The Competitiveness of Exports from Manufacturing Industries in Croatia and Slovenia to the EU-15 Market: A Dynamic Panel Analysis

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Abstract

It is often stated that the growth prospects of nations are closely related to patterns of competitiveness exercised by their firms and industries in the international market. Building on foundations of endogenous growth and new trade theories academics and policy-makers postulate that quality-driven competitiveness bears higher growth potential than the ability to compete in terms of prices. The transition of Central and Eastern European Countries has been characterised by movement from the latter towards the former pattern of competitiveness. This process was facilitated by the transfer of knowledge and skills through the outsourcing of production from their most important trading partners, the West European members of the European Union (EU-15 countries), which paved the way for the development of intra-industry trade. This paper explores the competitiveness of manufacturing industries from Croatia and Slovenia in the EU-15 market. Using dynamic panel analysis we find that between 2002 and 2007 producers from the two countries followed different patterns of competitiveness. While in Slovenia the quality of exports is the main determinant of EU-15 market share, the competitiveness of Croatian producers still depends on their labour costs. We also find a strong impact of intra-industry trade on the competiveness of industries from the two countries in the EU-15 market.

Keywords: competitiveness, manufacturing industries, dynamic panel analysis, Croatia, Slovenia

JEL classification: F12, F14, F43

1 Introduction

For many academics and policy-makers the competitiveness of nations comes down to the ability of governments to create a socio-economic environment that can facilitate the development of business activities and attract foreign direct investment (FDI). Recent research in this field, however, emphasises the ability of firms and industries to compete in the international market, and particularly their competitive profiles. The roots of such thinking can be traced to propositions of endogenous growth models (Romer, 1990; Aghion and Howitt, 1998) and new trade theory (Krugman and Obstfeld, 2003) which suggest that the growth prospects of nations increase as their producers move from price- towards quality-driven competitiveness (Guerson, Parks and Torrado, 2007; Hausmann, Hwang and Rodrik, 2007).

Patterns of competitiveness are closely related to the technological intensity of industries (Lall, 2000). High-technology-intensive industries are characterised by differentiated products, and this enables their producers to expand by competing in terms of quality. Furthermore, knowledge and skill spillovers generated by these industries have a beneficial effect on related upstream and downstream sectors, which increases the growth potential of the entire economy. Low-technology-intensive industries are, however, characterised by standardised products which are sensitive to changes in prices, market trends and technology. The competitiveness of producers within these industries is primarily driven by an ability to undercut their rivals. Furthermore, low-technology-intensive industries bear limited potential for learning and spillovers to other industries, thus limiting growth prospects for the entire economy.

The movement from price- towards quality-driven competitiveness is particularly challenging for firms and industries in developing and transition economies. They often lack the relevant skills and knowledge, and face obstacles in accessing technology. International trade, particularly intra-industry trade (IIT), can help these producers to overcome such barriers. Spillovers generated through interactions with foreign rivals from the same industry, outsourcing of production from developed to developing economies as well as an inflow of foreign direct investment from the former to the latter are identified as potential channels for knowledge and technology transfer (Hoekman and Djankov, 1997).

The demise of central planning in Central and Eastern European Countries (CEECs) was followed by a strengthening of links with West European members of the European Union (EU-15 countries). Initially, exports from the CEECs to the EU-15 market were concentrated in the group of low-technology-intensive industries where they enjoyed a competitive advantage of low unit labour costs owing to the combination of growing labour productivity and stagnating or declining wages (Benacek and Visek, 2002; Havlik, 2005; Borbely, 2007). However, in later years producers from some of the CEECs have moved towards high-technology-intensive industries (Benacek, Prokop and Visek, 2006; Stojčić and Hashi, 2011).

An important feature of the exchange in goods and services between the CEECs and the EU-15 during the last two decades has been the rise of intra-industry trade. The main reason for this was the outsourcing of production and an inflow of FDI from the latter to the former group of countries. However, this process did not have the same features in all the countries. The countries that joined the EU in 2004 (Czech Republic, Hungary, Slovak Republic, Slovenia and Poland) moved towards industries of high technological intensity, paving the way for the rise of horizontal intra-industry trade with both the CEECs and the EU-15 through trading in goods of a similar level of sophistication (Havlik, 2005). However, the intra-industry trade of other CEECs (Croatia, Bulgaria and Romania) with the EU-15 was observed in less sophisticated industries (Mikić and Lukinić, 2004; Teodorović and Buturac, 2006). As Stojčić and Hashi (2011) report, the bulk of this trade was of the vertical intra-industry type with these CEECs exporting goods of lower technological intensity and importing more sophisticated goods.

The objective of this paper is to examine the competitiveness of manufacturing industries from two transition economies, Slovenia and Croatia, in the EU-15 market between 2002 and 2007. These two countries had the potential to be among the front-runners of transition, but in later years they did not realise this potential with equal degrees of success. The aim of this paper is to investigate whether prices, the principal mode of competition for producers of low-technology-intensive standardised goods, or quality, typical for competition in the sophisticated, high-technology-intensive segments of the market, determine the ability of producers from the two countries to compete in the EU-15 market. In keeping with the literature on competitiveness, costs of production are used as a proxy for price-driven competitiveness, and relative export unit values as indicators of quality (Buckley, Pass and Prescott, 1988; Aiginger, 1998; Warren, 1999; Wziatek-Kubiak, 2003; Havlik, 2005; Fischer, 2007; Stojčić and Hashi, 2011). In addition to these variables, the model also includes several controlling variables such as the measure of intra-industry trade and the technological intensity of industry.

The approach in this paper expands existing knowledge of the competitiveness of industries in transition economies in several ways. First, the modelling strategy specifically takes into account the dynamic nature of competitiveness as a concept that evolves over time, thus looking at the relationship between its current level and its past realisations. Second, the choice of dynamic panel analysis enables consideration of the potential endogeneity of explanatory variables. Endogeneity can arise from the correlation between, for example, measures of price and quality competitiveness and unobserved sources of heterogeneity in error term. Third, the methodology enables the distinction between the short- and long-term impact of different factors on the competitiveness of the analysed industries. These issues are widely acknowledged as important in the competitiveness literature on a theoretical level, but they have rarely been addressed in empirical research. More importantly, to the best of our knowledge, this study presents the first attempt to address international trade between CEECs and EU-15 countries in such a framework.

The paper is structured as follows. The next section establishes the relationship between the concepts of economic growth, international trade and patterns of industrial competitiveness. The stylised facts about the competitiveness of Croatian and Slovenian manufacturing industries are presented in Section 3. The specification of the model is presented in Section 4, followed by a discussion about the methodology in Section 5. The estimation results are presented in Section 6, with the conclusion forming Section 7.

2 Growth, Trade and Patterns of Industrial Competitiveness

In recent years, the growth prospects of nations have increasingly been linked with the international competitiveness of their firms and industries. Both academics and policy-makers nowadays argue that the ability to compete in terms of quality offers higher growth potential than price-driven competitiveness. The roots of such thinking can be traced to models of endogenous growth (Romer, 1990; Aghion and Howitt, 1998) and the new trade theory (Krugman, 1980; Krugman and Obstfeld, 2003). The general message coming from the literature is that, in the presence of market imperfections, specialisation in knowledge and technology-intensive products provides producers with an opportunity to differentiate themselves from their rivals, to compete in terms of quality, and to achieve above-average rates of growth. Furthermore, it is postulated that the spillovers generated by these sectors have a beneficial effect on the growth of upstream and downstream industries, which in turn increases the growth prospects of the entire economy (Lall, 2000).

This reasoning has particularly important implications for the efforts of developing economies to initiate growth and provide their citizens with a better standard of living. These economies typically participate in the international market as producers of low-technology-intensive standardised products that are characterised by price-driven competitiveness. The weakness of such a competitive pattern is that it can be pursued only for a limited period of time and does not provide foundations for sustainable growth (Lall, 2000). Price-driven competitiveness usually originates from the cost advantages of the producers. Once these advantages have been exploited the ability to compete diminishes, and a move towards the technology-intensive segments of the market and quality-driven competitiveness is needed. From there it follows that changes in export structures relating to goods of higher technological intensity, and a parallel movement from price- towards quality-driven competitiveness hold the key to the sustainable growth of industries and nations (Hausmann, Hwang and Rodrik, 2007; Guerson, Parks and Torrado, 2007).

This is a departure from the traditional view of the relationship between trade and growth, under which trade can be only of the inter-industry type, and patterns of specialisation can give rise to different rates of growth only in the short term (Sohn and Lee, 2010). However, the new trade theory explains that market imperfections, such as demand for variety or economies of scale, can give rise to intra-industry trade (Krugman and Obstfeld, 2003). By introducing demand for variety and economies of scale as determinants of international trade in addition to relative factor endowments, the literature argues that within the same industries nations will specialise in goods of different quality. Less developed economies abundant in labour and resources will export standardised low-technology-intensive goods, and their developed counterparts, rich in technology and knowledge, will specialise in sophisticated goods of higher technological intensity (Greenaway, Hine and Milner, 1995; Fukao, Ishido and Ito, 2003).

The above reasoning suggests that through changes in export structure and movement from price- towards quality-driven competitiveness nations can improve their growth prospects and consequently provide their citizens with a better standard of living. In the existing literature, the search for determinants of this change has developed in several directions. Most authors agree that the quality of the institutional environment acts as a decisive factor in this process (Hausmann, Hwang and Rodrik, 2007; Bastos and Silva, 2010). The movement of producers from one competitive profile towards another can be limited by market failures such as the prevalence of corruption, absence of property rights or inability to enforce contracts. In such cases, government intervention may be desirable in order to provide firms with relevant information and facilitate the quality upgrading of their exports.

Models with their roots in the endogenous growth theory suggest that the movement towards the higher quality segment of the market may be facilitated by self-investment in physical and human capital and innovation activities (Hummels and Klenow, 2005; Schott, 2008). Also, impetus may be provided by trade spillovers from import pressure (Fernandes and Paunov, 2009; Sohn and Lee, 2010), domestic competition (Lelarge and Nefussi, 2007), foreign direct investment (Hoekman and Djankov, 1997) or through a learning-by-exporting process (Brooks, 2006). Finally, the evidence from some studies indicates that the quality of today's exports may be related to their own past realisations (Iacovone and Javorcik, 2008; Fernandes and Paunov, 2009; Stojčić and Hashi, 2011). The rationale behind such reasoning is that quality upgrading requires learning and the acquisition of specialist knowledge which can be a lengthy process.

3 Stylised Facts about the Competitiveness of the Croatian and Slovenian Manufacturing Industries in the EU-15 Market

As is underlined in the introduction to this paper, the principal objective of the investigation is to explore the determinants of the competitiveness of exports from Croatia and Slovenia to the EU-15 market. When central planning ceased, there were several reasons why these two countries had the potential to be among the front-runners of transition. Being organised as semi-market economies with their producers traditionally oriented towards the West European EU countries, they were expected to move more rapidly than other transition economies towards the adoption of the market environment. In the years that followed, Slovenia managed to realise much of this potential, being among the first group of CEECs to join the EU in 2004. By contrast, Croatia was constrained in realising its full potential due to various reasons, of which war and late integration into regional, European and global economic associations were the most prominent.

To trace the evolution of the industrial competitiveness of the two countries in the EU-15 market, the database of manufacturing industries in the 2002-2007 period, at the 3-digit level of NACE classification, is constructed from several

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sources.[1] Data on volumes and quantities of exports and imports were taken from Eurostat's COMEXT database at the most detailed 8-digit level of Combined Nomenclature classification and converted and aggregated at the 3-digit NACE level.[2] Additionally, Eurostat's structural indicators database STAN in the case of Slovenia, and data from the Croatian Financial Agency (FINA) provided information about unit labour costs of industries. In total information is provided for 142 industries of which 91 are from Croatia and 51 from Slovenia. The lower number of industries in the Slovenian sample is due to the fact that for several industries data on key variables were not available. Hence, these industries had to be excluded from the analysis.

Competitiveness is measured by a variety of indicators. Broadly speaking, measures can be divided into two categories, those reflecting competitive performance and those referring to competitive potential (Buckley, Pass and Prescott, 1988). The former group encompasses measures such as profits or market share which reflect the performance of firms in relation to their rivals. The latter group refers to a variety of factors and forces that enable firms to outperform their rivals. These range from features of environment over characteristics of industries and firms to elements of their behaviour such as cost or price behaviour, productivity or quality of their products. It is taken as fact that drawing conclusions about the competitiveness of an individual economic entity on the basis of one group of indicators alone can be misleading. Therefore, the remaining part of this section looks into both competitive performance, measured through market share, and the competitive potential of the analysed industries, measured through unit labour costs and relative export unit values.

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1 The choice of the analysed period was determined by the availability of data on variables for Croatia, such as unit labour costs of industries.

2 The aggregation was undertaken by authors on the basis of correspondence tables between NACE and Combined Nomenclature classifications provided by Eurostat on their website. While for most industries Combined Nomenclature and NACE classification fully correspond to each other, this correspondence is not complete. Hence, some manufacturing industries had to be excluded from the analysis.

***Table 1:** Market Share of Exports from Manufacturing Industries in Croatia and Slovenia to EU-15 Market*

	2002	2003	2004	2005	2006	2007
Manufacturing sector						
Croatia (%)	0.07	0.08	0.09	0.08	0.08	0.09
Slovenia (%)	0.20	0.26	0.24	0.32	0.22	0.19
Slovenia/Croatia	2.90	3.20	2.70	4.00	2.70	2.20
Low-technology-intensive industries						
Croatia (%)	0.10	0.11	0.11	0.10	0.10	0.10
Slovenia (%)	0.15	0.14	0.13	0.24	0.22	0.14
Slovenia/Croatia	1.60	1.20	1.20	2.40	2.20	1.50
Medium-low technology-intensive industries						
Croatia (%)	0.05	0.06	0.11	0.06	0.06	0.07
Slovenia (%)	0.30	0.26	0.37	0.37	0.39	0.38
Slovenia/Croatia	6.40	4.50	3.30	6.30	7.00	5.10
Medium-high technology-intensive industries						
Croatia (%)	0.04	0.05	0.05	0.05	0.06	0.07
Slovenia (%)	0.15	0.30	0.18	0.22	0.13	0.13
Slovenia/Croatia	4.00	6.70	3.90	4.50	2.30	2.00
High-technology-intensive industries						
Croatia (%)	0.08	0.10	0.15	0.12	0.15	0.12
Slovenia (%)	0.59	0.75	1.09	1.30	0.46	0.43
Slovenia/Croatia	7.70	7.60	7.30	10.60	3.10	3.50

Source: Authors' calculations.

Table 1 contains data about the market share of exports from the manufacturing industries of Croatia and Slovenia to the EU-15 market. The market share is defined as the share of exports from the two countries in the apparent consumption of the EU-15.[3] In addition to their market shares, their relative ratios (Slovenia/Croatia rows) are also presented. It can be seen that industries from both countries participated in the EU-15 market with market shares which were below 0.5 percent. Furthermore, in all the years of the study Slovenian producers had a substantially higher market share than their Croatian counterparts. According to the OECD (2007) classification, the division of industries by their technological intensity reveals that, judging by their market share, Slovenian producers were

3 Apparent consumption refers to total value of production in the EU-15 augmented for value of its imports from the rest of the world from which the value of exports from the EU-15 to the rest of the world is subtracted.

more competitive in all the groups of industries.[4] The difference between the two was particularly emphasised in the high-technology-intensive group of industries. As has been asserted earlier, products belonging in this category are typically labelled as sophisticated goods and said to bear a high potential for growth.

The trends observed above can be caused by a variety of factors. On the one hand, it should be emphasised that through much of its transition years Croatia did not have an Accession Agreement with the EU like other CEECs. Such agreements have provided other countries, including Slovenia, with preferential access to the EU-15 market. Moreover, such agreements prevented producers from the signatory countries from sourcing their inputs from countries with no agreement. On the other hand, the explanations for these observed trends could be looked for in the restructuring of enterprises in the two countries. The restructuring could be reflected in factors forming the competitive potential of industries such as costs or product quality.

There is a vast amount of evidence that the impact of rising productivity in CEECs was amplified by stagnating or declining wages (Wziatek-Kubiak, 2003; Havlik, 2005). The unit labour cost indices in Table 2 are constructed as the ratio between personnel costs and turnover.[5] They are presented for each country and in relative terms as a ratio between unit labour costs in the two countries (Slovenia/Croatia row). As can be seen from the table, at the level of manufacturing and in low- and medium-high technology-intensive industries the level of unit labour costs was pretty much similar for both countries. Yet, in medium-low technology-intensive and high-technology-intensive industries the costs of labour in Slovenia were almost twice as high as those in Croatia.

4 A detailed list of industries classified according to their technological intensity on the basis of OECD (2007) classification is provided in Table A5 in the Appendix.

5 Costs of labour defined this way include wages and salaries as well as all the other related costs of labour for the employer.

Table 2: *Unit Labour Costs of Manufacturing Industries in Croatia and Slovenia*

	2002	2003	2004	2005	2006	2007
Manufacturing sector						
Croatia	0.18	0.18	0.17	0.16	0.16	0.16
Slovenia	0.19	0.20	0.19	0.19	0.18	0.17
Slovenia/Croatia	1.07	1.10	1.12	1.17	1.14	1.07
Low-technology-intensive industries						
Croatia	0.19	0.19	0.19	0.18	0.18	0.18
Slovenia	0.19	0.20	0.20	0.20	0.20	0.19
Slovenia/Croatia	1.00	1.06	1.04	1.13	1.08	1.07
Medium-low technology-intensive industries						
Croatia	0.14	0.14	0.13	0.12	0.12	0.11
Slovenia	0.22	0.21	0.21	0.21	0.19	0.19
Slovenia/Croatia	1.54	1.54	1.57	1.69	1.64	1.64
Medium-high technology-intensive industries						
Croatia	0.21	0.21	0.19	0.18	0.18	0.19
Slovenia	0.17	0.17	0.17	0.16	0.16	0.14
Slovenia/Croatia	0.83	0.83	0.89	0.90	0.87	0.75
High-technology-intensive industries						
Croatia	0.14	0.14	0.15	0.14	0.14	0.15
Slovenia	0.25	0.26	0.24	0.26	0.26	0.24
Slovenia/Croatia	1.76	1.82	1.66	1.83	1.81	1.62

Source: Authors' calculations.

In the context of the earlier findings of the paper which showed a high EU-15 market share of these industries, the evidence from Table 2 can be taken as a sign of investment in human capital, which is an important prerequisite of quality upgrading. In this context, higher labour costs are associated with the efforts of firms to attract high quality human capital by offering above-average wages. However, such a finding can also signal declining cost competitiveness. The latter explanation is closer to the findings from earlier transition literature which identified Slovenia, particularly in its more sophisticated sectors, as the country with the highest level of unit labour costs among the CEECs (Landesmann, 2000; Havlik, 2005).

All the above indicates that the ability of Slovenian manufacturing industries to outperform their rivals from Croatia in the EU-15 market can be attributed to the difference in the quality of exported products. A common way to measure the quality of exported products is to use indices of relative export unit values (REUV). These indices are constructed as a ratio of the value and volume of the goods which are being sold abroad (export unit values) divided by the ratio of the value and volume of exports from their rivals. In this case, the denominator is defined as the export unit value of goods imported into the EU-15 market from the rest of the world.[6] There is ongoing debate whether REUV presents an appropriate indicator of product quality. To this end, it is noted that at much higher levels of aggregation (such as 2 or 3 digit) REUV is much closer to the meaning of a proxy for quality than for prices (Fischer, 2007).[7]

The relative export unit values of exports from the two analysed countries to the EU-15 market are presented in Table 3. In addition to relative unit export values, calculated as a ratio between export unit values of exports from Croatian and Slovenian manufacturing industries and those of exports from other importers to the EU-15 market, a direct comparison of export unit values of the two countries' exports to the EU-15 market (Slovenia/Croatia row) is presented. The results in general confirm expectations. At the level of manufacturing and in all four groups of industries divided by their technological intensity the relative unit values of exports from the Slovenian manufacturing industries are higher. Furthermore, while over the analysed period the relative quality of Croatian exports to the EU-15 market was stagnating or declining, Slovenian exports have been subject to significant quality upgrading. This is particularly visible in the segment of high-technology-intensive industries where the relative unit value of exports from Slovenia, compared to that of other importers to the EU-15 market, increased by more than 4 times (from 0.28 in 2002 to 1.19 in 2007) and by about 6 times in comparison to the unit value of exports from Croatia over the analysed period

6 Most authors agree that producers from CEECs competed through much of the 1990s and 2000s in the EU-15 market with importers from other countries rather than with their counterparts from the EU-15.

7 This is explained by the fact that at high levels of disaggregation there may not be two-way trade in particular groups of products among countries.

(from 0.24 in 2002 to 1.48 in 2007). Together with previous evidence this latest finding signals that Slovenian manufacturing industries in an advanced stage of transition have shifted from price- to quality-driven competitiveness, while their Croatian counterparts have remained within their traditional patterns of behaviour based on price-driven competitiveness.

Table 3: *Relative Export Unit Values of Exports from Manufacturing Industries in Croatia and Slovenia to EU-15 Market*

	2002	2003	2004	2005	2006	2007
Manufacturing sector						
Croatia	0.52	0.55	0.53	0.43	0.43	0.48
Slovenia	0.68	0.85	0.82	0.92	0.84	0.82
Slovenia/Croatia	1.30	1.55	1.52	2.13	1.96	1.71
Low-technology-intensive industries						
Croatia	1.02	0.98	0.98	0.74	0.62	0.72
Slovenia	1.06	1.09	0.93	1.35	1.06	0.83
Slovenia/Croatia	1.04	1.12	0.95	1.82	1.69	1.15
Medium-low technology-intensive industries						
Croatia	0.37	0.57	0.77	0.42	0.46	0.43
Slovenia	1.11	1.15	0.85	0.91	0.80	0.90
Slovenia/Croatia	3.00	2.01	1.10	2.16	1.75	2.10
Medium-high technology-intensive industries						
Croatia	0.53	0.57	0.63	0.59	0.53	0.61
Slovenia	0.32	0.65	0.73	0.83	0.93	0.98
Slovenia/Croatia	0.59	1.14	1.14	1.41	1.77	1.62
High-technology-intensive industries						
Croatia	1.18	0.96	2.19	3.11	1.02	0.81
Slovenia	0.28	0.95	1.43	3.07	1.41	1.19
Slovenia/Croatia	0.24	0.99	0.65	0.98	1.39	1.48

Source: Authors' calculations.

4 Model Specification

The competitiveness of Croatian and Slovenian manufacturing industries in the EU-15 market is investigated by a model that encompasses factors and forces recognised in the existing literature as important determinants of the ability to compete. The starting point in the building of this model is the thesis that the competitiveness of firms and industries is a concept which refers to both their competitive performance and competitive potential. As stated previously, the former refers to the relative ranking of business entities (firms or industries) in their market in terms of market share or profitability. The latter encompasses the activities of firms, their characteristics and features of their environment. In line with much of the relevant literature, competitiveness is considered as a dynamic concept (Davies and Geroski, 1997; Hay and Liu, 1997; Halpern and Korosi, 2001; Mitchell and Skrzypacz, 2005; Borbely, 2007; Stojcic, Hashi and Telhaj, 2011; Stojčić and Hashi, 2011). For reasons such as the extended period for realisation, imperfect information etc. the full impact of changes in competitive potential may only be visible in the competitive performance of firms and industries after a time lag.

The competitive performance of industries is measured through the share of exports from Croatia and Slovenia in the apparent consumption of the EU-15 countries (*eums*). The competitive potential of industries is presented in the model with two variables. Relative unit labour costs (*rulc*) are defined as the ratio between unit labour costs in industry and the average unit labour costs in the manufacturing sector, while relative export unit values (*reuv*) are defined as the ratio between the export unit value of exports from the analysed countries to the EU-15 market and the same values calculated for EU-15 imports from the rest of the world. Hence, we assume that on the international market individual industries compete either by lowering their prices or by offering products of better quality.

The characteristics of industry enter this model with four variables. The Grubel-Lloyd index (*gl*) is included as the measure of intra-industry trade. This variable is intended to capture the knowledge and technology transfer which can be realised through import pressure, learning-by-exporting, but also strategic alliances and outsourcing of activities from EU-15 countries to CEECs. As has been explained earlier in this paper, the growth of intra-industry trade between CEECs and the EU-15 has to a large extent been driven by outsourcing of activities and foreign direct investment from the latter to the former group of countries. While not being an ideal indicator of knowledge and technology transfer, it is the closest measure available. Hence, it is expected that strengthening intra-industry trade increases the market share of the analysed industries in the EU-15 market.

Based on the OECD (2007) classification, industries are divided into four groups according to their technological intensity, being defined as low (*low*), medium-low (*mlow*), medium-high (*mhigh*) and high (*high*) technology-intensive industries. These are modelled with categorical variables, for which the low-technology-intensive industries, the group encompassing the largest number of industries, are taken as reference group. The inclusion of these variables is intended as a control for factors such as minimum efficient scale or the intensity of barriers to entry (Davies and Geroski, 1997; Stojcic, Hashi and Telhaj, 2011). Finally, the model includes a categorical variable representing the countries (*country*) in which the industries are located. As has been noted earlier, the transition paths of Croatia and Slovenia were to a large extent different. These differences are controlled by modelling country-specific effects.

5 Methodology

The choice of methodology is driven by the characteristics of the dataset and model. The longitudinal nature of the dataset requires looking for a suitable estimator in the family of panel estimators. Furthermore, a modelling approach which considers competitiveness to be a dynamic concept requires an estimator capable of including the lagged dependent variable. As this variable by definition will be correlated with time-invariant elements of the error term, the estimator must be capable of handling this source of potential endogeneity.

Another source of heterogeneity could be the correlation between additional explanatory variables and the error term. It is well established in transition literature that changes in the competitiveness of producers in transition economies have been influenced by economic policies such as trade agreements or the quality of the institutional framework. Quality of management is another factor. Finally, particular ownership structures as well as foreign direct investment have been identified as channels of knowledge and technology transfer which in turn have had a beneficial effect on the competitiveness of firms and industries (Grosfeld and Roland, 1996; Djankov and Murrell, 2002). Most of the above-mentioned factors and forces can be considered as time-invariant or slowly adjusting elements, meaning that they will be correlated with explanatory variables in all the analysed years. Failure to exclude this source of potential endogeneity would lead to biased and inconsistent estimates.

The estimation technique capable of dealing with the above-mentioned issues is the dynamic panel econometric technique (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998), which is part of the larger family of GMM (generalised method of moments) type estimators. In the presence of endogeneity this technique obtains unbiased and consistent estimates by means of instrumental variables. In its simplest form, with only one lagged dependent variable as an explanatory variable, the dynamic panel model can be written as follows:

$$y_{it} = \beta y_{it-1} + u_i + v_{it}, |\beta| < 1 \,, \tag{1}$$

where β stands for the parameter on the lagged dependent variable to be estimated, u_i stands for the individual time-invariant effects and v_{it} for idiosyncratic errors. The individual time-invariant effects are by definition correlated with the past realisations of the dependent variable, which leads to a problem of endogeneity. However, in the absence of serial correlation in idiosyncratic errors, the lagged differences or lagged levels of the endogenous variable can be used as its instruments (Arellano and Bond, 1991; Greene, 2002).

Dynamic panel estimators can take two forms – a difference or a system estimator. The former can be biased and inefficient in situations where the lagged levels are close to a random walk (Blundell and Bond, 1998; Roodman, 2009b). The system estimator has an advantage in such situations. This estimator builds a stacked dataset with twice the number of observations, one for the levels equation and one for the differenced equation, but it treats the system as a single equation with the same linear relationship believed to hold for both transformed (differenced) and untransformed (level) variables (Roodman, 2009b). The introduction of the levels equation is explained by the argument that earlier changes of a dependent variable (as well as of potentially endogenous explanatory variables) are more predictive of current levels than the levels can be for future changes when the series is close to random walk. Another advantage of the system estimator over the difference one is its ability to include time-invariant variables, which are differenced together with fixed effects in the latter case. Furthermore, supplementing the instruments for the differenced equation with those for the levels equation, the system estimator increases the amount of information used in the estimation, thus leading to an increase in efficiency (Roodman, 2009b).

While it is superior to the difference estimator in many aspects, the system estimator also has its weaknesses. The use of a large number of instruments with the system estimator can weaken the ability of relevant diagnostics (Hansen test) to reject the null hypothesis of instrument validity. There appears to be no agreement over the optimal number of instruments, even though it is suggested that the number should not exceed the number of groups (cross-sectional units) used in the estimation (Roodman, 2009a). Furthermore, for steady-state assumption to hold it is important that the coefficient of the lagged dependent variable takes an absolute value less than unity, so that the process is convergent. The process of convergence should not be correlated with time-invariant effects.

In this analysis the dynamic panel system GMM estimator is used. There are several reasons which justify this choice. First, the dynamic panel estimators enable taking into account the dynamic nature of competitiveness. Second, the use of dynamic panel estimators allows controlling for potential endogeneity of the lagged dependent variable as well as that of other endogenous explanatory variables caused by the correlation between them and time-invariant elements of the error term. Third, given that several variables of interest in the model are modelled as categorical variables it is more reasonable to use the system estimator which allows the inclusion of time-invariant variables. Fourth, as has been mentioned earlier, in the presence of random walk or near random walk processes the system estimator is more efficient than the difference one. Finally, as will be explained, dynamic panel estimators enable distinguishing the short-term from the long-term effects of explanatory variables.

To obtain an estimator robust to modelled patterns of heteroscedasticity and cross-sectional correlation, a two-step procedure is followed in which the residuals from the first step are used to construct the proxy for the optimal weighting matrix which is then embodied in the feasible GMM estimator. As the standard errors obtained in this procedure can be biased downwards when the number of instruments is large, Windmeijer's (2005) corrections for the two-step standard errors are used. Finally, the use of dynamic analysis allows distinguishing between the short- and long-term effects. Extending the equation given above with an additional explanatory variable x gives us the following form:

$$y_{it} = \beta_1 y_{it-1} + \beta_2 x_{it} + u_i + v_{it}, |\beta| < 1 \quad . \tag{2}$$

In Equation 2 the β_1 is the estimated parameter on the lagged dependent variable while the coefficient β_2 is the estimated parameter on variable x and is known as the short-term multiplier which represents only a fraction of the desired change in a dependent variable (Greene, 2002: 568). To compute the long-term effect the long-term multiplier which is defined as $1/(1–\beta_1)$ is multiplied by the above-mentioned short-term coefficient. The standard error and the corresponding t-statistic for the coefficient obtained in this way can then be calculated using the delta method (Greene, 2002: 569; Papke and Wooldridge, 2005: 413). It should be emphasised, though, that the results obtained in this way are only valid under the assumption of the system's stability, i.e. the lack of structural breaks over the course of time, which may be considered in some cases as a major simplification.

6 Discussion of Findings

To obtain further insight into the competitiveness of firms and industries from Croatia and Slovenia in the EU-15 market the econometric model is estimated in the form:

$$CI_{it} = c + \alpha CI_{it-1} + \beta x_{it} + u_i + v_{it} \quad , \tag{3}$$

where CI represents the measure of competitiveness (defined as the share of the manufacturing industry from Croatia or Slovenia in the apparent consumption of the EU-15), while x is a matrix of explanatory variables as defined in Section 3. Furthermore, u_i represents time-invariant unobserved factors while v_{it} stands for the usual idiosyncratic errors. Substituting x with a set of explanatory variables our model takes the form of:

$$\begin{aligned} CI_{it} = c + \alpha CI_{it-1} + \beta_1 reuv_{it} + \beta_2 rulc_{it} + \beta_3 gl_{it} + \beta_4 mlow_{it} + \beta_5 mhigh_{it} \\ + \beta_6 high_{it} + \beta_7 country_i + u_i + v_{it} \quad . \end{aligned} \tag{4}$$

Three specifications are estimated, one each for Croatia and Slovenia, and one with all the industries from both countries together.

All non-categorical variables enter the model in logarithmic form. A set of annual dummy variables is also included. The inclusion of these variables is intended to control for cross-sectional dependency which might arise from the impact of universal time shocks on all the cross-sectional units (Sarafidis, Yamagata and Robertson, 2009). The model is estimated using the statistical software Stata 11 with the lagged dependent variable being treated as predetermined and variables measuring relative unit export value (quality of exports), unit labour costs (proxy for prices) and intra-industry trade as potentially endogenous. These variables are instrumented in the instrumentation matrix with their own lags and differences while exogenous variables enter this matrix on their own. For expositional convenience only the results of the main variables of interest are presented, while the coefficients of year-dummy variables can be found in the Appendix.

Before turning to the interpretation of the results it is important to address the model diagnostics which are presented in Table 4. From this it can be seen that all major diagnostics provide support to the model. First of all, the validity of instruments is confirmed with both the Hansen test and the Arellano-Bond test for autocorrelation in differences of residuals. While in the former test there is insufficient evidence to reject the null hypothesis of valid instruments, the diagnostics of the latter test suggest that there is autocorrelation of first order but no autocorrelation of second order in differences of errors.[8] Also, the number of instruments is relatively low in comparison to the number of cross-sectional groups, which means that the previously mentioned tests are not likely to be weakened.

To check for further sources of cross-sectional dependence the difference-in-Sargan test for levels equation is used (see Appendix). There is insufficient evidence to reject the null hypothesis of valid instruments for levels, which implies that the steady-state assumption is satisfied and the system estimator should be preferred over the difference one. Similarly, dummy variables for individual years are insignificant, suggesting that the units are not subject to universal time shocks. Further support for this thesis comes from an examination of the difference-in-Sargan test for the lagged dependent variable. Roodman (2009b) notes that the value of the true dynamic estimator should lie between the values obtained by the OLS and fixed effects methods. This is the case in this estimation (see Appendix). Finally, the Wald test for joint significance of explanatory variables suggests that the variables have explanatory power jointly. Together, all these diagnostics indicate that the model is well specified.

8 The m1/m2 test for autocorrelation in disturbances (Arellano and Bond, 1991) examines whether there is no first- and second-order autocorrelation of the error term in the first-differenced equation, where the null hypothesis is of no autocorrelation. The test checks for autocorrelation of first and second order for which reason it is known as the m1/m2 test. It is expected that differences of errors are correlated in terms of the MA(1) process, i.e. there is negative correlation of first order. However, it is also expected that there is no second-order autocorrelation in disturbances, i.e. no MA(2) processes which makes the second and higher lags of potentially endogenous variables valid instruments.

Table 4: *Estimation Results*

	Croatia		*Slovenia*		*Joint estimation*	
	Short run	**Long run**	**Short run**	**Long run**	**Short run**	**Long run**
Lagged dependent variable	0.25 (0.01)**	-	0.23 (0.01)**	-	0.32 (0.00)***	-
Constant term	-4.96 (0.00)***	-6.67 (0.00)***	-5.58 (0.00)***	-7.22 (0.00)**	-3.65 (0.00)***	-5.37 (0.00)***
Relative export unit value	0.15 (0.22)	0.20 (0.21)	0.38 (0.06)*	0.49 (0.04)**	0.0003 (0.99)	0.0005 (0.99)
Unit labour costs	-0.39 (0.03)**	-0.53 (0.04)**	-0.16 (0.80)	-0.21 (0.81)	-0.34 (0.08)*	-0.50 (0.10)*
Intra-industry trade	0.79 (0.00)***	1.07 (0.00)***	-0.19 (0.31)	-0.25 (0.33)	0.65 (0.00)***	0.97 (0.00)***
Medium-low technology-intensive industry	0.11 (0.570)	0.15 (0.57)	0.48 (0.30)	0.63 (0.32)	0.03 (0.86)	0.05 (0.86)
Medium-high technology-intensive industry	0.28 (0.076)*	0.37 (0.08)*	1.04 (0.00)***	1.35 (0.00)***	0.23 (0.22)	0.34 (0.20)
High-technology-intensive industry	0.24 (0.321)	0.32 (0.33)	0.91 (0.00)***	1.18 (0.00)***	0.11 (0.59)	0.16 (0.59)
Country	-	-	-	-	-0.84 (0.00)***	-1.24 (0.00)***
Number of observations	452		246		698	
Number of groups	91		51		142	
Wald test	331.03		69.09		485.48	
Prob>chi^2	0.000		0.000		0.000	
Sargan/Hansen J statistics	40.03		23.68		26.78	
Prob>chi^2	0.601		0.422		0.58	
Arellano-Bond test for AR(1) in first differences	-1.94		-2.08		-3.23	
Prob>chi^2	0.052		0.038		0.001	
Arellano-Bond test for AR(2) in first differences	1.12		-0.21		1.46	
Prob>chi^2	0.262		0.833		0.14	
Instrument count	55		35		42	

Notes: p-values in parentheses where ***, ** and * denote statistical significance of variables at 1, 5 and 10 percent level respectively; p-values are obtained from two-step dynamic panel procedure with Windmeijer's corrected robust standard errors. All specifications include year dummies.
Source: Authors' calculations.

In all three specifications the coefficient of the lagged dependent variable is highly significant and positive, which provides support to the thesis that the present ability of industries to compete depends on their past realisations. The magnitude of coefficient ranges around 0.3 meaning that the 1 percent increase in the market share of industries from Croatia and Slovenia in the EU-15 market in previous periods led to 0.3 percent higher market share of these industries in the long run. The inclusion of the lagged dependent variable enables calculation of the long-term multiplier which implies that the impact of the explanatory variables on the competitiveness of the analysed industries in the long run is about 1.4 times higher, as can be seen from the "Long run" column in Table 4.

A comparison of the findings across the two countries indicates that their industries follow different competitive profiles in their struggle for a share of the EU-15 market. While the ability of Croatian industries to sell their goods and services in that market increases for about 0.4 percent with a 1 percent reduction in their unit labour costs, the competitiveness of Slovenian industries is mainly driven by improvements in the relative quality of exports. A 1 percent higher relative unit value of exports produces an effect of the same size as the aforementioned cost reductions in Croatian industry. Curiously enough, intra-industry trade does not seem to have any impact on the competitiveness of Slovenian industries, while in Croatia its 1 percent increase leads to a higher market share of about 0.8 percent. The technological intensity of industry does not seem to be important in the case of Croatia, while in Slovenia the export market share of industries increases with the rise in their technological intensity.

How can one interpret these findings? Most authors agree that in the second decade of transition most transition economies from Central and Eastern Europe have moved their competitive profiles towards more sophisticated goods and quality-driven competitiveness (Havlik, 2005). The findings of this paper for Slovenia provide further support for this thesis. However, the findings of Stojčić and Hashi (2011) suggest that even though the structure of Croatian exports to the EU-15 from 2000 onwards moved from low-towards high-technology-intensive industries, the exchange between the two entities was dominated by vertical intra-industry trade. The findings of this paper for Croatia are along the same lines.

Several implications arise. First, as mentioned in the introduction of this paper, price-driven competitiveness makes producers particularly vulnerable to pressure from competition, market shifts and changes in technology as well as changes in the economic environment such as exchange rate movements. Second, the fact that such a pattern of competitiveness is typical for producers of standardised products which bear low added value means that they bear low growth potential. Third, the poor ability of such sectors to generate spillovers to related industries also implies lower growth potential for the entire manufacturing sector and consequently for the entire economy. Finally, the fact that price-driven competitiveness does not form a basis for sustainable growth suggests that structural changes may be needed in order to increase the ability of Croatian producers to compete and outperform their rivals in the long run.

The third column of Table 4 presents an estimation in which industries from the two countries are brought together. Accordingly, the intention is to investigate whether country-specific factors have any impact on the competitiveness of the analysed industries. As can be seen from the presented results, taken as a whole the most important factors for the ability of the analysed industries to compete are the costs of labour and intra-industry trade. Of these, the latter is particularly important, as in the long run increases in intra-industry trade translate completely into higher competitiveness of producers in the EU-15 market.

Such findings can be attributed to the knowledge and technology spillovers which are usually associated with horizontal intra-industry trade as well as with vertical knowledge transfer mechanisms such as outsourcing, strengthening of linkages with suppliers or learning-by-exporting effect. However, the most important finding is the negative and highly statistically significant coefficient on the country variable. As our base category is Slovenia it follows that Croatian industries are, in general, less competitive than their Slovenian counterparts in the EU-15 market. Such a finding can be associated with the late inclusion of Croatia in regional and European political and economic integration but it can also be attributed to the restructuring of enterprises in the two countries.

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7 Conclusion

Growth prospects of nations are increasingly being determined by the competitiveness of their industries in the international market. Recent research on the relationship between trade and growth suggests that the structure of exported products is by far the more important question for the ability to export. It is postulated that nations whose producers export sophisticated goods and compete in quality have much higher growth prospects and can reach a higher level of development more easily. Such reasoning is increasingly being adopted by policy-makers across the world, who are continuously searching for new policies to stimulate the restructuring of their economies towards quality-driven competitiveness.

This paper has adopted a novel approach, taking into account the dynamics of competitiveness, the potential endogeneity of explanatory variables and the distinction between the short and long term to analyse patterns of competitiveness exercised by exports of the manufacturing industries from Slovenia and Croatia in the EU-15 market. The results indicate that over the past decade industries from Slovenia competed in the EU-15 market mainly in terms of quality, while their Croatian counterparts are still relying on costs as their main competitive advantage. Such a competitive profile offers limited growth potential, particularly for a small and open economy such as Croatia.

Appendix

Table A1: *Estimation for Slovenia*

Estimated parameters

Dynamic panel data estimation, two-step system GMM

Group variable: NACE	Number of obs		=	246
Time variable: year	Number of groups		=	51
Number of instruments = 35	Obs per group:	min	=	3
Wald chi²(11) = 69.09		avg	=	4.82
Prob > chi² = 0.000		max	=	5

eums	Coef.	Corr. std. err.	z	P>z	[95% conf.	interval]
eums L1.	0.2274559	0.090961	2.50	0.012	0.0491755	0.4057362
reuv	0.3785182	0.2000059	1.89	0.058	-0.0134863	0.7705226
rulc	-0.1623353	0.6497654	-0.25	0.803	-1.435852	1.111181
gl	-0.1876945	0.1861406	-1.01	0.313	-0.5525235	0.1771344
mlow	0.4838071	0.4704248	1.03	0.304	-0.4382085	1.405823
mhigh	1.04423	0.2657988	3.93	0.000	0.5232737	1.565186
high	0.9088353	0.2867865	3.17	0.002	0.3467441	1.470927
yr3	0.1428924	0.219461	0.65	0.515	-0.2872433	0.573028
yr4	0.0856478	0.1864755	0.46	0.646	-0.2798375	0.4511331
yr5	0.1647608	0.196252	0.84	0.401	-0.2198861	0.5494077
yr6	0.3260603	0.2026367	1.61	0.108	-0.0711004	0.723221
_cons	-5.580422	0.7531156	-7.41	0.000	-7.056501	-4.104342

Model diagnostics

Arellano-Bond test for AR(1) in first differences:	z = -2.08		Pr > z = 0.038
Arellano-Bond test for AR(2) in first differences:	z = -0.21		Pr > z = 0.833
Sargan test of overid. restrictions:	chi²(23)	= 40.46	Prob > chi² = 0.014
Hansen test of overid. restrictions:	chi²(23)	= 23.68	Prob > chi² = 0.422
Difference-in-Hansen tests of exogeneity of instrument subsets:			
GMM instruments for levels			
Hansen test excluding group:	chi²(6)	= 6.57	Prob > chi² = 0.363
Difference (null H = exogenous):	chi²(17)	= 17.11	Prob > chi² = 0.447
gmm(reuv, lag(2 2))			
Hansen test excluding group:	chi²(14)	= 18.77	Prob > chi² = 0.174
Difference (null H = exogenous):	chi²(9)	= 4.91	Prob > chi² = 0.842
gmm(rulc, lag(2 2))			
Hansen test excluding group:	chi²(14)	= 16.63	Prob > chi² = 0.276
Difference (null H = exogenous):	chi²(9)	= 7.05	Prob > chi² = 0.632
gmm(gl, lag(2 2))			
Hansen test excluding group:	chi²(14)	= 18.56	Prob > chi² = 0.182
Difference (null H = exogenous):	chi²(9)	= 5.11	Prob > chi² = 0.824

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iv(mlow mhigh high)			
Hansen test excluding group:	$chi^2(20)$	= 22.31	Prob > chi^2 = 0.324
Difference (null H = exogenous):	$chi^2(3)$	= 1.36	Prob > chi^2 = 0.714
iv(yr3 yr4 yr5 yr6)			
Hansen test excluding group:	$chi^2(19)$	= 20.46	Prob > chi^2 = 0.368
Difference (null H = exogenous):	$chi^2(4)$	= 3.22	Prob > chi^2 = 0.522

Long-run coefficients

eums	Coef.	Std. err.	z	P>|z|	[95% conf.	interval]
lrreuv	0.4899631	0.2395473	2.05	0.041	0.0204591	0.9594672
lrulc	-0.2101307	0.8508736	-0.25	0.805	-1.877812	1.457551
lrgl	-0.2429564	0.2503016	-0.97	0.332	-0.7335386	0.2476258
lrmlow	0.6262518	0.6289397	1.00	0.319	-0.6064473	1.858951
lrmhigh	1.351677	0.3122062	4.33	0.000	0.7397637	1.963589
lrhigh	1.176419	0.4032398	2.92	0.004	0.3860831	1.966754
lrcons	-7.223434	0.408226	-17.69	0.000	-8.023543	-6.423326

Table A2: *Estimation for Croatia*

Estimated parameters

Dynamic panel data estimation, two-step system GMM

Group variable: NACE	Number of obs		=	452
Time variable: year	Number of groups		=	91
Number of instruments = 55	Obs per group:	min	=	3
Wald $chi^2(11)$ = 331.03		avg	=	4.97
Prob > chi^2 = 0.000		max	=	5

eums	Coef.	Corr. std. err.	z	P>z	[95% conf.	interval]
eums L1.	0.2553887	0.0988626	2.58	0.010	0.0616215	0.4491558
reuv	0.1477173	0.1194638	1.24	0.216	-0.0864274	0.3818621
rulc	-0.3911725	0.1760764	-2.22	0.026	-0.7362759	-0.0460691
gl	0.7958199	0.1258996	6.32	0.000	0.5490612	1.042579
mlow	0.1122524	0.1973553	0.57	0.570	-0.2745568	0.4990617
mhigh	0.2776238	0.1566335	1.77	0.076	-0.0293721	0.5846197
high	0.2407781	0.2424879	0.99	0.321	-0.2344894	0.7160456
yr3	0.091327	0.0514508	1.78	0.076	-0.0095147	0.1921686
yr4	0.0691603	0.0611601	1.13	0.258	-0.0507112	0.1890318
yr5	0.1611049	0.0648009	2.49	0.013	0.0340975	0.2881124
yr6	0.2064077	0.0636321	3.24	0.001	0.0816911	0.3311244
_cons	-4.961735	0.6623739	-7.49	0.000	-6.259964	-3.663506

Model diagnostics		
Arellano-Bond test for AR(1) in first differences:	z = -1.94	Pr > z = 0.052
Arellano-Bond test for AR(2) in first differences:	z = 1.12	Pr > z = 0.262

Sargan test of overid. restrictions:	$chi^2(43)$	= 101.33	Prob > chi^2 = 0.000
Hansen test of overid. restrictions:	$chi^2(43)$	= 40.03	Prob > chi^2 = 0.601
Difference-in-Hansen tests of exogeneity of instrument subsets:			
GMM instruments for levels			
Hansen test excluding group:	$chi^2(28)$	= 25.23	Prob > chi^2 = 0.615
Difference (null H = exogenous):	$chi^2(15)$	= 14.80	Prob > chi^2 = 0.466
gmm(L.eums, lag(1 .))			
Hansen test excluding group:	$chi^2(30)$	= 29.49	Prob > chi^2 = 0.492
Difference (null H = exogenous):	$chi^2(13)$	= 10.54	Prob > chi^2 = 0.649
gmm(reuv, collapse lag(2 .))			
Hansen test excluding group:	$chi^2(39)$	= 35.82	Prob > chi^2 = 0.616
Difference (null H = exogenous):	$chi^2(4)$	= 4.21	Prob > chi^2 = 0.378
gmm(rulc gl, lag(2 .))			
Hansen test excluding group:	$chi^2(13)$	= 7.63	Prob > chi^2 = 0.867
Difference (null H = exogenous):	$chi^2(30)$	= 32.39	Prob > chi^2 = 0.349
iv(mlow mhigh high yr3 yr4 yr5 yr6)			
Hansen test excluding group:	$chi^2(36)$	= 33.63	Prob > chi^2 = 0.582
Difference (null H = exogenous):	$chi^2(7)$	= 6.39	Prob > chi^2 = 0.495

Long-run coefficients

eums	**Coef.**	**Std. err.**	**z**	**P>|z|**	**[95% conf.**	**interval]**
lrreuv	0.1983818	0.1572386	1.26	0.207	-0.1098002	0.5065638
lrulc	-0.5253378	0.2598848	-2.02	0.043	-1.034703	-0.0159729
lrgl	1.068772	0.0911018	11.73	0.000	0.890216	1.247328
lrmlow	0.1507531	0.2660424	0.57	0.571	-0.3706805	0.6721866
lrmhigh	0.3728439	0.2095984	1.78	0.075	-0.0379614	0.7836492
lrhigh	0.3233608	0.328679	0.98	0.325	-0.3208383	0.9675599
lrcons	-6.663523	0.248703	-26.79	0.000	-7.150972	-6.176074

Table A3: *Estimation for Joint Sample*

Estimated parameters						
Dynamic panel data estimation, two-step system GMM						
Group variable: NACE				Number of obs		= 698
Time variable: year				Number of groups		= 142
Number of instruments = 42				Obs per group:	min	= 3
Wald $chi^2(12)$ = 485.48					avg	= 4.92
Prob > chi^2 = 0.000					max	= 5
eums	**Coef.**	**Corr. std. err.**	**z**	**P>|z|**	**[95% conf.**	**interval]**
eums L1.	0.3214103	0.1072553	3.00	0.003	0.1111937	0.5316269
reuv	0.0003345	0.1311732	0.00	0.998	-0.2567602	0.2574293
rulc	-0.3407048	0.1935786	-1.76	0.078	-0.7201119	0.0387022
gl	0.655412	0.1535591	4.27	0.000	0.3544417	0.9563823
country	-0.843754	0.1796116	-4.70	0.000	-1.195786	-0.4917218
mlow	0.0333996	0.183421	0.18	0.856	-0.3260988	0.3928981
mhigh	0.2296538	0.1879469	1.22	0.222	-0.1387153	0.5980229
high	0.1080884	0.2005657	0.54	0.590	-0.2850131	0.50119
yr3	-0.0152575	0.0939867	-0.16	0.871	-0.199468	0.168953
yr4	-0.0403184	0.0764267	-0.53	0.598	-0.190112	0.1094753
yr5	-0.0319755	0.0862275	-0.37	0.711	-0.2009783	0.1370272
yr6	0.0582761	0.0851714	0.68	0.494	-0.1086568	0.2252089
_cons	-3.645576	0.6511782	-5.60	0.000	-4.921862	-2.36929

Model diagnostics			
Arellano-Bond test for AR(1) in first differences:	z = -3.23		Pr > z = 0.001
Arellano-Bond test for AR(2) in first differences:	z = 1.46		Pr > z = 0.144
Sargan test of overid. restrictions:	$chi^2(29)$	= 70.34	Prob > chi^2 = 0.000
Hansen test of overid. restrictions:	$chi^2(29)$	= 26.78	Prob > chi^2 = 0.583
Difference-in-Hansen tests of exogeneity of instrument subsets:			
GMM instruments for levels			
Hansen test excluding group:	$chi^2(14)$	= 16.82	Prob > chi^2 = 0.266
Difference (null H = exogenous):	$chi^2(15)$	= 9.96	Prob > chi^2 = 0.822
gmm(L.eums, lag(1 1))			
Hansen test excluding group:	$chi^2(22)$	= 22.35	Prob > chi^2 = 0.439
Difference (null H = exogenous):	$chi^2(7)$	= 4.43	Prob > chi^2 = 0.729
gmm(reuv, lag(2 2))			
Hansen test excluding group:	$chi^2(21)$	= 15.46	Prob > chi^2 = 0.799
Difference (null H = exogenous):	$chi^2(8)$	= 11.32	Prob > chi^2 = 0.184
gmm(rulc, lag(2 .))			
Hansen test excluding group:	$chi^2(14)$	= 14.58	Prob > chi^2 = 0.408
Difference (null H = exogenous):	$chi^2(15)$	= 12.20	Prob > chi^2 = 0.663
gmm(gl, collapse lag(2 3))			

Hansen test excluding group:	$chi^2(26)$	= 23.40	Prob > chi^2 = 0.610
Difference (null H = exogenous):	$chi^2(3)$	= 3.38	Prob > chi^2 = 0.337
iv(country mlow mhigh high yr3 yr4 yr5 yr6)			
Hansen test excluding group:	$chi^2(21)$	= 25.57	Prob > chi^2 = 0.223
Difference (null H = exogenous):	$chi^2(8)$	= 1.22	Prob > chi^2 = 0.996

Long-run coefficients

eums	**Coef.**	**Std. err.**	**z**	**P>|z|**	**[95% conf.**	**interval]**
lrreuv	0.000493	0.193288	0.00	0.998	-0.3783445	0.3793305
lrulc	-0.5020778	0.3117418	-1.61	0.107	-1.113081	0.108925
lrcountry	-1.243394	0.2529863	-4.91	0.000	-1.739238	-0.7475494
lrgl	0.9658444	0.1459907	6.62	0.000	0.6797079	1.251981
lrmlow	0.0492192	0.2696454	0.18	0.855	-0.4792761	0.5777145
lrmhigh	0.3384281	0.2645747	1.28	0.201	-0.1801287	0.8569849
lrhigh	0.1592839	0.2940414	0.54	0.588	-0.4170265	0.7355944
lrcons	-5.372284	0.2421219	-22.19	0.000	-5.846834	-4.897733

Table A4: *Comparison of Estimated Parameters on Lagged Dependent Variable*

Estimation technique	**Slovenia**	**Croatia**	**Joint estimation**
Fixed effects panel estimator	-0.03(0.56)	0.05(0.03)**	0.06(0.04)**
Dynamic panel system GMM estimator	0.23(0.01)**	0. 25(0.01)**	0.32(0.00)***
Ordinary least squares (OLS) estimator	0.44(0.00)***	0.61(0.00)***	0.66(0.00)***

Notes: p-values in parentheses where ***, ** and * denote statistical significance of variables at 1, 5 and 10 percent level respectively.

Table A5: Classification of Industries by Technological Intensity

Description	NACE code
High-technology-intensive industries	
Aircraft and spacecraft	353
Pharmaceuticals	2423
Office accounting and computing machinery	30
Radio, TV and communications equipment	32
Medical, precision and optical instruments	33
Medium-high technology-intensive industries	
Chemicals excluding pharmaceuticals	24 excl. 2423
Electrical machinery and apparatus n.e.c.	31
Motor vehicles, trailers and semi-trailers	34
Railroad equipment and transport equipment, n.e.c.	352+355
Machinery and equipment, n.e.c.	29
Medium-low technology-intensive industries	
Coke, refined petroleum products and nuclear fuel	23
Rubber and plastic products	25
Other non-metallic mineral products	26
Basic metals and fabricated metal products	27-28
Building and repairing of ships and boats	351
Low-technology-intensive industries	
Food products, beverages and tobacco	15-16
Textiles, textile products, leather and footwear	17-19
Wood, pulp, paper, paper products, printing and publishing	20-22
Manufacturing n.e.c, recycling	36-37

Source: OECD (2007).

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