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CONFERENCE PAPER

# Structural Decomposition of the Economic Growth in the Croatian Economy

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***Abstract:*** *Croatia has been falling behind more successful new member states and belongs to the group of the least developed EU economies. After joining the EU, the availability of European structural funds, the removal of all trade barriers, and the strong growth of the tourism sector resulted in accelerating growth rates. This paper aims to decompose the total economic growth in the Croatian economy in the 2010-2018 period into the effect of increasing demand and technology improvements. The study is based on the structural decomposition analysis, which is the extension of the input-output model and has been widely used in previous studies in many economies to identify the driving forces of economic growth over a certain period. Based on empirical results, it can be concluded that the total final demand effects related to the increase in the total expenditures on the total economy level have been three times more intensive than the effects of technological change. It is estimated that the increase in final demand positively affected economic activity in each sector, while the distribution of technological change effects significantly varies. The highest positive impacts of technological change are found in the manufacturing, agri-food, and hospitality sectors. On the other hand, adverse effects of technological change are found in energy products, trade and transport, and various personal and business services. Significant variations are found in the growth dynamics of manufacturing sectors. The highest cumulative growth in 2010-2018 has been recorded in the production of computers and electronics, furniture, machinery and equipment, and wood products. In the case of computers, machinery, and furniture, the main effects are related to the product mix effects. At the same time, the economic growth of the wood industry is primarily the result of technological effects and increased participation in the supply chain of other industries.*

***Keywords:*** economic growth; technology change; final demand; product mix; structural decomposition analysis

***JEL classification:*** E20, C67

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## Introduction

Structural decomposition analysis (SDA) has been widely used in previous studies in many economies to identify the driving forces of economic growth over a certain period. SDA is primarily based on the extension of the input-output (IO) model where a total increase in output, gross value added (GVA), and employment in the analysed period is decomposed in the demand and technology effects (Ang & Zhang, 2000; Miller & Blair, 2009).

From the global crisis in 2009 until the accession to the EU, the Croatian economy recorded relatively modest economic growth rates. With the entry into the EU, the removal of the remaining barriers to free trade, and the availability of European structural funds, the economic growth of the Croatian economy is accelerating. However, Croatia is still falling behind other new member states (NMS) and is classified as one of the least developed EU economies. According to some previous studies, a significant proportion of the economic growth in Croatia is the result of the growing demand of final consumers, especially foreign tourists. At the same time, the role of technological change is limited. This study aims to empirically decompose economic growth in Croatia into the final demand and technology effects. The research questions addressed in this paper are: which are the driving forces of the economic growth of the Croatian sectors in the 2010-2018 period, and how important is the role of technological progress? The hypothesis tested in the paper is that the speed of adoption of technological progress has the most crucial role in the sectors that are more exposed to international competition on the global market, such as the manufacturing, agri-food, and hospitality industries.

After a short literature review, the theoretical background of the SDA method is presented. Results present the empirical findings on the sources of economic growth in the period 2010-2018, while the last chapter presents the main conclusions and discussion with previous studies.

## Literature review

In the economic literature, many works focus on identifying economic growth sources. Various methodological approaches are used for this purpose, and among other methods, the application of input-output tables plays a significant role. Regarding the availability of IO tables for several periods, appropriate methods can be applied to break down the total growth of economic activity into the part related to the general increase in demand from the part resulting from technological changes. Chenery (1960) proposes using the IO model to decompose the effects of demand on the national economy. Structural decomposition analysis was developed for this purpose,

and early empirical works of this type were designed by Feldman, McClain, and Palmer (1987) for the USA and Skolka (1989) for Austria. The development of the SDA methodology is presented in Rose and Casler (1996) or Dietzenbacher and Los (1998). The SDA has been employed by many authors to empirically test the role of demand and technology changes in the economic growth of different economies.

Wang et al. (2017) classify research based on the application of the SDA method into three major groups. The first group deals with analysing factors at the level of one region or country (for example, Rose & Chen, 1991; Wood, 2009). Another category of empirical research examines the links between growth factors and environmental impact in international trade (Kagawa & Inamura, 2004), while recently, there are more and more empirical studies that do not focus on the national economy but use international IO tables. to include feedback links (e.g. Kaltenegger et al., 2017; Lan, Malik, Lenzen, McBain & Kanemoto, 2016).

Analysis of empirical research also establishes several common conclusions. One of the analysis's primary results, confirmed in many studies, is that variations in domestic demand and relative prices are the two most significant factors that explain the long-term deindustrialisation trend (Liboreiro, Fernandez & Garcia, 2021). Many works also refer to globalisation and the substitution of domestic production by imports as a key element determining structural changes in the national economies. It has been observed that, in many recent economies, exports positively contribute to the growth of domestic economic activity. Still, most often, in the case of European economies, this positive contribution to export growth is insufficient to compensate for the increase in import dependence.

Messa (2012) and Moreira & Ribeiro (2012) applied SDA to the example of the Brazilian economy in the 2000s. These works concluded that the change in technological coefficients, reflected in the reduction of intermediate consumption of domestic industrial products, is the most significant determinant that leads to the difference in growth between services and the processing industry. Moreira and Ribeiro (2012) conclude that changes in final expenditures primarily drive output growth, while the role of technological progress is limited. Berg, Ostry, and Zettelmeyer (2012) conclude that the sophistication of export products is a significant factor in ensuring the long-term sustainable growth of exports, especially investments. The share of high-technology export products also proved to be an essential factor that was positively related to the country's development, according to the research of Felipe, Kuman, Abdon, and Bacate (2012).

In recent periods, in addition to analysing the role of changes in demand and technological coefficients on economic growth, the SDA method has been expanded to identify sources of emissions of harmful particles and energy consumption. Thus, one of the more recent studies (Wanga et al., 2017) lists 67 studies published in journals at the national economy level, which is based on the use of the SDA method on factors affecting energy consumption and the environment.

## Methodology

In the standard IO model, the matrix *A* has a crucial role that expresses a set of technical coefficients $a_{ij} = \frac{x_{ij}}{x_j}, i, j = 1, \ldots, n$ . Each element of the matrix *A* presents the share of the inputs from the sector *i* in the value of output produced by the sector *j*. The rows of the Leontief inverse matrix $L = (I - A)^{-1}$ present the total requirements of inputs from each economic sector per unit of output produced by the sector *j* (Miller & Blair, 2009). Elements of the matrix L cover the sum of direct and indirect effects. The sum of each row presents a type I multiplier of the relevant industry. Multiplier is defined as the total value of the output of all economic sectors required to produce final goods and services by sector *j*. Direct requirements cover inputs from specific sectors that are directly consumed in the production process of sector *j*. At the same time, indirect effects include inputs delivered by sector *i* to other economic sectors, which also produce intermediate inputs required in the sector's production process. An increase in the final demand for goods and services produced by sector *j* directly affects the production in sector j but also indirectly induces an increase in production in all other sectors, which produce intermediate inputs required in the production process of sector *j*.

Structural decomposition analysis is a method that decomposes changes in economic activity of the total economy and individual economic sector in an analysed period to effects induced by changes in final demand and technological coefficients (Dietzenbacher & Los 1998; Miller & Blair 2009). The precondition for applying the SDA model is the availability of IO tables for two periods (base period t=0 and reference period t=1).

The total production of economic sectors in each period is determined by final demand (vector row $Y^t$, which elements s $i = 1, \ldots, n$ present final demand for goods and services delivered by different sectors) according to the following expression $X^t = L^t Y^t$. The matrix $L^t$ is the Leontief inverse matrix in the year *t* as defined above. The change in outputs in the analysed period can be expressed as:

$$\Delta X = X^1 - X^0 = L^1 Y^1 - L^0 Y^0 \tag{1}$$

The total change in output in SDA analysis is the result of the changes in technical coefficients ($\Delta L = L^1 - L^0$) and changes in the level and structure of final demand ($\Delta Y = Y^1 - Y^0$). The economic literature proposes various potential decomposition methods (Rørmose, 2010). However, the usual procedure in most papers follows Dietzenbacher & Los (1998) recommendation which suggests the application of the average of the results. Total change in output $\Delta X$ is, according to this approach, decomposed into two parts:

$$\Delta X = \frac{\Delta L(Y^0 + Y^1)}{2} + \frac{(L^0 + L^1)\Delta Y}{2} \tag{2}$$

The first term consists of the effects of technological changes, while the second part only includes the final demand change effect. Having in mind data availability, the SDA model for the Croatian economy, as presented by equation 2 is defined as follows:

- $\Delta X$ – the 64 x 1 vector consisting of an increase in output produced by different economic sectors: $X^1 - X^0$ where the base period is 2010 and the reference period is 2018 (the most recent IO table for the Croatian economy)
- $\Delta L$ – the 64 x 64 matrix in which each element presents the change in the Leontief inverse matrix $(I - \bar{A})^{-1}$ : $\Delta L = L^1 - L^0$
- $\Delta Y$ the 64 x 1 vector of the increase in final demand for products delivered by different economic sectors: $Y^1 - Y^0$.

Total change in the final demand can be extended (Miller & Blair, 2009; Dietzenbacher & Los, 1998) to change in the level of total final demand, change in the product mix of each component of final demand, and distribution effects (change in the structure of main components of final demand: private consumption, government consumption, investment and exports).

$$\begin{aligned}\Delta Y = \left(\frac{1}{2}\right)(\Delta f)\left(\boldsymbol{B}^0 d^{\boldsymbol{0}} + \boldsymbol{B}^1 d^{\boldsymbol{1}}\right) + \left(\frac{1}{2}\right)\left[(f^0(\Delta B)\boldsymbol{d^1} + f^1(\Delta B)\boldsymbol{d^0}\right] \\ + \left(\frac{1}{2}\right)\left(f^0\boldsymbol{B}^0 + f^1\boldsymbol{B^1}\right)(\Delta \boldsymbol{d})\end{aligned} \tag{3}$$

Where:

- $\boldsymbol{B}$ – the 64 x 4 matrix of bridge coefficients. It presents the share of the final demand spent on 64 product groups for four significant components.
- $\boldsymbol{d}$ is a 4 x 1 vector which distributes the total final demand to 4 major components.
- $f$ is the value of the total final demand (scalar).

Superscripts 0 or 1 indicate base (2010) or referent (2018) period, while symbol $\Delta$ as means difference or absolute change in the value of relevant elements during the analysed period. The first part of term 3 presents the effects of the change in the total value of the final demand (volume effects under assumption on the unchanged distribution and product mix of components of final demand). The second part of term 3 captures the impact of the change in the product mix. The third part is focused on the effects of the variation in the distribution of the main expenditure items.

To estimate real (volume) trends, all data should be valued at the same base prices. Official IO tables published by the Croatian Bureau of Statistics (CBS) do not publish

IO at constant prices. The IO data in real terms should be converted to constant prices by applying the model proposed by Llop (2017). IO data are expressed in the prices of a reference period using the double deflation method. The implicit price index has deflated the assumption of homogenous products delivered by a particular economic sector, the gross output, intermediate consumption, and final demand. For that purpose, price effects for each industry have been estimated by applying more detailed Croatian national accounts data where output and relevant components besides current prices have also been expressed at the price level of the previous year. The chain-linking technique is then applied to capture cumulative price changes from 2010–2018.

By application of appropriate price indices and price chaining techniques, the IO data for 2010 could be converted to constant 2018 prices. If the ratio of the current price to the base-year price level for sector $i$ is expressed as $p_i$, the diagonal matrix $P$ can be constructed. It contains the elements $p_i$ (cumulative price index) on the main diagonal, while the other elements are 0. Then, the following formula can be applied:

$$X_r = A_r X_r + Y_r = (I - A_r)^{-1} Y_r \tag{4}$$

where $X_r = P^{-1} X$ is the vector of outputs expressed in constant prices of the reference period, $Y_r = P^{-1} Y$ is the deflated final demand vector and $A_r = P^{-1} AP$ is the matrix of IO coefficients expressed in constant prices.

Following data availability, the symmetric IO tables for the Croatian economy for the years 2010 and 2018 have been applied. The IO 2010 table for the Croatian economy is the first IO table based on the current international classification of products by activities (CPA rev. 1) classification, while the most recent data is referenced to the year 2018. Relevant data has been downloaded from Eurostat (2022).

All calculations have been made on the most detailed level (64 economic sectors), but due to clarity in presentation, results have been presented for aggregated sectors as presented in Table 1.

Table 1: Aggregated sectors used in the presentation of results

| CPA Code | Description of the aggregate sector |
|---|---|
| A + C10-12 | Agri-food |
| B + D + C_19 | Energy |
| C (except C_19) + E + F | Other industrial products (manufacturing industrial products except food and energy products) |
| G + H | Trade and transport |
| I + N_79 | Hospitality |
| O + P + Q | Public services |
| J + K + L + M + N (except N_79) + R + S + T | Other services |

Source: Aggregation of author based on CPA classification.

## Results

Total economic growth in the Croatian economy from 2010-2018 is decomposed into main components as defined in the methodological part. Table 2 presents the trends in the main components of final demand. Croatian economy recorded relatively slow economic growth until 2018, when the average growth rate was only 1.1 per cent. Personal and government consumption in that period recorded an average annual growth rate of under one percentage point. At the same time, the removal of all barriers to trade with EU partners after joining the EU in 2013 resulted in booming international trade. The availability of structural funds from the EU budget also resulted in relatively solid investment growth.

The COVID-19 crisis, which occurred in 2020, after the analysed period, had only short-term effects on the Croatian economy. In the post-COVID period, the Croatian economy recorded a solid economic recovery due to the availability of structural EU funds. Unfortunately, because of complex statistical procedures, IO tables are usually published with a time delay of three or four years, and the effects of the above-mentioned global disruption on technological change and the origin of intermediate inputs are not presented by the complete IO data yet.

Table 2: Final demand components and GDP growth in the analysed period

| | **Households and NPISH** | **Government** | **Gross capital formation** | **Exports of goods and services** | **Imports of goods and services** | **GDP** |
|---|---|---|---|---|---|---|
| | Million EUR in current prices | | | | | |
| 2010 | 26,238 | 9,953 | 8,907 | 15,794 | 16,524 | 44,368 |
| 2018 | 29,606 | 11,371 | 11,527 | 25,643 | 26,087 | 52,061 |
| | Million EUR, expressed at reference 2015 prices | | | | | |
| 2010 | 28,004 | 10,094 | 8,758 | 17,085 | 17,786 | 46,198 |
| 2018 | 29,261 | 10,858 | 11,364 | 24,769 | 25,801 | 50,469 |
| | Average annual growth rate | | | | | |
| 2010-2018 period | 0.6 | 0.9 | 3.3 | 4.8 | 4.8 | 1.1 |
| | Price index, 2010=100 | | | | | |
| 2018 | 101.2 | 104.7 | 101.4 | 103.5 | 101.1 | 103.2 |

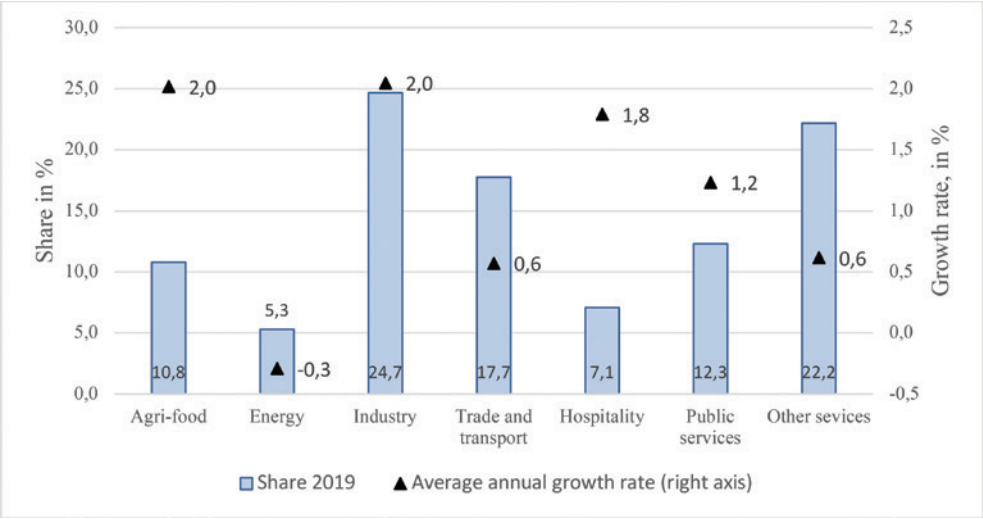
Source: CBS 2023. www.dzs.hr.

Regarding sectoral classification and definition of significant components, officially published IO data for the Croatian economy are not fully comparable with national accounts data. Thus, expenditures by households in national accounts include only consumption of the domestic population (while spending of foreign tourists is included in the exports of goods and services). On the other hand, the expenditures of households in IO data include total spending in the domestic territory of both domestic and foreign individuals. The classification of gross output in national accounts is

based on the principal activity of producers. In contrast, all transactions presented in the IO table are based on the concept of homogenous products. In addition, IO flows of domestic goods and services are separated from flows of imported products. Demand for domestic goods increases economic activity in the national economy, while imports meet the demand for imported products and stimulate economic activity in the country of origin.

Figure 1 presents the shares and average annual growth rates of analytical sectors. Industry, trade and transport, and other services are the most important sectors. The average annual growth rate in the analysed period has been relatively low, and the highest annual growth rate of 2% has been recorded for the agri-food sector and industry.

Figure 1: The share of economic sectors in the total economy and average annual growth rate in the period 2010-2018, in %




Source: Authors' calculations based on the Croatian IO table data.

As seen from Table 3. exports of goods and services and personal consumption (expenditures on Croatian territory of domestic households and foreigners) increased their share in the final demand for domestic output. The share of investments slightly decreased, while the share of government consumption decreased in the analysed period. While government expenditures have been concentrated on public sector services and investments in manufacturing industry products, expenditures on personal consumption are more diversified. Almost one in five EUR from personal consumption is paid to the hospitality sector, which includes hotels, restaurants, and travel agencies, which is higher than the amount paid to domestic manufacturers.

Table 3 presents the structure of the final demand components as critical data for constructing matrix **B** and vector ***d***.

Table 3: The structure of final demand for domestic output

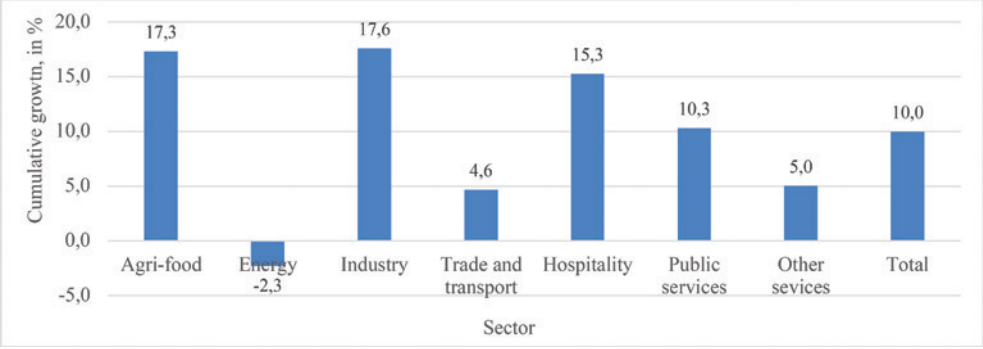
| | Structure of final demand for domestic output | | | |
|---|---|---|---|---|
| | **Personal consumption** | **Government consumption** | **Investments (including change in inventories)** | **Exports** |
| Agri-food | 16.0 | 0.8 | 6.7 | 10.5 |
| Energy | 4.7 | 0.3 | -4.4* | 5.2 |
| Other industrial products | 10.3 | 2.0 | 72.5 | 35.5 |
| Trade and transport | 16.4 | 3.8 | 14.7 | 28.5 |
| Hospitality | 19.9 | 0.0 | 0.0 | 0.0 |
| Public services | 5.6 | 82.5 | 0.0 | 2.0 |
| Other services | 27.0 | 10.6 | 10.5 | 18.2 |
| | Share in the final demand | | | |
| 2010 | 46.9 | 19.1 | 15.2 | 18.8 |
| 2018 | 47.3 | 17.5 | 15.1 | 20.0 |
| Change in share | 0.3 | -1.5 | -0.1 | 1.2 |

Source: Authors' calculations based on the Croatian IO table data.

*A negative sign is the result of the decrease in inventories.

As a result of a change in final demand total output in the Croatian economy in the analyzed period increased by 10% (Figure 2).

Figure 2: Cumulative growth in real output by economic sectors in the period 2010-2018, in %




Source: Authors' calculations based on the Croatian IO table data.

As a result of the trends in the promotion of environment-friendly activities and restructuring in the production of oil derivatives, a decrease in real economic activity

has been recorded only in the energy sector. The full liberalization of foreign trade with EU economies positively affected the production of various manufacturing products and the agri-food sector, which recorded a cumulative growth of more than 17 per cent. Cumulative solid growth has been also recorded in the hospitality sector, while various business and personal services recorded only modest growth.

Table 4: Decomposition in the cumulative increase in economic activity in the period 2010-2018, in mil EUR at constant 2018 prices

| | Structural effects | | | Total final demand effects | Technological change effects | Total change |
|---|---|---|---|---|---|---|
| | Increase in total demand | Product mix | Distribution | | | |
| | Effects expressed as a percentage of 2010 output for each economic sector | | | | | |
| Agri-food | 7.6 | 0.9 | 1.6 | 10.1 | 7.2 | 17.3 |
| Energy | 6.9 | -0.6 | 1.3 | 7.6 | -9.9 | -2.3 |
| Industry | 7.7 | -4.2 | 1.4 | 4.8 | 12.8 | 17.6 |
| Trade and transport | 7.2 | -2.4 | 1.6 | 6.4 | -1.7 | 4.6 |
| Hospitality | 7.5 | -3.3 | 0.6 | 4.8 | 10.4 | 15.3 |
| Public services | 7.3 | 5.1 | -6.7 | 5.7 | 4.6 | 10.3 |
| Other services | 7.1 | 2.8 | 0.3 | 10.2 | -5.2 | 5.0 |
| Total | 7.3 | -0.3 | 0.1 | 7.2 | 2.8 | 10.0 |

Source: Authors' calculation based on the SDA model.

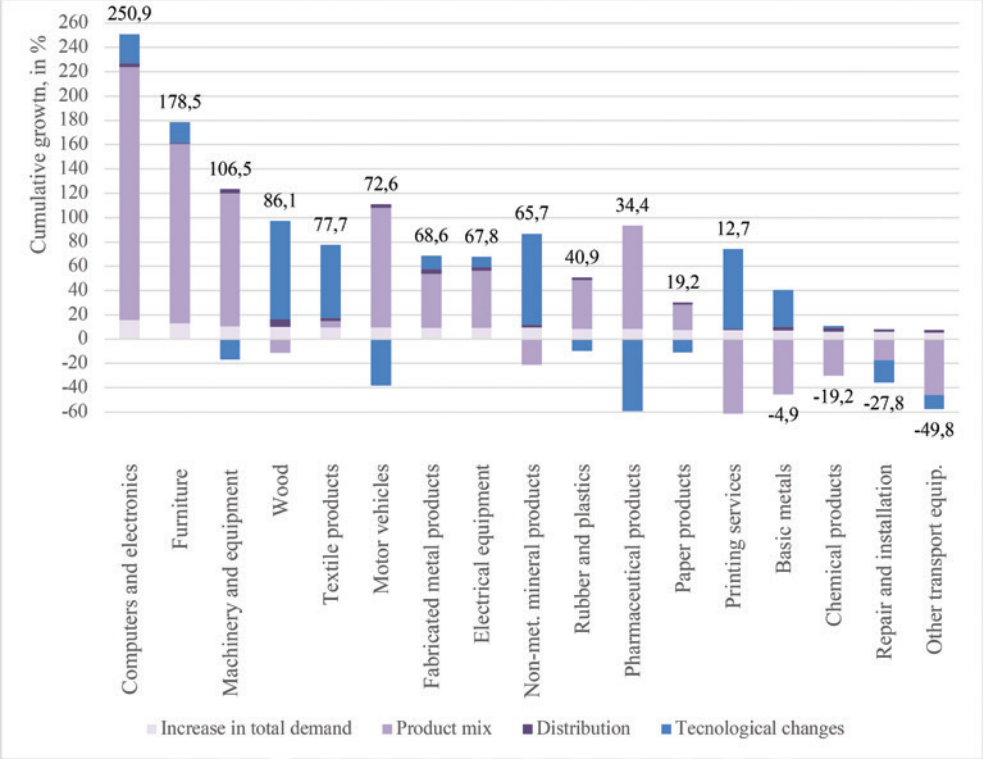
Table 4 presents the result of the structural decomposition analysis. The first part presents results in a million EUR at constant prices, while the lower part presents the distribution of effects for each economic sector. The total increase in output of each economic sector is the result of the change in the overall final demand and technological changes. The total final demand effects related to the increase in the final expenditures at the total economic level have been more important than the effects of change in technological coefficients. Final demand growth induced cumulative Croatian economic activity of 7.2 per cent. In comparison, the effects of technological change have been limited to only 2.8 per cent (the last row in Table 4). While the increase in final demand positively affected all economic sectors, the distribution of technological change effects is different. The positive technological change indicates the better integration of an economic sector in the production processes of the other national producers, i.e., an increased share of their products, which are delivered along a value-added chain. The manufacturing, agri-food, and hospitality sectors have the highest technological change effects. On the other hand, adverse effects of technological change are found in energy products, trade and transport, and other services.

Total final demand effects are further decomposed into general increases in final expenditures, product mix, and distribution effects. An increase in final expenditure contributed to cumulative growth in real output of 7.3 per cent, with a slight deviation

among economic sectors. Distribution effects reflect the change in the share of major components in the total final demand. On the total economy level, those effects are not significant as the source of economic growth, but the distribution of effects is significantly different. The distribution effects are adverse for public services because of the reduced share of government expenditures. On the other hand, the increased share of exports positively affects the production of various manufacturing products and the trade and transport sector. Product mix effects are related to the change in the final demand structure. Thus, the reduction in the volume of public expenditures in the provision of education and health services has been partially compensated by an increased share of private expenditures for those services.

Interestingly, agri-food is the only sector where all effects are estimated to be positive. It could be a result of the successful utilization of EU structural funds in activities that promote integration and consolidation of domestic agrifood clusters and a consequence of the growing demand for food products by foreign tourists.

Figure 3: Decomposition of the real growth in the 2010-2018 period




Source: Authors' calculations based on the Croatian IO table data.

Product mix effects are estimated to be negative in the sector, including various manufacturing industry products, while all other components are positive. However, this sector includes heterogeneous products with different effects, as presented in Figure 3.

According to IO data, the highest cumulative growth in 2010-2018 has been recorded in the production of computers and electronics, furniture, machinery and equipment, and wood products. The volume of output in the sector that produces computers and electronic products increased 2.5 times in the analyzed period because of the change in product mix in final demand due to the increasing use of modern electronic devices in households and rapid digitalization in production processes. The change in product mix in favour of furniture is probably related to the increasing living standard of households, increased investments in real estate, and products related to more comfortable housing. A certain proportion of product mix effects in increased demand for machinery and equipment is probably related to the availability of EU structural funds for business restructuring.

Contrary to the prevalence of product mix effects in the three sectors that recorded the highest growth, technological change is the dominant source of economic growth in wood production. It indicates that increasing demand for furniture positively impacted the development of the Croatian wood and furniture industry cluster. Besides wood products, technological changes strongly impacted the Croatian sectors: the textile industry, non-metallic mineral products (mainly construction materials), and printing services. Those sectors increased the volume of products delivered to other sectors for intermediary input in their production processes.

The worst performance in the analyzed period was recorded in sectors that produce primary metals, chemical products, and other transport equipment (ship-building industry) as well as repair and installation services. Reduction in the volume of those activities is primarily induced by product mix effects, i.e. decreasing share in total final expenditure. As in the case of other sectors, the effects of the change in total final demand were positive for all sectors, but their role was limited. It is interesting to note that the effects of product mix and technology change in the pharmaceutical industry and the production of motor vehicles were the opposite. While the increasing share in the total final expenditures for those product groups has a positive impact, the effects of technological change have been adverse. It is probably the result of the increasing share of imported intermediate inputs in those product groups that other domestic producers use. Some of the essential Croatian companies that operate in those sectors are becoming more integrated in international value chains and their economic performance is more related to trends in the global than domestic market.

Distribution effects related to the change in the structure of the main components of the final demand were the least important source of variation in the economic growth of the manufacturing industry.

## Conclusions

The Croatian economy's economic growth has been limited from 2010 to 2018, and Croatia was classified as one of the least developed EU economies. The economic growth showed better performance after the entrance into the EU when all remaining barriers to foreign trade were terminated and a significant amount of funds from the EU budget for restructuring the economy became available.

The results of the structural decomposition analysis point to the conclusion that the total economic growth in the analyzed period is more related to the increase in the final demand than the change in technological coefficients. The effects of the change in the final demand were positive for all economic sectors. On the other hand, the effects of technological change were different. The highest positive technological change effects are estimated for the sectors more exposed to international competition in the global market: the manufacturing industry, agri-food sector, and hospitality sector, which confirmed the research hypothesis. A decreasing level of integration into domestic production clusters has been found for the energy sector, transport, and other services, resulting in the lower value of domestic inputs incorporated in the final products of the other domestic sectors and adverse technological effects. In the manufacturing sector, the highest cumulative growth in the analysed period was found for the sectors that produce computers and electronic products, furniture, and various investment goods. The change in product mix in final demand is the most critical factor in the economic growth of those industries. In contrast, the growth of the wood industry is primarily related to the technological effects and increased volume of intermediary inputs delivered to other domestic sectors.

Although SDA can statistically decompose total changes in the analyzed period into demand and technology effects, its limitations are related to significant time delays in data availability and incapability to incorporate the impact of other variables and factors that affect the change in the level and structure of final demand or speed of technological progress. From the policy recommendation point of view, SDA results should be used in parallel with some other models to evaluate better the effects of monetary and fiscal policy on the macroeconomic performance of an economy and the speed of acceptance of technological progress.

In future research, the role of COVID-19 and political instability in the disruption of global and domestic value-added chains should be investigated. Increased probability of changes in technical coefficients for domestic output and imports, caused by global shortages and high prices of some essential production inputs, could affect the relative importance of demand factors and technological changes in the recent period. Furthermore, improvements and harmonization of IO data with the price statistics could improve the robustness and reliability of results.

## Declarations

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*Availability of Data and materials*

In this investigation, we exclusively used secondary data from public sources. Therefore, in this study, no new data is used or produced.

*Code Availability*

The computer program results are shared through the tables in the manuscript.

*Competing Interest*

There is no conflict of interest.

*Authors' Contributions*

Not applicable.

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