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# Changes in the tax structure and their impact on economic growth in the Republic of Croatia based on the VAR model

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**ABSTRACT**

In Croatia, the social security system is based on generational solidarity, i.e. payment of contributions, which is known as *pay as you go (PAYG)*, but the balance of its functioning is permanently and significantly disturbed by long-term unfavourable demographic processes. Projections show that the worrying demographic situation will deteriorate even further and that, with low birth and fertility rates and negative natural growth, negative net migration will contribute to further depopulation. In addition, contributions directly burden labour, i.e. they increase labour costs for employers and reduce their competitiveness in the marketplace, affecting economic growth. The paper reviews empirical research on the impact of different tax structures on economic growth, the sublimated conclusion of which is that direct taxes have a negative effect on growth, while indirect taxes are neutral. The Croatian tax system, with VAT as the main factor in the tax structure, is focused on taxing consumption, but is also characterized by a high level of levies. In this paper, the authors use the vector autoregression model to analyse the relationship between economic growth and the changed tax structure of the Republic of Croatia, in which the role of indirect taxes would be more emphasized. Data in model are consist of different types of taxes, GDPpc, population growth, gross fixed capital formation, unemployment rate and cover the time period from 2004 to 2019. The authors prove that the reduction of the tax burden through direct taxes has positive economic, demographic and fiscal effects.

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Tax structure; indirect taxes; economic growth; vector autoregression

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## 1. Introduction

The aim of this paper is to analyse the impact of the tax structure on economic growth in Croatia. Empirical research on the topic of optimal tax structure can be broadly divided into two directions. The first direction relates to the overlapping

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generations model, and two important directions have emerged - models of overlapping generations in unlimited time, or so-called Blanchard-Yaari models, and models of overlapping generations in discrete time, or so-called Diamond-Samuelson models. These models have brought great benefits to macroeconomic modelling because they are based on maximising the wealth of the population distribution, which offers significant advantages over the usual use of a 'representative' or average agent. As a result, these models have enabled numerous empirical studies to examine the effects of foreign trade, endogenous growth, monetary effects, the impact of public infrastructure investment, optimal consumption, optimal human capital accumulation, and many other contemporary issues. Because of its properties, the Diamond-Samuelson model has been used more extensively precisely in the study of the effects of the tax structure on economic growth. In this sense, the research of Auerbach (1979) on the study of the use of different tax rates in the taxation of capital income and of Kotlikoff and Summers (1981) on tax evasion are particularly noteworthy, up to recent research (Heer, 2018) on the optimal pension system under conditions of negative demographic trends. In his paper, Heer examines the effects of the PAYG system in the Federal Republic of Germany and concludes that reducing pension contributions has negative effects in terms of increasing social inequalities, but finds significant effects on economic growth, especially for countries with a higher share of pensioners in the population structure.

One of the main shortcomings of the approach to analyse the impact of the tax structure on economic growth through overlapping generations is certainly the limited setting of the theoretical model, but also the calibration of the economic parameters, which reduces the accuracy of the model and the possibility of projections. On the other hand, the lack of empirical research based on data on the shares of each tax form in total tax revenues is reflected in the fact that they are problematic due to frequent changes in the legal framework, tax rates and tax brackets, the impact of relevant macroeconomic parameters, and the lack of long time series. Precisely for the latter reason, most empirical studies rely on a panel of selected countries, usually the OECD group of countries. However, given the differences in tax structures and in macroeconomic and other characteristics across countries, such results should be interpreted with caution. Indeed, it is certain that countries with different economic structures cannot have the same optimal tax system structure. One of the most common problems in studying the effects of tax structure is endogeneity, which results from the fact that public spending increases during economic booms and decreases during economic crises, which has a repercussion on the evolution of tax revenues. It should also be remembered that certain forms of taxation have different elasticities, so that the tax structure itself changes according to the movement of economic cycles (Buterin, 2021; Buterin et al., 2021). Moreover, certain forms of taxation are easier to increase or decrease.

Given these shortcomings, the authors analyse the impact of the tax structure on economic growth in Croatia using a vector autoregression model based on quarterly data from the Ministry of Finance on the share of tax forms in total tax revenues. This analysis is particularly insignificant, as such empirical studies are rare in individual countries (mainly due to the lack of suitable time series).

The paper is organised as follows: Section 2 introduces the literature review, Section 3 is related with methodology, dataset and analysis. Section 4 includes the empirical results and last section refers to concluding remarks.

## 2. Literature review

The first study that analysed the impact of the fiscal variable on economic growth was conducted by Barro (1991a, 1991b) in his two studies, in which he analysed the ratio of real government spending to real GDP and found a significant negative correlation with growth. In contrast, Koester and Kormendi (1989) found only a limited association between taxes and growth. Levine and Renelt (1992) and Easterly and Rebelo (1993) also do not conclude that growth can be affected by taxes. Slemrod et al. (1995) also found no relationship between tax rates and GDP per capita in his study for OECD countries. Gechert and Heimberger (2022) indicate that the economic literature draws ambiguous conclusions regarding the impact of profit taxes on economic growth. After applying meta-regression methods to a novel data set with 441 estimates from 42 primary studies, they conclude that the hypothesis of a zero effect of profit taxes on growth cannot be rejected.

Kneller et al. (1999) find the negative economic effects of income and wealth taxes and the positive effects of increasing the share of consumption taxes. Widmalm (2001) examines the tax structures of 23 OECD countries between 1965 and 1990 and concludes that income taxes have a negative impact on economic growth, which is particularly true for progressive income tax systems. Nguyen et al. (2021) investigate the effects of different taxes in the United Kingdom from 1973 to 2009 and find that income tax reductions have significant effects on investment, consumption, and GDP. On the other hand, the effects of reductions in taxation of consumption are not statistically significant on GDP and growth. They conclude that shifting the burden of taxation from income towards consumption is expansionary. Similar results were reached by Padovano and Galli (2002) and Gentry and Hubbard (2000), who followed income trends in the United States between 1978 and 1993 and found that progressivity discourages self-employment and entrepreneurship. Schwellnus and Arnold (2008) and Vartia (2008) find the negative effects of income taxes, as do Lee and Gordon (2005) based on a sample of 70 countries between 1970 and 1997. It should also be emphasized the research of Alves and Afonso, (2019), who find that income taxation affects the increase in income inequality. They explain this effect by the inefficiency of the progressive tax system.

Examining the relationship between the size of government and economic growth, Fölster and Henrekson (2001) find a negative relationship between total public spending as a share of GDP and growth. Leibfritz et al. (1997) found that a 10 percent tax increase leads to a one-half percent decline in the growth rate and that the slowdown in growth can be partially explained by an increase in the overall tax burden. While recognising that increasing fiscal pressures due to an ageing population limit the scope for reducing the overall tax burden, they believe that positive effects on growth could be achieved by changing the tax structure and shifting from capital and labour taxes to consumption taxes. The results of their study show that direct taxes constrain

growth more than indirect taxes. Arnold (2008) believes that all taxes, with the exception of flat taxes, have a distortionary effect that can negatively impact growth. Already in the first half of the twentieth century, Ramsey (1927) argued that tax policy should distort consumer behaviour as little as possible, which is why he mentions differentiated consumption taxation in this context.

And Mankiw et al. (2009) propose taxing consumption to achieve an optimal tax structure, focusing on the VAT. McNabb and LeMay-Boucher (2014) argue that increasing the rate of direct taxes reduces the growth rate. Plosser (1992) also found a significant negative correlation between the income tax and the profits tax with the growth rate. Dowrick (1993) used OECD countries as examples to show the negative impact of income tax on economic growth, as opposed to income tax, which he found to have no effect. Gemmell et al. (2006) argue that income and property taxes are distortionary taxes that have a negative impact on growth rates, while consumption taxes are non-distortionary taxes that do not reduce growth. Alinaghi and Reed (2016) associate unproductive public spending and distortionary taxes with a strong negative relationship with growth, while according to them, non-distortionary taxes and productive consumption have a positive impact on growth. And a study by Bleaney et al. (2001) in OECD countries found that nondistortionary taxes and productive government spending increase growth rates. At the same time, consumption tax is the only tax that can be safely considered non-distortionary. The bias of profit and income tax was also indirectly found by Myles (2009). Although Myles does not establish a link between the overall level of tax burden in a country and growth, he demonstrated that higher profit and income tax rates have a discouraging effect on entrepreneurship and thus indirectly reduce growth rates. Roeger and Veld (2010) found that when unproductive government spending is reduced, a simultaneous change in the tax structure toward noncontributory taxes, such as the consumption tax and the wealth tax, leads to short-term declines in growth but has the largest positive impact on growth in the long run. Afonso and Jalles (2014) also conclude that income taxation slows growth. Dackehag and Hansson (2012) analyse the tax structures of the 25 rich OECD countries between 1975 and 2010 and find that income and profit taxation have a negative impact on growth, with this relationship being stronger for income tax.

Baunsgaard and Keen (2010) warn that in low-income countries, a shift in the tax structure toward consumption taxes leads to weak fiscal outcomes. Similarly, McNabb (2018), who conducted a comprehensive survey of 100 states, concludes that the impact of various growth taxes varies by state depending on the level of GDP per capita. This actually means that there is no tax structure that would be equally optimal or applicable in all circumstances. This argument is supported by previous research by Gordon and Li (2009), who show differences in the generosity of certain types of taxes at different income levels. Even more, Gunter et al. (2019) on data set of 51 countries from 1970 to 2014 to analyse the impacts of consumption taxes on economic growth and find that their effect on growth is noticeably non-linear. They find that at low rates with small changes, the effects are insignificant, but the growth rate slows with a higher initial rate and with larger change. For European industrialized countries, they suggest that tax cuts could cause economic growth.

Arnold et al. (2011) argue that raising income and profit taxes while lowering consumption taxes and property taxes reduces growth in the long run. Xing (2011) finds that in the case of the income and profit tax, it cannot be precisely determined which of the two has a larger negative impact on economic growth. In the above study, McNabb (2018) finds the negative effects of income tax increases and social security contributions on long-term growth rates.

The greatest recent impact has certainly been the findings of Arnold (2008), who, based on a panel analysis of 21 OECD countries over a 35-year period, found negative effects of income and profit taxation and less negative effects of consumption and especially wealth taxes. Based on the methodology of this paper, Grdinić et al. (2017) examine the impact of tax structure on economic growth of selected Central and Eastern European countries over the period from 1990 to 2010 and conclude that all forms of taxes have negative effects on economic growth. Particularly significant negative effects are found for income tax, profit tax and then wealth tax. Interestingly, the effect of the consumption tax is not statistically significant. For social security contributions, the authors find significantly high negative effects on economic growth in both the short and long run. These results explain the impact of the shadow economy, in which a significant number of individuals and firms pay minimum wages to reduce the tax base and reduce tax payments. As a result, most of the tax burden is concentrated in the formal sector, which leads to higher tax rates due to the reduced tax base. This also has a negative impact on economic growth, as it inhibits employment due to high labour costs (gross wages). In addition, high labour costs discourage investment.

## 3. Methodology, data collection and analysis

In this paper, modelling based on recent data on the evolution of the share of each form of tax is performed and its impact on economic growth is examined. Since quarterly data are available in the database of the Ministry of Finance, the conditions for the application of the model of dynamic vector autoregression (VAR), which is a generalization of dynamic models defined on the basis of an equation (Buterin, 2020), are given. The advantage of using VAR models is the fact that all model variables are endogenous in the sense that there is no classical model division into dependent and independent variables and there are no structural constraints in the basic model. This is emphasized as an advantage especially in those empirical studies in which there is a pronounced endogeneity of the variables, i.e. there is a mutual feedback between the variables.

The general form of the vector regression model is represented by the following expression:

$$Y_t = A_1 Y_{t-1} + \ldots + A_p Y_{t-p} + BX_t \quad + \quad \varepsilon_t \tag{1}$$

Where, $Y_t$ is the economic growth variable and $A_1$ denotes the self-regressive limb of the lagged economic growth variable, and $p$ is the time shift term based on the autocorrelation test, which is determined using appropriate tests that were also performed in this study. The vector of non-stochastic exogenous variables is represented

by the variable $X_t$ and may include a trend component, dummy variables, or seasonal components to ensure credible model results.

It is important to note that all data in the model have been transformed to natural logarithms to reduce the effects of heteroscedasticity of individual variables, but also to provide more meaningful results in the context of stationarity tests, which are important for the significance of model results. The degree of time lag within the modelling was also determined using the LM test, and the four-quarter time lag was determined to be most appropriate for assessing the impact of individual variables. A higher level of time lag is not even recommended due to the still short time series. All stationarity tests were also performed and the variables were found to have the same order of integration, which is important for the possibility of using this VAR model and the reliability of the results obtained (Lutkepohl, 2004).

Data from the Ministry of Finance, the Croatian National Bank, and Eurostat were used to conduct the empirical analysis (all of the above data are available on the online portals of these institutions). The taxes and other variables relevant for the empirical part of the analysis in this paper are listed below:

- Income tax (Ministry of Finance)
- Profit tax (Ministry of Finance)
- Social security contributions (Ministry of Finance)
- Property taxes (Ministry of Finance)
- Tax on goods, services, international trade and transactions (Ministry of Finance)
- Other revenues (Ministry of Finance)
- Total tax revenues (Ministry of Finance)
- Gross domestic product per capita (Eurostat)
- Share of tertiary education in total population (%, Eurostat)
- Population growth (%, Eurostat)
- Gross fixed capital formation, Croatian National Bank
- Unemployment rate (20-64 years, Eurostat).

Following the similar methodology in the empirical research mentioned earlier, the forms of taxation enter the econometric model as a share of total revenue. Also, the share of tertiary education in the total population is a proxy for the impact of human capital on economic growth, as is gross investment for the impact of capital factors. Within the model, the unemployment rate variable was used to account for cyclical developments that may affect the bias of the results. It should be said that the use of the share of individual taxes in total revenues is certainly a limitation of empirical research, as it is difficult to isolate the effects of changes in tax rates and tax bases within the movement of individual tax forms in the tax structure. Nor is it easy to isolate the asymmetric growth or decline of individual tax forms with respect to the state of the business cycle. However, these are characteristic problems that exist in all the other empirical studies mentioned above, and some caution is warranted in assessing the intensity of the impact of particular forms of taxation on economic growth. However, it is safe to say that the direction of the impact is an important indicator for assessing the direction of a particular public revenue policy or tax policy.

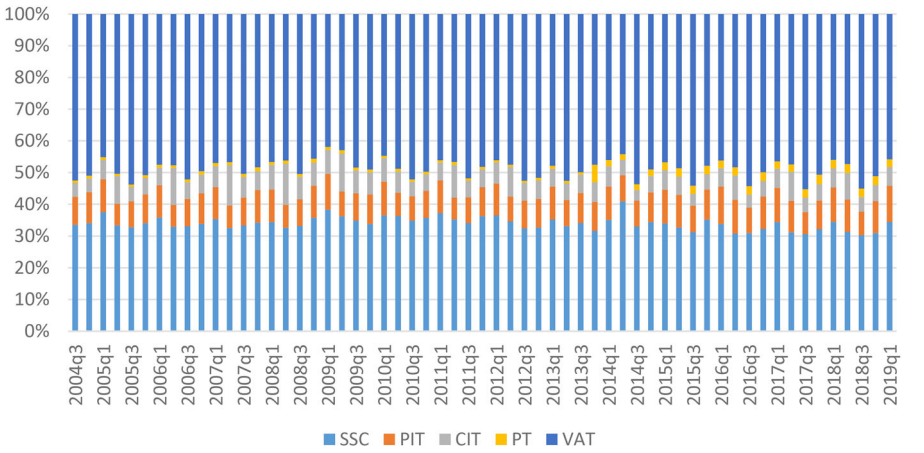


**Figure 1.** Tax structure in the period from 2004 (third quarter) to 2019 (first quarter).
Source: Ministry of Finance, authors' calculation

As mentioned above, the study of the tax structure, but also of the total tax burden on macroeconomic categories, is one of the most important research areas of modern tax science. The Republic of Croatia is one of the countries of the European Union characterized by the highest tax burden, i.e. the share of total taxes in the gross domestic product (including social security contributions).

Figure 1 shows the evolution of the tax structure from 2004 to 2019, showing a relatively stable share of certain forms of taxation, suggesting that despite numerous changes in the tax system and certain forms of taxation, especially in the form of tax deductions and reductions and tax rates, there were no really significant changes within the tax structure. Especially considering the different nature of each tax form in relation to the impact on social equality, fiscal generosity and economic growth objectives, it is indeed a system whose impact does not change. Certain fluctuations can be observed, in particular the increase in the share of social security contributions and the simultaneous reduction of VAT in the crisis years from 2009 to 2014.

The fact is that the tax system of the Republic of Croatia is focused on taxation of consumption, as revenues from VAT and excise taxes account for about 50% of total tax revenues. However, the tax system is also characterised by high levies, which account for about 35% of total tax revenues. On the other hand, income tax revenues, as a progressive tax element, account for only 10% of total tax revenues. Contributions and income tax are often related by the impact on labour costs or competitiveness and the social characteristics of the system. However, it is important to distinguish between these two forms of public revenue. Namely, while income tax has lost progressivity in the Croatian tax system despite the reduction of the top marginal tax rate, a large number of citizens with lower income status still do not pay this tax due to the high personal deductions. On the other hand, social security contributions are indeed proportional and, at the same time, have a socially regressive effect, negatively affecting the part of the labour market that is exposed to competition on the world market in terms of gross wages. In view of these assessments, the stagnation of the tax structure in the Republic of Croatia is worrisome.

## 4. Results

The results of the econometric analysis performed are presented in Figures 2 and 3, in Table 1 and in Tables A1–A8 in the Appendix. It can be stated that the results based on the empirical data collected are consistent with the results and conclusions of the theoretical model. First of all, it is important to say that following the example of Arnold (2008), the results of four model specifications are presented (Table 1). It is also important to point out that the results are consistent regardless of model specification and that one can conclude that the results and conclusions of the study are robust to changes in individual variables. Given the large number of results, the graphs show only the most important results based on the most comprehensive model specification (Model 4).

As can be seen in Figure 2, one can observe the impulse response function at the one standard deviation level of each form of tax, indicating the positive impact of all forms of taxes except Social Security. However, it is interesting to distinguish between short-term and long-term effects. Namely, in the short run, the income tax and, to a lesser extent, the profit tax have significantly negative effects on economic growth. Contributions, of course, have by far the largest negative impact in the observed model. What is also clear is that both the short-run and long-run trends in the direct forms of public taxes (income tax, profit tax, and contributions) harmonize, as do the taxes on goods, services, international trade, and transactions within the country, which are dominated by the value-added tax and excise taxes). However, although the trends are consistent, the implications in the long run are not the same. Indeed, it is evident that the long-term impact of the increase in the income tax is much more positive compared to the trends in all other tax revenues. As for direct tax revenues, to a greater extent, property taxes and excise taxes do not show a growth trend, but they are stable over time and have a mostly positive sign.

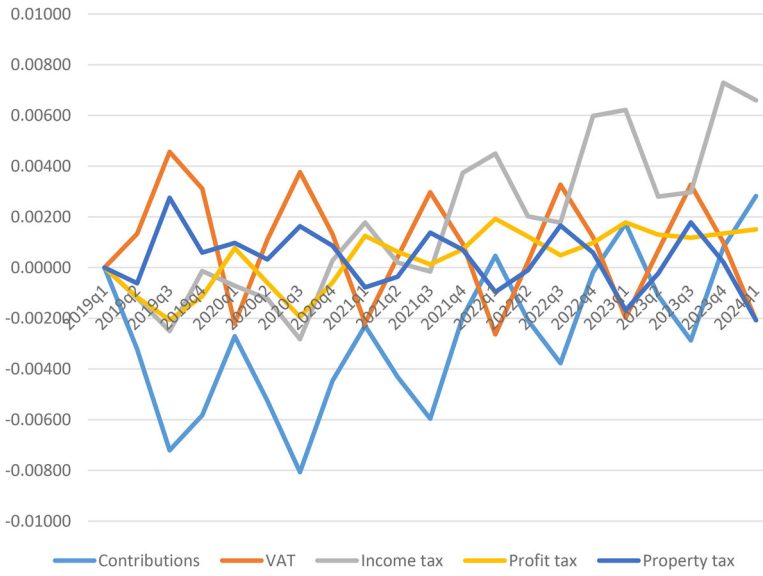


**Figure 2.** Effects of individual tax forms on economic growth.
Source: Authors' calculation

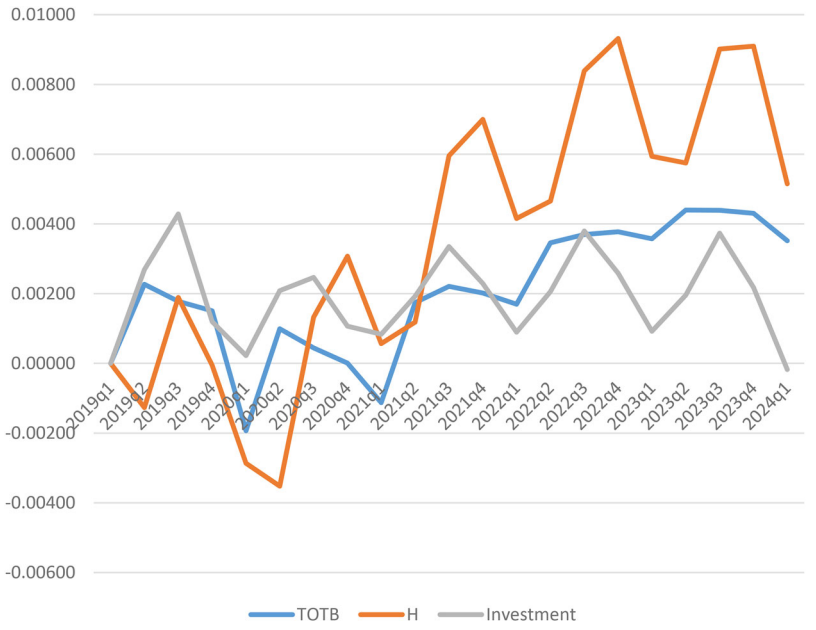


**Figure 3.** The effects of investment in human capital, investment, and population growth on economic growth.
Source: Authors' calculation

**Table 1.** Long-term effects of certain tax forms on economic growth (cumulative after 20 quarters).

| Specification | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| Investments | 0,046 | 0,039 | 0,024 | 0,04 |
| Human capital | 0,108 | 0,103 | 0,102 | 0,075 |
| Total tax burden | 0,059 | 0,066 | 0,036 | 0,04 |
| Contributions | −0,052 | −0,071 | −0,056 | −0,055 |
| Income tax | | | 0,045 | 0,037 |
| Profit tax | | | 0,031 | 0,0076 |
| VAT | | 0,011 | | 0,018 |
| Property tax | | | | 0,0067 |

Source: Authors' calculation.

It is also important to note the extremely positive impact of positive demographic trends (population growth) and investment in the education system and capital investment (chart 3). In the case of investment in education, there is a significant negative effect in the short term, but particularly significant results in the long term, which is consistent with the theoretical arguments related to investment in education characterized by long maturation periods. Thus, we can conclude that investment in education is consumption (with effects equivalent to transfers) with negative multiplier properties in the short run and investment in the long run. Gross investment has a stable positive effect on economic growth in the short and long run, which is certainly to be expected. However, the lower intensity of the long-term growth trend compared to the human capital and population growth categories is surprising. In the case of investment, the demand effect, which refers to the short-term impact of multiplication on economic growth, seems to dominate over the supply effect, which is

realized by capitalizing the indirect effects of investment projects (long-term impact of capital use in the economy).

The results showing the cumulative effect of impulse response functions are shown in Table 1. The negative economic effect of increasing the share of social security contributions is clearly visible in all specifications. Within the first base specification, the largest long-run positive effects are seen from human capital and capital investment and the smallest negative effects from contributions. When it comes to overall long-run effects, it appears that contributions are the only category of public taxes with negative effects. Income tax and consumption tax have the largest positive effects, while property taxes and profit taxes have a neutral effect.

The following is an economic interpretation of the previously presented results of the application of the empirical method. When interpreting the research results, it is important to take into account the characteristics of the econometric method used, in comparison with the results of previous contributions of empirical studies, as well as the specifics of the results obtained in this paper.

As already mentioned in the elaboration of the research methods most commonly used in research on the impact of the structure of public revenues, i.e. tax structure on economic growth, both commonly used methods have their limitations. Thus, it can be said that the general equilibrium models, first introduced by Auerbach and Kotlikoff (1987), and the modern models of overlapping generations are associated with relatively rigid theoretical frameworks, but also with difficulties in mathematical and computer-intensive operations. Indeed, it is still a great challenge to use the distribution of agents (taxpayers) with heterogeneous characteristics within certain characteristics such as income, propensity to spend and save, and other characteristics instead of the representative agent model in empirical research, but certainly with different interactions among the above categories. Therefore, the results of these empirical studies should be taken with caution. In addition, as mentioned above, the lack of empirical research based on data on the shares of individual tax forms in total tax revenues is problematic due to the frequent changes in the legal framework, tax rates and tax brackets, the impact of relevant macroeconomic parameters, and the lack of long time series. Therefore, research on the impact of tax structure on economic growth of individual countries is rare and most of the research is based on panel regression studies for a set of countries, mostly developed countries, OECD or EU (Buterin et al., 2017). Therefore, it can be said that the research conducted in this paper provides new insights in terms of the conducted analyses of groups of countries. In addition, it should be remembered that empirical results conducted on a sample of country groups are usually average results that do not sufficiently take into account the differences in tax structures, the different characteristics of the impact of tax forms on economic growth and other important variables in the economic and tax spheres that affect the realisation of the different effects of tax structures in different countries.

In this sense, the theoretically based empirical research conducted here clearly shows that it is justified to change the tax structure in the Republic of Croatia, in particular to reduce the burden of social security contributions and to increase the tax burden of consumption taxes (VAT). Despite the fact that the tax structures of the Republic of Croatia and most OECD member states and the European Union

differ in terms of the clear dominance of consumption taxes over other types of taxes, there is still room for reform towards further concentration on consumption taxation. Adding to this conclusion are the results of simulations that suggest that reducing taxes to cover social security system expenditures will lead to a reduction in income inequality and an increase in the population's disposable income. These observations arise from the characteristics of the contributions, because unlike the income tax, which is progressive due to generous personal deductions, they have the character of proportionality and directly reduce the disposable income of the population. On the other hand, taxation of consumption still occurs over a period of time, and in practice it certainly has a positive effect on the welfare function of individuals, especially on socially disadvantaged groups, through reduced tax rates on existential goods and services. In light of these considerations, significant differences in the short- and long-term effects of income tax and contributions in the Republic of Croatia can be interpreted. It is interesting to compare the results of an empirical study conducted by Grdinić et al. (2017) on a sample of Central and Eastern European countries. They show identical results in terms of the short-term impact of an increase in income tax shares, which is only slightly negative, while the impact of contributions is significantly negative. On the other hand, the long-term effects are completely different. These authors find particularly significant negative effects on the income tax and especially on the increase in the share of social security contributions, both in the short and long run. Since this study shows a positive effect of increasing the share of income tax in the long run, such a relationship can be explained precisely by the distributional differences in the payment of contributions and income tax. Indeed, contributions are paid by all taxpayers, while the burden of income tax is borne by the middle and high income strata. It can be concluded that the negative effects on economic growth manifest themselves mainly at the level of taxation of the lower social groups. The long-term positive effects of the increase in the share of income tax can be partly explained by income growth in the phase of economic development when wages increase, but also by higher taxation due to the transition to higher tax rates (progressive income tax effect). Since many Central and Eastern European countries have introduced a single-rate income tax, it is certain that the relationship between the share of income tax and economic growth is significantly different in these countries.

As for the impact of other forms of taxation on economic growth, it can be said that this study also argues for less negative effects of the consumption tax and the wealth tax. In this case, neutral (slightly positive in the long run) economic effects are associated with the profit tax, which is a significant difference from the studies in the group of developed countries (Arnold, 2008 and others) and the studies on former transition countries mentioned above. The reason for these developments is the relatively low tax burden of the profit tax system as well as the constant reforms aimed at lowering it.

## 5. Conclusion

It is unusual that the total tax burden shows a positive correlation with economic growth. However, this can also be understood by the dominance of tax forms within the tax structure that nevertheless have a positive effect, so that the net effect is

ultimately positive. We should also not forget the economic structure of the Croatian economy with the growing role of tourism in the creation of the annual national income, which affects the transfer of a large part of the tax burden to foreign residents, which certainly links the growth of tourist consumption with the growth of GDP and revenues from VAT, excise taxes and other consumption taxes.

The contribution of this paper is reflected in the fact that Croatia needs a change in the tax structure in such a way to reduce the role of contributions and to put emphasis on indirect taxes. This is primarily important due to the sustainability of the functioning of the social and pension insurance system.

Finally, it is important to reiterate the significant positive impact of capital investment, especially in the tertiary education sector. Indeed, it appears that capital investment is most noticeable through short-term effects in the form of demand for goods, services, and additional employment and income growth. On the other hand, the increase in spending in the education sector seems to have a negative impact on economic growth in the initial, short-term period as it is reflected in current consumption, but there are significant positive effects in the long run. However, it should be remembered that the econometric analysis carried out refers to the short term with its projections, and therefore it is possible that the positive economic trends coincided with the increased investment in the education sector.

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## Appendix

**Table A1.** Short-term and long-term effects of social security contributions on economic growth.

| step | (1) coirf | (1) Lower | (1) Upper | (1) S.E. | (1) oirf | (1) Lower | (1) Upper | (1) S.E. |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | −.003215 | −.005226 | −.001203 | .001026 | −.003215 | −.005226 | −.001203 | .001026 |
| 2 | −.010423 | −.015725 | −.005122 | .002705 | −.007209 | −.010879 | −.003538 | .001873 |
| 3 | −.016247 | −.025216 | −.007278 | .004576 | −.005824 | −.010151 | −.001497 | .002208 |
| 4 | −.018957 | −.031103 | −.006811 | .006197 | −.00271 | −.007043 | .001624 | .002211 |
| 5 | −.024209 | −.039892 | −.008525 | .008002 | −.005252 | −.0097 | −.000804 | .002269 |
| 6 | −.032275 | −.052192 | −.012358 | .010162 | −.008067 | −.013043 | −.00309 | .002539 |
| 7 | −.036745 | −.060564 | −.012925 | .012153 | −.00447 | −.009223 | .000284 | .002425 |
| 8 | −.039044 | −.065992 | −.012095 | .013749 | −.002299 | −.006722 | .002124 | .002257 |
| 9 | −.043357 | −.073222 | −.013493 | .015237 | −.004314 | −.008315 | −.000313 | .002041 |
| 10 | −.049316 | −.08214 | −.016492 | .016747 | −.005958 | −.009979 | −.001937 | .002052 |
| 11 | −.051258 | −.086597 | −.01592 | .01803 | −.001943 | −.006072 | .002187 | .002107 |
| 12 | −.050798 | −.088122 | −.013474 | .019043 | .00046 | −.003898 | .004817 | .002223 |
| 13 | −.052877 | −.092068 | −.013686 | .019996 | −.002079 | −.006098 | .00194 | .002051 |
| 14 | −.05665 | −.097908 | −.015391 | .021051 | −.003772 | −.007873 | .000328 | .002092 |
| 15 | −.056836 | −.100274 | −.013398 | .022163 | −.000186 | −.004869 | .004496 | .002389 |
| 16 | −.055104 | −.100713 | −.009496 | .02327 | .001732 | −.003504 | .006968 | .002672 |
| 17 | −.056214 | −.104099 | −.008328 | .024432 | −.001109 | −.006102 | .003883 | .002547 |
| 18 | −.059083 | −.10959 | −.008576 | .025769 | −.00287 | −.007829 | .00209 | .002531 |
| 19 | −.058293 | −.111848 | −.004738 | .027324 | .000791 | −.004729 | .00631 | .002816 |
| 20 | −.055475 | −.112173 | .001224 | .028928 | .002818 | −.003057 | .008693 | .002998 |

Note: coirf – cumulative orthogonal impulse response function, oirf – orthogonal impulse response function, lower – lower and upper – upper limit, S.E. – standard error.
Source: Authors' calculation.

**Table A2.** Short-term and long-term effects of income tax on economic growth.

| step | (1) coirf | (1) Lower | (1) Upper | (1) S.E. | (1) oirf | (1) Lower | (1) Upper | (1) S.E. |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | −.001198 | −.002813 | .000417 | .000824 | −.001198 | −.002813 | .000417 | .000824 |
| 2 | −.003701 | −.007789 | .000386 | .002086 | −.002503 | −.005329 | .000322 | .001442 |
| 3 | −.003836 | −.010578 | .002905 | .00344 | −.000135 | −.003423 | .003154 | .001678 |
| 4 | −.004557 | −.013372 | .004259 | .004498 | −.000721 | −.003961 | .002519 | .001653 |
| 5 | −.005786 | −.017019 | .005447 | .005731 | −.001229 | −.004692 | .002234 | .001767 |
| 6 | −.008611 | −.022889 | .005667 | .007285 | −.002824 | −.006677 | .001029 | .001966 |
| 7 | −.008334 | −.025592 | .008923 | .008805 | .000276 | −.003658 | .00421 | .002007 |
| 8 | −.006559 | −.026194 | .013077 | .010018 | .001776 | −.002117 | .005668 | .001986 |
| 9 | −.006364 | −.028388 | .01566 | .011237 | .000195 | −.00362 | .00401 | .001946 |
| 10 | −.006522 | −.030993 | .017948 | .012485 | −.000158 | −.003972 | .003656 | .001946 |
| 11 | −.002783 | −.029489 | .023924 | .013626 | .00374 | −.000271 | .00775 | .002046 |
| 12 | .001711 | −.026794 | .030217 | .014544 | .004494 | .000315 | .008673 | .002132 |
| 13 | .003731 | −.026383 | .033846 | .015365 | .00202 | −.001998 | .006037 | .00205 |
| 14 | .005505 | −.02632 | .037331 | .016238 | .001774 | −.002324 | .005872 | .002091 |
| 15 | .011485 | −.022166 | .045135 | .017169 | .00598 | .001479 | .010481 | .002297 |
| 16 | .017701 | −.017745 | .053147 | .018085 | .006216 | .001362 | .011071 | .002477 |
| 17 | .020498 | −.016826 | .057823 | .019043 | .002797 | −.002026 | .007621 | .002461 |
| 18 | .023467 | −.016026 | .062961 | .02015 | .002969 | −.001943 | .007881 | .002506 |
| 19 | .030756 | −.011269 | .072781 | .021442 | .007289 | .001962 | .012615 | .002718 |
| 20 | .037354 | −.007264 | .081971 | .022765 | .006598 | .001053 | .012142 | .002829 |

Note: coirf – cumulative orthogonal impulse response function, oirf – orthogonal impulse response function, lower – lower and upper –upper limit, S.E. – standard error.
Source: Authors' calculation.

**Table A3.** Short-term and long-term effects of profit tax on economic growth.

| step | (1) coirf | (1) Lower | (1) Upper | (1) S.E. | (1) oirf | (1) Lower | (1) Upper | (1) S.E. |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | −.001173 | −.002579 | .000234 | .000718 | −.001173 | −.002579 | .000234 | .000718 |
| 2 | −.003238 | −.00685 | .000374 | .001843 | −.002065 | −.004598 | .000468 | .001292 |
| 3 | −.004374 | −.010318 | .001569 | .003033 | −.001136 | −.004 | .001727 | .001461 |
| 4 | −.003611 | −.011115 | .003893 | .003829 | .000764 | −.001884 | .003411 | .001351 |
| 5 | −.004208 | −.013411 | .004994 | .004695 | −.000598 | −.00328 | .002085 | .001369 |
| 6 | −.00616 | −.017449 | .005129 | .00576 | −.001952 | −.00491 | .001006 | .001509 |
| 7 | −.00675 | −.019842 | .006341 | .006679 | −.00059 | −.003502 | .002322 | .001486 |
| 8 | −.0055 | −.019518 | .008517 | .007152 | .00125 | −.001384 | .003884 | .001344 |
| 9 | −.004876 | −.019741 | .009988 | .007584 | .000624 | −.001858 | .003106 | .001266 |
| 10 | −.004755 | −.020754 | .011243 | .008163 | .000121 | −.002401 | .002644 | .001287 |
| 11 | −.004033 | −.021171 | .013104 | .008744 | .000722 | −.002071 | .003515 | .001425 |
| 12 | −.00211 | −.019959 | .015739 | .009107 | .001923 | −.000983 | .00483 | .001483 |
| 13 | −.000886 | −.019413 | .017641 | .009453 | .001224 | −.001517 | .003965 | .001399 |
| 14 | −.000404 | −.019925 | .019117 | .00996 | .000482 | −.002249 | .003213 | .001393 |
| 15 | .000571 | −.020063 | .021206 | .010528 | .000975 | −.002022 | .003972 | .001529 |
| 16 | .002353 | −.019248 | .023953 | .011021 | .001781 | −.001423 | .004985 | .001635 |
| 17 | .00365 | −.019007 | .026307 | .01156 | .001297 | −.00181 | .004405 | .001586 |
| 18 | .004825 | −.019193 | .028843 | .012254 | .001175 | −.001852 | .004201 | .001544 |
| 19 | .006171 | −.019432 | .031775 | .013063 | .001346 | −.001917 | .00461 | .001665 |
| 20 | .007678 | −.019398 | .034753 | .013814 | .001506 | −.00194 | .004952 | .001758 |

Note: coirf – cumulative orthogonal impulse response function, oirf – orthogonal impulse response function, lower – lower and upper – upper limit, S.E. – standard error.
Source: Authors' calculation.

**Table A4.** Short-term and long-term effects of value added tax on economic growth.

| step | (1) coirf | (1) Lower | (1) Upper | (1) S.E. | (1) oirf | (1) Lower | (1) Upper | (1) S.E. |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | .00133 | −.000114 | .002773 | .000736 | .00133 | −.000114 | .002773 | .000736 |
| 2 | .005892 | .002584 | .0092 | .001688 | .004562 | .002235 | .006889 | .001187 |
| 3 | .009005 | .00353 | .01448 | .002793 | .003113 | .000298 | .005928 | .001436 |
| 4 | .006795 | −.000424 | .014014 | .003683 | −.002209 | −.005 | .000581 | .001424 |
| 5 | .007896 | −.00129 | .017083 | .004687 | .001101 | −.00191 | .004113 | .001537 |
| 6 | .01166 | .000226 | .023093 | .005834 | .003763 | .000556 | .006971 | .001637 |
| 7 | .012983 | −.000599 | .026565 | .00693 | .001323 | −.001894 | .004539 | .001641 |
| 8 | .010796 | −.004264 | .025855 | .007684 | −.002187 | −.005118 | .000744 | .001496 |
| 9 | .011214 | −.00526 | .027688 | .008405 | .000418 | −.00226 | .003096 | .001366 |
| 10 | .01418 | −.003755 | .032115 | .009151 | .002966 | .000263 | .005669 | .001379 |
| 11 | .01511 | −.004262 | .034482 | .009884 | .00093 | −.001899 | .003759 | .001443 |
| 12 | .012475 | −.007919 | .032868 | .010405 | −.002635 | −.005561 | .00029 | .001493 |
| 13 | .012698 | −.008659 | .034056 | .010897 | .000224 | −.002538 | .002986 | .001409 |
| 14 | .015964 | −.006496 | .038424 | .011459 | .003265 | .000436 | .006095 | .001444 |
| 15 | .017161 | −.006561 | .040882 | .012103 | .001197 | −.001826 | .00422 | .001542 |
| 16 | .015182 | −.009656 | .04002 | .012673 | −.001979 | −.005262 | .001304 | .001675 |
| 17 | .015849 | −.010133 | .041831 | .013256 | .000667 | −.002432 | .003767 | .001582 |
| 18 | .019114 | −.008205 | .046433 | .013939 | .003265 | .000158 | .006372 | .001585 |
| 19 | .020115 | −.008818 | .049049 | .014762 | .001001 | −.002256 | .004258 | .001662 |
| 20 | .018039 | −.012494 | .048572 | .015578 | −.002077 | −.005617 | .001464 | .001806 |

Note: coirf – cumulative orthogonal impulse response function, oirf – orthogonal impulse response function, lower – lower and upper – upper limit, S.E. – standard error.
Source: Authors' calculation.

**Table A5.** Short-term and long-term effects of property tax on economic growth.

| step | (1) coirf | (1) Lower | (1) Upper | (1) S.E. | (1) oirf | (1) Lower | (1) Upper | (1) S.E. |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | −.000616 | −.002157 | .000926 | .000787 | −.000616 | −.002157 | .000926 | .000787 |
| 2 | .002136 | −.001322 | .005595 | .001765 | .002752 | .000473 | .005031 | .001163 |
| 3 | .002726 | −.003119 | .00857 | .002982 | .00059 | −.002365 | .003544 | .001507 |
| 4 | .003696 | −.004271 | .011663 | .004065 | .00097 | −.001866 | .003805 | .001447 |
| 5 | .004017 | −.006 | .014033 | .005111 | .000321 | −.002663 | .003304 | .001522 |
| 6 | .005646 | −.006777 | .018068 | .006338 | .001629 | −.001487 | .004745 | .00159 |
| 7 | .006507 | −.008135 | .021148 | .00747 | .000861 | −.002226 | .003948 | .001575 |
| 8 | .005722 | −.010573 | .022018 | .008314 | −.000784 | −.003521 | .001953 | .001396 |
| 9 | .005362 | −.012134 | .022857 | .008927 | −.000361 | −.002707 | .001985 | .001197 |
| 10 | .006736 | −.011959 | .02543 | .009538 | .001374 | −.000857 | .003606 | .001138 |
| 11 | .007436 | −.012486 | .027357 | .010164 | .0007 | −.001906 | .003306 | .00133 |
| 12 | .006471 | −.014425 | .027367 | .010661 | −.000965 | −.003669 | .001739 | .00138 |
| 13 | .00637 | −.015248 | .027987 | .01103 | −.000101 | −.002718 | .002517 | .001335 |
| 14 | .008027 | −.014494 | .030547 | .01149 | .001657 | −.00084 | .004154 | .001274 |
| 15 | .00861 | −.015159 | .03238 | .012127 | .000584 | −.002321 | .003488 | .001482 |
| 16 | .006929 | −.018184 | .032042 | .012813 | −.001681 | −.00489 | .001528 | .001637 |
| 17 | .006695 | −.019591 | .03298 | .013411 | −.000234 | −.00332 | .002852 | .001575 |
| 18 | .008472 | −.019065 | .036008 | .01405 | .001777 | −.001078 | .004632 | .001457 |
| 19 | .008689 | −.020539 | .037917 | .014912 | .000217 | −.002958 | .003392 | .00162 |
| 20 | .006616 | −.024472 | .037703 | .015861 | −.002074 | −.005522 | .001375 | .00176 |

Note: coirf – cumulative orthogonal impulse response function, oirf – orthogonal impulse response function, lower – lower and upper – upper limit, S.E. – standard error.
Source: Authors' calculation.

**Table A6.** Short-term and long-term effects of the total tax burden on economic growth.

| step | (1) coirf | (1) Lower | (1) Upper | (1) S.E. | (1) oirf | (1) Lower | (1) Upper | (1) S.E. |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | .002269 | −2.1e-07 | .004537 | .001158 | .002269 | −2.1e-07 | .004537 | .001158 |
| 2 | .004047 | −.001878 | .009973 | .003023 | .001779 | −.002296 | .005854 | .002079 |
| 3 | .005553 | −.004105 | .015212 | .004928 | .001506 | −.002936 | .005948 | .002266 |
| 4 | .003622 | −.00911 | .016355 | .006496 | −.001931 | −.006398 | .002536 | .002279 |
| 5 | .004612 | −.012037 | .021261 | .008494 | .00099 | −.003961 | .005941 | .002526 |
| 6 | .005054 | −.01628 | .026388 | .010885 | .000442 | −.005194 | .006078 | .002876 |
| 7 | .005057 | −.020449 | .030564 | .013014 | 3.4e-06 | −.005413 | .00542 | .002763 |
| 8 | .003929 | −.024953 | .032812 | .014736 | −.001128 | −.006266 | .00401 | .002621 |
| 9 | .005669 | −.026604 | .037942 | .016466 | .00174 | −.003229 | .006709 | .002535 |
| 10 | .007877 | −.027902 | .043655 | .018255 | .002207 | −.003024 | .007439 | .002669 |
| 11 | .009894 | −.028657 | .048446 | .01967 | .002018 | −.003127 | .007162 | .002625 |
| 12 | .011591 | −.028941 | .052122 | .02068 | .001696 | −.003242 | .006634 | .002519 |
| 13 | .015049 | −.027584 | .057682 | .021752 | .003458 | −.001398 | .008314 | .002477 |
| 14 | .018745 | −.026623 | .064113 | .023147 | .003696 | −.001753 | .009144 | .00278 |
| 15 | .02252 | −.025656 | .070696 | .02458 | .003775 | −.002206 | .009756 | .003052 |
| 16 | .026091 | −.024758 | .07694 | .025944 | .003571 | −.002493 | .009635 | .003094 |
| 17 | .030488 | −.023416 | .084391 | .027502 | .004396 | −.001534 | .010326 | .003026 |
| 18 | .034876 | −.022861 | .092614 | .029459 | .004389 | −.001968 | .010745 | .003243 |
| 19 | .03918 | −.022558 | .100918 | .0315 | .004304 | −.002454 | .011062 | .003448 |
| 20 | .042698 | −.022663 | .108059 | .033348 | .003518 | −.003113 | .010148 | .003383 |

Note: coirf – cumulative orthogonal impulse response function, oirf – orthogonal impulse response function, lower – lower and upper – upper limit, S.E. – standard error.
Source: Authors' calculation.

**Table A7.** Short-term and long-term effects of education on economic growth.

| step | (1) coirf | (1) Lower | (1) Upper | (1) S.E. | (1) oirf | (1) Lower | (1) Upper | (1) S.E. |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | −.001267 | −.003684 | .001149 | .001233 | −.001267 | −.003684 | .001149 | .001233 |
| 2 | .000621 | −.005622 | .006864 | .003185 | .001889 | −.002361 | .006138 | .002168 |
| 3 | .000569 | −.009652 | .01079 | .005215 | −.000052 | −.004871 | .004767 | .002459 |
| 4 | −.002295 | −.015831 | .01124 | .006906 | −.002864 | −.007633 | .001905 | .002433 |
| 5 | −.005815 | −.023394 | .011763 | .008969 | −.00352 | −.008842 | .001802 | .002715 |
| 6 | −.004492 | −.026907 | .017923 | .011436 | .001324 | −.004617 | .007264 | .003031 |
| 7 | −.001421 | −.028171 | .025329 | .013648 | .003071 | −.002608 | .00875 | .002898 |
| 8 | −.000854 | −.031034 | .029327 | .015398 | .000567 | −.004812 | .005946 | .002745 |
| 9 | .000328 | −.033265 | .03392 | .017139 | .001182 | −.004055 | .006418 | .002672 |
| 10 | .006279 | −.03081 | .043368 | .018923 | .005951 | .000629 | .011273 | .002715 |
| 11 | .013274 | −.026728 | .053277 | .02041 | .006995 | .00164 | .012351 | .002732 |
| 12 | .017428 | −.024821 | .059678 | .021556 | .004154 | −.00132 | .009628 | .002793 |
| 13 | .022084 | −.022416 | .066583 | .022704 | .004655 | −.000672 | .009983 | .002718 |
| 14 | .030472 | −.016585 | .077529 | .024009 | .008388 | .002761 | .014015 | .002871 |
| 15 | .039787 | −.009805 | .08938 | .025303 | .009316 | .003318 | .015313 | .00306 |
| 16 | .045725 | −.006387 | .097837 | .026588 | .005938 | −.000397 | .012272 | .003232 |
| 17 | .051474 | −.003628 | .106576 | .028114 | .005749 | −.000534 | .012033 | .003206 |
| 18 | .060487 | .001683 | .11929 | .030002 | .009013 | .002378 | .015647 | .003385 |
| 19 | .069582 | .006776 | .132387 | .032044 | .009095 | .00212 | .01607 | .003559 |
| 20 | .074733 | .007975 | .14149 | .03406 | .005151 | −.001926 | .012228 | .003611 |

Note: coirf – cumulative orthogonal impulse response function, oirf – orthogonal impulse response function, lower – lower and upper – upper limit, S.E. – standard error.
Source: Authors' calculation.

**Table A8.** Short-term and long-term effects of investment on economic growth.

| step | (1) coirf | (1) Lower | (1) Upper | (1) S.E. | (1) oirf | (1) Lower | (1) Upper | (1) S.E. |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | .00269 | .000498 | .004881 | .001118 | .00269 | .000498 | .004881 | .001118 |
| 2 | .006974 | .001113 | .012834 | .00299 | .004284 | .00032 | .008248 | .002022 |
| 3 | .008171 | −.001329 | .01767 | .004847 | .001197 | −.003167 | .005561 | .002226 |
| 4 | .008393 | −.00374 | .020527 | .00619 | .000223 | −.003633 | .004078 | .001967 |
| 5 | .010476 | −.004631 | .025584 | .007708 | .002083 | −.002005 | .006171 | .002086 |
| 6 | .012942 | −.005994 | .031879 | .009662 | .002466 | −.002213 | .007145 | .002387 |
| 7 | .014009 | −.008177 | .036195 | .01132 | .001067 | −.003342 | .005475 | .002249 |
| 8 | .014844 | −.009545 | .039233 | .012444 | .000835 | −.003148 | .004818 | .002032 |
| 9 | .016767 | −.009797 | .043331 | .013553 | .001923 | −.001947 | .005794 | .001975 |
| 10 | .020115 | −.008939 | .049169 | .014824 | .003348 | −.000593 | .007288 | .002011 |
| 11 | .022403 | −.008687 | .053492 | .015862 | .002288 | −.001873 | .006449 | .002123 |
| 12 | .023295 | −.009179 | .05577 | .016569 | .000893 | −.003453 | .005238 | .002217 |
| 13 | .025353 | −.008627 | .059333 | .017337 | .002057 | −.002028 | .006143 | .002085 |
| 14 | .02915 | −.006798 | .065098 | .018341 | .003797 | −.000246 | .00784 | .002063 |
| 15 | .031735 | −.006209 | .069678 | .019359 | .002584 | −.001986 | .007155 | .002332 |
| 16 | .032657 | −.007195 | .072508 | .020333 | .000922 | −.004137 | .005982 | .002581 |
| 17 | .034615 | −.007298 | .076527 | .021384 | .001958 | −.00282 | .006737 | .002438 |
| 18 | .038347 | −.005973 | .082667 | .022613 | .003732 | −.000878 | .008342 | .002352 |
| 19 | .040524 | −.006433 | .087481 | .023958 | .002177 | −.002941 | .007295 | .002611 |
| 20 | .040347 | −.009272 | .089965 | .025316 | −.000177 | −.005643 | .005289 | .002789 |

Note: coirf – cumulative orthogonal impulse response function, oirf – orthogonal impulse response function, lower – lower and upper – upper limit, S.E. – standard error.
Source: Authors' calculation.