The structure and quality upgrading of Croatian exports to EU15 market

Stojcic, Nebojsa and Hashi, Iraj

University of Dubrovnik, Department of Economics and Business, Staffordshire University

March 2011

The structure and quality upgrading of Croatian exports to EU15 market

Nebojsa Stojcic
University of Dubrovnik
nstojcic@unidu.hr

Iraj Hashi
Staffordshire University
i.hashi@staffs.ac.uk

Abstract

This paper aims to explore the changes in the structure of Croatian exports to EU15 market. Our analysis is nested in the wide body of literature which postulates that the structure of exported products has important role for explaining the ability of nations to grow and to provide their citizens with better standard of living. Substantial body of evidence points that, following demise of central planning, most transition economies penetrated market of EU15 countries as producers of price-competitive products but that over time some of them shifted to quality-competitive segments of market. Our investigation aims to identify whether there has been a change in the structure of Croatian exports to EU15 market, if any change was of inter- or intra-industry type and how the quality of Croatian exports to this market can be improved. To address these issues we apply dynamic shift and share and dynamic panel methodologies to a panel of 89 3-digit manufacturing industries in the period between 2001 and 2007. Our results indicate that, over the years, Croatian exporters to EU15 market have shifted from low technology intensive towards high technology intensive industries but within these sectors Croatian trade with EU15 had all the characteristics of vertical intra-industry trade, a pattern typical for exchange between developed and developing economies. Furthermore, investment in new technology, innovations and import-led spillovers have key role in improvements in the relative quality of exports.

Keywords: competitiveness, trade, growth, quality upgrading, manufacturing

JEL: F12, F43

1. Introduction

There is a long standing debate in the trade and growth literature over the question whether the structure of nation's exports matters for its growth. Recent contributions in this literature suggest that the level of sophistication embodied in a country's exports has an important role in explaining the growth potential of that country. This literature argues that quality based competitive profiles embody a higher growth potential than price based profiles. Therefore the key issue for the competitiveness of developing and transition economies is the identification of factors and forces which can lead to the quality upgrading of their exports. In a sizeable body of literature these factors and forces have been identified by the theories explaining the behaviour of firms and industries by the Austrian, evolutionary and institutional economics schools.

Following the demise of central planning, transition economies reoriented their international trade towards the economies of EU15 whose markets they penetrated as producers of price-competitive products. Even though EU15 countries have been the most important trading partners of transition economies the trade between these two blocks has for a long time been of vertical intra-industry type with transition economies exporting products of lower quality to the EU15 market and importing from there more sophisticated products (Aturupane et al., 1997; Rojec and Ferjancic, 2006). However, in later years of transition, exporters from several transition economies, particularly those in Central and East European Countries (CEECs), have shifted from low to high technology intensive industries and to high quality segments of the market (Havlik, 2000; Benacek et al., 2006).

The structure and geographical direction of exports from transition economies have been investigated by a large number of studies. Yet, relatively little quantitative empirical work on the factors affecting improvements in the quality of exports to EU15 has been undertaken (Hoekman and Djankov, 1997; Dulleck et al., 2005). This is particularly true for group of 'laggard' transition economies which have not yet joined the EU and which includes Croatia. Bearing in mind that Croatia is country with the highest prospect of becoming the next EU member, it is important to address the ability of its producers to compete on EU market. The present investigation aims to identify whether there has been a change in the structure of Croatian export to EU15 market, if any change was of inter- or intra-industry type, and how the quality of Croatian exports to this market can be improved.

Outside the transition context, several studies have investigated the determinants of quality upgrading of exported products measuring the quality of exports with the unit export values (Dulleck et al., 2005; Lelarge and Nefussi, 2007; Monfort et al., 2008; Fernandes and Paunov, 2009; Bastos and Silva, 2010), the indices of specialisation such as RCA (Hoekman and Djankov, 1997) and by the productivity embodied in the production of exported products (Hausmann et al., 2007). A different approach to these has been adopted by Hummels and Klenow (2005) who suggest that competitiveness of country is quality-driven if it exports higher quantities of goods at higher prices than its rivals.

The evidence from the existing body of empirical literature suggests that there exists a relationship between the structure of exported products and the level of nation's development. In general, developed economies tend to export more sophisticated goods of higher quality and to charge for them higher prices (Hummels and Klenow, 2005; Hausmann et al., 2007). More importantly, this finding remains robust to particular measures of the level of development such as GDP or GDP per capita. In addition, the characteristics of the destination market seem to be important for exporters from developing economies. Bastos and Silva (2010) report that unit export values of exported products increase with the rise in GDP of importing countries while Dulleck et al. (2005) obtain a positive sign for the coefficient on market share of individual industries on the EU15 market. These findings are interpreted as the evidence of the learning-by-exporting effect. In building their competitiveness, producers from developing economies can benefit from the knowledge and technology spillovers associated with participation in the markets of developed economies.

The pressure of foreign competitors on the domestic market is another important mechanism of quality upgrading of exported products. Lelarge and Nefussi (2008) find that competitive pressure of producers from low-wage countries on the domestic market of developed economies facilitates their innovation activity which in turn has a positive effect on the quality of their exports. Similar findings have been reported by Fernandes and Paunov (2009) who use the transport costs of imported products as a proxy for import penetration and Monfort et al. (2008) who take the removal of trade barriers as a proxy for the stronger presence of low-cost producers on the EU15 market. In addition, Hoekman and Djankov (1997) report the positive impact of the imports of intermediate inputs on the structure of exports of transition economies. Their study also finds a positive relationship between outward intra-firm trade and the structure of exports. These findings imply that horizontal spillovers have an important role in quality upgrading of exports from transition economies. However, they do not find any relationship between the structure of exports and FDI. Finally, the quality of institutions does not seem to statistically affect the level of sophistication of a nation's exports (Hausmann et al., 2007).

In addition to previously mentioned innovation, human capital has important role in determining the sophistication of nation's exports (Hausmann et al., 2007; Monfort et al., 2008) while the relationship between capital intensity of industry and measures of export quality is found to be statistically insignificant (Lelarge and Nefussi, 2008; Monfort et al., 2008). A distinctive approach to the matter of quality upgrading is taken by Dulleck et al. (2005) who control for the dependence of changes in relative unit export values on their initial level. They obtain a statistically significant and negative coefficient for the initial level of export quality.

With the exception of a few studies using cross-section datasets (Hummels and Klenow, 2005; Bastos and Silva, 2010) most of the studies referred to above used panels of firms or industries which have been estimated using static panel methods or as pooled cross sections which is interpreted as evidence that quality upgrading takes place at slower pace within industries with higher initial quality than among those with lower levels (Hoekman and Djankov, 1997; Dulleck et al., 2005; Hausmann et al., 2007; Lelarge and Nefussi, 2008; Monfort et al., 2008; Fernandes and Paunov, 2009). Although it has been acknowledged that models of quality upgrading may be subject to endogeneity due to reverse causality between the relative unit export values and factors such as FDI or export market share as well as due to the correlation between factors such as innovation, skills and capital intensity on one hand, and the error term on the other (owing to the impact of omitted variables such as institutions, quality of management or ownership on the former) the empirical strategy in most studies has been to ignore these issues.

Our investigation is undertaken on an industry-level, employing a panel of 89 3-digit manufacturing industries in the period between 2001 and 2007. The first part of the empirical investigation will use dynamic shift and share analysis to examine whether the change in the share of Croatian manufacturing industries on the EU15 market has been led by competitiveness, restructuring or changes in demand. We will then move to examine the within-industry changes in the structure of Croatian trade with EU15 using 3-digit industries in our analysis. The last part of investigation will bring together several important aspects recognised in the trade and transition literature as we investigate which factors and forces can improve the relative quality of Croatian export on EU15 markets. Next section establishes theoretical basis of research while our model for analysis of quality upgrading in Croatian exports to EU15 market will be developed in Section 3. The main characteristics of the dataset will be discussed in Section 4 followed by the analysis of changes in the structure of exports to the EU15 market in Section 5. Section 6 will investigate the question of how the relative quality of Croatian exports can be improved. Finally, Section 7 will conclude.

2. Theoretical framework

Theories of trade and growth usually predict that through effects of specialisation, such as greater production efficiency or the exploitation of economies of scale, international trade increases the ability of nations to grow and to provide their citizens with better standard of living (Ram, 1985). In addition, it has been postulated that exporting is related to economic growth indirectly through the impact of knowledge and technology spillovers on the productivity of physical and human capital (Hesse, 2009; Sohn and Lee, 2010). However, a sizeable body of knowledge underlines that a far more important issue than ability of nations to export is the structure of their exported products (Cuaresma and Worz, 2005; Hausmann et al., 2007; Guerson et al., 2007). The origins of such thinking can be traced to work of different economic schools which consider that the impact of individual industries on growth will differ due to factors such as innovation capacity or the extent of economies of scale. This implies that the structure of exports may hold part of the answer to the question why some nations perform better than others in trade and growth.

The structure and quality of exports are usually explained using three strands of trade theories. The traditional trade models postulate that the structure and quality of exported products are determined by relative factor endowments. In this context, quality is usually associated with technological intensity of the industry; it is postulated that nations relatively endowed with factors conducive to specialisation in sophisticated and high-technology intensive, i.e. high quality goods are likely to achieve higher rates of growth than those specialised in low technology or standardised price-competitive products (Fontagne et al., 1998; Liu and Shu, 2003; Cuaresma and Worz, 2005; Monfort et al., 2008; Sohn and Lee, 2010). From here it follows that quality upgrading of a nation's exports takes place through shifts in specialisation from the low towards the high technology intensive industries.

The new trade theories are more focused on trade taking place within industries. Models in this category consider economies of scale and demand for varieties as the main factors behind intra-industry trade (Krugman and Obstfeld, 2003). The key to explaining the structure and quality of a nation's exports becomes its general level of economic development. Hence economies at similar levels of development will be more inclined to trade similar products with developed economies exchanging more sophisticated goods among themselves and with their less developed counterparts trading in similar goods of lower quality.

There is also a third way of explaining the structure and quality of a nation's export which has its roots in the concept of vertical intra-industry trade (Greenaway et al., 1995; Fontagne et al., 1998; Fukao et al., 2003; Monfort et al., 2008; Sohn and Lee, 2010). It implies that, within industries, nations at different stages of development will exchange varieties of goods differentiated by their level of quality. This literature complements the standard arguments for intra-industry trade models mentioned above with assumption that the preferred level of quality will be determined by the relative factor endowments of an economy thus bringing together both traditional and new trade theories (Fontagne and Freudenberg, 1997; Hummels and Klenow, 2005). It is predicted that producers from developed economies are more likely to compete in high quality segments of their industries and thus achieve higher rates of growth while their counterparts from developing economies will, due to their lack of technology and skills, compete in less sophisticated varieties of the same goods (Greenaway et al., 1995; Imbriani et al., 2008; Monfort et al., 2008).

The explanations for improvements in the relative sophistication of a country's exports can be identified in the contributions of the Austrian, evolutionary and endogenous growth literature. In this context, most of studies include physical and human capital and innovations, the factors identified in transition literature as forms of strategic restructuring (Fontagne et al., 1998; Kandogan, 2004; Hummels and Klenow, 2005; Verhoogen, 2007; Monfort et al., 2008; Schott, 2008). In some studies, the authors suggest that the quality of the country's institutional environment, particularly the prevalence of corruption, enforcement of contracts and property rights may also have an impact on the structure of its exports (Hummels and Klenow, 2005; Hausmann et al., 2007; Bastos and Silva, 2010). In addition, Hausmann et al. (2007) link the incentives of producers to move towards the higher quality segments of their industries with the ability of the market to provide them with the needed information about returns on such activities and postulate that in cases involving market failure government policies have a key role in shaping the country's production and trade structures.

In the endogenous growth models, the existing literature has recognised that knowledge and technology spillovers have an important role for quality upgrading of exports from developing economies. One group of authors suggest that the quality of traded products is positively related to the import penetration in industries (Monfort et al., 2008; Fernandes and Paunov, 2009). On the one hand, import penetration in industries from developing economies acts as an incentive for high-cost firms in developed countries to move to the quality segments of their industries. A similar reasoning is employed by Lelarge and Nefussi (2007) who include in their model the intensity of domestic competition. On the other hand, import penetration acts as a channel for horizontal knowledge and technology spillovers in developing economies. In the context of transition economies, the imports of intermediate inputs and final goods as well as foreign direct investment, have been identified as the key channels for technology transfer (Hoekman and Djankov, 1997; Kandogan, 2004). In addition, spillovers may be realised through the 'learning-by-exporting' process, i.e. a strong and continuous presence on foreign markets (Brooks, 2006).

In addition to above channels, the quality of exported products may be improved through intra-firm trade (Hoekman and Djankov, 1997; Kandogan, 2004; Marin, 2006). Such relationship may have beneficiary impact on affiliates through several channels such as the imposition of minimum quality requirements by the parent company or through access to the know-how and technology of its parent. Also, the intra-firm trade may affect the parent company through learning-by-exporting. Besides intra-firm trade, Hausmann et al. (2007) suggest that financial constraints may be an important factor in explaining the quality of exported products. Finally, the work of some authors suggests that quality upgrading takes place over time (Iacovone and Javorcik, 2008; Fernandes and Paunov, 2009). The explanation is that the shift from one segment of the market to another requires learning and acquiring or developing specific assets and skills which may be a lengthy process.

Summarising this discussion we can see that economic theory provides the rationale for the link between the structure of a nation's exports and its economic growth. In this context, it is postulated that improvements in quality may come through cross-industry structural changes and through changes in the level of sophistication of products traded within industries. Furthermore, the shift from one quality segment to another is considered as a dynamic process commonly related to investment in capital, innovations and skills as well as to knowledge and technology spillovers. Finally, institutional factors and financial constraints may have important roles in explaining the structure of a nation's exports.

3. Model specification

Having established the theoretical basis for the research we can develop an empirical model to analyse the quality upgrading of Croatian exports to EU15 markets. Taking the earlier discussion of international trade, the basic model can be written as:

$$Ruev_{it}=f(Ruev_{it-1},Rest_{it},Fin_{it},Spill_{it}) \tag{1}$$

The dependent variable (*Ruev*) in equation 1 is the relative unit export value defined as ratio of the unit value of Croatian exports to EU15 to the unit value of EU15 imports from the rest of the world. At higher levels of aggregation (2 or 3-digit) export unit value is much closer to the meaning of proxy for quality than for prices (Fischer, 2007). A similar measure for the relative quality of exports has been used by Dulleck et al. (2005) and Monfort et al. (2008). Our choice of denominator was based on the findings from earlier literature which postulates that producers from transition economies have been mainly competing on the EU15 market with exporters from other countries (Havlik et al., 2001).

On the right hand side of equation we include the dependent variable lagged one period to control for the dependence of the current quality of exports on its past values. As we mentioned in Section 2, the movement from price to quality segment of market requires learning and acquiring or developing specific assets and skills. This is consistent with propositions from the endogenous growth literature which imply that improvements in a country's (industry's, firm's) competitiveness take place through gradual improvements in the quality of its products (Grossman and Helpman, 1994; Klette and Griliches, 2000).

In equation 1 the *Rest* refers to the process of restructuring. We model this process with three variables. Having in mind how the obsolescence of physical capital and a lack of innovativeness have been among the main deficiencies of firms in former centrally-planned economies, we include the capital-labour ratio (*Kl*) to control for the acquisition of new and the replacement of obsolete capital and a variable controlling for innovation intensity of the industry defined as the ratio of innovation output (including patents, licenses and project development) to the number of employees (*Inne*). We also consider that the shift towards higher quality segment of the market may be easier in industries with higher proportion of skilled labour. In line with Hausmann et al. (2007) we expect that the better quality of human capital would help producers to discover the potential returns of their actions and to reduce their aversion to investment necessary for the development of high quality products. For this reason the ratio of the average wage paid in industry to the average wage in manufacturing sector is included as a proxy for the quality of labour or the human capital (*Wpremium*). While not being perfect indicator of human capital as it may pick up effect of labour costs it is the closest measure available to us. For all three variables we expect to find positive signs.

In terms of factors deterring restructuring, we consider access to finance as one of the important barriers to improvements in the behaviour of firms. In equation 1, *Fin* stands for set of variables which control for financial constraints. As the quality upgrading may be financed from internal funds only by the largest firms and in competitive industries with a large number of small producers external funds may be more important, we introduce a measure of leverage defined as the quotient between long-run debt to assets ratio and number of firms in the industry (*Lev*). We consider that firms rely on long-run loans for strategic operations such as quality upgrading while short-run borrowing is being used to finance current activities. However, we do not have a priori expectations about the sign of this variable. On the one hand, the higher borrowing can be positively related to improvements in the quality of exports. On the other hand, the excessive amount of debt can act as a burden for firm, thus constraining its strategic activities. In such cases, a negative sign can be expected. The model also includes the level of subsidies, measured by the total amount of revenues from subsidies divided by the number of firms in a given industry (*Subs*). Similar to the 'leverage' we do not have *a priori* expectations about the sign of this variable as a higher amount of subsidies may help firms to improve their competitiveness but also in the absence of hard budget constraints, it may weaken the incentive for restructuring. This variable, in addition to access to finance, reflects aspects of government policies towards the specific sector.

To capture the effects of knowledge and technology spillovers (*Spill*) on quality upgrading several variables are introduced. To control for the presence of horizontal and vertical spillovers to domestic market from imports we include relative import intensity (*Imp*) defined as the ratio of total imports in an industry and average imports in the manufacturing sector. The extent of competition in an industry is measured with a variable *Comp* defined as the number of firms in that industry divided by average number of firms in the manufacturing sector. In light of discussion in Section 2, we expect that horizontal and vertical spillovers in combination with threat of market seizure should act as incentive for firms to invest their efforts in quality upgrading.

We also control for the intensity of intra-firm trade (*IFT*) with a variable constructed as a ratio between revenues of Croatian firms from exports to affiliates, parent companies or other enterprises belonging to same group which are located abroad and their total revenues from exports. We expect that quality upgrading can be easier for firms which can minimise transaction costs through sharing of technology, know-how and networks within organisation. Finally, the market share of each individual industry in the EU15 market (*EUMshare*) is included in order to control for the learning-by-exporting mechanism. The complete list of variables is presented in Table 1.

Table 1: Description of variables

Dependent variable	
Ruev	Relative unit export value – Unit value of Croatian export to EU15/Unit value of export from other countries to the EU15
Independent variables	
KL	Capital labour ratio - tangible fixed assets/employee – EUR per head
Inne	Patents, licences and development projects/employee – EUR per head
WPremium	Wage premium – Wage per employee in industry i/average wage per employee in manufacturing sector – proxy for the quality of human capital
Lev	Leverage – (Long run debt/shareholders equity)/number of firms in industry i – proxy for external finance
Subs	Subsidies per company– Value of subsidies to industry i/Number of firms in that industry – EUR
Imp	Import intensity – Total imports in industry i/Average imports in manufacturing sector
Comp	Competition – Number of firms in industry i/Average number of firms in manufacturing sector
IFT	Intra-Firm Trade – sales to enterprises abroad which belong to same group /total revenues from sales of goods and services abroad
EUMshare	EU15 Market share – export of industry i to EU15/EU15 apparent consumption in industry i (output minus exports plus imports)

In modelling of quality upgrading we must take into account potential problems of endogeneity. Primarily this relates to the lagged dependent variable which, by definition, will be correlated with time-invariant elements of the error term. Moreover, variables representing restructuring process may be correlated with factors such as the quality of institutions or FDI which have been identified as important drivers of quality upgrading in Section 2. Similarly, the extent of intra-firm trade may be influenced with features of institutional environment such as legislation, tax benefits, absence of corruption etc. For this reason, we treat all three restructuring variables and variables measuring intra-firm trade in our model as potentially endogenous.

Additional problems of this type may arise from the fact that the choice of lenders about provision of loans and decisions of policy makers concerning allocation of subsidies to industry may be based on observed quality of its exports. Also, the ability of Croatian producers to differentiate themselves and seize market share of their rivals on EU15 market may be determined with their previous and current relative quality of products. For this reason we treat financial variables and EU15 market share also as potentially correlated with the error term. Having discussed all the relevant factors, it is now possible to develop a model to investigate how the quality of Croatian exports to EU15 market can be improved. This is done in Section 5. Before discussing the model, we will present the dataset used in the research and examine major changes in the structure of Croatian exports to the EU15 market.

4. The dataset

We use the industry level data for Croatia's 3-digit manufacturing industries by NACE classification covering the period between 2001 and 2007, the most recent year for which data were available. The database is constructed from several sources. The unit export values and data on the Croatia-EU15 trade have been taken from the Eurostat's Comext database at the most detailed 8-digit Combined Nomenclature level. They were then converted and aggregated into NACE 3-digit industry data. Furthermore, the Eurostat's PRODCOM database had been used in the construction of EU15's apparent consumption to calculate Croatia's market share of the EU15 market. Finally, the industry specific variables were constructed using an industry-level dataset obtained from the Croatian Financial Agency (Financijska Agencija, or FINA). As all firms in Croatia are obliged to submit their annual financial statements to this Agency, the database is of all producers in each industry. Nevertheless, for some categories individual values are missing, although at very low rate, which means that we are dealing with an unbalanced panel.

As the Combined Nomenclature and NACE classification do not fully correspond with each other, some of the industries had to be excluded from the analysis while the data for two industries belonging to the same 2-digit NACE group had to be combined to correspond to one of the Combined Nomenclature group. Moreover, for some variables, the data in individual years were missing causing our panel to be unbalanced. The data set used in econometric model, therefore, contains 89 out of 101 3-digit NACE manufacturing industries with a total of 529 observations in the period between 2002 and 2007. As the data in FINA's dataset are provided in Croatian national currency Kuna (HRK) they were converted to Euro using the average annual exchange rates obtained from the Croatian National Bank. Moreover, all nominal variables including capital, innovation intensity and subsidies have been deflated by the annual producer price indices for the manufacturing sector obtained from Croatian Statistical Office (DZS). The brief descriptive statistics of our dataset are presented in Table 2 which shows that we are dealing with a panel with a fairly low rate of missing observations. The detailed annual descriptive statistics of the dataset are presented in Tables in Appendix.

Table 2: Descriptive statistics

Name	*Mean*	*StDev.*	*Missing(%)*
Ruev	1.20	1.17	0.6
KL	286.92	298.81	0.3
Inne	4.71	16.62	0.3
WPremium	1.00	0.31	0.3
Lev	0.67	8.79	0.2
Subs	71.51	258.81	0.0
Imp	1.00	3.09	0.0
Comp	1.00	1.46	0.0
IFT	0.15	0.20	2.4
Eums	0.001	0.003	0.2

From descriptive statistics in Table 2 several interesting facts about the competitiveness of Croatian manufacturing industries on the EU15 market are revealed. These figures show that in the apparent consumption of EU15 the share of Croatian manufacturing industries was very low, about 0.1%. The average relative unit value of goods exported from Croatia to EU15 was above unity suggesting that in comparison with other exporters to the latter market, Croatian industries on average exported products of higher quality. However, we must be cautious in interpreting this finding as Hoekman and Djankov (1997) suggest that divergent conclusions can be drawn from observing trade between EU15 and transition economies at different levels of aggregation, an issue to which we will return in next section which will examine major changes in the structure of Croatian exports to the EU15 market.

5. Changes in the structure of Croatian exports to the EU15 market

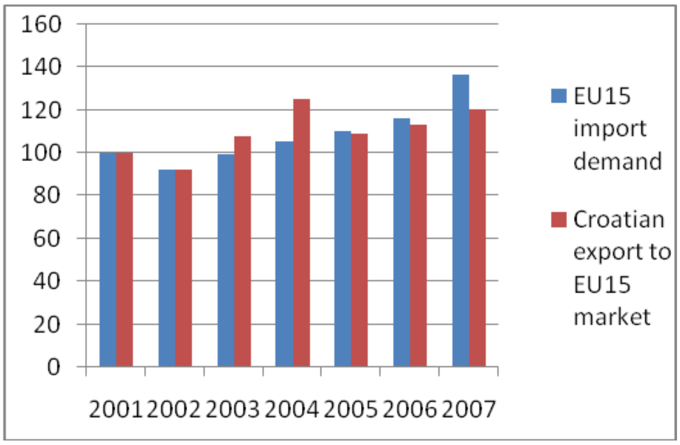
During transition, EU15 countries have been most important foreign markets for producers from Croatian manufacturing industries. In this section we analyse at a more detailed level the changes in the structure of Croatian exports. In this context, we first address changes that have taken place across industries and then consider whether there has been any shift in the 'within-industry' pattern of trade.

5.1. Cross-industry changes in the structure of exports from Croatian manufacturing industries to EU15 market

We begin by comparing the demand of EU15 countries for total imports and their demand for imports from Croatia (defined as share of imports in apparent consumption) in 2001-2007 period. Indices in Figure 1 reveal that, with the exception of 2002, the demand of

EU15 for imports had been rising and in 2007 its share in apparent consumption was 37% higher than in 2001. Croatian exports to the EU15 market over the analysed period also showed a generally upward though less consistent trend with its share in apparent consumption being 20% higher compared to 2001 level. We can conclude that EU15 demand for Croatian products increased at much slower rate than its overall demand for imports.

Figure 1: EU15 imports demand and Croatian exports to EU15 market (as share of apparent consumption), 2001-2007 (2001=100)

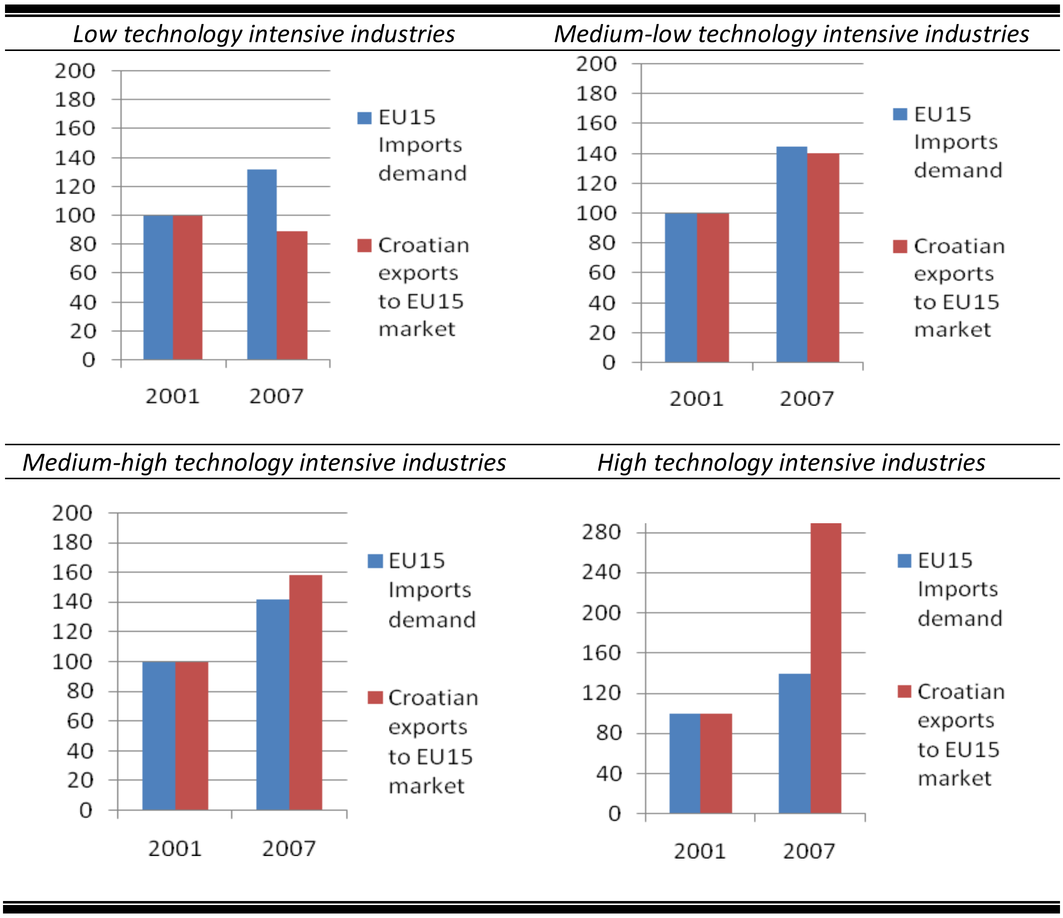


Source: Author's calculations based on EUROSTAT Comext database

The division of Croatian industries by technological intensity on the basis of OECD (2007) classification reveals that over the analysed period the EU imports demand in all four groups increased by about 40% (Figure 2). But in terms of imports from Croatia, the share of low technology intensive industries was reduced and by 2007 it was at 89% of its 2001 level. Other three groups increased their market share with particularly strong increase taking place in high technology intensive industries. Between 2001 and 2007 the share of this group on the EU15 market increased by about 191%.[1] Hence, we can say that in analysed period there has been a clear cross-industry change in structure of Croatian exports (particularly their technological structure) to the EU15 market.

[1] In terms of levels, Table A1 in Appendix VI shows that in 2001 low and medium low technology intensive industries from Croatia had almost two times a higher share of EU15 market than their medium-high and high technology intensive counterparts. However, while the former two groups of industries have not increased their market share between 2001 and 2007 the share of latter two groups increased, with high technology intensive industries having highest share among the four groups of Croatian industries by 2007.

Figure 2: EU15 imports demand and Croatian exports to EU15 market (as share of apparent consumption), 2001-2007 by technological intensity of industries (2001=100)



Source: Own calculations based on EUROSTAT's Comext database

To further investigate the reasons behind changes in the structure of Croatian exports to EU15 market we undertake the so-called 'shift and share analysis'. This technique enables us to decompose the change in the volume of imports from Croatia in the EU15 market and distinguish between changes induced by improved competitiveness, increased demand and restructuring. The starting point in the 'shift and share analysis' is the assumption that the overall demand of a country *k* (or s group of countries such as EU15) for industry *i* and its demand for imports of same industry from country *j* increase proportionally. The divergence between two ratios is commonly labelled as a "shift" (Selting and Loveridge, 1994). Using previous notation, the change in the volume of exports (x) of industry *i* from country *j* to country *k* between two periods can be decomposed in the following way:

$$\Delta x_{ijt}=x_{ijt-n}(\Delta M_{kt}/M_{kt-n}) + x_{ijt-n}[(\Delta M_{ikt}/M_{ikt-n})-(\Delta M_{kt}/M_{kt-n})]$$
$$+x_{ijt-n}[(\Delta x_{ijt}/x_{ijt-n})-(\Delta M_{ikt}/M_{ikt-n})], n \in (0,\infty) \quad (2)$$

In equation (2), the exports of industry i from country j to country k is decomposed into three components: a general increase in demand in country *k*, an increase in the demand of country *k* for industry *i* in excess of the general increase in demand, and an improvement in the competitiveness of industry *i* from country *j* in comparison with other importers of the same industry in country *k*. Here, x_{ij} stands for the volume of exports from industry *i* in country *j* to country *k* while M_k and M_{ki} refer to overall imports and the imports of industry *i* in country *k*.

The term $x_{ijt-n}(\Delta M_{kt}/M_{kt-n})$ is usually referred to as the general demand component. It shows how the demand for exports of industry i (group of industries, manufacturing sector) would develop if it was growing at the same rate as the overall demand for imports. The second term $x_{ijt-n}[(\Delta M_{ikt}/M_{ikt-n})-(\Delta M_{kt}/M_{kt-n})]$ is known as the structural effect component. It shows whether the demand for industry *i* in destination market has grown at above-average or below-average rate. Hence, a positive sign for this component indicates that the demand for a particular industry's imports has grown at a higher rate than the overall demand for imports in the destination country. Finally, the third component $x_{ijt-n}[(\Delta x_{ijt}/x_{ijt-n})-(\Delta M_{ikt}/M_{ikt-n})]$ is the competition effect component. It indicates whether the rate of growth of a particular country's exports of a given industry is higher than the rate of growth of exports from other producers to the same market. It is commonly interpreted as an indicator of given industry's competitiveness on the destination country's market. The first two components are considered exogenous while the last one is considered endogenous.

Each component of change in export is weighted by the factor x_{ijt-n}. Commonly this factor takes the value of the variable of interest (in this case exports from Croatia) in the base or in the terminal year in which case the technique is referred to as the static shift and share analysis. However, it has been suggested in the literature that the choice of the base or terminal year as the weight may lead to a bias as such practice rests on the assumption that the export structure remains constant through the analysed period (Barff and Knight, 1988; Selting and Loveridge, 1994; Wilson et al., 2005). Another source of bias is the so-called compounding effect which is related to problems of assigning weights to particular components of change in the market share, primarily to the change in demand which is likely to be underestimated when the export of a particular industry grows faster than the overall export. To eliminate these biases, Barff and Knight (1988) have proposed the dynamic shift and share analysis which estimates the three components on an annual basis and then adds them together or interprets them separately.

Table 3: Shift and share analysis of changes in Croatian exports to EU15, 2001-2007 (millions EUR)

Period	$\Delta(x_{ijt})$	Demand effect	Structural effect	Competition effect
2002	-42	-80	30	8
2003	186	7	7	171
2004	439	231	-25	233
2005	-254	386	-142	-498
2006	282	-2431	2744	-31
2007	118	535160	-534727	-310
Total	729	533270	-532113	-427

Source: Own calculations using Eurostat Comext database

Table 3 shows that the volume of exports from the manufacturing sector in Croatia to EU15 increased (with exception of 2002 and 2005 years). However, a comparison between the realised volume of exports for whole period and the magnitude of demand effect reveals that the overall demand of EU15 for imports was growing at higher rate than its demand for Croatian products. A closer look at the structural effect suggests that Croatian industries have mainly exported products for which EU15 demand was growing at below average rate while the negative sign on the competition effect implies that they were losing competitiveness in comparison to other exporters to EU15. A brief examination of the annual changes suggests that from 2005 onwards (with exception of 2006) Croatian exports to EU15 recorded low rates of growth which were the result of the combination of structural problems and the loss of competitiveness. Table 4 provides the analysis of changes in the volume of exports by Croatian industries to EU15 market according to their technological intensity.

Table 4: Dynamic shift and share analysis of changes in the volume of exports of Croatian manufacturing Industries to EU15 by their technological intensity, 2001-2007 (million EUR)

Technological Intensity	$\Delta(x_{ijt})$	Demand Effect	Structural effect	Competitive effect
Low	-93	519	-137	-474
Medium Low	319	292	119	-92
Medium High	304	182	23	97
High	199	164	-11	46

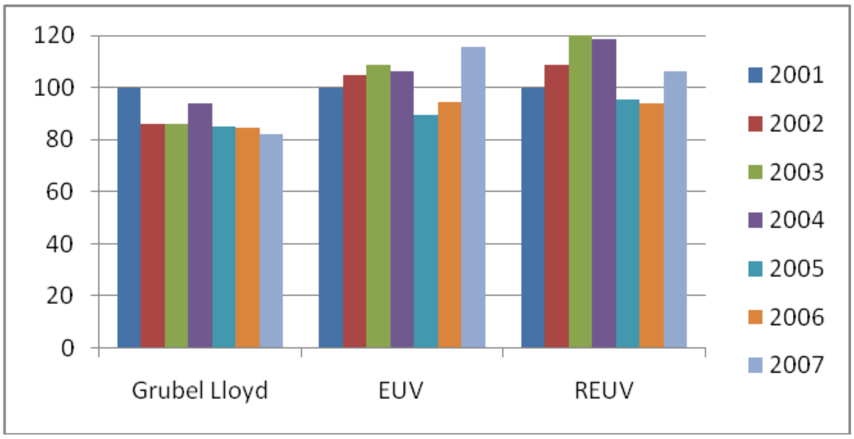
Source: Own calculations from EUROSTAT Comext database

Analysis across industries by their technological intensity in Table 4 enables us to understand our earlier findings in Figure 2 and Table 3. The table shows that the structural problems and declining competitiveness were behind the decline in the volume of exports from Croatian low technology intensive industries to the EU15 market while above average growth of EU15 demand for medium-low technology intensive industries triggered a rise in volume of exports from these Croatian industries. Finally, the rising market share of Croatian medium-high and high technology intensive industries on the EU15 market can be attributed to improvements in their competitiveness. These findings are further evidences of changes in the structure of Croatian export to EU15.

5.2. Within-industry changes in the structure of Croatian exports to EU15 market

Our analysis in the previous section showed that the structure of Croatian export to the EU15 market shifted towards products of higher technological intensity. This finding may indicate that Croatian exporters have been increasingly competing with products of higher quality. In Section 2 we postulated that within industries producers can compete at different levels of quality, while existing literature claims that vertical intra-industry trade was the dominant mode of trade between transition economies and EU15 (Aturupane et al., 1997; Rojec and Ferjancic, 2006). We can now examine the pattern of trade between Croatia and EU15 to see whether this trade is of inter or intra-industry type and whether it is characterised by vertical differentiation or with horizontal exchange in similar products.

Figure 3: Indices of intra-industry trade, unit export values and relative unit export values of Croatian trade with EU15 2001-2007 (2001=100)



Source: Own calculations based on EUROSTAT's Comext database
The base category in construction of relative unit export values is EU15 imports from the rest of the world.

Figure 3 shows the Grubel Lloyd index of intra-industry trade, unit export values and relative unit export values (imports from Croatia relative to EU15 imports from the rest of world) of Croatian export to EU15. From there we can see that over analysed period the share of intra-industry trade in overall exchange between the two entities declined and in 2007 it was at 80% of its 2001 level. However, same Figure shows that the quality of Croatian exports to the EU15 market in this period increased in both absolute (15%) and relative (6%) terms.

Table 5: Intra-industry trade (IIT), unit export values (EUV) and relative unit export values (RUEV) of Croatian trade with EU15, 2001-2007

	IIT		EUV (2001=100)		RUEV (2001=100)	
Year/Industry type	2001	2007	2001	2007	2001	2007
Low tech	1.0	0.8	100	69	100	64
Medium low tech	0.5	0.5	100	183	100	142
Medium high tech	0.4	0.3	100	104	100	117
High tech	0.4	0.6	100	121	100	137
Manufacturing	0.6	0.5	100	115	100	106

Source: Own calculations based on EUROSTAT's Comext database
The base category in construction of relative unit export values is EU15 imports from the rest of the world.

Further look in these issues in Table 5 reveals that the intra-industry trade accounted for about half of the overall exchange between Croatian and EU15 manufacturing sectors. The grouping of industries by their technology intensity shows that the highest proportion of intra-industry trade between EU15 and Croatia in the analysed period took place in low technology intensive industries. In 2001, nearly all trade in this group of industries was of intra-industry type but by 2007 its share decreased by about one fifth. In medium-low and medium-high technology intensive industries, the proportion of intra-industry trade remained relatively stable and was of similar magnitude to the whole manufacturing sector. The share of intra-industry trade in group of high-technology intensive industries, however, increased from 0.4 to 0.6 over the analysed period. The absolute and relative export unit values show that, with the exception of low technology intensive industries, all groups experienced an increase in the value of their export to EU15. In relative terms, particularly strong increases can be observed in medium-low and high technology intensive industries.

To identify the type of trade conducted by individual Croatian industries, we follow the methodology originally developed by Abd-El-Rahman (1991) and later improved by Greenaway et al. (1995) and Fontagne and Freudenberg (1997). By comparing degrees of product similarity and of trade overlap this methodology enables us to distinguish sectors for which trade is of inter-industry type from those in which exchange is of vertically or horizontally differentiated nature (intra-industry). Hence, we begin by disentangling the intra-industry trade of industry *i* in year *t* between Croatia and EU15 into two components, vertical and horizontal.

$$\mathrm{IIT_{it}}=\mathrm{HIIT_{it}}+\mathrm{VIIT_{it}} \qquad (3)$$

In equation (3) IIT is the overall intra-industry trade in industry *i* while HIIT and VIIT are its horizontal and vertical components respectively. Greenaway et al. (1995) suggest that ratios between unit values of exports and imports of a particular industry may reveal whether the within industry trade is of vertical or horizontal type. Assuming that differences in unit values reflect variations in quality of traded products they argue that within industry trade is of horizontal type if unit values meet following condition:

$$1-\propto\leq\frac{\mathrm{EUV_{it}}}{\mathrm{IUV_{it}}}\leq1+\propto \qquad (4)$$

while trade will be of vertical intra-industry type if

$$\frac{\mathrm{EUV_{it}}}{\mathrm{IUV_{it}}}<1-\propto \text{ or } \frac{\mathrm{EUV_{it}}}{\mathrm{IUV_{it}}}>1+\propto \qquad (5)$$

where EUV and IUV are the unit export and unit import values of industry *i* in period *t* respectively and $\propto$ is the dispersion factor taking value of 0.15.[2] However, Fontagne and Freudenberg (1997) suggest that such defined criterion does not take into account the distinction between one-way and two-way trade. Therefore, they propose an additional criterion to measure the degree of overlap in trade between two economic entities. A trade is considered to be of intra-industry type if the value of minority flow (exports or imports) represents at least 10% of the majority flow (imports or exports). This condition can be written as follows

$$\frac{\mathrm{Min}(X_{it}, M_{it})}{\mathrm{Max}\,(M_{it}, X_{it})} > 10\% \qquad (6)$$

When the two criteria are brought together they enable us to distinguish first between inter- and intra-industry trade and then within the intra-industry trade between horizontal and vertical differentiation. This typology is presented in Table 6.

Table 6: Criteria for identification of trade patterns

Degree of overlap between export and import values: Does the minority flow represent at least 10% of the majority flow	**Similarity of unit export and import values**: Do export and import unit values differ less than 15%	
	Yes Horizontal differentiation	*No* Vertical differentiation
Yes	*Two-way trade in similar products*	*Two-way trade in vertically differentiated products*
No	*Inter-industry trade*	

Source: Fountagne and Freudenberg (1997)

Table 6 combines two previously mentioned criteria for distinction between different types of trade. The first column of this table enables us to distinguish between inter- and intra-industry trade. Hence, if the degree of overlap between unit export and import values is below 10% the trade is defined as exchange of intra-industry type.[3] However, if two flows

[2] This dispersion factor refers to the minimum threshold that can be used to distinguish between similar and vertically differentiated products. It commonly takes values of 0.15 and 0.25 (Greenaway et al., 1995; Fontagne and Freudenberg, 1997). Our analysis adopts the former, more conservative criterion.

[3] Fontagne and Freudenberg (1997) suggest that such finding means that minority flow is not the structural component of trade and therefore can be labelled as insignificant.

diverge for more than 10% this implies that exchange is of inter-industry type (last row of table). If the first criteria for intra-industry trade is satisfied, next two columns of table can be used to distinguish between horizontal and vertical within industry exchange. Hence, if the minority flow represents at least 10% of majority flow and unit export and import values differ for less than 15% the products are considered to be horizontally differentiated. But if the degree of overlap is above 10% and the unit export and import values differ by more than 15% the products are considered to be vertically differentiated.

Using above presented methodology, Table 7 provides detailed overview of trade patterns between Croatia and EU15 at the level of 3-digit NACE industries in 2001 and 2007 (the beginning and the end of the period under consideration). From here we can observe a change in the pattern of trade between two economic entities over the analysed period. It is evident that the number of industries characterised by horizontal intra-industry trade has increased across all groups except the low technology intensive group. Also, several industries have shifted from the inter-industry to vertical intra-industry group. Particularly interesting is the pattern observed in the high technology intensive group where in 2001 there were no horizontally differentiated industries. By 2007, production of electronic valves and tubes (NACE 321) and manufacturing of sound and video receiving and recording goods (NACE 323) had been characterised with horizontal intra-industry trade. However, it is evident that in most Croatian industries, even in this advanced stage of transition, trade continues to be dominated by vertical differentiation. This is particularly true for industries of lower technological intensity.

Table 7: Trade pattern Croatia/EU15 at level of 3-digit industries, 2001-2007

	Inter-industry	Vertical intra-industry	Horizontal intra-industry
2001			
Low tech	154-157, 160, 172, 176, 363	158,159, 174,175,181, 182, 183, 192, 193, 201, 202, 204, 205, 21 222, 361, 362, 364-366	151-153, 171, 177, 203, 221
Medium low tech	263-267, 271, 273	232, 251, 252, 261, 262, 268, 272, 274, 281-286, 351	287
Medium high tech	243, 245, 246, 293, 296, 314, 341	247, 291, 292, 295, 297, 311-313, 315, 316, 342, 343, 352, 354, 355	294
High tech	300, 322, 323, 331, 334	321, 332, 333, 335, 353	-
2007			
Low tech	156, 157, 160, 172, 176, 363, 364, 365	151, 153-155, 158, 159, 171, 174, 175, 181-183, 193, 201-205, 211, 212, 221, 222, 361, 362, 366	152, 177, 192
Medium low tech	232, 263, 264, 273, 274, 283, 286	251, 252, 261, 262, 266–268, 271, 272, 282, 351	265, 281, 284, 285, 287
Medium high tech	243, 245, 246, 296, 314, 315, 341, 354	244, 247, 291-295, 297, 311, 316, 342, 343, 352, 355	312, 313
High tech	331, 333, 335	300, 322, 332, 334, 353	321, 323

Source: Own calculations based on EUROSTAT's Comext database

The overall picture emerging from this analysis is that in the advanced stage of transition changes have occurred in the structure of Croatian exports to EU15 both across and within industries. The composition of Croatian exports has shifted from low towards high technology intensive industries with the latter exhibiting the highest increase of EU15 market share. This was mainly caused by improvements in the competitiveness of these industries. Over analysed period unit export values of Croatian exports to EU15 have increased in both absolute and relative terms although we observed a lot of fluctuation in individual years in this respect. At first, this signals within-industry improvements in the quality of products. However, the analysis of similarity and overlapping in trade flows between Croatia and EU15 reveals that the bulk of this trade still takes place through vertical differentiation. Thus the results of our investigation are in line with studies mentioned earlier in this paper which suggested that most of the trade between transition economies and EU15 countries is of intra-industry type with the former competing in low quality segments of the latter's market. The evidence of several industries switching from vertical to horizontal type of intra-industry trade over the analysed period may be taken as an indicator of changing specialisation patterns towards the high quality segments of the market within Croatian manufacturing industries.

6. Determinants of quality upgrading of Croatian exports to EU15 market

The evidence from previous section suggests that quality upgrading has taken place both across and within Croatian manufacturing industries. Yet, they also point out that trade in many of Croatian industries is still characterised by vertical intra-industry trade. In this section we attempt to investigate which factors and forces can improve the relative quality of exports to EU15. To do this we estimate the model discussed in Section 3. Taking all elements identified there as relevant for the investigation the model to be estimated can be written as:

$$\ln(\mathrm{Ruev})_{it}=\alpha_o+\alpha_1\ln(\mathrm{Ruev})_{it\text{-}1}+\alpha_2\ln(\mathrm{Kl})_{it}+\alpha_3\mathrm{Inne}_{it}+\alpha_4\ln(\mathrm{WPremium})_{it}+\alpha_5\mathrm{Imp}_{it}$$
$$+\alpha_6\ln(\mathrm{Comp})_{it}+\alpha_7\ln(\mathrm{Eumshare})_{it}+\alpha_8\mathrm{IFT}_{it}+\alpha_9\mathrm{Lev}_{it}+\alpha_{10}\mathrm{Subs}_{it}+\sum_{t=2003}^{2007}\mathrm{year}_t+u_i+v_{it} \qquad (7)$$

where variables include those in Table 1 and annual time dummies (*year*). In the estimation of equation (7) we use the twostep GMM system dynamic panel estimator with Windmeijer's corrections for robust standard errors.

The GMM is a general method for estimation of population parameters which unlike other methods does not require assumptions such as normality or homoskedasticity. The only requirements of GMM are assumed population conditions, expressed in terms of expectations or moments. A fundamental moment condition which needs to be satisfied in order to produce unbiased and consistent estimates of coefficients of interest is the restriction on the covariance between the error term and independent variable $E(\varepsilon_t, x_t) = 0$. When this condition is not satisfied the estimates are likely to be biased and inconsistent. The problem can be overcome by the use of instrumental variables which have to be uncorrelated with the error term but correlated with the endogenous variables. The number of these instruments is not limited and can be very large, by defining more than one moment condition per parameter to be estimated, which maximises the information available to the estimation process. This advantage of GMM is especially exploited in the dynamic panel estimation.

On the basis of GMM two types of dynamic estimators are developed – a difference GMM estimator (Arellano and Bond, 1991) and a system GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998). With only one lagged dependent variable as an explanatory variable, such a model takes the following form:

$$y_{it}=\beta_1 y_{it-1}+\eta_i+v_{it}, \qquad |\beta|<1 \qquad (8)$$

where η_i stands for the individual time invariant effects and v_{it} for the idiosyncratic errors. The time invariant nature of the former effects implies that they are correlated with dependent variable but also with its past realisations which appear on the right-hand side. In the difference estimator the problem of time invariant effects is solved by differencing the model.

$$y_{it}-y_{it-1}=\beta y_{it-1}-\beta y_{it-2}+v_{it}-v_{it-1}, \qquad |\beta|<1 \qquad (9)$$

Although the time invariant effects are removed the problem of endogeneity remains as the differenced lagged dependent variable and error term are correlated through the correlation between y_{it-1} and v_{it-1} (Greene, 2002; p.308). However, under the assumption of no serial correlation in idiosyncratic errors, Arellano and Bond (1991) have proposed the use of lagged difference $y_{it-2} - y_{it-3}$ or lagged level y_{it-2} as instruments (Greene, 2002; p. 308). Higher lags of levels and of differences of endogenous variables can also be used as instruments although the validity of these instruments would depend on their correlation with the explanatory variables. As Greene (2002; p.309) suggests, the instruments which are lagged too far are likely to bear less information.

The difference estimator has been found to be biased and inefficient in situations when the lagged levels of series are close to a random walk (Blundell and Bond, 1998; Pugh, 2008; Roodman, 2009b). The “system” GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998) has an advantage in this situation. This builds a stacked dataset with twice the observations, one for the levels equation and one for the differenced equation. The introduction of levels equation in the model is explained by the argument that past changes may be more predictive of current levels than the levels can be of future changes when the series are close to random walk. Nevertheless, the system is treated as a single equation and the same linear relationship with the same coefficients is believed to apply to both the transformed (differenced) and untransformed (level) variables (Roodman, 2009b). Another advantage of system estimator over difference one is its ability to include time-invariant variables which are being differenced together with fixed effects in the latter case. Finally, supplementing instruments for differenced equation with those for the levels equation, the system estimator increases amount of information used in estimation thus leading to an increase in efficiency.

While being superior to the difference estimator in many aspects, the system estimator is also not without flaws. Its most commonly cited problems are the sensitivity to the number of instruments and on violation of the steady-state assumption. Roodman (2009a) notes that in finite samples large number of instruments may weaken the ability of relevant diagnostics (Hansen test) to reject the null hypothesis of instrument validity. There is no consensus over the question of optimal number of instruments but it is taken as rule of thumb that this number should not exceed number of groups (cross-sectional units) used in estimation. Another issue recognised in context of system estimator is requirement of steady-state assumption. There are two requirements for this condition to hold. First, the coefficient on lagged dependent variable must have absolute value less than unity so that the process is convergent and second, this process of convergence should not be correlated with time-invariant effects.

In our estimation we use the system dynamic panel estimator. There are three reasons which can justify our choice. First, the dynamic panel analysis enables us to control for potential endogeneity of other variables caused by their correlation with unobserved time-invariant characteristics in the same way as the relationship between these characteristics and lagged dependent variable is controlled for. Second, as we mentioned earlier in the presence of random walk or near random walk processes system estimator is more efficient. Finally, as we will explain soon, the dynamic analysis provides us with an opportunity to discern the short-run from the long-run effects of explanatory variables.

Dynamic estimators can be estimated in one-step and two-step procedures. In the one-step procedure the GMM estimator is developed by imposing some reasonable but arbitrary assumption (such as homoscedasticity) about the weighting matrix. However, this estimator is not robust to heteroskedasticity or cross-correlation. Therefore, the procedure for obtaining a robust estimator involves another step 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, which is robust to the modelled patterns of heteroskedasticity and cross-correlation (Roodman, 2009b, p. 9). However, the standard errors obtained in the two-step procedure are known to be downward biased when the number of instruments is large. This problem can be greatly reduced with the use of Windmeijer's (2005) corrections for the two-step standard errors. Given that Windmeijer's corrected standard errors are found to be superior to the cluster-robust one-step standard errors (Roodman, 2009b, p. 12), we decide to apply this approach.

Another benefit of dynamic analysis is that it allows us to discern between the short - and long-run effects. Supposing that equation (8) includes additional explanatory variable x this can be written as

$$y_{it}=\beta_1 y_{it-1}+\beta_2 x_{it}+\eta_i+v_{it}, \qquad |\beta|<1 \tag{11}$$

In equation (11), the coefficient β_2 is the estimated coefficient and is known as the short-run multiplier which represents only a fraction of the desired change (Greene, 2002, p. 568). The long-run effect can then be calculated algebraically as product of the coefficient β_2 and the long-run multiplier $\frac{1}{1-\beta_1}$. The standard error and the corresponding t-statistic for coefficient obtained this way can be then calculated using delta-method (Greene, 2002, p. 569; Papke and Wooldridge, 2005, p. 413). However, we must bear in mind that the results obtained with the long-run coefficients are valid only under the assumption of the system's stability, i.e. lack of structural breaks over course of time which is however major simplification.

The above mentioned properties of system dynamic panel GMM estimator make it suitable methodology for the analysis of determinants of quality upgrading in this chapter for several reasons. As we outlined, there are reasons to expect a correlation between several of the variables and the error term. To control for this we treat the lagged dependent variable as predetermined and capital and innovation intensity, wage premium, EU15 market share and intra-firm trade as well as the two financial variables as endogenous. Our model also includes annual time dummies to control for potential sources of cross-sectional dependence. The examination of descriptive statistics in Section 4 implies that non-normality and heteroscedasticity may be present. While the normality is not among requirements of GMM dynamic panel estimators, the latter issue can be controlled for with use of two-step estimator. As in such case, standard errors tend to be downward biased we also apply previously mentioned Windmeijer's correction.

Predetermined and endogenous variables have been instrumented with their own lags and lagged differences while exogenous variables entered instrumentation matrix as own instruments. Our choice of instruments had to meet all relevant model diagnostics but between several alternative sets of instruments which satisfied above condition we decided for those outcomes which made more economic sense. However, in all considered specifications the major variables of interest retained their signs and significance suggesting the robustness of our model. Finally, the dependent variable and most of explanatory variables enter our model in logarithmed form. However, several right-hand side variables also take value of zero and were thus used in non-logarithmic form. We now move to interpret our main findings. We begin with a discussion about model diagnostics.

The main results of estimation and model diagnostics are presented in Table 8 while detailed printouts of estimation can be found in the Appendix. We can see that there is insufficient evidence to reject the null hypothesis of valid overidentifying restrictions in the Hansen's test for the validity of instruments. Similar to the estimations in previous chapters, the computed p-value is well above the most conservative threshold suggested in the literature (0.25). The difference-in-Sargan-tests for subsets of instruments for the levels equation and for the lagged dependent variable also do not provide sufficient evidence to reject the null hypothesis of valid overidentifying restrictions (see Appendix). Former implies that the steady-state assumption can be accepted and that the system GMM estimator should be preferred to the difference one while the latter diagnostic suggests that our model is not likely to suffer from cross-sectional dependence.

We also checked for the first and second order autocorrelation. As expected, the relevant diagnostics reject the null hypothesis of no first order autocorrelation but not the one of no second order autocorrelation. In addition, the comparison of magnitude of coefficient on the lagged dependent variable with magnitudes obtained in OLS and panel FE estimations shows that our coefficient lies between the former two (Appendix). Finally, the number of instruments relative to the number of groups of observations is relatively low.

Table 8: Dynamic panel system GMM estimations for quality upgrading of Croatian export to EU15 market, 2002-2007 (Dep. variable: ln (Ruev))

	SR	LR
Lagged dependent variable	0.63(0.000)***	-
RESTRUCTURING		
Capital Intensity: ln*(Kl)*	0.26(0.018)**	0.71(0.027)**
Innovation Intensity: (*Inne*)	0.01(0.031)**	0.02(0.021)**
Wage Premium: ln *(WPremium)*	-1.86(0.000)***	-5.03(0.001)***
SPILLOVERS		
Import Intensity: *(Imp)*	0.03(0.0022)**	0.09(0.019)**
Number of Competitors: ln *(Comp)*	0.02(0.547)	0.05(0.566)
EU15 Market Share: ln *(Eums)*	-0.11(0.165)	-0.29(0.267)
Intra-Firm Trade: *(IFT)*	-0.20(0.380)	-0.54(0.412)
ACCESS TO FINANCE		
Leverage: *(Lev)*	-0.04 (0.030)**	-0.11(0.006)***
Subsidies: *(Subs)*	-0.0001(0.801)	-0.0002(0.798)
Constant term(*cons*)	-2.44(0.000)***	-
MODEL DIAGNOSTICS		
Number of observations	529	-
Number of groups	91	-
Wald test	422.53	-
Prob>chi2	0.000	-
Hansen J Statistic	33.54	-
Prob> chi2	0.789	-
Arellano-Bond test for AR(1) in first differences	-3.19	-
Prob>chi2	0.001	-
Arellano-Bond test for AR(2) in first differences	0.51	-
Prob>chi2	0.609	-
Instrument count	57	-

*Note: p-values in brackets where ***, ** and * denote statistical significance of variables at 1%, 5% and 10% level of significance respectively. p-values are obtained from two-step dynamic panel procedure with Windmeeijer's corrected robust standard errors. Model includes year dummy variables.*

Having examined the diagnostics we can move to discuss main findings from Table 8. All the discussion of the effect of individual variables is ceteris paribus and we start with the short run estimates. The positive and highly significant coefficient on the lagged dependent variable suggests that the relative quality of Croatian exports to EU15 market is positively related to its past realisations. The magnitude of coefficient implies that a one percent improvement in relative export unit value in the previous period leads to about 0.6% improvement in the current period. Such a finding is consistent with the propositions of the endogenous growth literature which postulates that quality upgrading is a gradual process taking place over time.

All three restructuring variables are significant but only two of them have the expected sign. The coefficient on capital intensity indicates that one percent increase in capital/labour ratio leads to 0.29% improvement in the relative quality of Croatian exports to the EU15 market. Similarly, an additional euro of innovation output per employee (innovation intensity) improves the relative quality of Croatian export to EU15 market by about 0.7%. These findings are in line with predictions from the transition literature that investment in new machinery and equipment and in development of new production processes and new products should improve the international competitiveness of producers from transition economies. More importantly, they support the Austrian, evolutionary and endogenous growth literature about the relation between innovation and technology on one hand, and the ability to compete through quality on the other. However, the coefficient on wage premium, our proxy for the quality of human capital is statistically significant with negative sign. This probably means that the variable captures the cost component of wages rather than human capital. Hence, the ability of industries to reduce costs of labour leaves producers with more funds which can be invested in upgrading of quality.

Among the four measures of spillovers we obtain a statistically significant and positive coefficient only on import intensity. It implies that if imports in an industry relative to average for the whole manufacturing increases by one hundredth of an unit, it would lead to improvement in the relative quality of export by about 0.03%.[4] This finding may be interpreted as the evidence for several hypotheses mentioned in the transition and international trade literature. First, it may imply that imports of intermediate inputs and technology play important roles in shaping the competitiveness of transition economies as

[4] Having in mind descriptive statistics of this variable we consider movement for 0.01 unit to represent sufficiently marginal change.

proposed in Hoekman and Djankov (1997). Second, it may also suggest that the stronger presence of importers on final goods market provides the entire industry with the knowledge and technology spillovers which have a beneficial impact on the relative quality of its exports, a process which is similar to the mechanism of learning discussed by Hausmann et al. (2007). Finally, it may mean that the pressure of foreign competitors forces domestic firms to look for new ways to differentiate themselves, leading them to the quality segments of the market with a consequent impact on the structure of their exports (Fernandes and Paunov, 2009).

Access to subsidies does not seem to have had a significant role in quality upgrading of Croatian exports. However, we do obtain negative and statistically significant coefficient on our measure of leverage. The coefficient is small suggesting that a decline in the debt to asset ratio per firm of one hundredth of unit leads to a 0.04 percent increase in the relative sophistication of Croatian exports to EU15 market.[5] This finding may be taken as the evidence that borrowing acts as a constraint for strategic activities of firms such as improvements in the quality of their exports.

Finally, the last column of Table 8 gives the long-run coefficients calculated from the results of the estimation. As it can be seen all the coefficients retain their significance and they are about 2.7 times higher than their short-run counterparts. We interpret this as the evidence that the outcomes of actions undertaken by firms in our sample are completely realised only in the long run.

7. Conclusion

Several economic schools postulate that for the ability of country to grow and to provide its citizens with better standard of living, the structure of its exports is far more important than the ability to compete on international markets. It has been argued that the ability to compete in high quality segments of the market gives higher potential for growth of the economy than competitive profiles based on standardised price-competitive products. For this reason, a substantial body of literature has attempted to explain the channels through which less developed and transition economies can improve the level of

[5] Again we consider movement for 0.01 to represent sufficiently marginal change.

sophistication of their exports. In the same spirit, our objective was to investigate changes in the structure of Croatian exports to the EU15 market in the advanced stage of transition. To tackle this issue we traced the evolution of changes in trade patterns both across and within the Croatian manufacturing industries.

The results of the investigation are mainly in line with findings of previous literature about competitive profiles of transition economies and potential channels for improvements in the relative sophistication of nation's exports. Over the years, Croatian exporters to EU15 market have shifted from low technology intensive towards high technology intensive industries. It was established that the main reason for this was the loss of competitiveness in the former and competitiveness gains in the latter group of products. However, our analysis of within-industry trade implies that Croatian firms mainly compete in terms of prices. Although the Croatian manufacturing is reorienting towards the more technologically intensive sectors our evidence suggests that, within these sectors, the Croatian trade with EU15 has all the characteristics of vertical intra-industry trade, a pattern typical for exchange between developed and developing economies. Finally, the last part of our investigation showed that technology and innovations play a key role in improvements in the relative quality of exports alongside with import-led spillovers, thus confirming the predictions from the trade and growth literature

The results of this analysis can be understood as evidence of the adverse effect exercised by specific characteristics of Croatian transition on its competitiveness. To this end, observed structure of Croatian exports to EU15 market may be explained with the delayed restructuring of its firms and industries while our findings about channels for quality upgrading may show the way for improvements in the overall competitiveness of the Croatian economy.

Literature

Abd-El-Rahman, K. (1991). Firms' Competitive and National Comparative Advantages as Joint Determinants of Trade Composition. *Review of World Economics , 127* (1), pp. 83-97.

Aturupane, C., Djankov, S., & Hoekman, B. (1997). Determinants of Intra-Industry Trade between East and West Europe. *Policy Research Working Paper (1850)* . Washington, D.C.: World Bank.

Barff, R., & Knight, P. (1988). Dynamic Shift-Share Analysis. *Growth and Change , 19* (2), pp. 1-9.

Bastos, P., & Silva, J. (2010). The Quality of a Firm's Exports: Where You Export to Matters. *Journal of International Economics , 82* (2), pp. 99-111.

Benacek, V., Prokop, L., & Visek, J. A. (2006). Determining Factors of Trade and Specialisation in Transition: Econometric Testing of the Czech Exports and Imports, 1993-2001. *Social Science Studies (PPF-017)* . Prague: Charles University.

Brooks, E. (2006). Why Don't Firms Export More? Product Quality and Colombian Plants. *Journal of Development Economics , 80*, pp. 160-178.

Cuaresma, J. C., & Worz, J. (2005). On Export Composition and Growth. *Review of World Economics , 141* (1), pp. 33-49.

Dulleck, U., Foster, N., Stehrer, R., & Worz, J. (2005). Dimensions of Quality Upgrading: Evidence from CEECs. *Economics of Transition , 13* (1), pp. 51-76.

Fernandes, A., & Paunov, C. (2009). Does Tougher Import Competition Foster Product Quality Upgrading? *World Bank Policy Research Working Paper (4894)* . The World Bank.

Fischer, C. (2007). Food Quality and Product Export Performance. An Empirical Investigation of the EU Situation. *Contributed Paper Prepared for Presentation at the 105th EAAE Seminar.* Bologna: European Association of Agricultural Economists.

Fontagne, L., & Freudenberg, M. (1997). Intra-Industry Trade: Methodological Issues Reconsidered. *Working Paper (1997-01)* . CEPII Research Center.

Fontagne, L., Freudenberg, M., & Peridy, N. (1998). Intra-Industry Trade and the Single Market: Quality Matters. *CEPR Discussion Paper (1959)* . C.E.P.R. Discussion Papers.

Fukao, K., Ishido, H., & Ito, K. (2003). Vertical Intra-Industry Trade and Foreign Direct Investment in East Asia. *Journal of the Japanese and International Economies , 17* (4), pp. 468-506.

Greenaway, D., Hine, R., & Milner, C. (1995). Vertical and Horizontal Intra-Industry Trade: A Cross Industry Analysis for the United Kingdom. *The Economic Journal , 105* (433), pp. 1505-1518.

Greene, W. (2002). *Econometric Analysis* (5th Edition ed.). Upper Saddle River, New Jersey, USA: Prentice Hall.

Grossman, G. M., & Helpman, E. (1994). Endogenous Innovation in the Theory of Growth. *The Journal of Economic Perspectives , 8* (1), pp. 23-44.

Guerson, A., Parks, J., & Torrado, M. (2007). Export Structure and Growth: A Detailed Analysis for Argentina. *World Bank Policy Research Working Paper (4237)* . The World Bank.

Hausmann, R., Hwang, J., & Rodrik, D. (2007). What You Export Matters. *Journal of Economic Growth , 12* (1), pp. 1-25.

Havlik, P. (2005). Structural Change, Productivity and Employment in the new EU Member States. *WIIW Research Report (313)* . Vienna: The Vienna Institute for International Economic Studies.

Havlik, P. (2000). Trade and Cost Competitiveness in the Czech Republic, Hungary, Poland and Slovenia.

Havlik, P., Landessman, M., & Stehrer, R. (2001). *Competitiveness of CEE Industries: Evidence from foreign Trade Specialization and Quality Indicators.* Vienna: The Vienna Institute for International Economic Studies.

Hesse, H. (2009). Export Diversification and Economic Growth. In R. Newfarmer, W. Shaw, & P. Walkenhorst (Eds.), *Breaking Into New Markets: Emerging Lessons for Export Diversification.* World Bank Publications.

Hoekman, B., & Djankov, S. (1997). Determinants of the Export Structure of Countries in Central and Eastern Europe. *The World Bank Economic Review , 11* (3), pp. 471-87.

Hummels, D., & Klenow, P. (2005). The Variety and Quality of a Nation's Exports. *The American Economic Review , 95* (3), pp. 704-723.

Iacovone, L., & Javorcik, B. (2008). Multi-Product Exporters: Diversification and Micro-Level Dynamics. *World Bank Policy Research Working Paper Series (4723)* . The World Bank.

Imbriani, C., Morone, P., & Testa, G. (2008). Exporting Quality: Is It the Right Strategy for the Italian Manufacturing Sector? *MPRA Paper (13327)* . University Library of Munich.

Kandogan, Y. (2004). How Much Restructuring did the Transition Countries Experience? Evidence from Quality of their Exports. *William Davidson Institute Working Paper (637)* . Flint, Michigan, USA: The William Davidson Institute.

Klette, T. J., & Griliches, Z. (2000). Empirical Patterns of Firm Growth and R&D Investment: A Quality Ladder Model Interpretation. *Economic Journal , 110* (463), pp. 363-87.

Krugman, P., & Obstfeld, M. (2003). *International Economics: Theory and Policy* (6 ed.). Boston, Massachussetts , USA: Pearson Education Inc.

Lelarge, C., & Nefussi, B. (2007). *Exposure to Low-Wage Competition, Activity Changes and Quality Upgrading: An Empirical Assesment.* Retrieved 1. 12., 2011, from http://iri.jrc.ec.europa.eu/concord-2007/papers/strand4/Lelarge%20+%20Nefussi.pdf

Liu, X., & Shu, C. (2003). Determinants of Export Performance: Evidence from Chinese Industries. *Economics of Planning , 36* (1), pp. 45-67.

Marin, D. (2006). A New International Division of Labor in Europe: Outsourcing and Offshoring to Eastern Europe. *Journal of the European Economic Association , 4* (2-3), pp. 612-622.

Monfort, P., Vandenbusche, H., & Forlani, E. (2008). Chinese Competition and Skill-Upgrading in European Textiles: Firm-Level Evidence. *LICOS Discussion Papers (19808)* . LICOS - Centre for Institutions and Economic Performance, K.U.Leuven.

OECD. (2007). *OECD Science, Technology and Industry Scoreboard.* OECD.

Ram, R. (1985). Exports and Economic Growth: Some Additional Evidence. *Economic Development and Cultural Change , 33* (2), pp. 415-425.

Rojec, M., & Ferjancic, M. (2006). Overview of Export Performance of "New Europe": Theoretical Underpinnings and Empirical Evidence. In J. Winiecki (Ed.), *Competitiveness of New Europe Papers from the Second Lancut Economic Forum.* United Kingdom: Routledge.

Roodman, D. (2009a). A Note on the Theme of Too Many Instruments. *Oxford Bulletin of Economics and Statistics , 71* (1), pp. 135-158.

Roodman, D. (2009b). How to Do xtabond2: An Introduction to Difference and System GMM in Stata. *The Stata Journal , 9* (1), pp. 86-136.

Schott, P. (2008). The Relative Sophistication of Chinese Exports. *Economic Policy , 23* (1), pp. 5-49.

Selting, A., & Loveridge, S. (1994). Testing Dynamic Shift-Share. *Regional Science Perspectives , 24* (1), pp. 23-41.

Sohn, C.-H., & Lee, H. (2010). Trade Structure, FTA and Economic Growth: Implications to East Asia. *Review of Development Economics , 14* (3), pp. 683-698.

Verhoogen, E. (2007). Trade, Quality Upgrading and Wage Inequality in the Mexican Manufacturing Sector. *CEPR Discusssion Paper (6385)* . C.E.P.R. Discussion Papers.

Wilson, P., Chern, T. S., Ping, T. S., & Robinson, E. (2005). A Dynamic Shift-Share Analysis of the Electronics Export Market 1988-2001: Can the NIEs Compete with China? *SCAPE Policy Research Working Paper Series (0507)* . National University of Singapore, Department of Economics, SCAPE.

Appendix

Table A1:EU15 market share of Croatian manufacturing industries divided by their technological intensity 2001-2007 (in %)

	2001	2007
Low-technology intensive industries	0.10	0.09
Medium low-technology intensive industries	0.06	0.08
Medium high-technology intensive industries	0.04	0.07
High-technology intensive industries	0.04	0.10

Source: Eurostat Comext Database

Table A2: Number of observations for dataset in Chapter Six

Year	*Observations*
2002	*86*
2003	*89*
2004	*89*
2005	*88*
2006	*89*
2007	*88*

Table A3: Descriptive statistics for dynamic panel system GMM estimation for quality upgrading of Croatian export to EU15 market, 2002-2007 (Dep. Variable: ln(Ruev))

	Ruev		Kl		Inne		WPremium		Lev	
	Mean	Std.Dev	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
2002	1.15	1.21	240	190	4.54	17.26	0.98	0.31	0.04	0.17
2003	1.14	0.88	261	238	4.27	15.83	0.99	0.29	0.07	0.31
2004	1.40	1.50	261	200	4.20	15.42	0.99	0.29	0.15	0.94
2005	1.39	1.68	279	228	4.6	16.40	0.99	0.29	0.06	0.26
2006	1.10	0.84	307	271	5.32	18.04	1.01	0.31	0.34	2.67
2007	1.09	0.83	336	378	5.79	18.70	1.00	0.29	0.09	0.52
	Subs		Imp		Comp		IFT		EUMshare	
	Mean	Std.Dev	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
2002	70	329	1.04	2.96	1.06	1.48	0.14	0.18	0.001	0.002
2003	68	302	1.01	2.95	1.02	1.48	0.16	0.19	0.001	0.002
2004	70	244	1.01	2.76	1.02	1.47	0.16	0.20	0.001	0.003
2005	68	214	1.02	3.30	1.03	1.48	0.15	0.20	0.001	0.002
2006	81	213	1.02	3.32	1.02	1.49	0.16	0.21	0.001	0.002
2007	77	234	0.71	0.91	1.03	1.50	0.17	0.22	0.001	0.002

Table A4: Correlation among variables used in dynamic panel system GMM estimation for quality upgrading of Croatian export to EU15 market 2002-2007 (Dep.variable: ln(Ruev))

	ruev	L. ruev	kl	Inne	WPremium	Imp	Comp
ruev							
--.	1.0000						
L1.	0.8112	1.0000					
kl	-0.1813	-0.1438	1.0000				
Inne	0.0392	0.0512	0.2797	1.0000			
WPremium	-0.1676	-0.1229	0.3670	0.3986	1.0000		
Imp	0.0855	0.1047	0.2355	0.0584	0.3543	1.0000	
Comp	-0.0290	-0.0077	-0.0688	-0.0408	-0.0121	0.0752	1.0000
EUMS	0.2671	0.2489	-0.2779	0.0030	-0.2081	-0.0165	-0.0044
IFT	-0.0813	-0.0840	0.1237	0.1885	0.2384	0.2199	0.0020
Lev	-0.2020	-0.1951	0.0919	-0.0147	-0.0309	-0.0338	-0.0691
Subs	-0.0741	-0.0760	0.0804	0.0161	0.1016	0.1294	0.0318
yr3	-0.0123	-0.0223	-0.0489	-0.0137	-0.0131	0.0067	-0.0028
yr4	0.0497	-0.0176	-0.0375	-0.0156	-0.0026	0.0064	-0.0028
yr5	0.0571	0.0877	0.0048	-0.0049	-0.0014	0.0081	0.0006
yr6	-0.0304	0.0441	0.0649	0.0141	0.0228	0.0087	-0.0027
yr7	-0.0184	-0.0151	0.0914	0.0266	0.0088	-0.0416	0.0005

	EUMS	IFT	Lev	Subs	yr3	yr4	yr5
EUMS	1.0000						
IFT	-0.0425	1.0000					
Lev	-0.0181	-0.0759	1.0000				
Subs	0.2065	-0.0560	-0.0162	1.0000			
yr3	-0.0065	0.0097	-0.0206	-0.0077	1.0000		
yr4	0.0371	0.0082	0.0089	-0.0045	-0.2023	1.0000	
yr5	-0.0202	-0.0108	-0.0246	-0.0076	-0.2009	-0.2009	1.0000
yr6	-0.0106	0.0094	0.0814	0.0146	-0.2023	-0.2023	-0.2009
yr7	0.0265	0.0189	-0.0122	0.0088	-0.2009	-0.2009	-0.1995

	yr6	yr7
yr6	1.0000	
yr7	-0.2009	1.0000

Table A5: Printout of dynamic panel system GMM estimation for quality upgrading of Croatian export to EU15 market 2002-2007 (Dep.variable ln(Ruev))

```
. xtabond2 ruev l.ruev kl Inne wpremium Imp comp eumshare IFT Lev Subs yr3-yr7,
>  gmm(l.ruev, lag(1 .) coll) gmm(kl wpremium eumshare IFT Subs Lev, lag(2 4) c
> oll) gmm(Inne, lag(2 5)) iv(Imp comp yr3-yr7) twostep robust
Dynamic panel-data estimation, two-step system GMM

Group variable: NACE                          Number of obs      =       529
Time variable : Year                          Number of groups   =        91
Number of instruments = 57                    Obs per group: min =         2
Wald chi2(15) =    422.53                                    avg =      5.81
Prob > chi2   =     0.000                                    max =         6
```

ruev	Coef.	Corrected Std. Err.	z	P>|z|	[95% Conf.	Interval]
ruev L1.	.6295546	.1090828	5.77	0.000	.4157561	.843353
kl	.2641292	.1116442	2.37	0.018	.0453105	.4829479
Inne	.0074026	.0034279	2.16	0.031	.0006839	.0141212
wpremium	-1.862003	.3825103	-4.87	0.000	-2.611709	-1.112297
Imp	.032085	.0140502	2.28	0.022	.0045471	.0596229
comp	.020207	.0335772	0.60	0.547	-.0456031	.0860172
eumshare	-.1057862	.0761993	-1.39	0.165	-.2551341	.0435617
IFT	-.1990455	.2268125	-0.88	0.380	-.6435898	.2454988
Lev	-.0412872	.0190325	-2.17	0.030	-.0785902	-.0039842
Subs	-.0000748	.000296	-0.25	0.801	-.0006549	.0005053
yr3	.0714369	.0589374	1.21	0.225	-.0440783	.1869521
yr4	.1458695	.0601595	2.42	0.015	.027959	.2637801
yr5	.0139618	.0504663	0.28	0.782	-.0849504	.112874
yr6	-.030063	.0611177	-0.49	0.623	-.1498515	.0897255
yr7	.1009653	.0666955	1.51	0.130	-.0297554	.231686
_cons	-2.435804	.6715224	-3.63	0.000	-3.751964	-1.119644

```
Arellano-Bond test for AR(1) in first differences: z =  -3.19  Pr > z =  0.001
Arellano-Bond test for AR(2) in first differences: z =   0.51  Pr > z =  0.609

Sargan test of overid. restrictions: chi2(41)   =  44.94  Prob > chi2 =  0.310
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(41)   =  33.54  Prob > chi2 =  0.789
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(29)   =  27.34  Prob > chi2 =  0.553
    Difference (null H = exogenous): chi2(12)   =   6.20  Prob > chi2 =  0.906
  gmm(L.ruev, collapse lag(1 .))
    Hansen test excluding group:     chi2(36)   =  30.56  Prob > chi2 =  0.725
    Difference (null H = exogenous): chi2(5)    =   2.98  Prob > chi2 =  0.703
  gmm(kl wpremium eumshare IFT Subs Lev, collapse lag(2 4))
    Hansen test excluding group:     chi2(17)   =  16.30  Prob > chi2 =  0.503
    Difference (null H = exogenous): chi2(24)   =  17.25  Prob > chi2 =  0.838
  gmm(Inne, lag(2 5))
    Hansen test excluding group:     chi2(21)   =  19.99  Prob > chi2 =  0.522
    Difference (null H = exogenous): chi2(20)   =  13.55  Prob > chi2 =  0.853
  iv(Imp comp yr3 yr4 yr5 yr6 yr7)
    Hansen test excluding group:     chi2(34)   =  30.87  Prob > chi2 =  0.622
    Difference (null H = exogenous): chi2(7)    =   2.67  Prob > chi2 =  0.914
```

Long-run coefficients

```
. nlcom (lrkl: _b[kl]/(1-_b[l.ruev])) (lrInne: _b[Inne]/(1-_b[l.ruev])) (lrwpre
> mium: _b[wpremium]/(1-_b[l.ruev])) (lrImp: _b[Imp]/(1-_b[l.ruev])) (lrcomp: _
> b[comp]/(1-_b[l.ruev])) (lreumshare: _b[eumshare]/(1-_b[l.ruev])) (lrIFT: _b[
> IFT]/(1-_b[l.ruev])) (lrLev: _b[Lev]/(1-_b[l.ruev])) (lrSubs: _b[Subs]/(1-_b[
> l.ruev]))
```

ruev	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lrkl	.7130043	.3231574	2.21	0.027	.0796275	1.346381
lrInne	.0199829	.0086407	2.31	0.021	.0030474	.0369183
lrwpremium	-5.026389	1.482952	-3.39	0.001	-7.932922	-2.119857
lrImp	.0866119	.0367806	2.35	0.019	.0145233	.1587006
lrcomp	.0545479	.0950547	0.57	0.566	-.1317559	.2408517
lreumshare	-.285565	.2574233	-1.11	0.267	-.7901055	.2189755
lrIFT	-.5373139	.655618	-0.82	0.412	-1.822302	.7476738
lrLev	-.1114528	.0405334	-2.75	0.006	-.1908969	-.0320087
lrSubs	-.0002019	.00079	-0.26	0.798	-.0017503	.0013465

Table A6: Comparison of coefficients on lagged dependent variable obtained with OLS, dynamic panel system GMM and fixed effects estimation techniques

	Coef.	Std.Error	z	P>|z|
Specification 1				
Fixed Effects (FE)	0.18	0.07	2.69	0.008
System GMM	0.63	0.11	5.77	0.000
Ordinary least squares (OLS)	0.74	0.04	18.72	0.000