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Contents

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Abstract:
Information on the key sectors of an economy can have important policy implications. This paper identifies key sectors in Croatia based on the recently published input-output table for year 2004. Comparison of different methodological approaches used in the paper suggests that identified key sectors are most likely relevant only for the analyzed period (construction activity). Additionally, service sectors were often identified as important, and not export-oriented sectors.

Keywords: input-output analysis, Croatia
JEL classification: C67

Identificiranje ključnih sektora hrvatskog gospodarstva temeljem *input-output* tablice

Sažetak:
Informacija o ključnim sektorima u nekom gospodarstvu može biti važna za donošenje ekonomskih odluka. U ovom se radu identificiraju ključni sektori hrvatskog gospodarstva na temelju nedavno objavljene *input-output* tablice za 2004. godinu. Usporedbom nekoliko metodoloških pristupa u radu, dolazimo do zaključka da su identificirani sektori uglavnom relevantni za promatrano razdoblje (građevinarstvo). Dodatni zaključak je da se često djelatnosti u okviru sektora usluga pronalaze kao značajne, a ne djelatnosti koje su orijentirane izvozu.

Ključne riječi: *input-output* analiza, Hrvatska
JEL klasifikacija: C67

1 Introduction

The main question addressed in this paper is frequently deliberated in Croatian public discussions, yet the arguments are seldom quantified. The importance of specific sectors for the rest of the economy can be illustrated with simple share in value added, share in employment, growth, export performance or a similar indicator. A shared aspect of these indicators is that they inspect each activity individually, without investigating the relations to other activities. This paper tries to identify those activities within the Croatian economy which have significant impact on other activities. Thus, the inter-industry linkages are explored and those activities having the strongest impact on the rest of the economy are considered as key sectors.

Identification of the key sectors within an economy is an important analytical task, which can have significant and wide policy implications (for example, Temurshoev and Oosterhaven, 2013). These sectors are important as they could be considered as the ones creating demand for other segments of the economy and thus acting as leaders of economic growth. Attempts to identify key sectors are not only important on the national level, but such attempts also exist at the level of the European Union (European Commission, 2007a; 2007b). Such analytical efforts serve as one segment of the product market analysis. Since similar studies for Croatia do not exist, this paper aims to provide initial evidence on the subject.

Additional motivation comes from the fact that the Croatian Bureau of Statistics at the beginning of August 2013 published the input-output table for 2004 as well as supply and use tables for years 2004 and 2005 (First Release 12.1.4, August 6, 2013). So, although there are other methods for identifying important sectors in an economy, the availability of the new data source in the case of Croatia has been exploited to stimulate further discussion of the topic.

The structure of the paper is following. Section 2 presents the data for the input-output table and discusses them within the social network analysis framework. Section 3 contains a description of methodology for identifying key sectors of the economy based on input-output data. Section 4 covers results and discussion of the possible implications of these findings. The last section briefly summarizes conclusions.

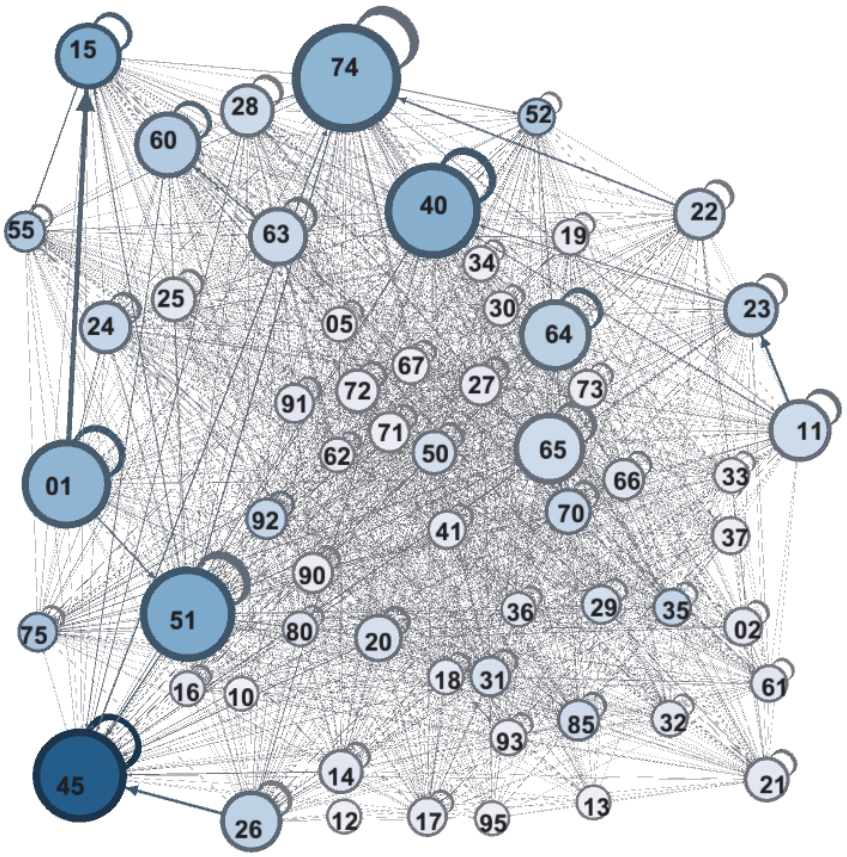
2 Preliminary Data Analysis

The analysis in the present paper is focused on Croatian economy, and does not extend to the relations with other countries. Thus, the main data source is the input-output table of domestic output for year 2004. Since Croatia is a small open economy, such an approach could be considered as restrictive. Yet, it also enables stronger emphasis on the links within the Croatian economy, which are rarely analyzed in Croatian literature.

In addition to traditional representation, the input-output table could be also considered within the context of network analysis. Activities within the economy could be represented as nodes and flows between the activities as edges. Network analysis relies on the graph theory, where nodes represent analyzed objects, while edges represent links between those objects. Network theory is relatively widely used in social sciences, but broad applications can also be seen in computer sciences.[1] The benefit of discussing the input-output table within this framework is that it enables clear visualization as well as application of some network-analysis tools, to enhance the understanding of the links within the Croatian economy.[2]

The input-output table represented as a network can be seen in Figure 1.

Figure 1 **Croatian Input-Output Table for Year 2004**



Note: 2-digit numbers refer to NACE 2002 activities, which are explained in detail in Table A1 in the Appendix.
Source: Croatian Bureau of Statistics.

[1] More information on network analysis, from the origins of the method to an overview of various applications, can be found in Easley and Kleinberg (2010).

[2] Visualizations were made by Gephi (Bastian, Heymann and Jacomy, 2009). The interested reader can visit https://gephi.org/ for more information.

The size of the nodes represents weighted out-degree in terms of network analysis, which in terms of input-output table refers to row-sum or the total output of an activity. The bigger the node, the higher the out-degree. The color of the node refers to weighted in-degree, which corresponds to column-sum or total inputs in an activity. The darker the color, the higher the in-degree. Edges are directed and represent the flow between the sectors. A larger edge represents more intensive flow.

So, what can we conclude from the representation in Figure 1? It can help to distinguish the important activities within the Croatian economy based on different indicators. There are five activities with relatively high out-degree. These are:[3]

- 74 - Other business services
- 40 - Electrical energy, gas, steam and hot water
- 51 - Wholesale trade and commission trade services, except of motor vehicles and motorcycles
- 45 - Construction work
- 01 - Products of agriculture, hunting and related services

These are also the activities with relatively high in-degree, with the addition of activity 15 - Food products and beverages. Construction work has the highest in-degree.

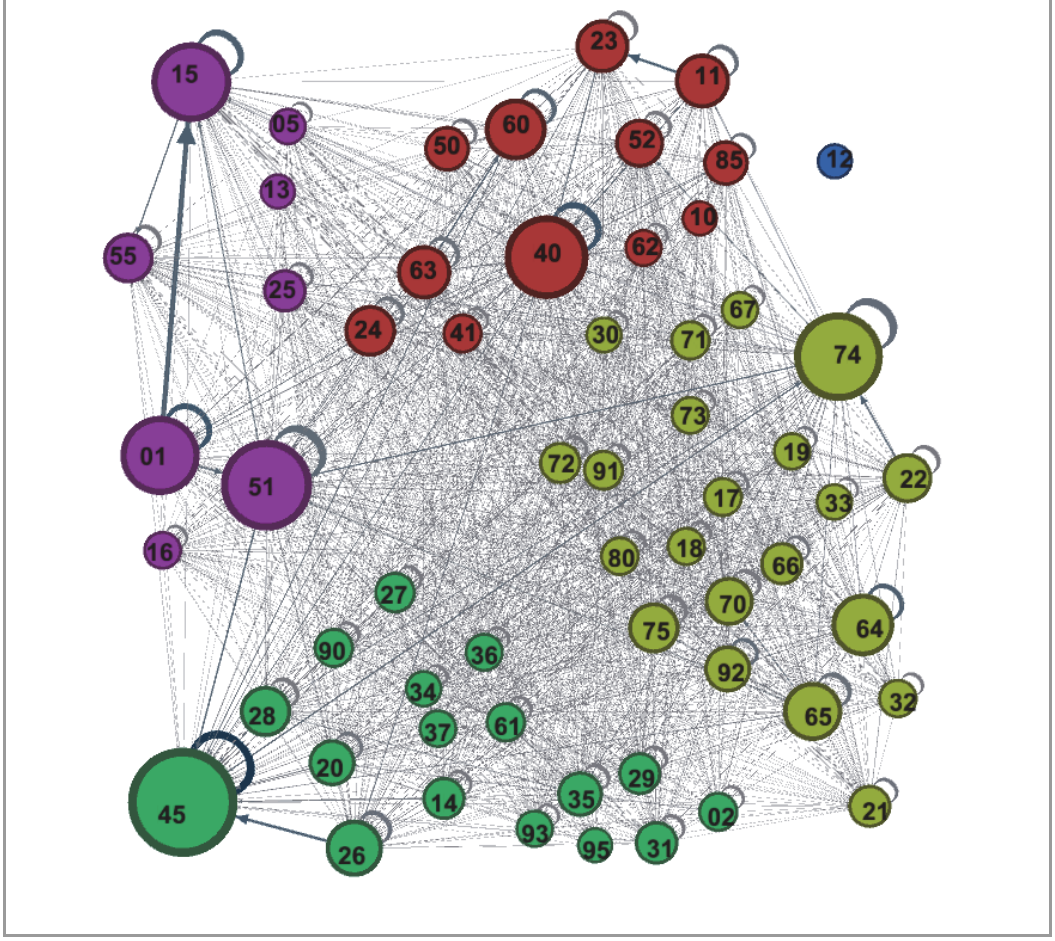
The network seems relatively dense, yet significant flows are scarce. Edges reveal that there are only few that can be considered significant within the Croatian economy:

- From 01 (Products of agriculture, hunting and related services) to 15 (Food products and beverages)
- From 26 (Other non-metallic mineral products) to 45 (Construction work)
- From 11 (Crude petroleum and natural gas; services incidental to oil and gas extraction excluding surveying) to 23 (Coke, refined petroleum products and nuclear fuels)
- From 22 (Printed matter and recorded media) to 74 (Other business services)
- From 01 (Products of agriculture, hunting and related services) to 51 (Wholesale trade and commission trade services, except of motor vehicles and motorcycles)

Another benefit from discussing input-output tables within the network analysis framework is the utilization of available algorithms for detecting clusters, or communities within the network (Blondel et al., 2008). Communities reflect those nodes with more distinguished connections, which implies those economic activities that have stronger connections to each other than to the rest of the economy. It has to be noticed that the algorithms could be guided to produce more or less communities. The following communities are produced with standard values of the algorithm.

[3] The names of the activities are taken as published by the Croatian Bureau of Statistics in the First Release. They correspond NACE activities to the CPA (Classification of Products by Activities) product classification.

Figure 2 **Clusters within Croatian Economy**



Note: 2-digit numbers refer to NACE 2002 activities, which are explained in detail in Table A1 in the Appendix.
Source: Croatian Bureau of Statistics.

The "purple" cluster mostly belongs to food production and distribution activities. The "red" cluster is energy and transport. The "green" cluster is mostly manufacturing industry and construction. The "olive" cluster comprises service sectors, including some segments of the manufacturing industry. Since the size of the nodes in Figure 2 represents average weighted degree, it stands for average relative importance of a specific activity for other activities. It can be seen that the identified clusters have pinpointed 1-3 important activities.

Visualizations have important, yet limited impact for the identification of key sectors in the Croatian economy. In the following sections we proceed with a more formal approach to this issue. Input-output tables enable analysis of the economy from various aspects. Probably the most frequently used indicators are output or export multiplicators. These would also be important to analyze in the case of Croatia, but are not the main focus of the present paper. The methodology for the indicators used in this paper will be briefly summarized in the next section.

3 Methodology

The methodology for identifying key sectors of an economy based on input-output tables is relatively old and it can be traced back to Rasmussen (1956). However, this approach is still widely discussed in more recent literature.[4] For explanatory purposes, we will briefly present the basic concepts.

As is well-documented (Christ, 1955), the input-output model can be considered as a system of linear equations, which form can be represented by the following expression:

$$X_i = \sum_{j=1}^{n} a_{ij} X_j + F_i \ , \tag{1}$$

where there are n sectors in an economy, X_i is the total output of sector i, F_i is the final demand and a_{ij} is the so-called technical coefficient describing the intermediate input of sector i to sector j. This could also be written in the matrix form:

$$X = (I - A)^{-1} F \ , \tag{2}$$

where I is the identity matrix and inverted $(I - A)$ is the so-called Leontief inverse. The column-sum elements of the Leontief inverse matrix contain the so-called backward linkages or output multipliers of a sector. The backward linkages represent the total input requirements for a unit increase in the final demand for the analyzed activity. So it measures the impact on the supplier industries of a unit increase in the final demand for a product. To analyze the relative position of different activities in the economy, the so-called power of dispersion index is used, which normalizes the previously calculated backward linkages to one. Thus, the final index obtains a value greater or smaller than one. If the value is larger than one, the activity is more important for an economy.

A similar concept is forward linkage or input multiplier. In that case, we consider the following expression:

$$X_j = \sum_{i=1}^{n} b_{ij} X_i + V_j \ , \tag{3}$$

where X_j is total input for activity j, V_j is the primary input (or the value added) of the same sector, and b_{ij} is the output coefficient of sector j to sector i. The same expression could be reorganized in matrix form:

$$X' = (I - B)^{-1} V \ , \tag{4}$$

[4] See, for example, Soofi (1992), Sanchez-Choliz and Duarte (2003), Cai and Leung (2004).

where $(I - B)$ is called Ghosh inverse (Ghosh, 1958). The row-sum elements of the Ghosh inverse matrix contain the so-called forward linkages or input multipliers of a sector. The forward linkages represent the increase in the output of sector i needed to supply the inputs required to produce a unit of the final demand output in sector j. Similar to backward linkages, forward linkages could also be normalized to one, which results in sensitivity of the dispersion index. The interpretation is also similar – if the index is larger than one, the activity has significant impact for the rest of the economy.

Backward and forward linkages estimate the magnitude of transactions between activities. The indicators could also be interpreted in non-normalized form. For example, if backward or forward linkage of activity A is larger than that of activity B, it could be argued that a monetary unit value expansion of activity A would be more beneficial to the economy than the equal expansion of activity B. However, such policy implications should not be made, because the actual expansions depend on the demand projections as well as capacity limitations.

Additionally, it can be argued that magnitudes are more relevant if the activity itself has more impact on the rest of the economy. In addition to previously described indices, which are unweighted backward and forward linkages, weighted indicators could also be produced. The weights for backward linkages used in this paper are the shares in total final uses, to reflect the notion that backward linkages are demand-oriented. In the case of forward linkages, value-added shares are used as weight to reflect the underlying supply-driven model of the economy.

In addition to backward and forward linkages, Dietzenbacher (1992) proposed to implement the notion of overall network influences (power of pull) into the input-output analysis. The concept stems from social network analysis (Seeley, 1949) and is similar to popularity score or eigenvector centrality concepts used within the social network analysis. The idea is that a node achieves a more powerful position if it is connected to other nodes with more power. The proposed power-of-pull method relies on identifying the normalized left-hand eigenvector of the input coefficient matrix. As the input coefficient matrix, the Leontief inverse matrix is used, since the pull concept corresponds to the demand model which underlines the backward linkages method.

When inverting matrices, activities 12 and 13 were excluded, since they had no detected values in the original data. Furthermore, since forward linkages reflect a supply-driven model, including activity 95 (Private households with employed persons), which has only negligible effect, in the row-sums of the Ghosh matrix would significantly skew the normalized sensitivity of dispersion indices without offering additional insights. Thus, for these indices, activity 95 was excluded from calculations.

4 Results and Discussion

The results of the described methodology for backward and forward linkages are briefly presented in Table 1. Both weighted and unweighted power of dispersion and sensitivity of dispersion indices are presented. Those activities for which both indices are greater than one are marked in an additional column.

Before discussing the relative indicators in Table 1, a brief discussion of the values obtained for backward and forward linkages is due. It has to be noticed that the values for forward and backward linkages were generally quite similar across the activities. So, we could not identify activities that have profoundly strong influence on the rest of the economy. None of the activities seem to be dominant either in providing inputs to other sectors or creating demand for other sectors. This could be expected, since Croatia is a small and open economy, and also highly dependent on imports. However, it clearly poses important constraints for the domestic policy-making when discussing the growth-driving industries.

If we consider absolute backward linkage indicators, the highest values in the unweighted case were obtained by the following five activities:

- 05 - Fishing, operating of fish hatcheries and fish farms
- 15 - Manufacture of food products and beverages
- 21 - Manufacture of pulp, paper and paper products
- 37 - Recycling
- 95 - Private households with employed persons

The highest forward linkage values in the unweighted case were obtained for the following five activities:

- 16 - Manufacture of tobacco products
- 92 - Recreational, cultural and sporting services
- 05 - Fishing, operating of fish hatcheries and fish farms
- 21 - Manufacture of pulp, paper and paper products
- 15 - Manufacture of food products and beverages

This clearly indicates the need for a weighted approach, since the sectors which have relatively small shares in value added (such as fishing) have been identified as those with relatively high impact on the rest of the economy. The ranking exercise for the weighted backward linkages has identified the following activities as the most important:

- 45 - Construction work
- 15 - Manufacture of food products and beverages
- 70 - Real estate services
- 40 - Electricity, gas, steam and hot water supply
- 75 - Public administration and defence

In the case of weighted forward linkages, the highest values were obtained for the following activities:

- 15 - Manufacture of food products and beverages
- 01 - Agriculture, hunting and related services
- 85 - Health and social work
- 16 - Manufacture of tobacco products
- 05 - Fishing, operating of fish hatcheries and fish farms

Table 1 **Key Sectors in Croatian Economy Based on Relative Backward and Forward Linkages**

	Unweighted			Weighted		
Activity	**Power of dispersion**	**Sensitivity of dispersion**	**Effect**	**Power of dispersion**	**Sensitivity of dispersion**	**Effect**
01	1.0039	1.0001	X	1.0020	1.0002	X F
02	0.9824	0.9999		0.9785	0.9999	
05	1.0060	1.0002	X B F	1.0034	1.0001	X F
10	1.0019	1.0001	X	0.9977	1.0001	
11	1.0021	1.0001	X	0.9989	1.0001	
14	1.0032	1.0001	X	1.0029	1.0001	X
15	1.0046	1.0001	X B F	1.0096	1.0002	X B F
16	1.0027	1.0004	X F	1.0008	1.0002	X F
17	1.0018	0.9996		0.9988	0.9995	
18	0.9964	0.9989		0.9952	0.9989	
19	1.0037	0.9989		1.0004	0.9988	
20	0.9972	0.9999		0.9943	1.0000	
21	1.0045	1.0001	X B F	1.0023	1.0001	X
22	1.0011	1.0001	X	1.0007	1.0001	X
23	1.0036	1.0001	X	1.0013	1.0001	X
24	1.0031	1.0001	X	1.0043	1.0001	X
25	1.0028	1.0001	X	1.0015	1.0001	X
26	1.0041	1.0001	X	1.0049	1.0001	X
27	1.0019	0.9998		1.0029	0.9998	
28	1.0022	1.0000	X	1.0023	1.0001	X
29	1.0025	1.0001	X	1.0028	1.0000	X
30	1.0022	1.0001	X	1.0008	1.0001	X
31	1.0018	1.0001	X	1.0025	1.0001	X
32	1.0021	1.0001	X	1.0033	1.0001	X
33	1.0032	1.0001	X	1.0045	1.0001	X
34	1.0036	0.9999		1.0024	0.9998	
35	1.0025	1.0000	X	1.0033	1.0000	X
36	1.0019	0.9992		1.0007	0.9992	
37	1.0045	1.0001	X B	1.0007	1.0001	X
40	1.0039	1.0001	X	1.0077	1.0001	X B
41	1.0034	0.9998		1.0069	0.9998	
45	1.0022	1.0000	X	1.0159	1.0001	X B
50	0.9993	1.0000		0.9987	1.0000	
51	0.9990	1.0001		1.0048	1.0001	X
52	0.9915	0.9998		0.9965	0.9998	

55	0.9876	1.0001		0.9912	1.0001	
60	1.0008	1.0001	X	0.9990	1.0001	
61	1.0036	1.0001	X	1.0008	1.0001	X
62	1.0029	1.0001	X	0.9994	1.0001	
63	0.9925	1.0001		0.9909	1.0001	
64	0.9983	1.0001		0.9976	1.0001	
65	0.9996	1.0001		0.9995	1.0001	
66	0.9955	1.0001		0.9953	1.0001	
67	0.9987	1.0001		0.9960	1.0001	
70	1.0010	1.0000	X	1.0077	1.0001	X B
71	1.0004	1.0001	X	0.9995	1.0001	
72	1.0009	1.0001	X	0.9990	1.0001	
73	0.9999	1.0001		0.9996	1.0001	
74	1.0020	1.0001	X	1.0022	1.0001	X
75	0.9999	1.0001		1.0075	1.0001	X B
80	0.9957	1.0001		0.9991	1.0001	
85	0.9901	1.0001		0.9936	1.0002	F
90	0.9966	1.0000		0.9952	1.0001	
91	0.9860	1.0001		0.9840	1.0001	
92	0.9962	1.0002	F	0.9949	1.0001	
93	0.9945	1.0001		0.9928	1.0001	
95	1.0043		B	1.0010		

Notes: X denotes both power of dispersion and sensitivity of dispersion larger than 1; B denotes 5 activities with largest backward linkages; F denotes 5 activities with largest forward linkages. 2-digit numbers refer to NACE 2002 activities, which are explained in detail in Table A1 in the Appendix.
Source: Author's calculations based on Croatian Bureau of Statistics data.

Unweighted indices detected 30 activities which have significant impact on the rest of the Croatian economy. The weighted approach reduced this number to 26. This implies that it is highly unlikely to identify which of the activities should be of special concern to policy-makers. The ranking exercise also points to those activities which have important forward linkages, but do not have correspondingly important backward linkages. Our previous illustration of the weighted and unweighted approach leads to the conclusion that more emphasis should be put on weighted indices. Thus, from this segment of the analysis we can single out the following activities as candidates for key sectors of the Croatian economy:

A. Activities having important backward and forward linkages
   - 15 - Manufacture of food products and beverages

B. Activities having important backward linkages
   - 40 - Electricity, gas, steam and hot water supply
   - 45 - Construction work
   - 70 - Real estate services
   - 75 - Public administration and defence

C. Activities having important forward linkages
   - 01 - Agriculture, hunting and related services
   - 05 - Fishing, operating of fish hatcheries and fish farms
   - 16 - Manufacture of tobacco products

If we go back to Figure 2, we will notice that categories A and C belong to the same "purple" cluster. B category is dispersed within the other three clusters. Although activities 40 and 45 have been identified as those having relatively high degrees, activities 70 and 75 have not been identified in that segment of the analysis.

An interesting interpretation of the results could be found in Los (2004). The argument is that in recession the activities with higher backward linkages are more important than those with higher forward linkages. Activities with higher backward linkages create proportionally more demand for intermediate inputs and thus positively influence other sectors within the economy. If we look at the previously identified activities with important backward linkages based on the Croatian input-output table for 2004, it seems that those were indeed the activities that were progressive during the last boom phase (construction, real estate, public administration, public utilities). Unfortunately, those were also the activities that were mostly affected during the present crises and could not be expected to take the role of leading sectors in the recovery phase. This finding also emphasizes once more that without structural changes in the Croatian economy, growth prospects remain dim.

Another methodology might be able to detect other potential sectors that could be seen as growth leaders. So we turn to the power-of-pull analysis. To estimate this indicator, eigenvalues and eigenvectors of the Leontief inverse with the same 57 activities were calculated. The elements of the eigenvector corresponding to dominant eigenvalue are graphically presented in Figure A1 in the Appendix. It can be seen that the activities with the largest identified power of pull according to this method are:

- 74 - Other business services
- 40 - Electricity, gas, steam and hot water supply
- 64 - Post and telecommunication services
- 51 - Wholesale trade and commission trade services, except of motor vehicles and motorcycles
- 45 - Construction work

This also corresponds to the clusters identified in Figure 2. Activities 40 and 64 comprise public utilities that are undergoing privatization processes, but at different speeds. The telecommunication sector has been liberalized and could be seen as a potentially important sector for future growth prospects. On the other hand, the national electricity company has only recently been faced with competition, when Croatia joined the European Union. It could be argued, though, that the energy sector will be important in the future and could be one of the leading sectors as a result of joined European efforts

in that segment. However, the question remains whether it could be important for the rest of the domestic producers or will the technology be of foreign origin. Energy sector development might create additional demand for other sectors within Croatia or it might create additional import demand.

A highly expected result is that business services are important to other sectors, since they are able to provide activities that other sectors require. This sector could grow even in the near future, as the government has announced intentions to increase outsourcing of non-core activities in the public sector, for example divesting cleaning services from hospitals. Yet, it is questionable whether business services could grow without the sectors to which they provide services. Thus, their role is more important in supplying other industries than in creating demand for the rest of the economy.

Power-of-pull data can be analyzed from another perspective. Recently, Luo (2013) proposed that the power-of-pull indicator could be used to determine which activities to bail out in recession times, as these have the most impact on the rest of the economy. We could not use this argument to claim that it would have been better if the Croatian government had spent more money on the activities that had higher power of pull, since there are important data restrictions which will be addressed in detail later. However, we can discuss the power of pull of those activities that have been heavily subsidized during the recession.

The Croatian Competition Agency publishes reports on state aid in Croatia (Agencija za zaštitu tržišnog natjecanja 2011; 2012). These reports indicate that in the 2006-2011 period there was a gradual increase in the share of state aid received by agriculture and fisheries in comparison to industry and services. The Croatian Competition Agency also monitors the state aid towards so-called special sectors – steel production, transport, shipbuilding, tourism, and radio and television broadcasting. Steel production in Croatia received only a negligible amount of state aid during the 2008-2011 period. The reports reveal that three activities received the largest share of state aid:

- Transport, with increasing share in the total
- Shipbuilding, with decreasing share in the total
- Broadcasting, with increasing share in the total

If we discuss this within the power-of-pull data presented in Figure A1, we can notice that transport activities, i.e. activities 60 and 63, do have above-median power of pull. Since the Croatian Bureau of Statistics data rely on the NACE 2002 classification of activities, shipbuilding is classified in activity 35 and broadcasting in activity 92. Both of these have relatively low power of pull. The grounds for endorsing certain activities cannot be determined just by the power-of-pull indicator. It does, however, present an interesting point for discussion in the situation where public funding is scarce and the demand for support from the state is relatively high. The decision which sectors to support with additional funding should be documented and preferably supported by empirical

evidence. However, the evidence should rely on relatively recent data. This brings us to an important disclaimer.

One important restriction on the relevance of previously stated arguments comes from the fact that the analysis in the present paper relies on data that refer to year 2004. Although there are numerous methods for updating input-output tables available in the literature,[5] it is questionable whether it would be advisable to use them in the Croatian case. There are at least two reasons why this might be challenging. First, the input-output table for year 2004 is the first of its kind produced since Croatia became an independent country. Thus, it is relatively difficult to assess whether the updating exercise would give plausible results if different updating methods were used, since there are no other points for comparison. Another issue is that we can expect significant structural changes, either due to crises (real estate, construction) or EU accession (shipbuilding, public utilities). Instead of the updating exercise, which could be a separate topic, we restrain from making firm conclusions based on the present dataset.

5 Conclusions

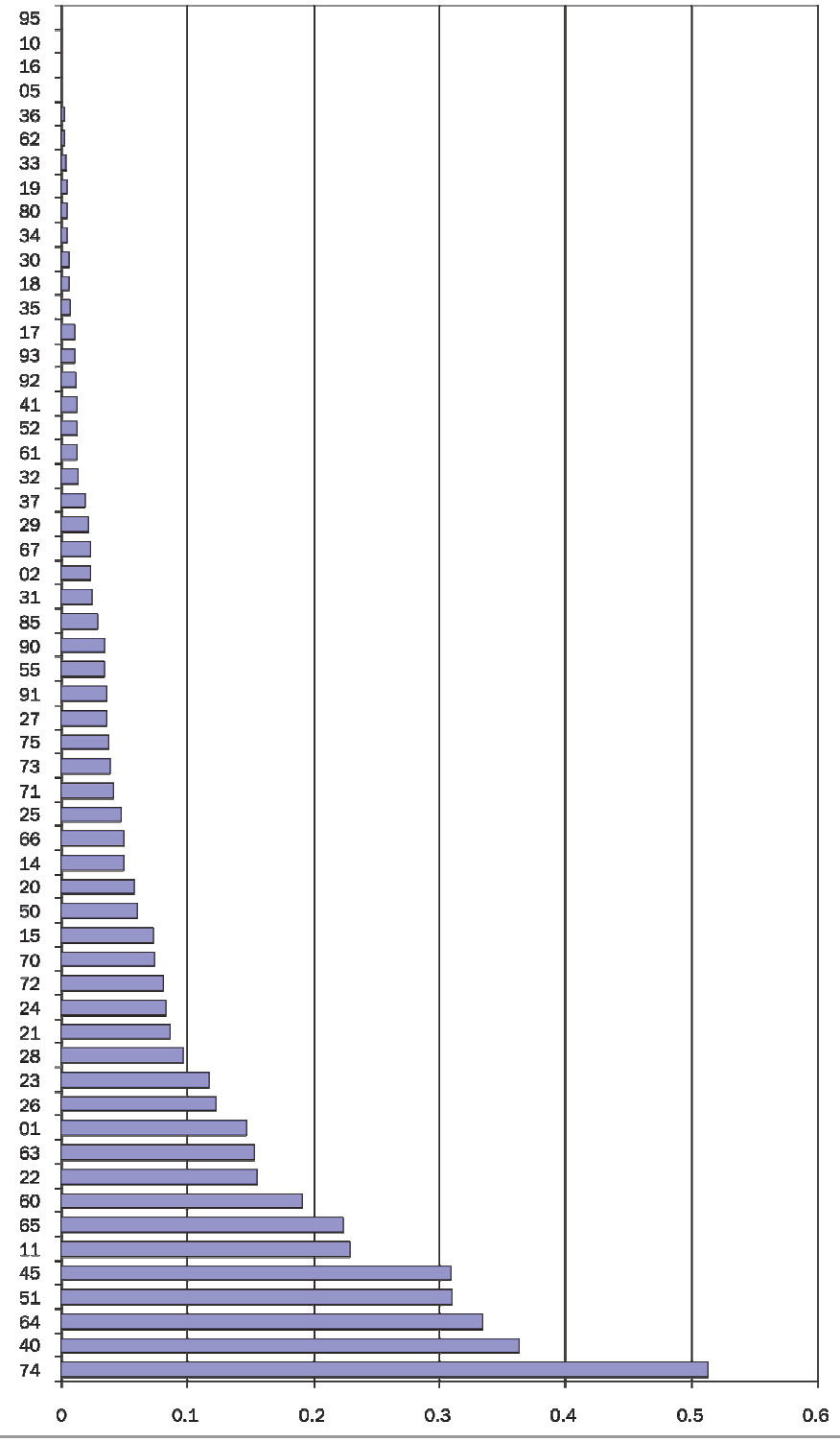
The main question addressed in this paper is what the key sectors in Croatian economy are. To tackle this issue, we used the Croatian input-output table for the year 2004 which has just been released by the Croatian Bureau of Statistics. The analysis was carried out on a 2-digit NACE level (2002 version) using only flows within Croatia. The methodology included network analysis, backward and forward linkages identification and power-of-pull measurement. The different methodological approaches were used as supplements, to increase the credibility of the key sector identification process.

The main findings show that all the methods used point to two activities – 40 (electricity) and 45 (construction) – which have important backward linkages. Forward linkages are related to food production (01 and 05) and tobacco processing (16), while food processing (15) has in addition also important backward linkages. Other sectors which are identified as important mostly come from the service sector and belong to the group of untradables. The analysis here has shown that the sectors having stronger linkages to the rest of the Croatian economy are not the sectors with strong export performance. The missing links or presence of weak links within the Croatian economy certainly contribute to an unfavorable position on international markets. Thus, the lack of competitiveness of the Croatian economy, even during the latest boom phase, has been confirmed by yet another method of analysis. The issue, however, remains that the domestic literature which relies on any of the other methods of analysis has not been able to detect significant positive changes in the Croatian competitiveness position since 2004. And this points to the possible reasons behind the relative deep impact of the present recession on the Croatian economy.

[5] See, for example, the review in Temurshoev, Yamano and Webb (2010).

The main restriction to the interpretation of the results is related to the fact that the data are almost ten years old. Thus, it is not advisable to use these results for current economic policy purposes. The results, however, do indicate that some policy decisions could have probably been made sooner. For example, relatively high state aid directed towards shipbuilding was frequently justified by its alleged high demand impact for the rest of the Croatian economy. This assumption could not be verified by the data used in this paper.

Figure A1 **Power of Pull Based on Input Coefficients in 2004**



Note: 2-digit numbers refer to NACE 2002 activities, which are explained in detail in Table A1.
Source: Author's calculation based on Croatian Bureau of Statistics data.

Table A1 **NACE Activity Codes Corresponding to CPA Product Classification**	
Code	**Product classification**
01	Products of agriculture, hunting and related services
02	Products of forestry, logging and related services
05	Fish and other fishing products; services incidental of fishing
10	Coal and lignite; peat
11	Crude petroleum and natural gas; services incidental to oil and gas extraction excluding surveying
12	Uranium and thorium ores
13	Metal ores
14	Other mining and quarrying products
15	Food products and beverages
16	Tobacco products
17	Textiles
18	Wearing apparel; furs
19	Leather and leather products
20	Wood and products of wood and cork (except furniture); articles of straw and plaiting materials
21	Pulp, paper and paper products
22	Printed matter and recorded media
23	Coke, refined petroleum products and nuclear fuels
24	Chemicals, chemical products and man-made fibres
25	Rubber and plastic products
26	Other non-metallic mineral products
27	Basic metals
28	Fabricated metal products, except machinery and equipment
29	Machinery and equipment n. e. c.
30	Office machinery and computers
31	Electrical machinery and apparatus n. e. c.
32	Radio, television and communication equipment and apparatus
33	Medical, precision and optical instruments, watches and clocks
34	Motor vehicles, trailers and semi-trailers
35	Other transport equipment
36	Furniture; other manufactured goods n. e. c.
37	Secondary raw materials
40	Electrical energy, gas, steam and hot water
41	Collected and purified water, distribution services of water
45	Construction work
50	Trade, maintenance and repair services of motor vehicles and motorcycles; retail sale of automotive fuel
51	Wholesale trade and commission trade services, except of motor vehicles and motorcycles
52	Retail trade services, except of motor vehicles and motorcycles; repair services of personal and household goods
55	Hotel and restaurant services
60	Land transport; transport via pipeline services
61	Water transport services
62	Air transport services
63	Supporting and auxiliary transport services; travel agency services
64	Post and telecommunication services
65	Financial intermediation services, except insurance and pension funding services
66	Insurance and pension funding services, except compulsory social security services
67	Services auxiliary to financial intermediation
70	Real estate services

71	Renting services of machinery and equipment without operator and of personal and household goods
72	Computer and related services
73	Research and development services
74	Other business services
75	Public administration and defence services; compulsory social security services
80	Education services
85	Health and social work services
90	Sewage and refuse disposal services, sanitation and similar services
91	Membership organisation services n. e. c.
92	Recreational, cultural and sporting services
93	Other services
95	Private households with employed persons

Source: Croatian Bureau of Statistics.

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