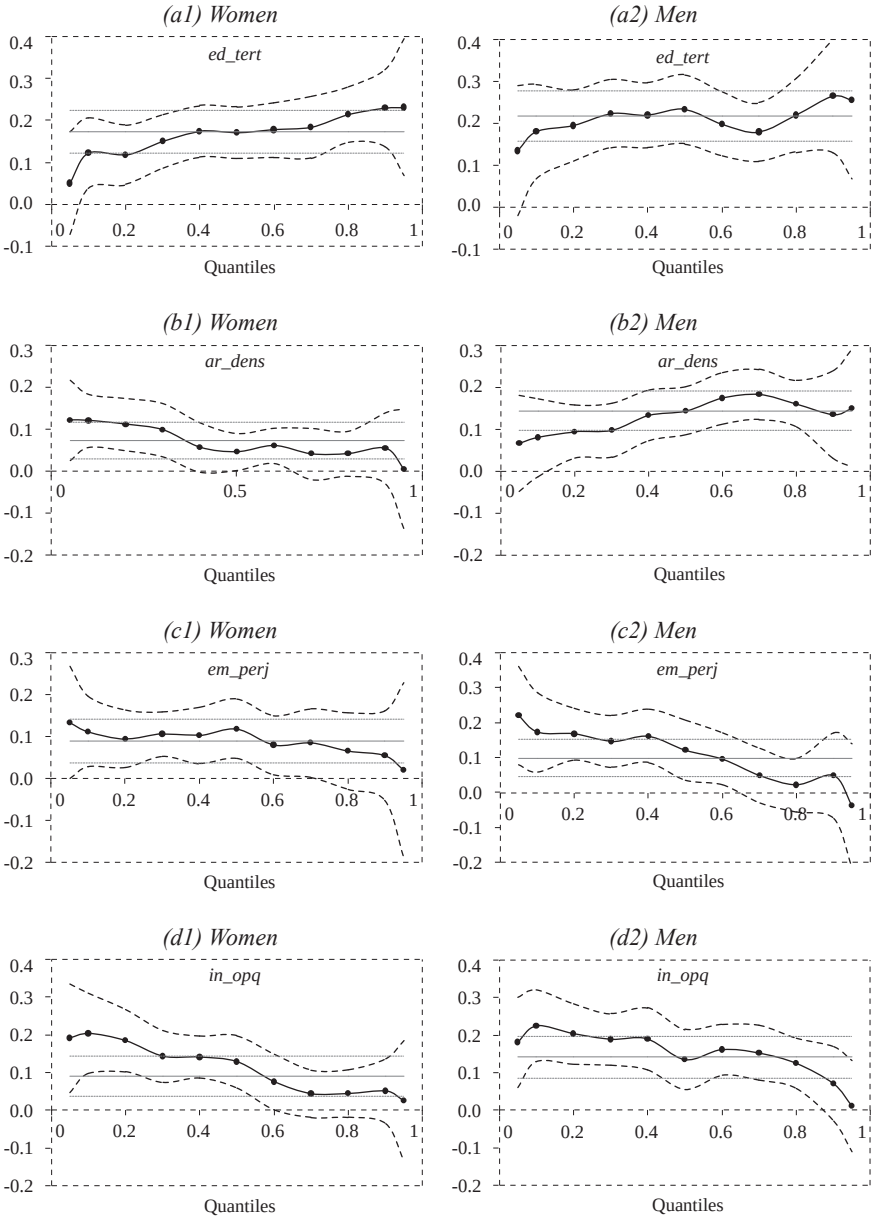


FIGURE A2

Coefficients from QRM and LRM regressions, with confidence intervals



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The structure and economic significance of government guarantees in Croatia and the European Union

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Article**
JEL: H63
doi: 10.3326/fintp.40.1.2

* The views expressed in this paper are exclusively those of the authors and should not be attributed to the institutions with which they are affiliated. The authors would like to thank two anonymous referees for their useful comments and suggestions. This paper is based on the master's thesis written by Ivan Župančić under the supervision of Marko Primorac.
** Received: September 16, 2015
Accepted: November 26, 2015

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FINANCIAL THEORY AND PRACTICE
40 (1) 63-83 (2016)

Abstract

In the aftermath of the financial crisis, when countries are facing difficulties in raising the amounts of revenue needed to cover the expenditure side of the budget, fiscal risks can pose a significant threat to the sustainability of public finance. This became particularly evident in the case of public enterprises and their liabilities, which often increased public debt because of difficulties in meeting their financial obligations. The aim of this paper is to evaluate fiscal risks from government guarantees in Croatia and the European Union in general. Moreover, the paper aims to analyse the dynamics of the value and structure of government guarantees in Croatia in the period from 2009 to first half of 2015. Particular emphasis is placed on the impact of government guarantees on direct public debt in the context of methodological changes in the registration of public debt.

Keywords: fiscal risks, contingent liabilities, government guarantees, public debt, Croatia

1 INTRODUCTION

Sound government finance has always been a prerequisite for competitiveness, economic development and the well-being of the population. The global financial crisis has made this imperative even more important. Public financial management has as almost never before been under the continuous surveillance of rating agencies, creditors, and other relevant institutions. This applies to all levels of government and often becomes an issue of supranational supervision as in the European Union (EU). In order to facilitate and maintain the stability of the Union, member states have signed the stability and growth pact, which implies fiscal monitoring of member states and ensures their compliance with the Maastricht criteria. This is particularly important for new EU members with weaker capacities for public financial management. In addition, those economies are mostly still undergoing the transition process, which makes their public finances even more vulnerable to the unrestrained rise in government liabilities. Besides explicit liabilities, those countries often face a sizable fiscal risk emerging from contingent government liabilities and other sources of risk.

This paper aims to analyse the importance of government guarantees in the EU, with particular reference to the Republic of Croatia. State guarantees – an important type of budgetary contingencies – tend to be partly ignored in the context of fiscal analysis. With such an approach, the assessment of the financial health of the state can result in an inaccurate impression of the real fiscal position of a country. This paper strives to highlight the importance of the appropriate treatment of government guarantees. Comparing the data for various EU countries, the paper will examine whether the stock of government guarantees in EU countries exceeds the level of their explicit direct liabilities. Moreover, the comparative analysis will show whether government guarantees in Croatia are higher than the EU average. Finally, the main part of the paper will examine the structure of government guarantees in Croatia largely building upon the previous work of Bajo and

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Primorac (2011) on the size and structure of government guarantees in Croatia. Bajo and Primorac (2011) in their analyses covered the period from 1996 to 2010, whereas this paper covers the remaining period until first half of 2015, capturing the effect of the accession to the EU. This is important not only due to changes that have occurred in the size and structure of guarantees, but also in the statistical treatment (changes in the methodology of national accounts) of government guarantees in Croatia (which has gradually aligned with the EU standards).

The paper is divided into six chapters. After the introduction, we provide a theoretical background to the issue and management of guarantees and contextualize the topic in the light of the recent trends in public financial and risk management. The third chapter is devoted to government guarantees in the EU. The fourth chapter analyses the size and structure of government guarantees in Croatia, and the fifth chapter aims at discussing the fiscal implications of government guarantees, capturing their impact on public debt. The last, sixth, part is the conclusion.

2 THEORETICAL BACKGROUND AND POLICY CONTEXT

Fiscal risks can be broadly defined as the possibility of deviations of fiscal outcomes from what was expected at the time of preparation of the budget or other forecasts (Cebotari et al., 2009). Fiscal risks come from many sources and in many forms, which makes it difficult for governments to identify and categorize them for the purposes of analysis and disclosure. However, most can be grouped into macroeconomic and specific risks (IMF, 2014). Macroeconomic risks include unforeseen developments in real GDP growth and inflation, commodity prices, exchange rates and interest rates, external assistance flows, and so on. Specific risks relate to budgetary contingencies, asset and liability management, government guarantees, public private partnerships, financial sector exposure, as well as natural resource and environmental risks.

In the second half of 2014 the International Monetary Fund (IMF) presented its new Fiscal Transparency Code (FTC) – an international standard for disclosure of information about public finances. The Code comprises a set of principles built around four pillars: (1) fiscal reporting; (2) fiscal forecasting and budgeting; (3) fiscal risk analysis and management; and (4) resource revenue management. The fiscal risks pillar (with its 12 principles) should ensure that risks to public finances are disclosed, analysed and managed, and fiscal decision-making across the public sector effectively coordinated. As a part of its initiative, the IMF's Fiscal Affairs Department developed a comprehensive framework for evaluating fiscal risk management practices and conducted pilot fiscal transparency evaluations in several countries (e.g. Costa Rica, Ireland, Russia and Bolivia).

Fiscal risk management is relatively underdeveloped in Europe and not well reflected in EU fiscal requirements. In fact, fiscal risks in EU countries have been ignored until quite recently. At the beginning of 2015, Eurostat for the first time released information about contingent liabilities and non-performing loans of EU

member states (Eurostat, 2015). The data were collected as part of the Enhanced Economic Governance Package (the "six-pack", Council Directive 2011/85/EU). In this classification, contingent liabilities include guarantees, liabilities related to public-private partnerships recorded off-balance sheet, and liabilities of companies that are controlled by the state, but classified outside the general government (public corporations). However, the detailed structure of those liabilities, as well as the probability of their occurrence remains unknown.

Government guarantees are part of contingent but *explicit* government liabilities, by which the guarantor (the government) undertakes to a lender that if a borrower defaults, the guarantor will make good the loss the lender would otherwise suffer (Bajo and Primorac, 2015). In case the guarantees are called (e.g. due to the occurrence of an "insured" event) the government takes on full responsibility for liabilities covered by the guarantee. International public sector accounting standards define a contingent liability as: (1) a possible obligation that arises from past events and whose existence will be confirmed only by the occurrence or non-occurrence of one or more uncertain future events not wholly within the control of the entity; or (2) a present obligation that arises from past events but is not recognized because: (a) it is not probable that an outflow of resources embodying economic benefits or service potential will be required to settle the obligation; or (b) the amount of the obligation cannot be measured with sufficient reliability (International Federation of Accountants, 2013: International Public Sector Accounting Standard 19). The most frequent examples of government guarantees include those for liabilities incurred by lower levels of government and public enterprises, development banks and guarantee agencies, public-private partnership projects and other forms of cooperation between the government and the private sector (Bajo and Primorac, 2011).

Although government guarantees might be convenient in terms of reaching the desired outcome (supporting beneficiaries) without incurring expenditure, this is at the same time the most dangerous disadvantage of guarantees. Potential obligations from government guarantees are not budgeted and accounted for, nor are they considered in conventional fiscal analysis (Polackova, 1999). They can be used as a means to bypass the government's fiscal constraints on central and local government borrowing, which is why they can produce a hidden and adverse effect on fiscal policy (Bajo and Primorac, 2011). Guarantees can often have potentially significant fiscal consequences. This is clearly the case where countries have issued guarantees extensively, as happened in many countries in transition that sought to shift the costs of structural reforms to the future through guarantees (Ter-Minassian, 2005).

Managing fiscal risk at the national level is particularly important in the European Union as a way of maintaining fiscal and general economic stability. However, very few member states have the institutional frameworks and capacities to effectively control and manage contingent liabilities (Polackova and Brixi, 2004). For instance, fiscal costs can be significant in federal countries where there is an assumption that the central government will bail out sub-national governments that get into financial difficulties, as well as in transition countries where governments are generally ex-

pected to stand behind privatised firms and financial institutions once they get exposed to competition (Ter-Minassian, 2005). In the EU context, new member states have been perhaps most prone to the accumulation of contingent liabilities and related fiscal risk (Polackova and Brixi, 2004). A further concern is that the fiscal costs of guarantees and other contingent liabilities are often exposed precisely during crises (Ter-Minassian, 2005). One way to reduce the risk of such surprises and improve the measurement and budgeting of guarantees is to promote transparency about fiscal risks and their potential costs (Thobani, 1999; Ter-Minassian, 2005).

3 GOVERNMENT GUARANTEES IN THE EU

According to the EU law, contingent liabilities are not included in the scope of the general government debt.[1] The value and structure of government guarantees for most EU countries have been publicly available for some time. However, data on other contingent liabilities of EU member states were first made publicly available in January 2015. This was the outcome of a process that started in November 2011, when the European Parliament and the Council adopted an Enhanced Economic Governance package – the so-called "six pack", which required collection and publication of relevant information on contingent liabilities of all general government sub-sectors with a potentially large impact on the state budget, including guarantees, non-performing loans and liabilities of public enterprises. The new questionnaire ("Supplement on contingent liabilities and potential obligations to the excessive deficit procedure related questionnaire") was added to an existing group of questionnaires on the excessive deficit procedure. Thus, national statistical offices submit data from the new questionnaire annually (by December 31) for the previous year, including data on standardised and one-off guarantees, off-balance sheet public-private partnerships and non-performing loans (Eurostat, 2014).

Standardised guarantees are typically issued in large numbers, each usually backing a small loan (e.g. export credits and guarantees for student loans). They are issued for the benefit of financial institutions granting loans under specific lending programmes approved by national authorities. *One-off guarantees* are awarded on a case-by-case basis, usually for individual high-value contracts (e.g. big infrastructure projects, guarantees for loans of public enterprises). These guarantees are typically subject to close monitoring, because they could potentially provide unfair competitive advantage to the particular firms whose loans are guaranteed. Therefore, the issuance of such guarantees is monitored by EU competition authorities or even the WTO.

Data on guarantees in the EU do not include those issued under the Framework Agreement of the European Financial Stability Facility[2], derivative-type guaran-

[1] See Council Regulation (EC) No 479/2009 on the application of the Protocol on the excessive deficit procedure annexed to the Treaty establishing the European Community.

[2] The European Financial Stability Facility (EFSF) is a company agreed to by the countries that share the euro in 2010 and incorporated in Luxembourg. The EFSF's objective is to preserve financial stability of Europe's monetary union by providing temporary financial assistance to euro area member states if needed. The assistance is financed by the EFSF through the issuance of bonds and other debt instruments backed by guarantees given by the euro area member states in accordance with their share in the paid-up capital of the European Central Bank (for more information see: http://www.efsf.europa.eu/about/index.htm).

tees (e.g. credit default swaps)[3], deposit insurance guarantees and comparable schemes and government guarantees issued for natural disasters (earthquakes, large scale flooding), the occurrence of which is very difficult to cover via commercial insurance (Eurostat, 2015).

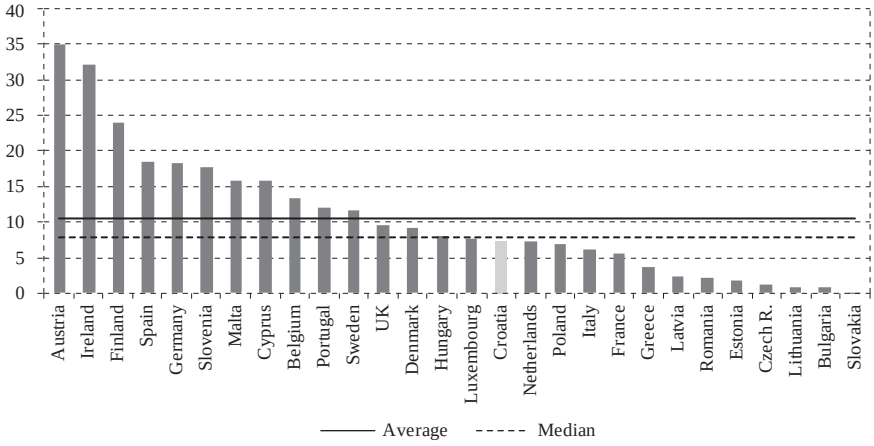
The global financial crisis has had a significant effect on the accumulation of government guarantees in EU countries. Since the consequences of the crisis were most severe in the financial sector, governments have often called for state intervention in order to safeguard the collapsing financial systems. Therefore, a significant amount of government guarantees arose in the past due to securities issued under liquidity schemes (e.g. in Greece and the United Kingdom). Some member states even created special purpose vehicles to tackle the emerging problems faced by the financial sector. In Denmark – a state guarantee was issued to cover losses in Roskilde Bank, in Ireland – a special purpose vehicle related to the National Asset Management Agency (NAMA), in Spain – Sociedad de Gestión de Activos procedentes de la Reestructuración Bancaria (SAREB), in France – Societé de Financement de l'Economie Française (SFEF), and in Austria – guarantees were issued for the activities of Clearingbank (Eurostat, 2014b). However, countries have also issued guarantees to support other sectors and causes. For example, Finland has used government guarantees to promote its exports (particularly to United States and Germany), as well as for domestic operations of SMEs through Finnvera (a state-owned financing company that is the official export credit agency for Finland). Guarantees were also issued for the long-term loans of Finavia – a state-owned corporation responsible for maintaining and developing its 25 airports and Finland's air navigation system. In general, the structure and intensity of issuing guarantees in EU countries depend on national particularities including the strategic objectives, the structure of the economy (dominant economic sectors and those of strategic importance), state ownership and many other factors.

In 2013, guarantees as a share of GDP were highest in Austria (35%), followed by Ireland, Finland, Spain, Germany and Slovenia, whereas the lowest shares were recorded in the new member states from Central and Eastern Europe (Slovakia, Bulgaria, the Baltic States, the Czech Republic, Romania) but also in Greece (figure 1). The Croatian government had issued guarantees amounting to 7.25% of GDP, which is lower than the EU average of 10.5%. However, the average is a biased statistic given the wide dispersion of data: in terms of the median, which is a more accurate measure of the central tendency of data in this sample, Croatia was positioned just slightly below the median observation, which was 7.9%.

[3] Derivative-type guarantees are those that are actively traded on financial markets and fall under the usual treatment of derivatives, which do not require specific provisions for government transactions in the EU markets. The derivative is based on the risk of default and generally not actually linked to an individual loan or bond (Eurostat, 2013).

Figure 1

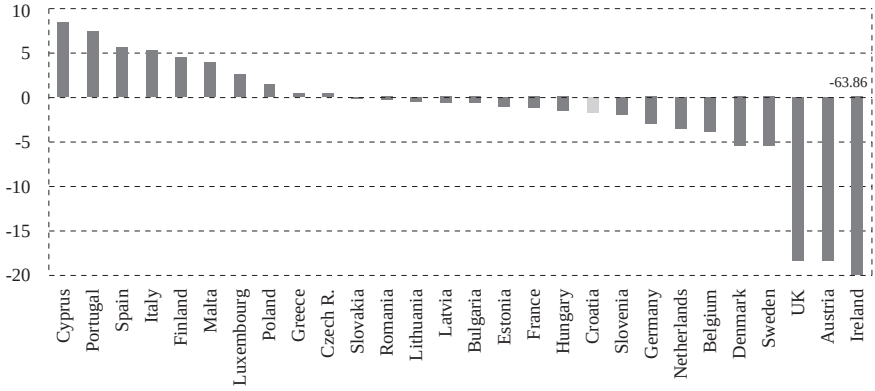
General government guarantees of EU countries in 2013 (% of GDP)



Source: Eurostat.

Figure 2

The increase in the amount of guarantees of EU countries from 2010 to 2013 (% of GDP)



Source: Eurostat.

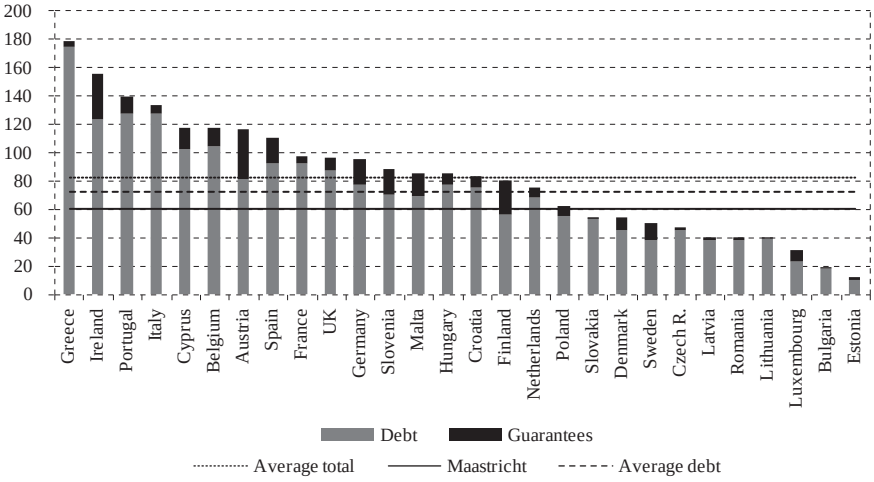
It is quite surprising that the old EU members in general have higher relative amounts of guarantees than the new members. The old members tend to take a leading role in promoting transparency, accountability and implementing good practices in public financial management. Nonetheless, they seem to use off-balance sheet liabilities more frequently than the new members, which are still in different phases of transition and would therefore be expected to rely more heavily on government guarantees. Whether the old EU members really have more experience in utilising the benefits of guarantees or some other factors have determined their particularly high exposure to guarantees remains an open question. One should however note that in several countries guarantees were issued within the framework of broader policies aimed at bailing out financial institutions

affected by the crisis. Moreover, the coverage of guarantees is incomplete in most countries (Eurostat, 2015). In Croatia, for instance, data are not available for standardised guarantees and guarantees of the local government subsector.

In any case, the recent crisis indubitably plays an important role in explaining how the size of government guarantees changed over time. Government guarantees in Cyprus, Portugal, Spain and Italy increased from 2010 to 2013 by more than 5% of GDP mainly due to new issues of guarantees provided to financial institutions. On the other hand, guarantees in the United Kingdom, Austria, and especially Ireland decreased significantly, mostly due to setting aside the rescue measures related to state interventions in the financial system during the crisis. In the United Kingdom, the guarantees issued under the liquidity schemes ceased to exist in 2013. Austrian Clearingbank, which served as an intermediary on the interbank market by borrowing funds (backed up by state guarantees) and lending to credit institutions and insurance undertakings, wound up in 2011. Irish NAMA was set up with the aim of addressing the problem of impaired assets in the banking system. Assets (primarily land and development loans) were transferred from banks to NAMA to strengthen their balance sheets and ensure that uncertainty over bad assets is reduced. In addition, the Eligible Liabilities Guarantee (ELG) scheme was introduced to provide the participating institutions (mainly systemically important and solvent credit institutions incorporated in Ireland) with access to medium-term state-guaranteed funding (with maturities of up to five years). Since the ELG scheme was abolished and the NAMA's task was to bring the balance sheet down to zero as soon as commercially practicable, government guarantees in Ireland decreased from 2010 to 2013 by almost 65% of GDP.

Figure 3

Total general government debt (gross debt plus guarantees) of EU countries in 2013 (% of GDP)



Source: Eurostat.

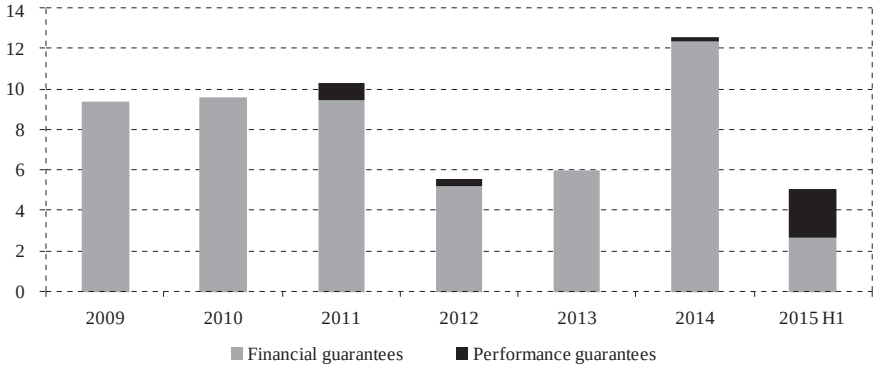
To get a clear perspective on the significance of government guarantees in EU countries, it is also useful to compare the size of government guarantees with the size of public debt. The share of general government debt in GDP in 2013 was lowest in Estonia (10%) and highest in Greece (175%) (figure 3). The debt/GDP ratio in Croatia was 76%, which was above the EU average of 72%. With government guarantees included, the overall picture of relatively high public sector indebtedness does not change much: in addition to Greece, Ireland, Portugal, Italy Cyprus and Belgium, two more countries – Austria and Spain – would have a total government debt exceeding 100% of GDP, and three more – France, the United Kingdom and Germany – would be close to that benchmark. Only 10 out of 28 countries would satisfy the 60% benchmark Maastricht criterion, as against the 12 when government guarantees are not included in public debt.

4 SIZE AND STRUCTURE OF GOVERNMENT GUARANTEES IN CROATIA

The Croatian Government and Ministry of Finance have been issuing financial guarantees since 1995 and performance guarantees since 1998 (Bajo et al., 2011). With financial guarantees, the government warrants that an original debtor's financial liabilities will be settled if the debtor is unable to settle them fully and on time. Performance guarantees are issued against a pledge of movable property to guarantee the fulfilment of a contract to deliver/return goods or services. Figure 4 shows the amounts of financial and performance guarantees issued in the period from 2009 to the first half of 2015.

Figure 4

Financial and performance guarantees issued from 2009 to first half of 2015 (in billion HRK)



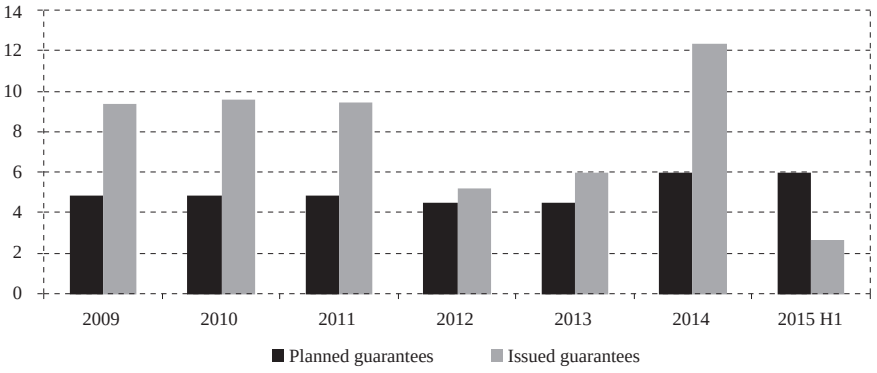
Source: Authors based on Ministry of Finance (2009, 2010, 2011, 2012, 2013, 2014a and 2015a).

The total amount of guarantees issued ranged from HRK 5.6bn in 2012 to HRK 12.6bn in 2014. Financial guarantees are prevalent in the reported period, whereas a significant amount of performance guarantees appears only in the first half of 2015 and relates to the shipbuilding sector, which – after a while – again seems to have become a significant (if not the dominant) beneficiary of government guarantees.

The Law on the Execution of Government Budget, which is passed for each year, stipulates the annual value of the new government guarantees (planned), as well as conditions of their issuance. Figure 5 shows a comparison of planned and issued guarantees: the amount of financial guarantees actually issued exceeded the limit set forth by the budget law through the entire period. This is because guarantees issued pursuant to the decisions of the Parliament, which account for a large share of the total, are not counted towards the annual limit in the budget law (Bajo and Petrušić, 2014). In 2012 and 2013, this gap was somewhat smaller because the Parliament was less active in issuing guarantees, so the limit set out by the budget law was largely adhered to. However, the trend reversed in 2014, when the amount of guarantees issued was more than double the maximum amount of guarantees prescribed in the budget law.

FIGURE 5

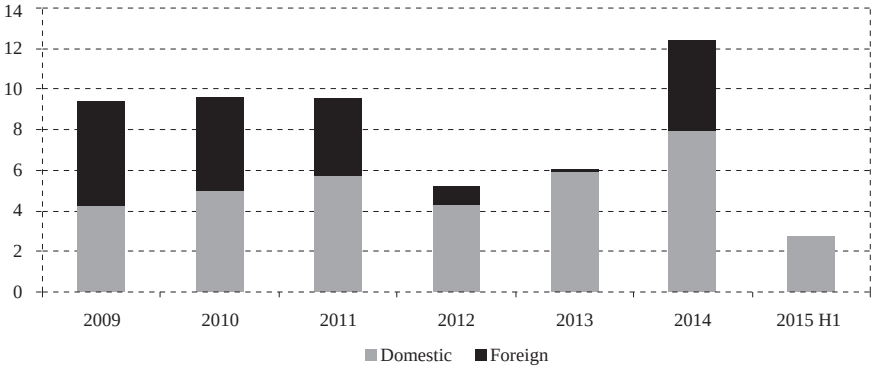
Planned and issued financial guarantees from 2009 to the first half of 2015 (in billion HRK)



Source: Authors based on Ministry of Finance (2009, 2010, 2011, 2012, 2013, 2014a and 2015a).

FIGURE 6

Domestic and foreign financial guarantees issued from 2009 to the first half of 2015 (in billion HRK)



Source: Authors based on Ministry of Finance (2009, 2010, 2011, 2012, 2013, 2014a and 2015a).

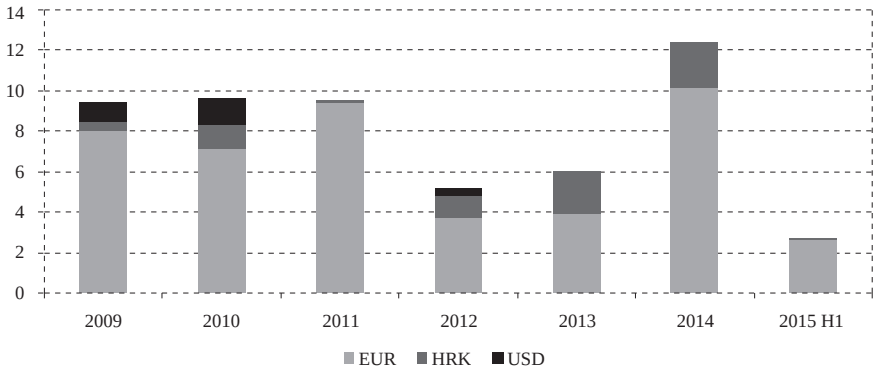
Several other breakdowns provide interesting information on the structure of government guarantees and how it has evolved over time.

Among financial guarantees there has been a steady increase in the share of guarantees on loans provided by domestic financial institutions (figure 6). In 2013, the share of such guarantees reached 98% of the total. However, this increase did not reflect greater reliance of public enterprises on borrowings from domestic banks, but rather a sharp fall in foreign bank lending and, as a result, guarantees on such loans. This trend reversed in 2014, with HRK 4.5bn of guarantees issued for the loans that Croatian Highways took from foreign financial institutions.

Most of the guarantees back bank loans denominated in euros (figure 7). Guarantees for bank loans denominated in HRK increased steadily between 2009 and 2014, but disappeared in the first half of 2015.

Figure 7

Currency structure of financial guarantees issued from 2009 to the first half of 2015 (in billion HRK)



Source: Authors based on Ministry of Finance (2009, 2010, 2011, 2012, 2013, 2014a and 2015a).

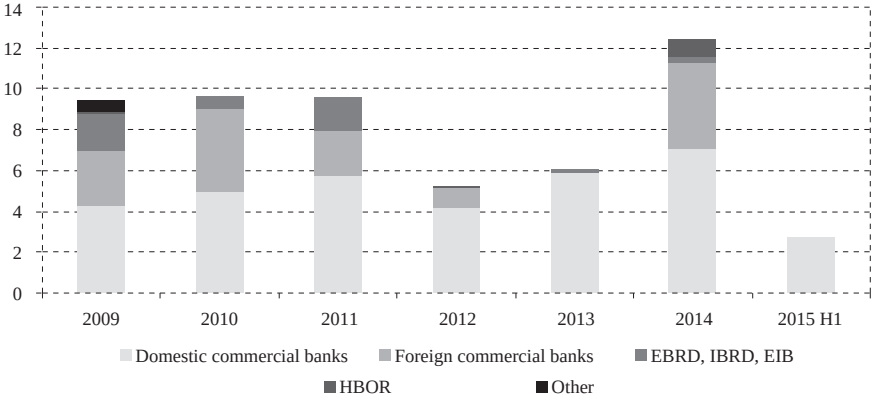
Most of the government guarantees back loans provided by domestic commercial banks (figure 8). The share of financial guarantees backing up loans provided by foreign financial institutions decreased significantly between 2010 and 2013, but jumped in 2014 to the highest level ever. This reflected mainly the guarantee for the Deutsche Bank London loan to Croatian Highways to refinance existing loans. In 2009-11, some guarantees were also issued to back up the loans provided by EBRD, IBRD and EIB for infrastructure projects (highways, roads and ports); and in 2014 for a HRK 0.8bn loan provided by the Croatian Bank for Reconstruction and Development (CBRD) to Croatian Railways Passenger Transport for the purchase of trains.

Turning to sectoral breakdown, between 2009 and 2013 financial guarantees were mostly issued for the transport and manufacturing sectors (figure 9). Within the transport sector, most guarantees were issued for loans granted to Croatian Roads,

Croatian Highways, Croatian Railways, and port authorities in Rijeka, Split and Zadar. In 2009 and 2010, a large part of financial guarantees was issued to firms in the manufacturing sector, more specifically to shipbuilders.[4] As shipyards were restructured and privatised in 2011 the government no longer had to issue guarantees for their loans. However, financial difficulties of highway companies intensified, so almost all guarantees issued since 2011 have backed up loans to the transportation sector. In sum, government guarantees before 2010 were used almost exclusively for propping up the loss-making shipbuilding industry, and since 2011 the loss-making highway companies.

FIGURE 8

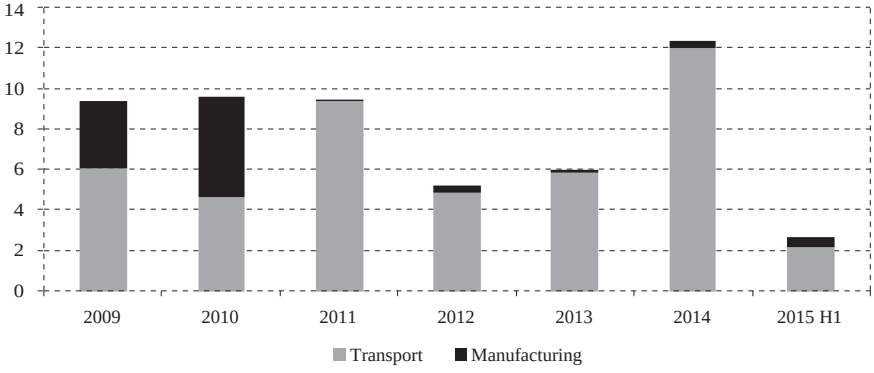
The structure of financial guarantees issued by type of creditor from 2009 to first half of 2015 (in billion HRK)



Source: Authors based on Ministry of Finance (2009, 2010, 2011, 2012, 2013, 2014a and 2015a).

FIGURE 9

Structure of the value of financial guarantees issued by sectors from 2009 to the first half of 2015 (in billion HRK)



Source: Authors based on Ministry of Finance (2009, 2010, 2011, 2012, 2013, 2014a and 2015a).

[4] For a detailed discussion on fiscal risks emerging from guarantees issued to the shipbuilding sector, see Bajo and Primorac (2011a).

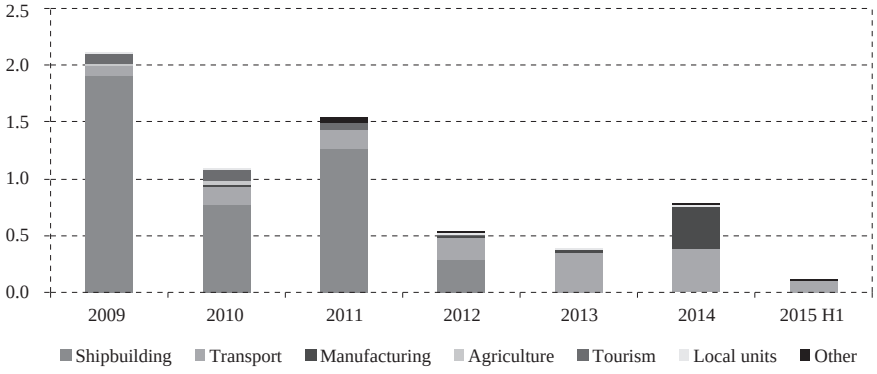
5 FISCAL IMPLICATIONS OF GOVERNMENT GUARANTEES

If guarantees are called on, they become direct government debt. A portion of loans for which guarantees are called on has to be repaid by the government. The Government and the Ministry of Finance normally attempt to recover part of the amount they had to pay for defaulted loans from guarantee reserves. Unfortunately, the amounts recovered and transferred to the budget are low, as the original debtors typically have longstanding financial difficulties and are not able to meet their obligations.

The majority of guarantees were called in 2009, 2010 and 2011, primarily in the shipbuilding sector (in 2009 by as much as HRK 1.9bn), but also in the transport sector, tourism and agriculture. In 2012, the amount of called guarantees decreased by 65.4%, primarily due to the fact that the payments for the liabilities of shipyards were, as of March 2012, recorded under expenses for the repayment of the principal and interest – and not as withdrawals from the guarantee reserves. This change was caused by the administrative manoeuvre by which the Government in 2011 converted the shipyards' contingent liabilities – totalling HRK 11.3bn – into explicit public debt (Bajo and Primorac, 2011a).

FIGURE 10

Called financial guarantees by sector from 2009 to the first half of 2015 (in billion HRK)

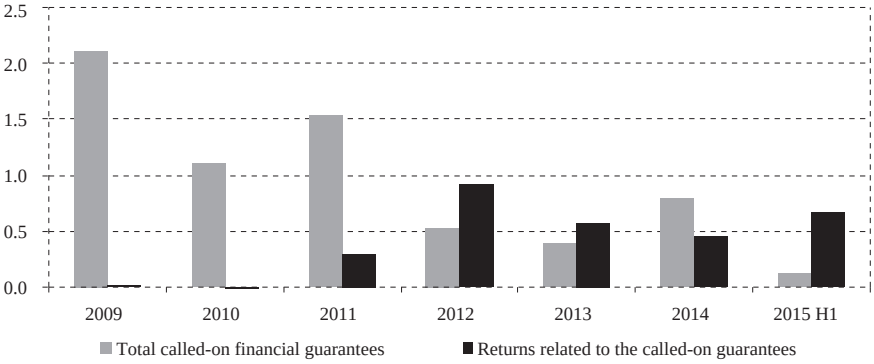


Source: Authors based on Ministry of Finance (2009, 2010, 2011, 2012, 2013, 2014a and 2015a).

In 2009 and 2010, the total amount of called financial guarantees was far greater than returns to the government budget. The original debtors, based on direct deposit or otherwise, repaid only 1% of the total amount of guarantees called in those years. However, the situation improved in 2011. In addition to direct payments to the budget of only HRK 26m, the state also collected claims for paid guarantees by acquiring company shares worth HRK 257m and assets worth HRK 25m.

FIGURE 11

Called guarantees and refunds from 2009 to first half of 2015 (in billion HRK)



Source: Authors based on Ministry of Finance (2009, 2010, 2011, 2012, 2013, 2014a and 2015a).

Since 2012, things have drastically changed. Recovery related to guarantees called in 2012 was nearly double the total amount of guarantees called in that year. This is a direct result of the transformation of claims based on called guarantees issued to Croatia Airlines into shares amounting to almost HRK 900m and the acquisition of the debtor's real estate worth HRK 3m. In the same way the government acquired shares in Croatian Railways Cargo – in the first half of 2015 – amounting to HRK 454m. This is *de facto* hidden financing through increasing the shareholders' equity, although the Republic of Croatia is already the only shareholder (holding 100% of the equity). Therefore, there is not much economic reason behind these operations – they are, in effect, state subsidies with a delayed effect and a different accounting treatment.

TABLE 1

Guarantee reserves and called financial guarantees from 2009 to first half of 2015

Year	Guarantee reserves (HRK bn)	Called guarantees (HRK bn)	Potential maturity (HRK bn)	Reserves/ Maturity (%)	Reserves/ Called (%)	Called/ Maturity (%)
2009	0.7	2.1	3.8	18	32	56
2010	1.0	1.1	3.2	31	91	34
2011	1.0	1.5	7.7	13	65	20
2012	1.0	0.5	5.1	20	187	10
2013	0.5	0.4	4.3	11	121	9
2014	0.8	0.8	5.6	15	106	14
2015 H1	0.5	0.1	4.5	12	464	3

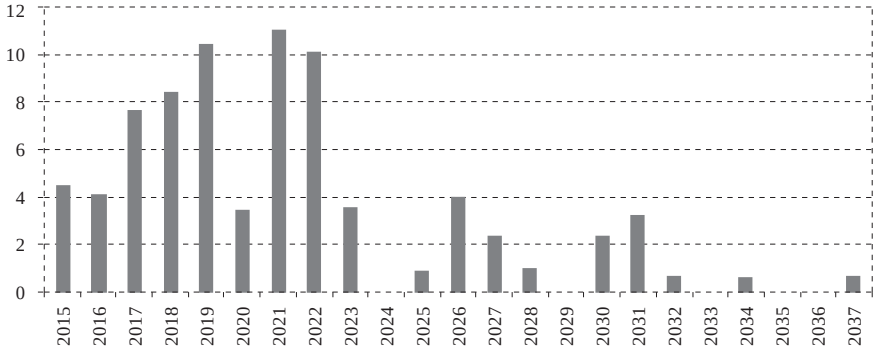
Source: Authors based on Ministry of Finance (2009, 2010, 2011, 2012, 2013, 2014a and 2015a).

Between 2009 and 2011 the guarantee reserve funds were not sufficient to cover the guarantees called – additional funds had to be provided from alternative sources. In the remainder of the observed period, there was an excess of guarantee reserve. This is mainly due to changes in the record-keeping of shipyards' debt

secured by government guarantees in 2011. Throughout the period, guarantee reserves covered less than 20% of outstanding guarantees (with the exception of 2010 – 31%). The ratio of called and outstanding guarantees gradually decreased from as much as 56% in 2009 to only 3% in the first half of 2015, which is also largely a result of the change in the national statistics and record-keeping.

Figure 12

Value and potential maturity of financial guarantees active at the end of the first half of 2015 (in billion HRK)



Source: Authors based on Ministry of Finance (2009, 2010, 2011, 2012, 2013, 2014a and 2015a).

The beneficiaries of government guarantees have created obligations for the repayment of debts and interest until as far as 2037. The amount and maturities of financial guarantees vary. In 2015 and 2016 approximately HRK 8bn of loans backed up by government guarantees will become due. From 2017 to 2019, and also in 2022, the state budget will be under significant pressure from potential "activation" of issued financial guarantees and their conversion into direct public debt.

The uncertainty created by government guarantees is a significant source of risks from the debt sustainability perspective. If the extent of guarantees called surpasses the expected level, it could undermine the sustainability of the debt, increase the likelihood of fiscal problems, and ultimately lead to a crisis (IMF, 2005).

Although often misinterpreted in the public, an increase in the value of Croatian public debt in the last couple of years cannot be attributed solely to the increase of government net-borrowing, but also to a "statistical increase" due to changes in the methodological frameworks for debt statistics. These changes mostly relate to the increase of the scope of public debt by increasing the scope of the general government. The methodological frameworks mostly evolve so as to include institutions formally outside the general government in the scope of general government, if it is likely that general government will take on their liabilities. The inclusion of liabilities of such institutions in direct public debt decreases the amount of government guarantees granted to those institutions to avoid double inclusion of the same amount in the debt statistics (first as a direct and then also as an indirect liability).

From 2009 to 2013 the amount of debt to GDP in Croatia increased by 73%. However, the transition of methodological frameworks – from GFS (Government Finance Statistics) to ESA (European System of National and Regional Accounts) 95 and finally to ESA 2010 – created the public perception of the public debt to GDP ratio in 2013 as double the value of 2009 (76% of GDP in 2013 according to ESA 2010 related to 36% of GDP in 2009 according to GFS).

Table 2

General government debt and government guarantees from 2009 to 2013, according to different methodologies (in billion HRK and % of GDP)

Methodology	2009		2010		2011		2012		2013	
	Bn HRK	% GDP	Bn HRK	% GDP	Bn HRK	% GDP	Bn HRK	% GDP	Bn HRK	% GDP
BDP (ESA 2010)[c]	331.0	100	328.0	100	332.6	100	330.5	100	330.1	100
General government debt										
GFS 2001[a]	117.7	36	138.0	42	156.0	47	177.3	54	n/a	n/a
ESA 95[b]	120.8	36	145.7	44	170.9	51	183.7	56	220.2	67
ESA 2010[c]	158.9	48	186.9	57	211.9	64	228.8	69	266.1	81
ESA 2010-95	38.1	12	41.2	13	41.0	12	45.1	14	45.9	14
Government guarantees										
GFS 2001[a]	50.9	15	59.4	18	59.9	18	55.1	17	n/a	n/a
ESA 95[b]	51.9	16	56.9	17	51.0	15	54.3	16	53.7	16
ESA 2010[c]	13.1	4	14.9	4	8.4	3	8.6	2	8.0	2
ESA 2010-95	-38.8	-12	-42.0	-13	-42.6	-12	-45.7	-14	-45.7	-14

Sources: [a] MOF (2014), [b] CNB (2014), [c] CNB (2015), and MOF (2015).

Since September 2014, all EU countries are obliged to apply the ESA 2010, which is the European version of the UN's methodological framework System of National Accounts (SNA 2008). Due to the new way of expressing certain parts of the national economy, the scope of economic sectors changed significantly. In addition to changes in the calculation of GDP, the changes are also reflected in the scope and size of the deficit and general government debt.

The primary reason for the change in the level of general government debt and government guarantees by switching from ESA 95 to ESA 2010 was the reclassification of the liabilities of Croatian Highways and Rijeka-Zagreb Highway, Croatian Railways Infrastructure, Croatian Radio and Television, together with the Croatian Bank for Reconstruction and Development, State Agency for Deposit Insurance and Bank Resolution and the Croatian Energy Market Operator into the consolidated central government sector (CBS, 2015). This retroactively increased the general government debt, and consequently reduced the amount of guarantees throughout the entire period. In 2013, the difference between the amount of guarantees according to the old (ESA 95) and the new (ESA 2010) methodology was almost HRK 46bn. In relative terms, the guarantees amounted to 16% of GDP

according to ESA 95 and 2% of GDP according to ESA 2010. At the same time, the general government debt expressed according to these two methodologies differed by an almost identical amount – reaching 67% of GDP according to ESA 95 and 81% of GDP according to ESA 2010. The total public debt (general government debt plus guarantees) amounted to 83% of GDP in both cases, only the structure of the debt (direct vs. indirect) being different. This proves that an increase in the general government debt in 2013 was – to a large extent – offset by a corresponding decrease in the amount of guarantees, i.e. indirect was transformed into direct debt (due to methodological changes) causing a "statistical increase" of the public debt. A similar conclusion can be reached for the remainder of the observed period (see table 2 and compare the difference ESA 2010-95 for general government debt and government guarantees).

6 CONCLUSION

Government guarantees are a significant source of fiscal risk and threaten the stability of public finance in both developing and developed economies. This points to the need for the implementation of a well-developed policy for issuing and managing government guarantees. Good practices in contingent liabilities management include the provision of comprehensive and transparent databases, introduction of certain limitations to exposure to fiscal risks, the establishment of contingencies reserve funds and the existence of separate legislation and institution(s) responsible for management of fiscal risks.

The financial crisis has hit EU economies hard and destabilized their financial sectors. In order to maintain the financial stability, the governments have implemented various emergency measures often relying on government guarantees. Accordingly, the amount of guarantees in certain countries (e.g. Ireland, Austria, Finland, and Slovenia) reached significant amounts. On the other hand, Slovakia, the Czech Republic, Bulgaria and the Baltic countries have had relatively low levels of guarantees. Although Croatia has had a moderate level of guarantees as a percentage of GDP compared to other member states, it has to be pointed out that guarantees in Croatia proved to be an extremely significant risk source. Namely, the adoption of a broader European framework of national statistics (ESA, 2010) has provided a more comprehensive picture of government finances by converting indirect liabilities (guarantees) amounting to about 14% of GDP into direct liabilities (general government debt). Therefore, the lower-than-average level of guarantees in Croatia is not the result of a prudent (restrictive) issuing policy, but rather the fact that the majority of issued guarantees qualified for conversion into direct general government debt, leaving only a small portion of issued guarantees being recognized as contingent liabilities.

Two types of guarantees appear in Croatia – financial and performance guarantees. They may be approved by the Government or the Parliament. Croatia has mainly issued financial guarantees and mostly in amounts higher than planned. Guarantees were predominantly issued for borrowing in the domestic market and

denominated in euros. The structure of creditors is constantly dominated by domestic commercial banks, whereas the structure of beneficiaries has changed significantly throughout the observed period. The share of the transport sector increased because of the restructuring and privatization of shipyards, which caused a decrease in the share of guarantees issued to the manufacturing sector. In the structure of the called financial guarantees, the most significant liabilities occurred between 2009 and 2011 in the shipbuilding sector, whereas from 2012 the amount of called guarantees decreased significantly. Refunds related to guarantees called from 2009 to 2011 were extremely low, while afterwards they even exceeded the amount of the called guarantees. However, this is mainly the result of the conversion of government claims into shares through accounting operations without any real cash inflow into the budget.

The policy of issuing government guarantees mainly to public companies with major financial problems has led to undesirable consequences for the Croatian public debt. Instead of supporting prosperous and healthy economic sectors to induce growth and employment, government guarantees in Croatia have actually served as a support to loss-making sectors (shipbuilding, transport and the like) until their restructuring or privatization. The country should have found appropriate solutions for such sectors through much earlier privatisation or concessioning.

Adequate management of government guarantees can significantly reduce the associated fiscal risks. However, the prerequisite for implementing the quality strategic objectives is the availability of reliable information on the size and structure of government guarantees. In Croatia, the existence of comprehensive and transparent databases on the size and structure of government guarantees would help formulate strategic objectives. The administrative framework for issuing and managing guarantees should also be improved. The legislative framework could be enhanced by adopting a single act regulating the area of public debt and fiscal risks, whereas gathering all functions related to the management of public debt and fiscal risks in one institution (agency) would certainly upgrade the institutional framework, which is currently organized around a few employees of the Ministry of Finance. An appropriate administrative infrastructure is a precondition for the compilation of relevant and reliable fiscal risk reports and the adoption of the public debt and fiscal risks management strategies.

APPENDIX

Table A1

Total stock of government guarantees in EU countries from 2010-2013 (% of GDP)

	2010	2011	2012	2013	Average 10/13
Belgium	17.17	14.30	17.08	13.29	15.46
Bulgaria	1.33	1.15	0.98	0.75	1.05
Czech Republic	0.82	0.72	1.10	1.19	0.96
Denmark	14.62	12.77	7.15	9.18	10.93
Germany	21.23	19.66	18.81	18.22	19.48
Estonia	2.64	2.19	1.95	1.71	2.12
Ireland	96.00	83.89	66.89	32.14	69.73
Greece	3.23	3.85	3.86	3.67	3.65
Spain	12.74	14.84	20.68	18.41	16.67
France	6.65	5.57	4.55	5.53	5.58
Croatia	8.97	6.76	7.55	7.25	7.63
Italy	0.81	3.53	6.16	6.10	4.15
Cyprus	7.47	7.81	14.46	15.85	11.40
Latvia	2.88	3.03	2.91	2.31	2.78
Lithuania	1.36	0.99	0.84	0.82	1.00
Luxembourg	5.12	5.03	7.66	7.72	6.38
Hungary	9.48	8.82	8.74	8.03	8.77
Malta	11.80	12.53	16.52	15.88	14.18
Netherlands	10.77	9.95	7.95	7.22	8.97
Austria	53.35	47.13	41.16	35.01	44.16
Poland	5.28	6.28	6.25	6.80	6.15
Portugal	4.63	10.93	12.22	11.97	9.94
Romania	2.36	1.75	2.08	2.15	2.09
Slovenia	19.73	17.89	16.10	17.82	17.89
Slovakia	0.06	0.05	0.04	0.03	0.05
Finland	19.62	20.72	21.83	24.08	21.56
Sweden	17.05	14.15	12.13	11.56	13.72
United Kingdom	27.76	15.42	10.36	9.47	15.75

Source: Eurostat.

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The estimate of regional balances of payments in Croatia

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Article**
JEL: R10, E31, E42
doi: 10.3326/fintp.40.1.3

* The author is grateful to two anonymous reviewers, as well as his colleagues Nenad Starc and Dražen Koska, for their useful comments and suggestions.
** Received: October 12, 2015
Accepted: December 13, 2015

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FINANCIAL THEORY AND PRACTICE
40 (1) 85-128 (2016)

Abstract

Neither the region, as part of the state, nor regional development has occupied the centre of attention in the theory of international trade. There are several reasons, both theoretical and methodological, as well as entirely practical, including the want of any adequate statistics, particularly those necessary for the construction of Croatian regional balances of payments. Accordingly, there are several objectives to this work. After the introduction in which reference is made to the limitations of the running of individual regional economic policies, comes a chapter in which the content of an ideal regional balance of payments is defined. On the way from the ideal to the objective content of regional balances of payments, that is, one reflecting the available data, many methodological problems had to be solved and suitable statistics set up. In the sequel, the analysis of the balances of payments reveals a whole scale of regions that are negative or positive in terms of foreign currency. Although the quantities of the individual balances and items are interesting in themselves, it is important to understand that the different regional exposures to monetary policy possibly require a selective approach from economic policy. At the end, making use of the regional balances of payments, the influence of the depreciation of the kuna on the gross domestic product of the regions is analysed. It is established that in some hypothetical depreciation, if foreign currency transactions were treated ceteris paribus in relation to other economic aggregates, there would be important gains and losses, which would lead to ever greater developmental inequality in Croatia.

Keywords: region, balance of payment, exchange rate, developmental disparities, Croatia

1 INTRODUCTION, OR, NATIONAL AND REGIONAL ECONOMIES AND ECONOMIC POLICIES

When in Croatia in discussions of given economic problems, the terms metropolis and province are used as indicators of geography and development, only a little charge is necessary for arguments to be produced saying that those in the province would find it better if they managed their own economy.[1] At that moment the tone of voice becomes sharper, the province is less developed than the national average. And then, an octave higher still, the provinces are isolated in every sense with all the consequences entailed. After that into the discussion an argument is adduced that will not brook criticism, that the region is characterised by a high environmental sensitivity, which sometimes moves the interest of investors away from these areas. At the end, to the sound of fist on table, everything is top-down, instead of allowing something in the management approach that is bottom-up.

Then the region, irrespective of the internal dissents and divisions, is imagined as an economic entity that is in many elements like a little state, with an open economy, on which exogenous factors have a strong and yet not a crucial impact. It is interesting that regional theory and international trade theory have often dealt with

[1] For more on this see Filipić (2006).

the similarities and differences of the national economy and a smaller and more or less isolated part of it, the region.

If this theoretical framework is adjusted to the special requirements of the Croatian economic scene, but not only the Croatian (Filipić and Grčić, 2002; Capello and Nijkamp, 2009) the following can be observed:

– the regions are at different stages of development,
– regional economies are more open than the national economy,
– the economy of the region is more closely connected with the economies of other regions within the national economy than different national economies are with each other,
– a poorer economic structure makes a regional economy sensitive to varied measures of economic policy.

In addition, regional specificities necessitate different forms of regional development policy, for:

– some of the regions are more less isolated from information,
– some of the regions are characterised by high environmental sensitivity,
– they have different urban structures (Barca et al., 2012), and also
– they have various patterns of innovation (Alderman and Davies, 1990; Abreu et al., 2008).

The recent global economic crisis made the discussion about the specific features of European regional economies very topical. Two aspects are in the centre of attention (Camagni, 2015). In member states of the monetary union who by accession to the union were reduced, as it were, to the status of region, the impossibility of a devaluation of the currency in the event of a negative balance of trade increased the exposure to the crisis and deepened the social differences more strongly in the more weakly developed regions. In addition, the policy of austerity generated asymmetrical effects that in the situation of reduced public spending hit the more weakly developed regions dependent on public transfers and internal demand more strongly, and the rise of interest rates is reflected on the reduction of investment, which is particularly visible in industrial regions.

What is particularly important is that there are constraints on the economic policy measures that the region had in their armoury to deal with their own economic problems (Filipić, 2000). This refers to all economic policies, particularly the most important, fiscal and monetary. Rules of the common national fiscal policy apply at the regional level. Although we have seen various kinds and strengths of fiscal decentralisation, the most productive budgetary revenues are always in the hands of the central (economic) policy. The region is part of the area of the common currency in which the money supply is controlled by the central bank, which means that not even in monetary policy is it possible for it to seek instruments and measures to govern its own development (Filipić, 2001). However, this does not mean that these themes should be removed from the purview of research.

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An important and very topical segment of economic policy is the regulation of relations with foreign countries. Foreign trade policy and price policy are directly interwoven with monetary and foreign exchange policies, and then, via a multiplier, with other policies, so as ultimately to produce the most favourable result for the national economy. All of this in the annual statement is entered in the balance of trade of the state, which represents a systematic representation of the value of the economic transactions of (Croatian) residents with foreign countries in a given period.

In most countries, regional balances of payments are not constructed, and this is the case with Croatia as well. Since 2012, data concerning the imports and exports of the counties have not been reported, although this had happened in an orderly manner for fifty years previously. And the current situation will certainly continue, for contemporary monetary theory, instead of addressing the regions, prompted by the monetary issues in the euro area, has reaffirmed and improved (Dellas and Taclas, 2009; Cesarano, 2006) the almost forgotten theory of optimal currency areas (Mundell, 1963). Nevertheless, even alongside these important theories, some entirely mundane questions will continue to look for answers. Like the following, converted into the case study at the end of this article: to what extent does a change in the exchange rate for the kuna affect regional developmental disparities in Croatia?

An attempt will be made to arrive at answers to these questions with the help of the regional balances of payments of the Croatian regions and countries constructed for the purpose of this analysis.

2 THE BALANCE OF PAYMENTS AND REGIONAL POSSIBILITIES AND IMPOSSIBILITIES

Every textbook on international economics or macroeconomics on its numerous pages will list everything about the concept and the structure of the balance of payments, the techniques of the accounts that are published in this balance, and will devote most of its space to the policy of balancing the balance of payments (for example, Babić and Babić, 2008). In the many methodological documents that are usually published by the central banks (for Croatian by the CNB, Annual Reports) there are definitions of every position of the balance sheet and listings of the residents who are bound to give the building elements of the balance of payments to the central bank and the statistics office are provided. In line with the universally accepted theory, and with the conviction that all levels lower than the national are unimportant for macroeconomic policy, never, ever, in all these books and implementation documents are there mentions of the balance of payments of the smaller territorial units. In truth, in academic articles regional balances of payments are mentioned, in three of their aspects: (a) when regions are understood to mean states that belong to economic, political or geographical groupings; (b) in the context of debates about the theory of optimal currency areas, and (c) when it is being proved that discussions of regional balances of payments are actually unnecessary (for example, Ramos, 2006) and the discussion is directed to the regional balances of current transactions (Ramos, 2007).

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So the theme of regional balances of payments is not at all on the agenda, either of theory or of practice. The logical questions arises: whence the interest in drawing up Croatian regional balances of payments?

Once a year, each year, Croatian exporters meet (Brnić, 2015). Tirelessly, they repeat their demand for a correction of the kuna exchange rate. Upwards, of course, for, and here one has to agree with them, export is supposed to exert a positive effect on the whole of the economy. But the effects of this requested depreciation on the rest of the participants in economic life are not mentioned, nor is there any word of importers, for example. Several times a year, each year, debtors with loans denominated in a foreign currency or in kuna with a currency clause get together (Gatarić, 2015) who, logically, want the exchange rate not to be altered, or if it has to be, then to a lower level, the level of a few years back. Nor does this interest group pay any attention in its exchange rate calculations to the others; any mention of foreign currency deposits is for them anathema. It is important for the topic of this article, that both of them, and all others, live and make a living in a very concrete space, in the regions, in the counties, and in many ways share the destinies of their own economic surrounding. Will a change in the exchange rate of the domestic currency improve or damage the economic situation in the region or county? Will a positive different of regional foreign currency inflows and outflows lead to a great income per capita of the region and a small number of unemployed? To find out, it is necessary to start off from analyses that ultimately, outside the scope of this work, can result in adequate measures of economic policy, and an appropriate analytical apparatus consists of the regional balances of payments.

It is the general government sector at all of its levels that makes the fundamental difference between the national and the regional balances of payments (sectorisation according to European System of National and Regional Accounts, ESA, EC, 2013). It does not exist in the Croatian regional balances of payments that will be presented below. It is possible, according to some key (for example the structure of GDP or tax revenues) to divide state transfers and government loans into regions/counties, but in this case the regional balances of payments would to a great extent (because of the large aggregates of government sources and the use of the funds) lose their specificities. All other residents from the national balance of payments are also there in the regional: (1) non-financial corporations, (2) financial corporates (excluding monetary institutions), (3) households, and (4) foreign countries.

Looked at in terms of the narrower balances that make up the balance of payment (table 1), the balance of current transactions (save for government transfers) is in its content the same for the national and the regional level. The difference is only in the geographical scope. All transactions that are conducted in the goods, service and transfer segment in a foreign currency or in kuna equivalent are listed here. Naturally, this makes up a difference from the regional corporate accounts and the kuna inter-regional transactions are treated as trade of a region with “abroad”.

Table 1
Content of the balance of payments

National level – Croatia		Regional or county level	
Current account		**Current account**	
Debit	Credit	Debit	Credit
A. Goods and services		**A. Goods and services**	
1. Goods imports	1. Goods exports	1. Goods imports	1. Goods exports
Goods balance		Goods balance	
2. Services imports	2. Services exports	2. Services imports	2. Services exports
2.1. Tourist spending abroad	2.1. Spending of foreign tourists inland	2.1. Tourist spending abroad	2.1. Spending of foreign tourists inland
2.2. Other services from abroad	2.2. Other services sold abroad	2.2. Other services from abroad	2.2. Other services sold abroad
Services balance		Services balance	
Balance of goods and services		Balance of goods and services	
B. Income and current transfers		**B. Income and current transfers**	
3. Transfers abroad	3. Transfers from abroad	3. Transfers abroad	3. Transfers from abroad
3.1. Remittances of foreign workers employed inland	3.1. Remittances of domestic workers from abroad	3.1. Remittances of foreign workers employed inland	3.1. Remittances of domestic workers from abroad
3.2. Pensions paid to foreigners	3.2. Pensions of domestic residents from abroad	3.2. Pensions paid to foreigners	3.2. Pensions of domestic residents from abroad
3.3. Other private transfers to foreigners (interest and dividends)	3.3. Other private transfers from abroad (interest and dividends)	3.3. Other private transfers to foreigners (interest and dividends)	3.3. Other private transfers from abroad (interest and dividends)
3.4. Government transfers abroad	3.4. Government transfer revenues		
Balance of current transfers		Balance of current transfers	
3.5. Compensations to employees	3.5. Compensations to employees	3.5. Compensations to employees	3.5. Compensations to employees
3.6. Income from FDI in the domestic economy	3.6. Income from FDI abroad	3.6. Income from FDI in the domestic economy	3.6. Income from FDI abroad
3.7. Income from portfolio investment	3.7. Income from portfolio investment	3.7. Income from portfolio investment	3.7. Income from portfolio investment

National level – Croatia		Regional or county level	
3.8. Income from other investments	3.8. Income from other investments	3.8. Income from other investments	3.8. Income from other investments
Balance of income		Balance of income	
Capital and financial account		**Capital and financial account**	
Assets	Liabilities	Assets	Liabilities
C. Long-term capital		**C. Long-term capital**	
4. FDI abroad	4. FDI from foreign countries	4. FDI abroad	4. FDI from foreign countries
5. Private investments in securities abroad	5. Private foreign portfolio investments in the country	5. Private investments in securities abroad	5. Private foreign portfolio investments in the region
6. Government loans made abroad	6. Government borrowing abroad		
D. Short-term capital		**D. Short-term capital**	
7. Private commercial loans made to foreigners	7. Private commercial loans received from foreigners		7. Foreign currency loans of credit institutions
8. Private deposits in foreign banks	8. Private deposits of foreigners in domestic banks	8. Foreign currency deposits in banks	7.1. Non-financial corporates
		8.1. Non-financial corporates	7.2. Household
		8.2. Household	
9. Private purchases of foreign monetary instruments	9. Private sale of monetary instruments to foreigners	9. Private purchases of foreign monetary instruments	9. Private sale of monetary instruments to foreigners
10. Government loans made abroad	10. Government borrowing abroad		
Reserves account		**Balance of foreign currency inflows and outflows**	
Assets	Liabilities	Foreign currency outflow	Foreign currency inflow

Source: for the national level, CBS; regional level, author.

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Everything stated about the balance of current transactions also applies to the long-term capital sub-balance in the balances of capital and financial transactions, naturally apart from the item of government loans and borrowings. All real and portfolio investments to or from foreign countries, that have their origin or destination in a region, can be recorded in the regional balance of payments too.

The "domestic-foreign" criterion of the national accounts unquestioningly takes it for granted that everything inland is paid in the domestic and abroad in the foreign currency. In the regional short-term balances of capital and financial transactions that are presented here, this criterion is replaced by the "foreign currency-kuna" criterion, according to which, apart from the county location, the only essential thing is the currency involved in the transaction. All financial transactions of residents in a region in foreign currency or in kuna with a currency clause are the content of this segment of the regional balances of capital and financial transactions. In this manner, sometimes also because of want of information, on the way from national to regional, items 7 and 8 are modified and transformed into regional foreign currency loans and deposits.

Finally, the reserves account. For reasons stated above (general government level) it does not exist at the regional level. Instead of reserves, in the regional balance of payments, the balance of foreign currency inflows and outflows is recorded.

As already stated, the balance of payments is a systematic representation of the values of economic transactions of residents with the rest of the world in a given period. Regional balances of payments, in the way arranged in this paper, require a new definition. They are a systematic depiction of the value of economic transactions of regional residents that, irrespective of whether they are with foreign countries or with domestic residents, are carried out in a foreign currency, or in the domestic currency with a foreign currency clause, in a given period. Conceived in this way, in a considerable part, they can be considered foreign currency balances.

3 SOURCES OF DATA, OR *PER ASPERA AD* (REGIONAL) *ASTRA*

There are three kinds of sources of data for the compilation of the national balance of payments: (1) reports of government institutions: the Croatian Bureau of Statistics (CBS), the Croatian Institute for Retirement Insurance (CIRI); (2) specialised reports of the CNB about aggregated payment transactions with foreign countries, debtor relations with foreign countries, monetary statistics and international reserves; and (3) assessments and statistical reports conducted by the CNB. In principle, the goods balance is made by the CBS, the balance of transfers in the part relating to pensions is the task of CIRI, and the rest, the balance of services, not including tourism, and items in the balance of capital and financial transactions, pursuant to reports by residents, is aggregated by the CNB. This "in principle" means that within all the balances there are items that are either estimated or adopted from foreign sources.

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All these data arrive from residents who carry out business transactions with foreign countries. In their reports are the addresses of residents, their principal places of residence or domiciles, depending on whether legal or natural entities are concerned. This fact, that the location of the transaction is known, suggests the conclusion that in some ideal statistics it would be possible without any great problems to draw up regional balances of payments (or regional social accounts, including regional input-output tables). But this is not done, and some of the reasons for this, to which one has to add the high degree of centralisation of almost everything in people's minds and in practice, were given in the previous chapter. For the making of regional balances of payments, then, it would be necessary to identify where the information is, to ask those who have it to reorganise it according to the counties, and where this information does not exist, to estimate it and in some cases to make use of the information of international institutions.

Here concretely are the regional data that have led to the rearrangement of the Croatian databases about the balance of payments.

Goods balance. In Croatia, for more narrowly defined territorial units, for years, balances of goods exchanges with foreign countries were drawn up. Once these units were the unions of communes, and at request it was possible to obtain the balance from a commune. Then came the counties, for which these balances were properly drawn up as well. Until 2012, the last year in this long-term series, since which time the CBS has ceased to publish them. After Croatia joined the EU and had to meet the requirements of Eurostat, the goods exchanges of the counties with foreign countries are no longer (publicly) available. Although as a member of the EU it has to meet its requirements, Croatia is still a concrete country with its own regional identity.[2] Accordingly, for analytical and economic reasons as well as for those of economic policy, it would be very important to known the economic and not just the political *raison d'être* of the counties. Especially if the raw data do exist somewhere. It is the merchandise trade balance that temporally defined for this paper the regional balance of payments, worked out for 2012. The data, then, are not up-to-date, which partially diminishes their topicality, but since changes in the balance of payments are in a great extent the consequences of structural changes, the fundamental trends still hold.

And one specific feature that stems from the great concentration of economic activities in Zagreb. The CBS data in terms of counties are obtained on the basis of the classification of firms that have exported from or imported to the county (municipality, city) in which they are registered according to the Register of Business Entities. In this manner almost 60% of the total imports of goods (and 62% of services imports) are carried out in Zagreb. This information (marked *), tells us not only about the concentration but also the earnings of importers located in

[2] Members of the EU do on the whole make up regional balances of the imports and exports of goods and services. As examples, only, the UK <https://www.uktradeinfo.com/Statistics/RTS/Pages/default.aspx>, and Germany <https://www.bundesbank.de/.../statso_11_balance_of_payments_by_region>.

Zagreb (and then about the employees and the paid-in tax on personal and corporate income tax), but does not provide any information about the final allocation of the imports. For this reason, for the sake of greater reality in the regional balances of payments, alternative estimates (labelled **) have been made that assign the imports of goods and services across Croatia in line with the structure of GDP. Unlike imports, regional exports are well correlated with the GDP of the regions and do not need to be corrected. For example, in that same year, 2012, the city of Zagreb accounted for 37% of Croatian exports, and 33% of GDP.

Balance of services. There are two items in this balance. The first, the tourist (2.1) is estimated at the regional level, for there are no such balances. For the income side this is done in three steps: (1) the foreign current income from foreign tourists according to spending in commercial accommodation per county is calculated as the product of the number of overnight stays by foreign tourists per county and the daily spending of tourists in commercial accommodation in euros, (2) then the foreign currency earnings according to spending in commercial accommodation expressed in percentages for the counties, and (3) the structure calculated in this way per county is multiplied by the total foreign currency earnings from tourism in the balance of payments of the Republic of Croatia for 2012. On the debit side, tourist spending of the domestic population abroad is obtained by adaptation of data about foreign spending published by the CBS and the Institute of Tourism in Zagreb. Conceived in this way, it relies on the methodological consideration of the position of tourism in the balance of payments of Croatia (Galinec, 2000). Sources of data used in these calculations are given in tables A7, A8 and A9 in the appendix.

The second item (2.2), services from abroad and services sold abroad is taken in its entirety from the national balance of payments with the proviso that the employees of the statistics section[3] of the CNB have, making use of the addresses of the residents, converted it into a regional balance of services.

Income and current transfers. Drawing up this balance at a regional level turned out to be an insuperable problem. To such an extent that there are data for not a single item of transfers and earnings in the regional balances of payments. For example, information about the foreign currency remittances of workers abroad (3.1) are (in spite of the order of the CNB that they are reported on the regulation forms) partial, for the majority of foreign currency earnings are personally picked up abroad. At the national level the World Bank helps, for with the help of the IMF it draws up each year an estimate of foreign currency remittances for most countries in the world. For Croatia in 2012 this came to almost 1.1 billion euros.[4]

In the case of pensions (3.2) the story is a bit different, but the outcome for the regional balances of payments is just as unsatisfactory. In the official statistical

[3] Thanks of the author to employees in the Statistics Sector of the CNB for their expertise, patience and good will.
[4] Available at: <http://data.worldbank.org/indicator/BX.TRF.PWKR.CD.DT>.

records of the CIRI for example, on December 31, 2014, there were 153,721 beneficiaries whose pensions were defined by the application of international social security agreements, the average pension coming to 742.38 kuna. This works out to an annual sum of almost 1.4bn kuna or 180 million euros. In the number of 153,721 beneficiaries of these pensions, users whose pensions are sent abroad and to the Republic of Croatia are included. For the pensions that the CIRI pays abroad in the database of the beneficiaries of pensions there is no information about the municipality of origin from which it would be possible to list the data per county, only the foreign address of the residence of the beneficiary as reported to the CIRI. On the other hand, there is also no information about beneficiaries of pensions or the pension receipts that have their residence in the Republic of Croatia but who receive their pensions from abroad, for the payment from abroad is made directly into the bank account of the beneficiary, and not through the CIRI.

Undoubtedly, the regional balances of payments would be more realistic if foreign currency remittances and pensions were included in them. However, these two items, in the sum total of about 1.3 million euros make up less than 3% of the total foreign currency inflows of the regional balances of payments of about 42 million euros, which means that, after all, the results obtained have a high level of reliability.

Capital and financial transactions. As is done in the national balance of payments, in the regional balances of capital and financial transactions, all transactions are divided into short- and long-term. As for long-term transactions, for private investments in securities abroad and private foreign portfolio investments at home (item 5 in table 1) there are no data for levels below the national. When direct investment (item 4) is concerned, the CNB has information about foreign investment in the country and also for investments from the country abroad. The methodology for foreign direct investment in the regional balances of payments follows the national methodology,[5] with the proviso that here too the statistics sector of the CNB excelled itself, converting for the purposes of this paper national into county-level data. Data about foreign investments are harmonised with the most recent statistical requirements (BPM6) of the EU, which has adopted the methodology of the IMF (IMF, 2009).[6]

The short-term capital segment in the regional balance of capital and financial transactions basically records loans and deposits in the same way as in the national balance of payments. However, not only are there different levels of geographical coverage, but there is an important difference in content. At the regional level all foreign and domestic loans (item 8) and deposits (item 7) are comprehended if the transaction is executed in a foreign currency or in kuna with a foreign currency clause. For private sales of monetary instruments (item 9), there are no data at a level lower than the national.

[5] Available at: <http://www.hnb.hr/statistika/strana-ulaganja/h-info-nova-metodologija.pdf>.
[6] Detailed explanations of the introduction of BPM6 (Assets and Liability Principle) instead of BPM5 (Direction of Investment Principle) at Škudar (2014).

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Reserves account. The sum of the balance of current transfers and capital transactions in the national balance of payments is equal to the changes in reserves. Although in the regional balances of payments, conceived for this paper, the balance of all transactions expressed in the balances of current and capital transactions is shown, no reserves account, as final closing of the balance of payments, exists, for there is no need to cover the temporal gap between foreign currency earnings and expenses.

The data that were available determined the final appearance of the regional balances of payments. Together with the amounts of the final items, the total balances for all the countries are show in table 2 below.

4 RESULTS

Disaggregation of the items of the national balance of payments according to the regional sample reveals to us the volume of transactions that the regional level carries out in foreign currency (or in kuna equivalent). As already pointed out, this is a kind of foreign currency balance sheet of the counties. But unluckily the data refer only to 2012, because there are no more recent figures for some important items (exports and imports), and to go back into the past, which would result in better quality conclusions, goes beyond the physical capacities of an individual. Nevertheless, the data gathered and processed for the one year analysed do throw light on the intra-Croatia foreign currency image which, in its basic aggregates and structure, holds good today too.

Some important information is contained in table 2. Above all, that concerning the total volume of transactions. The counties, together, in 2012 carried out foreign currency transactions that almost reach the level of total Croatian GDP. In figures, that year Croatian GDP came to about 44 million euros, and foreign currency transactions on the outflow side came to 39.5 million euros (about 90% of GDP) and on the inflow side about 42 million euros (about 96% of GDP). These are very important resources, then, which can, in somewhat different approaches to the decentralisation of policy and economic policy, affect the development of the regional level.

The consolidated county balance is positive: foreign currency inflows are greater than outflows. The balance of 2.6 billion euros says that the foreign currency outflows are almost 7% lower than the inflows. Naturally, here it has to be said that in the regional balance of payments there are no transfers and earnings, as there are not in general government, its sources and uses, which would as explained in chapter 2, have an effect on this balance.

Looked at in terms of structure, the real sector shown in the balance of current transactions on the debit accounted for 47.3% and on the credit side 43.9% of all transactions covered by the consolidated balance. The preponderance is then on the side of capital and financial transactions. In consequence, of which we are becoming fully cognisant today, the exposure of the economy and of households to foreign currency risk on the basis of transactions with the banking system is great.

TABLE 2

Consolidated balance of payments of all the counties in 2012, in millions of euros

Consolidated counties balance of payments			
Current account			
Debit		Credit	
A. Goods and services			
1. Goods imports	16,147.1	1. Goods exports	9,605.7
Goods balance	6,541.4		
2. Services imports	2,526.7	2. Services exports	8,890.3
2.1. Tourist spending abroad	1,016.5	2.1. Foreign tourist spending inland	6,858.7
2.2. Other services from abroad	1,510.2	2.2. Other services inland	2,031.6
Services balance			6,363.6
Goods and services balance	177.8		
Capital and financial transactions			
Assets		Liabilities	
C. Long-term capital			
4. FDI abroad	-63.5	4. FDI from abroad	1,109.2
Long-term capital balance			1,172.8
D. Short-term capital			
8. Foreign currency deposits in banks	20,883.2	7. Foreign currency loans of credit institutions	22,518.8
8.1. Non-financial corporate	2,291.0	7.1. Non-financial corporates	9,265.5
8.2.Households	18,592.2	7.2. Households	13,253.4
Short-term capital balance			1,635.6
Balance of capital and financial transactions			2,808.4
Balance of foreign currency inflows and outflows – all counties			
Foreign currency outflow	39,493.5	Foreign currency inflow	42,124.0
Foreign currency inflow and outflow balance			2,630.6

Finally, the sub-balances. The imports of goods are greater than the exports. Services imports are smaller than exports, both in tourism and in other services; foreign investments are greater than Croatian investments abroad, foreign currency loans to the non-financial sector are four times the size of the foreign currency deposits of the same sector; foreign currency deposits of households are 40% greater than their loans in foreign currency. All of these relations are on the whole familiar from CBS statistics about the balance of payments of the country.

What is not known is the territorial distribution of these balance of payments items and their balances. The data in table 3 distribute the figures in the last row of table 2 across the Croatian space.

Table 3

The balance of regional balances of foreign currency (RFCBP) and estimated balance (ERFCBP) inflows and outflows in 2012, according to NUTS 2, macroregions and counties in millions of euros

NUTS 2, macroregion, county	Regional balance	
	RFCBP*	ERFCBP**
Zagreb or Central Croatian macroregion		
Zagreb County	-283.5	-17.8
Krapina-Zagora County	113.7	70.5
Sisak-Moslavina County	390.3	124.0
Karlovac County	40.7	-170.2
Varaždin County	549.6	503.9
Koprivnica-Križevci County	256.4	18.1
Bjelovar-Bilogora County	60.6	-133.3
Međimurje County	21.6	-47.1
Total excl. Zagreb	1,148.8	348.0
City of Zagreb	-4,685.1	247.0
Zagreb macroregion total	-3,536.3	595.1
Osijek or Slavonian macroregion		
Virovitica-Podravina County	121.3	-5.9
Požega-Slavonia County	63.0	-54.7
Brod-Posavina County	94.8	-66.0
Osijek-Baranja County	752.8	181.1
Vukovar-Srijem County	139.5	-72.7
Osijek macroregion total	1,171.3	-18.2
NUTS 2 Continental Croatia	-2,365.0	576.9
Rijeka or Primorje-Gorski Kotar macroregion		
Primorje-Gorski Kotar County	1,064.3	132.7
Lika-Senj County	174.0	30.5
Istria County	1,840.2	1,512.2
Rijeka macroregion total	3,078.5	1,675.4
Split or Dalmatia macroregion		
Zadar County	732.0	351.2
Šibenik-Knin County	1,001.1	920.9
Split-Dalmatia County	-453.0	-1,159.8
Dubrovnik-Neretva County	637.0	265.9
Split macroregion total	1,917.0	378.2
NUTS 2 Adriatic Croatia	4,995.5	2,053.7
RC total	2,630.6	2,630.6

Table 3, like all the subsequent tables, contains two variants of the balance of the balance of foreign currency inflows and outflows of the more closely defined territorial units. In the first, labelled (*), data per county are obtained on the basis of the classification of firms that have imported or exported goods and/or services into or out of the county (municipality, city) in which they are registered according to the registry of business entities. This is the usual approach in official statistics, hence the this variant of the balance has no E in its title. The second variant, marked with (**), estimates (hence the E) the imports of goods and services per county by

dividing the total Croatian imports according to the country structure of GDP. Such a distribution can be justified by a direct import coefficient that is calculated by comparing import with GDP. Other sub-balances (tourism, long-term and short-term capital) are the same in both versions of the regional balances of payments.

Apart from data for the twenty counties and Zagreb City, regional aggregates are also produced in table 3. In line with European criteria, Croatia is divided into two NUTS 2 regions, Continental Croatia and Adriatic Croatia (Regional Development of Croatia Law, OG 147/14) and also according to the division into regions from the Croatian Encyclopaedia (LZMK 2013-2015) into four macro-regions, those of Zagreb, Osijek, Rijeka and Split.

All sources, as well as the methodology of the alternative balances, and for the definitions of the regional units, are given along with the tables in the appendix.

In the official version (RFCBP*), all the counties, except for the Zagreb County, Zagreb City and Split-Dalmatia are positive with respect to foreign currency. The import of goods is the item that conditions this distribution of success. The very low coverage of goods imports by exports has brought the whole of the Zagreb macroregion, and even the NUTS 2 Continental Croatia, to a negative balance. In the Split-Dalmatia County, the negative balance of foreign currency inflows and outflows is contributed to not only by the import-export deficit but also by the very large discrepancy of loans and deposits.

Graph 1

Regional balances of foreign currency inflows and outflows per county in 2012*

The picture will be different and, it seems, more realistic if imports are divided according to GDP criteria. This criterion brings imports closer to their ultimate purpose and is more accurate than records according to the address of the import firm. To answer the question just how much more accurate, one would have to have data of the importers (mainly from Zagreb) about the ultimate destination of the goods imported.

Instead of the three counties, in this estimated version of regional balances of payments a negative balance is shown by ten of them, with the proviso that the City of Zagreb is no longer among them. It has delivered its negative balance to the surroundings and to the East, to Slavonia. The consequence of this transformation of imports is that both the NUTS 2 regions and the three macroregions, save for the Osijek, are foreign currency in the black.

Graph 2

*Balance of regional balances of foreign currency inflows and outflows** per county, 2012*

County statistics that reveal foreign currency positives and negatives, in which some have trading or capital surpluses, and some deficits, suggest a very ordinary question: is it good to be in the black and bad to be in the red? The answer to this question takes us to three situations: (a) a theoretically desirable balance, which from a series of (mainly structural) reasons is never achieved, particularly at the regional level, where the greater openness is positively correlated with opportunities for development; (b) a positive balance, which up to a certain surplus encourages economic development and does not invite criticisms from the surroundings; and (c) a negative balance, which with every greater percentage invites every greater balance of payments problems. Although at first glance the selection is simple one should not forget that we are now inside economic theory and practice, in which the obvious often deceives. Although the positive is good and the negative is bad, for a final estimate of success, the balance of payments of each regional unit has to be located in its national and regional economic framework, in the context of the economic analysis, so that we can give a more accurate answer to the previous question. In essence, this is not the task of this work. But for regional balances of payments not to be just a statistical display and live in isolation, they are correlated with GDP below.

Table 4

Total volume of foreign currency transactions (TVFCT) per unit of GDP and per capita, according to NUTS 2, macroregions and counties in 2012, Croatia = 100

NUTS 2, macroregion, county	TVCFT*/ GDP	UODT**/ GDP	TVCFT */ per capita	TVCFT **/ per capita
Zagreb or Central Croatian macroregion				
Zagreb County	99.6	93.8	75.8	71.4
Krapina-Zagora County	87.9	90.7	53.1	54.8
Sisak-Moslavina County	63.7	74.1	49.7	57.8
Karlovac County	65.5	77.3	48.0	56.5
Varaždin County	98.5	100.2	79.4	80.7
Koprivnica-Križevci County	58.6	70.8	52.0	62.8
Bjelovar-Bilogora County	63.1	76.0	41.8	50.3
Međimurje County	88.3	92.2	72.5	75.7
Total excl. Zagreb	81.7	86.1	62.0	65.2
City of Zagreb	113.6	95.5	205.7	172.9
Zagreb macroregion total	100.8	91.7	116.9	106.4
Osijek or Slavonian macroregion				
Virovitica-Podravina County	63.3	76.5	37.8	45.7
Požega-Slavonia County	68.9	82.5	40.3	48.2
Brod-Posavina County	75.7	85.1	42.8	48.1
Osijek-Baranja County	68.9	81.5	54.0	63.8
Vukovar-Srijem County	59.6	70.4	34.5	40.7
Osijek macroregion total	67.7	79.5	44.4	52.2
NUTS 2 – Continental Croatia	94.8	89.5	96.6	91.2
Rijeka or Primorje-Gorski Kotar macroregion				
Primorje-Gorski Kotar County	86.9	99.8	110.7	127.2
Lika-Senj County	77.2	97.2	57.4	72.2
Istria County	138.5	145.3	170.9	179.2
Rijeka macroregion total	106.1	117.0	128.4	141.6
Split or Dalmatia macroregion				
Zadar County	113.5	128.2	91.0	102.7
Šibenik-Knin County	168.1	173.2	126.9	130.8
Split-Dalmatia County	103.3	113.9	79.3	87.5
Dubrovnik-Neretva County	122.0	138.6	117.2	133.1
Split macroregion total	116.3	128.1	93.1	102.6
NUTS 2 – Adriatic Croatia	111.2	122.6	107.0	117.9
RC total	100.0	100.0	100.0	100.0

It is usual to measure the inclusion of some economy in international change by the share of imports and/or exports of goods and services in GDP. This is how economies are ranked and compared. Because of the heterogeneous structure of the balance of payments, it includes the funds, and so it is only exceptionally compared with GDP. Since the regional balances of payments presented in this paper are very specific, the arguments were set out on the preceding pages, and since the natural need of researchers is to compare and rank, the indicator of inclusion of given regional units in Croatian foreign currency transactions (at home and abroad) is defined. In the indicator the total volume of foreign currency transac-

tions of regional units (TVFCT), those on the inflow and outflow side, is first of all compared with the GDP of these units, and then with the Croatian average. In the result is the index of inclusion that locates (and ranks) regional units around the Croatian average. The same procedure is repeated for the second indicator, although here instead of GDP it is the populations of regional units that are placed in the denominator. Additional analytical gains would come from an indicator that would analyse foreign currency inflows and outflows separately, but this investigative pleasure must be reserved for some other occasion or some other analyst.

One country, two foreign currency economies. Or perhaps three, because the City of Zagreb is a story all to itself. With the honourable exception of Varaždin, all the counties in Continental Croatia are below the Croatian average in terms of the first indicator. The volume of foreign currency transactions in terms of GDP is somewhere between 58 and 85% of the Croatian average. In Adriatic Croatia, only Lika-Senj County shares the same fate. All the other counties, save the Split-Dalmatia per capita, are above the Croatian and even the Zagreb average.

Per capita indicators increase the regional differences. The Osijek macroregion is just above half of the Croatian average, and the Zagreb (not including Zagreb City) hovers at two thirds of this average. While the Split macroregion according to this indicator has come down to the Croatian average, the Rijeka macroregion is a serious rival to the City of Zagreb.

As already pointed out, all these differences do not have to mean that Adriatic Croatia is richer and that it's better to live and do business there, and that in Continental Croatia all of that is worse. What the numbers do show, however, is that there is a different degree of exposure among the counties to almost all instruments and measures of monetary policy (exchange rate, inflation, foreign currency interventions, interest rates and so on). This would require a selective approach to monetary (and fiscal) policy, although such a demand as a whole brings an ironical or sour smile to the face of someone in charge of this policy. In favour of such a demand, although unwillingly it is sometimes necessary to look for the heaviest artillery, constitutional and statutory regulation about regional equality in which there is an insistence of the link of local and regional developmental needs with the priorities of the development of the central level and the adoption of measures for the even development of units of local and regional self-government.

TABLE 5

Balance of sub-balances of regional balances of payments, 2012, in terms of NUTS 2, macroregions and counties in millions of euros

NUTS 2, macroregion, county	Trade in goods Exports (+) Imports (-)		Trade in services Earnings (+) Expenditures (-)		Tourist activity Foreigners (+) Locals (-)	Direct investment From (+) to (-) abroad	F.c. loans (+) and deposits (-)
	Balance*	Balance**	Balance*	Balance**	Balance	Balance	Balance
Zagreb or Central Croatian macroregion							
Zagreb County	-864	-549	84	35	-35	128	4,049
Krapina-Zagora County	42	17	-8	-27	-8	2	863
Sisak-Moslavina County	205	-19	11	-31	-12	7	179
Karlovac County	55	-133	4	-18	15	3	-36
Varaždin County	223	218	-2	-43	-19	44	303
Koprivnica-Križevci County	73	-139	4	-22	-15	6	188
Bjelovar-Bilogora County	-31	-200	1	-24	-12	23	79
Međimurje County	97	55	-2	-29	-12	2	-64
Total excl. Zagreb	-200	-749	93	-158	-97	213	1,139
City of Zagreb	-6,147	-1,865	105	756	-220	753	824
Zagreb macroregion total	-6,347	-2,614	198	597	-318	967	1,963
Osijek or Slavonian macroregion							
Virovitica-Podravina County	49	-60	-0.06	-18	-8	1	80
Požega-Slavonia County	33	-70	-1	-16	-8	1	38
Brod-Posavina County	-23	-155	15	-13	-14	3	113
Osijek-Baranja County	29	-466	10	-67	-38	1	751
Vukovar-Srijem County	-54	-232	1	-33	-17	-8	217
Osijek macroregion total	33	-984	26	-147	-85	-1	1,199
NUTS 2 Continental Croatia	-6,314	-3,598	224	450	-403	965	3,163
Rijeka or Primorje-Gorski Kotar macroregion							
Primorje-Gorski Kotar County	-31	-887	131	56	1,032	106	-174
Lika-Senj County	5	-125	-0.15	-13	167	4	-2
Istria County	15	-269	-4	-48	2,123	55	-349
Rijeka macroregion total	-10	-1,281	126	-5	3,322	165	-525
Split or Dalmatia macroregion							
Zadar County	25	-345	47	37	773	12	-126
Šibenik-Knin County	2	-55	100	78	319	-21	600
Split-Dalmatia County	-199	-841	-45	-110	1,075	46	-1,329
Dubrovnik-Neretva County	-46	-420	69	72	756	6	-148
Split macroregion total	-218	-1,662	171	76	2,923	43	-1,002
NUTS 2 Adriatic Croatia	-228	-2,943	297	71	6,245	208	-1,527
RC total	-6,541	-6,541	521	521	5,842	1,173	1,636

A look at the balance of sub-balances in table 5 will expand the understanding and more precisely indicate the need for and direction of action. In the mosaic of positive and negative foreign currency balances there are sufficient elements for a separate study to be written about each country. Particularly if the absolute amounts of the individual items presented in the tables at the end of the paper are used as analytical material as well.

In this place, merely a basic impression.

Something has been already said about goods trade and services trade with foreign countries from the perspective of consolidated regional balances. In this balance sheet, just as in the balance of services, a change of registration of import from the address of the firm that has implemented imports of goods and services to the potential final purpose of the import has spread the negative county balances into the whole Croatian space. The foreign currency balance of tourism has without any doubt divided Croatia into two parts. The households and corporate of continual Croatia spend more on going abroad than they earn in foreign currency terms from foreign tourists. The balance of foreign investments is negative only in two counties (Vukovar-Srijem, Šibenik-Knin). And finally, the balance of foreign currency loans and deposits. Non-financial corporate show a negative balance in all counties, and the balance of households, and still more the total balance of loans and deposits of both residents, once again tells of a bipartite foreign currency and economic Croatia.

Graph 3

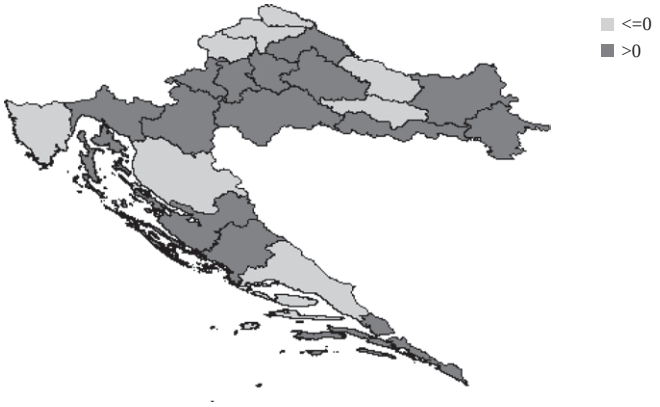
Balance of imports (+) and exports* (-) according per county, 2012*

Graph 4

Balance of goods exports (+) and imports (-) per country, 2012*

Graph 5

Balance of earnings (+) and expenditures (-) on services per county, 2012*



Graph 6

Balance of earnings (+) and expenditures** (-) per county, 2012*

Graph 7

Balance of foreign currency earnings (+) and expenditures (-) from tourism per county, 2012

Graph 8

Balance of direct investments to (-) and from (+) foreign countries, per county, 2012

Graph 9

Balance of foreign currency loans (+) and deposits (-) of non-financial corporates per county, 2012

Graph 10

Balance of foreign currency loans (+) and deposits (-) of households per county, 2012

Graph 11

Balance of foreign currency loans (+) and deposits (-) of non-financial corporates and households per county, 2012

5 CASE STUDY: EXPOSURE TO FOREIGN CURRENCY RISK, OR, THE EFFECTS OF A CHANGE IN THE EXCHANGE RATE OF THE KUNA ON THE GDP OF THE REGIONS

The purpose of making a regional balance of payments is to provide a data base for the economic analysis of the effects of the foreign currency activities of the region founded on macroeconomic aggregates. Because of the meagre information base of the regional level in Croatia, only a few variables can be correlated. How vigorously some economic variable will react to the change of some other variable with which it is interdependent shows us the coefficient of elasticity. Having at our disposal information about the foreign currency transactions of the regions allows us to calculate GDP elasticity to changes in the exchange rate of the national currency.

In every macroeconomics textbook you can read that, with certain elasticity conditions, devaluation will improve the foreign trade balance. What happens if we factor into the analysis the other segments of the balance of payments? Elementary economic logic will tell us of the consequences of depreciation (or devaluation) of the domestic currency to every individual resident (Babić, 2000). Let us go in order.

The depreciation of the domestic currency will, immediately after the announcement of the new exchange rates, increase the value of foreign claims and claims contracted with a foreign currency clause. Earnings related to foreign currency outputs on foreign and domestic markets are increased. On the other side, that of liabilities, the costs for the procurement of raw materials and foreign equipment will be increased by the amount of the exchange rate change, and the costs of interest payment on foreign currency loans and loans with a foreign currency clause as well. All the necessary data for the calculation of this effect are contained in the balances of payments of the regions displayed above.

Households in Croatia have more assets than liabilities, which in the event of a depreciation of the domestic currency will result in positive effects for the assets of this sector, as compared with its liabilities. If the statistical circumstances were more favourable (if remittances from abroad and foreign pensions were not included) the positive effect of this resident in the calculation would be still more marked.

The financial sector too is powerfully involved in the matter of depreciation. Foreign currency loans and loans with a currency clause would become more expensive by the amount of the depreciation. Repayment instalments would be increased by the same amount. At the same time, owners of foreign currency deposit accounts would send their hearty thanks to the Central Bank governor who had signed the decision to depreciate.

General government does not exist in the balances of payments, and in the calculation that follows this sector is not effected by depreciation. Accordingly, if only for heuristic reasons, it should be said that with this resident, foreign liabilities (particularly foreign debt) are preponderant, each devaluation will increase them by the same percentage because in every payment the government has to sell kuna.

Table 6 shows the results of two calculations of a hypothetical depreciation of the kuna applied to the regional balance of payments conditions of 2012. This is the reason for the base exchange rate for the kuna being taken as 7.5172 for one euro, the average in that year. In columns 2 and 3 of the table a one-percent deprecation of the kuna is calculated, which has the significance of coefficient of elasticity of GDP on changes in the exchange rate of the domestic currency. In columns 4 and 5 come the results in the case of a ten-percent devaluation. Although the last two columns could have been omitted, a concession was made to the managers of exporting companies who, every year, once again demand depreciation of about that much. Here too, as in the previous calculations, the results are shown for both versions of regional balances of payments obtained by a different treatment of the allocation of the imports of goods and services.

The result is, once again, the same story. Half of the country would win by a depreciation, half would lose. And not a random half of the counties, scattered here and there, but grouped very clearly in terms of geography and the economy. Only to prove the principle that the exception confirms the rule, there is however Međimurje, the only county that would have a positive effect expressed in the percentage of GDP in Continental Croatia, and Šibenik-Knin, the only one with a negative effect in Adriatic Croatia.

The extent to which (in the ERFCBP** version) a potential depreciation would affect the existing regional differences in development, if for a moment we leave out the City of Zagreb, is shown by the following figures. In the thirteen counties of depreciation losers, in 2012, about 49% of the population of Croatia produced about 35% of GDP. On the other hand are the seven winning counties, in which

33% of the population produced 32% of Croatian GDP. There are two important depreciation effects on regional disparities. The first, the better off, would be additionally distanced from those weakest in development; the second, if we look at them as a whole, is that if there were a ten-percent depreciation, the better off would reach the Croatian GDP average.

Table 6

Effect of a depreciation of the kuna against the euro on percentage of GDP of the regions, 2012

NUTS 2, macroregion, county	Difference in % GDP			
	Kuna/euro exchange rate 7.5172→7.5924 (>1%)		Kuna/euro exchange rate 7.5172→8.2689 (>10%)	
	RFCBP*	ERFCBP**	RFCBP *	ERFCBP **
Zagreb or Central Croatian macroregion				
Zagreb County	-0.440	-0.333	-4.397	-3.326
Krapina-Zagora County	-0.071	-0.123	-0.711	-1.230
Sisak-Moslavina County	0.024	-0.169	0.236	-1.694
Karlovac County	0.117	-0.101	1.174	-1.005
Varaždin County	-0.039	-0.071	-0.395	-0.708
Koprivnica-Križevci County	-0.114	-0.341	-1.144	-3.410
Bjelovar-Bilogora County	-0.121	-0.360	-1.210	-3.596
Međimurje County	0.156	0.084	1.558	0.841
Total excl. Zagreb	-0.114	-0.194	-1.138	-1.945
City of Zagreb	-0.431	-0.095	-4.315	-0.954
Zagreb macroregion total	-0.303	-0.135	-3.033	-1.354
Osijek or Slavonian macroregion				
Virovitica-Podravina County	-0.075	-0.319	-0.747	-3.191
Požega-Slavonia County	-0.030	-0.281	-0.297	-2.812
Brod-Posavina County	-0.143	-0.318	-1.432	-3.179
Osijek-Baranja County	-0.305	-0.538	-3.052	-5.383
Vukovar-Srijem County	-0.277	-0.476	-2.769	-4.761
Osijek macroregion total	-0.226	-0.446	-2.263	-4.456
NUTS 2 Continental Croatia	-0.289	-0.191	-2.894	-1.914
Rijeka or Primorje-Gorski Kotar macroregion				
Primorje-Gorski Kotar County	0.365	0.124	3.647	1.242
Lika-Senj County	0.457	0.088	4.575	0.875
Istria County	0.964	0.840	9.642	8.397
Rijeka macroregion total	0.599	0.395	5.989	3.954
Split or Dalmatia macroregion				
Zadar County	0.704	0.431	7.038	4.314
Šibenik-Knin County	-0.236	-0.330	-2.356	-3.304
Split-Dalmatia County	0.615	0.418	6.151	4.179
Dubrovnik-Neretva County	0.772	0.464	7.717	4.644
Split macroregion total	0.557	0.338	5.572	3.385
NUTS 2 Adriatic Croatia	0.578	0.367	5.778	3.667
RC total	-0.015	-0.015	-0.146	-0.146

Graph 12

Positive and negative effects of a hypothetical depreciation per county, 2012

Discussion about the result of each individual county would dilute the essence of this analysis. But at least the leading results among the potential winners and losers should be brought out. In the S version of regional balances of payments, the biggest losers are Zagreb County, City of Zagreb, Osijek-Baranja, Vukovar-Srijem and Šibenik-Knin Counties. In this version of payments balances the winners are all the Adriatic counties apart from Šibenik-Knin. In the E version, the positives are less positive, the negatives more negative, and only the City of Zagreb profits.

At the end, it is important to mention once again, that all the previous calculations hold *ceteris paribus*, that is, in a situation of an isolated influence of foreign currency transfers on economic development. How the effects of depreciation might work if the amount of it, for example, to spill over, in its entirety, through prices, as a result of great exchange rate price elasticity, to end consumers, or, if users might not be able to pay off their loans are issues the answers to which exceed the limits of this paper.

6 CONCLUSION, OR, WHO THINKS THAT FROM THE ANGLE OF FOREIGN CURRENCY LOCALISM THE REGIONAL DIMENSION SHOULD BE DROPPED

It is very clear that the very mention of the regional aspect in the economy of international trade arouses doubts as to the credibility of the methodological apparatus this aspect uses, and then the results based on it. After all it is semantically dubious to apply something international, between nations, then, to smaller territorial units, components of a single nation (and a single economy). If to this is added the unquestionable national monetary integrity, any efforts to build up the statistical and methodological apparatus capable of helping to give answers to many questions about the level to which the regions are involved in international goods and foreign currency flows, and the quality of that involvement, or concerning the influence of monetary policy measures on regional economies, seems futile. It would be possible to carry out many analyses if one were in possession of regional corporate

accounts in which the trade of a region with the surroundings, both domestic and foreign, were registered. However, analysts of the regional economy of Croatia cannot do this, since quite simply such accounts are not drawn up in Croatia.

But what will happen if some analyst insists on wasting his time and attempting, what is more, to present the results of his barren attempts to the public? The public on the whole likes what is attractive. The occasional attraction, even if founded on a dubious methodological framework, can be found in this paper. The academic public, however, requires academic arguments. This public weighs and judges whether there are sufficiently strong arguments in a paper for it to be considered relevant.

Below are what, in this sense, can be found above in this paper.

Above all, the statistics that have been kept in the last sixty years about the situation of the regional Croatian economy moved along the curve of a normal distribution with a temporally precisely determined maximum. The movement was upwards, quantitatively and qualitatively, up to the moment when the first and last regional statistical bulletin was issued (CBS, 1994). Since then, there have been ever fewer regional statistics (save for the demographic), and there are none that are published and capable of being used in the making of regional balances of payments. Accordingly, this paper, implicitly, argues for the restoration of regional economic statistics to the public, for a published regional step forward by the CBS.

Secondly, about the methodology of drawing up regional balances of payments. For the compilation of these balances, the template of the national balance of payments was used, the idea being to territorialise the items, that is, distribute them over the Croatian regional units. From this point of view the ideal regional balance of payments was determined without the items of general government. On the way from the ideal, because of the non-existence of all the necessary data, regional balances of payments were transformed into what is objectively possible. They became a systematic depiction of the values of accessible economic transactions of regional residents that, no matter whether with foreign countries or with domestic residents, were carried out in a foreign currency or in the domestic currency with a foreign currency clause in a given period. Conceived in such a way, regional balances of payments should in great part be considered foreign currency balances. The final result of the gap between theory (the ideal balance) and statistical practice (what is objectively possible) is the regional balances of payments shown in the paper, in which the balances of goods and services and the balances of capital and financial transactions are shown, while the balance of transfers and earnings, because of problems with data, is omitted. One more important change happened on the way from the national to the regional balances. The criterion of national accounts "domestic-foreign" in the regional short-term balances of capital and financial transactions was replaced by the "foreign currency-kuna" criterion, according to which all financial transactions of regional residents in foreign currency or kuna with a currency clause, those abroad and those at home, then, is the content of this segment of regional bal-

ances of capital and financial transactions. The paper, then, explicitly offers a methodology for drawing up the balances of payments of the Croatian regions.

Analysis of data from the regional balances of payments identifies important regional differences, in both consolidated balances and in each individual sub-balance. However, it is pointed out in the paper that the differences do not have to mean that some county or region is wealthier or more developed than others that show worse balance of payments performance. What is stressed in the paper is that the different level of county exposure to foreign currency risk potentially requires a selective approach to economic policy.

For an assessment of the foreign currency (and overall international) position of individual regional units, two indicators are used. The first quantifies the involvement of the regions in foreign currency transactions and transactions with a foreign currency clause; the second, used in the Case Study is the coefficient of elasticity of GDP to the kuna exchange rate. Never mind that the first identifies the strength and rate of involvement, and the second a marginal change of a variable, both of them, from the position of the foreign currency balance, indicate the powerful bipartite nature of the Croatian economic space, already recognised in the procedure in which Croatia was divided into Continental and Adriatic. In the event of a depreciation of the kuna, where foreign currency transactions as compared to other economic aggregates are treated *ceteris paribus*, important regional losses and gains would occur, which, according to the results of this analysis, would lead to a great developmental inequality in Croatia. This paper wishes to transform the attractiveness of the results obtained, irrespective of their restrictions in theory and practice, into an invitation for additional research into the influences of measures of economic, and in particular monetary, policy, on regional development.

Well, that was that. Was it worth the effort? Can what has been put forward stand up to academic critiques? Even if the answers to these questions are negative, the author spent three jolly research months on them.

TABLE A1

Area and population of RC per NUTS 2, macroregion** and county in 2011*

NUTS 2, macroregions* and counties of Croatia	Area (km²)	%	Population	%	Pop. den. (inh./km²)
Zagreb or Central Croatian macroregion					
I Zagreb	3,060	5.41	317,606	7.41	103.8
II Krapina-Zagora	1,229	2.17	132,892	3.10	108.1
III Sisak-Moslavina	4,468	7.89	172,439	4.02	38.6
IV Karlovac	3,626	6.41	128,899	3.01	35.5
V Varaždin	1,262	2.23	175,951	4.11	139.4
VI Koprivnica-Križevci	1,748	3.09	115,584	2.70	66.1
VII Bjelovar-Bilogora	2,640	4.66	119,764	2.80	45.4
XX Međimurje	729	1.29	113,804	2.66	156.1
Total	18,762	33.15	1,276,939	29.80	68.1
City of Zagreb	641	1.13	790,017	18.44	1,232.5
Zagreb macroregion total	19,403	34.28	2,066,956	48.24	106.5
Osijek or Slavonian macroregion					
X Virovitica-Podravina	2,024	3.58	84,836	1.98	41.9
XI Požega-Slavonia	1,823	3.22	78,034	1.82	42.8
XII Brod-Posavina	2,030	3.59	158,575	3.70	78.1
XIV Osijek-Baranja	4,155	7.34	305,032	7.12	73.4
XVI Vukovar-Srijem	2,454	4.34	179,521	4.19	73.4
Osijek macroregion total	12,486	22.06	805,998	18.81	64.5
NUTS 2 – Continental Croatia	31,889	56.34	2,872,954	67.05	90.09
Rijeka or Primorje-Gorski Kotar macroregion					
VIII Primorje-Gorski Kotar	3,588	6.34	296,195	6.91	82.5
IX Lika-Senj	5,353	9.46	50,927	1.19	9.5
XVIII Istria	2,813	4.97	208,055	4.86	74.0
Rijeka macroregion total	11,754	20.77	555,177	12.96	47.2
Split or Dalmatia macroregion					
XIII Zadar	3,646	6.44	170,017	3.97	46.6
XV Šibenik-Knin	2,984	5.27	109,375	2.55	36.6
XVII Split-Dalmatia	4,540	8.02	454,798	10.61	100.2
XIX Dubrovnik-Neretva	1,781	3.15	122,568	2.86	68.8
Split macroregion total	12,951	22.88	856,758	19.99	66.1
NUTS 2 – Adriatic Croatia	24,705	43.65	1,411,935	32.95	57.15
RC total	56,594	100.00	4,284,889	100.00	75.0

** Pursuant to Article 43 of the Official Statistics Law (OG 103/03, 75/09, 52/12) the CBS determines the National Classification of Spatial Units. In August 2012 the EC accepted the proposal for the division of the RC into two NUTS 2 regions, that is, Continental and Adriatic Croatia. The use of the new classification for the purpose of the Cohesion Policy started when Croatia joined the EU, i.e. on July 1, 2013.*

*** Regionalisation according to: Hrvatska enciklopedija, Internet edition, Leksikografski zavod Miroslav Krleža, Zagreb, 2013-2015.*

Source: CBS, Census of population, households and dwellings, 2011; CBS, Statistical Bulletin, 2014.

TABLE A2

GDP of the RC per NUTS 2, macroregion and county in 2012

NUTS 2, macroregions, counties	GDP millions of euros	%	Per capita GDP in euros	Croatia = 100
Zagreb or Central Croatian macroregion				
Zagreb	2,481	5.64	7,812	76.1
Krapina-Zagora	823	1.87	6,193	60.4
Sisak-Moslavina	1,380	3.14	8,003	78.0
Karlovac	968	2.20	7,510	73.2
Varaždin	1,454	3.31	8,264	80.6
Koprivnica-Križevci	1,052	2.39	9,102	88.7
Bjelovar-Bilogora	813	1.85	6,788	66.2
Međimurje	958	2.18	8,418	82.1
Total excl. Zagreb	9,929	22.59	7,776	75.8
City of Zagreb	14,675	33.38	18,576	181.1
Zagreb macroregion total	24,604	55.97	11,903	116.0
Osijek or Slavonian macroregion				
Virovitica-Podravina	520	1.18	6,129	59.7
Požega-Slavonia	468	1.06	5,997	58.5
Brod-Posavina	920	2.09	5,802	56.6
Osijek-Baranja	2,452	5.58	8,039	78.4
Vukovar-Srijem	1,065	2.42	5,932	57.8
Osijek macroregion total	5,425	12.34	6,731	65.6
NUTS 2 – Continental Croatia	30,029	68.31	10,452	101.9
Rijeka or Primorje-Gorski Kotar macroregion				
Primorje-Gorski Kotar	3,873	8.81	13,076	127.5
Lika-Senj	388	0.88	7,619	74.3
Istria	2,633	5.99	12,655	123.4
Rijeka macroregion total	6,894	15.68	12,418	121.0
Split or Dalmatia macroregion				
Zadar	1,398	3.18	8,223	80.2
Šibenik-Knin	847	1.93	7,744	75.5
Split-Dalmatia	3,583	8.15	7,878	76.8
Dubrovnik-Neretva	1,208	2.75	9,856	96.1
Split macroregion total	7,036	16.01	8,212	80.0
NUTS 2 – Adriatic Croatia	13,930	31.69	9,866	96.2
RC total	43,959	100.00	10,259	100.0

Source: CBS, Communication no. 12.1.6. Gross Domestic Product for the RC, NCSU, level two and counties for the 2000-2012 period (ESA 2010), Zagreb, 13 March 2015.

TABLE A3

International goods trade of the RC in mil. euros♦ – exports and imports* per NUTS 2, macroregion and county in 2012*

NUTS 2, macroregions, counties	Export*	%	Import*	%	Balance	Coverage (Export/Import)
Zagreb or Central Croatian macroregion						
Zagreb	362.1	3.77	1,226.2	7.59	-864.1	29.53
Krapina-Zagora	319.8	3.33	278.2	1.72	41.6	114.95
Sisak-Moslavina	488.1	5.08	282.8	1.75	205.3	172.62
Karlovac	222.4	2.32	167.4	1.04	55.0	132.87
Varaždin	752.3	7.83	529.5	3.28	222.8	142.07
Koprivnica-Križevci	247.8	2.58	174.6	1.08	73.2	141.96
Bjelovar-Bilogora	98.7	1.03	129.4	0.80	-30.7	76.30
Međimurje	406.9	4.24	310.1	1.92	96.7	131.20
Total excl. Zagreb	2,898.0	30.17	3,098.0	19.19	-200.1	93.54
City of Zagreb	3,525.5	36.70	9,672.1	59.90	-6,146.6	36.45
Zagreb macroregion total	6,423.5	66.87	12,770.1	79.09	-6,346.6	50.30
Osijek or Slavonian macroregion						
Virovitica-Podravina	130.6	1.36	81.7	0.51	48.9	159.80
Požega-Slavonia	101.5	1.06	69.0	0.43	32.5	147.11
Brod-Posavina	182.8	1.90	205.8	1.27	-23.0	88.82
Osijek-Baranja	434.93	4.53	406.1	2.52	28.6	107.04
Vukovar-Srijem	159.3	1.66	213.4	1.32	-54.1	74.66
Osijek macroregion total	1,008.8	10.50	976.0	6.04	32.9	103.37
NUTS 2 – Continental Croatia	7,432.3	77.37	13,746.0	85.13	-6,313.8	54.07
Rijeka or Primorje-Gorski Kotar macroregion						
Primorje-Gorski Kotar	535.3	5.57	565.9	3.50	-30.6	94.59
Lika-Senj	17.4	0.18	12.2	0.08	5.3	143.32
Istria	698.1	7.27	682.7	4.23	15.5	102.27
Rijeka macroregion total	1,250.9	13.02	1,260.8	7.81	-9.8	99.22
Split or Dalmatia macroregion						
Zadar	168.1	1.75	142.6	0.88	25.5	117.86
Šibenik-Knin	255.7	2.66	253.3	1.57	2.4	100.94
Split-Dalmatia	475.2	4.95	674.4	4.18	-199.3	70.45
Dubrovnik-Neretva	23.5	0.24	69.9	0.43	-46.4	33.60
Split macroregion total	922.5	9.60	1,140.3	7.06	-217.8	80.90
NUTS 2 – Adriatic Croatia	2,173.4	22.62	2,401.1	14.87	227.7	90.52
Regions total	9,605.7	100.00	16,147.1	100.00	-6,541.4	59.49
Unassigned	23.0	0.24	67.3	0.42	-44.3	34.14
RC total	9,628.6	100.24	16,214.4	100.42	-6,585.7	59.38

♦ *Average euro/kuna exchange rate in 2012 = 7.5172.*

** Data per county obtained pursuant to the classification of firms that have exported from and imported into the county or municipality or city in which they are registered according to the Register of Business Entities.*

Source: CBS, Communication no. 4.2.4, Trade in goods of the RC with foreign countries in terms of counties, cities and municipalities in 2012 – final figures, Zagreb, 13 June 2013.

TABLE A4

International trade in goods of the RC in millions of euros♦ – exports and imports**, per NUTS 2, macroregion and county in 2012*

NUTS 2, macroregions, counties	Export*	%	Import**	%	Balance	Coverage (Export/Import)
Zagreb or Central Croatian macroregion						
Zagreb	362.1	3.77	911.3	5.64	-549.3	39.73
Krapina-Zagora	319.8	3.33	302.3	1.87	17.5	105.78
Sisak-Moslavina	488.1	5.08	506.9	3.14	-18.8	96.29
Karlovac	222.4	2.32	355.6	2.20	-133.2	62.54
Varaždin	752.3	7.83	534.1	3.31	218.2	140.85
Koprivnica-Križevci	247.8	2.58	386.4	2.39	-138.6	64.13
Bjelovar-Bilogora	98.7	1.03	298.6	1.85	-199.9	33.05
Međimurje	406.9	4.24	351.9	2.18	55.0	115.62
Total excl. Zagreb	2,898.0	30.17	3,647.1	22.59	-749.2	79.46
City of Zagreb	3,525.5	36.70	5,390.5	33.38	-1,864.0	65.40
Zagreb macroregion total	6,423.5	66.87	9,037.6	55.97	-2,614.1	71.07
Osijek or Slavonian macroregion						
Virovitica-Podravina	130.6	1.36	191.0	1.18	-60.4	68.35
Požega-Slavonia	101.5	1.06	171.9	1.06	-70.4	59.06
Brod-Posavina	182.8	1.90	337.9	2.09	-155.2	54.08
Osijek-Baranja	434.9	4.53	900.7	5.58	-466.0	48.26
Vukovar-Srijem	159.3	1.66	391.2	2.42	-231.9	40.72
Osijek macroregion total	1,008.8	10.50	1,992.7	12.34	-983.9	50.63
NUTS 2 – Continental Croatia	7,432.3	77.37	11,030.3	68.31	-3,598.0	67.38
Rijeka or Primorje-Gorski Kotar macroregion						
Primorje-Gorski Kotar	535.3	5.57	1,422.6	8.81	-887.3	37.63
Lika-Senj	17.4	0.18	142.5	0.88	-125.1	12.24
Istria	698.1	7.27	967.2	5.99	-269.0	72.18
Rijeka macroregion total	1,250.9	13.02	2,532.3	15.68	-1,281.4	49.40
Split or Dalmatia macroregion						
Zadar	168.1	1.75	513.5	3.18	-345.4	32.73
Šibenik-Knin	255.7	2.66	311.1	1.93	-55.4	82.20
Split-Dalmatia	475.2	4.95	1,316.1	8.15	-840.9	36.10
Dubrovnik-Neretva	23.5	0.24	443.7	2.75	-420.2	5.29
Split macroregion total	922.5	9.60	2,584.5	16.01	-1,662.0	35.69
NUTS 2 – Adriatic Croatia	2,173.4	22.62	5,116.8	31.69	-2,943.4	42.48
Macroregions total	9,605.7	100.00	16,147.1	100.00	-6,541.4	59.49
Unassigned	23.0	0.24	67.3	0.42	-44.3	34.14
RC total	9,628.6	100.24	16,214.4	100.42	-6,585.7	59.38

♦ *Average euro/kuna exchange rate in 2012 = 7.5172.*

** Export: Data per county obtained pursuant to the classification of firms that have exported from and imported into the county or municipality or city in which they are registered according to the Register of Business Entities.*

*** Import: Estimate of imports per county obtained by dividing RC total imports according to the county structure of GDP.*

Source: CBS, Communication no. 4.2.4. Trade in goods of the RC with foreign countries in terms of counties, cities and municipalities in 2012 – final figures, Zagreb, 13 June 2013.

TABLE A5

International trade in services of the RC in million euros♦ – earnings and expenditures, per NUTS 2, macroregion and county in 2012*

NUTS 2, macroregions, counties	Earnings	%	Expenditures	%	Balance
Zagreb or Central Croatian macroregion					
Zagreb	120.6	5.94	36.1	2.39	84.4
Krapina-Zagora	1.6	0.08	9.7	0.64	- 8.1
Sisak-Moslavina	16.2	0.80	5.3	0.35	11.0
Karlovac	15.0	0.74	10.5	0.70	4.4
Varaždin	7.2	0.36	8.9	0.59	- 1.7
Koprivnica-Križevci	14.0	0.69	9.7	0.64	4.3
Bjelovar-Bilogora	4.0	0.20	3.2	0.21	0.9
Međimurje	4.2	0.21	6.1	0.40	- 1.9
Total excl. Zagreb	182.8	9.00	89.4	5.92	93.4
City of Zagreb	1,259.7	62.01	1,154.7	76.46	105.0
Zagreb macroregion total	1,442.5	71.01	1,244.1	82.38	198.4
Osijek or Slavonian macroregion					
Virovitica-Podravina	0	0.00	0.1	0.00	- 0.1
Požega-Slavonia	0.1	0.01	1.2	0.08	- 1.1
Brod-Posavina	18.4	0.91	3.0	0.20	15.4
Osijek-Baranja	17.4	0.86	7.1	0.47	10.3
Vukovar-Srijem	3.5	0.17	2.2	0.14	1.3
Osijek macroregion total	39.4	1.94	13.6	0.90	25.8
NUTS 2 – Continental Croatia	1,482.0	72.95	1,257.7	83.28	224.2
Rijeka or Primorje-Gorski Kotar macroregion					
Primorje-Gorski Kotar	189.0	9.30	58.2	3.85	130.8
Lika-Senj	0.001	0.00	0.2	0.01	- 0.2
Istria	42.7	2.10	47.0	3.11	- 4.3
Rijeka macroregion total	231.7	11.40	105.4	6.98	126.3
Split or Dalmatia macroregion					
Zadar	85.4	4.20	38.2	2.53	47.1
Šibenik-Knin	106.6	5.25	6.6	0.44	100.0
Split-Dalmatia	12.6	0.62	58.1	3.84	- 45.4
Dubrovnik-Neretva	113.3	5.58	44.2	2.93	69.1
Split macroregion total	317.9	15.65	147.1	9.74	170.8
NUTS 2 – Adriatic Croatia	549.6	27.05	252.5	16.72	297.2
RC excl. tourism	2,031.6	100.00	1,510.2	100.00	521.4
Unknown county (tourism)**	7,609.9	374.58	1,611.4	106.70	5,998.6
RC total	9,641.5	474.58	3,121.6	206.70	6,520.0

♦ *Average euro/kuna exchange rate in 2012 = 7.5172.*

** Data per county obtained pursuant to the classification of firms that have had earnings or expenditures in the county or municipality or city in which they are registered according to the Register of Business Entities.*

*** The item unknown county refers to the services that cannot be assigned to a county, and mostly relate to travel services (tourism) the expenditures of which cannot be geographically divided because of the shortcomings of the method of estimation.*

Source: CNB, Statistics Sector, July 2013.

Drawn up in alignment with the Metodologija za razmjenu usluga s inozemstvom <http://www.hnb.hr/statistika/razmjena-usluga-inozemstvom/h-obuhvat-metodologija.pdf >.

TABLE A6

International trade in services of the RC in million euros♦ – earnings and expenditures, per NUTS 2, macroregion and county, 2012*

NUTS 2, macroregions, counties	Earnings	%	Expenditures	%	Balance
Zagreb or Central Croatian macroregion					
Zagreb	120.6	5.94	85.2	5.64	35.3
Krapina-Zagora	1.7	0.08	28.3	1.87	-26.6
Sisak-Moslavina	16.2	0.80	47.4	3.14	-31.2
Karlovac	15.0	0.74	33.3	2.20	-18.3
Varaždin	7.2	0.36	50.0	3.31	-42.7
Koprivnica-Križevci	14.0	0.69	36.1	2.39	-22.2
Bjelovar-Bilogora	4.0	0.20	27.9	1.85	-23.9
Međimurje	4.2	0.21	32.9	2.18	-28.7
Total excl. Zagreb	182.8	9.00	341.1	22.59	-158.3
City of Zagreb	1,259.7	62.01	504.2	33.38	755.6
Zagreb macroregion total	1,442.5	71.01	845.3	55.97	597.3
Osijek or Slavonian macroregion					
Virovitica-Podravina	0	0	17.9	1.18	-17.9
Požega-Slavonia	0.1	0.01	16.1	1.06	-16.0
Brod-Posavina	18.4	0.91	31.6	2.09	-13.2
Osijek-Baranja	17.41	0.86	84.2	5.58	-66.8
Vukovar-Srijem	3.5	0.17	36.6	2.42	-33.1
Osijek macroregion total	39.4	1.94	186.4	12.34	-146.9
NUTS 2 – Continental Croatia	1,482.0	72.95	1,031.6	68.31	450.3
Rijeka or Primorje-Gorski Kotar macroregion					
Primorje-Gorski Kotar	189.0	9.30	133.1	8.81	55.9
Lika-Senj	0.001	0.00	13.3	0.88	-13.3
Istria	42.7	2.10	90.5	5.99	-47.7
Rijeka macroregion total	231.7	11.40	236.8	15.68	-5.2
Split or Dalmatia macroregion					
Zadar	85.4	4.20	48.0	3.18	37.3
Šibenik-Knin	106.6	5.25	29.1	1.93	77.5
Split-Dalmatia	12.6	0.62	123.1	8.15	-110.5
Dubrovnik-Neretva	113.3	5.58	41.5	2.75	71.8
Split macroregion total	317.9	15.65	241.7	16.01	76.2
NUTS 2 – Adriatic Croatia	549.6	27.05	478.6	31.69	71.1
RC services excl. tourism	2,031.6	100.00	1,510.2	100.00	521.4
Unknown county (tourism)**	7,609.9	374.58	1,611.4	106.70	5,998.6
RC total	9,641.5	474.58	3,121.6	206.70	6,520.0

♦ *Average euro/kuna exchange rate in 2012 = 7.5172.*

** Data per county obtained by dividing the total expenditures on services of the RC according to the country GDP structure.*

*** The item unknown county refers to the services that cannot be assigned to a county, and mostly relate to travel services (tourism) the expenditures of which cannot be geographically divided because of the shortcomings of the method of estimation.*

Source: CNB, Statistics Sector, July 2013.

Drawn up in alignment with the Metodologija za razmjenu usluga s inozemstvom <http://www.hnb.hr/statistika/razmjena-usluga-inozemstvom/h-obuhvat-metodologija.pdf >.

TABLE A7

Foreign currency earnings from tourism in 2012, million euros♦, estimate according to NUTS 2, macroregions and counties

NUTS 2, macroregion, counties	Daily spending	Foreign overnight stays in commercial accommodation	%	Foreign currency earnings
Zagreb or Central Croatian macroregion				
Zagreb	53.77	1.8	0.05	3.2
Krapina-Zagora	53.77	2.5	0.06	4.4
Sisak-Moslavina	53.77	1.3	0.03	2.2
Karlovac	53.77	14.0	0.36	24.8
Varaždin	53.77	2.1	0.06	3.8
Koprivnica-Križevci	53.77	0.5	0.01	0.8
Bjelovar-Bilogora	53.77	0.5	0.01	0.8
Međimurje	53.77	1.8	0.05	3.2
Total excl. Zagreb	53.77	24.4	0.63	43.2
City of Zagreb	104.86	101.1	2.61	179.2
Zagreb macroregion total	88.52	125.4	3.24	222.4
Osijek or Slavonian macroregion				
Virovitica-Podravina	53.77	0.4	0.01	0.7
Požega-Slavonia	53.77	0.3	0.01	0.5
Brod-Posavina	53.77	0.9	0.02	1.6
Osijek-Baranja	53.77	2.5	0.06	4.4
Vukovar-Srijem	53.77	1.0	0.03	1.8
Osijek macroregion total	53.77	5.0	0.13	8.9
NUTS 2 – Continental Croatia	86.36	130.5	3.37	231.4
Rijeka or Primorje-Gorski Kotar macroregion				
Primorje-Gorski Kotar	57.55	624.3	16.14	1,107.0
Lika-Senj	56.18	96.4	2.49	171.0
Istria	63.79	1,226.1	31.70	2,174.1
Rijeka macroregion total	61.25	1,946.8	50.33	3,452.1
Split or Dalmatia macroregion				
Zadar	78.04	464.2	12.00	823.1
Šibenik-Knin	53.77	197.2	5.10	350.0
Split-Dalmatia	69.64	678.5	17.54	1,203.2
Dubrovnik-Neretva	92.63	450.7	11.65	799.2
Split macroregion total	73.92	1,790.7	46.30	3,175.2
NUTS 2 – Adriatic Croatia	66.73	3,737.5	96.63	6,627.3
RC total	67.24	3,868.0	100	6,858.7

♦ *Average euro/kuna exchange rate in 2012 = 7.5172.*

Source:

1) *Overnight stays of foreign tourists per county of the SBC, Statistical Reports 1491/2013, Table 2.12. Beds, arrivals and overnight stays of tourists per country, city and municipality in 2012, pp. 61-68.*
2) *Average daily tourist spending.*
   - *2.1) Institute of Tourism, Tomas 2012, Views and spending of tourists in Croatia, Table B27. Average daily spending of tourists (commercial accommodation) in euros per county.*
   - *2.2) For the City of Zagreb: Institute of Tourism, Tomas 2014, Views and spending of tourists and visitors to Zagreb, Zagreb 2013, pp. 41-43.*
   - *2.3) For the counties: Zagreb, Krapina-Zagora, Sisak-Moslavina, Karlovac, Varaždin, Koprivnica-Križevci, Bjelovar-Bilogora, Virovitica-Podravina, Požega-Slavonia, Brod-Posavina, Osijek-Baranja, Vukovar and Međimurje estimate at the level of the lowest daily spending level of the Institute of Tourism.*
3) *Balance of Payments, DZS, Statistical Annual Report 2014, tab. 22-11, Balance of payments of the RC, p. 407.*

TABLE A8

Tourist activity of the domestic population in 2012, travels abroad. Estimate according to NUTS 2, macroregions and counties in millions of euros♦

NUTS 2, macroregion, counties	Business	Private	Travels abroad by domestic population
Zagreb or Central Croatian macroregion			
Zagreb	21.7	16.5	38.3
Krapina-Zagora	7.2	5.5	12.7
Sisak-Moslavina	3.7	10.2	13.9
Karlovac	2.6	7.2	9.7
Varaždin	12.7	9.7	22.4
Koprivnica-Križevci	9.2	7.0	16.2
Bjelovar-Bilogora	7.1	5.4	12.5
Međimurje	8.4	6.4	14.8
Total excl. Zagreb	72.7	67.9	140.6
City of Zagreb	111.3	288.3	399.6
Zagreb macroregion total	184.0	356.2	540.2
Osijek or Slavonian macroregion			
Virovitica-Podravina	0.6	8.4	9.0
Požega-Slavonia	0.6	7.6	8.1
Brod-Posavina	1.1	14.9	16.0
Osijek-Baranja	2.9	39.6	42.5
Vukovar-Srijem	1.3	17.2	18.5
Osijek macroregion total	6.4	87.7	94.1
NUTS 2 – Continental Croatia	190.4	443.8	634.2
Rijeka or Primorje-Gorski Kotar macroregion			
Primorje-Gorski Kotar	17.9	57.0	74.9
Lika-Senj	1.0	2.9	3.9
Istria	12.2	38.8	50.9
Rijeka macroregion total	31.1	98.6	129.8
Split or Dalmatia macroregion			
Zadar	13.7	36.4	50.2
Šibenik-Knin	8.3	22.1	30.4
Split-Dalmatia	35.2	93.4	128.6
Dubrovnik-Neretva	11.9	31.5	43.3
Split macroregion total	69.2	183.3	252.5
NUTS 2 – Adriatic Croatia	100.3	282.0	382.2
RC total	290.7	725.9	1,016.5

♦ *Average euro/kuna exchange rate in 2012 = 7.5172.*

NB: Used for the estimate were data from the publication "Tourist activity of the domestic population in 2012", CBS and IZTZG [Institute of Tourism] from April 2013, by regions of permanent dwelling that in this publication represent statistic units (Zagreb, N. Croatia, Slavonia, Lika, Kordun and Banija, Istria, Kvarner and Gorski Kotar, Dalmatia) being disaggregated with the use of data about country GDP into counties and then aggregated into macroregions.

TABLE A9

Foreign currency balance sheet of tourism in the RC in 2012. Estimate per NUTS 2, macroregion and county in million euros♦

NUTS 2, macroregion, counties	Revenue (foreign tourists)	%	Expenditures (foreign travel)	%	Balance
Zagreb or Central Croatian macroregion					
Zagreb	3.2	0.05	38.3	3.76	-35.1
Krapina-Zagora	4.4	0.06	12.7	1.25	-8.3
Sisak-Moslavina	2.2	0.03	13.9	1.37	-11.7
Karlovac	24.8	0.36	9.7	0.96	15.1
Varaždin	3.8	0.06	22.4	2.21	-18.6
Koprivnica-Križevci	0.8	0.01	16.2	1.60	-15.4
Bjelovar-Bilogora	0.8	0.01	12.5	1.23	-11.7
Međimurje	3.9	0.05	14.8	1.45	-11.9
Total excl. Zagreb	43.2	0.63	140.6	13.83	-97.4
City of Zagreb	179.2	2.61	399.6	39.31	-220.4
Zagreb macroregion total	222.4	3.24	540.2	53.14	-317.8
Osijek or Slavonian macroregion					
Virovitica-Podravina	0.7	0.01	9.0	0.89	-8.3
Požega-Slavonia	0.5	0.01	8.1	0.80	-7.6
Brod-Posavina	1.6	0.02	16.0	1.57	-14.3
Osijek-Baranja	4.4	0.06	42.5	4.18	-38.1
Vukovar-Srijem	1.8	0.03	18.5	1.82	-16.7
Osijek macroregion total	8.9	0.13	94.1	9.25	-85.1
NUTS 2 – Continental Croatia	231.4	3.37	634.2	62.39	-402.9
Rijeka or Primorje-Gorski Kotar macroregion					
Primorje-Gorski Kotar	1,107.0	16.14	74.9	7.37	1,032.1
Lika-Senj	171.0	2.49	3.9	0.38	167.1
Istria	2,174.1	31.70	50.9	5.01	2,123.2
Rijeka macroregion total	3,452.1	50.33	129.8	12.76	3,322.3
Split or Dalmatia macroregion					
Zadar	823.1	12.00	50.2	4.94	772.9
Šibenik-Knin	349.7	5.10	30.4	2.99	319.3
Split-Dalmatia	1,203.2	17.54	128.6	12.65	1,074.6
Dubrovnik-Neretva	799.2	11.65	43.3	4.26	755.9
Split macroregion total	3,175.2	46.29	252.5	24.84	2,922.7
NUTS 2 – Adriatic Croatia	6,627.3	96.62	382.2	37.60	6,245.1
RC total	6,858.7	100.00	1,016.5	100.00	5,842.2

♦ *Average euro/kuna exchange rate in 2012 = 7.5172.*

Sources and methodology of the estimate: see tables 6 and 7.

TABLE A10

Direct investments, liabilities and assets, per NUTS 2, macroregion and county in 2012 in million euros♦

NUTS 2, macroregion, counties	Liabilities	%	Assets	%	Balance (liabilities-assets)
Zagreb or Central Croatian macroregion					
Zagreb	-33.4	-3.01	-161.0	253.39	127.6
Krapina-Zagora	4.5	0.40	2.4	-3.79	2.1
Sisak-Moslavina	6.8	0.61	0.0	0.00	6.8
Karlovac	2.3	0.21	-0.3	0.50	2.7
Varaždin	51.5	4.64	7.902	-12.44	43.6
Koprivnica-Križevci	-3.7	-0.33	-9.6	15.04	5.9
Bjelovar-Bilogora	22.6	2.04	-0.1	0.15	22.7
Međimurje	1.2	0.11	-1.0	1.50	2.1
Total excl. Zagreb	51.7	4.67	-161.6	254.37	213.4
City of Zagreb	870.6	78.49	117.3	-184.67	753.3
Zagreb macroregion total	922.4	83.15	-44.3	69.70	966.7
Osijek or Slavonian macroregion					
Virovitica-Podravina	0.8	0.07	0.0	0.00	0.8
Požega-Slavonia	0.8	0.07	0.0	0.00	0.8
Brod-Posavina	4.0	0.36	0.6	-0.94	3.4
Osijek-Baranja	-17.5	-1.57	-19.0	29.83	1.5
Vukovar-Srijem	-8.2	-0.74	0.0	0.00	-8.2
Osijek macroregion total	-20.1	-1.81	-18.4	28.89	-1.7
NUTS 2 – Continental Croatia	902.3	81.34	-62.6	98.59	964.9
Rijeka or Primorje-Gorski Kotar macroregion					
Primorje-Gorski Kotar	101.0	9.10	-5.1	8.13	106.1
Lika-Senj	3.5	0.32	0.0	0.00	3.5
Istria	45.6	4.11	-9.6	15.08	55.2
Rijeka macroregion total	150.1	13.53	-14.7	23.20	164.8
Split or Dalmatia macroregion					
Zadar	-22.5	-2.02	-34.8	54.83	12.4
Šibenik-Knin	-20.9	-1.89	0.01	-0.02	-21.0
Split-Dalmatia	92.8	8.37	47.3	-74.39	45.6
Dubrovnik-Neretva	7.4	0.67	1.4	-2.22	6.0
Split macroregion total	56.9	5.13	13.8	-21.80	43.0
NUTS 2 – Adriatic Croatia	207.0	18.66	-0.9	1.40	207.8
RC total	1,109.2	100.00	-63.5	100.00	1,172.8

♦ *Average euro/kuna exchange rate in 2012 = 7.5172.*

Source: Croatian National Bank, Statistical Sector, July 2015.

For the FDI methodology see <http://www.hnb.hr/statistika/strana-ulaganja/h-info-nova-metodologija.pdf >. More detailed explanations about the introduction of the BPM6 (Assets and Liabilities Principle) instead of BPM5 (Direction of Investment Principle) at <http://www.hnb.hr/statistika/esa-2010/h-esa-prezentacija-skudar.pdf >.

NB: Negative investment in bonds is most often recorded when: (1) a firm in the RC partially or totally pays off a loan given by a foreign creditor with which the Republic of Croatia is affiliated, (2) a firm in the RC pays out a profit share to a foreign investment in an amount greater than the profit made in the same period, and (3) a firm in the RC in which there is a registered foreign investment has negative profits in any amount. If the situation is reversed (a firm outside the RC that is affiliated with an investor in the RC), then negative investment is recorded in Assets.

TABLE A11

Foreign currency loans from credit institutions to non-financial corporates per NUTS 2, macroregion and county at the end of 2012 in million euros♦

NUTS 2, macroregion, counties	Foreign currency loans	The interest on these	Loans with a foreign currency clause	Interest on these	Foreign currency loans total	%
Zagreb or Central Croatian macroregion						
Zagreb	114.5	1.2	338.6	5.8	453.1	4.89
Krapina-Zagora	14.6	0.3	82.3	0.9	96.9	1.05
Sisak-Moslavina	15.2	0.1	80.1	0.9	95.2	1.03
Karlovac	11.2	0.1	72.5	0.99	83.7	0.90
Varaždin	65.7	1.0	299.4	3.6	365.1	3.94
Koprivnica-Križevci	70.8	0.4	103.9	1.3	174.7	1.89
Bjelovar-Bilogora	8.9	0.2	117.4	2.0	126.3	1.36
Međimurje	20.5	0.5	113.3	1.5	133.8	1.44
Total excl. Zagreb	321.4	3.8	1,207.5	16.9	1,528.9	16.50
City of Zagreb	1,129.8	15.9	2,527.6	41.2	3,657.4	39.47
Zagreb macroregion total	1,451.1	19.7	3,735.1	58.1	5,186.2	55.97
Osijek or Slavonian macroregion						
Virovitica-Podravina	0.4	0.01	74.74	0.7	75.1	0.81
Požega-Slavonia	3.9	0.04	61.7	0.8	65.6	0.71
Brod-Posavina	8.4	0.1	138.8	1.9	147.2	1.59
Osijek-Baranja	48.0	0.7	633.8	8.7	681.8	7.36
Vukovar-Srijem	8.1	0.1	163.7	1.5	171.8	1.85
Osijek macroregion total	68.8	0.9	1,072.7	13.7	1,141.5	12.32
NUTS 2 – Continental Croatia	1,519.9	20.6	4,807.8	71.9	6,327.7	68.29
Rijeka or Primorje-Gorski Kotar macroregion						
Primorje-Gorski Kotar	111.4	1.6	543.8	8.3	655.2	7.07
Lika-Senj	3.6	0.04	51.8	0.5	55.4	0.60
Istria	114.9	1.5	417.9	6.8	532.8	5.75
Rijeka macroregion total	230.0	3.1	1,013.4	15.6	1,243.4	13.42
Split or Dalmatia macroregion						
Zadar	40.3	0.5	258.3	3.7	298.6	3.22
Split-Dalmatia	245.4	3.9	661.8	10.3	907.2	9.79
Šibenik-Knin	21.1	0.3	199.4	1.9	220.5	2.38
Dubrovnik-Neretva	22.4	0.2	245.6	4.3	268.0	2.89
Split macroregion total	329.2	4.9	1,365.2	20.2	1,694.4	18.29
NUTS 2 – Adriatic Croatia	559.2	8.0	2,378.6	35.8	2,937.8	31.71
RC total	2,079.1	28.6	7,186.4	107.7	9,265.5	100.00

♦ *Average euro/kuna exchange rate in 2012 = 7.5172.*

Source: Croatian National Bank, Statistical Sector, July 2015.

The methodology follows <http://www.hnb.hr/statistika/statisticki_pregled/hmetod.pdf >, or tables D5 Statistical Review of the CNB for Institutional Sectors.

TABLE A12

Foreign currency loans of credit institutions to households per NUTS 2, macroregion and county at the end of 2012 in million euros♦

NUTS 2, macroregion, counties	Foreign currency loans	Interest on these	Loans with a foreign currency clause	Interest on these	Foreign currency loans total	%
Zagreb or Central Croatian macroregion						
Zagreb	1.8	0.069	1,243.9	7.7	1,245.7	9.40
Krapina-Zagora	0.3	0.005	301.0	2.1	301.2	2.27
Sisak-Moslavina	0.4	0.019	402.6	2.2	403.1	3.04
Karlovac	0.4	0.004	260.5	1.5	260.9	1.97
Varaždin	0.6	0.009	423.9	2.5	424.5	3.20
Koprivnica-Križevci	0.4	0.003	266.5	1.7	266.9	2.01
Bjelovar-Bilogora	0.04	0.001	254.4	1.5	254.5	1.92
Međimurje	1.8	0.009	245.5	1.3	247.2	1.87
Total excl. Zagreb	5.7	0.120	3,398.2	20.4	3,403.9	25.68
City of Zagreb	12.2	0.137	3,631.1	21.8	3,643.3	27.49
Zagreb macroregion total	17.9	0.257	7,029.3	42.2	7,047.2	53.17
Osijek or Slavonian macroregion						
Virovitica-Podravina	0.07	0.001	159.2	1.0	159.3	1.20
Požega-Slavonia	0.01	0.000	162.4	1.0	162.4	1.23
Brod-Posavina	0.3	0.011	339.8	2.1	340.1	2.57
Osijek-Baranja	0.2	0.006	824.1	4.9	824.2	6.22
Vukovar-Srijem	0.04	0.001	331.2	2.0	331.2	2.50
Osijek macroregion total	0.6	0.019	1,816.6	10.8	1,817.2	13.71
NUTS 2 – Continental Croatia	18.5	0.276	8,845.9	53.1	8,864.4	66.88
Rijeka or Primorje-Gorski Kotar macroregion						
Primorje-Gorski Kotar	0.3	0.004	1,067.5	5.4	1,067.8	8.06
Lika-Senj	0.4	0.008	117.5	0.7	117.9	0.89
Istria	0.7	0.015	812.5	4.5	813.2	6.14
Rijeka macroregion total	1.4	0.027	1,997.5	10.6	1,998.9	15.08
Split or Dalmatia macroregion						
Zadar	3.0	0.071	483.1	2.9	486.1	3.67
Šibenik-Knin	0.04	0.002	224.1	1.8	224.1	1.69
Split-Dalmatia	4.8	0.074	1,199.3	7.1	1,204.1	9.09
Dubrovnik-Neretva	6.4	0.078	469.3	2.2	475.7	3.59
Split macroregion total	14.2	0.225	2,375.9	14.0	2,390.1	18.03
NUTS 2 – Adriatic Croatia	15.6	0.252	4,373.3	24.6	4,389.0	33.12
RC total	34.1	0.527	13,219.3	77.6	13,253.4	100.00

♦ *Average euro/kuna exchange rate in 2012 = 7.5172.*

Source: Croatian National Bank, Statistical Sector, July 2015.

The methodology follows <http://www.hnb.hr/statistika/statisticki_pregled/hmetod.pdf >, or tables D5 Statistical Review of the CNB for Institutional Sectors.

TABLE A13

Foreign currency deposits of non-financial corporates per NUTS 2, macroregion and county at the end of 2012 in million euros♦

NUTS 2, macroregion, counties	Foreign currency deposits	Interest on these	Deposits %
Zagreb or Central Croatian macroregion			
Zagreb	65.5	0.4	2.86
Krapina-Zagora	48.4	0.1	2.11
Sisak-Moslavina	27.4	0.1	1.20
Karlovac	18.0	0.1	0.79
Varaždin	45.9	0.4	2.00
Koprivnica-Križevci	15.4	0.1	0.67
Bjelovar-Bilogora	6.3	0.1	0.27
Međimurje	45.7	0.2	2.00
Total excl. Zagreb	272.6	1.6	11.90
City of Zagreb	1,093.8	7.3	47.74
Zagreb macroregion total	1,366.4	8.9	59.64
Osijek or Slavonian macroregion			
Virovitica-Podravina	21.5	0.7	0.94
Požega-Slavonia	6.4	0.02	0.28
Brod-Posavina	15.7	0.2	0.69
Osijek-Baranja	28.1	0.04	1.23
Vukovar-Srijem	12.9	0.04	0.56
Osijek macroregion total	84.6	0.9	3.69
NUTS 2 – Continental Croatia	1,451.0	9.8	63.33
Rijeka or Primorje-Gorski Kotar macroregion			
Primorje-Gorski Kotar	127.8	0.7	5.58
Lika-Senj	2.1	0.02	0.09
Istria	381.8	3.2	16.67
Rijeka macroregion total	511.7	3.9	22.34
Split or Dalmatia macroregion			
Zadar	61.2	1.0	2.67
Šibenik-Knin	11.4	0.1	0.50
Split-Dalmatia	130.1	0.1	5.68
Dubrovnik-Neretva	125.6	0.9	5.48
Split macroregion total	328.3	2.9	14.33
NUTS 2 – Adriatic Croatia	840.0	6.7	36.67
RC total	2,291.0	16.5	100.00

♦ *Average euro/kuna exchange rate in 2012 = 7.5172.*

Source: Croatian National Bank, Statistical Sector, July 2015.

NB: Foreign currency deposits include foreign currency deposits and kuna deposits with a currency clause.

The methodology follows <http://www.hnb.hr/statistika/statisticki_pregled/hmetod.pdf >, or tables D5 Statistical Review of the CNB for Institutional Sectors.

TABLE A14

Foreign currency deposits of households per NUTS 2, macroregion and county at the end of 2012 in million euros♦

NUTS 2, macroregion, counties	Foreign currency deposits	Interest on these	Deposits %
Zagreb or Central Croatian macroregion			
Zagreb	1,229.6	19.2	6.61
Krapina-Zagora	263.9	4.7	1.42
Sisak-Moslavina	292.0	3.6	1.57
Karlovac	363.1	5.1	1.95
Varaždin	440.2	7.1	2.37
Koprivnica-Križevci	237.8	3.5	1.28
Bjelovar-Bilogora	295.0	4.4	1.59
Međimurje	399.2	4.2	2.15
Total excl. Zagreb	3,520.7	51.8	18.94
City of Zagreb	5,383.3	77.6	28.95
Zagreb macroregion total	8,904.0	129.3	47.89
Osijek or Slavonian macroregion			
Virovitica-Podravina	132.8	2.0	0.71
Požega-Slavonia	183.2	3.3	0.99
Brod-Posavina	358.3	5.1	1.93
Osijek-Baranja	727.3	11.5	3.91
Vukovar-Srijem	273.0	3.8	1.47
Osijek macroregion total	1,674.6	25.7	9.01
NUTS 2 – Continental Croatia	10,578.6	155.1	56.90
Rijeka or Primorje-Gorski Kotar macroregion			
Primorje-Gorski Kotar	1,769.3	22.0	9.52
Lika-Senj	172.9	2.8	0.93
Istria	1,313.5	17.8	7.06
Rijeka macroregion total	3,255.7	41.8	17.51
Split or Dalmatia macroregion			
Zadar	849.	9.9	4.57
Šibenik-Knin	519.6	4.2	2.79
Split-Dalmatia	2,623.1	38.5	14.11
Dubrovnik-Neretva	765.7	9.4	4.12
Split macroregion total	4,757.8	61.9	25.59
NUTS 2 – Adriatic Croatia	8,013.6	103.7	43.10
RC total	18,592.2	258.8	100.00

♦ *Average euro/kuna exchange rate in 2012 = 7.5172.*

Source: Croatian National Bank, Statistical Sector, July 2015.

NB: Foreign currency deposits include foreign currency deposits and kuna deposits with a currency clause.

The methodology follows <http://www.hnb.hr/statistika/statisticki_pregled/hmetod.pdf >, or tables D5 Statistical Review of the CNB for Institutional Sectors.

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Tax penalties in SME tax compliance

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Review article**
JEL: H26, H32, H83, K42
doi: 10.3326/fintp.40.1.4

* The author is grateful to John Norregaard and Enrique Rojas (both IMF), and two anonymous referees for their valuable comments. All errors and omissions are the author's sole responsibility.
A previous version of this paper was presented at the regional conference: *Challenges of Tax Compliance by Small and Medium Enterprises* organized by the World Bank in Sankt Petersburg, Russia on September 20-21, 2012.
** Received: September 25, 2015
Accepted: November 10, 2015

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FINANCIAL THEORY AND PRACTICE
40 (1) 129-147 (2016)

Abstract

Small business tax compliance requires special attention. On the one hand small businesses are often incapable of rigorously fulfilling their tax obligations, more vulnerable to external risks and tempted to exploit opportunities to be non-compliant. On the other hand, unlike larger businesses, they are usually sole proprietors or owner-operated businesses, hence highly responsive to personal, social, cognitive and emotional factors. These attributes pave the way to a better use of measures designed to influence their behavior and choices. This paper discusses the role and effectiveness of tax penalties in enhancing tax compliance in small businesses. It argues that tax penalties, although indispensable for tax enforcement, may not be a first-choice tool in ensuring tax compliance. Too punitive a tax regime is an important barrier to business formalization and increasing severity of tax penalties does not produce the intended results. To be effective, tax penalties should deter and motivate taxpayers rather than exert repressive measures against them.

Keywords: tax penalties, tax enforcement, SME's tax compliance, SME taxation

1 INTRODUCTION

Small and medium-sized enterprises (SMEs) are an important part of the taxpayer population in any country around the globe. Their taxation usually poses a number of challenges. They are numerous but contribute relatively little to the state coffers, while often absorbing a large share of scarce tax administration resources much needed elsewhere in administering the tax system. Moreover, low levels of tax compliance are observed among SMEs, particularly among the self-employed, thus further reducing potential tax collections and increasing the tax administration effort (Engelshalk 2004; OECD, 2009; 2014). Many countries address these issues by adopting simplified tax regimes for SMEs and implementing dedicated compliance strategies (IFC, 2007; OECD, 2009; Crawford and Freedman, 2010). While the primary objective of a well-designed simplified tax regime is to improve efficiency of small businesses taxation, by reducing both compliance costs and tax administration effort, the compliance-enhancing strategies aim at the inclusion and more efficient use of different administrative instruments that allow more taxpayers to be brought into the tax net, encourage existing taxpayers to voluntarily fulfill their tax obligations, and ultimately to create a widespread culture of paying taxes.

There is a whole universe of measures that may be used to boost tax compliance. Presumptive taxation, less onerous tax obligations, including reduced frequency of filing and tax payments, use of third party information, IT solutions, and open communication with taxpayers are just a few examples (Thuronyi, 1998; Chen et al., 2002; Engstom et al., 2006; OECD, 2009; 2010; Swistak, 2015). Tax penalties also play a role – from deterrence to motivation and correction of improper behavior of taxpayers (Wenzel, 2004; OECD, 2010; Poppelwell, 2012).

None of these measures give satisfactory results if implemented alone. They are more efficient when used in a mix of complementary instruments. Tax penalties

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may be, and usually are, a very important part of this mix (Devos, 2004; Poppelwell et al., 2012). They may be powerful in influencing taxpayer behavior but never should they be seen as a primary or a stand-alone tool (Tyler, 2006; OECD, 2010). As noted by Matthews (2005) the myth of punitiveness has long been shattered. Tax penalties have the potential to work better if used as an auxiliary means of delivering and implementing a sound compliance strategy. It is thus important that policy makers and tax administrators have a good understanding of the nature of tax penalties. Otherwise their negligence or overuse may become commonplace.

Yet, it is not only the extent to which traditional tax penalties are used that defines the overall quality of taxation and behavioral responsiveness of taxpayers. Certain tax design features and tax administration actions may also be punitive for taxpayers. As such they become an important part of the discussion on tax penalties, or – to put it broadly – the punitiveness of the tax system (Wenzel, 2004; Kirchler et al., 2007; OECD, 2010).

Therefore, there are important questions to be answered: Does tax compliance in small businesses require special attention? If so, how important are tax penalties in enhancing and enforcing it? In what ways do they influence taxpayers' behavior? To what extent may they affect business informality? And, how punitive should the tax regulations be?

This article provides for a brief overview of the role of tax penalties in tax compliance in small businesses and aims to answer the above questions. First, it discusses the potential of tax penalties in driving tax compliance in SMEs. Then it discusses objectives and forms of tax penalties and follows with a brief elaboration on the severity of tax penalties and alternatives to their use. The final section offers concluding thoughts as well as a few practical guidelines for the effective use of tax penalties.

2 WHY PENALTIES MATTER IN SME TAXATION

Taxation of SMEs poses different challenges from larger businesses. There are several reasons why the size and structure of businesses matter in tax compliance. Small businesses, in most cases sole proprietors or owner-operated incorporated companies, may lack the capacity properly to fulfill their tax obligations, even more so if these are onerous (Evans et al., 2005; Engstom et al., 2006). Not many small entrepreneurs can or want to afford professional tax services and, instead, they rely on themselves. However, the low awareness of tax obligations[1], coupled with relatively slower adjustment to tax law changes, commonly leads to mistakes

[1] Small businesses may lack not only understanding of specific tax obligations but also the basic nature of taxes. A value added tax is a primary example. Small businesses often perceive VAT as a tax on the profits they make, not as a tax on final consumption. Without in-depth knowledge of the VAT mechanism they may be inclined to avoid registering for VAT even if it would be beneficial for them. By "hiding" behind the VAT registration threshold they themselves add to evasion and – by breaching an invoice trail – provide further non-compliance opportunities to other businesses.

and delays in tax calculations, reporting and payment (McKerchar, 1995; Coleman and Freeman, 1997). The vulnerability of small businesses to changes in market conditions further increases the risk of involuntary non-compliance. Any exposure to trade shocks (e.g. a temporary ban on exports) or backlog of payments for supplied goods and services (e.g. delays in payments by a general contractor to its subcontractors) may easily result in a temporary cash flow-insolvency (Kitching, 2011; Ogawa et al., 2012). Since small businesses, unlike large companies, have also limited options in securing additional funding, e.g. accessing bank credit, they may be unable to pay their taxes promptly (Ayadi and Gadi, 2013; Darvas, 2013; ECB, 2013; Ozturk and Mrkaic, 2014).

The risk of voluntary non-compliance is also higher in the case of small businesses (Cowell, 2003; Slemrod, 2004; Crocker and Slemrod, 2005). Many SMEs, even if incorporated, are managed by the owners. Unlike professional managers or accountants in large companies, they do business using their own capital and have different interests in its use. Their personal risk-aversion may be lower as any gains arising from tax evasion directly accrue to business manager-owners. For this reason they are more sensitive to changes in the financial situation, unfair treatment by tax administration or simply tempted by existing opportunities. Unquestionably, there are more opportunities for small businesses to be non-compliant than for larger ones – they can use cash transactions, disguise their private consumption as business inputs, or hide actual wage payments (Cowell, 2003; Engstom et al., 2006). By doing so they manipulate their sales, margins, profits, and even taxable wages paid to their employees. More importantly, it is easier for them not to be formalized at all. Specific tax concessions available for small businesses offer further avenues for tax abuse, e.g. hiding below the eligibility threshold in a presumptive tax (OECD, 2009).

Apart from penalties associated with non-compliance there are other risks that have an impact on small businesses. Unlike large enterprises, they are prone to abusive actions enforced by tax administration (e.g. excessive audits, lengthy and impeded tax procedures, unjustified certification requirements, corruption). Such actions although not strictly classifiable as tax penalties may be seen as penalizing in a broader sense and discourage compliance (McClellan, 2013).

Tax design also matters. Onerous tax obligations, multiple taxes, high tax rates and overall complexity of tax laws pose much of a challenge for small businesses. Even if these challenges give rise to the introduction of some special concessionary measures (e.g. less frequent filing and tax payments, cash flow accounting or presumptive taxation) not all risks are eliminated. Some measures are conditional (e.g. taxpayers in good standing only) and limited (e.g. turnover threshold, employment limits, exclusion of specific activities) so there is a need for a constant observance of eligibility criteria, adding to the existing risk of abuse (Thuronyi, 1998; IFC, 2007; OECD, 2009).

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As pointed out above, the risks of being non-compliant are numerous. At the same time, small businesses due to their size and personal characteristic are more susceptible to corrective stimuli than large businesses. This suggests that behavioral measures, including tax penalties, are of great relevance for enhancing tax compliance in small businesses.

3 TAX PENALTIES AS A COMPLIANCE DRIVER

3.1 ECONOMIC DETERRENCE MODEL

In many countries revenue bodies seem to rely on increased checks and severity of penalties as the main vehicle for enforcement of taxes. The established conviction of the effectiveness of this approach goes back to the economic deterrence model, developed by M. Allingman and A. Sandmo (1972).

The model assumes that rational taxpayers base their decisions purely on economic calculation. If they expect that costs of evasion are higher than benefits received as a result of it, they will comply. If the expected costs of evasion are lower than the expected benefits they have no incentive to be compliant. Therefore, it is enough to check taxpayers more frequently and impose more severe penalties to limit tax evasion. This approach, in its simplicity, seems to be very convincing. However, no tax administration has the capacity frequently to check all taxpayers and impose severe penalties. Rational taxpayers may well factor this into their calculations and choose to continue evading taxes. In addition, practice does not confirm the theory – there is much less tax evasion than the model would imply. Other factors, sociological and psychological, for instance, determine actual levels of tax compliance.

Therefore, revenue bodies should be compelled to shift from reliance on the classical economic deterrence model to a better understanding of taxpayer behavior and the provision of incentives for boosting tax compliance. This does not mean that tax penalties are no longer important. They are still necessary but need to be used in a well-informed way and supplemented with other actions and strategies. Tax penalties are just one of the many factors that drive taxpayer compliance. Other drivers include risk aversion, personal and social norms, opportunities, fairness and trust and economic factors (OECD, 2010). Reliance only on tax penalties is thus not effective. To achieve the best results, the knowledge of taxpayer behavior is critical, yet extremely complex. As is the relationship between tax penalties and tax compliance (OECD, 2010; Poppelwell et al., 2012).

3.2 VOLUNTARY VS. NON-VOLUNTARY COMPLIANCE

It is important to distinguish between involuntary and voluntary non-compliance. Taxpayers already willing to comply are not likely to be motivated through tax penalties. In fact they may feel discouraged if unjustly punished. Voluntarily non-compliant taxpayers are also not a homogenous group – some of them cheat occasionally, some do it on a regular basis by taking advantage of existing opportunities, and some resort to permanent fraudulent actions. Ideally, they should be treated differently.

Different strategies are needed to foster voluntary compliance and enforce tax laws. Improving the climate of doing business and paying taxes does not require reliance on tax penalties whereas dealing with detected cases of tax offenses would be difficult without them. Elimination of excessive tax obligations, streamlining tax administration processes, support and trust are likely to give better results.

As mentioned above, the relationship between tax penalties and tax compliance is complex. Tax penalties may have both positive and negative impact on taxpayers. If tax penalties are fair and acceptable they strengthen taxpayers' compliance. If they are perceived as oppressive they are likely to create resistance and result in even more non-compliance.

Also, deterrence does matter. Not all taxpayers respond to this element in quite the same way. Recent OECD research (2010, 2012) found that tax penalties have greater deterrence impact on taxpayers who assess risk and severity of penalties as high, are not driven by a moral obligation to comply, and perceive the high social cost of non-compliance and notice that non-compliant taxpayers are being caught and punished. This underscores the fact that understanding personal characteristics of taxpayers and behavior patterns is a key challenge. It also calls for a strong and trustworthy tax administration that undertakes effective actions to create a sense of unavoidability and fairness of tax penalties. If taxpayers see that those who are non-compliant are not punished it harms their morale. It is then important to penalize non-compliant behavior not only to deter and motivate a given taxpayer but also to convey a message to the general public that such behavior is not acceptable. The effectiveness of revenue bodies in this domain builds trust and creates a very important social norm, i.e. paying taxes is the right thing to do.

Dealing with experienced fraudsters requires a slightly different approach. Detection and punishment of a single tax offence may create an illusion of security – those taxpayers may believe that lightning never strikes the same place twice and continue their fraudulent practices. In such a case the deterrence of tax penalties is compromised and repetitive actions are required – up to fining those taxpayers out of business. As noted above, the consistency and effectiveness of the tax administration is crucial for the general perception of fairness and the creation of social norms.

3.3 TAX PENALTIES AND BUSINESS FORMALIZATION

Tax penalties may drive not only tax compliance of registered businesses but also be a barrier to business formalization. Naturally, there are other reasons for businesses to operate in the informal sector. Burdensome regulations, multiple and high taxes, labor law requirements, bureaucracy, corruption, etc. are traditionally cited as primary hurdles. Tax penalties just further add to this list.

The impact of tax penalties on business formalization is not uniform. Penalties may be seen at two extremes – as a barrier to formality or an invitation to informality. Tax penalties become a barrier if they are widespread, severe or abused by tax ad-

ministration. The number of tax obligations itself translates into higher risk of non-compliance and associated punishment. If this is coupled with a heavy reliance on penalties in tax enforcement actions a dire disincentive is created for business formalization. It becomes even bigger if penalties are unrelated to actual infringements or are used for purposes of corruption. Small businesses may choose to stay in the shadow to avoid any obligations and potential contact with the authorities. If they risk anything, it is the possibility of being detected and punished – but only once.

Tax penalties may also be seen as an encouragement to informality. This is due to poor design of tax penalties or poor performance of the tax administration. If the deterrence effect is not big enough or the tax administration is too weak to enforce penalties, businesses may prefer to stay in the shadow, not believing that they are in any danger.

A sound system of tax penalties should be therefore seen as one of the vehicles of incentivizing business formalization. It has a significant potential to influence taxpayers' choices, even more so if coupled with the removal of other barriers and adverse incentives (e.g. onerous tax obligations). The high efficiency of a tax administration in the enforcement of tax penalties is crucial, as is the support offered to taxpayers in their efforts to be tax registered and compliant. Without a strong trust in the tax administration and their conduct, including the trust in the fairness of penalties used, no incentives offered to small businesses to step out of the shadow economy are likely to be effective. Mutual trust helps in the building of strong social norms. Without those norms, no compliance strategy, which tax penalties are a part of, may give satisfactory results.

In designing a strategy for business formalization, lawmakers and tax administration should focus on a few core elements. Businesses ought not to be worse-off when formalized, there should be little or no risk that they will end up paying more penalties than when they are informal, the odds of being detected and punished must be very high and the penalties enforced need to be substantial as compared to those applied to businesses that are formalized but prone to making mistakes. To increase the deterrent effect and social acceptance, prompt and firm enforcement of tax penalties is also crucial. On balance, strong support should be offered to formalized business. Certain rewards (e.g. training, temporary forgiveness or well targeted concessions) are of additional benefit.

Yet, not all revenue bodies focus enough on the informal sector. Little research is done on country-specific reasons for a large informal economy, actual taxpayers' segmentation or existence and potential impact of social norms. Many countries lack comprehensive strategies, including studies on the possibilities of best employment of tax penalties in addressing business formalization and boosting tax compliance. Tax administrations, especially in emerging economies, find it easier to focus on known businesses, ignoring those invisible to them. Apart from fiscal costs there is a huge social cost attached to this – a culture of non-payment of

taxes becomes widespread and engulfs more and more businesses, even those potentially willing to be compliant.

The experience of Poland, although not exceptional, may be instructive by showing deficiencies in designing and delivering a sound compliance strategy for small businesses. Box 1 gives an overall picture of how much needs to be done to effectively tackle existing challenges, many of which have a historical and cultural background. Poland is a high-income country still strengthening its democratic traditions and the rule of law after the collapse of the Eastern Bloc. The troubled history and long-standing non-democratic regime, where one had to cheat, maneuver and avoid authorities to get by, greatly loosened once-strong social norms and imprinted a stigma on the culture of paying taxes (Majka, 2010). Even nowadays, non-compliant taxpayers are not condemned by society. In many cases they are seen as those who have the brains to play the system. It is the tax administration that is blamed for being oppressive even if its actions are necessary and justified (Debowska-Romanowska, 2008).

Box 1: Poland – deficiencies in compliance strategy and use of tax penalties

- No comprehensive research on taxpayers' segmentation and behavior and impact of personal and social norms.
- No tax gap measurement, limited compliance data analysis, little data on informal economy size and structure.
- No comprehensive strategy on tax administration of SMEs (some scattered measures exist, e.g. limitation on length and number of audits).
- Little communication and few campaigns (though some distinct actions have been recently undertaken, e.g. the media campaign "Take a receipt", promoting VAT compliance).
- No specific deterrence strategy.
- Heavy reliance on tax penalties, barely any alternatives are used.
- Fines keep increasing, currently up to USD 1,000 (though usually lower ranges are used).

Source: Ministry of Finance's documents (www.mf.gov.pl); Action Plan for Improved Tax Compliance and More Effective Tax Administration: 2014-2017 (http://www.mf.gov.pl/documents/764034/1161625/pakiet_dzialan_podatkowych.doc); author's analysis.

Such a heritage, most likely relevant to other countries of the former Eastern Bloc, creates a great challenge for a tax administration and requires a tremendous effort to put tax compliance back track and match the levels observed in the developed world. A strong commitment to research and sound analysis of the current structure of compliance strategies, including the structure and use of tax penalties, is needed. Yet, in Poland, there is very little of this.

Such a phenomenon may only be partly explained by the tax authorities' capacity constraints. The other factors entail insufficient awareness of the challenges, limited experience in applied behavioral economics, and more importantly – the lack of political will.

4 OBJECTIVES AND FORMS OF TAX PENALTIES

A tax is a compulsory unrequited payment to general government.[2] It is unrequited in the sense that benefits provided by the government to taxpayers are not in proportion to the payments they make. Since there is no direct benefit, taxpayers are naturally resistant to the payment of taxes. The resistance differs amongst taxpayers but is largely commensurate with the overall tax burden and the quality of taxation and also the perception of government spending efficiency.

Unquestionably, the higher the acceptance of taxes, the easier the task for the tax administration to collect them. It would be too optimistic, however, to rely only on taxpayers' inner conviction that "paying taxes is a right thing to do". Legal coercion and sanctions are still necessary to enforce taxation. Obligations have to go hand in hand with sanctions (Ripstein, 2004). Otherwise they would become a classic *lege imperfecta*, an unimaginable approach in the public finance domain (Dębowska-Romanowska, 2008).

The critical question therefore is not whether sanctions should be used but what they should be like. Although there is no universal answer to it, two basic features emerge. First, a tax penalty should influence taxpayers' behavior – prevent non-compliance and induce compliant demeanor in the future. Second, it should be more painful than fulfillment of a given tax obligation, yet not repressive.

The preventive aspect of tax penalties lies mainly in deterrence (Wenzel, 2004; OECD, 2010; Majka, 2010). Taxpayers choose to comply with their tax obligations rather than paying more than the cost of obligation or losing potential tax benefits (e.g. tax concessions). However, it is only true if they know what the consequences of non-compliance are, find it unprofitable to cheat and believe they may be detected.

Tax penalties also motivate taxpayers. First, they may educate them, but only if tax penalties are fair and unavoidable. Certainty of being detected and punished is the prerequisite for taxpayer education (Frey and Feld, 2002; Torgler, 2007). The other is fairness of penalties applied. If they are too lenient taxpayers may find it beneficial to be non-compliant again. If they are too strict taxpayers may find them too oppressive and unacceptable and are likely to choose playing the tax system, even if they did not do it before. Second, tax penalties may contribute to the creation or promotion of social norms. If tax penalties are perceived as fair by other taxpayers they build up a sense of justice and reward those complying. At the same time a clear message is sent out – "paying taxes is a right thing to do", "taxpayers are honest – only those few non-compliant are punished". Such norms strongly motivate taxpayers, especially individual small businesses, to be compliant about their tax obligations (Torgler, 2007; Poppelwell et al., 2012).

[2] Although there is no common consensus on treatment of other charges, fees and social security contributions taxpayers are likely to perceive them as taxes, even if there is a direct benefit for these payments (e.g. service provided, license issued).

As noted above, tax penalties are not fair if they are too lenient. They are punitive only if taxpayers find them more painful than fulfillment of a given tax obligation. Therefore, in any tax penalty there must be a reasonable financial meaning – again, mostly to deter and motivate tax compliance. Tax penalties, unlike criminal penalties, should not aim at repression (Majka, 2010). The society still needs entrepreneurs to pay their taxes in the future – it should not be interested in severe penalties leading to business closure. This is naturally different in the case of fraudulent businesses. If serious crime is involved, tax penalties should lead to cessation of such an activity. For example, if small businesses register for VAT only to take advantage of fraudulent VAT refunds, the tax administration has a vested interest in the ultimate closure of such businesses. There are neither fiscal nor social benefits from allowing those businesses to operate. Severe penalties may be used in achieving this goal.

Tax penalties should not be imposed for revenue generation purposes (Debowska-Romanowska, 2008). The overarching goal of a well-designed and administered tax system is to create a situation where all taxpayers are compliant and no penalties are actually used. In this sense no government should count on the revenue from tax penalties. Any proceeds received are a mere consequence of imperfections both on taxpayers and the tax administration's side. They should be treated as a last resort measure to correct for those imperfections. By no means are tax penalties an effective revenue source. Increasing proceeds from tax penalties should be interpreted as an indicator of declining quality of taxation rather than of the effectiveness of the tax administration. It should encourage the government to undertake necessary actions to bring voluntary compliance and sound tax administration practices back on track.

Compensation is also not an objective of tax penalties (Majka, 2010). Any payment made by taxpayers to compensate the budget for loss of revenue (e.g. interest paid on tax arrears) is not a tax penalty. If compensation does not exceed the limits of the harm done (loss of revenue) there is no element of pain and it should be seen as a mere restitution, not a tax penalty. Yet, in many cases taxpayers may perceive it this way.

There is a whole universe of tax penalties – from standard fines administered by revenue bodies to more sophisticated measures like increased tax rates, additional tax payments, etc. Some other actions and solutions, even if unintended, may also be punitive for taxpayers.

The most commonly used form of tax penalties is fines. They are administered by revenue bodies, without courts' intermediation, whenever a case of non-compliance is discovered. They may be set forth in laws as fixed amounts or, less often, imposed in relation to taxpayer's income, profits, turnover, value of business assets, or any other easily observable factor. Seldom are they related to actual tax diminution. First, not every example of non-compliance results in understated tax

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payment, e.g. lack or delayed notifications, deficiencies in tax accounts. Second, fines are typically administered immediately after non-compliance is detected, without unnecessary delay. It would require a thorough examination of every case for a tax administration to determine the amount of tax not paid as a consequence of non-compliance.

Other forms of tax penalties may involve increased tax rates and additional tax liabilities (e.g. additional VAT payment calculated as a percentage of under-declared tax). Incrementally increasing interests on tax arrears (depending on the ageing of outstanding payments) are also penalizing in nature – if they exceed regular interests on tax arrears.

Legal qualification of tax penalties may be irrelevant for taxpayers. They may perceive as a tax penalty any measure that is a consequence of breaching a tax obligation, resulting in a disadvantageous economic situation as compared with the situation where no such obligation was breached. Legal coercion is usually associated with sanctions. However, there may be sanctions where coercion is absent. Revocation of tax concessions and denial of certain rights illustrate this. If a taxpayer enjoyed a simplified form of taxation or accelerated depreciation and this is taken away from him there is certainly an element of pain, comparable to that stemming from a traditional tax penalty.

Traditionally only the measures that were enacted with a clear view to provide a degree of pain to non-compliant taxpayers would be recognized as tax penalties. Some measures, however, even if not intended to be punitive, are tax sanctions in effect.[3] There are numerous examples of tax design that either directly penalize taxpayers or induce non-compliance and make taxpayers vulnerable to traditional penalties. The first group may involve, for instance, lack of opt-in opportunities for small business choosing to be taxed under presumptive tax or lack of voluntary registration for VAT purposes. Small taxpayers may choose to be taxed under presumptive tax but after some time they may find it not beneficial to continue to do so (e.g. their margins drastically fall and taxation of turnover is excessive as compared to taxation of actual income under the general tax regime). If the election of presumptive taxation is fixed in time and switching to the general tax regime is not possible, small businesses are forced to pay higher tax. In this case it represents a penalty for them. Similarly, although the vast majority of small businesses find it beneficial to be exempt from VAT, some of them (e.g. exporters or those supplying mainly to VAT registered taxpayers) may be vitally interested in registration. If they are not allowed to do it they are penalized – they need to accept lower margins to remain competitive.

[3] It is not the aim of this article to discuss tax policy measures that may be punitive – intentionally, e.g. to discourage consumption of certain goods (excises on tobacco or alcoholic beverages), or unintentionally, e.g. by providing tax credits to married couples with children, single and childless taxpayers are punished or by taxing compound interest long-time savings are penalized, etc.

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The second group of tax design solutions that may have a punitive impact on taxpayers encompasses excessive tax obligations and the quality of tax law. Excessive reporting requirements, short terms for fulfilling tax obligations, disproportionate conditionality of tax concessions are often not justified but add to compliance costs. In this sense they may be perceived as a penalty, even more so if contrasted with the option of staying in the informal sector. Lack of clarity of tax provisions and frequent changes of tax laws further complicate fulfillment of tax obligations. Such features of tax design and legislation may induce non-compliant behavior – if taxpayers are not aware of their obligations or have little time to act they are more likely to make mistakes and cause delays, exposing themselves to traditional tax penalties.

Improper actions of revenue bodies may be also seen as tax sanctions and a significant impediment to doing business (Silvani and Baer, 1997; IFC, 2007; McClellan, 2013). Incorrect tax decisions, faulty advanced rulings, lengthy tax appeals, frequent audits, delayed payments of VAT refunds, etc. add uncertainty and increase the costs of business. As such they are an indirect penalty. If no compensation is paid as a result of faulty actions of revenue bodies (e.g. interests on delayed VAT refunds, compensation for incorrect tax decisions, etc.) they become a genuine tax penalty – even more painful than traditional penalties.

Tax penalties may have a significant impact on business economics. They increase business operating costs not only by the amount of penalty paid but also by the associated costs of proceedings and appeals, if applicable. Since tax penalties, and rightly so, are not deductible for income tax purposes they affect the post-tax rate of return. Fixed lump-sum payments or penalties expressed as percentage of turnover or value of assets have different meaning for businesses with distinct profitability. If not adjusted properly they are regressive.

5 SEVERITY OF TAX PENALTIES

The probability of being detected and punished seems to be more of a deterrent than the sheer severity of penalty (Tullock, 1974; Majka, 2010; OECD, 2010; Poppelwell, 2012). If taxpayers see that it is more and more difficult to remain uncaught (e.g. due to risk-based and better targeted audits, or more sophisticated IT solutions) they may find it risky to continue evasive practices. If they can only observe increases in potential tax penalties they will not be more afraid than they were before. Indeed, there is not much difference between a 50, 70 or 90 percent penalty tax rate; or between a USD 5,000 and a USD 6,000 fine for a small entrepreneur. All those penalties seem to be equally in their detterent effect or irrelevant for taxpayers. Their responsiveness to increased levels of potential tax penalties is not proportional.

Making tax penalties more and more severe has therefore no real impact on taxpayers' behavior. This is not to say that tax penalties do not require revisions. They do. Policy makers and tax administrators should have them on their agenda – first

a comprehensive review of the penalty system, then periodical reviews to make sure that the catalogue and levels of penalties respond to changes in business environment, economy, society and culture. The experience of the UK may be instructive. In 2008 HMRC embarked on a review of their sanctions for late or non-filing and payment, as part of their compliance strategy improvement (HMRC, 2008).

Tax penalties actually imposed certainly matter for taxpayers and society. On one hand they have to be painful enough to discourage non-compliant behavior. On the other hand they need to be acceptable, fair and not repressive. Limits for tax penalties are difficult to set (Debowska-Romanowska, 2008; Majka, 2010). Again, there are key roles for policymakers and revenue bodies to play in this exercise. They first have to design a proper catalogue, forms and limits for tax penalties. The latter have to pick the right penalty if there is some room left for the revenue body's discretion.

It is impossible to give a definitive answer to what a perfect penalty should be. However, some basic directives for effective penalties may be formulated.

First, they have to be painful enough to void any cost-benefit calculations on the taxpayer's side. Fulfillment of a tax obligation must be more advantageous for taxpayers than the option of being non-compliant. Taxpayers have to respect the financial needs of the government and predictability of its revenue streams. It is widely accepted that taxpayers may not use unpaid taxes as a source of revenue for financing their business activity. Interests on tax arrears are a primary instrument that prevents such situations and compensate the government for late payments. Tax penalties, e.g. fines and incremental increases in interest rate on tax arrears beyond the standard rate, are just an additional form of safeguarding due payments. It is the role of tax penalties to make non-compliance unprofitable and painful. Assessment of understated tax and payment of interest is not disadvantageous as this is only restitution of what should be paid and compensation for loss of time value of money.

Second, they may not be too harsh or destructive. Excessive repression never worked, not only in the area of taxation. Experience of the Eastern Bloc is instructive. Communist regimes imposed draconian penalties for any form of non-compliance, and yet evasion was widespread (Majka, 2010).

While setting up a fair penalty, a balance has to be struck between the desired painfulness and non-repressiveness. It means that a fair penalty has to take into account other factors. It has to recognize the type of non-compliance. It would be inaccurate to punish occasional mistakes and voluntary cheating in the very same way. The type of breached tax obligation also matters – late filing is different from underestimation of tax. Most importantly, however, a fair penalty has to be adjusted to taxpayer's ability to pay. A USD 100 fine has a different meaning for a blacksmith and a lawyer, as they are likely to operate in a different market and

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have different margins. Similarly, a 10 percent penalty based on turnover would be a different share of the actual business' profitability largely varying across sectors.

The law needs to provide for a reasonable list of potential violations and indicate the range of a potential penalty or penalties. It does not have to be excessively casuistic, i.e. foresee every possible type of non-compliance and circumstances of violation. Indication of a fixed amount of fine is also not a good solution. A range or at least an upper limit, especially in case of fines expressed in amounts, not percentages, seems to be a good approach. It leaves a certain level of discretion for the revenue body with regards to both qualification of a given violation and actual penalty imposed, thus allowing it to choose a right and fair penalty in given circumstances. In countries where the tax administration is weak a positive indication of tax violations along with the limits of an applicable tax penalty allows confining – at least to some extent – the abusive actions against taxpayers.

The other challenge is the use of an IT system in administration of tax penalties. IT systems are an integral part of a modern tax administration and in fact they are indispensable for the efficient monitoring of taxpayer compliance. If used for verification of fulfillment of taxpayer obligations (e.g., late or non filing, required notifications, tax payments, etc.) they easily pick up non-compliant taxpayers. They may be programmed to impose a fine (or other penalty) automatically in every single case of non-compliance identified and notify taxpayers without any intermediation of the officials of the revenue body. This vastly speeds up administrative processes and reduces not only the amount of work otherwise to be completed by the revenue body's employees but also the risk of abusive actions on their part. However, such a process may appear to be "soulless" and contradict the idea of a fair penalty. Unless there is a "wise" algorithm in use, i.e., an algorithm capable of taking into account most relevant circumstances (e.g. a newly set up business, first late filing or payment), a verification of the penalty imposed is necessary – if not beforehand, then through a simplified appeal.

Escalating a tax penalty for a late fulfillment of tax obligations (e.g. filing) may partially add fairness to the system of tax penalties. If the purpose of a late-filing penalty is to encourage timely filing of a tax return, or at least to encourage its filing as soon after the due date as possible it seems equitable to gradually increase the penalty amount – the later the obligation is met the more unpleasantness taxpayers suffer. The actual design of such incremental penalties – a surtax on tax due or a flat amount – would largely depend on the capacities of the tax administration and taxpayers' responsiveness to tax penalties (IMF, 2004).

6 ALTERNATIVES TO TAX PENALTIES

Reliance on tax penalties in the enforcement of taxpayers' obligations is ineffective if not supplemented with other actions and measures. An increased severity of penalties is of no avail either. Therefore, there is a need for a comprehensive treatment strategy, a balance between the use of penalties and other actions that could

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enhance tax compliance in less distortive and more supportive way. It is the old sticks and carrots dilemma – how much of each to use to have the best possible results. No easy answers may be offered; however, there are reasons to believe that the balance should tip to the latter. Even though this is challenging, some options do exist.

Tax authorities may find it beneficial to use indirect and direct alternatives to tax penalties. Indirectly, it may encourage tax compliance by providing more support to small businesses, especially start-ups, and by building trust through its professionalism, effective communication, training and technical support (Silvani and Baer, 1997; Hadler, 2000). This way the need for imposing penalties decreases and they may be used as a last resort, i.e., where other measures fail.

If non-compliance is detected a warning should be considered where possible, as a direct alternative to a tax penalty. Apart from deterrence, such warnings may exhibit a degree of support. On the one hand they signal to the taxpayer that tax authorities are watching and may take further actions if the case of non-compliance is not reversed corrected (deterring effect). On the other hand they let a taxpayer know that a mistake was made and that it requires his attention (supportive effect). If the taxpayer neither takes corrective action nor seeks the tax administration's assistance in solving the problem, the tax administration has to be determined to use and be able to enforce a fair tax penalty.

The use of communications and spot checks is also deterrent in nature (OECD, 2010). Occasional communications via Internet website, e-mails, and other media on planned campaigns (e.g. verification of seasonal business in summer or winter resorts) may well discourage taxpayers from taking advantage of existing opportunities. Occasional checks in general may have similar effects to a tax penalty if used responsibly. Too frequent checks of a compliant taxpayer may be perceived as oppressive and give opposite results, i.e. lower levels of compliance. If a sanction is justified non-monetary penalties may be considered. They include a degree of unpleasantness but do not affect directly business economics – there is no payment involved. Publication of non-compliant taxpayers ("name and shame"), enforcement of mandatory compliance courses, or higher levels of the scrutiny may be just as painful and deterring as traditional tax penalties.

Lawmakers may also contribute to a lesser use of tax penalties. Apart from assuring transparency and simplicity of the tax law, balanced tax obligations and well targeted concessions for small businesses. they may consider adopting a number of "rewards in law". These specific solutions motivate taxpayers to be compliant in order to get other benefits, e.g. deductibility of invoiced expenses only, clear tax records to participate in public procurement, renew business license or even to register a car, a good compliance record to benefit from accelerated VAT refund payments, etc. In all likelihood taxpayers will value those rewards more than a potential gain from being non-compliant.

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7 CONCLUDING THOUGHTS

Tax compliance in small businesses requires special attention. On one hand they are often not able to fulfill all their tax obligations, more vulnerable to external risks (e.g. economic shocks, unfair competition, lack of transparency, and abusive actions) and tempted to use different opportunities to be non-compliant. On the other hand, unlike larger businesses, they are usually sole proprietors or owner-operated businesses, being thus highly responsive to personal, social, cognitive and emotional factors. These attributes pave the way to a better use of measures designed to influence their behavior and choices. Tax penalties are one of the behavioral measures that may be effectively used in addressing tax compliance challenges. Through deterrence, motivation, fairness and the creation of desired social norms they may drive taxpayers' choices and therefore play a significant role in encouraging business formalization and enhancing tax compliance.

To achieve this goal, lawmakers and tax administrators should be well aware of a few important attributes and challenges of tax penalties. The first to note is that tax penalties are important and still needed. They sanction improper behavior of taxpayers and facilitate enforcement and collection of taxes. However, they give best results if used as a supplement to other drivers of taxpayer compliance – the tax administration should not rely on tax penalties only. Too punitive a tax regime or administration is an important barrier to business formalization and a disincentive to tax compliance. Widespread penalties counteract creation of positive social norms and a culture of paying taxes.

Second, tax penalties should be designed to deter and motivate taxpayers, rather than repress or raise additional revenue. Tax penalties even if used for securing tax revenue should not be seen as source of revenue itself.

Finally, increasing the severity of tax penalties does not work – fairness and prompt enforcement is of much greater importance, also to reassure the compliant majority that the tax administration treats non-compliance seriously. Tax penalties, if necessary, have to be painful but not blind – they have to take into account an individual taxpayer's situation, at least type and reason of non-compliance, and taxpayer's ability to pay. Late notification of change of address should not be punished as much as under-declaration of tax. Also, a fixed lump-sum penalty has different meaning for businesses with distinct profitability. Other instruments may work better than tax penalties; lawmakers and tax administration – wherever possible – should make use of other deterrent instruments (e.g. checks, warnings, communications), non-monetary penalties and "rewards in law". Supportive actions and building trust in the tax administration may also foster tax compliance. After all, the effective use of tax penalties requires knowledge of taxpayer's segmentation, behavioral responsiveness as well as personal, social and cultural norms.

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Informal Economies in Post-Socialist Spaces – Practices, Institutions and Networks

JEREMY MORRIS and ABEL POLESE (Eds.)
Palgrave Macmillan, Houndmills, Basingstoke, 2015, pp. 302

Book review by PREDRAG BEJAKOVIĆ*
doi: 10.3326/fintp.40.1.5

* Received: September 7, 2015
Accepted: September 14, 2015

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Hidden, informal or unofficial economies have been present during civilisation in all societies regardless of their prevailing economic, social and political systems. However, there are significant differences in the scope and form that informal economies may assume in each society, so particularly interesting are the relatively rare studies on these activities in post-socialist countries. The differences among these countries were bigger than the similarities even before the transition, and now they have considerably widened. Thanks to accelerated economic growth and EU integration, some of these countries have achieved respectable economic and social results, but others are stuck in underdevelopment, poverty, widespread corruption and the almost non-existence of any positive development perspective for the near future. A new book edited by Jeremy Morris and Abel Polese, dedicated to the most important characteristics of the informal economy in previously socialist countries, is a significant contribution to better understanding this complex phenomenon.

The book consists of three parts and begins with introductory remarks by the co-editors. In their introduction entitled *My Name Is Legion – The Resilience and Endurance of Informality beyond, or in spite of, the State,* Morris and Polese remind us that informality exists as long as there is a state that tries to regulate relationships and interactions between citizens. As societies are more and more complex, states around the world try to formalize the rules and patterns of required behaviour hoping that everybody will respect the same principles and have the same opportunities. For those who do not respect the rules there is a consequently strict punitive system. Of course, there is always space for behaviour that is opposite to the proclaimed rules of the omnipotent state. Informal rules are often necessary in cases of high unemployment and poverty and an important buffer in circumstances of prolonged economic crisis, a weak state and lack of rule of law. Informal economic practices are often embedded in social relationships, so the formalization of some currently informal activities can be just the legalization of certain socially accepted practices.

Part I, entitled *Thinking Informality and Development Writ Large and Small* contains four papers by five authors. Williams and Onoshchenko give an overview of different theoretical approaches to informal activities, starting from the *residue theory* – the informal economy is just a leftover of a previous mode of production and consumption and will disappear with economic development; to the *by-product theory* – the informal economy is an integral part of the economy, and the *complementary theory* – the relationship between these two economies is complementary, with growth and decline present in both of them, and finally the *alternative theory* – the problems are in the overregulated formal economy. In the further text, the authors evaluate the validity of the different theoretical approaches to the informal economy in Ukraine. They conclude that only a combination of all the mentioned theories enables a broad enough understanding of the complex and diverse nature of the informal economy, because particular theories can provide insight only into some aspects. For example, the by-product theory is more pre-

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sent among low-paid salaried workers, whose employers endeavour to lower costs by not registering part of their labour force, but it is inappropriate for the self-employed. In that way, only post-structuralist theory, comprising heterogeneous approaches and explanations, is valid in the demanding description of the various characteristics of the informal economy in Ukraine.

Huseyn Aliyev in his contributions describes institutional transformation and informality in Azerbaijan and Georgia. The post-Soviet period in both countries has been tainted by economic and political instability, missed processes of democratisation and economic development. Interestingly, relatively limited are insights into the extent to which institutional transformation and formalization impact and influence the informal sector, primarily human relationships, reciprocal exchange of favours, individual informal networks and other forms of informal relations in the former Soviet Union. Over the decades of Soviet rule, informal practice became an integral part of inter-personal relationships and associations as well as of institutional behaviour. For efficient functioning of the informal economy, there is a need for strong inter-personal networks where reciprocity of favours is based on honour and seniority. The end of Soviet rule in both observed countries led to the dismantling of decaying systems of communist institutions and the building of new systems that relied even more strongly on informality. Thus, the increased reliance on informal structures not only provides private safety nets in everyday life, but also substitutes for dysfunctional formal institutions.

Ida Harboe Knudsen writes on informal workers and the financial crisis in Lithuania. Surprisingly, working in formal sector in this country has often been as insecure as working informally. Working without insurance is a risky and very serious matter, not only in the eyes of the state but also according in the opinions of the workers themselves, but it is a necessary part of their survival strategy. Harboe Knudsen provides three very impressive case studies of workers in the shadow faced with an everyday challenge. These stories confirm the unstable, harmful environment and the disrespect for workers' rights, skills and attained experience. Social insecurity and marginalization force a significant number of citizens to search a job in the informal sector and to rely increasingly on alternative informal policies.

While most contributions in the book cover the ubiquity of informal subversions of rules and formally arranged interactions in the post-socialist world, a topic of the interest by Aet Annist is the formal crutches for broken Estonian sociality. The author demonstrates that in some cases informality is more an assumption than a reality. It is not necessarily accessible for those experiencing new adversities after crises and/or a useable device for understanding people's relations in dire circumstances. As some citizens become rich, they are more and more surrounded by others who are poor and in this process people forget to care for their neighbours and former friends. The grim reality is linked to the poverty of resources, because it is impossible to provide reciprocal hospitability to their rich friends and the related indebtedness produces shame and embarrassment for

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those that are poor. The situation is exacerbated by the opinions of many social workers, media and other stakeholders that the poor people are often so passive that they cannot be helped.

Part II of the book titled *Power, Culture, Kinship and History* begins with the contribution by Anna Danielsson on the social situation and informal economic practices in Kosovo. The author argues that various dominant and conventional approaches to informality systematically fail to account for the main reasons for participation in informal economic activities. Some citizens are forced to operate in the informal economy due to the activities of other persons who enjoy relatively high status and political position. A key assumption of the author is that informality represents a social phenomenon that emerges and is expressed through social practices, which over time have become institutionalised to the point that they are considered almost commonsensical and unchangeable. In such circumstances, various participants find innovative ways of distancing themselves from the formal regulations without abandoning them completely.

Karla Koutkova writes on the importance of having appropriate and strong connections or links (*štela*) in Bosnia. These links are vital in any aspect of the public life, like getting a job, obtaining medical treatment, for enrolment in university or successfully finishing tertiary education. The denotation of the term *štela* is not entirely negative and has a less negative connotation than the word corruption. Various reports have provided data about the overpowering pervasiveness of *štela* in Bosnia and Herzegovina on both the quantitative and the qualitative level: *štela* is a very important system in the life of Bosnian citizens, the terms and conditions of which were known to most of the respondents. Koutkova concludes that *štela* is a culturally embedded practice, but it is also co-produced on both the international and local level.

Tanya Chavdarova in chapter 7 deals with perceptions and practices of nepotism in small businesses in Bulgaria. The author adopts an extended definition of nepotism and considers its capacity as an informal hiring practice. The concept of nepotism typically receives negative connotation, but can be seen also in positive terms as a natural healthy concerns for family and those similar to ourselves. Furthermore, this practice can lower recruiting and training costs and employee turnover. Chavdarova points out that in terms of doing business, in Bulgaria an entrepreneur usually starts a business with people who can be trusted and in that way people prefer to enter business relationships after private relationships have been established. The introduction of market economy seriously shook the foundations of nepotism, so the acceptance of formal market institutions in Bulgaria caused a confrontation between the indigenous relationship-oriented culture and dominant Western rule-oriented culture. In that way, interestingly, the kinship relations – often characterised by the absence of working habits, insufficient conscientiousness or various forms of abuse – became harmful in business.

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Christian Giordano analyses the personalized relationships in the post-socialist rural Bulgarian region Dobrudzha. The author reminds us that in societies filled with distrust in public institutions due to their perceived riskiness, only personal and informal relations are safe and trustworthy. With the de-collectivization and the land restitutions to the previous owners, new capitalist entrepreneurs began to emerge. These skilful entrepreneurs of rural economy, often conceived by the political elite, have a major role and have become critical in linking city and countryside. A discrepancy has emerged between the legal framework and informal social practice, a gap that challenges the traditional assumptions according to which legality and legitimacy are inseparable. Such a crevice between legality and legitimacy produces mistrust in official institutions, rules and relationships, and leads to trust in only personal and well-known relationships.

The third part of the book titled *Informal Public Sectors and Welfare: State Intervention or Withdrawal?* begins with a very interesting comparison of informal payments in Ukrainian and Lithuanian health care prepared by Tetiana Stepurko and co-authors. The aim of the paper is to shed light on the roots of informal practices through the special attention given to the factors that inhibit the provision of medical care in terms of accessibility, accountability and transparency. Informal patient payments have a variety of facing with different characteristics. They differ in nature, timing, reasons different attitudes, perceptions and beliefs. In Ukraine (according to *The Guardian* from February 4, 2015 the most corrupt nation in Europe), patients who are not willing or able to give gifts are often deprived the adequate services. The causes of the flourishing corruption in Ukraine's health care are a weak state combined with the low salaries of medical staff caused by low general tax revenues and insufficient social insurance contributions, the multiple moralities associated with the payments requested, and the toleration of inconsistency in practices. On the other hand, in Lithuania, with significant lower informal payment, patients receive services with quicker access and better quality. The authors conclude that for improving the situation there is a need to assure adequate remuneration of staff in medical care, define and implement clear professional rules, assure adequate investment in and efficient use of healthcare resources, introduce clear rules for patients' co-payment of health care services and develop the private health care services as support alternatives to public provision.

According to the official resources there are over 2.15 million people in Ukraine who live on territory designated as contaminated by Chernobyl nuclear catastrophe in 1986. The contribution by Thom Davies is based on over three years of ethnographic study around the Chernobyl exclusion zone and the author concludes that the observed region presents a model where an individual's entire bio-political position can be changed through bribery and connections. This can be achieved by obtaining higher disability status and in that way receiving higher social benefits or by entering into the forbidden area in the search for foodstuff or engaging in poaching. The mixture of social network, bribery and negotiations with various border control bodies shows how informal activity is a normalized part of every-

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day life. Environmentally risky foodstuffs from restricted areas, like mushrooms, berries, game and fish, through different informal channels, regularly enter the food market in Ukraine. The people living in the mentioned region believe that is better to live with the invisible threat of radiation than to risk the obvious reality of severing the social network and in that way endangering the ability to use informal methods of survival and reciprocity. In other words, the possibility of using social networks, informal activity and local knowledge to survive in the harsh environment outside the formal economy is placed above the risk of contamination.

Controlling informal payments in Chinese healthcare is the topic that interests Jingqing Yang. The author analyses two major approaches used by the Chinese government to reduce informal payments and provides possible reasons why these attempts have not been successful. In China informal payment (*bu zheng zhi feng*) is deemed a form of malpractice that is not as serious as corruption, but is morally, politically and legally incorrect. For the fight against the informal payment practice, three major governmental and disciplinary agencies, with very similar administrative authorities, but with insufficient collaboration among them, are responsible. Although the Chinese government is very active in reducing the informal payment through various campaigns and numerous programmes, the situation has not been improved as much as expected due to the defects in institutional and policy design. Thus, further co-ordinated activities of all stakeholders will be necessary.

Liam O'Shea writes on informal economic practices within the Kyrgyz Police (*militsiiat*). According to the author, violence and political instability in Kyrgyzstan have occurred because the country lacks the formal and informal institutional mechanisms by which to regulate political and social conflict. The author underlines the fact that informal economic practices have been long embedded in the police organization, so the country suffers from petty corruption, with the policemen on the streets very often behaving like bandits. After the country obtained independence, officers' participation in informal economic activities has increased due to their own precarious economic situation and the lack of state capacity and willingness to control them. In Kyrgyzstan, from the top to the bottom, the financial structures are highly personalised and the economic fortunes of subordinate officers are dependent on their superiors, so lower ranked policemen pay regularly those in higher positions. The reform of the police organisation in this country has been almost impossible because in addition to the low and ineffective state control, the formal and informal leadership of police units have used their subordinates in a struggle for control of economic activities. Furthermore, there have been few incentives to introduce effective anti-corruption measures because Kyrgyzstan retains the legacy of a historical system in which numerous formal procedures are impractical, difficult to implement and enforce and widely circumvented.

The co-editors Morris and Polese in a short conclusion *Agency Strikes Back? Quo Vadis Informality?* explain the possible causes and the importance of informality. It can be and certainly is a social shield for the poor and socially excluded, ena-

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bling them to cope with transition, inequality and social injustice, but it is also a way for the middle class to gain access to services and resources that cannot be obtained formally. While in the academic community there are opinions that informality is transitional, temporary and destined to fade away, Morris and Polese believe that the formal system will never be perfect and that the market changes faster than a state can respond to new circumstances, so informality is going to stay.

We can reiterate that since the early 1970s, the notion of economic informality has served as pivotal point for wide-ranging scholarly thinking and the development of policy initiatives enhanced by international organisations. Yet, informality shows a puzzling resilience. As a conclusion for this very useful book, it's important to remember that informality in the observed countries has become so deeply rooted and widespread that it competes with the actions of the state and is a necessary survival strategy for the majority of the population. It is particularly valuable that the many authors in the book analyse informal activities from different angles and go beyond the traditional functionalistic perspective. They also show that informality is a mode of alternative governance, while formalization of certain non-registered or non-observed activities may be the legislation of socially acceptable practice. Formalization instead of repression does not cause costs and mostly enables increased economic development and growth in employment.

As correctly observed by Aliyev, the employment of informal practices and participation in the informal sector cannot be easily eradicated through the transition to a market economy and by encouraging economic growth and/or by implementing the formalization and modernization of institutions. Citizens experience increased pressure to demonstrate their needs to the formal institutions that have become less accessible and useful for them and as a result are left to their own devices as a result of the lack of formal solutions or state aid.

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phone: +385 (0)1 4886 444; 4819 363; fax: +385 (0)1 4819 365
web-site: www.fintp.hr; e-mail: fintp@ijf.hr

Subscription
Annual subscription amounts 400 kuna
Payments to account no. HR7024840081100661775, Institut za javne financije, Zagreb; quoting: subscription to Financial Theory and Practice, 2016

Printed in 100 copies

The journal comes out four times a year

The journal is co-financed by the Ministry of Science, Education and Sport of the Republic of Croatia

Computer typesetting and printing
Denona d.o.o., Zagreb, Marina Getaldića 1

Pursuant to the requirements of Article 34 Paragraph 3 of the Media Law (Official Gazette no. 59/2004, 84/2011, 81/2013), in 2015 the total income from sales of the journal Financial Theory and Practice was 29,714.10 kuna and the average print order was 115 copies.