STUDIA UNIVERSITATIS ECONOMICS SERIES
"Vasile Goldiș" Western University of Arad
2026 - 36(3)
DOI: 10.2478/sues-2026-0012

SIMPLIFICATION OPPORTUNITIES IN SOME WESTERN EUROPEAN PERSONAL INCOME TAX SYSTEM

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(Received: May 2025; Accepted: September 2025; Published: July 2026)

Abstract: This paper builds on earlier analyses of international examples to further explore the limitations of simplification opportunities in personal income tax systems. To this purpose, a program has been developed to determine parameters of a simple, theoretical tax system can be closely matched to the tax burden curves of the countries under study. The findings from previous studies suggest that replacing complex systems with simpler tax parameters is a real option. This can be effectively accomplished using the paper's chosen theoretical tax system, provided that there are no significant breakpoints in the tax burden curve being analysed. This study specifically focuses on these breakpoints and investigates personal income tax systems in Western Europe that have not been previously examined. The analysis identifies that a breakpoint in the tax burden curves often occurs due to substantial differences between two tax rates, the withdrawal of certain tax reliefs at a certain income level, or the capping of the elements that can be considered as allowances. However, even with these elements included in the analysed system, a simple theoretical tax system can still be effective if these elements are applied in a manner that does not significantly disrupt the tax burden curve.

Keywords: optimal taxation; tax burden curve; personal tax system; simulation systems.

JEL CODES: H21, C61, K34.

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1. Introduction

The government has several instruments for redistributing income: the system of public expenditure provides an opportunity, but another fundamental pillar is the tax system. Fiscal policy decisions affect the public interest and have an impact on endogenous variables in the economy, and their objectives are mostly achieved through the tax system (Turof, 2009).

There is no one correct solution for the optimal mix of economic policy instruments to achieve a given income redistribution effect, considering that the factors determining redistribution can be complex. Nevertheless, the choice between fairness or efficiency and simplicity, and consequently determining optimal tax parameters, are important areas of theoretical discussion.

In the area of personal income taxation, a related field that has been less researched is whether the tax burden of a complex system that emphasizes fairness (possibly with multiple rates, and various benefits) can be achieved by the elements of a simple, efficient system (with few tax parameters). If the answer is positive, it raises the question of whether it is necessary to maintain complex tax systems at all costs. Are there elements that, in terms of their impact on the shape of the tax burden curve, are not worth using because the tax system can provide the same tax burden without them? Overall, the choice between fairness and simplicity may not always be a forced one.

The author's analysis seeks to answer this question by examining the possibilities of simplifying the parameters of the personal income tax system: its tax rates, its benefits, and its structure, within a given framework. In this context, the analyses take a new perspective: they look for simplification not from the revenue side (considering its invariability as an objective) but from the perspective of the tax burden on taxpayers. To this purpose, it is necessary to define a theoretical tax model whose basic elements fulfil the conditions for a simple tax system. The study examines whether this theoretical tax model can be adjusted with parameters to ensure its tax burden curves closely align with the tax burden curves of the country's system, as expected. The parameters of the theoretical tax model can be calculated using a special program written by the author in MATLAB to obtain a tax burden curve that matches the real data as closely as possible.

The author's previous analyses for part of the Visegrad countries, including Hungary (Author, 2020 and Author, 2021), have demonstrated that the theoretical tax model often fits well the tax burden curves of the systems studied. However, the analyses also showed that the chosen theoretical system can fit well a personal income tax system provided there are no significant breakpoints in the tax burden curves or tax

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 36 Issue 3/2026
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 33-57

benefit elements that make different types of families taxed differently (e.g., splitting, family taxation), only if these parameters are also applied in the theoretical system.

By reducing the number of parameters, a simple system can possibly fit the tax burden curves of a complex personal income tax system to an acceptable degree. A closer fit is more achievable for reducing sub-elements that apply uniformly to all family types studied, such as tax rates and general benefit elements (Author, 2025).

Based on previous research, this paper examines the personal income tax systems in Western Europe, further exploring the challenge of fitting tax burden curves with breakpoints that have previously posed difficulties in achieving accurate approximations.

2. Literature review

Since the time of the mercantilists, taxation has primarily focused on two main questions: how to fairly distribute the tax burden and how to tax efficiently – that is, in a way that does not harm the economy while still generating necessary revenue. Today, a central issue remains finding a balance between fairness and efficiency in the tax system, along with considerations for the overall fiscal effort and potential reductions in the tax burden.

The literature suggests that optimal taxation involves having multiple (though limited) types of taxes, with few differentiated rates, rather than relying on a single tax with varying rates. A simpler tax system reduces collection costs and facilitates control. Additionally, the system can help keep marginal tax rates lower, which can encourage greater tax compliance. In many models, an optimal approach often includes a combination of indirect taxes and income taxes (Scharle et al., 2010; for a summary of this topic, see Elek-Scharle, 2008). However, the specific characteristics of other areas of fiscal policy must also be considered: for example, in countries with public social security systems well developed and large public expenditures, taxes on labour are high in order to support social spending, while the tax burden on capital is low. (Radu, 2012).

Table 1. Overview of papers on optimal tax systems

Paper	Main results
Optimal tax system in general	
Mirrlees (1971)	He examined the theoretical principles of tax system optimisation. The tax system must consider individual work preferences and motivations, particularly in relation to labour supply and income redistribution. When

	determining tax levels and progressivity, trade-offs between tax efficiency and fairness must be considered.
Mankiw et al. (2009)	There is no single "perfect" tax system, but the goal is to develop a system that balances economic efficiency, fairness and practical feasibility.
Krekó et al. (2022)	An optimal tax system is one that achieves the necessary fiscal revenue and desired income redistribution with the lowest possible social cost, which includes administrative expenses and distortionary effects. A single-rate tax system can be advantageous in many aspects, but may decrease the level of redistribution, potentially increasing income inequality.
Hall and Rabushka (2007)	They developed the flat-rate tax system. It has several advantages (simplicity and transparency, it reduces tax evasion, contributes to economic growth, stability and predictability, it reduces structural distortions in the tax burden). In practice it can also pose many challenges, such as questions of fairness compared to progressive tax systems.
Adhikari and Alm (2016)	They analysed the impact of flat tax reform on incomes in eight Eastern and Central European countries, using "synthetic control" methods. They found positive impacts. A single-rate tax system can be advantageous in terms of social costs because it lowers the marginal tax rate on higher incomes. This reduction can lead to an increase in the labour supply from higher-income earners.
Ivanova et al. (2005)	They analysed the Russian "flat tax" reform. It concludes that there is no evidence of a strong supply-side effect of the reform. A single-rate tax system can minimize tax avoidance.
Optimal parameters for income taxation	
Mirrlees (1971)	Optimal taxation varies depending on income levels, and tax rates should be set to balance incentives and revenue. The optimal income tax system applies gradually increasing, moderately progressive tax rates.
Mankiw et al. (2009)	The optimal income tax system is moderately progressive, with tax rates set at a level that encourages economic activity while financing public expenditure. Tax rates should be set at a level that minimises tax evasion and the decline of economic efficiency.
Diamond (1998)	Marginal tax rates are higher at the highest and lowest income levels, while tax rates are lower in the middle. This "U-shaped" pattern suggests that the optimal tax system is not continuously progressive, but applies different tax rates at certain income levels to balance labour incentives and tax revenues.
Saez (2001)	Tax rates should be established in such a way as to balance maximising tax revenues and minimising economic distortions, considering social

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ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 33-57

	welfare and the behaviour of economic agents. Their specific value at a given income level depends on the behavioural effects characteristic of income earners at that level and on social preferences. The more income earners respond to increases in tax rates, the less worthwhile it is to apply high taxes, as high tax rates can cause significant income losses for employees.
Heathcote and Tsujiyama (2019)	They propose a framework in which the tax structure simultaneously considers the maximisation of social welfare and the minimisation of economic distortions, thereby reconciling the principles of Mirrlees and Ramsey. The optimal income tax system is a progressive system that balances income fairness, individual motivation, and economic efficiency. This generally applies higher tax rates to high earners, but these must be designed to cause minimal distortion in economic behaviour while achieving social redistribution goals.
Farhi and Gabaix (2020)	They revisited traditional theories of optimal taxation by incorporating behavioural agents to account for behavioural effects. They argue that several factors, such as nudge [1]. The level of attention taxpayers pay to taxes and behavioural attitudes toward non-linear income taxation may influence optimal policy decisions in ways that have not been sufficiently measured.
Kaplow (2022)	He highlighted that each combination of assumptions about individuals' behaviour towards savings and existing saving policies results in different optimal income tax regimes.

Source: own compilations.

Balogh, Gál, and Parádi-Dolgos (2014) argue that creating a simple and fair tax system is, in effect, impossible. Fairness in taxation is closely tied to the complexity of the system; a more intricate and detailed regulatory framework can better accommodate individual interests. While exceptions and exemptions can contribute to a fairer system, they also increase complexity and make the system more circumventable. As a result, a single-rate (simple) and fair taxation is not fully compatible, as strengthening one aspect can undermine the other.

Studies in the literature provide a very good summary of the factors influencing the fairness and efficiency of an income tax system. These studies also emphasise the importance of optimising these factors. However, it is important to note that ultimately, the tax burden curves of the income tax system are influenced by these factors. This effect is realised through the general tax parameters of the tax system (tax rates, general allowances, special taxes) and special allowances and tax burdens imposed on specific groups of taxpayers. About tax burden curves, however,

it is also possible to analyse whether the same tax burden curve can be produced using other, possibly fewer, simpler parameters.

3. Methodology and empirical data

The aim of this study, as in previous ones (Author, 2020; Author, 2021; Author, 2025), is to examine, within a defined framework, the possibilities for simplifying personal income tax systems that are potentially complex, with multiple taxation elements, tax rates, and allowances. The investigation of simplification possibilities is based on the possible principles of a theoretical, simple, optimal, and efficient tax system. The fundamental purpose is to examine whether the contradiction between the fairness and simplicity of personal income tax systems is debatable from a certain point of view.

In this study, we developed a theoretical tax model that meets the criteria of a simple tax system and examined how this model can be parameterised to align with the tax burden curves of the income tax systems being analysed. The theoretical model is a personal income tax system characterized by a single tax rate, a general lump-sum tax credit, a child tax credit, and a spousal tax credit. The analysis focuses on identifying the parameters of these components: the tax rate, general lump-sum allowance, child tax allowance, and spousal tax allowance.

We fit the tax burden curves created by parameterising the theoretical tax system to the tax burden curves of the country's system under study, to achieve the best fit. We determine the parameters of the theoretical tax model using a special MATLAB program created by the author. The program utilises MATLAB's built-in optimization algorithm to find the minimum sum of squares of the difference between the tax burden values of the theoretical system calculated for different incomes, using the parameters of the theoretical system we are looking for, and the tax burden values according to the real data. Throughout this process, the parameters are adjusted to achieve the most accurate tax burden curve within the specified limits.

The real tax burden data used as a basis for comparing the theoretical and the real system are sourced from the OECD database, which shows tax burden rates ranging from 50% to 250% of average gross wages. The analysis focuses, in line with the data and previous work, on the most detailed OECD data, which includes four types of families: single persons with no child or with two children, and single-earner couples with no child or with two children. The program seeks to identify optimal tax parameters by analysing the aggregate "error curves" of these four family types. However, because of the concrete personal income tax systems of the countries considered in this study, either the spouse or the child tax credit is applied, the tax

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 36 Issue 3/2026
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 33-57

burden curves for two of the four family types always coincide. As a result, in the theoretical model, one of the two parameters being analysed is zero by definition.
The tax model created using MATLAB is structured as follows. The model utilizes the following notations:
$\mathbf{x}_{0s}$, $\mathbf{x}_{2m}$, $\mathbf{x}_{0m}$, and $\mathbf{x}_{2s}$ are the incomes of different types of families (single person without child, one-earner married couple with two children, one-earner married couple without child, and single parent with two children),
$\mathbf{th}_{0s}$, $\mathbf{th}_{2m}$, $\mathbf{th}_{0m}$, and $\mathbf{th}_{2s\,a}$re the tax burdens for different family types,
v is the general tax base allowance,
n is the tax base allowance for married couples,
m is the tax base allowance for children,
a is the tax rate,
Wa is the average gross wage,
$\mathbf{Th}_i$ are the theoretical tax burden for different family types,
$\mathbf{Tr}_i$ are the real tax burden by family type.
The personal income tax burden for the four family types is determined as follows:

$$\mathbf{th}_{0s} = (a \cdot \mathbf{x}_{0s} - v)/\, x_{0s} \quad (1)$$
$$\mathbf{th}_{2m} = (a \cdot \mathbf{x}_{2m} - v - n - m)/\, x_{2m} \quad (2)$$
$$\mathbf{th}_{0m} = (a \cdot \mathbf{x}_{0m} - v - n)/\, x_{0m} \quad (3)$$
$$\mathbf{th}_{2s} = (a \cdot \mathbf{x}_{2s} - v - m)/\, x_{2s}, \quad (4)$$

assuming that

$$\mathbf{x}_i \in \mathbb{N} \text{ and } 0{,}5Wa \leq \mathrm{x}_i \leq 2{,}5\mathbf{Wa},$$
$$\mathbf{th}_i > 0,$$

where i = {0s, 2m, 0m, 2s}.

The analysis aims to minimize the error function defined as the sum of squares of the difference between the theoretical and real tax burden:

$$\mathrm{E}(\mathbf{x}_i) = \Sigma\, (\mathbf{Th}_i - \mathbf{Tr}_i)^2 \rightarrow \min, \quad (5)$$

assuming that

$$(\mathbf{Th}_i - \mathbf{Tr}_i) < 0.$$

4. Empirical results

4.1. Analysis of the Austrian personal income tax system

In the Austrian personal income tax system for 2022, several types of tax base allowances and tax credits were applied. There were different tax rates for regular and non-regular income from employment; specifically, regular income was taxed at six rates, while non-regular income faced seven rates. Tax base benefits included deductions for work-related expenses and percentage reductions for social security contributions. Tax credits were typically lump-sum reductions, which included various forms of child benefits, some of which reduced the amount of the benefit based on the beneficiary's income level.

The theoretical tax model designed for the comparison of the Austrian system differs slightly from the one described above. In this theoretical framework, certain tax benefits can be deducted as negative tax [2]. Thus, the model also allows for the possibility of refunding the child benefit.

In the tax model, the notations are used as defined above, with the following differences:

$\mathbf{t_1h}_i$ is the calculated tax burden for each family before claiming the child tax credit and after claiming the other tax credits.

$\mathbf{t_2h}_i$ is the calculated tax burden for each family after tax credits are claimed.

The calculated tax burden of the four types of families before receiving child tax credits is determined as follows:

$$\mathbf{t_1h}_{0s} = (a \cdot \mathbf{x}_{0s} - v)/\ \mathbf{x}_{0s} \quad (6)$$

$$\mathbf{t_1h}_{2m} = (a \cdot \mathbf{x}_{2m} - v - n)/\ \mathbf{x}_{2m} \quad (7)$$

$$\mathbf{t_1h}_{0m} = (a \cdot \mathbf{x}_{0m} - v - n)/\ \mathbf{x}_{0m} \quad (8)$$

$$\mathbf{t_1h}_{2s} = (a \cdot \mathbf{x}_{2s} - v)/\ \mathbf{x}_{2s}, \quad (9)$$

assuming that

$$\mathbf{x}_i \in \mathbb{N} \text{ and } 0{,}5\mathbf{Wa} \leq x_i \leq 2{,}5\mathbf{Wa},$$
$$\mathbf{t_1h}_i > 0,$$

where i = {0s, 2m, 0m, 2s}.

After the child tax credit is applied, the tax burdens are:

$$\mathbf{t_2h}_{0s} = \mathbf{t_1h}_{0s} \quad (10)$$

$$\mathbf{t_2h}_{2m} = \mathbf{t_1h}_{2m} - m/\ \mathbf{x}_{2m} \quad (11)$$

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ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 33-57

$$\mathbf{t_2h}_{0m} = \mathbf{t_1h}_{0m} \quad (12)$$

$$\mathbf{t_2h}_{2s} = \mathbf{t_1h}_{2s} - m/\ \mathbf{x}_{2s}, \quad (13)$$

But here we do not specify the positivity of the theoretical tax burden.
The study continues to minimize the error function defined as the sum of squares of the differences between the theoretical and real tax burden:

$$E(\mathbf{x}_i) = \Sigma\ (\mathbf{Th}_i - \mathbf{Tr}_i)^2 \rightarrow \min, \quad (14)$$

assuming that

$$(\mathbf{Th}_i - \mathbf{Tr}_i) < 0$$

The values of the unknown variables are sought within the following bounds:

$$0.01 \leq a \leq 0.5$$
$$100 \leq v \leq 10{,}000$$
$$110 \leq m \leq 11{,}000$$
$$0 \leq n \leq 12{,}000$$

The fit of the theoretical model to the analysed system for each family type is shown in Figure 1.
The smaller breakpoint observed in the real tax burden curve at 67% of the average gross wage is caused by the withdrawal of the commuting tax credit supplement and the withdrawal of the inflation tax credit after its reduction in line with income. At 151% of the average gross wage, the breakpoint is caused by the maximum basis of social security contributions that can be taken as a tax base reduction. For families with children, the breakpoint at 67-70% of the average gross wage is further exacerbated by the obligation to refund certain tax credits [3] linked to social security contributions, whose dependent nature ensures the maximisation of the negative tax (refund). In our theoretical model, these smaller breakpoints in the real tax burden functions may explain the smaller differences in convergence observed in the graph. According to OECD data regarding the Austrian system, the tax burden for married couples does not differ from that of single individuals across the four family types analysed. Therefore, in the theoretical model, the tax allowance for married couples is set at €0, indicating that this allowance element is not necessary for the comparison.

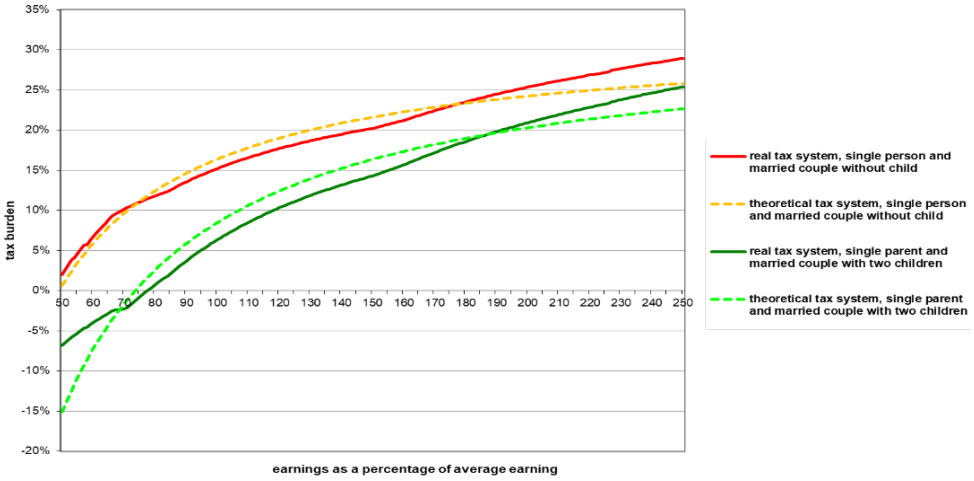

Figure 1. The tax burden of the theoretical, simple income tax system and the Austrian central income tax system for various types of families, 2022
Source: own elaboration.

The parameters of the theoretical tax system were defined by the optimization program run as follows:

- general tax credit: €8,279,
- spousal tax credit: €0,
- tax rate: 32.1%,
- child tax credit: €2,079 per child.

To assess the adequacy of the function fit, the magnitude of the relative residual variance is also presented in Table 2.

Table 2. The relative residual variance value for the theoretical tax system fitted to the Austrian personal income tax system

Family type	Relative residual variance
Single person, without a child	0.0698
One-earner married couple, with two children	0.1392
One-earner married couple, without a child	0.0698
Single parent, with two children	0.1392

Source: own calculation.

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ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 33-57

The relative residual variance values for childless families indicate a good fit for the real system's function. In contrast, for families with children, the values exceeded the acceptable 10% threshold for function fit, suggesting that the fit was inadequate. Overall, it can be concluded that the Austrian personal income tax system, which includes various components in addition to the child benefits, such as seven or six different tax rates, could be adequately substituted by our theoretical model. This model operates with a single tax rate and a general allowance, benefiting only families with children. As observed in previous analyses, the discrepancy arose from breakpoints in the tax burden curve of the real tax system. In this case, these breakpoints were exacerbated by the withdrawal of the low-income tax credit for families with children, leading to a situation where the function fit was no longer appropriate.

If we examine a modified Austrian personal income tax system where the negative tax amount is not capped, we can assess whether smoothing out the breakpoint improves the model's fit. In this scenario, we remove one breakpoint from the real tax burden curve for families with children, while not handling the others, such as the capped contribution base and the withdrawal of the supplement for the commuting tax allowance and the inflation tax allowance. In this case, the basic allowance and the supplement to the commuting tax credit, the inflation tax credit, and the single-parent tax credit would simply be treated as negative taxes in the real tax system.

To compare the modified Austrian system with the theoretical system used in this section, the fit of the tax burden function is shown in Figure 2.

The parameters of the theoretical tax system were defined in this case by the optimization program run as follows:

- general tax credit: €8,650,
- spousal tax credit: €0,
- tax rate: 32.9%,
- child tax credit: €2,350.5 per child.

It is worth noting that, due to changes in the Austrian tax system, the program has slightly modified not only the child tax credit but also the tax rate and the general tax credit for a more precise fit of the theoretical tax system.

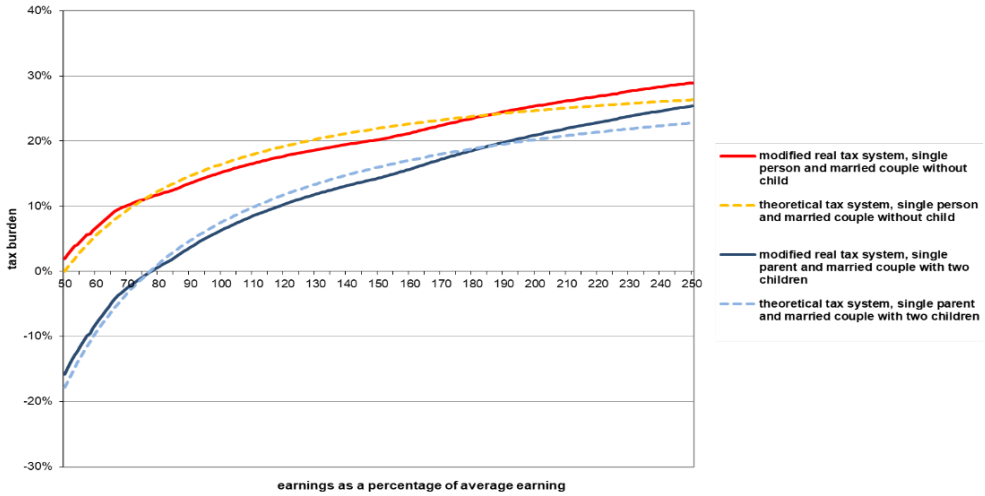

Figure 2. The tax burden of the theoretical, simple income tax system and the modified Austrian central income tax system for various types of families, 2022
Source: own elaboration.

These changes in the tax system specifically affected the tax burden for single individuals with two children and married couples with two children, smoothing the breakpoint in the real system at 67-70% of the average income. However, the tax burden curve for childless singles and childless married couples remained unchanged. By eliminating this breakpoint, the program was able to align the tax burden curve of our theoretical model to fit more closely to the modified real system, as seen in the graph. Additionally, the magnitude of the relative residual variances presented in Table 3 further indicates this improvement.

Table 3. The relative residual variance value for the theoretical tax system fitted to the modified Austrian personal income tax system

Family type	Relative residual variance
Single person, without a child	0.0674
One-earner married couple, with two children	0.0867
One-earner married couple, without a child	0.0674
Single parent, with two children	0.0867

Source: own calculation.

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Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 33-57

Our theoretical system closely resembles the Austrian income tax system, which features multiple rates, tax base reliefs, and tax credits if the amount of negative tax returned is not capped. This change would minimize any significant breakpoints on the tax burden curve for families with children.

4.2. Examination of the United Kingdom personal income tax system

The United Kingdom had a relatively uncomplicated personal income tax system in 2022. This system featured three tax rates, although only two of these rates applied to the income levels presented by the OECD. The key components of the system included a lump-sum personal tax credit, which was phased out for higher incomes, and a lump-sum spousal tax credit, which was reduced at a certain income threshold. Our theoretical model is the same as the basic model. The values of the unknown variables are sought within the following bounds:

$$0.01 \le a \le 0.5$$
$$0 \le v \le 10{,}000$$
$$1 \le m \le 11{,}000$$
$$2 \le n \le 12{,}000$$

The results of the function fitting are shown in Figure 3.

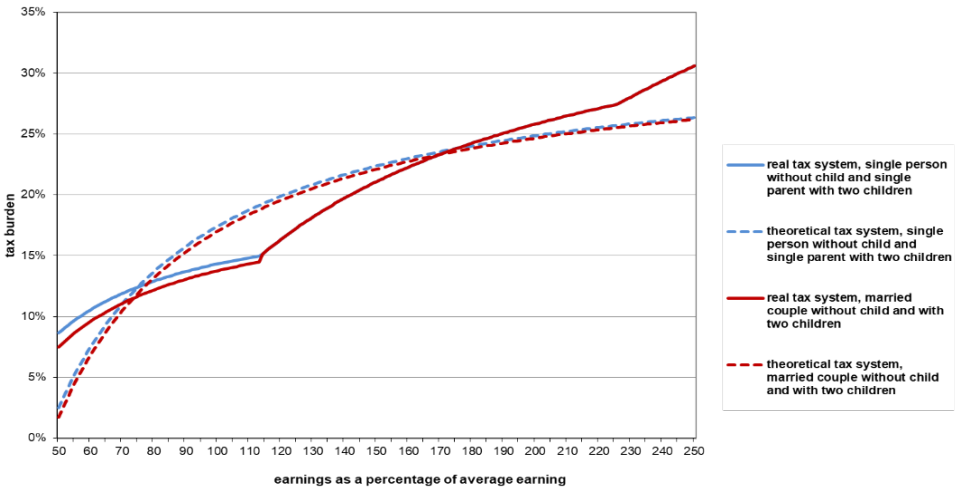

Figure 3. The tax burden of the theoretical, simple income tax system and the British central income tax system for various types of families, 2022
Source: own elaboration.

The parameters of the theoretical tax system were defined by the optimization program run as follows:

- general tax credit: £6,596,
- spousal tax credit: £177,
- tax rate: 32.3%,
- child tax credit: £0.

In this system, as in the Austrian income tax system, only two types of families are distinguished from each other in terms of tax benefits. However, since the child tax credit is not applied here, but the spouses receive a tax credit, the tax burden curve for families with no children and families with children becomes equal, and the tax burden curve for married families differs from the one for single families.

The UK personal income tax system, as outlined, is relatively straightforward, with few tax elements reflected in the OECD data. Our simplified theoretical model struggled to converge accurately, as illustrated in the graph, due to notable breakpoints in the actual tax burden curves. The breakpoint at 114% of average gross wages is caused by the significant difference in tax rates between the first and second tax bands (with the rate rising from 20% to 40%). For married taxpayers, this breakpoint is also influenced by the immediate elimination of the married tax base allowance at the band limit, without any income-related reduction. Furthermore, the breakpoint at 226% of average gross wages arises from the initial reduction in the personal allowance [4].

If we focus solely on single, childless family types (excluding specific benefits), we can only construct a tax burden curve using a theoretical system that differs from our current one, which has one tax band and one general tax credit. This theoretical system would need to incorporate at least three tax elements: either three tax bands or two tax bands, along with one general tax allowance [5]. In cases where only two of these elements are included, the tax burden curve typically appears either concave without a breakpoint (as seen with one tax band and one general tax allowance) or concave after an initial steady tax burden that runs parallel to the income axis (as seen with two tax bands and no allowance). However, the income tax system in the United Kingdom under consideration is in fact a two-rate system (without considering the benefits for each type of family) with a general tax base allowance. This is consistent with the system to which we should extend our theoretical system to resemble the system we are investigating. Perhaps a three-key system could also be considered. Thus, for reasons of its simplicity, no further simplification of the British system is possible.

The relative residual variances are presented in Table 4.

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 36 Issue 3/2026
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 33-57

Table 4. The relative residual variance value for the theoretical tax system fitted to the British personal income tax system

Family type	Relative residual variance
Single person, without a child	0.1125
One-earner married couple, with two children	0.1121
One-earner married couple, without a child	0.1121
Single parent, with two children	0.1125

Source: own calculation.

It's noteworthy that, based on the relative residual variances, even though the graph of the function fit isn't perfect, the variances only slightly exceed the 10% threshold that is generally considered acceptable for fitting.

4.3. Examination of the Italian personal income tax system

Italy's income tax system in 2022 is significantly more complex than that of the United Kingdom. It includes a capped tax base allowance along with three regular tax allowances, two of which are mentioned in OECD data. Both the standard tax allowance and the spouse's allowance are set as lump-sum amounts that decrease at higher income levels. The tax system operates on a four-tier scale, and the data also reflects regional, progressive, banded tax as well as local, percentage-based tax on income.

Our theoretical model is also the same as in the basic model, where the values of the unknown variables are sought within the following bounds:

$$0.01 \leq a \leq 0.5$$
$$1 \leq v \leq 11{,}000$$
$$0 \leq m \leq 10{,}000$$
$$2 \leq n \leq 12{,}000$$

The results of the function fitting are presented in Figure 4.

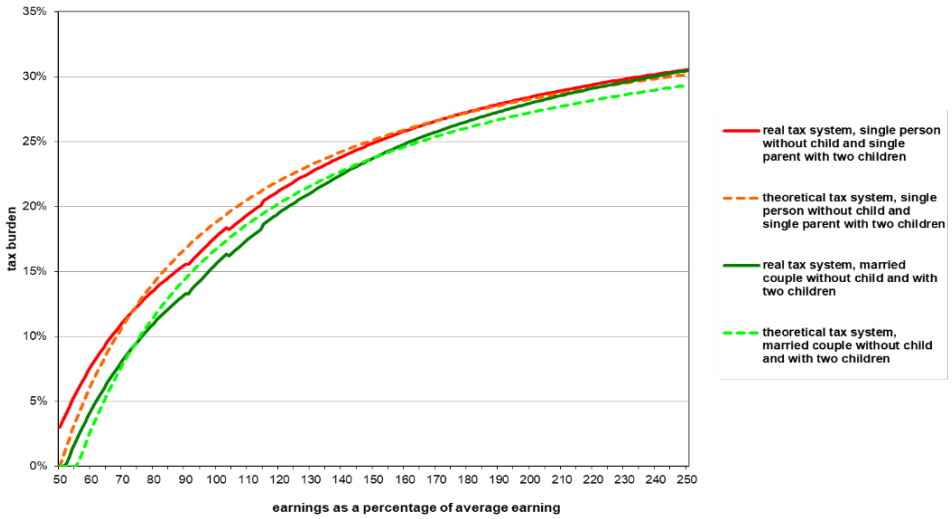

Figure 4. The tax burden of the theoretical, simple income tax system and the Italian central income tax system for various types of families, 2022
Source: own elaboration.

The figure indicates that the tax burden curves of the complex Italian income tax system, which includes multiple rates, central and local income taxes, as well as various tax deductions and credits, can be sufficiently approximated by our theoretical model, which features a single tax rate along with a general tax credit and a spousal tax credit.
The parameters of the theoretical tax system were determined by the optimization program run as follows:

- general tax credit: €6,384,
- spousal tax credit: €705,
- tax rate: 37.7%,
- child tax credit: €0.

The sums of the relative residual variances are presented in Table 5.

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 36 Issue 3/2026
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 33-57

Table 5. The relative residual variance value for the theoretical tax system fitted to the Italian personal income tax system

Family type	Relative residual variance
Single person, without a child	0.0335
One-earner married couple, with two children	0.0372
One-earner married couple, without a child	0.0372
Single parent, with two children	0.0335

Source: own calculation.

The relative residual variances do not exceed the 10% limit for any family type that is considered acceptable for fitting. The probable reason for the very good approximation is that the tax burden curves of the Italian income tax system are well "smoothed" to eliminate possible breakpoints due to the maximisation of certain benefits. As a result of this smoothing, the breakpoints are minimal, allowing our theoretical model to closely approximate the tax burden curves generated by a multi-rate system with various benefits, including local taxes.

5. Discussion and recommendation

5.1. Empirical results

The Austrian personal income tax system employs a multiple-rate structure with various benefits. The breakpoints in the tax burden curve were influenced by the withdrawal of certain tax benefits due to an income-related reduction, the capped contribution base for social security contributions as a form of tax base relief, and limitations on specific tax benefits for children, which are considered negative taxes. Our simplified theoretical model was able to fit almost adequately; however, we encountered significant fitting problems for taxpayers with children. Examining a "modified" Austrian personal income tax system – where the breakpoint resulting from the maximization of negative taxes specifically for families with children is adjusted, while keeping all tax rates and other benefits the same – we found that our simpler model's fit to this modified system was already satisfactory.

The British income tax system is relatively simple, featuring only a few key components. However, the tax burden curves exhibit significant breakpoints, primarily due to the large differences in tax rates. This results in our theoretical model, which typically generates a tax burden curve without breakpoints, being unable to accurately reflect the real system. Considering that our theoretical system includes only one tax bracket and one general tax credit, we believe that a perfect fit of the tax burden curve of a basic tax system without special benefits for each family

type could be obtained by using at least three tax elements: either three tax brackets or two tax brackets and one general tax credit. However, the use of two tax bands and a standard deduction would be the same as the United Kingdom's system, and three tax bands would not be simpler either; therefore, this simple personal income tax system cannot be simplified further.

The Italian personal income tax system applies four tax rates, as well as regional and local tax elements and various tax base allowances and tax credits. This complex system results in tax burden curves that, despite their intricacies, do not feature significant breakpoints. Our theoretical model approximated these curves with impressive accuracy, primarily because the capped benefit elements only led to minor breakpoints in the tax burden curves.

5.2. Discussion

The study is not in contradiction with existing literature, indicating that tax rates should be designed to balance the goals of maximizing tax revenues and minimizing economic distortions. This balance must consider social welfare, the behavior of economic agents, and the potential for tax avoidance (Mirrlees, 1971; Mankiw et al., 2009; Saez, 2001; Heathcote and Tsujiyama, 2019). These studies do not seek to identify a single, perfectly optimal income tax system, as no such universal solution exists. Instead, an optimal tax framework can be developed by considering economic, social, and political factors to effectively balance efficiency and equity. The characteristics of optimal taxation may differ from one country to another and from one context to another, reflecting local economic, social, and political conditions.

However, the study recommends reconsidering the claim that it is impossible to create a simple and fair tax system, because the fairness of such a system is closely linked to more detailed regulations (Balogh, Gál, and Parádi-Dolgos, 2014). The research examines possibilities for simplifying the general elements of income tax systems, filling gaps in the existing literature. The findings indicate that, under certain conditions, the general parameters of the tax system can be simplified without significantly altering the calculated curves of tax burdens based on key quantifiable tax parameters. Therefore, while fairness in the tax system often leads to more complex regulations, achieving a balance between simplicity and fairness is not entirely impossible.

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 36 Issue 3/2026
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 33-57

5.3. Recommendations

The results of the study suggest that simplification of the general tax elements in income taxation can be achieved with good results if there is no major break point in the tax burden curve. Considering that one of the reasons for the marked breakpoints in the tax burden curves of the countries examined is the larger difference between the tax rates of the system, the change in marginal tax rates as a consequence of simplification is an issue to be further investigated. The first results show that the marginal tax rate of our simple tax system with a single rate, a general tax credit, and some special benefits is unchanged with increasing incomes. The impact of this finding on the tax system under examination may be the subject of further analysis, with reference also to Diamond (1998), who argues that marginal tax rates in an optimal income tax system follow a U-shape. Piketty (2015) notes that it is not surprising that marginal tax rates are higher for high-income earners in the French tax system, as these individuals fall into the highest tax brackets. Conversely, marginal tax rates are also higher for low-income earners because when a person transitions from having zero wage income to earning some income, they not only have to pay taxes on their wages but also lose access to certain social transfer payments that are available only to those with no earned income. Given this finding, a more comprehensive analysis could be conducted in the future that combines the income tax system with social transfers.

In many instances, decision-makers aim to ensure that the tax burden of a group of taxpayers remains as unchanged as possible, despite some change in the system. The calculation system and program developed by the author can also help parameterize the personal income tax system to fit a predetermined tax burden curve. By determining the number of tax rates within the income tax system and identifying potential tax relief elements, the author's computer program can calculate the tax system parameters that most accurately fit the specified tax burden curve. This is an important opportunity for the policymaker to align the elements of the income tax system to the predetermined and desired tax burden curve, rather than the opposite: the elements of the pre-established income tax system determine a tax burden curve. One of the fundamental aims of governments and policymakers is to collect revenue through taxation and to influence the distribution of income in a certain way. One expression of the impact on revenue and income distribution is the tax burden curve, which the study examined. The results of the study suggest that a given tax burden curve can be achieved with simpler parameters rather than a very complex system in some cases, and that the potentially overly sophisticated fairness of income tax systems and the use of very complex tax relief elements should be carefully considered.

6. Conclusions

The study explores the potential for simplifying personal income tax systems, examining the conflict between equitable (complex) systems and efficient (simple) systems. It investigates whether the tax burden curves of a complex tax system could be approximated by a simpler one. Based on prior analyses, it is determined that a simple tax system might be appropriate if the tax burden curves of the tax system under study do not exhibit significant breakpoints or do not use benefit elements that lead to different taxation methods for various types of families (such as splitting or family taxation). However, if these elements are introduced into the theoretical system, fitting becomes feasible. In this paper, we further examined the limited possibilities for such approximation using our chosen simple personal income tax system, focusing particularly on potential breakpoints while analysing the tax systems of three Western European countries.

The analysis of the potential for simplifying tax systems, particularly concerning breakpoints in the tax burden curves, suggests that substituting complex systems with fewer tax parameters remains a viable option. However, our suggested theoretical tax system, which typically relies on a single tax rate and one general tax base or tax allowance, along with preferential treatment for specific family types, can yield favourable outcomes primarily when there are only minor breakpoints in the tax burden curve being analysed. The study revealed that the breakpoints in the tax burden curves were due to significant differences between the two tax rates, the elimination of certain tax reliefs at specific income levels, and the maximum contribution base for social security contributions that can be claimed as a tax base relief. Reversely, it can be argued that when examining these tax elements, our simplified theoretical tax system might still be a suitable fit if the benefit elements' withdrawal or the larger gap between the two tax rates is managed so that it does not create substantial breakpoints on the tax burden curve. A key finding of this study is that we can approximate a multi-rate system with various benefit elements through our very simple theoretical system; thus, when evaluating tax systems, solely from the perspective of the tax burden, we do not always need to sacrifice equity for simplicity.

This opportunity for simplification is not limited to some of the cases examined in this paper, but can be applied more widely, for example in other Visegrad and Western European countries, as well as in previous Hungarian personal income tax systems, as shown in previous studies on similar issues (Author, 2020; Author, 2021; Author, 2025).

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 36 Issue 3/2026
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 33-57

In addition to the results of the study, it is important to note some of its limitations. A drawback of the approach used in the studies, as well as the underlying OECD data, is that it can only consider four main family types and some major benefit types. One of the main reasons for this is the limitations of the dataset and the fact that analysing detailed income data for these four family types is already a considerable challenge. Therefore, the analysis does not cover the two-earner family type, nor the specific, special benefit elements of the personal income tax system. The latter would overcomplicate the system, but their inclusion would represent a significant innovation in the analysis.

Proposal of simplifying the general benefits and tax rates of income tax systems and suggesting further application of the developed program may enhance how the economic and legal communities approach the planning and revision of personal income tax systems.

Acknowledgments

The author thanks the anonymous reviewers and editors for their valuable contributions.

Author contributions

The entire article was written by Éva Szabóné Bonifert.

Funding

This research received no external funding.

Disclosure Statement

The author declares no conflict of interest.

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Notes:

[1] Guiding the decision-maker towards a predetermined decision while leaving them with the freedom to make their own decisions.
[2] See the appendix for more details.
[3] See the appendix for more details.
[4] See the appendix for more details.
[5] An approximation of a theoretical system operating with two tax bands and a tax credit would not be appropriate based on our primary analysis, for reasons that require further investigation.

Appendix

The following tax elements appear in the OECD data for the Austrian, British, and Italian personal income tax systems.

Austria

In Austria, for the year 2022, work-related expenses can be deducted from the tax base, with a minimum deduction of €132. Among the social security and related contributions, a total of 15.12% of the gross wage is deductible from the tax base. This includes contributions for health insurance, pension insurance, contributions to the labour chamber, and contributions for the promotion of residential building. The amount of unemployment insurance is also deductible from the tax base; the contribution rate varies based on gross salary:

- 0% for monthly income up to €1,828,
- 1% for income between €1,829 and €1,994,
- 2% for income between €1,995 and €2,161,
- 3% for income above €2,161.

The maximum contribution base for regular wages is €68,040 per year, while it is €11,340 per year for Christmas bonuses and other bonuses. Note that there are no

contributions to the labour chamber or for the promotion of residential buildings applicable to Christmas bonuses and other bonuses.

If the total income tax liability for the year is negative, social security contributions are refunded, limited to 55% of the total social security contribution, up to a maximum of €1,150.

A different tax rate is applied for regular wages and Christmas and other bonuses (non-regular income from the employer). Both are progressive: for regular income, the tax scale is 7 rates, ranging from 0 to 55%, and for bonuses, the tax scale is 6 rates, also ranging from 0 to 55%. (In OECD data, bonuses are shown as 13th and 14th monthly salary: gross income divided by 14 gives monthly gross income, 12 times the normal tax rates, and 2 times the tax rates applied to bonuses.)

A commuting tax allowance is available, consisting of a basic tax allowance of €400 and a supplement of €650. For annual incomes above €16,000, the tax credit is reduced, and for incomes above €24,500, the reduced amount is €400. In 2022, a one-time inflation tax reduction of €500 was introduced. The tax credit was gradually reduced to zero for annual incomes between €18,200 and €24,500. If the income tax liability on regular income is negative, social security contributions (as negative tax) are refunded. The amount to be refunded is the absolute value of the negative result of the tax payable on regular income, limited to 70% of the total social security contribution. In 2022, the maximum amount to be refunded is €1,550. The amount to be refunded includes the inflation tax allowance and the basic and supplement allowance of the commuting tax relief.

A family tax credit of €2,000 per child is available (€650 if the child is over 18). Single parents or single earners with children can claim a tax credit if the spouse's annual income does not exceed €6,000. This tax credit is €494 for one child, increased by €175 for the second child, and €220 for the third and each additional child. This allowance for single (or single-earner) parents can also be claimed as a negative income tax.

United Kingdom

In the United Kingdom, for the tax year 2022, there is a tax base allowance (personal allowance) of £12,570 for every person with an income of less than £100,000. The allowance is then reduced by £1 for every £2 of income above £100,000.

A married couple (also possible as a civil partner) tax base allowance of 10% of the personal allowance is available to those where the higher-earner is taxed at the basic rate, but only if the lower-earner member of the couple earns less than the personal

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 36 Issue 3/2026
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 33-57

allowance. (In practice, this is a transfer of part of the ineligible allowance from one lower earner to another.)
The tax bracket has three rates (20, 40, and 45%), but the limit of the third tax bracket is above the highest income in the OECD data, so it has no effect on the OECD data. No tax credit is applied.

Italy

In Italy, for the year 2022, social security contributions are deductible from the tax base at a rate of 8.69% for workers earning up to €35,000, 9.49% up to €48,279, 10.49% for those earning between €48,279 and €105,014, and no further increase above €105,014.
The tax scale has four bands, with a tax rate of between 23% and 43%. The OECD data also include a regional surcharge tax, which in the most representative city, Rome (Lazio), is 1.73% for incomes below €15,000 and 3.33% for taxable incomes above €15,000. However, if the taxable income is below €35,000, the rate for the total taxable income is 1.73%. The OECD data also include the local surcharge tax, which in Rome is 0.9%.
An employee tax allowance of €1,200 is available for net incomes below €15,000. The general tax allowance is €1,880 below a tax base of €15,000, decreasing continuously above this amount up to a tax base of €50,000, and 0 above this amount. The spousal tax allowance is €800, which is reduced steadily above a tax base of €15,000 and eliminated above €80,000.
From 2022, the tax allowance for children under 21 years of age, the former family allowance, and some smaller measures to support households have been replaced by the new family allowance scheme, so that this type of allowance is no longer available in the tax system.