

Sources of export growth and development of manufacturing industry: empirical evidence from Croatia

Goran Buturac, Davor Mikulić & Petra Palić

To cite this article: Goran Buturac, Davor Mikulić & Petra Palić (2019) Sources of export growth and development of manufacturing industry: empirical evidence from Croatia, Economic Research-Ekonomska Istraživanja, 32:1, 101-127, DOI: [10.1080/1331677X.2018.1550003](https://doi.org/10.1080/1331677X.2018.1550003)

To link to this article: <https://doi.org/10.1080/1331677X.2018.1550003>



© 2019 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



Published online: 18 Feb 2019.



[Submit your article to this journal](#)



Article views: 1012



[View related articles](#)



[View Crossmark data](#)



Citing articles: 1 [View citing articles](#)

Sources of export growth and development of manufacturing industry: empirical evidence from Croatia

Goran Buturac, Davor Mikulić  and Petra Palić

Institute of Economics, Zagreb, Croatia

ABSTRACT

The article quantifies the sources of manufacturing export growth in Croatia. The research objectives are achieved by applying the constant market share method (C.M.S.) and input–output model. While the C.M.S. method quantifies the factors which explain trends in manufacturing exports, the input–output method quantifies the impacts of manufacturing exports on other domestic sectors. The obtained results show that after the E.U. accession export performance of the Croatian manufacturing industry have substantially improved. The results indicate that a gain in competitiveness in the Croatian manufacturing industry was the most important factor which determined the increasing share of national companies in a period from 2013 to 2015. Besides the manufacturing industry, export growth indirectly contributes to better performance of all domestic producers included in the value added chain of exporters. Indirect effects are the most pronounced for agriculture, trade, transport and business services.

ARTICLE HISTORY

Received 16 October 2017
Accepted 5 November 2018


KEY WORDS

export growth;
manufacturing; constant
market share (C.M.S.)
method; input–output
analysis; Croatia

1. Introduction

The main goal of the research is to explore the sources of export growth of Croatian manufacturing and to quantify the overall contribution of the export of manufactured products on the national economy. This study on manufacturing is motivated by its importance for the national economy and it tries to provide empirical evidence on the sources of export growth and therefore enable a comparison to other European Union (E.U.) countries because Croatia was rarely included in the previous studies on the E.U. and its new member states (N.M.S.) countries. As manufacturing is one of the most important Croatian economic sectors, development in that sector indirectly contributes to other economic sectors.

The hypothesis of the research is that the Croatian manufacturing industry was continuously decreasing its share on the global and E.U. market up to 2013 as a consequence of weak international competitiveness which contributed to prolonging the economic recession in the overall value added chain of manufacturing. E.U.

CONTACT Goran Buturac  gbuturac@eizg.hr

© 2019 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

membership in 2013, however, changed the course of events and reversed the trend in the manufacturing industry. The study employs two complementary methods: a constant market share (C.M.S.) and an input output analysis. The methodological background of the C.M.S. method was developed and first applied in research conducted by Tyszynski (1951) followed by further methodological and empirical improvements proposed by numerous authors referenced in the methodological part of the paper. Leontief (1986) defined the input–output model as an adaptation of the neoclassical Walras’ general equilibrium model to the empirical quantitative interdependence among economic sectors. While the C.M.S. identifies the factors which explain trends in manufacturing exports, the input–output method goes one step further and quantifies the indirect and induced effects of manufacturing exports on other domestic sectors. The geographical and product structure as well as international competitiveness of producers affect not only manufacturing but also economic activity of all units included in the value added chain of manufacturing.

An empirical study on the performance and the contribution of Croatian manufacturing exports in the period prior and after the E.U. accession is conducted for the first time. It provides empirical evidence on the impact of the accession, on the intensity of international integration, and export competitiveness of Croatian manufacturing industry. Most previous studies usually focus on the E.U. or the N.M.S. which joined the E.U. in 2004 and 2007.

In the interpretation of the results obtained it must be taken into account global economic and trade conditions. The analysed period was characterised by relatively stable economic growth of Croatian main trading partners as well as favourable trade conditions especially with the E.U. countries. However, recent trade restricting measures, introduced by U.S.A., have given rise to fears about a further undermining of the multilateral trading system with possible negative impacts on complex global value chains (European Commission, 2018).

The introductory section is followed by the literature review. The methodology is explained in the third part of this article. The fourth part of the paper is devoted to the analysis of the obtained results which includes: the analysis of Croatian manufacturing trade performance, the analysis of export decomposition in the geographical, product and competitiveness effect (CE) and the input–output analysis. The article ends with a conclusion.

2. Literature review

For small economies like Croatia, export is substantial in sustaining economic growth and development. Export growth has contributed significantly in terms of capital inflows, employment, expansion of industry and widening the production base. The subject of the research is very complex due to a broad impact, both on the micro and macro level, i.e., impact on production, consumers, the interdependency of certain manufacturing sectors and the effects on the national economy.

In research on the relationship between export and economic growth, the most important arguments in favor of the positive role of export growth on domestic economy are spillover effects and price equalisation. Large literature on knowledge spillovers from foreign direct investment (F.D.I.) has subsequently emerged, both

theoretically (Romer, 1987; Grossman, Helpman, 1991) as well as empirically (Keller, 2004). Recent literature in this field is more oriented towards measuring net trade and quantification of the value added content of trade (Belke, Wang, 2006; Daudin, Schweisguth, 2011; Johnson, Noguera, 2012). The results are sensitive to variations in sector composition of exports. In exports of manufacturing industries, because of higher vertical integration, the share of domestic value added in exports is, as a whole, lower, although high variations are recorded. This suggests that internal E.U. innovativeness and efficiency is probably much more important for the level and growth of the E.U.27 G.D.P. than its external competitiveness. Empirical and comparative research of other countries often finds that the value added content in exports represents a lower share in terms of total value added of the economy in comparison to the exports coefficient with respect to gross production. Researchers (Fujii and Ascarraga, 2012) found an explanation for the low domestic value added in manufacturing exports in the fact that indirect value added represents a low proportion of the value added content in exports, which is a result of weak linkages of export activities with the rest of the national economy, especially with the same manufacturing activities.

The identification of key economic sectors was usually based on the input–output model which was a convenient tool to identify the intensity of backward linkages in value added chains of domestic producers. Based on the input–output methodology, the role of each sector in the national economy regarding its contribution to the overall production, value added, and employment can be determined. Balla (2014), based on input–output tables disaggregated to 13 sectors, identified the key economic sectors for Romania, Slovakia and Hungary. Šidlauskaitė and Miškinis (2013) used the input–output model in an analysis of the production and trade structure in the Baltic countries. They analyzed the backward and forward inter-industry linkages of manufacturing and service industries and found that the share of sectors creating a lower value added had decreased, and a deeper economic integration was observed in the majority of industrial sectors of the Baltic countries. They estimated that backward linkages for the food industry for internal interdependence in 2009 was above average and ranged between 73% for Lithuania and 96.8% in Latvia. This percentage of output growth was indirectly induced by the increase of demand for products from a certain sector.

In the recent literature for European transition economies, factors behind trends in manufacturing industry exports were the subject of numerous researches, especially for the group of NMS countries which joined EU in 2004 and 2008 (Dritsakis, 2004; Funke, Ruhwedel, 2005; Gherman, Stefan, 2015; Brodzicki, 2015). Authors often conducted comparative studies on a sample which included a group of N.M.S. countries or the entire E.U. As a country outside the E.U. until 2013, Croatia is usually not included in those surveys on export competitiveness of the manufacturing industry. Surveys differ in period covered, sample size and methods used, but some general conclusion on the factors behind different trends in various countries can be reached. In general, N.M.S. countries which were able to increase international competitiveness and improve the product mix according to the possibilities offered by the E.U. market, significantly benefited from E.U. accession.

Different aspects of the Croatian export growth have been investigated in many papers. Recent studies by domestic authors are mostly oriented on the analysis of

export competitiveness and comparative advantages (Mikic and Lukinic, 2004; Vuksic, 2007; Buturac, 2009; Stojcic et al., 2012). The common conclusion stemming from these studies is that reductions in unit labor costs, improvements in productivity and inflow of F.D.I. have a positive effect on the competitiveness of Croatian exports. Also, most exports are achieved in less sophisticated industries with low technology intensity and low value added. The comparison among manufacturing sectors reveals that export competitiveness shows modest growth in the engineering sector, stagnation in the chemical industry, oscillation in the shipbuilding industry and significant fall in the textile and clothing industry (Buturac, 2008). The abovementioned studies which were conducted at the industry level, were followed by research based on econometric analysis at the firm level (Stojčić, 2012; Stojčić et al., 2014). Stojčić (2012) modelled the export competitiveness of firms as a function of their activities, characteristics, and features of their environment. The obtained results are in line with theoretical predictions about the behaviour of price competitive firms. In building their international position, Croatian exporters rely on cost reductions and improvements in labor productivity.

Systematic empirical research on factors behind the trends in Croatian manufacturing exports and their contribution to other economic sectors has not been conducted except for a limited number of sectors such as the textile and wood industries (Buturac, Lovrinčević, Mikulić, 2014; Lovrinčević, Buturac, Mikulić, 2015).

3. Methodology

3.1. Introduction

The proposed research uses two methodological concepts: C.M.S. analysis and input-output method. While C.M.S. identifies the sources of export growth of different branches of manufacturing, the input-output method quantifies the impact of exports on other domestic sectors. The applied complementary methods have been determined in accordance to the research goal, hypothesis, as well as, data sources. Several recent studies, which explore export competitiveness of manufacturing industry, relied on the G.M.M. method of dynamic panel analysis (Stiebale, 2008; Bellone et al., 2010; Stojčić, 2012).

3.2. Constant market share methodology

The C.M.S. analysis is applied to quantify export performance and sources of international competitiveness of Croatian manufacturing. In economic literature, various factors have been identified as potential factors behind the decreasing share of exports in the total world trade:

- a. National exports in manufacturing may be concentrated on products that are experiencing a lack of demand;
- b. The concentration of exports of manufactured products to relatively stagnant regions;
- c. Weak international competitiveness of the domestic manufacturing.

The C.M.S. is able to explain these effects in the case of Croatian manufacturing. The C.M.S. method was first applied in research conducted by Tyszynski (1951).

Methodological and empirical improvements of the C.M.S. technique were proposed by numerous authors who all used a similar concept (Baldwin 1958; Leamer and Stern 1970; Richardson 1971; Jempa 1986; Fagerberg and Sollie 1987; Merkies and van der Meer 1988; Milana 1988; Kapur 1991).

According to the C.M.S. concept, the export performance of a certain industry mainly depends on product composition, geographical distribution of the exports, and the level of international competitiveness. Trends in export of Croatian manufacturing based on this methodology could be decomposed in three different parts.

According to the revised version of the CMS (Milana 1988); trends in total exports can be decomposed into four components:

$$TE = CE + PE + GE + RE$$

where:

TE = total effect

CE = competitiveness effect

PE = product effect

GE = geographical effect

RE = residual effect

The TE is calculated as follows:

$$TE = \left[\frac{\sum_m \sum_p q^t_{m,p}}{\sum_m \sum_p Q^t_{m,p}} - \frac{\sum_m \sum_p q^{t-1}_{m,p}}{\sum_m \sum_p Q^{t-1}_{m,p}} \right] \times 100$$

The CE:

$$CE = \sum_m \sum_p 0.5 \times \left[\frac{q^t_{m,p}}{Q^t_{m,p}} - \frac{q^{t-1}_{m,p}}{Q^{t-1}_{m,p}} \right] \times \left[\frac{Q^{t-1}_{m,p}}{\sum_m \sum_p Q^{t-1}_{m,p}} + \frac{Q^t_{m,p}}{\sum_m \sum_p Q^t_{m,p}} \right] \times 100$$

The PE:

$$PE = \sum_m \sum_p 0.5 \times \left[\frac{q^{t-1}_{m,p}}{Q^{t-1}_{m,p}} + \frac{q^t_{m,p}}{Q^t_{m,p}} \right] \times \left[\frac{\sum_m Q^{t-1}_{m,p}}{\sum_m \sum_p Q^t_{m,p}} - \frac{\sum_m Q^t_{m,p}}{\sum_m \sum_p Q^{t-1}_{m,p}} \right] \times 100$$

The GE:

$$GE = \sum_m \sum_p 0.5 \times \left[\frac{q^{t-1}_{m,p}}{Q^{t-1}_{m,p}} + \frac{q^t_{m,p}}{Q^t_{m,p}} \right] \times \left[\frac{\sum_p Q^t_{m,p}}{\sum_m \sum_p Q^t_{m,p}} - \frac{\sum_p Q^{t-1}_{m,p}}{\sum_m \sum_p Q^{t-1}_{m,p}} \right] \times 100$$

The residual effect equals the difference between the TE and individual components:

$$RE = TE - (CE + PE + GE),$$

where:

q^t = aggregate exports of an industry

q_p^t = exports of the p-th commodity of an industry

Q_p^t = world exports of the p-th commodity

m = market index

p = product index

t = time

An explanation of the aforementioned effects on the industry's export growth from the basic model is displayed in [Table 1](#).

The C.M.S. method reveals that, even if a country maintains its share of every product in every market, it still can have a decrease in its aggregate market share if it exports to markets that grow more slowly than the world's average. The CE is the capacity of a country to increase its market share due to competitiveness factors only, independent of structural developments in the market or in the product trade pattern. If a country only exports certain traditional products for which international demand is growing slowly compared to other products, then its total export market share of world trade will decline even if this country succeeds in maintaining its market share in these traditional products. A similar reason holds for the geographical distribution of export markets. Therefore better export performance is achieved through a pattern of exports oriented towards the most dynamic market and products in world trade (Skriver, 2009).

The CMS model was used to explore the sources of export growth of Croatian manufacturing in the global market as well as E.U. 15 and E.U. 27 markets from 2001–2015. The analysis of changes in export shares is based on three sub-periods,

Table 1. Description of effects in the C.M.S. model.

<i>Effect</i>	<i>Description of meaning</i>
Total Effect (T.E.)	The total effect (T.E.) measures the annual change of a certain industry's aggregate export share in world trade. A positive value suggests that the exports of a certain industry expanded faster compared to the rest of the world, while a negative value indicates the opposite.
Competitiveness Effect (C.E.)	The competitiveness effect (C.E.) reveals the capacity of a certain industry to increase its market share due to competitiveness factors only, independent of structural developments in markets or in a product trade pattern. A positive value indicates a competitive advantage of the exports of a certain industry compared to the rest of the world, while a negative value indicates a disadvantage.
Product Effect (P.E.)	The product effect (P.E.) is part of export growth attributed to the composition of a certain industry's export by commodities. The product effect is positive if export is concentrated in commodities in which world demand is growing rapidly.
Geographical Effect (G.E.)	The geographical effect (G.E.) measures the effect related to the geographical breakdown of exports. This effect is positive if the industry's export is concentrated in markets which have been experiencing rapid growth. A negative value shows that the exports of a certain industry are directed to markets in which demand is growing slower than in international trade.
Residual Effect (R.E.)	Residual effect (R.E.) captures the difference between the actual export growth and the growth that would have occurred if the export shares remained constant.

Source: Authors' calculations based on Milana (1988).

2001–2005, 2006–2010, and 2011–2015. The formation of three sub-periods makes the analysis more plausible and avoids issues related to business cycles. The export data set was obtained from the UN Comtrade database.¹ The data set is disaggregated at the two HTS² code level. Data values are expressed in current million euros. The referent period is 2001–2015.

The C.M.S. method presents a convenient analytical framework, but the application and interpretation of the method has some limitations which must be taken into account (Ahmadi-Esfahani 2006). The most significant limitation is that the C.M.S. is applied to a discrete time period. Milana (1988) proposes a satisfactory solution for this limitation, by applying the decomposition to discrete observations at the beginning and the end of the period. The Milana model (1988) has been extended using dynamic development, with the decomposition method applied to each observation of the time horizon, and the results of the C.M.S. analysis are time series. The interpretation of the residual effect is not as straightforward as the interpretation of competitiveness, the product, or the G.E. A negative residual implies a failure in maintaining CMSs and according to the basic assumption³ of the C.M.S. analysis this residual is related to changes in relative prices. However, the basic assumption ignores the impact of numerous other factors that affect the stability of the country's exports. The most important being: differences in quality, development of new exports; improvements in the efficiency of marketing or in the terms of financing export activities. In spite of those limitations and constraints, the dynamic consideration of the C.M.S. analysis in general, successfully identifies changes in the trade structure and competitiveness over time.

3.3. Concept of multipliers in the input–output model

Changes in the export of manufacturing, besides direct impact on exporters, have a significant impact on the rest of the economy related to the value added chain of the manufacturing. An indirect impact is assessed through an input–output model which is able to quantify the total contribution of exports to the national economy. In this work, a concept of input–output analysis with the open model is employed when indirect effects are estimated, while induced effects which are related to changes in household sector consumption are employed to quantify induced effects. A limited data set is the main obstacle for an estimation of a closed model with additional forward induced effects for the Croatian economy.

The input–output analysis is based on a static presentation of the structural relationship among different industries in the national economy. An analytical approach is generally oriented on the estimation of the impact that the final demand has on domestic output, gross value added, employment, and prices. The concept of an inter-sectoral relationship between economic units is very old, but usually Wassily Leontief is considered the main developer of the input–output analysis (Ten Raa 2005, Miller-Blair 2009).

Input–output tables are used as a quantitative model suitable for economic analysis of interdependent industries at a national or regional level (D'Hernoncout et al. 2011). In global markets, characterised by international competition and more

complex production processes, the input–output analysis which enables the identification of supply chains on a domestic and international level is even more important. The techniques and areas covered by the input–output analysis are described in Ten Raa (2005) and Blair and Miller (2009).

In the input–output framework, matrix A usually presents a technical coefficient matrix (ratios of inputs of each industry in the gross output), x is a vector of gross output and y a vector of final demand. The model could be specified in terms of total technical coefficients (domestic and imported intermediates) or in terms of domestic technical coefficients which describe only part of the value added chain related to deliveries between domestic producers. As Eurostat recommends official tables to be published separately for the domestic and imported component of technical coefficients, this type of model is used in the research.

A linear equation system can be presented in matrix form where:

A^D = matrix of input coefficients for domestic intermediates (technology matrix comprising n rows and n columns with elements a_{ij} as defined in the previous paragraph, according to data availability $n = 64$ in this study)⁴

I = unit matrix ($n \times n$ matrix with value 1 on the main diagonal and value 0 on the other cells)

$(I - A^D)$ = Leontief matrix for domestic inputs

$(I - A^D)^{-1}$ = Leontief inverse for domestic inputs

f^D = vector of final demand (final expenditures of households, government, non-profit institutions serving households, gross investments and exports)

x = vector of output.

The following set of equations can be derived in the input–output model (Soklis 2009):

1. $A^D x + f^D = x$
2. $x - A^D x = y$
3. $(I - A^D)x = y$

The solution of this linear equation system is:

$$4. \quad x = (I - A^D)^{-1} * y$$

Matrix algebra is further used in multiplying a matrix of unit inputs (domestic and intermediate consumption, employment, and value added) with the total domestic gross output induced by foreign demand:

$$5. \quad V = v * (I - A^D)^{-1} * y$$

V is the value of inputs (vector of value added, intermediate consumption and employment) and v is a technical input coefficient (input component per unit of output as recorded in base year V/Y).

Vector $A^D x$ reflects the requirements for intermediates, while vector y represents the exogenous aggregate final demand. The matrix $(I - A^D)$ is usually called the

Leontief matrix for domestic products. On the diagonal of this matrix the net output is given for each sector with positive coefficients (revenues), while the rest of the matrix covers the input requirements with negative coefficients (costs). The Leontief inverse for domestic production $(I - A^D)^{-1}$ reflects direct and indirect requirements for intermediates. In the estimation of multiplicative effects on the domestic economy it is crucial to identify the proportion of domestic intermediates which are used in the production process of an industry. The higher the share of domestic intermediate inputs, the more significant indirect effect is expected and vice versa.

The notion of multipliers rests upon the difference between the initial effect of an exogenous change in final demand (in our case, the change in foreign demand for manufacturing industry products) and the TEs of that change on the domestic economy. The intensity of backward linkages of certain economic sectors is usually defined as changes at the level of the economy produced by one unit change in a sector's final demand. It can be expressed in the form of a multiplier or as a percentage of indirect effects in the direct change of demand. An output multiplier for exports of manufacturing is defined as the total value of production of all domestic sectors that is necessary to meet the value of final demand for manufacturing. It is worth noting that a multiplier is effective in both directions. Deterioration in international competitiveness which induces export decrease, directly affects revenues of exporters, but also has a negative impact on other domestic industries which are part of the supply chain.

4. Results

The Croatian manufacturing industry has experienced significant structural adjustments and changes in the period from 1995 to 2015 (Buturac, 2017). These processes have been additionally spurred by the E.U. accession process and the emergence of the global economic crisis. The latest trends on the international markets are characterised by a fall in demand and a strengthening of competitive pressures. The analysis begins with the overview of basic indicators and trends followed by C.M.S. analysis and input-output analysis.

4.1. Trade performance of croatian manufacturing: Basic indicators and trends

The key characteristics of the Croatian manufacturing industry in international trade are the growth of export orientation, trade deficit, emphasising manufacturing and market concentration. The Croatian manufacturing industry had approximately €10.8 million in export in 2015. At the same time, due to significantly bigger import than export a foreign-trade deficit was present (Table 2). Its size was determined before the deficit with the E.U. As opposed to that, a profit was registered in trading with the Central European Free Trade Agreement (C.E.F.T.A.). With a modest 0.3% share in total world exports Croatia confirms that it has not used its export potential and it has not been orientated enough in export in the manufacturing sector. According to Bezić et al (2011) one of the main reasons of the weakened export competitiveness is insufficient investment in production which would speed up adjustment of the

Table 2. Trade performance indicators of Croatian manufacturing.

	Average annual export growth rate ^a 2001–2015 (%)	Average annual import growth Rate 2001–2015 (%)	The share of total		Relative deficit ^b in 2015 (%)	Export concentration ^c in 2015	Import concentration in 2015	The share of world export in 2015 (%)
			Croatian manufacturing export in 2015 (%)	Croatian Manufacturing import in 2015 (%)				
WORLD	5.5	4.1	100.0	100.0	-23.1	0.22	0.23	0.3
EU 15	4.0	3.3	43.7	51.2	-30.5	0.21	0.21	1.6
NMS 12	9.2	8.2	22.9	26.8	-30.4	0.25	0.26	0.4
CEFTA	6.0	9.6	17.9	5.0	34.1	0.27	0.27	5.2

Source: Authors' calculations based on data from the U.N. C.O.M.T.R.A.D.E. database.

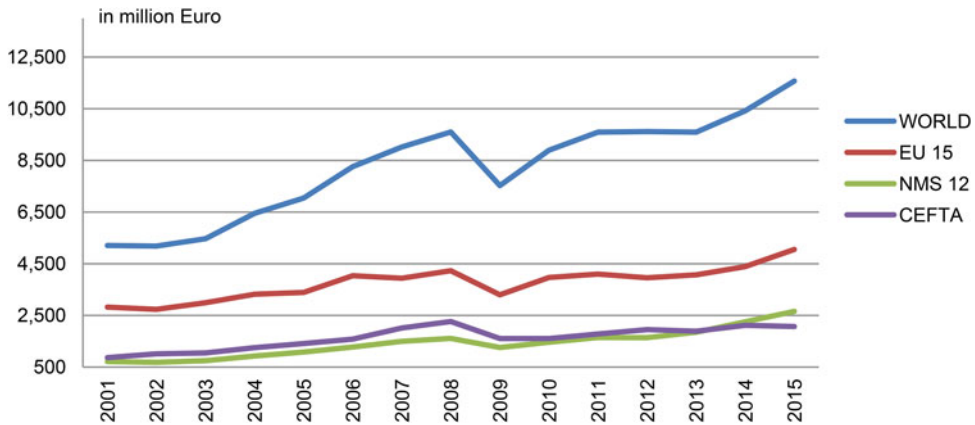


Figure 1. Export of Croatian manufacturing.
Source: UN Comtrade.

Croatian manufacturing industry to the competitive conditions at the international market. This weakened connection results in reduced innovating competences of the manufacturing industries.

The most important export markets for Croatian manufacturing are the E.U. 15, which make up 43.7% of the total export. It is followed by N.M.S. 12 which has a 22.9% share of total export and a 17.9% share of the C.E.F.T.A. market. The global economic crisis that started in the middle of 2008 had negative consequences on the Croatian economy (Buturac, Teodorović, 2012). The first to be hit by the crisis were the traditional export sectors: the textile industry, the leather and shoe industry, as well as wood and furniture manufacturing. The economic recovery of the E.U. in 2010 and 2011 positively reflected on the export movement in the Croatian manufacturing industry. On the other hand, in the conditions of recession in Croatia, real depreciation and falling domestic demand have contributed to an increase in the export of low-tech industries (Bogdan, et al 2015). However, there was no positive shift in the growth of medium- and high-tech exports. Total export growth intensified with Croatia's accession to the E.U. (after 2013) (Figure 1). In comparison to the period between 2010–2012 export in the manufacturing industry grew an average of 2.6% per year, and in the period between 2013–2015 it grew up to 6.4%.

4.2. Export decomposition in the geographical, product and competitiveness effect

The C.M.S. effects – the T.E., the C.E., the P.E. and the G.E. have been calculated for the export of the Croatian manufacturing industry on the global market as well as separately for the E.U. 15, N.M.S. 12 and C.E.F.T.A. markets (Table 3).⁵ A positive value of individual effects indicates a gain in the market share of the Croatian manufacturing industry while a negative value indicates a loss.

Regarding the T.E. in the global market, negative signs are recorded in 2009 and in the period 2011–2012. While in 2009 the T.E. is primarily attributable to the negative C.E., in 2012 negative sign of the T.E. is a consequence of the P.E. and in 2012 a

Table 3. Export of the Croatian manufacturing – distribution of CMS effects.

	TE	CE	PE	GE	RE
WORLD					
2002	0.0079	-0.0094	0.0179	0.1088	-0.1093
2003	0.0482	0.0040	0.0356	0.0867	-0.0782
2004	0.0910	0.1173	-0.0429	0.2354	-0.2188
2005	0.0077	-0.0469	0.0396	-0.0133	0.0283
2006	0.0349	0.0162	0.0166	0.0237	-0.0218
2007	0.0341	0.0889	-0.0569	0.1232	-0.1210
2008	0.0276	-0.0314	0.0268	0.0635	-0.0314
2009	-0.0173	-0.0548	0.0432	0.0464	-0.0521
2010	0.0005	-0.0246	0.0334	-0.0845	0.0761
2011	-0.0305	0.0227	-0.0662	0.0419	-0.0290
2012	-0.0080	0.0189	-0.0400	-0.0467	0.0597
2013	0.0113	0.0142	-0.0018	0.0405	-0.0417
2014	0.0776	0.0743	0.0131	0.0168	-0.0266
2015	0.0768	0.0783	0.0015	-0.0941	0.0911
EU 15					
2002	-0.0180	-0.0276	0.0227	-0.0191	0.0060
2003	0.0884	0.0529	0.0465	0.0043	-0.0153
2004	0.0207	0.0589	-0.0345	0.0052	-0.0090
2005	-0.0636	-0.0980	0.0546	0.0117	-0.0318
2006	0.0535	0.0371	0.0190	-0.0020	-0.0006
2007	-0.0809	-0.0160	-0.0561	-0.0082	-0.0006
2008	0.0380	0.0190	0.0587	-0.0080	-0.0318
2009	-0.0222	-0.0657	0.0380	0.0073	-0.0019
2010	0.0226	-0.0087	0.0253	0.0075	-0.0016
2011	-0.0756	0.0058	-0.0551	-0.0025	-0.0237
2012	-0.0452	0.0056	-0.0275	-0.0064	-0.0170
2013	0.0418	0.0493	-0.0029	-0.0040	-0.0006
2014	0.0712	0.0501	0.0033	-0.0134	0.0312
2015	0.1176	0.0981	0.0012	0.0074	0.0109
NMS 12					
2002	-0.1270	-0.2658	0.1566	-0.0558	0.0381
2003	0.0638	0.0706	-0.0095	0.0168	-0.0141
2004	0.0767	0.0610	-0.0120	-0.0232	0.0510
2005	0.0113	0.0667	-0.0369	-0.0359	0.0174
2006	-0.0419	0.0093	-0.0431	-0.0465	0.0384
2007	0.0019	0.0251	-0.0346	-0.0118	0.0232
2008	-0.0521	-0.1098	0.0634	-0.0508	0.0451
2009	0.0400	-0.0070	0.0422	0.0111	-0.0062
2010	-0.0610	-0.0623	-0.0043	0.0014	0.0043
2011	-0.0310	-0.0511	-0.0053	-0.0386	0.0639
2012	-0.0228	-0.0318	0.0133	-0.0066	0.0022
2013	0.1127	0.1097	0.0184	-0.0149	-0.0006
2014	0.1710	0.1812	0.0015	-0.0084	-0.0034
2015	0.1265	0.1600	0.0019	-0.0098	-0.0256
CEFTA					
2002	0.0056	0.0179	-0.1433	-0.1211	0.2521
2003	0.1949	0.2587	-0.0577	0.3897	-0.3959
2004	-0.8934	-0.0191	-0.0259	-0.0257	0.3496
2005	0.1097	0.0608	-0.0250	0.0860	-0.0122
2006	-0.1720	-0.2595	-0.3141	0.1554	0.2463
2007	0.0079	0.0391	-0.0736	-0.0484	0.0908
2008	0.0951	0.0564	-0.0151	0.0863	-0.0325
2009	-0.1453	-0.1055	-0.0877	-0.0066	0.0545
2010	-0.1164	-0.1064	-0.0185	0.0111	-0.0026
2011	-0.0506	-0.0808	-0.0279	-0.0154	0.0735
2012	0.0775	0.0605	0.0106	-0.0213	0.0278
2013	-0.0441	0.0054	-0.0154	-0.0105	-0.0236
2014	0.0858	0.0123	-0.0012	0.0181	-0.0206
2015	-0.0355	-0.0221	0.0215	-0.0074	-0.0275

Source: Authors' calculations based on data from the U.N. C.O.M.T.R.A.D.E. database.

mix of the P.E. and G.E. The result obtained in 2009 reveals the inability of Croatian manufacturing to increase its market share due to competitiveness factors, independently of structural developments in the market or in the product trade patterns.

However after the E.U. accession international competitiveness of the manufacturing industry has substantially improved. In the period 2013–2015 competitiveness and TEs were estimated to be positive. A mild economic recovery of E.U. markets (2011–2012) has not positively affected the exports of Croatian manufacturing. However the continuation of economic growth in the main EU trading partners in the period 2013–2015 coupled with the full membership status which cancelled any non-tariff barrier for Croatian exports, contributed to the recovery in export competitiveness of Croatian manufacturing. At the same time, in comparison with other analysed markets, the strongest growth in export competitiveness was on N.M.S. 12 markets. Observing E.U. 15 markets the most significant growth in export competitiveness was recorded in 2015 (C.E. = 0.0981).

Although the P.E. was negative in some years of the period 2011–2013, it is very close to zero. It can be concluded that after the Croatian accession to the E.U., the product mix of exported manufacturing products on the European market (C.E.F.T.A., E.U. 15, and N.M.S. 12) has not been an obstacle for export expansion. It confirms the fact that the Croatian export of manufacturing is concentrated on commodities in which European demand is relatively stable.

The G.E. on separated markets was mostly negative in the period 2011–2015. It reveals an unfavourable geographical export structure of the Croatian manufacturing industry due to a high export concentration to markets in which demand is growing slower (Bosnia and Herzegovina, Slovenia, and Italy) in comparison to the world market.⁶

In general, it is obvious that the loss or gain of competitiveness of Croatian manufacturing is the most important factor which determines its share of the international market. The impact of product structure is more or less neutral while regional reorientation of export to countries with stable growth of international trade could be helpful for export performance of Croatian manufacturing.

Besides identifying different effects on the level of the total manufacturing industry, the C.M.S. model is able to give insight into export performance among various manufacturing sectors. In the period from 2001 to 2015 most sectors noticed a growth of export shares in total world exports (Table 4). These sectors represent a significant part of the total export structure of the Croatian manufacturing industry. The distribution of the C.E. and the P.E. according to manufacturing sectors reveal the positive values of CEs for the world market in most products (Table 5).

However, the results obtained for individual markets indicate significant difference between E.U. 15, N.M.S. 12 and C.E.F.T.A. markets. While the export competitiveness of most manufacturing sectors increased on E.U. 15 and N.M.S. 12 markets, on C.E.F.T.A. market decreased. The loss of competitiveness on C.E.F.T.A. could be explained by decreasing of the price competitiveness after Croatian accession to the E.U.⁷ It is extremely highlighted in the food sector (Buturac and Vizek, 2015).⁸

At the same time, the results of the C.M.S. analysis demonstrated that the differentiated growth of world import demand across sectors and destinations had

Table 4. Relative changes of export share of Croatian manufacturing in total world export in the period 2001–2015.

Code	Sector	$\frac{(2005-2001)}{2001} \times 100$	$\frac{(2010-2006)}{2006} \times 100$	$\frac{(2015-2011)}{2011} \times 100$	$\frac{(2015-2001)}{2001} \times 100$
10	Manufacture of food products	52.5	-28.2	18.0	66.1
11	Manufacture of beverages	31.1	31.2	9.0	107.4
12	Manufacture of tobacco products	-0.9	-10.6	-21.9	-58.5
13	Manufacture of textiles	-23.6	28.0	97.7	78.5
14	Manufacture of wearing apparel	-21.9	-30.9	35.8	-33.5
15	Manufacture of leather and related products	40.7	-10.8	21.0	64.4
16	Manufacture of wood and products of wood	-7.8	14.4	37.4	58.3
17	Manufacture of paper and paper products	22.6	20.3	19.2	96.1
18	Printing and reproduction of recorded media	57.4	2.7	-5.5	36.7
19	Manufacture of coke and refined petroleum products	8.6	-21.3	53.3	10.9
20	Manufacture of chemicals and chemical products	24.1	5.9	1.3	53.5
21	Manufacture of pharmaceutical products and preparations	-23.6	24.7	14.0	67.4
22	Manufacture of rubber and plastic products	23.8	13.6	8.0	12.0
23	Manufacture of other non-metallic mineral products	22.8	-2.3	20.1	43.3
24	Manufacture of basic metals	35.3	14.6	9.3	89.9
25	Manufacture of fabricated metal products, except machinery	2.2	34.1	77.9	345.5
26	Manufacture of computer, electronic and optical products	26.1	5.9	33.5	81.0
27	Manufacture of electrical products	54.3	11.8	6.0	69.9
28	Manufacture of machinery and equipment	99.0	28.1	26.0	246.6
29	Manufacture of motor vehicles, trailers and semi-trailers	40.4	54.7	11.6	441.4
30	Manufacture of other transport equipment	-50.5	-12.7	-40.5	-62.0
31	Manufacture of furniture	19.0	-10.3	30.0	75.3
32	Other manufacturing	-40.2	-1.8	77.1	2.3

Source: Authors' calculations based on data from the U.N. COMTRADE database.

Table 5. Distribution of competitiveness effect and product effect according to products of the manufacturing industry in the period 2011–2015.

Code	Sector	WORLD		EU 15		NMS 12		CEFTA	
		CE	PE	CE	PE	CE	PE	CE	PE
10	Manufacture of food products	0.0163	-0.0044	0.0113	0.0014	0.0673	0.0032	-0.0076	0.0158
11	Manufacture of beverages	0.0007	-0.0003	-0.0006	0.0005	0.0010	0.0022	-0.0017	0.0044
12	Manufacture of tobacco products	-0.0054	0.0003	-0.0041	0.0005	0.0010	0.0016	-0.0146	-0.0088
13	Manufacture of textiles	0.0047	0.0006	0.0042	0.0001	0.0081	-0.0025	0.0084	-0.1029
14	Manufacture of wearing apparel	0.0181	0.0084	0.0306	0.0009	0.0177	0.0068	0.0046	-0.0158
15	Manufacture of leather and related products	0.0051	0.0091	0.0166	0.0042	-0.0071	0.0087	-0.0050	-0.0049
16	Manufacture of wood and products of wood	0.0247	0.0079	0.0194	0.0042	0.0181	0.0105	-0.0020	-0.0001
17	Manufacture of paper and paper products	0.0040	-0.0002	0.0040	-0.0001	0.0033	-0.0003	0.0013	0.0001
18	Printing and reproduction of recorded media	0.0003	0.0001	0.0016	-0.0001	0.0022	-0.0003	-0.0026	-0.0026
19	Manufacture of coke and refined petroleum products	0.0246	-0.0073	-0.0015	-0.0031	0.1974	-0.0010	0.1037	0.0101
20	Manufacture of chemicals and chemical products	0.0145	-0.0049	0.0105	-0.0005	0.0145	0.0038	0.0116	-0.0033
21	Manufacture of pharmaceutical products and preparations	0.0136	-0.0040	0.0383	0.0004	0.0102	0.0010	-0.0008	-0.0045
22	Manufacture of rubber and plastic products	-0.0101	-0.0008	-0.0071	-0.0015	-0.0236	-0.0092	-0.0166	-0.0141
23	Manufacture of other non-metallic mineral products	0.0148	-0.0047	0.0374	-0.0018	-0.0051	0.0052	-0.0129	-0.0465
24	Manufacture of basic metals	0.0086	0.0067	-0.0002	0.0021	0.0270	-0.0022	-0.0012	-0.0274
25	Manufacture of fabricated metal products, except machinery	0.0044	-0.0005	0.0004	-0.0035	0.0005	-0.0050	0.0028	-0.0055
26	Manufacture of computer, electronic and optical products	0.0010	-0.0061	0.0006	-0.0038	0.0019	-0.0023	0.0038	-0.0073
27	Manufacture of electrical products	0.0003	-0.0005	0.0011	0.0003	0.0255	-0.0032	-0.0048	-0.0055
28	Manufacture of machinery and equipment	0.0246	-0.0032	0.0139	-0.0031	0.0258	-0.0121	0.0063	-0.0175
29	Manufacture of motor vehicles, trailers and semi-trailers	0.0134	-0.0181	0.0211	-0.0101	0.0014	-0.0221	-0.0037	-0.0762
30	Manufacture of other transport equipment	0.0079	-0.0843	-0.0119	-0.0795	-0.0682	0.0356	0.0063	-0.0424
31	Manufacture of furniture	0.0121	0.0089	0.0129	0.0026	0.0123	0.0090	-0.0014	-0.0002
32	Other manufacturing	-0.0001	0.0055	0.0029	0.0066	0.0057	-0.0018	-0.0011	-0.0096

Source: Authors' calculations based on data from the U.N. C.O.M.T.R.A.D.E. database.

contributed to the Croatian manufacturing industry specialised in fast-growing sectors and export markets, to compensate for the loss of export competitiveness in other sectors.

Although the competitive edge of the manufacturing industry in the Croatian economy is improving, a multiplying effect, in terms of the total economy, gross value added, and employment, remains stable. These effects are more thoroughly analysed in the following section.

4.3. Input–output analysis

This section presents estimates of contribution of manufacturing exports to the domestic economic activity based on input–output model. The official I/O tables for the Croatian economy cover data for 2010. I/O tables are usually published with a considerable delay, but because of limited technology changes in the short run, this approach could give a useful insight into the importance of Croatian manufacturing. The manufacturing industry comprises division B in the Classification of Products by Activities (C.P.A.) 2007 classification and the analyses will cover all sections according to data availability.

In terms of input–output model, exports present a component of final demand which is directly delivered abroad by domestic producers. The total Croatian Gross Value Added (G.V.A.) related to manufacturing exports is higher than the direct effect because of additional indirect and induced activity of other producers included in the value added chain as described in the methodological part of the paper. The concept of G.V.A. measure only net effect on income of resident sectors, i.e., intermediate goods used up in the production process are deducted from the gross output. The total contribution in terms of value added and employment as well as structure of direct, indirect and induced effects are presented by [Figure 2](#) and [Figure 3](#).

The input–output model, besides overall contribution on the level of national economy, could provide a detailed estimate of G.V.A. and employment effects for homogeneous branches. The homogeneous branch in the input–output table consists of a grouping of units of homogeneous production. The homogeneous branch produces those goods or services specified in the classification and only those products (Eurostat, 1996). Units of homogeneous production cannot usually be observed directly but statistical offices use appropriate methods and rearrange economic flows in order to express them in terms of homogeneous branches. Calculations based on the input–output model are conducted on the branch level according to availability of technical coefficients (65 C.P.A. groups). However, production units are grouped in sectors as presented by [Table 6](#) for the purpose of presenting the results.

Manufacturing exports induced approximately 57 billion H.R.K. in 2015 in indirect and induced impacts on other domestic producers included in the value added chain. The contribution of exports to the Croatian economy is more intense in the recent period as a result of an upward trend after the E.U. accession and improved

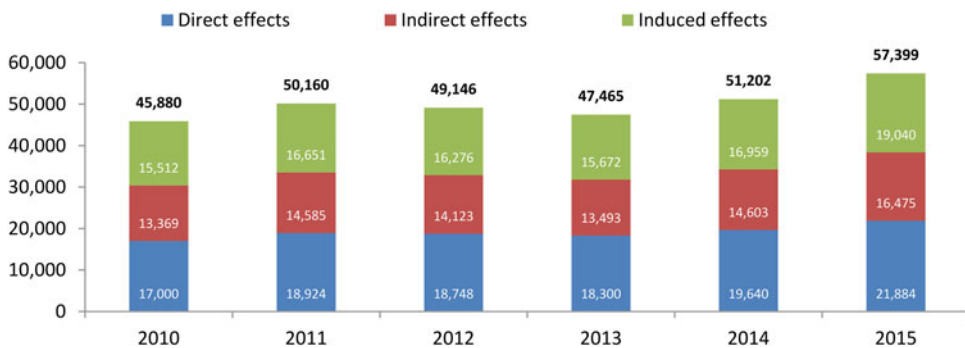


Figure 2. Total contribution of manufacturing exports to the Croatian GVA, million HRK.

Source: Authors' calculations.

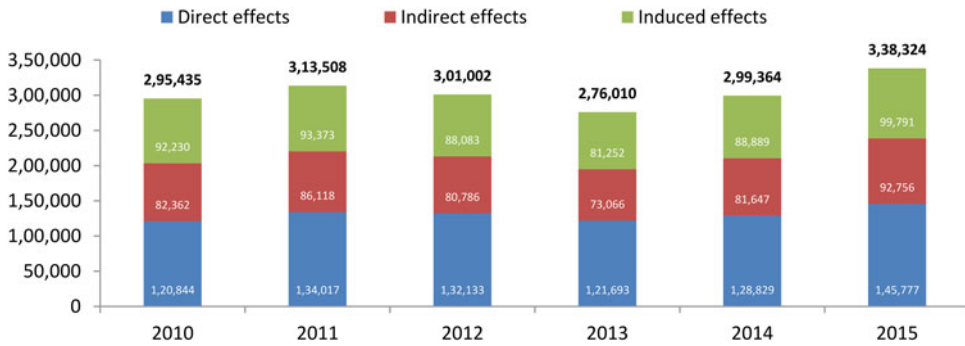


Figure 3. Total contribution of manufacturing exports to Croatian employment, number of jobs on annual level.

Source: Authors' calculations.

Table 6. Definition of aggregate sectors.

CPA Code	Description of the sector
A	Agriculture, forestry and fishing
B,C,D,E	Manufacturing, mining and quarrying and other industries
Of which C	Manufacturing industry
F	Construction
G,H	Wholesale and retail trade, transportation, storage
I	Accommodation and food service activities
J	Information and communication
K	Financial and insurance activities
L	Real estate activities
M,N	Professional, scientific, technical, administrative and support service activities
O,P,Q	Public administration and defence, education, human health and social work activities
R,S,T,U	Other service activities

Source: C.P.A. classification (www.dzs.hr).

competitiveness as described by the C.M.S. method. A direct impact on the manufacturing industry presents approximately one third of the total induced G.V.A. as a consequence of intense backward effects on other producers in the value added chain.

Approximately one fifth of the overall Croatian G.V.A. is induced by manufacturing exports and an upward trend could be noticed in the recent period. Almost half of the total value added in the manufacturing industry could be attributed to the export activity. Producers of agricultural products, transport and trade and business services indirectly also benefit from manufacturing exports. Those producers deliver intermediate goods to exporters or supply goods for personal consumption financed by income of employees engaged by exporters. In 2015 approximately 340,000 jobs were induced by manufacturing exports.

If indirect and induced effects are included, it can be concluded that more than 50% of jobs in the manufacturing industry are directly or indirectly related to manufacturing exports. If international competitiveness continues to improve in the next period, manufacturing exports could give significant contribution in decreasing the unemployment rate and therefore positively influence the living standard of households.

From a macroeconomic perspective, growth potential of manufacturing exports could be the most important factor in speeding up the convergence process through

inclusion in global value added chains, adoption of new technologies and productivity increase. The Croatian economy was strongly affected by the global recession and recorded a negative growth rate continuously in the last two years. Export performance of the manufacturing industry in the period after joining the E.U. gave a strong stimulus to the overall activity. In absolute terms, the most important contribution of exports to economic growth have been related to traditional branches as food products, beverages and tobacco, textiles and wearing apparel, leather products and metal products except machinery. Access to the large E.U. market without any trade barriers helped Croatian producers to expand exports of relatively low tech products based on less expensive labour. More intense integration in global value chains and export growth is evident in certain more sophisticated branches as production of furniture, pharmaceutical products, and motor vehicles. Although in absolute terms their contribution is lower in comparison to traditional branches, those sectors could potentially become the key sectors of Croatian export-led growth in the future. According to Kersan-Škabić (2017) Croatia has achieved worse results than other E.U. members regarding global value chain participation. In addition, the highest index of global value chain has been found for chemical products and transport equipment.

As can be seen from Table 9 if overall effects of manufacturing exports are excluded, the rest of economy is still in a downward trend, i.e., still records negative growth rates. Producers which are primarily oriented to the household and government sector are operating in a stagnant environment because of the weak domestic demand related to budget constraints and the overall socioeconomic and demographic situation. On the other side, producers included in international trade benefited from the positive economic trends in global and especially the E.U. market and recorded a significant growth rate in the recent period. Positive trends could potentially pull the rest of the economy but exporters should continuously improve international competitiveness as well as adjust geographical and product mix in accordance with global demand.

4.4. Robustness of the results

The main assumption of the input–output model is the existence of fixed technological coefficients defined as a_{ij}^D (i.e., the share of intermediate inputs delivered by sector i to sector j in the output value of sector j is assumed to be constant). The results presented in Tables 7–11 are all calculated by equations described in the methodological part of the paper holding elements of matrix A fixed (based on the 2010 input–output table). However, technology could be changed in a longer period as a result of the implementation of more efficient production processes, the use of modern I.C.T. technologies, changes of relative prices and other factors (Miller and Blair, 2009). Besides assumption on constant technical coefficient, an additional disadvantage of I.O. approach is related to the application of the constant share of domestic and imported intermediates. This could result in biased estimates if the change in relative prices is likely to not only affect the composition of exports, but also the composition of imports, and thus the input–output

Table 7. Percentage of G.V.A. induced by manufacturing exports, in % of sector G.V.A.

	2010	2011	2012	2013	2014	2015
A	16,7	18,2	18,8	19,7	23,6	26,5
B + C + D + E	34,1	36,2	35,2	34,5	36,6	40,4
Of which C	38,1	40,5	39,6	39,3	41,4	45,2
F	1,4	1,6	1,7	1,7	1,9	2,1
G + H	25,9	27,7	27,7	27,5	29,8	32,3
I	11,4	11,9	11,4	10,2	10,8	11,7
J	10,1	10,7	10,6	10,3	11,2	12,7
K	8,2	8,6	8,8	8,7	9,5	10,6
L	13,5	14,4	14,3	13,7	14,8	16,6
M + N	13,7	14,6	14,2	13,4	14,4	16,1
O + P + Q	2,4	2,6	2,6	2,5	2,7	3,0
R + S + T	9,1	9,7	9,3	8,8	9,3	10,4
TOTAL	16,36	17,56	17,53	17,09	18,47	20,47

Source: Authors' calculations.

Table 8. Percentage of total employment induced by manufacturing exports, in % of employment of certain sector.

	2010	2011	2012	2013	2014	2015
A	16,7	18,0	18,7	19,4	23,4	26,5
B + C + D + E	36,8	40,7	40,1	39,2	40,3	46,0
C	40,0	44,6	44,1	43,2	44,0	50,1
F	1,4	1,6	1,7	1,7	1,9	2,1
G + H	25,2	26,8	26,7	25,5	27,0	30,3
I	11,4	11,9	11,4	10,2	10,8	12,1
J	10,5	10,7	10,6	9,9	11,0	12,5
K	8,7	9,4	9,4	9,1	10,5	11,9
L	20,9	17,8	21,5	19,9	21,2	23,8
M + N	12,4	13,4	13,1	12,4	12,8	14,5
O + P + Q	2,6	2,8	2,9	2,8	3,1	3,4
R + S + T	8,9	9,8	9,4	9,0	9,6	10,7
Total	17,4	19,2	19,1	18,0	19,0	21,5

Source: Authors' calculations.

coefficients themselves. The official input–output tables for a more recent period are still not available. The application of certain statistical techniques and the availability of partial data for a recent period (output or total final demand by products) could be used in an estimation of the technical coefficient for a more recent period. Although, in the short run, the assumption on stability of input–output coefficients is not violated (because technology is not rapidly changing), in the medium or long run, connections between domestic sectors may change due to technological improvements, trends in relative prices or changes in the institutional environment. The shorter distance between the periods described in the I-O table and reference year for estimates of variables of interest leads to improving reliability of the I-O model. Given that the stagnation of investment activities in the recession period limited the potential for technological changes in Croatia, full E.U. membership in 2013 lead to changes in the institutional environment which may potentially affect input–output coefficients due to changing trends in international trade. A methodology of construction of updated input–output tables and an estimate of the Croatian input–output table for 2013 is presented in Mikulić (2018) and is used in this paper to test the robustness of results on export contribution on variation of technological coefficients. The

Table 9. Impact of manufacturing exports on Croatian G.V.A. in real terms.

	2010	2011	2012	2013	2014	2015
Current prices						
Total G.V.A. for Croatia	280.465	285.701	280.297	277.799	277.216	280.366
Contribution in G.V.A. of manufacturing exports	45.880	50.160	49.146	47.465	51.202	57.399
G.V.A. for Croatia without contribution of consumption of exports	234.585	235.541	231.151	230.334	226.014	222.967
Constant 2010 prices						
G.V.A. deflator, prices 2010 = 100	100	101,9	103,3	103,5	103,3	103,1
Total Croatian G.V.A. in real terms	280.465	280.383	271.453	268.453	268.438	272.078
Contribution of manufacturing exports	45.880	49.226	47.595	45.868	49.580	55.673
G.V.A. for Croatia without contribution of manufacturing exports	234.585	231.157	223.857	222.584	218.858	216.263
Growth rate						
Total G.V.A. for Croatia		-0,03	-3,19	-1,11	-0,01	1,36
Total contribution of exports		7,29	-3,31	-3,63	8,09	12,10
G.V.A. for Croatia without contribution of exports		-1,46	-3,16	-0,57	-1,67	-1,35

Source: Authors' calculations.

bi-proportional adjustment of the rows and columns of the base technology matrix A (RAS method) is used in Mikulić (2018) in line with the methodology proposed by Miller and Blair (2009). The comparison of results based on the 2010 and 2013 input–output tables are presented in Table 10. Generally, the introduction of updated technological coefficients did not significantly affect results on the export contribution to employment and economic activity. The overall impact which includes direct, indirect and induced effects for 2015 is slightly higher in terms of employment but lower in terms of GVA when updated coefficients are used. Although differences of T.E.s are in range up to 3% as estimated for 2015, the composition of effects changed. Updated technical coefficients point to a higher level of integration of domestic producers in the export value added chain. On the other hand, the restructuring of exporters resulted in productivity growth above the increase of labour costs. The lower share of compensation of employees in output resulted in lower induced effects if measured by updated technical coefficients. Regardless of the changed mix of effects, it can be concluded that results in terms of total contribution of exports to Croatian economy as presented above are robust.

5. Discussion and conclusion

Most of the new E.U. member states fully explored the advantages of the free movement of goods, labour and capital and significantly improved their export performance in the period after the E.U. accession. Fontuoura and Serodio (2017) analyses the export performance of N.M.S. based on the C.M.S. methodology and concluded that new E.U. members registered a major improvement in their export performance in periods from 1990 to 2013. International competitiveness improved already in the pre-accession sub-period, as a result of reforms implemented by these countries.

Table 10. Stability of results – comparison of total effects based on the 2010 and updated technological coefficients.

	2010	2011	2012	2013	2014	2015
Total effects						
G.V.A., IO 2010	295,435	313,508	301,002	276,010	299,364	338,324
G.V.A., IO 2013	282,778	302,223	291,671	266,161	291,136	329,963
<i>Difference, in %</i>	-4.28	-3.60	-3.10	-3.57	-2.75	-2.47
Employment, IO 2010	45,880	50,160	49,146	47,465	51,202	57,399
Employment, IO 2013	45,876	50,002	48,871	47,467	51,564	58,047
<i>Difference, in %</i>	-0.01	-0.32	-0.56	0.00	0.71	1.13
Indirect effects						
G.V.A., IO 2010	82,362	86,118	80,786	73,066	81,647	92,756
G.V.A., IO 2013	82,831	86,517	82,776	76,155	86,755	98,035
<i>Difference, in %</i>	0.57	0.46	2.46	4.23	6.26	5.69
Employment, IO 2010	13,369	14,585	14,123	13,493	14,603	16,475
Employment, IO 2013	14,166	15,354	15,039	14,701	16,160	18,188
<i>Difference, in %</i>	5.97	5.28	6.49	8.95	10.67	10.39
Induced effects						
G.V.A., IO 2010	92,230	93,373	88,083	81,252	88,889	99,791
G.V.A., IO 2013	79,103	81,689	76,762	68,313	75,552	86,151
<i>Difference, in %</i>	-14.23	-12.51	-12.85	-15.92	-15.00	-13.67
Employment, IO 2010	15,512	16,651	16,276	15,672	16,959	19,040
Employment, IO 2013	14,710	15,724	15,084	14,465	15,764	17,975
<i>Difference, in %</i>	-5.17	-5.57	-7.32	-7.70	-7.05	-5.59

Opposite to the experience of other N.M.S., Croatia with a limited share in total world exports hasn't used its export potential.

In N.M.S. the C.E. played a dominant and major role in export growth (Fontuoura and Serodio, 2017) while the same effect for Croatia was usually negative or stagnant in the period to 2014. Only in the recent period has the competitiveness of Croatian exports substantially contributed to export performance. Both the geographical and P.E. were positive for N.M.S. in all sub-periods, except in the period from 2008–2013 when the global recession reduced exports of some important products to traditional international partners of N.M.S. It is interesting to note that the C.E. was strong enough to overcome a negative G.E. and P.E. and N.M.S. recorded relative export growth even in the period during the impact of global recession. According to the results of this article, although the competitiveness of Croatian export showed some positive signals even in 2011, other effects (geographical and product) dominated and the export performance of Croatian manufacturing was lagging behind N.M.S. However, the E.U. accession positively affected the total exports of the Croatian manufacturing industry.

Regarding export performance by sectors, N.M.S. recorded the best results in high and medium tech exports. Exports of the low tech manufacturing industry also recorded a weak but positive growth rate. Fontuoura and Serodio (2017) concluded that the most important contribution is related to the C.E.s which were especially pronounced for high and medium tech products. In the Croatian case, the best export performance is also related to products belonging to the high tech sector such as the production of machinery and equipment and motor vehicles. When all factors are put together, it can be concluded that Croatian export performance was more similar to the least successful N.M.S. countries such as Cyprus, Malta and Slovenia while the

competitiveness of Croatian exporters was significantly reduced in comparison to the best performers, namely the Czech Republic, Slovakia or Hungary.

Positive trends in international competitiveness of N.M.S. positively contributed to the economic growth, not only directly but also by integration of domestic producers in the overall value added chain. Stehrer (2013) conducted an input–output analyses based on the decomposition of economic growth on domestic and foreign demand and results suggested that the G.D.P. growth in E.U.-12 (similar to China) particularly benefitted from integration into the world production systems and value added exports. In the most countries, effects of international demand on G.V.A. growth are higher than recorded in old E.U. economies and a significant proportion of economic growth in N.M.S. is a result of improvements in international competitiveness. The most pronounced effects are recorded for the same set of economies identified as the best export performers by the C.M.S. method (the Czech Republic, Slovakia and Hungary) where export demand contributed to an average annual G.V.A. growth in the range above 3 percentage points in the long-term period 1995–2011. The results based on the input–output analysis highlight a negative impact of foreign demand on the Croatian economy in 2012 and 2013 while the E.U. accession and competitiveness growth in the recent period significantly contributed to the recovery of the Croatian economy in the recent period.

Unfortunately, the input–output tables for the period prior to 2010 are not available for the Croatian economy and a comparison of export contribution for a long-term period is not possible. When interpreting the results one should take into consideration that the C.M.S. and the input–output model were based on specific assumptions about the economic environment. While the C.M.S. is more dynamic and oriented to changes in market shares during the analysed period, the input–output method is more static because it applies assumptions on fixed technological coefficients. However, those methods could provide a multidimensional overview of the same complex phenomenon. According to the C.M.S. results international competitiveness of the manufacturing industry was weaker, which therefore limited export contribution in Croatian economic growth during the total period of the transition.

The latest trends on international markets are characterised by a fall in demand and a strengthening of competitive pressures. In this context the ability of adjusting to new market circumstances and strengthening export competitiveness are especially important for achieving continuous economic growth. The main features of Croatian manufacturing in international trade are the increase in export orientation, a huge trade deficit and high level of export and import concentration. Although the Croatian manufacturing industry presented a certain resistance to the recession which started in 2008, the trends in the period between 2009 until the E.U. membership (2013) confirmed a deterioration of export performance which was primarily the consequence of decreasing export competitiveness. A suboptimal export performance is more related to a loss in competitiveness than product structure, especially on E.U. 15 and N.M.S. 12 markets. Besides the loss of export competitiveness, an unfavourable geographical export structure and high level of export concentration to stagnant markets, contributed to the negative G.E.s.

However, recent developments, after the E.U. accession in 2013, regarding competitiveness of the Croatian manufacturing industry were much more favourable and encouraging. This could be explained by the removal of all non-tariff barriers after the E.U. accession and reorientations towards foreign markets. As for different sectors, the manufacturing industry exhibited the most significant growth even during the recession period with positive competitiveness and P.E. A specialisation towards a more dynamic market and reorientation to the export of manufacturing products with a higher share of value added were crucial factors for the further increase of export competitiveness of the Croatian manufacturing industry.

The input-output method based on traditional multiplier principle, estimates the macroeconomic effects of exports on the national economy and depends on the overall macroeconomic framework. The model of economic growth of the Croatian economy in the prerecession period was primarily based on strong domestic demand of households and government. The competitiveness and importance of manufacturing exports was lagging behind in comparison to other transitional economies, especially N.M.S., where export of the manufacturing industry was one of the crucial factors behind strong economic growth prior to the global recession but also helped N.M.S. to overcome negative consequences of recession and pull back the rest of the economy in an upward economic trend.

On the other hand, weak performance of the Croatian manufacturing industry on the international market in the period before joining the E.U., together with limited domestic demand, resulted in prolonged recession of Croatian economy. Full liberalisation of trade, cancellation of all non-tariff barriers and other benefits related to the E.U. membership, helped Croatian exporters to improve overall competitiveness and in the recent period significantly contribute to the recovery of the Croatian economy. Contribution of manufacturing exports in terms of share in G.V.A. and employment increased to a level above 20%. Besides the manufacturing industry, export growth indirectly contributed to better performance of all domestic producers included in the value added chain of exporters. Indirect effects are the most pronounced for agriculture, trade, transport and business services. Total G.V.A. and employment induced by exports are almost three times higher than direct effects, i.e., export multiplier is in range of 2 to 3, depending on the specific product exported. While direct exporters employ approximately 140,000 people, a total impact on employment in the overall value added chain is around 340,000. Manufacturing exports, therefore, have an important role in the realisation of socio economic goals, the reduction of unemployment, the adoption of modern technologies and the integration of the Croatian economy in the E.U. and the global market.

Notes

1. The U.N. Comtrade database was used for the export data because of data availability and international comparability in the period 2001–2015. Other sources of data such as the Croatian Bureau of Statistics offers data at the 2- and 4-digit H.T.S. code level only for the period 2011–2015, which is not appropriate for the purpose of this proposed research.
2. H.T.S. is the abbreviation for Harmonized Tariff System.

3. The basic assumption of the C.M.S. approach is that a country's export share in world markets should remain unchanged over time. The theoretical foundations of this assumption are drawn from the idea that demand for exports in a given market from competing sources is a function of relative prices. This suggests that export shares will remain constant, except when relative prices vary. This establishes the validity of the constant share norm and suggests that the difference between the export growth implied by the constant-share norm and the actual export growth may be attributed to price changes. The discrepancy between the constant-share norm and actual performance has been labelled the competitiveness effect. Thus when a country fails to maintain its share in world markets, the competitiveness term will be negative and will indicate price increases for the country in question somewhat greater than its competitors.
4. In order to estimate induced effects by employing closed I/O model, matrix AD is extended by an additional row (share of gross wages and salaries in output for each sector) and an additional column which presents the structure of households' expenditures on final consumption on domestic goods and services.
5. In the calculations and interpretations of the results obtained, it is necessary to consider possible variations in foreign exchange rates. In order to mitigate the effect of foreign currency exchange rate fluctuations on the results obtained, euros were used instead of dollars. Namely, in the reference period, the euro experienced a significantly smaller variation in movement, measured by the standard deviation and coefficient of variation.
6. In 2015 Bosnia and Herzegovina, Italy and Slovenia accounted for 35.5% of the total export of the Croatian manufacturing industry.
7. It should be noted that the share of residual effect in TE is considerably higher for the C.E.F.T.A. market compared to E.U.-15 and N.S.M.-12. It can be explained by considerably greater importance of relative prices for exports to the C.E.F.T.A. market than to the E.U. and N.M.S. 12. Namely, C.E.F.T.A. is, measured by the GDP per capita and personal consumption per capita, significantly poorer market than E.U.-15 or N.M.S.-12. Therefore, this market is much more sensitive to price changes and dominated by price competitiveness.
8. This article aims to decompose sources of Croatian export growth and quantify the impact of exporting across various sectors and industries and does not include the analysis across the companies. In order to gain a more detailed insight into the effects of Croatia's accession to the E.U. on export competitiveness of Croatian firms, it is necessary to combine the results of the C.M.S. method with other scientifically justified and appropriate analytical tools such as dynamic panel analysis. This method has been applied in the research on export competitiveness of Croatian firms, but before Croatia joined the E.U. (Stojčić, 2012). Stojčić (2012) modelled the export competitiveness of firms as a function of their activities, characteristics, and features of their environment. The obtained results are in line with theoretical predictions about the behaviour of price competitive firms. In building their international position, Croatian exporters rely on cost reductions and improvements in labour productivity. After that research, Stojčić, Hashi and Telhaj (2013) explored the competitiveness of firms in transition E.U. economies and Croatia. Competitiveness measured by a firm's market share was defined as a function of several elements of firms' restructuring behaviour (e.g., improvements in cost-efficiency and labour productivity and investment in new machinery and equipment) as well as characteristics of firms and their environment, such as location, experience, technological intensity of their industries, and intensity of competition. In the struggle to retain, or expand, their market shares in the period under consideration, Croatian firms relied on the same factors and strategies as firms in other countries. Moreover, authors found more evidence of strategic restructuring in Croatia than in some of the other countries, as in Croatia the market share of firms was related to the productivity of investment in addition to labour productivity and unit labour costs. The results obtained showed there wasn't any significant difference in the behaviour of firms in advanced transition economies that are members of the E.U. and firms in Croatia. It

suggested that Croatian firms have been able to catch up with their counterparts in countries in the advanced stages of transition.

9. Average annual export growth rate is calculated using the formula:

$$AAGR_{T,T-n} = \left[\left(\frac{X_T}{X_{T-n}} \right)^{1/n} - 1 \right] \times 100$$

where X = the value of export, T = final year, n = number of year

10. Relative deficit is defined as $\frac{x-m}{x+m} \times 100$, where x is the value of merchandise export, and m the value of merchandise import.
11. Index of trade (export) concentration is calculated using Hirschman index. It can be calculated as:

$$H_j = \sqrt{\left(\sum \left(\frac{x_i}{X} \right)^2 \right)}$$

The values of Hirschman index range between 0 and 1. Values closer to 1 indicate more concentrated export structures.

Disclosure Statement

No potential conflict of interest was reported by the author.

Funding

The Institute of Economics, Zagreb.

ORCID

Davor Mikulić  <http://orcid.org/0000-0002-9847-6116>

References

- Ahmadi-Esfahani, F. Z. (2006). Constant Market Shares Analysis: Uses, Limitations and Prospects. *The Australian Journal of Agricultural and Resource Economics*, 50(4), 510–526.
- Baldwin, E. R. (1958). The Commodity Composition of Trade: Selected Industrial Countries, 1900-1954. *Review of Economics and Statistics*, 40(1), 50–68.
- Balla, E. (2014). Sectoral Interdependencies and Key Sectors in the Romanian, Hungarian and Slovak Economy – An Approach Based on Input-Output Analysis. *Acta Universitatis Sapientiae, Economics and Business*, 2(1), 37–57.
- Belke, A., & Wang, L. (2006). The degree of openness to intra-regional trade—towards value-added based openness measures. *Jahrbücher für Nationalökonomie Und Statistik*, 226(2), 115–138.
- Bellone, F., Musso, P., Nesta, L., & Schiavo, S. (2010). Financial Constraints and Firm Export Behavior. *World Economy*, 33(3), 347–373.
- Bezić, H., Cerović, L., & Galović, T. (2011). Changes in the competitive advantages of Croatia's manufacturing industry. *Zbornik Radova Ekonomskog Fakulteta u Rijeci: časopis za Ekonomsku Teoriju i Praksu*, 29(2), 465–487.
- Bogdan, Ž., Cota, B., & Rogić, L. (2015). Modeliranje funkcije robnog izvoza Republike Hrvatske u uvjetima recesije. *Ekonomski Pregled*, 66(4), 321–357.

- Brodzickii, T. (2015). Does variety matter? Export pattern of Poland prior and after accession to the EU. *International Economics Letters*, 4(2), 103–118.
- Buturac, G. (2008). Komparativne prednosti i izvozna konkurentnost hrvatske prerađivačke industrije. *Ekonomska Istraživanja*, 21(2), 47–59.
- Buturac, G. (2009). Structural Characteristics of Exports and Imports of Croatian Manufacturing. *Ekonomski Pregled*, 60(9-10), 432457.
- Buturac, G. (2017). Croatia's Path in the Recession. *Journal of Croatian Studies*, 49 (, 31–44.
- Buturac, G., & Teodorović, I. (2012). The Impacts of the Global Recession on Southeast European Countries. *Eastern European Economics*, 50 (1), 78–97.
- Buturac, G., Lovrinčević, Ž., & Mikulić, D. (2014). Export competitiveness of Croatian textile industry - CMS analysis and importance for economy. *Tekstilvekonfeksiyon*, 24(2), 158–168.
- Buturac, G., & Vizek, M. (2015). Export of Croatian Food Industry and Effects on Economy: the Case of Croatia. *Ekonomski Pregled*, 66 (3), 203–230.
- Daudin, G., Riffart, C., & Schweisguth, D. (2011). Who produces for whom in the world economy? *Canadian Journal of Economics/Revue Canadienne D'économique*, 44(4), 1403–1437.
- D'Hernoncourt, J., Cordier, M., & Hadley, D. (2011). Input-output multipliers specification sheet and supporting material. Spicoza Project Report, Université Libre de Bruxelles – CESE.
- Dritsakis, N. (2004). Exports, investments and economic development of pre-accession countries of the European Union: an empirical investigation of Bulgaria and Romania. *Applied Economics*, 36(16), 1831–1838.
- European Commission (2018). *European Economic Forecast - Spring 2018, European Economy - Institutional paper 077*, Bruxelles: European Commission.
- Eurostat (1996). *European System of Accounts - ESA 1995*, Office for Official Publications of the European Communities, Luxembourg.
- Fagerberg, J., & Sollie, G. (1987). The Method of Constant Market Shares Analysis Reconsidered. *Applied Economics*, 19(12), 1571–1583.
- Feder, G. (1983). On exports and economic growth. *Journal of Development Economics*, 12(1–2), 59–73.
- Fontoura, M. P., & Serôdio, P. (2017). The Export Performance of the 2004 EU Enlargement Economies since the 1990s: a Constant Market Share Analysis. *International Advances in Economic Research*, 23(2), 161–174.
- Fujii, G., & Ascárraga, W. (2012). Fragmentation, vertical specialization, manufacturing exports and economic growth in Mexico. In 19th International Input-Output Association Conference.
- Funke, M., & Ruhwedel, R. (2005). Export variety and economic growth in East European transition economies. *The Economics of Transition*, 13(1), 25–50.
- Gherman, A. M., & Ștefan, G. (2015). Exports—trends and impacts on Romania's economic growth process. *Theoretical and Applied Economics*, 22(2 (603), 43–54.
- Grossman, G. M., & Helpman, E. (1991). *Innovation and Growth in the Global Economy*. Cambridge: MIT Press.
- Jempa, C. J. (1986). *Extensions and Application Possibilities of the Constant-Market-Shares Analysis*. Groningen: Rijkuniversiteit, Groningen.
- Johnson, R. C., & Noguera, G. (2012). Fragmentation and trade in value added over four decades. NBER Working Papers 18186. National Bureau of Economic Research.
- Kapur, S. N. (1991). The Structure and Competitiveness of India's Exports. *Indian Economic Review*, 26(2), 221–237.
- Keller, W. (2004). International technology diffusion. *Journal of Economic Literature*, 42(3), 752–782.
- Kersan-Škabić, I. (2017). Sudjelovanje Republike Hrvatske u globalnim lancima vrijednosti ili obilježja hrvatske vanjske trgovine u dodanom vrijednošću. *Ekonomski Pregled*, 68(6), 591–610.

- Leamer, E. E., & Stern, R. (1970). *Quantitative International Economics*. Boston: Allen & Bacon.
- Leontief, W. (1986). *Input-Output Economics*. New York: Oxford University Press.
- Lovrinčević, Ž., Buturac, G., & Mikulić, D. (2015). Export performance of the Croatian wood industry and its contribution to the overall Croatian economy. *Forest Products Journal*, 65(3-4), 159-165.
- Mantalos, P. (2000). A graphical investigation of the size and power of the Granger-causality tests in integrated-cointegrated VAR systems. *Studies in Nonlinear Dynamics & Econometrics*, 4(1), 1558-3708.
- Merkies, A. H. Q. M., & Van der Meer, T. (1988). A theoretical foundation for CMS analysis. *Empirical Economics*, 13 (2), 65-80.
- Mikic, M., & Lukinic, G. (2004). Using Trade Statistics to Gauge Croatian Competitiveness. In *An Enterprise Odyssey*. International Conference Proceedings (p. 302). University of Zagreb, Faculty of Economics and Business.
- Mikulić, D. (2018). *Osnove input-output analize s primjenom na hrvatsko gospodarstvo*. Ekonomski institut, Zagreb.
- Milana, C. (1988). Constant-Market-Shares Analysis and Index Number Theory. *European Journal of Political Economy*, 4(4), 453-478.
- Miller, E. R., & Blair, D. P. (2009). *Input-Output Analysis: Foundations and Extensions*. 2nd ed., Cambridge: Cambridge University Press.
- Ricardo, D. (1817). On foreign trade. *Principles of political economy and taxation*.
- Richardson, J. D. (1971). Constant-market-shares analysis of export growth. *Journal of International Economics*, 1(2), 227-239.
- Romer, P. M. (1987). Growth based on increasing returns due to specialization. *The American Economic Review*, 77(2), 56-62.
- Skriner, E. (2009). Competitiveness and Specialisation of the Austrian Export Sector – A Constant-Market-Shares Analysis. FIW Working Paper No 32. FIW.
- Soklis, G. (2009). The Conversion of the Supply and Use Tables to Symmetric Input-Output Tables: A Critical Review. *Bulletin of Political Economy*, 3(1), 51-70.
- Stehrer, R. (2013). Value added trade, structural change and GDP growth – A decomposition approach. (GRINCOH, Working Paper No. 1.06). Warsaw
- Stiebale, J. (2008). Do Financial Constraints Matter for Foreign Market Entry? A Firm Level Examination. *Ruhr Economic Paper*, 51.
- Stojčić, N. (2012). The competitiveness of exporters from Croatian manufacturing industry. *Ekonomski Pregled*, 63(7-8), 424445.
- Stojčić, N., Bečić, M., & Vojinić, P. (2012). The Competitiveness of Exports from Manufacturing Industries in Croatia and Slovenia to the EU-15 market: A Dynamic Panel Analysis. *Croatian Economic Survey*, 14, 69-105.
- Šidlauskaitė, B., & Miškinis, A. (2013). The development of economic structure and inter-industry linkages in the Baltic countries. *Ekonomika*, 92(2), 32-48.
- Ten Raa, T. (2005). *The Economics of Input-Output Analysis*. Cambridge: Cambridge University Press.
- Tyszynski, H. (1951). World Trade in Manufactured Commodities. *The Manchester School*, 19(3), 272-304.
- Vukšić, G. (2007). Foreign Direct Investment and Export Performance of the Transition Countries in Central and Eastern Europe. Paper presented in 12th Dubrovnik Economic Conference, Croatian National Bank, Croatia.