

Title: Effect of specialisation on income convergence in Croatian counties

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Abstract

Sectoral transformation in European transition economies has been inevitable. The process was driven mostly by deindustrialisation and increasing tertiarisation and coupled with the countries' integration into the international trade and investment flows. Croatia is no exception to this scenario. Relying on the policy idea that FDI will bring about positive spillovers and eventually raise the rate of growth prove unfounded as the bulk of investment flows into the services sector in the capital city with little effect on other sectors and regions. Ten years following the onset of transition, country is constituted of 21 counties or NUTS level III with the capital city forming a metropolitan region, and the country is strategically headed towards the EU integration. Deindustrialisation becomes apparent throughout the transition period as a continuation of widening structural weaknesses that have taken root as early as 1980es with no persistence in investment policy to slow down the trend or support a reversal. In 2000, when the data for Croatian regions becomes available, using hierarchical cluster analysis, four clusters of counties are identified for their distinct sectoral characteristics and the level of development. The capital city region is services-oriented, along with two more counties in the Adriatic region and they are the most prosperous counties. Counties are clustered geographically, and a specific form of clusters-concentric circles formed around the capital point to its economic influence. Clusters also followed the four major cities pattern, reinforcing the role of these cities as historical development hubs of Croatian regions. Using the same procedure for 2011 yields a different structure of counties and this can be taken as an indication of further structural transformation. The capital's sectoral transformation towards specialisation in services is unparalleled to the rest of the country and the capital grows faster. Industry-oriented cluster splits into two new clusters with diverging performance, pointing to both unresolved structural weaknesses and to the rise of new entrepreneurial activity in this sector. Most-specialised counties are mostly specialised in industry and agriculture and remain so throughout the period, but simultaneously, more urban counties increase their specialisation in services. The result of the specialisation dynamics is that sectoral structure among counties is becoming less similar on average. Further on, industry- and agriculture-oriented clusters have proven more vulnerable in the recession period. A number of statistical and econometric techniques are employed to overcome the weakness of the data, with the purpose to establish whether a common growth pattern between counties exists and if it can be linked to the changes in the economic structures. Results show that counties follow their individual growth path. Within-cluster convergence is more likely than the within-counties convergence, and this finding

resembles the club convergence. This can be extended to the results on the interrelatedness of sectoral structures and income growth path that have shown mixed. Counties with similar sectoral structures both are positively and negatively correlated in income growth patterns, suggesting that a number of counties with similar sectoral structures are sharing a common growth path and that a number of them diverge in economic performance and in development levels. Unobserved factors that can be accounted for these results may be lack of restructuring, intrinsic characteristic of activities and branches within sectors, differences in factor endowments and regional development policies.

Key Words: Croatian regions, income growth path, regional specialisation, employment structure

JEL Classification: R11, O14, J21

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1. Introduction

The aim of this paper is to research the link between the development of economic structure of the Croatian counties and their convergence to the average Croatian income per capita. In other words, the aim is to research whether counties with more *specialised* economic structures perform better than counties with less specialised economic structures over time? This type of research question has mostly been focused on research across EU-regions and countries.

Croatia makes an interesting case of a small transition economy on few points. As a runner-up at the beginning of the economic transformation in the 1990es, despite the periods of speeding growth spurred largely by public investments into highway development and the growing domestic demand, the country slowly loses its pace of economic development throughout the following two decades and finishes mid-ranked in the list of European transition economies according to income-per-capita. The classic-transition recipe is followed throughout the period: enterprises are privatised, foreign direct investments (FDI) are attracted and trade is liberalised. Still, this fails to produce desired results as: the FDI have flown mostly into services and have been related to the privatisation process, and have flown mostly into the City of Zagreb; the export competitiveness proves vulnerable and despite growing opportunities related to trade liberalisation, exports remain modest and directed mainly into CEFTA countries. Successful tourism activity to some extent offset the underperforming merchandise exports. The long-awaited membership in the EU is granted in 2013, nine years after the first-wave of the accession countries. As a part of the integration process, Croatia is organised into two level NUTS level II regions and into 21 NUTS level III regions-counties.

Looking down on a regional level (county-level), a specific development pattern seems to emerge. The City of Zagreb as the capital grows faster than the rest of the country and

attracts the bulk of foreign direct investment, which further strengthens its urban attraction forces. Zagreb produces approximately 33 percent of country's GDP in 2011 and is then followed by two counties centred around the City of Rijeka in the Adriatic region producing further 15 percent according to the latest available data in 2011 (CBS, 2014). The rest of the counties seem to follow their own development path, continuously growing, however, in prevalent number of cases at a slower pace. In terms of sectoral structure, the wide industrial base from the beginning of the 1990es has deteriorated. One of the problems inherent to the previous economic system was the "latent unemployment", causing on the one hand, a high number of employed and later, and with the transition to the market economy, a high number of unemployed.

In industry, the number of employed has decreased mostly likely on this account. Additional factors are the decreasing industry competitiveness and the loss of key ex-Yugoslav export markets. Services have, on the contrary, expanded in their range and across the whole country. Some specific market-based types of services have propelled in larger urban regions (banking, insurance, real-estate services). As a result, the sectoral structure of the country has changed. The change in the sectoral structure on the county level has been more dynamic in urban counties.

Several research questions and topics have emerged in the realm of this research. Croatia has clearly undergone a sectoral transformation in the process of transition. Therefore, the first question relates to the deindustrialisation and the associated tertiarisation – what differences can be observed between prevalently urban and less urban counties in this respect? As a result of this sectoral transformation, the economic structure of counties has either diversified or has become more specialised. Using a sectoral division (agriculture-industry-services) across counties, what types of structures are performing better – more diversified or specialised? Cities are recognised as major engines of growth and development of regions, so can this research corroborate the role of four major cities in Croatia in the economic development of surrounding counties? The overall economic trends in Croatian counties have been mostly positive as they have reflected in the continually increasing income per capita up the 2008 recession. However, it is probable that variations in the quality of economic growth exist. This raises a question on whether counties follow their own inherent growth path (and actually are possibly diverging) or are they sharing a common path of growth and what role does sectoral transformation play in either of the cases?

In an effort to answer these questions, we use data on employment and GDP data of 21 Croatian counties from 2000 to 2011. Croatian counties differ with respect to their sectoral structure, level of economic development, presence of a major city and their geographical position. The results of statistical and econometric analysis carried out in this paper on the issue of a common growth path are not unequivocal. Club convergence seems most likely. Counties clearly did follow an individual, inherent growth path. Another result is that the City of Zagreb' sectoral transformation with the industry sector halved to the rising services share, has been striking and possibly, could be the key factor that has propelled Zagreb's divergence from the rest of the country. If these growth trends continue, the development gap between the City of Zagreb and the rest of the country will grow further. This raises a question of the issue of adequacy of checking convergence of small, capital city-dominated countries to the EU average. Ultimately, it is quite probable that in that case, we are actually implicitly researching the competitiveness of major cities.

The paper is organised as follows. Theory and empirical findings are presented in section 2. Further on, research questions and methods are outlined and described in section 3, along with the structuring of data. A statistical analysis of Croatian regions follows in section 3; a cluster analysis is carried out and indices of sectoral specialisations are computed. In section 5, using a sample of counties, an individual and a common growth path hypothesis are tested. Empirical results are discussed in conclusion, in section 6.

2. Theory and empirical findings

Research on (geographic) specialisation generally focuses either on activities or sectors, in the latter case including all three traditional sectors - primary sector (agriculture, forestry and fishing), industry and services¹. The term "specialisation" is not uniquely defined throughout research papers. Often it is referred to as "geographic specialisation", pointing to the spatial dimension of the concept.

Specialisation may be defined as the distribution of the shares of the industries in a specific geographical area. For example, a region is considered specialised in an industry if this industry has a high share in the total value added of the manufacturing of the region. Highly-specialised regions are regions with small number of industries that constitute a large share of production. (paraphrased, Aiginger, 1999., p. 14-15)

A wide array of indicators is used to measure the degree of geographic specialisation and they are mostly measures of dispersion. These measures are typically applied to a number of variables such as value added, import-export values, number of employed etc. In research on specialisation with the European Union different level of data used, ranging from country level data to a spectrum of regional level data. Different economic theories – trade models and growth models – explain specialisation in different contexts depending on the aim of the model. Hallet (2000) summarises overview of development of specialisation in the context of these theories and findings:

- a) In trade models, specialisation occurs through trade as a way to maximise gains. Specialisation is either built on comparative advantages coming from technology or from factor endowments.
- b) Growth theory predicts income convergence of countries based on converging factor productivity and therefore specialisation would decrease.
- c) Empirical findings that intra-industry trade in similar products prevails over inter-industry trade in different products imply that perceived specialisation will depend on the level of disaggregation of data.

Stierle–von Schütz and Stierle (2013) make a point that economic theories have not succeeded in explaining and predicting the development of specialisation and conclude that

¹ Beyond the traditional structure, an additional sector can be specified as quaternary sector encompassing several human capital-intensive service activities. Kenessey (1987, p. 363) defines quaternary sector consisting of finance, insurance, and real estate in the setting of the United States economy using Standard Industrial Classification major groups. Public administration is considered a separate group.

in the case of EU integration, empirical results should bring more understanding to this topic. The area of European Union with its integration processes, the deepening of the single market development and the on-going accession processes is an ideal candidate for research post-integration effects of specialisation patterns. Research is generally carried out for countries and more lately, for EU regions. In the latter case, authors try to assess whether common patterns of specialisation can be found among regions, often irrespective of national borders. Regions with similar sectoral structures are grouped and common factors are then researched in trying to explain the sectoral convergence. One line of research on specialisation is motivated by the Krugman's hypothesis (1991) that economic integration of a given geographic area will lead to more specialisation and, in turn, to more exposure to asymmetric economic shocks. However, in the European case, results of research on specialisation patterns are inconclusive and are quite sensitive to the level of aggregation of data.

Another link that has been researched is that between geographic specialisation and convergence. Real convergence is a widely researched topic and the most famous paper is Barro and Sala-i-Martin from 1992 on intra-US income convergence and the North-South income convergence where convergence has been confirmed in both cases using regressions. Growth convergence can be seen as a long-term convergence of the level of development of different countries and regions. As a result, real economic variables such as income or employment become similar, but also economic structures. Another closely related type of convergence is cyclical convergence where conformity of business cycles among countries can be observed. In the case of Central and Eastern European countries, Matkowski and Prochniak (2004)² confirm both income and cyclical convergence and find that they are “*related to international cooperation, including trade and capital flows, technology transfer, labour movement, increased competition, economies of scale and policy coordination*” (p. 6). Botric (2013) uses a variety of econometric methods in trying to establish whether the next wave of accession countries forming the Western Balkan region converge terms of income to the EU income level. With due regards to the structural issues of these countries, including the strong presence of the unofficial economy and the data weaknesses, the author finds that Western Balkan countries do not seem to convergence to the EU level or bilaterally to the incumbent member, in most cases.

Research on structural changes from industry to services in advanced economies was carried out by Rowthorne and Ramaswamy in 1997. More specifically, they identified higher productivity in industry than in services as the principal cause of deindustrialisation. However, trade specialization plays an important role as it explains why some economies deindustrialize faster than others. In a later extensive research, Rowthorne and Ramaswamy (1999), apart from the sectoral productivity differentials (and the associated fall in the relative price of manufactures), the cause of deindustrialisation is recognised in shifts in the structure of demand between manufactures and services. Intensified North-South trade i.e. trade

² Matkowski and Prochniak (2004, p. 6) found that Central and Eastern European (CEE) countries have in the period 1993-2004 converged between themselves and towards the EU in the income level and they had good cyclical synchronisation with the EU. They found that both types of economic convergence were strongly affected by the dependence on the EU markets, including trade and capital flows.

between the advanced and the developing economies that is often seen as the main threat to the fall of industrial employment in the advanced economies contributes to one-fifth of the relative decline of manufacturing employment and with little effect on the volume of output.

OECD has focused on specialisation both for EU regions and for EU countries. Firstly, a regional specialisation index was calculated for NUTS level 1 regions in euro area based on employment in the traditional three sectors and the results have shown a *tendency towards less specialisation* in 1996 compared to 1986 (OECD, 1999, p.108f.). A research from the year 2004 for countries in euro-area has shown that integration and associated changes in trade, investment and market shares in the euro-area did not result in significant changes in the degree of specialisation. The Krugman specialisation index was applied for both sectoral employment and value added data, and changes in the value seem to be slow (OECD, 2004, 124-125). Marelli (2004) researched the link between convergence and sectoral specialisation of 145 European regions using employment structures and found that specialisation has decreased over the period 1983-1997. In other words, economic structures have become more similar across regions and this is due to the process of tertiarisation. Despite the growing importance of services sector, regressions have shown that the industrial specialisation was central to the economic growth of regions. However, a strong income convergence of regions was not confirmed, contradicting the observed convergence of economic structures. Author explains these findings by counter-factors such as diverging macroeconomic policies and conditions and, at the regional level, by the effects of growth externalities such as agglomeration effects, technological spillovers and processes.

Hallet (2000) has researched both regional specialisation and concentration in European Union using data on 17 branches over the period between 1980 and 1995 using indices and coefficients of variation. Results have shown that specialisation has a similar pattern over regions due to the structural change from manufacturing towards services, as later confirmed by Marelli's research in 2004. Concentration was found to be stable over time and branches were distinguished into three distinct groups: a. Agriculture's degree of concentration was low; b. Traded goods which are mostly manufacturing goods have a high degree of concentration and c. Non-traded goods which are mostly services inherently tend to follow the spatial pattern of purchasing power.

Traistaru et al (2002) have researched the same topic for accession countries concentrating on industrial activity alone. The aim was to establish whether economic effects had any effects on regional specialisation and the geographic concentration in Bulgaria, Estonia, Hungary, Romania and Slovenia. Authors obtained mixed results. While some counties have experienced regional *relocation* of industries, its effect on the level of specialisation was twofold – increases in some countries and decreases in other. In the remainder of the counties, no significant changes in the level of specialisation were observed. Factor endowments and geographic proximity to the European core are recognised as the main determinants of the location of manufacturing.

Stierle–von Schütz and Stierle (2013) report their findings using most relevant comparable indicators of regional specialisation and concentration for EU and separately for new member states. They use data on employment and on gross value added. In the period ranging from 1995 to 2010, they find that in the EU specialisation has decreased - more profoundly when

employment data is used than in the case of gross value added data. In the latter case, specialisation decrease is slower. In the case of Central European countries, changes in the relative specialisation are more dynamic. Period up to 2008 is marked by decrease in employment specialisation. Production specialisation exhibits a different pattern up to 2004. Authors argue that differences in indicators may be reflecting differences in productivity. Capital-city regions in several countries are distinctive for being highly specialised in market services in several countries.

On the individual country level, in assessing the effects of regional policies to changes in the industrial structure in the period in 1971-1994 in United Kingdom, Wren and Taylor (1999) find that regions have increased their industrial specialisation and that industrial employment structures have converged. This was due to the decrease in geographical concentration of industry, geographic expansion of services activities and a shift from the traditional manufacturing industries. Authors used both absolute and relative measures of specialisation on employment data.

3. Research questions and methods

Based on theoretical and empirical literature, three research questions are posed in this paper:

1. What are the consequences of the processes of deindustrialisation and tertiarisation on the development of sectoral structure of Croatian counties?

The aim is to research the change in the sectoral structure of 21 Croatian counties with respect to four economic sectors – agriculture, industry, tertiary and quaternary sector. Additionally, the role of public sector is also examined using this structure due to the strong presence of the public sector in Croatian economy. Using Croatian sectoral data along with income per capita, clusters analysis will help group counties with similar sectoral and development characteristics. These clusters will be mapped and further used to provide conclusions about the possibility of differentiating discernable geographic and sectoral patterns.

2. Does diversification bring about more prosperity than sectoral specialisation?

Are counties that have become more diversified (i.e. with rising specialisation in services) performing better, or is this true for counties specialised, for example, in industry? Development of (di)similarity of sectoral structures across counties is analysed in the observed period. As four major cities play an important role in country's regional development, their role is also examined. Indices of specialisation and indices of inequality (pertaining to sectoral specialisation) are used as the appropriate methodological tool in providing answers to these questions.

3. Have Croatian counties been converging in the observed period and what is the role of sectoral development of counties in this process?

The aim is to check whether whether counties (and clusters) have been converging in terms of income per capita and whether specialisation can account for these developments. A number of methodological steps are undertaken in this section, including testing a convergence model.

The five-sector structure will be applied to available employment data from 2000 to 2011. It can be noted that in earlier papers researchers in this field have mostly been using the traditional three-sector structure – agriculture, industry and services, including public services (Marelli, 2004; OECD, 2004), or have focused on industry and its branches (Traistaru et al., 2002; Hallet, 2000). However, these authors have dealt with larger samples of cross-EU regional data. As we are dealing with a relatively small economic territory, using the five-sector structure enables us to capture more subtle differences in specialisation across Croatian counties. In the period under observation, National classification of activities necessary for aggregation into sectors has changed in 2007. This methodological change makes the comparison of some individual activities questionable; however, it is possible to aggregate economies of counties into five sectors so that the sectors are fully comparable. The aggregation of sectors used in this paper is represented in table 1.

Table 1. Aggregation of sectors using National Classification of Activities from 2002. and 2007.

National classification of activities from 2007.	National classification of activities from 2002.
Agriculture:	
A Agriculture, forestry and fishing	A Agriculture, hunting and forestry B Fishing
Industry:	
B Mining and quarrying C Manufacturing D Electricity, gas, steam and air condition supply E Water supply; sewage, waste management and remediation activities F Construction	C Mining and quarrying D Manufacturing E Electricity, gas and water supply F Construction
Tertiary:	
G Wholesale and retail trade, transportation and storage, accommodation and food services activities H Transportation and storage I Accommodation and food service activities J Information and communication	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods H Hotels and restaurants I Transport, storage and communication
Quaternary:	
K Financial and insurance activities L Real estate activities M Professional, scientific and technical activities N Administrative and support service activities	J Financial intermediation K Real estate, renting and business activities
Public:	
O Public administration and defence P Education Q Human health and social work activities	L Public administration and defence; compulsory social security M Education N Health and social work

4. Analysis of Croatian regions

As pointed out, Croatia consists of a system of 21 counties (NUTS level III regions), including the City of Zagreb as a separate county. These counties have been aggregated into two NUTS level 2 regions – Continental Croatia and Adriatic Croatia as of 1 January 2013. An extensive economic analysis of Croatian NUTS level II regions and counties has been provided in the Strategy of Regional Development of the Republic of Croatia for the period 2011– 2013 (MRRŠVG, 2010³). On the issue of regional disparities among counties, measures show that they have increased in the period starting from 2000. Puljiz and Mareković (2007) use several inequality measures on personal income and unemployment data for the period 2000-2005 and show that both types of inequality have increased. Newer data confirm that disparities have continued to increase. According to EUROSTAT's data (2014) on dispersion of regional GDP per capita on NUTS level III, disparities in Croatia have increased in the recession period, from 32,8 percent in 2008 to 35 percent in 2011. Croatia's level of regional disparities in 2011 is higher than the average level of incumbent EU members and roughly at the average level of the new members.

Disparities between Croatian counties exist, as well as in any other country and a question may be posed – what is the structure of economic activities of these counties and can common traits be found between their structures and their level of income? Turning out attention to the data, the aggregate GDP has continuously been increasing up to 2008, when the recession starts and continues onward until the end of the observed period. Figure 1 shows that the sectoral structure in 2000 and 2011 based on GDP value varies greatly across counties. In the year 2011 it can be noted that:

a. The highest shares of **agriculture** are found in the Western Continental Croatia (in the range between 13,6-22,3%) where natural endowments for agriculture and associated activities exist, as well as a traditional orientation towards agriculture. Compared to 2000, agriculture is losing its importance to industry across these counties, with shares in agriculture falling roughly by 1,5 percentage point on average. The exceptions to this are Osijek and Baranja County and Slavonski Brod and Posavina County where these shares are lower due to presence of cities of Osijek and Slavonski Brod.

b. **Industrial activity** is concentrated around two hubs, the City of Zagreb and the City of Rijeka. Industry shares of counties that form a circle around the City of Zagreb and County of Zagreb (apart from County of Bjelovar-Bilogora) are on average over 41% while the City of Zagreb's industry share is 17,6% as a result of the past process of relocation of industries from Zagreb to the surrounding areas. County of Sisak-Moslavina as a traditional heavy-industry centre is standing out with 47,3% of industry share. As a result of asymmetric exposure of sectors during recession, the share of industry on the whole has increased by 3 percentage points on average.

c. **The tertiary services sector** shares are predominant in all the counties along the coast (in the rough range of 21-38%) and in all four major cities, the City of Zagreb in particular (31%). This is not surprising because of strong tourist activity in these counties. This sector

³ MRRŠVG denotes the Ministry of Regional Development, Forestry and Water Management. The document is available at <http://www.mrrfeu.hr/>.

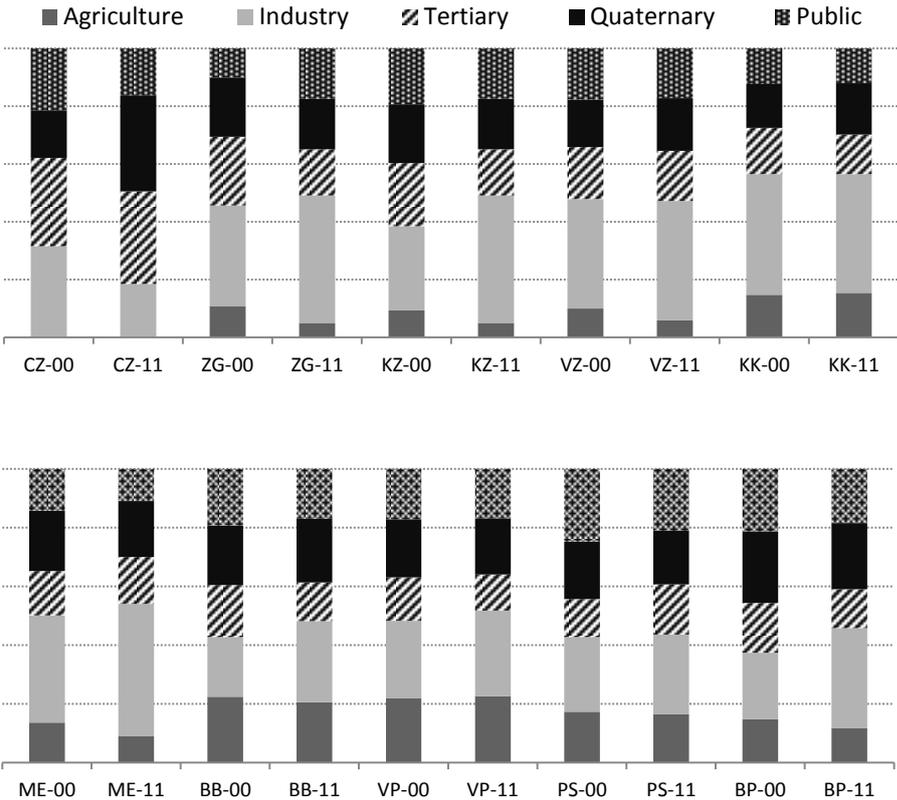
seems to be most concentrated in the very North and the very South part of the coast. Overall share of this sector is losing its importance to quaternary services sector.

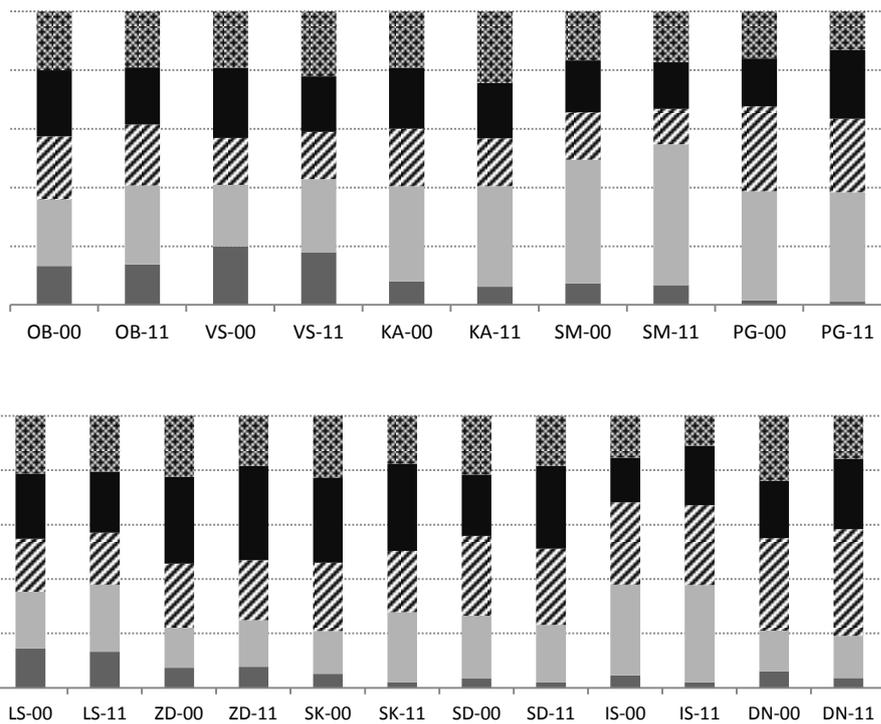
d. As expected, **the quaternary services sector**, highly intensive in human capital and requiring good market access, is mostly strong in counties with strong urban centres, following purchasing power pattern. Also, counties with higher shares of tertiary sectors are at the same time counties with higher shares of quaternary sector. The City of Zagreb's share of quaternary sectors is the highest, 32,2%, and this share has actually doubled compared to 2000. Taking into consideration that at the same time industry share has halved, the capital's sectoral transformation appears overwhelming.

e. **The public services sector** seems to be alleviating poor performance of other sectors in less progressive counties, and as a result, its share in these counties has increased roughly to 20%. On the other hand, public services seem to less important in the overall structure in major cities although these cities are hosting a number of important public institutions.

Based on the values of coefficient of variation, shares of sectors across counties in 2011 vary the most in agriculture (0,75) and then are followed by tertiary services sector (0,36), industry (0,31), quaternary (0,25) and public services (0,22).

Figure 1. Sectoral structure of counties in 2000 and 2011 based on GDP value



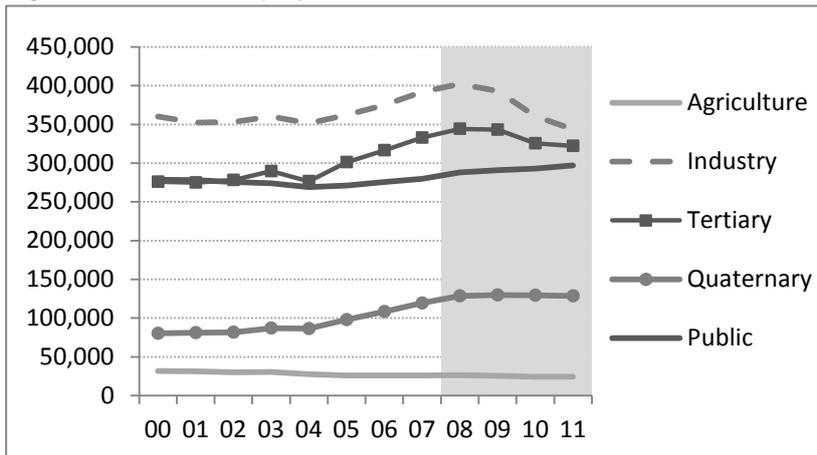


Source: Authors' calculations based on the Central Bureau of Statistics (CBS) data (2014);

Legend: Abbreviations for counties stand as follows. CZ – City of Zagreb, ZG - County of Zagreb, KZ - County of Krapina-Zagorje, VZ - County of Varaždin, KK - County of Koprivnica-Križevci, ME - County of Međimurje, BB - County of Bjelovar-Bilogora, VP - County of Virovitica-Podravina, PS - County of Požega-Slavonia, BP - County of Slavonski Brod-Posavina, OB - County of Osijek-Baranja, VS - County of Vukovar-Sirmium, KA - County of Karlovac, SM - County of Sisak-Moslavina, PG - County of Primorje-Gorski kotar, LS - County of Lika-Senj, ZD- County of Zadar, SK - County of Šibenik-Knin, SD - County of Split-Dalmatia, IS - County of Istria, DN - County of Dubrovnik-Neretva.

We also turn our attention to the sectoral employment distribution and sectoral employment pattern in Croatia, for the 2000-2011 period. At the beginning of the period, roughly 60 percent are employed in services, 34 percent in industry and 3 percent in agriculture, while at the end of the period share of in employment in agriculture decreases by 1 percentage point and, also in industry by 4 percentage points to the rising services share. Employment in industry and in tertiary sector follows a cyclical pattern (Figure 2). In agriculture, the employment is continually decreasing throughout the entire period as a result of its low price competitiveness, increasing competition in the domestic market and generally a lack of agricultural and land reforms. The public sector employment has gradually been decreasing toward the mid-period and then changes its direction. Employment in this sector has continually been increasing since then, cushioning the cyclical unemployment in market services and industry.

Figure 2. Sectoral employment in Croatia from 2000 to 2011



Source: Authors' calculations based on the CBS data (2014);

Industry employment was mostly stable up to mid-period, when a recovery in industry begins along with an expansion in construction. The latter was spurred by wider credit availability and the positive outlook in the economy. Industry employment is affected by recession even in 2008, and since then continues to plummet. Construction proves more resistible and is affected two years later. Quaternary sector employment has been increasing up to 2010 and proves quite stable in the recession period.

The importance of sectoral transformation has been a topic of public interest in Croatia since the onset of transition, still, very few researchers have analysed the effects of deindustrialisation and the growing importance the services sector⁴. Jurčić (2011) has dealt with this topic extensively, advocating transformation and strengthening of the Croatian industry, based on the argument that the most advanced economies are those with a strong industrial base that is supported by an "invisible" institutional and policy framework⁵.

The experience of deindustrialisation of advanced economies can prove valuable for the European transition economies in the catching-up process. Apart from the well-documented fact is that productivity in industry has, due to the technological progress, grown faster than in services in the advanced economies during the 1970-1994 period, at the same time employment in industry has fallen sharply, while the employment in services has been increasing constantly and resulting in higher shares of services in advanced economies (Rowthorne and Ramaswamy, 1997).

⁴ Furthermore, a lack of consensus on the role and importance of Croatian industry in the scientific and business community has resulted in only a few consecutive strategic documents envisaging the future development path of this sector, but with little implementation power.

⁵ Jurčić makes a point that tertiary sector in every country is providing services to the industry, thus making the industry the centre of the economic activity. He identifies a number of structural problems in industry inherent to the political history of Croatia: a relatively late start-up of industry development in Croatia, mostly in post-World War II, and then up to 1980 can be characterised as a period of investment in industry, and after that the development and transformation of industry seizes. The transition period in the 1990s is a continuation of this phase, with insufficient investment in industry.

Croatia has also undergone the process of deindustrialisation and tertiarisation as a part of the economic transition process since 1990es, as opposed to a development phase of a post-industrial society. Instead of a gradual development process including technological upgrading of the industry, industry processes and activity were disrupted during the Homewar in the first half of the 1990es and exposed to increasing international competition through the simultaneous liberalisation of trade in a very short period. Loss of access to key ex-Yugoslavian markets, technological aging and the overall loss of competitiveness, together with the inherited structural unemployment are factors that have contributed to a significant decrease in industrial employment. Reduced number of industry workers together with the industrial activity gradually recovering toward the end of 1990es, has resulted in the growth of productivity in industry. However, a clear distinction should be made between Croatia's source of industry productivity growth and the productivity growth based on technological upgrading in advanced economies. (Bačić, 1998) In the latter case, the competitiveness is strengthened, and in the Croatian, it is stagnating and worsening which is particularly evident in seriously unfavourable economic results and in the inability of the economy to recover to the previous level of growth since 2009.

In most transition economies in Central and Eastern Europe, greenfield foreign direct investments (FDI) were considered a panacea for complementing insufficient domestic investment and for transferring new technologies and know-how since the onset of transition. In the Croatian case, FDI has flown mostly into services sector seizing lucrative privatisation opportunities in the services sector as opposed to investments into new production capacities that directly contribute positively to the economic growth rate. Another characteristic of FDI into Croatia is its concentration to Zagreb and the rise of the quaternary sector, thus pronouncing the existing core-periphery differences. This is quite in line with the sectoral development of metropolises of new EU members from Central and Eastern Europe (CEE). Lintz, Müller and Schmude (2007) highlight the contrast between the setback of some industrial cities and the favourable position of capital-city regions that have exploited their endogenous potential embodied in infrastructure and in resources, and have raised the interest of foreign developers. Additional evidence is presented in research by Dogaru et al (2014), where authors find that capital city-regions in six CEE countries attracted relatively more greenfield FDI than other regions and these investments have been more diversified in terms of sectors and functions.

Another influence on both specialisation and concentration may be seen in the European Union integration process resulting in intensifying liberalisation of trade, FDI and merging with the single market. Croatia joined the EU on 1 July 2013, but trade liberalisation has begun as early as the start of transition process. Along with the structural changes, new patterns of trade have emerged throughout the last twenty years, both in products and in the direction of trade. Up to 2011, Croatia has exported goods most strongly to CEFTA countries while merchandise imports to Croatia have flown in mostly from the European Union, exceeding Croatian export to EU value by almost twice. As to the issue of specialisation rising from trade, Buturac's research (2006) on intra-industry trade has shown that Croatia's goods export is mostly of low value added in food and wood products, clearly confirming Croatia's lagging in export-orientated industry restructuring, the central issue in a small open economy.

4.1. Cluster analysis of Croatian counties

In the interest of finding common economic development patterns in Croatian counties, in this section counties are clustered using data on employment shares in the five sectors along with GDP per capita index data as an indicator of the level of development. More specifically, the goal is to discern what clusters are specialised at and to find distinctive indicator values associated with the observed level of development using cluster data. To this end, hierarchical cluster analysis is used to find out the appropriate number of clusters and to allocate cluster members to appropriate clusters as a technique that is suitable for small samples of data. As an alternative to hierarchical clustering, K means clustering iterative procedure has yielded less logical results.

Using data for the initial year 2000 and the final year 2011, two sets of clusters for the aforementioned years are identified. The number of clusters in each set is determined as a result of dendrogram analysis done separately for both years. The variables used in the analysis are denoted as follows: y_r^i as income per capita index value of a region r (Croatian average income per capita=100) and $x_{A,r}^i, x_{I,r}^i, x_{T,r}^i, x_{Q,r}^i, x_{P,r}^i, x_{A,r}^f, x_{I,r}^f, x_{T,r}^f, x_{Q,r}^f, x_{P,r}^f$ employment shares in the five sectors in the initial (i) and the final year (f). Cross-correlation analysis was carried out and the values of coefficients were under 0.9. Mean values of all the variables within each cluster in are presented in table 2, along with the number of cluster members.

The change in the number of clusters and in cluster composition from the year 2000 to 2011 is a clear indicator of structural changes taking place in a very short period; in the year 2000 four clusters are identified and in the year 2011, a further divergence among clusters appears along with an additional cluster. The prevalence of the City of Zagreb and its fast sectoral transformation result in this separate cluster which is constituted of the City of Zagreb alone.

Table 2. Croatian specialisation clusters

Initial year (2000)							
Cluster	Membership	GDPpc	Agriculture	Industry	Tertiary	Quaternary	Public
C1i	3	142.3	1.6	33.0	31.6	9.9	20.3
C2i	6	87.5	3.0	52.7	19.7	4.7	18.6
C3i	8	72.7	9.0	40.3	21.0	4.3	23.4
C4i	4	78.8	2.0	28.0	35.0	6.7	24.8
Total/ average	21	100.0	3.9	38.5	26.8	6.4	21.8

C1i cluster members are CZ, PG, IS; C2i cluster members are: ZG, KZ, VA, KK, ME, SM; C3i cluster members are BB, BP, OB, KA, VP, PS, VS, LS; C4i cluster members are ZD, SK, SD, DN.

Final year (2011)							
Cluster	Membership	GDPpc	Agriculture	Industry	Tertiary	Quaternary	Public
C0f	1	179.2	0.3	20.8	32.8	18.1	24.2
C1f	7	93.6	1.6	27.4	31.6	9.5	26.5
C2f	3	81.6	2.2	50.3	18.9	6.8	20.2
C3f	4	65.2	8.5	29.9	20.4	4.3	34.8

C4f	6	70.1	3.7	39.1	18.8	6.3	30.0
Total/ average	21	100.0	3.3	33.5	24.5	9.0	27.11

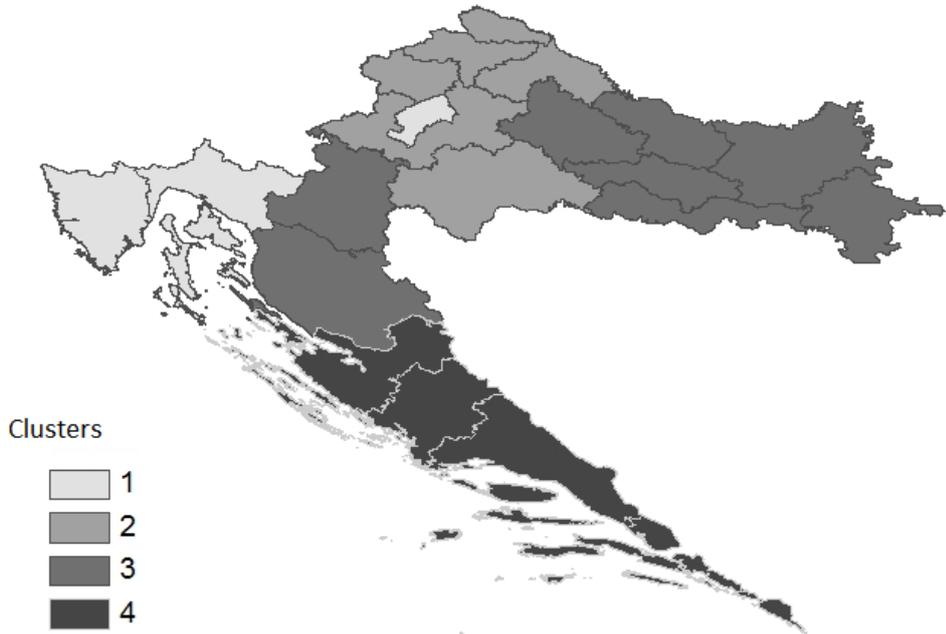
C0f cluster member is CZ; C1f cluster members are ZG, PG, ZD, SK, SD, IS, DN; C2f cluster members are VA, KK, ME; C3f cluster members are VP, PS, VS, LS; C4f cluster members are KZ, BB, BP, OB, KA, SM.

Mapping clusters by using county map of Croatia brings forth another perspective on the cluster distribution as it is discernable that clusters follow a geographical pattern (Map 1 and Map 2). It may be a result of exploiting comparative advantages stemming from endowment in natural resources of certain regions, and/or a result of previous economic planning, most probably at the national level as regional policies have only recently gained a stronger ground.

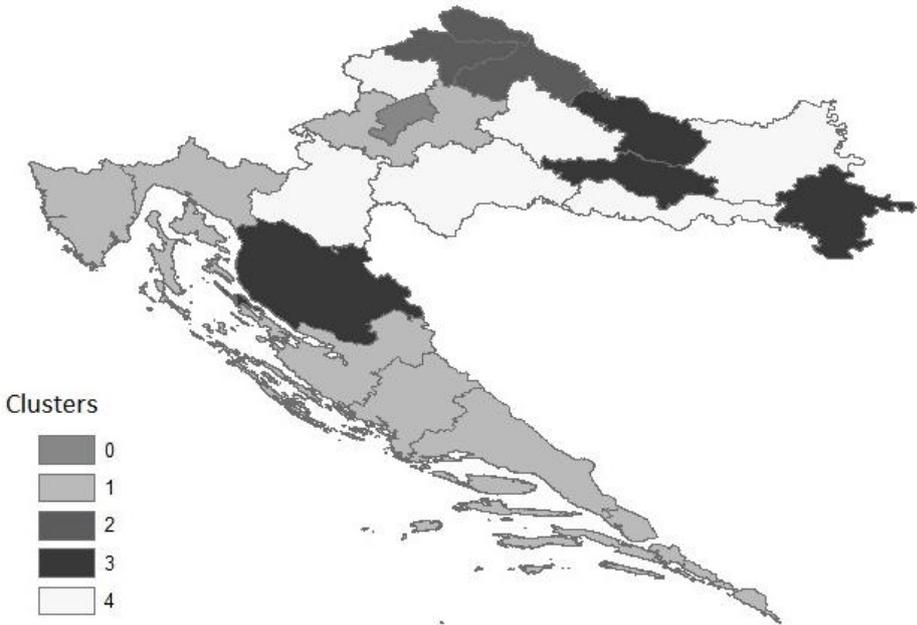
In the initial period, the City of Zagreb as the capital stands out as a sole member of first cluster in the north of the country and appears to be a center of two other clusters as they take the form of concentric circles. The city's economic power contrasts the rest of the country. This is quite apparent in the final year as well. This raises the question of the implications of the capital's economic reach. The question of monocentricity-one city dominating the national urban system, and its implications in new EU member states seems important, as the balance between keeping the larger cities (usually the country's capital) internationally competitive and at the same time not further deepening regional disparities is sensitive and these principles may conflict.

There are two other clearly discernable patterns. The first one is the pattern of four major cities – Zagreb, Split, Rijeka and Osijek. Apart from Zagreb's far-reaching influence, the geographical distribution of clusters places these four major cities at the heart of the clusters. The second pattern is the purchasing power-pattern/development pattern: Zagreb within the first cluster produces the highest income per capita, and then the income per capita falls with the distance from the City of Zagreb. The Adriatic Croatia is largely an exception to this as it seems to be more independent of capital's economic influence.

Map 1. The cluster distribution in 2000



Map 2. The cluster distribution in 2011



Specialisation clusters' distinct characteristics are as follows:

- C1 The best-performing cluster (with GDP pc 142.3 in the initial year compared to the national average) is only partially a regional cluster. The City of Zagreb is the best performing county, followed by the two neighbouring counties in the Adriatic Croatia. At the centre of the latter region is the city of Rijeka. Both Zagreb and Rijeka were two

major industrial hubs up to 1980es. The main characteristics of this cluster are: the dominance of the services sector, in particular a high share of quaternary services, almost 10%; very low share in agriculture and an average share in industry. Eleven years on, the City of Zagreb is on its own development path and constitutes a separate cluster. New members coming from the coastal region join in and the cluster expands to seven members.

- C2 The cluster that geographically constitutes a ring around Zagreb is predominantly based on industry (52.7%) and is the second-performing cluster in country in the initial year. The income per capita index value of 87,5 compared to the runner-up value, points to substantial regional/cluster disparities. This is less visible in the case of in-between comparison of the follower clusters. Another characteristic of this cluster is below-average services share, both in tertiary and quaternary sectors. This may be explained by that fact that this cluster lacks benefits of a major urban centre as none of the four major cities are present in this cluster and hence, services share are low. At the end of the period this cluster's counties diverge and only three progressive industry-oriented counties from the north remain within this cluster (with income per capita index value at 81,6).
- C3 The economic structure of the cluster that produces the lowest income per capita (72.7) is distinctive for combination of strong presence of agriculture (9%) and the second strongest presence of industry (40.3%). It is located in the second ring around Zagreb, and the eastern part of this cluster benefits from the presence of Croatia's fourth major city, Osijek. In the final year, there are only four remaining members of this cluster, compared to eight members from the initial period. Its level of income per capita is also lower.
- C4 Situated in the South Adriatic, this cluster is the third best-performing cluster with income per capita index value at 78.8. It is specific for the prevailing tertiary sector, namely due to strong tourism sector and associated activities. Quaternary sector is also strong, as well as public services. Members of this cluster seem to have progressed at a faster pace than the other counties and as a result, at the end of the period, they are fully integrated into the leading cluster, C1. Therefore, C4 cluster from the initial period and the final period are not comparable at all. At the end of the period, this cluster is composed of entirely new members and those are industry-oriented counties with relatively poor performance. Another characteristic is the major role of public sector that is probably cushioning poor performance in other sectors.

4.2. Applying indices of specialisation to Croatian data

Measures of the level of specialisation across sectors are most commonly compared to a reference value, and in this case, the reference value is the Croatian average specialisation in the observed sectors. The measure of specialisation appears in the form of a specialisation index, computed as follows:

$$S_c = \frac{1}{2} \sum_i |x_{i,c} - x_{i,HR}| \quad (1)$$

where $x_{i,c}$ is the share of sector i in employment in county c , and $x_{i,HR}$ is the corresponding sectoral share at Croatian level (the average). If the sectoral employment structures of a country are identical to the Croatian average, then the index value will be 0 and to the contrary, if the sectoral employment structures are dissimilar from the Croatian average, the index's value will be higher. Specialisation level in all the sectors is then summed for each county separately. Results for counties and also for clusters from the initial (i) and the final period (f) are given in table 3.

Table 3. Specialisation coefficient

Counties	2000	2011	change	%ch. income pc	Clusters	2000	2011	change	%ch. income pc
	1	2	(2-1)	3		4	5	(5-4)	6
CG	0,073	0,099	0,026	12,7	C1i	0,088	0,060	-0,028	0,4
ZG	0,125	0,100	-0,025	-4,2	C2i	0,187	0,195	0,007	-10,7
KZ	0,171	0,206	0,034	-14,6	C3i	0,135	0,175	0,040	-5,1
VZ	0,191	0,215	0,025	-11,3	C4i	0,098	0,087	-0,011	3,8
KK	0,225	0,201	-0,024	-19,2					
ME	0,224	0,258	0,034	-0,3					
BB	0,152	0,176	0,024	-6,6	C0f	0,073	0,099	0,026	12,7
VP	0,213	0,170	-0,043	-12,4	C1f	0,101	0,076	-0,025	-5,0
PS	0,189	0,199	0,010	-12,1	C2f	0,208	0,222	0,015	-10,3
BP	0,092	0,184	0,092	-4,0	C3f	0,157	0,194	0,038	-4,2
OB	0,076	0,099	0,023	2,2	C4f	0,136	0,169	0,034	-6,9
VS	0,107	0,196	0,088	1,6					
KA	0,135	0,164	0,029	-4,0					
SM	0,189	0,187	-0,001	-14,5					
PG	0,105	0,032	-0,073	-6,2					
LS	0,117	0,213	0,096	-5,6					
ZD	0,066	0,109	0,043	6,1					
SK	0,063	0,109	0,046	5,1					
SD	0,058	0,026	-0,032	-1,1					
IS	0,087	0,050	-0,037	-5,3					
DN	0,205	0,106	-0,100	5,1					
Correl. c.		0,66		0,14					

Cluster values were obtained by averaging county values. GDP per capita changes were calculated as a difference between GDP index values in the observed years (Croatian average for the observed year=100).

According to results, highly specialised counties in 2000 are mostly regions highly specialised in industry and agriculture, and one highly specialised in tourism. Also, most of these counties remain the most highly specialised counties in 2011. Several best-performing counties are least specialised, i.e. their sectoral structure is most diversified. This also holds true for counties where four largest cities are located and that also that have more diversified sectoral structure. On the county level, changes in the specialisation coefficient and the income per capita changes do not seem to be correlated. Nevertheless, when counties are aggregated into clusters, change in the specialisation coefficient is negatively associated to change in income per capita. This would suggest that increase in specialisation (and this occurred in agriculture- and industry-orientated sectors) is associated to a fall in the relative income per capita.

The index measures inequality of sectoral distribution across counties and is computed as follows:

$$Ei = \frac{1}{n} \sum_c (x_{i,c} - x_{i,HR})^2 \quad (2)$$

where n is the number of counties. Higher values are associated with more dissimilarity in the distribution of sectoral structures. Index for all sectors is a sum of index values across sectors and this is also how cluster index values are obtained. Results are presented in table 4.

Table 4. Index of inequality of sectoral structure

		2000	2011	Change
		1	2	(2-1)
All sectors		0,027	0,030	0,002
Contributions:				
	<i>Agriculture</i>	0,002	0,001	-0,001
	<i>Industry</i>	0,015	0,011	-0,004
	<i>Tertiary</i>	0,006	0,011	0,005
	<i>Quaternary</i>	0,001	0,002	0,001
	<i>Public</i>	0,003	0,004	0,000
Without the public sector		0,024	0,027	0,003
Without City of Zagreb		0,029	0,031	0,002
<i>Clusters</i>	C1i	0,009	0,006	-0,003
	C2i	0,050	0,051	0,001
	C3i	0,021	0,032	0,011
	C4i	0,019	0,011	-0,008
	C0f	0,005	0,014	0,009
	C1f	0,019	0,014	-0,005
	C2f	0,062	0,067	0,005
	C3f	0,027	0,035	0,008
	C4f	0,026	0,035	0,009

Ideally, the change in the index should help answer the question: "Are sectoral structures of counties and clusters becoming more similar?". In the year 2011 compared to 2000, the index value has increased, showing that sectoral structures are becoming less similar across counties. An increase in the index is mostly a result of an increase in inequality of specialisation in tertiary and quaternary services as these services have expanded in the some best-performing counties and this is the major factor in the overall growing cross-county differences. On the contrary, industry and agriculture shares are becoming more similar among counties. The public sector employment plays an important role in buffering growing dissimilarities in sectoral structures. Also, City of Zagreb with its diversified sectoral structure contributes to lowering the overall inequality index value in the observed years.

When indices for clusters from the initial period are observed, it appears that the sectoral structures of the services-orientated clusters (C1i and C4i) and are the least dissimilar from the rest of the country. The agriculture/industry-orientated cluster (C3i) is most dissimilar from the prevailing sectoral structure and these differences have increased in the observed years. The results are quite similar for the clusters from the final period. The differences arise only in the case of two industry-orientated clusters (C2f and C3f) where sectoral structures

are diverging – one is becoming more diversified while the other is becoming more specialised and less similar to the prevailing sectoral structure.

5. Income convergence and structural changes

In this last section, a number of methodological steps is undertaken to establish whether convergence among counties exists and whether specialisation can account for this in either of the cases. The purpose is to learn more about the role of sectoral specialisation/diversification in the economic development of Croatian counties in the period from 2000 to 2011. Although a decade does not constitute a long period for an advanced economy, it can be argued that for a post-transition economy that is undergoing many economic, social and political changes, more distinct development changes can be identified over that span of time. The observed change in the cluster structure of Croatian counties can support this argument.

This section of the paper is structured according to three research goals:

- a) Establishing the distribution of the income per capita across counties using sigma coefficient and coefficient of variation;
- b) Researching the presence of individual growth path on a random sample of counties using unit root test for individual root and a pool regression for beta-convergence and;
- c) Researching convergence among counties i.e. finding a common growth path for the sample using a unit root test for a common root. In trying to find a link between sectoral specialisation and sharing a common growth path of counties, cross-correlation and seemingly unrelated regression are employed.

Using a variety of different methods is supported with an argument that we are dealing with relatively short time series and in order to come to a clear understanding as to presence of convergence or divergence, all the results of different methods employed should unequivocally point to the same direction. If this is not the case, then the answer to the question of convergence will be considered inconclusive.

5.1. Distribution of income per capita

Research on income convergence in growth economics differentiates two approaches to income convergence. Those are sigma and beta convergence. Sigma convergence exists when income per capita dispersion across economies/regions decreases over time. On the other hand, beta convergence exists when the partial correlation between growth in income and its initial level is negative. In other words, when beta convergence exists, lower initial real income per capita is associated with more dynamic economic growth. If this is true, then catching-up of less developed regions or countries is possible. Still, many researchers show that beta convergence is a necessary condition for sigma convergence; however it is not a

sufficient condition (Young, Higgins and Levy, 2008⁶). The scope of this research is narrower than the usual cross-country econometric framework of beta and sigma convergence research. Due to data restraints, a simple methodological framework is considered more appropriate.

We thus use two measures of dispersion to the data on income per capita for all counties and for clusters from the initial period. The main benefit of these measures is their simplicity and complementarity to the econometric methods.

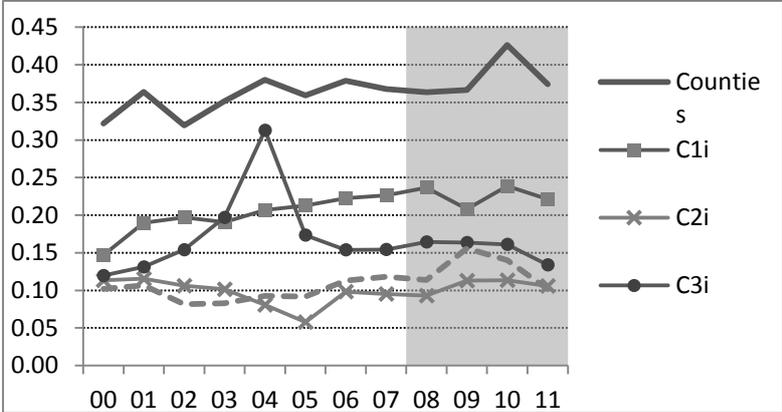
1. **The coefficient of variation** defined as the ratio of the standard deviation to the mean and;

2. **The sigma coefficient** defined as $sigma_t = \left[\frac{\sum_r [\ln(y_{c,t}) - \ln(y_{HR,t})]^2}{n} \right]^{1/2}$ where $y_{c,t}$ is

GDP per capita, c denotes a county, HR denotes Croatia, n is the number of regions.

Income per capita is approximated with GDP per capita in EUR. Purchasing power index is not available for counties and therefore real income per capita across counties cannot be used; however, this does not compromise the analysis because cross-county price differentials can be considered insubstantial⁷. The results are shown in Figure 3 and 4. We do not expect the results for both indicators to match in the case of clusters due to the computational differences: the coefficient of variation will point to the within-cluster convergence or divergence whereas the sigma coefficient will point to the between-cluster convergence or divergence compared to the country average.

Figure 3. Coefficient of variation



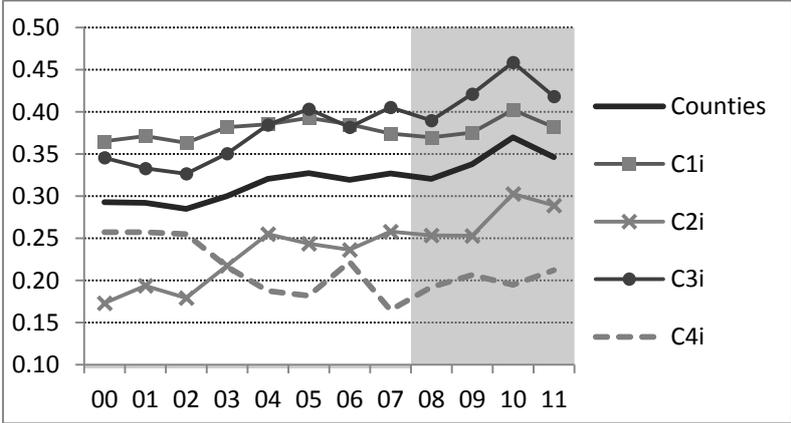
⁶ Authors demonstrated that sigma convergence did not occur within a majority of the individual U.S. states in the period from 1970 to 1998, despite the fact that confirm the presence of positive and statistically significant beta convergence rates. It is more likely that club convergence is occurring – groups of states of the same level of development converge among themselves.

⁷ The only price differentials across counties may be recorded during tourist season. In tourism-orientated cities and islands in counties along the Adriatic coast prices usually increase in summer and then decrease again to the country average level in the post-tourist season.

As expected, **the coefficient of variation** is the highest for the whole country as cross-county differences in the distribution are the greatest. Furthermore, a cyclical pattern is recognisable for the country, as opposed to the steady path of convergence, independent of current economic developments. This would imply that in some points of the business cycle some counties fare better and some fare worse, resulting in more inequality. Looking at the recession period starting in 2008, a rise in inequality is evident, reaching a peak in the midst of the recession in the period up to 2011.

Using cluster division is useful at this point as this may yield an answer to the question – what types of sectoral specialisation bring about more inequality/susceptibility to economic shocks? Firstly, the most stable path of convergence in the recession period can be noticed within the cluster specialised in industry and distinct for its export-orientation, C2i. The unfavourable economic conditions seem to be affecting all the members in the same manner. Contrary to this, the inequality rises particularly within the “runner-up” clusters that are sectorally diversified. They are services-orientated: the “urban” cluster (C1i) and the “maritime” cluster highly specialised in tourism and related services (C4i). The leading counties, like the City of Zagreb, continually are more prosperous and fare better than others crisis and this brings about more inequality in distribution, and at the end of the period, these clusters remain most prosperous.

Figure 4. Sigma coefficient



As to **the sigma coefficient** for Croatia, it is pointing to divergence rather than to convergence as the overall coefficient is rising and within cluster members. The exception to this is the “urban” cluster (C1i) following a steady-path, comparable to the country-path. Again, this is not surprising, as its influence on country’s GDP is prevalent. The “maritime” cluster was marked by the lowest level of inequality and in the pre-recession period it was on a path to decreasing inequality compared to the country average and probably converging to the “urban” cluster. The differences between industry-orientated cluster C2i and the country average are growing, reflecting diverging economic performance between the industry and services sectors.

Comparing the results of the two indicators creates an overall picture that resembles “club convergence”. Members of the development clubs (i.e. clusters) seem to be converging among themselves and diverging from the progressive clubs, the “urban” club and the “maritime” club. This divergence among clusters is a direct result of a fast pace of development of the

City of Zagreb, heading the “urban” club and a slower pace of development of follow-up clusters, namely the industry-orientated cluster situated in a wider ring around the City of Zagreb and the agriculture-and-industry-orientated cluster. During the recession period, the inequality within clusters members has increased more in the follow-up clusters, remained roughly the same for the leading cluster, and has reduced for the “maritime” cluster. This would suggest that services-oriented clusters that are more diversified in terms of economic structure have fared better and have been less exposed to shocks, while the follow-up clusters distinctly orientated towards industry have generally decreased their pace of development. This finding is in line with the theoretical proposition on susceptibility of more specialised regions to economics shocks.

5.2. Individual growth path

We continue with research on convergence of Croatian regions by trying to establish whether counties follow an individual growth path, in line with beta-convergence. Due to the constraints of the short of data series, we turn to the panel data analysis. In the empirical convergence literature, some are authors using unit root testing for testing income convergence (Pesaran, 2007; Botrić, 2013). The advantage of panel unit root tests is that they are considered to have more power than the individual unit root tests. Given the great disparities in income across Croatian counties and only recent membership in the EU, we find it plausible to test convergence of a sample of counties to the country average. We use random sampling procedure and test 12 out of 21 counties. The City of Zagreb is a clear outlier and was therefore excluded from the procedure. The sample consists of the following members: County of Bjelovar-Bilogora, County of Slavonski Brod-Posavina, County of Krapina-Zagorje, County of Lika-Senj, County of Međimurje, County of Osijek-Baranja, County of Šibenik-Knin, County of Split-Dalmatia, County of Virovitica-Podravina, County of Vukovar-Sirmium, County of Zadar and County of Zagreb.

We are evidently faced with the shortcomings of the data, both in terms of the short period under the consideration as well as the possibility of picking-up structural shocks across counties. Smaller economic territories are inherently more prone to structural shocks, and in turn, even just one structural shock across the section can have an impact on the whole sample. The evidence to this can be seen in the movement of the coefficient of variation that picked up an increase in GDP of unexpected proportions in County of Lika-Senj in 2004 due to the public investment into highway development. The result was apparent in the spike in the overall value of the coefficient for the country. Bearing this in mind, we continue with the unit root testing without trying to resolve this issue as testing for structural breaks as this might compromise the series of data that are already short and sometimes, methodologically challenged.

In applying unit root procedure for counties, we follow a preposition by Pesaran (2007) that for two countries to be convergent, the difference in their log output should be stationary. Using this preposition, ADF-Fisher unit root test for individual root seems appropriate. Autoregressive coefficients are allowed to vary across section in tests of this type of test.

Table 5. Panel unit root tests - individual root

Variable	Test	Null hypothesis	Statistic	Probability
log(Y _{HR})-log(Y _r)	ADF-Fisher Chi-square	Individual unit root (divergence hypothesis)	22,4	0,557

The hypothesis of the null trend stationarity of some sections as a divergence hypothesis is rejected (table 5). The alternative hypothesis that some cross sections may be trend-stationary has therefore been accepted. This would in the context of growth, imply that some counties are convergent with the country average (mostly dominated by the City of Zagreb) and, possibly, that they follow their own growth path.

Further on, a beta-regression on pooled data is used to check the notion of individual growth pattern of individual counties. A number of authors use this approach in cross-EU convergence research. Series are used in a different form – county GDP per capita is placed in relation to the country level (the variable is normalised), again using the same sample of 12 counties. The normalised dependant variable should solve the issue of fixed effects. The beta-coefficient, in the case of convergence, has a negative sign. The Hausmann test was also used to check for the presence of fixed effects and they were included in the regression. The following model is tested:

$$(\ln Y_{r,t} - \ln Y_{r,t-1}) = \alpha + \beta \ln Y_{r,t-1} + \varepsilon \quad (3)$$

The results are shown in table 6. The beta-coefficient is significant and negative, implying the presence of individual growth path across sections. As this is a pre-condition for convergence, then it is plausible to assume that counties converge among themselves. This type of model is also used in Marelli (2004).

Table 6. Regression results: Pooled Least Squares

Dependant variable	Period	Method	No. of obs.
Log(Y _{r,t})-log(Y _{r,t-1})	2000-2011	LS	132
Constant (t-statistic)	log(Y _{r,t-1})	Adjusted R ²	
-0,304 (-8,94)	-0,999* (-9,23)	0,383	

*denotes significance at 1% level

5.3. Common growth path

In assuming that counties converge among themselves, we employ two tests that assume a common unit root for the cross section: Levin, Lin and Chu and Breitung test. The hypothesis of the null of trend-stationarity in our case is a divergence hypothesis. The alternative hypothesis is the null of unit root and can be considered a convergence hypothesis. The tests are carried out with an intercept and an individual trend. Convergence is confirmed if we reject the null of trend-stationarity in both tests. The results are summarised in table 7.

Table 7. Panel unit root tests - common root

Variable	Test	Null hypothesis	Statistic	Probability
log(Y _{HR})-log(Y _r)	Levine, Lin and Chu	Common unit root (divergence hypothesis)	-2,6	0,005
log(Y _{HR})-log(Y _r)	Breitung		-1,9	0,031

According to the results of both tests, divergence hypothesis is not accepted as the autoregressive coefficient was not identical across the section. Therefore, the common unit root process was not confirmed and it is possible to presume that counties converge toward the country average. The finding confirms that regions are developing and catching-up, but it is limited in terms of finding out about the speed of conversion of counties. Furthermore, what is the role of sectoral structure in catching up and in income convergence? Aiginger (1999) sees that sectoral specialisation and income convergence are interrelated in the following: demand for certain industries is supported by a certain level of income, and in turn, supply (provided by production structures) is matching this demand. Therefore, if levels of income converge, so would the production structures. He makes another interesting point - despecialisation will come as a result of convergence of incomes (when also associated with convergence in endowments and or preferences).

If this is applied to the case of Croatian regions converging in incomes, there would also be similarity in sectoral structures development. In assessing this point, cross-correlation coefficients can be useful. They are used for the sample on income per capita data (relative to national income per capita) and on data on specialisation (shares of employed across sectors in total employment) for pair of counties. Coincident significant coefficients for income per capita and for sectors are identified in table 8.

Table 8. Cross-correlation matrix

	BB	BP	KZ	LS	ME	OB	SK	SD	VP	VS	ZD	ZG
BB	1,00 -----											
BP	0,78** (3,93) q,p	1,00 -----										
KZ	0,59* (2,29) a,i,q,p	0,61* (2,46) a,q,p	1,00 -----									
LS	0,20 (0,64)	0,26 (0,84)	0,23 (0,73)	1,00 -----								
ME	0,74** (3,51) i, q, p	0,67* (2,89) a,p	0,10 (0,33)	-0,21 (-0,67)	1,00 -----							
OB	0,14 (0,46)	0,09 (0,28)	-0,11 (-0,36)	-0,39 (-1,34)	0,47 (1,67)	1,00 -----						
SK	-0,86** (-5,35) a,i,q,p	-0,78** (-3,94) a,t,q	-0,43 (-1,49)	0,11 (0,34)	-0,85** (-5,19) -a,i,q,p	-0,10 (-0,33)	1,00 -----					
SD	-0,55 (-2,06)	-0,54 (-2,03)	-0,19 (-0,61)	-0,01 (-0,04)	-0,57* (-2,20)	0,17 (0,54)	0,55 (2,06)	1,00 -----				
VP	0,71** (3,16) a,p	0,79** (4,10)	0,92** (7,34) i,q,p	0,30 (0,99)	0,36 (1,20)	-0,01 (-0,02)	-0,59* (-2,33) a,-t,q,p	-0,29 (-0,97)	1,00 -----			
VS	0,53 (1,98)	0,42 (1,48)	0,31 (1,02)	-0,02 (-0,06)	0,48 (1,71)	0,39 (1,34)	-0,39 (-1,32)	-0,49 (-1,76)	0,48 (1,71)	1,00 -----		
ZD	-0,33 (-1,10)	-0,46 (-1,64)	-0,30 (-1,00)	0,42 (1,46)	-0,40 (-1,36)	0,01 (0,02)	0,56 (2,17)	0,25 (0,83)	-0,36 (-1,21)	-0,17 (-0,55)	1,00 -----	
ZG	0,30 (0,99)	0,30 (0,99)	0,29 (0,94)	0,33 (1,10)	0,09 (0,30)	0,17 (0,56)	-0,03 (-0,08)	-0,21 (-0,67)	0,24 (0,79)	0,20 (0,65)	-0,03 (-0,10)	1,00 -----

Significance at 1% level is denoted as **; at 5% as *.

According to these results, a handful of counties are correlated both in terms of income and in terms of sectoral structure. Out of 66 possible income-pairwise correlating links, 13 turn

out to be significant and 11 out of those are with either positively or negatively correlated in terms of sectoral structure. As nearly half of the correlation coefficients for income bear a negative sign while county sectoral structures are positively correlated, this finding is rather pointing to diverging development of counties with similar sectoral structures. Even these simple statistical measures prove to be indicative of a missing link between similar sectoral structures and their directions of development in a number of counties. Obviously, unobserved factors can account for these developments – some of these may be investment policies, human capital endowments, technological deterioration and regional development policies.

On the other hand, some counties seem to be positively correlated both in sectoral shares and in income:

- County of Slavonski Brod-Posavina to County of Bjelovar-Bilogora in quaternary and public sectors;
- County of Krapina-Zagorje to County of Bjelovar-Bilogora in agriculture, industry, quaternary and public sector; and County of Krapina-Zagorje to County of Slavonski Brod-Posavina in agriculture, quaternary and public sector;
- County of Međimurje to County of Bjelovar-Bilogora in industry, quaternary and public sector; County of Međimurje to County of Slavonski Brod-Posavina in agriculture and public sector and;
- County of Virovitica-Podravina to County of Bjelovar-Bilogora in agriculture and public sector; County of Virovitica-Podravina to County of Krapina-Zagorje in industry, quaternary and public sectors.

A common factor of these counties is the geographical proximity as they are all situated with the wider region of Continental Croatia (NUTS level II). With this respect to the regional aspect, it is possible that natural endowments may also play a role. Another issue to be considered is the reverse relationship - commonalities in the sectoral structures of these counties could be a consequence of similar economic performance of counties. This is also quite possible explanation for their sectoral and income linkages confirmed by the correlation coefficient.

Considering these results together with the results of URT that pointed to overall convergence among counties, it must be noted that do not conflict in any way. Rather, results on correlation analysis are supplementary to the results of URT. Clearly, counties are converging toward the country average at their own pace, so a number of sectorally similar counties share a common growth path, and also, a number of sectorally similarly counties do not follow the same growth path. The differences can be accounted to the speed of convergence. Results of correlation analysis are partially supportive of the preposition of the interrelatedness of income and sectoral convergence in a smaller number of cases. Given the fact that all the counties have been exposed to the same national economic policy (while the regional development policies gained attention only lately), county sectoral structure probably has developed as a result of craft and industry tradition, and as a result of previous economic planning. As pointed out, in the transition period, international and domestic trade and trade-related opportunities and developments have mostly likely transformed the sectoral structure. The result of these developments is quite clear – there are not a lot of cases of both structurally- and income-converging regions. Although we do not pursue this

line of research, it is also quite likely that in the case of some structurally-correlating counties, there is no convergence of income.

In presuming the possible sectoral and income development similarity or dissimilarity (in the case of a negative correlation coefficient) between counties, we use the seemingly unrelated regression method to further research whether income per capita of one county can explain for the path of income per capita of another county. Along with the possible unobserved factors that can explain for these relations, another possible link can be seen in inter-sectoral relations and in the influence of major cities as the cluster analysis revealed that clusters where geographically situated around these cities. The regression is used by testing a set of equations for:

- **clusters** from the initial period by setting the income of a cluster member (county) as a dependant variable and the income per capita of its cluster members as explanatory variables. This was done respecting the criteria of minimum three explanatory variables. The results of the regression analysis did not confirm that income per capita of a cluster member can be explained by income per capita of other cluster members, including counties where four major Croatian cities are located. That is why these results were not reported. Notwithstanding, the results are revealing in terms of the possibility of lacking in stronger inter-sectoral linkages and spillovers within clusters.
- **counties**, irrespective of cluster membership. Lesage and Fischer (2008.) find that long-term regional income depends on neighbouring region's characteristics along with other important spatial elements using data on EU regions in spatial regression modelling. As we aim to check whether the income per capita of neighbouring counties and the income per capita of the nearest of four major cities can explain for the income per capita of a county. We use this approach only for counties that are surrounded by at least three counties and no more than four counties so that the risk of running a singular matrix is avoided. By doing this, a number of borderline counties are dismissed from the analysis. Results are available in table 9, from a) to d), and counties are represented in tables regionally.
- **four major cities** as this is another link to be researched in the context of the regional development. We use the procedure from the last step by setting the income of a major city as a dependant variable and the income of the remaining three major cities as explanatory variables. Results are reported in table 9. e).

Table 9. Seemingly unrelated regression (SUR) results

a) SUR results for income of regions in the surrounding area of the City of Zagreb

	ΔYCZ	ΔYKK	ΔYVZ	ΔYME	ΔYKA	ΔYBB	ΔYBP	ΔYVP	ΔYSM	ΔYPS	ΔYPG	R^2	DW
ΔYZG	-6,55** (-3,35)	-0,73 (-1,42)	0,02 (0,03)									0,63	2,59
ΔYSM	1,97 (1,06)				-0,34 (-0,98)	0,91 (2,34)	-0,41* (-0,94)					0,53	0,91
ΔYKA	0,00 (0,00)								0,17 (0,63)		-1,67* (-2,41)	0,47	1,92
ΔYBB	-2,77 (-1,50)	-0,37 (-0,74)						0,41 (1,57)			-1,23** (-2,92)	0,71	1,93
ΔYKK	-2,55 (-2,10)		0,54 (1,18)	-0,10 (-0,24)								0,60	1,91

ΔYVA	2,77 (-1,51)	-0,37 (-0,74)						0,42 (1,57)		-1,24* (-2,92)		0,71	1,93
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b) SUR results for income of regions in the surrounding area of the City of Rijeka

	ΔYPG	ΔYKA	ΔYZD	R^2	DW
ΔYLS	-4,36** (-3,53)	-2,35** (-4,10)	0,12 (0,22)	0,72	3,12

c) SUR results for income of regions in the surrounding area of the City of Split

	ΔYSD	ΔYLS	ΔYSK	ΔYZD	ΔYDN	R^2	DW
ΔYZD	-0,17 (-0,30)	0,08 (0,60)	0,29 (1,01)			0,15	2,12
ΔYSD			0,06 (0,49)	-0,09 (-0,60)	0,60** (3,76)	0,72	2,42

d) SUR results for income of regions in the surrounding area of the City of Osijek

	ΔYOB	ΔYBB	ΔYVP	ΔYBP	ΔYPS	R^2	DW
ΔYPS	-0,05 (-0,21)	-0,58 (-3,12)	0,00 (0,02)	0,38 (1,47)		0,62	2,40
ΔYVP	0,22 (0,40)	0,46 (1,00)			0,52 (0,70)	0,43	2,17

e) SUR results for income of four major Croatian cities

	ΔYCZ	ΔYPG	ΔYSD	ΔYOB	R^2	DW
ΔYOB	-2,91** (-4,14)	-0,64 (-1,98)	-0,10 (-0,37)		0,76	1,92
ΔYPG	-1,59 (-1,50)		-0,24 (-0,99)	-0,56 (-1,99)	0,44	1,05
ΔYSD	-0,69 (-0,39)	-0,52 (-0,99)		-0,19 (-0,37)	0,13	2,19
ΔYCZ		-0,15 (-1,50)	-0,03 (-0,39)	-0,24** (4,14)	0,71	2,67

T-statistics are reported in the parenthesis below the regression coefficient. Significance at 1% level is denoted as **; at 5% as *.

According to regression results, income per capita growth pattern of seven counties out of 11 analysed counties can be explained by growth pattern of another country (with one county dismissed because of low Durbin-Watson statistic). Goodness of fit is satisfactory in all cases. The growth pattern of County of Zagreb, County of Karlovac and County of Lika-Senj can be explained by the growth pattern of the nearest major city – City of Zagreb in the first case, and City of Rijeka in the latter two cases. Regression coefficients are negative and this cannot be explained by other than the clear divergence of the two counties. In the remainder, there are three regions with cities of regional importance (County of Sisak-Moslavina, County of Bjelovar-Bilogora and County of Varaždin) where their income per capita is explained by income per capita of another country in the wider region, but the relation is negative. This could be explained by diverging developments in the main sectors of these counties associated with economic cycles. A number of counties where no explanatory variable has proven significant are counties with cities of local impact that seem to be developing independently of major cities, in many cases basing their economic development on specialisation in two to three major activities, and very often with just one larger firm and a number of smaller firms within each activity.

In assessing the results for four major cities only one explanatory variable is found significant, and also with a negative coefficient. This is in the case of City of Zagreb region and City of Osijek region. Again, this points to divergence between two cities. Major cities follow their own development pattern irrespectively of other major cities. This is an interesting finding in the light of the growing importance of urban networks and functional linkages between cities. Burgerabc, van der Knaapa and Walld (2013) can be brought up as a point of reference to this in the context of polycentricity. In the case of four major Croatian cities, perhaps better functional linkages are a missing link in the development coherence of these cities.

6. Conclusion

Sectoral transformation in the period between 2000 and 2011 in some Croatian counties has been radical (City of Zagreb, for example) and headed towards stronger services-share, while a number of counties remained specialised in agriculture and/or industry. Along with these changes, counties have steadily progressed in terms of income per capita at their own pace. This speed of growth is the determining factor of sharing a common growth path. Using the hierarchical clustering procedure, four clusters are identified in 2000 according to their sectoral structure and their level of development. They can be differentiated as: the leading cluster which is the urban cluster composed of counties headed by two important urban centres and; an industry-orientated cluster; industry-and-agriculture-orientated cluster and tourism-and-related services cluster as a runner-up. Repeating the same cluster procedure for 2011 yields a different cluster structure, a clear indicator of new development patterns accompanied by sectoral transformation. An additional cluster appears, consisting solely of City of Zagreb as an apparent result of the divergent development of the City of Zagreb from the rest of the country. This notion reinforces the importance of the issue of the monocentricity and its implications to the configuration of the national urban system and regional disparities. The cluster structure follows a geographical pattern where adjacent counties form clusters, and the pattern of four major cities, as clusters appear concentrated around these cities.

Using specialisation coefficient it is possible to come to the conclusion that the best-performing counties' structure is diversified compared to the country average. This is also the case of counties where four major cities are located. On the cluster level, increase in the level of specialisation, which mostly occurred in agriculture- and industry-orientated clusters, appears negatively associated with income per capita change. As the period under observation partially captures the period of the 2008 recession, it can be argued that these counties have fared worse in the recession period. At the end of the period, sectoral structures are becoming less similar across counties, in particular in tertiary and quaternary services and this is a major source in the overall increasing cross-country differences. On the other hand, industry and agriculture services shares are becoming more similar among counties. The public sector has played an important social role because it has been buffering the growing sectoral employment dissimilarities and weaknesses.

Coming to the issues of the presence of individual and common growth path, a number of methods have been used to overcome the weakness of the data and to come to an unequivocal conclusion. A random sample of 12 counties is chosen. Simple measures such

as the coefficient of variation and the sigma coefficient have proven useful in learning that the inequality of distribution of income per capita across Croatian counties has increased, pointing to divergence. These indicators have also followed a cyclical pattern with some counties faring better in some points in the business cycle. Distinct income distribution patterns of clusters point to club convergence. Some within-cluster convergence is occurring, but less developed clusters are diverging from the progressive clusters. Services-oriented clusters have proven less vulnerable in the economic downturn and better-performing throughout the observed period. Given their overall diversified economic structure, this notion seems to be in line with the theoretical proposition that more specialised regions are more susceptible to economic downturns and shocks.

Furthermore on the issue of convergence, panel unit root tests are used for confirming the presence of individual and common growth path. Additionally, a beta convergence model is tested with a pool regression on normalised income per capita panel data. The results confirmed that counties follow their own growth path and both unit root tests point to convergence, contradicting the cyclical pattern of income distribution and its growing inequality. In finding the link between a common growth path and sectoral similarities, a cross-correlation matrix is used both for sectoral shares and for income. Roughly only a fourth of all the possibly income-correlated links between counties have been confirmed and these counties are mostly situated in the Continental Croatia (NUTS level III). While a number of counties with similar sectoral structures are also income-correlated, the income-correlation coefficient is found negative in some cases. These findings suggest that similar economic structures across the country are in some cases performing similarly, and in some cases differently, leading to different levels of development. The findings are quite indicative of a missing link between similar sectoral structures and their directions of development. We presume that unobserved factors can account for these developments such as firms' investment policies, human capital endowments, technological deterioration, national economic policies and lately, regional development policies.

In an effort to further research factors that may be accountable for convergence of regions we examine the possibility that income growth pattern of one county is dependant on income growth pattern of neighbouring counties and the closest major city, we use seemingly unrelated regression. These types of relations can be explained with similar factor endowments and inter-sectoral linkages. Results confirm significance of income growth pattern of neighbouring counties, and in a few cases also the significance of the nearest major city. The regression coefficients were mostly negative and this cannot be explained by other than the divergence of the counties. Results were also revealing in terms of development of few counties headed by cities of local significance where no explanatory variable has proven significant suggesting that these counties are developing independently of major cities. Regions with major Croatian cities follow their own development pattern irrespectively of other major cities, with one case pointing to divergence from the City of Zagreb.

In conclusion, the results of econometric and statistical testing mostly are not unequivocal, but are neither confusing. Rather, it is probable that counties are selectively converging at different speed of growth. That is why club convergence seems most likely with the capital city clearly leading the way and the rest of the country following at its own pace, within its own development club headed by a major city. The implications of this research highlight the

role of four major cities in Croatia as historical development hubs of Croatian counties and raise the question of appropriateness of intra-EU country income-convergence research in the case of small economies as it appears that instead of country-convergence we may be researching income-convergence of metropolitan regions.

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