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IMPACT OF IN-WORK BENEFITS ON WORK INCENTIVES IN CROATIA: A MICROSIMULATION ANALYSIS

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Abstract

Generous social benefit systems reduce work incentives, which has prompted more than half of the EU countries to introduce some sort of make work pay policies. Previous research for Croatia has shown that certain types of households have very low work incentives. Therefore, this paper aims to analyse the impact of in-work benefits on work incentives of non-employed persons and the poverty rate in Croatia. Using the tax-benefit microsimulation model EUROMOD, which is based on the EU-SILC 2020 data, three hypothetical types of in-work benefits are simulated. The results show that the characteristics and the design of in-work benefits are essential, and the choice of the appropriate type of benefit depends on the policy objectives. This paper is the first to analyze the impact of in-work benefits on the work incentives of all non-employed persons in Croatia.

Keywords: *work incentives, in-work benefit, microsimulation, Croatia*

JEL classification: *C15, D31, H31, I30*

1. INTRODUCTION

Although a generous social benefit system may substantially reduce the poverty of the working-age population, this often comes at cost of diminished financial work incentives which consequently leads to a decrease in employment. According to Bargain and Orsini (2006), the primary goal of social policy-making is to provide a level of income that ensures a minimum living standard for non-employed persons, but tax-benefit policies implemented should not reduce work incentives excessively. Therefore, it is vital to analyse the effects of fiscal policies on work incentives of vulnerable groups of non-employed persons, especially the long-term unemployed, couples with children, single parents, etc. The analysis should also consider introducing make work pay policies, such as in-work benefits. In-work benefits may help reduce the exclusion of vulnerable groups from the labour market and reduce government spending on social protection programs. Their purpose is to increase the income of low-wage workers and encourage the employment of persons with low-earning capacity.

There are several studies on the financial work incentives for non-employed persons in Croatia. The

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studies by Bejaković et al. (2012) and Bezeredi (2019) exposed very low work incentives for some types of hypothetical households such as single parents and one-earner couples with children. Bezeredi (2021) analysed work incentives on the extensive margin of labour supply in Croatia using EUROMOD and microdata. The study found that non-employed persons with a larger number of dependent children, persons with lower market incomes of other household members and those with a lower level of education are more likely to be affected by low work incentives. Finally, Bezeredi et al. (2019) examined the impact of introducing two types of in-work benefits (family- and individual-based benefits) on the labour supply of Croatian couples. The results have shown that individual-based in-work benefit increases the overall labour supply of couples, while family-based benefit reduces it.

Since joining the European Union, Croatia has been among the five countries with the lowest employment rate.[1] Therefore, low employment combined with the fact that there are families in Croatia with low financial work incentives suggests that it would be essential to make an empirical analysis of the potential introduction of in-work benefits in Croatia. The aim of this paper is therefore to analyse the impact of in-work benefits on work incentives at the extensive margin and on the poverty rate in Croatia. Work incentives at the extensive margin are measured by the participation tax rate (PTR), which represents a portion of gross employment income lost by a household owing to changes in taxes and benefits following the transition from non-employment to employment.

PTR and poverty rate are first calculated for the baseline scenario, reflecting actual Croatian tax-benefit systems in 2019. Subsequently, three reform scenarios are introduced, in which we implement three hypothetical types of in-work benefits. The first type is a family-based in-work benefit grounded on the British Working Tax Credit (WTC). Since such types of policies have negative effects on work incentives for the secondary earners in couples, we introduce two additional types of in-work benefits so as to resolve the mentioned problem. Accordingly, the second is the individual-based in-work benefit, whose features are also borrowed from the British WTC. However, the disadvantage of such type of benefit is that they may be awarded to low-paid individuals in wealthy households. To suppress potential disincentive effects on secondary earners, the third type of in-work benefits are introduced which is family-based in-work benefit with a premium for the secondary earners in couples. This seeks to preserve the main advantages of family-based benefits, which is targeting the poorest families, while mitigating potential negative work incentives for the second earners. Calculations are made using EUROMOD, a tax-benefit microsimulation model for the European Union (EU). Data used are those from the EU-SILC (Statistics on Income and Living Conditions) for 2020, with the income variables referring to 2019.

This paper contributes to the existing literature in the following ways. This is the first paper which analyzes the impact of the potential implementation of in-work benefits on work incentives for all non-employed persons on an extensive margin of labour supply for Croatia. Second, the paper analyzes the introduction of an innovative type of family-based in-work benefit with a premium for the second earners. Such policies have been rarely analyzed in the literature. To the best of our knowledge, the analyzes were made in the case of Italy (De Luca, Rossetti, and Vuri 2014) and Poland (Kurowska, Myck, and Wrohlich 2017). Third, the paper analyzes the impact of different types of in-work benefits on the poverty rate. Fourth, this paper provides an up-to-date analysis of work incentives at the extensive margin in Croatia.

The paper is composed of five sections. Section 2 provides a short overview of the literature. Section 3 describes the research method and data. Section 4 analyses the impacts of the introduced in-work benefits on work incentives and poverty rate. Section 5 concludes.

2. IN-WORK BENEFITS IN THE LITERATURE

The impact of taxes and benefits on labour market participation is usually at the centre of public debates concerning the effectiveness of the social security system. Disposable income depends on various factors, such as wage levels, social insurance contributions, personal income taxes and social benefits. All these

factors influence individuals' choices, both on an extensive (decision to work or not) or intensive (decision on the number of working hours for those currently working) margin of labour supply. In the most typical case of "non-employment to employment transition", the net financial effect is usually lower than the gross wage earned on the labour market. This is because a part of the gross wage is lost due to taxes and social insurance contributions. At the same, unemployment benefits may be terminated, whereas subsistence benefits are partially reduced or entirely lost.

As suggested by theoretical literature and empirical results, the main factor that determines financial work incentives is the tax-benefit system. Redistributive instruments such as taxes and benefits and their potential disincentive effects on labor supply are particularly emphasized in the scientific literature and political circles. The redistribution of financial resources towards the needy, in the form of directing financial resources towards those who do not work, can create negative work incentives for these persons, as well as for their family members. For example, generous social transfers during non-employment reduce the net financial effect of employment (Björklund et al. 1991; Snower 1995). Non-employed persons may lose the motive for employment and fall into the unemployment or inactivity trap. According to Carone et al. (2004), an individual decides whether "work pays or not" depending on many factors, the most important being the features of the personal income tax (personal deductions, tax bracket thresholds and marginal tax rates) and the social benefit systems.

In the optimal tax theory, work incentives at the extensive margin are summarised by PTR and by the marginal effective tax rate at the intensive margin (Saez 2002). Theoretically, a higher PTR rate lowers employment and labour force participation rates. This theory has been verified by empirical studies. For example, Collado (2018) showed that the increase in PTR negatively affects the likelihood of employment of the long-term unemployed in Belgium. Dockery, Ong, and Wood (2011) also reveal the negative correlation between PTR and the likelihood of transition of non-employed persons into employment in Australia. Bartels and Pestel (2016) pointed out that a decrease in PTR significantly increases the likelihood of entering employment in Germany.

When designing a tax-benefit system, the main concern is how to reallocate resources from high- to low-income persons while maintaining strong work incentives (Figari 2015; Immervoll and Pearson 2009). Achieving the goals of equality and fairness may have direct costs in the form of increased funds for social protection programs, but also indirect costs in the form of a reduction in the labor supply. To meet the goals of efficiency and equity by implementing social protection instruments, more than half of OECD countries have introduced make work pay policies to increase work incentives, i.e., to reduce poverty and promote the employment of low-productive persons. In-work benefits are the most prevalent type of these policies and are generally understood as cash transfers awarded to low-income employees (Matsaganis and Figari 2016). The main feature of in-work benefits is that they simultaneously strive to achieve two goals: 1) increase employment; 2) alleviate poverty rates (Leppik 2006; Immervoll and Pearson 2009). Employment is increased because additional financial incentives motivate low-wage persons to accept low-wage jobs and help sustain such persons' employment. Poverty is alleviated because low-wage employees receive income both from their own earnings and social benefits.

In-work benefits are usually income-tested. Depending on the assessment unit, we differentiate between two types of in-work benefits: (a) family-based, where the income test is based on the total income of the family; (b) individual-based – only individual's income enters the income test. In the former case, the benefit amount depends on the family's structure and the incomes of all members. In the latter case, the benefit amount only depends on an individual's characteristics and income. The impact of in-work benefits on work incentives at the extensive margin of labour supply critically relies on the benefit type. Between these two types, the family-based in-work benefit is substantially more poverty-reducing because it targets the lowest-income families more effectively. However, the effect of family-based in-work benefit on work incentives is disputed since this kind of benefit positively impacts incentives in one-earner families but negatively in two-earner families. In contrast, individual-based in-work benefit positively impacts work incentives among individuals across all

types of families. However, its weakness is reflected in its reduced impact on decreasing poverty because it does not effectively target vulnerable individuals. Specifically, the individual-based in-work benefit can be received by low-wage persons ranked in the middle or at the top of the income distribution according to disposable household income.

The first countries to introduce in-work benefits were the United States, with the Earned Income Tax Credit (EITC), and the United Kingdom, with the Working Tax Credit (WTC). Both of these benefits are family-based benefits. It is shown that WTC negatively impacts work incentives in two-earners families, but it encourages employment in one-earner families (Blundell 2000; Blundell and Hoynes 2004; Eissa and Hoynes 2004; Brewer et al. 2006). The absence of negative impact on work incentives is the most likely reason why individual-based benefits have become popular in recent years in continental Europe (Belgium, Finland, Hungary, the Netherlands, Sweden) (Immervoll and Pearson 2009). Given this, individual-based benefits can be an effective alternative to family-based benefits. However, Bargain et al. (2010) argue that even with individual-based benefits there are several open questions regarding the optimal structure of such a policy. That is, individual-based benefits can negatively affect work incentives at the intensive margin of labour supply, while most individual-based benefits combine positive effects at the extensive and adverse effects at the intensive margin of labour supply.

Much interest has been devoted to analysing hypothetical reforms on work incentives. Figari (2010) examined hypothetical family and individual-based in-work benefits in Portugal, Greece, Italy, and Spain. WTC was used as an archetype for the former benefit type, while the latter is simulated as a wage subsidy. The results reveal that individual-based benefits are more effective in improving work incentives than family-based benefits. This was particularly evident for women in France and Italy who live in couples and whose employment rate is far below the EU average. Vandelannoote and Verbist (2020) analysed the impact of different in-work benefits on poverty and work incentives in Belgium, Italy, Poland, and Sweden. They showed that existing and hypothetical in-work benefits generally have a positive impact on the extensive margin of labour supply, but this impact is more robust for individual-based benefits than for family-based benefits. Their results imply that the effects are quite heterogeneous across countries with more pronounced effects in Belgium and Sweden, while the effects in Poland were negligible. The impact on the poverty rate varies depending on the benefit design; family-based in-work benefits cause a greater reduction in the poverty rate than individual-based in-work benefits.

Using a sample of couples in Italy, De Luca, Rossetti, and Vuri (2014) analysed the introduction of two in-work benefits based on the EITC and WTC. However, in addition to the standard design of these two benefits, a premium for the employment of a second spouse was introduced. The mentioned premium was introduced to overcome the potential negative impacts of the family-based benefits caused by the employment of the second spouse. The study showed that, simulated in-work benefits could significantly improve the redistributive effects and work incentives of working couples in Italy, provided that an appropriate amount of premiums for the second employed spouse is introduced. Additionally, the redesigned EITC is more effective than the WTC in boosting employment, while the redesigned WTC is more effective in reducing poverty. Similar research was conducted by Kurowska, Myck, and Wrohlich (2017), who explored the impact of increasing the generosity of existing in-work benefits and introducing a premium for the second employed spouse in Poland. They showed that the redesign of existing in-work benefits, targeting families with children and low incomes, can effectively increase female employment rates. Furthermore, they confirmed that introducing a premium for the second employed spouse in the family, which would be granted to low-income families, could successfully reduce child poverty resulting from direct financial support and greater parental activity in the labour market.

To the best of our knowledge, the only empirical analysis of in-work benefits in Croatia was done by Bezeredi et al. (2019). They analysed the impact of two types of in-work benefits on the labour supply of couples. The first is the family-based in-work benefit, inspired in design by WTC, and the second is the individual-based benefit, founded on the Slovakian Employee Tax Credit. Their results showed that only

individual-based in-work benefit increased the labour supply of couples, while family-based benefit had an overall negative impact due to the adverse effect on the two-earner couples.

This new paper will extend the above-mentioned analysis. Accordingly, this paper analyzes the impact of three types of in-work benefits on work incentives for all non-employed persons and analyzes the impact of in-work benefits on the poverty rate. The methodology and results are presented in the following sections.

3. METHODS AND DATA

3.1. Participation tax rate

The unit of observation is a person *i*, who lives in a single- or multi-member household. The incomes of every person *i* in the states $s = \{0,1\}$ are observed, where 0 and 1 denote pre-transition and post-transition status, respectively. The total gross income of a person *i*'s household in the state *s* is divided into employment income earned by the person *i*, denoted by E_i^s, and all the remaining household income, denoted by Z_i^s. Taxes paid and benefits received by person *i*'s household are denoted by T_i^s and B_i^s, respectively. The disposable income of the person *i*'s household in the state *s* is obtained as $Y_i^s = E_i^s + Z_i^s + B_i^s - T_i^s$.

Suppose that the person *i* undergoes a transition from state 0 to state 1, which consists of changing the employment status from non-employment to employment. That is to say, the non-employed person *i* becomes employed. The change of employment income, $\Delta E_i = E_i^1 - E_i^0$, triggers the change in household disposable income, $\Delta Y_i = Y_i^1 - Y_i^0$. The following indicator puts these two changes into relation:

$$PTR_i = \frac{\Delta E_i - \Delta Y_i}{\Delta E_i} = 1 - \frac{Y_i^1 - Y_i^0}{E_i^1 - E_i^0} \quad (1)$$

$$PTR_i = \frac{\Delta B_i - \Delta T_i}{E_i^1 - E_i^0} = \frac{\left(T_i^1 - T_i^0\right) + \left(B_i^0 - B_i^1\right)}{E_i^1 - E_i^0} \quad (2)$$

This is the popular indicator for measuring work incentives on the extensive margin– the participation tax rate (PTR), where it is assumed that $Z_i^e = Z_i^n$. When a non-employed person gets employed, employment income increases $(E_i^1 - E_i^0 > 0)$. Consequentially, taxes typically rise $(T_i^1 - T_i^0 > 0)$, whereas benefits typically decline $(B_i^0 - B_i^1 > 0)$. Accordingly, PTR shows the proportion of increased earnings lost due to increased taxes and decreased social benefits in the transition from non-employment to employment.

3.2. Definition of employed and non-employed persons

To calculate PTR, we select particular subpopulations of persons, employed and non-employed persons. Following Bezeredi et al. (2019) and Bezeredi (2021), "flexible" persons are first defined as females aged 18 to 60 and males aged 18 to 65, who have been in one of the following three statuses for all 12 months during the reference income year: employed, unemployed or inactive. The inactive group excludes some types, traditionally called "inactive", such as pensioners, students, and persons with disabilities. Effectively, inactive persons primarily include "persons fulfilling domestic tasks and care responsibilities". Flexible individuals do not necessarily have to be in the same status throughout the year; instead, they can switch between the mentioned three statuses. However, a person who has spent at least one month in a "non-flexible" status (i.e., pensioner, student, etc.) is considered non-flexible. Women with children up to the age of one are also considered non-flexible.

Having defined flexible persons, we create the new groups of "employed" and "non-employed" from this basin. The latter group embraces flexible persons who have worked less than 260 hours during the year. The former group consists of flexible persons who have worked at least 1,560 hours in the year.[2] PTR is calculated for non-employed persons. Notice that, in the original sample, there may exist households with two or more non-employed persons. In these cases, the necessary number of replicas of such households are created so that the transition of each non-employed person is treated separately.[3]

3.3. Household microdata and EUROMOD

This analysis uses EUROMOD, a microsimulation model of taxes and social benefits for EU countries.[4] The Croatian module of EUROMOD is employed, based on the tax-benefit rules valid on 30 June 2019.[5] EUROMOD is used to assess the impact of direct taxes, social insurance contributions, and social benefits on disposable household income and work incentives and allows comparisons between EU countries. EUROMOD is a static non-behavioural model: "non-behavioural" means that potential "behavioural" reactions of individuals are not considered when calculating taxes and social benefits; "static" means that the sociodemographic characteristics of the observed individuals are unchanged in the observed period (otherwise, the model would be "dynamic"). EUROMOD also assumes that there is no tax evasion and that all persons entitled to benefits take it in full.

EUROMOD input data are based on the EU Statistics on Income and Living Conditions (EU-SILC).[6] The data for the income year 2019 is used, based on the EU-SILC 2020. Input data contain information on the gross incomes of each household member, separately for various income sources (income from employment, self-employment, contractual work, capital, and property). There is also information on various social benefits (e.g., social assistance benefits, unemployment benefits, disability benefits, etc.) and private transfers (e.g., alimony). Furthermore, EUROMOD input contains information on education, economic activity and employment status, and many other demographic and socioeconomic characteristics of persons and households.

EUROMOD simulates the main tax-benefit instruments for each country: social insurance contributions, personal income taxes, unemployment benefits, social assistance benefits, child benefits, etc. In some cases, simulation of a tax or a benefit is not possible, primarily due to the lack of information in the EU-SILC; in these cases, the amount reported by a respondent is used, if available.[7]

For the calculation of PTR, we need employment income and gross incomes obtained from other sources, social insurance contributions, personal income taxes and social benefits. All these components are obtained from EUROMOD. For each selected person and each tax-benefit scenario, the model is run twice: for the state of non-employment and employment.

Since many of the analysed persons did not work during the reference income period, there are, obviously, no inputs for their monthly earnings. Heckman's selection model is used to predict the gross monthly earnings of non-employed persons using the data on the wages of employed persons. The results of the model are available in Appendix.[8]

3.4. Description of in-work benefits

Three types of in-work benefits are implemented into the Croatian tax-benefit systems. All three reforms include introducing modified benefits borrowed from the UK, namely WTC.[9] The essential features of these policies are retained, but various adjustments and simplifications are introduced.

Eligible are persons between 18 and 65 years of age, who have worked at least 20 hours per week. In the first and third reforms, the simulated benefit is family-based (henceforth WTC-Fam-I and WTC-Fam-II), while in the second, an individual-based in-work benefit is introduced (henceforth WTC-Ind). In the case of WTC-Fam-I and WTC-Fam-II, the beneficiary unit is a family consisting of spouses and their children up to 18 years of age if they are in education (or children up to 16 years of age if they are no longer in education). The only difference between these two benefits is that WTC-Fam-II uses an extended withdrawal threshold in the case there is a couple in the household in which both persons are eligible for the in-work benefit.

The benefit amount depends on the income remaining after social insurance contributions are paid. The amount of benefit also varies depending on the type of household (single person, single parent, couple, etc.; applicable for WTC-Fam-I and WTC-Fam-II) and the number of hours per week spent in employment. The parameters needed to calculate the benefit amount are shown in Table 1 and were calibrated so that the total cost of introducing the benefit is equal to EUR 200 million.

Table 1. Parameters of in-work benefits, in EUR

	WTC-Fam-I	WTC-Ind	WTC-Fam-II
Components:			
(a) Basic amount	1,069	1,034	982
(b) Supplement for a single parent	1,090	0	1,007
(c) Supplement for a couple	1,090	0	1,007
(d) Supplement for 40 hours per week of work or more	439	427	406
Income threshold (IT_i^1)	3,480	3,386	3,216
Extended income threshold for secondary earners (IT_i^2)	-	-	6,431
Withdrawal rate (w)	0.41	0.41	0.41

Source: Authors' calculations

Note: The amounts are converted using an exchange rate of HRK 7.5345 = 1 EUR.

The total benefit amount obtained by a person *i* is obtained as follows:

$$IWB_i = \max\{0, M_i - \max[0, w(D_i - IT_i^r)]\}, \quad (3)$$

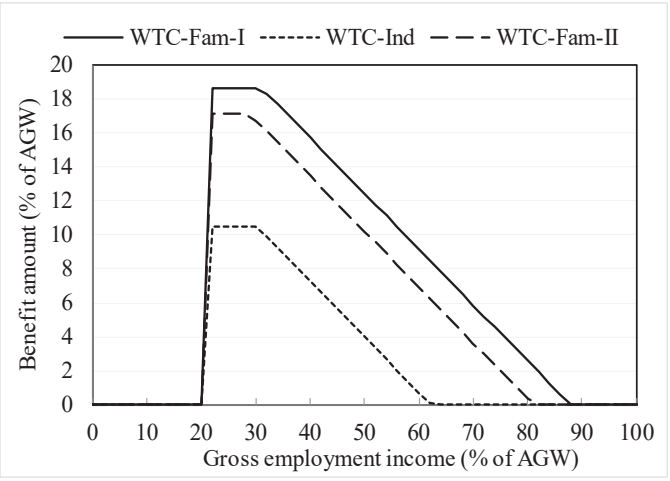
where in the WTC-Fam-I and WTC-Ind, the index r accounts for 1 ($r = 1$), while in WTC-Fam-II scenario it takes two values, $r = \{1,2\}$. Accordingly, in the WTC-Fam-II scenario, $r = 1$ if only one person in the couple is eligible and $r = 2$ if both persons in the couple are eligible for the in-work benefit. In all three scenarios, M_i denotes the maximum amount of benefit, which equals the sum of components (a), (b), (c), and (d) (see Table 1), D_i is income net of social insurance contributions, IT_i^r is the threshold after which the maximum benefit is reduced, and w is the withdrawal rate.

To illustrate the potential amounts of benefits, Figure 1 shows the amounts of three simulated in-work benefits as a function of the gross employment income. The subject of this analysis are (a) a one-earner couple, i.e., a family in which the first spouse is considering full-time employment (40 hours per week), and the second is non-employed; and (b) two-earner couple, i.e., a family in which the second spouse is considering full-time employment, and the first is already employed on a full-time basis, earning a minimum gross wage (which is equal to 42% of the average gross wage (AGW)). In 2019, average monthly gross wage in Croatia was EUR 1,163.

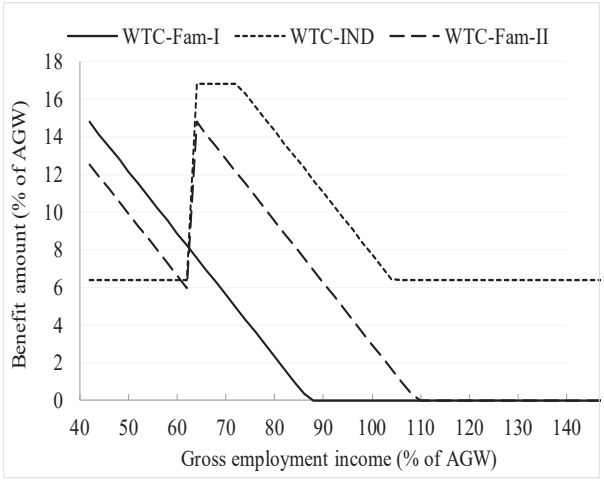
The amounts of all three benefits shown in Figure 1a have the same "shape". We notice a "plateau" on the

Figure 1. Annual amounts of in-work benefits for one-earner and two-earner couples

(a) One earner couple



(b) Two earner couple



Source: Authors' calculations

left-hand side, which begins at employment incomes of 21% of the AGW[10] and ends at the value related to the income threshold parameter. To the right of income threshold, the benefit amount linearly decreases with each additional euro of employment income, at the rate of 41%. In this case, the first spouse is full-time employed and can earn 42% of the AGW and more. As shown in Figure 1a, both WTC-Fam-I and WTC-Fam-II provide almost the same benefit amounts for this type of family and can be received by persons employed at a gross wage up to 80% and 86% of AGW, respectively. On the other hand, WTC-Ind amounts are about half as much and can be received by persons who earn up to 60% of AGW.

Since it is assumed that the first spouse is already employed at 42% of the AGW, Figure 1b shows gross incomes from 42% AGW and above. When the second spouse becomes employed at a minimum gross wage (household gross employment income amounts 84% of AGW), the WTC-Fam-I amount is only 1% of the AGW. On the other hand, we can see the advantage of the WTC-Fam-II benefit, which is designed for two-earner families where both earners receive relatively low amounts of gross wage. If the second spouse is also employed at 42% of the AGW, the WTC-Fam-II benefit amounts to 8% of the AGW, and the benefit drops to zero when the second spouse reaches a gross wage of 68% of the AGW (the point at which household gross income is 110% of the AGW). As for WTC-Ind benefit, for lower amounts of gross wages, WTC-Ind has a similar form as WTC-Fam-II. However, when one of the spouses works on low amounts of gross wages, the WTC-Ind benefit will never fall to zero even if the other spouse earns very high amounts of gross wages.

4. RESULTS

4.1. Main data characteristics

Table 2 and Table 3 present the structure of Croatian samples, whereby the sample and subsample sizes are expressed in weighted terms. Table 2 shows that the starting population comprises females aged 18 to 60 and males aged 18 to 65. There are 2.4 million such individuals in Croatia, with 67% of them being flexible.

Table 2. Flexible and inflexible persons in Croatia

	Number of persons (in thousands)	Share in the total number (%)
Persons aged 18 to 60(65)	2,445	100
All flexible persons	1,658	67
Not selected	113	5
Non-employed persons	295	12
Employed persons	1,250	50

Source: Authors' calculations

Table 3. Division of non-employed persons

	Number of persons (in thousands)	Share in the total number (%)
Non-employed persons	295	100
N1. In a couple with a non-employed spouse	28	10
N2. In a couple with an employed spouse	104	35
N3. In a couple with a non-flexible spouse	60	20
N4. Single in a multi-member household	74	25
N5. Single in a one-member household	23	8
N6. Single parent	6	2

Source: Authors' calculations

The share of non-employed persons in the total number is 12%, while the share of employed persons is 50%.

In the group of non-employed persons, the largest share (35%) is occupied by non-employed persons who live in a couple with an employed spouse. They are followed by singles in multi-member households (25%) (Table 3). The smallest subgroups of non-employed persons are non-employed single parents (2%).

4.2. Distribution of participation tax rate

Table 4 presents the distribution of PTR in the baseline, WTC-Fam-I, WTC-Ind and WTC-Fam-II scenario. The baseline scenario shows the situation according to the existing tax-benefit system in 2019. In contrast, the scenarios "WTC-Fam-I", "WTC-Ind" and "WTC-Fam-II" show how the situation changes if in-work benefits, described in section 3.4, are introduced into Croatian tax-benefit systems. For different subgroups of non-employed persons, the average PTR and the shares

Table 4. Distribution of PTR before and after the introduction of in-work benefits (in %)

	Average PTR	PTR 50-70%	PTR >70%
All non-employed			
Baseline	32.0	5.1	3.5
WTC-Fam-I	28.7	6.4	1.9
WTC-Ind	23.2	5.4	0.8
WTC-Fam-II	28.0	4.5	1.8
N1. In a couple with a non-employed spouse			
Baseline	34.2	7.9	8.5
WTC-Fam-I	14.7	8.1	0.3
WTC-Ind	24.8	9.1	3.5
WTC-Fam-II	17.7	8.3	1.6
N2. In a couple with an employed spouse			
Baseline	33.4	6.9	3.7
WTC-Fam-I	39.1	13.3	3.7
WTC-Ind	23.4	7.4	1.1
WTC-Fam-II	35.5	8.0	3.1
N3. In a couple with a non-flexible spouse			
Baseline	31.7	5.3	5.0
WTC-Fam-I	22.4	2.3	2.8
WTC-Ind	16.2	6.4	0.1
WTC-Fam-II	22.0	1.3	2.8
N4. Single in a multi-member household			
Baseline	28.3	1.3	0.2
WTC-Fam-I	25.2	0.5	0.0
WTC-Ind	25.5	0.5	0.0
WTC-Fam-II	26.1	0.7	0.0
N5. Single in a one-member household			
Baseline	34.5	2.0	2.0
WTC-Fam-I	29.2	1.8	0.0
WTC-Ind	29.9	1.8	0.0
WTC-Fam-II	30.3	2.8	0.0
N6. Single parent			
Baseline	35.8	16.3	7.4
WTC-Fam-I	14.0	8.8	0.0
WTC-Ind	26.7	17.4	2.9
WTC-Fam-II	17.8	13.6	0.0

Source: Authors' calculations

of persons with "high PTR" (in the range of 50 to 70%) and "very high PTR" (above 70%) are calculated. The results of the baseline scenario show that the average PTR for all non-employed persons in Croatia is 32.0%; 5.1% have a high PTR, while 3.5% have a very high PTR.

Because in-work benefits affect different groups of non-employed persons differently, it is more instructive to observe the distribution of PTR by these groups than to look at the whole population. Among those in couples, the highest PTR is seen for persons living with a non-employed spouse (N1), which is expected. The average PTR for this subgroup (N1) is 34.2%. Because neither of the spouses is employed, social benefits are more generous than in other cases, and they are steeply reduced when a person starts working. A higher average PTR is also recorded for single parents (N6), equalling 35.8%.

We now turn to reform scenarios and focus on the most problematic groups regarding the WTC-Fam-I: non-employed persons living in a couple with an employed spouse (N2). Expectations from the literature are fulfilled for this subgroup; WTC-Fam-I significantly increases the average PTR, from 33.4% to 39.1%. It also increases the share of persons with PTR higher than 50%, from 10.6% to 17.0%. On the other hand, WTC-Fam-II increases the average PTR more moderately, by 2.1 percentage points for the subgroup N2, and slightly increases the share of persons with PTR higher than 50% by 0,5 percentage point. Finally, the WTC-Ind reduces the average PTR by 10.0 percentage points and also reduces the share of persons with PTR greater than 50% by 2.1 percentage points.

For all other groups of the non-employed, all three types of simulated in-work benefits reduce the average PTR, but with different relative intensities. WTC-Fam-I and WTC-Fam-II are much more effective in reducing PTR for persons living with a non-employed spouse (N1) and single parents (N6), who also have the highest PTR in the baseline scenario. In subgroup N1, WTC-Fam-I and WTC-Fam-II reduce PTR by 19.5 and 16.5 percentage points respectively, while WTC-Ind reduces PTR by 9.4 percentage points. Furthermore, in the subgroup N6, WTC-Fam-I and WTC-Fam-II reduce PTR by 21.8 and 18.0 percentage points, in turn, while WTC-Ind reduces PTR by 9.1 percentage points.

For other types of persons, all three simulated in-work benefits achieve similar results, except for persons living with a non-flexible spouse (N3), where WTC-Ind in Croatia is significantly more effective than the other two types.

The results of this research for Croatia are in line with previous research conducted for other countries. This paper confirmed the results from the previous research (e.g. Blundell 2000; Blundell and Hoynes 2004; Eissa and Hoynes 2004; Brewer et al. 2006) that 'classic' family-based in-work benefits like WTC-Fam-I increase work incentives of vulnerable groups such as persons living with a non-employed spouse (N1) and single parents (N6). However, WTC-Fam-I have a negative impact on work incentives of non-employed persons living in a couple with an employed spouse (N2). On the other side, WTC-Ind is by definition an individual-based benefit, therefore it increases the work incentives of all subgroups. Its main disadvantage is that it can be awarded to persons living in wealthier households, which is why it has a weaker effect on more vulnerable groups (e.g. subgroups N1 and N6) than the WTC-Fam-I. Family-based in-work benefit with a premium for secondary earners (WTC-Fam-II) retained all the positive characteristics of the WTC-Fam-I and almost eliminated the negative impact of the benefit on the second earner in the family. Therefore, the introduction of this type of in-work benefit could be an effective tool in achieving the goal of increasing work incentives in Croatia.

4.3. Redistributive effects of in-work benefits

This subsection analyzes the impact of introduced in-work benefits on poverty indicators, without taking into account any potential behavioural effects. Poverty lines are calculated based on the baseline scenario and the results are shown in Table 5.

The results show that both family-based in-work benefits (WTC-Fam-I and WTC-Fam-II) have similar effects on poverty reduction, while the individual-based in-work benefit (WTC-Ind) reduces the poverty to a lesser extent. At the poverty line of 60% of the median, the baseline poverty rate is 19.6%, and the introduction of the WTC-Fam-I and WTC-Fam-II benefits reduce the poverty rate by 5.9% and 5.8% and about 14 and 13 thousand households rose above the poverty line,

Table 5. Poverty indicators before and after the introduction of in-work benefits

	Baseline scenario	WTC-Fam-I	WTC-IND	WTC-Fam-II
Poverty line at 60% of median equivalised income				
At risk of poverty rate (in%)	19.6	18.5	19.0	18.5
Changes in the at risk of poverty rate compared to the base scenario (in %)		-5.9	-3.2	-5.8
Number of households below the poverty line (in thousands)	338	324	331	325
Poverty line at 40% of median equivalised income				
At risk of poverty rate (in %)	8.1	7.5	7.8	7.5
Changes in the at risk of poverty rate compared to the base scenario (in %)		-8.2	-3.7	-7.7
Number of households below the poverty line (in thousands)	145	138	141	138

Source: Authors' calculations

respectively. On the other hand, at the poverty line of 60%, the WTC-Ind benefit reduces the poverty rate by 3.2%, which moves around 7 thousand households above the poverty line. As for the results at the poverty line of the 40% median, it turns out that in relative terms the reduction in the poverty rate after the introduction of in-work benefits is even greater when the poverty line is set at 40% of the median than when it is set at 60%.

The conducted analysis shows that although in-work benefits are primarily intended to increase work incentives, they also have a positive impact on reducing the poverty rate. The results also illustrate that family-based in-work benefits better target the poor population, and are at the same time more effective in reducing the poverty rate than individual-based in-work benefit.

5. CONCLUSION

This paper analyses the impact of three hypothetical in-work benefits on work incentives and the poverty rate in Croatia. The first benefit (WTC-Fam-I) is family-based and uses the British WTC as an exemplar and the second benefit (WTC-Ind) is individual-based. Because the standard types of family-based in-work benefits are known to have a negative impact on the work incentives for the secondary earners, a third type of in-work benefit is introduced. This one is the family-based in-work benefit with a premium for secondary earners (WTC-Fam-II), which aims to mitigate the mentioned negative effect. As an indicator of work incentives for the transition from non-employment to employment, the participation tax rate (PTR) is estimated. EUROMOD (the tax-benefit microsimulation model for EU countries) is used for the PTR and poverty rate estimation. Income data and tax-benefit rules refer to 2019.

Starting with the types of in-work benefits that have been commonly analysed in the literature (WTC-Fam-I and WTC-Ind), the results show that WTC-Fam-I and WTC-Ind have different effects on the size of the PTR for specific subgroups of non-employed persons. WTC-Fam-I is more effective in reducing the PTR of the most vulnerable subgroups of non-employed persons, namely those living with a non-employed spouse and single parents. However, WTC-Fam-I increases the PTR of non-employed persons living in a couple with an employed spouse. This finding confirms a well-known fact about the possible negative impact of family-based in-work benefits. On the other hand, the WTC-Ind benefit reduces the PTR for all subgroups of non-employed persons, but it is not concentrated on the most vulnerable subgroups.

WTC-Fam-II provides almost the same results as WTC-Fam-I for all but one subgroup of non-employed persons. The exception is in the case of non-employed persons living with an employed spouse, where WTC-Fam-I significantly increases the average PTR as well as the share of persons with a PTR greater than 50%, while WTC-Fam-II only slightly increases the average PTR and the share of persons with a PTR greater than 50%. The above showed that the WTC-Fam-II retained

all the positive characteristics of the WTC-Fam-I and almost eliminated the negative impact of the benefit on the second earner in the family.

Despite the fact that the primary aim of in-work benefits is not to reduce poverty in the population, the results illustrate that all three types of benefits reduce the poverty rate in the population. As expected, both family-based in-work benefits have a greater impact on poverty reduction than individual-based one, since they target poorer households by definition. WTC-Fam-I and WTC-Fam-II reduce the poverty rate by 1.1 percentage points (from 19.6% to 18.5%), while WTC-Ind reduces it by 0.6 percentage points.

In the Croatian Recovery and Resilience Plan (RPP) (European Commission 2021), it is pointed out that the employment rate in Croatia is still well below the EU average despite the progress achieved in recent years. Furthermore, under the component of the RPP called the improvement of the social welfare system, it is also stated that one of the main tasks is raising the adequacy and coverage of the Guaranteed Minimum Benefit which is the main poverty-reducing benefit at the national level.[11] In general, poverty reduction and increasing social benefits amounts are very important, especially in the current times of high inflation. However, when reforming the social benefit system, policymakers should definitely pay attention that the increase in the social benefits amounts does not negatively impact work incentives. One of the possibilities could be the introduction of in-work benefits.

One of the more important policy implications arising from this research is that the government should be careful when choosing the type of in-work benefits, especially when choosing between individual-based or family-based benefits. All means-tested social benefits in Croatia are awarded using a means test at the family level. Therefore, Croatian policymakers could be more inclined to the introduction of family-based in-work benefits. It has been shown that such benefits for certain types of households have a negative effect on work incentives. However, with careful design of family-based benefits (such as the WTC-Fam-II), all the positive characteristics of family-based benefits can be exploited as well as their negative effects on work incentives can be overcome.

To sum up, the results showed that in-work benefits increase work incentives and at the same time reduce the poverty rate. Therefore, in-work benefits could be an ideal upgrade to the reforms included in the RPP, which are related to increasing the employment rate and reducing the poverty rate in the population. This research shows that one of the directions could be the introduction of in-work benefits such as WTC-Fam-II, which has been shown to combine the positive characteristics of the two most commonly used types of benefits such as WTC-Fam-I and WTC-Ind. Of course, choosing the best type of in-work benefits depends on the policy objectives and we hope that this paper will encourage policymakers and researchers to further research this topic. One of the potential topics for future research can be an empirical analysis of the impact of in-work benefits on the labor supply in Croatia.

The limitations of the research are reflected in the limitations of the survey data and the EUROMOD microsimulation model. Limitations in the data consequently reduce the accuracy of the estimates of the microsimulation models that use this data. Some of the limitations of the data are the lack of information on assets and the aggregation of income variables at the annual level, which makes it impossible to precisely define the income censuses used in the simulation of social assistance programs. To anonymize the data in the EU-SILC survey, several types of social benefits are aggregated into one variable, which also reduces the accuracy of the model's estimates. Furthermore, due to the lack of precise data on all types of social benefits and taxes, only the most significant policies from the tax-benefit system in an individual country are incorporated into EUROMOD. Tax evasion is also not modeled in EUROMOD due to a lack of data, and full take up of benefits is assumed. However, despite all the limitations mentioned, this research provides a representative picture of the situation in Croatia.

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Endnotes

1 The information was downloaded from the Eurostat database (online data code: LFSI_EMP_A). It refers to the population aged 20 to 64.

2 The standard full-time hours per week in Croatia is 40, which gives 2,080 hours per year.

3 For example, let us take a household that consists of two non-employed spouses without children. We create two replicas of that household. In the first case, we observe the transition of the first spouse from non-employment to employment, with unchanged characteristics of the second spouse. In the second case, we observe the transition of the second spouse from non-employment to employment, with unchanged characteristics of the first spouse.

4 For the detailed description of the EUROMOD, please see the paper Sutherland and Figari (2013).

5 The detailed description of the tax and social benefits system in Croatia can be found in the Euromod Country Report for Croatia (Urban and Bezeredi 2022).

6 EU-SILC is a mandatory survey that allows a comparative analysis of income statistics, poverty indicators, and social exclusion for all EU countries. For more information, see https://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions.

7 Property taxes, public pensions, and health and disability benefits are examples of tax-benefit instruments typically not simulated in EUROMOD.

8 For examples of similar applications, see Bargain and Orsini (2006), Bargain et al (2010), O'Donoghue (2011), Bezeredi and Urban (2016).

9 For more about the design of the "original" WTC, see Reis and Tasseva (2020).

10 The condition for receiving in-work benefits is that the person works at least 20 hours per week, whereby the person can earn at least half the minimum wage, i.e. 21% of AGW.

11 One of the goals is to reduce the poverty rate below 15%.

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APPENDIX

A.1. The results of Heckman's selection model

We predict the gross wages of non-employed persons in Croatia using Heckman's selection model. We use the logarithm of gross wage per hour as a dependent variable, and the independent variables used in the model are defined in Table A1.

Table A1. Description of variables used in Heckman's selection model

Independent variables	Description of variables
age	Number of respondents years.
dob²/100	The squared amount of the variable "*age*" divided by 100.
education	Number of years spent in education.
work_exp	Number of years spent in employment.
work_exp²/100	The squared amount of the variable "*work_exp*" divided by 100.
urban	A binary variable that takes the value 1 if a person lives in an urban area.
health _prbl1	A binary variable that takes the value 1 if a person has a health limitation in activities that people usually perform.
health _prbl2	A binary variable that takes the value 1 if a person has a strongly health limitation in activities that people usually perform.
marital_st	A binary variable that takes a value of 1 if a person has a partner/spouse.
chld00_06	Number of children aged 0 to 6 years.
chld07_14	Number of children aged 7 to 14 years.
income1	Equivalent household income consisting of the income of other household members from: (a) employment and self-employment; (b) capital and property; (c) received private transfers. The total amount was divided by 10,000, and income was equalized using the OECD scale.
income2	Equivalent household income consisting of the income of other household members from: (a) pension; (b) unemployment benefit, sickness, maternity and parental leave benefits. The total amount was divided by 10,000, and income was equalized using the OECD scale.
income3	Equivalent household income consisting of the income of other household members from: (a) child benefits; (b) social benefits. The total amount was divided by 10,000, and income was equalized using the OECD scale.

Source: Authors' work

The results of Heckman's selection model for Croatia are shown in Table A2.

Table A2. Estimation of Heckman's selection model

	Females	Males
	Coeff. (Std. Error)	Coeff. (Std. Error)
Wage equation		
age	-0.016 (0.007)**	0.003 (0.008)
age^2	0.001 (0.009)	-0.011 (0.009)
education	0.099 (0.003)***	0.089 (0.004)***
work_exp	0.042 (0.004)***	0.023 (0.005)***
work_exp^2*/100*	-0.048 (0.009)***	-0.026 (0.009)***
urban	0.137 (0.018)***	0.133 (0.018)***
constant	2.211 (0.134)***	2.325 (0.132)***
Selection equation		
age	0,001 (0.022)	-0.013 (0.021)
age	-0.105 (0.027)***	-0.107 (0.025)***
education	0.126 (0.012)***	0.144 (0.016)***
work_exp	0.192 (0.010)***	0.152 (0.012)***
work_exp^2*/100*	-0.253 (0.025)***	-0.096 (0.027)***
urban	0.198 (0.067)***	-0.050 (0.073)
health _prbl1	-0.262 (0.070)***	-0.514 (0.075)***
health _prbl2	-0.795 (0.130)***	-1.154 (0.140)***
marital_st	-0.094 (0.071)	0.125 (0.082)
chld00_06	-0.436 (0.055)***	0.179 (0.073)**
chld07_14	-0.181 (0.042)***	0.082 (0.057)
income1	-0.259 (0.070)***	0.160 (0.097)*
income2	-0.420 (0.201)**	-0.358 (0.278)
income3	-3.983 (1.866)**	-14.221 (2.166)***
constant	-0.513 (0.405)	-0.265 (0.411)
rho	0.662 (0.054)	-0.237 (0.064)***
sigma	0.404 (0.008)	0.427 (0.005)***
lambda	0.267 (0.026)	-0.101 (0.028)***
Number of obs	4,032	4,118
Censored obs	1,213	732
Uncensored obs	2,819	3,386
Log likelihood	-2,701	-3,122

*Significance: *p<0.1, **p<0.05, ***p<0.01*

Source: Authors' calculations