

From a centrally planned economy to an economy in transition:  
- The effects on regional patterns of corn exports in Serbia

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## Summary

This study investigates the regional structure of corn exports of Serbia over the period 1986 to 2009 with the main purpose to reveal how the Serbian corn sector has been affected by break-up of former centrally planned economies focusing on changes in the geographical patterns of its corn exports. The main part of the study is devoted to an in-depth analysis of the main drivers behind the manifested trends in the regional patterns of Serbian corn exports over the last 25 years. Corn has been Serbia's biggest single commodity which had a crucial role for agricultural trade.

A gravity model is developed to empirically analyze the factors that affected Serbian corn exports with the aim on accounting for the relevant political, economic and social events that took place in Serbia since the collapse of communism and transition process in the whole region. Consideration was given to investigating the impact of GDP, per capita GDP, distance and ratio of relative prices, as explanatory variables. In addition, the model specification has been augmented through the addition of other variables that are thought to impact on Serbian corn export flows such as dummy variables for sanctions, collapse of centrally planned economies, common language and free trade agreements. The results of the gravity model estimated using pooled OLS, found all variables to be highly statistically significant and their coefficients take the signs that are expected from the standard gravity literature and consistent with economic theory. The distance variable, as a time-invariant measure, is statistically insignificant but has the anticipated negative sign. The analysis investigates impact of the collapse of centrally planned economies and sanctions showing that both of these factors had strong and negative impact on Serbian corn export which is consistent with theory.

The further studies should use the gravity approach focusing on the recent period to evaluate the impact of regional trade integration and the impact of trade liberalization between Serbia and the European Union. A more open trade policy is needed to respond to the opportunities of Serbia's corn sector, and priority should be given to the EU rather than sub-regional trade agreements.

# 1 Introduction

## 1.1 General introduction

The collapse of the centrally planned economic and social systems in Central and Eastern Europe (CEE) and the former Soviet Union (FSU) and the transition towards market economies in the beginning of 1990s induced rapid and substantial changes in the agricultural and food trade environment in these countries. The transition process led to restructuring of trade relationships and diminishing importance of the economic ties among former centrally planned economies (Csaki, 2008). Furthermore, these events were followed by major transformations in the structure and volume of foreign trade in the transition countries, both in geographical and commodity structure (Dudzinski, 2008).

Serbia's economic adjustment was not the same as it was in other former centrally planned economies. The initial conditions of the Yugoslav transition path to a market economy bore the stamp of its recent past, characterized by unfavourable economic, territorial and political changes after the disintegration of the previously unified economic area of the former Socialist Federal Republic of Yugoslavia (SFRY). Moreover, the exclusion of Serbia from trade associations in the region also influenced that transition process and trade liberalization lagged in Serbia. In the 1990s, Serbia did not have an association agreement with the EU, and was neither a member of the Central European Free Trade Agreement (CEFTA)<sup>1</sup> nor of the World Trade Organization (WTO). These have all been impediments to its trade development (Mulaj, 2006).

Before the 1990s Yugoslavia had successfully cooperated with both Western countries and the members of the Eastern bloc, as a socialist country with market economy elements (Jefferson, 2003). However, during the 1990s, Serbia was either in complete or in semi-isolation from most of the world while Serbia's traditional partners from western Europe started to increasingly shift

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<sup>1</sup> Original CEFTA agreement was signed in 1992 by Poland, Hungary and Czech and Slovak republics, while entered into force in 1994 who put efforts to integrate Western European institutions and to join European political, economic, security and legal systems. Until 2006 five other countries joined CEFTA: Slovenia (1996), Romania (1997), Bulgaria (1999), Croatia (2003) and Macedonia (2006). All of the parties of the original agreement left CEFTA when they joined the EU. In 2006, a joint declaration on expansion of CEFTA to Albania, Bosnia and Herzegovina, Moldova, Serbia, Montenegro and Kosovo, was adopted. The agreement went into effect in 2007. (wikipedia)

their trade towards other CEE countries<sup>2</sup>, which managed to establish themselves as important EU trading partners. After the isolation and economic stagnation of Serbia, economic recovery started with the political changes in 2000 (Crnobrnja, 2007).

Serbia enjoyed preferential status in agricultural product exports to the EU since 2001, based on the Autonomous Trade Measures approved by the European Union for the Western Balkan countries (as part of the Stabilization and Association Process, or SAP). These new trade relations implied EU imports of agricultural products originating from Serbia were no longer burdened by customs duties (Jevtic, 2012).

During the mid-1980s to the late 2000s, Serbia's external trade and the trade patterns underwent a series of step changes resulting from the dissolution of the SFR Yugoslavia, the transition from planned to market economy and the re-orientation of trade to western Europe (Ash, 1996). This series of step changes arguably can be divided into three stages to analyze whether Serbia's trade patterns have changed (and the degree to which they did) resulting from structural changes and the process of specialization occurring in the economies in transition as their economies became subjected to market signals, privatization and re-regulation. The three periods for consideration are summarized as follows:

- *1986-1991*: the period coinciding with the collapse of the centrally planned economic and social systems in CEE and the FSU, marking the beginning of the transition process from a socialist-type command economy towards a market-oriented economy when Serbia was a part of SFRY;
- *1992-1999*: the period in which the transition towards market economy in other CEE countries was occurring and that coinciding with SFRY's disintegration. This was a period of economic isolation of the Federal Republic of Yugoslavia (FRY), of which Serbia was a part together with Montenegro and Kosovo, from Europe and the rest of the world due to sanctions (1992-1996) and the NATO bombing (1999); and

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<sup>2</sup> *Central and Eastern European Countries (CEECs)* is a term describing former communist states in Europe, after the fall of the Berlin Wall in 1989/90. CEECs is an OECD term for the group of countries comprising Albania, Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, the Slovak Republic, Slovenia, and the three Baltic States. Since Serbia has not recorded trade (corn export) with Baltic States the term CEECs does not include them for the purpose of this analysis. Moreover, Croatia and Slovenia are presented within the group- former Yugoslavia.

- *2000-2009*: the beginning of international re-integration of Serbia into the world economy and the formal implementation of its economic reforms and trade liberalization.

These periods are specified to analyze the changes in the volume and geographical patterns of Serbia's trade and the volume and value of trade from a base period, the years just before and after the dissolution of FSRY, to the two subsequent periods, one intended to capture the effect of international sanctions and the other to measure the post-sanctions effects. To simplify the analysis, Serbia's trade patterns are limited to a study of its trade in corn. The focus on Serbia and the corn sector, in particular, is of interest for several reasons. These reasons are described below.

First, Serbia was unique among both the CEE transition economies and the other SFRY republics because it (along with Montenegro) was the only post-socialist country that had to function under the imposition of rigorous UN sanctions (1992-1996). Thus, Serbia was either in complete or in semi-isolation from most of the world for the better part of the 1990s (Cvijanovic, 2009). Other ex-centrally planned economies started their economic transition process in 1989-1991 and immediately began advancing their economy's market orientation and integration into the world economy. Serbia did not initiate its reforms until 2000. The deterioration of the 1990s left a more difficult legacy in comparison to the stabilization and reform processes that took place in other CEE countries. Moreover, during the dissolution of ex-SFRY and through the transition period, as with other former SFRY republics, Serbia's economy, including the agricultural sector, was adversely affected by the effects of the rupture of trade networks and marketing channels and the loss of regional and international markets due to the end of trade relations and economic sanctions<sup>3</sup> (Djordjevic, 2009).

Inflation in Serbia and Montenegro reached several million per cent in 1993 which created the worst hyperinflation in history up to this time,  $2,35 \cdot 10^{23}$  % (64% daily). The security problems in Kosovo and Metohia province (1997-1999) culminated in NATO bombing (1999) and positioning this province under international protectorate, which further impeded Serbian

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<sup>3</sup> A general economic blockade was declared by the UN Security Council in 1992, just a month after the declaration of the Federative Republic of Yugoslavia (FRY).

economy, agriculture, its industry and infrastructure. Political instability resulted with the political and economic changes in 2000, gaining independence of Republic Montenegro (2006), and the uncertainty of current negotiations concerning the final status of Kosovo (Bulatovic, 2011).

Second, this analysis of the corn sector is to serve as a reflection of the types of changes that Serbian agriculture and that trade linkages as a whole experienced relative to the base period. Arguably, the greatest impact of the transition in CEE and the FSU has been on agricultural production and the shifts in trade patterns, and within agriculture the grain sectors and their marketing systems were among the most affected (Brooks, 2003). Hence, it can be useful to study a single commodity corn which can be seen as a microcosm of the entire agricultural sector, allowing one to analyze changes in patterns of specialization and the implications for trade. By analyzing the corn sector, one can gain insight into how Serbia's production, trade and marketing links have been affected over these periods.

For Serbia, agriculture stands for so much more than an economic sector that provides food security for the Serbian population and source of raw materials for for the food industry; it is the basis for economy and the only sector with a positive foreign trade balance (Jevtic, 2011). Corn was an important sub-sector of agriculture which in turn was an important sector of overall economic activity and was a sub-sector that was highly linked to the external trade (export). Over the long term within observation period, it has been the crop with the largest output value, ranging from 10% to 20% in the total Serbian agricultural output which increased to about 25% of the value of total agricultural production since 2005 (Outlook, 2006). Corn average shares in terms of the value of Serbian agricultural production were 12.5%, 14% and 15.7% (around 19% in 2009) within first, second and third period defined.<sup>4</sup> It participates with about 40% of total planted area of field crops<sup>5</sup> over the previous ten-year period. Since 2005 and especially due to exports in 2008 and 2009 corn became the single largest export commodity. Exports of yellow corn and frozen raspberries account for over one third of total Serbian exports in the agri-food

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<sup>4</sup> Gross Production Value (constant 2004-2006 1000 IS) (1000 Int. \$). Data for SFRY for the first period. Data observed from FAOSTAT.

<sup>5</sup> In the total agricultural area in 2009, arable fields and gardens participate with 65.3%. Cereals dominate crop production in Serbia, accounting for about 60% of arable land, and 30% of Serbia's gross agricultural output (GAO).



products (in 2009) (USAID, 2010). In 2009, Serbia broke all the records regarding corn exports and was one of the largest corn exporters in Europe and the eight among the 10 largest exporters of this cereal in the world. Corn is also among 10 most significant domestic economy products when it comes to export value (160 million EUR (234 million USD) in 2009). Corn average shares in value of Serbian agricultural exports were 7.6%, 11.8% and 7.9% in export value (1000\$) (15% in 2009) in the three periods defined. The high customs duties on corn of 30% during the long period had their effects in a sense that the imports of this cereal was burdened and this sector likely will remain of special policy concern in the course of Serbians integration efforts. Thus, the analyses of regional structure of Serbian corn trade is only focused on export side since Serbia is traditionally net exporter of corn while its imports remained modest or even did not exist due to the high level of protection in most of the period considered.

## **1.2 The objectives of the thesis**

This thesis is a case study of post-socialist Serbia's economic transformation and integration into the world economy. The purpose is to analyze whether, how, and the degree to which Serbia's trade patterns have changed resulting from structural changes and the process of specialization occurring in the economies in transition by studying economic changes to the corn industry and its external linkages through corn exports. The volume and value of corn exports and the geographical patterns of those exports are analyzed until 2009 relative to the 1986-91 base period. A gravity model is developed to empirically analyze the factors that affected Serbian corn exports over the 1986-2009 period with the aim on accounting for the relevant political, economic and social events that took place in Serbia since the collapse of communism and transition process in the whole region. The model includes a number of variables to analyze economic, political factors explaining trade flows between countries. These variables include GDP, distance, differences in per capita income and other dummy variables. Also, an estimation of the impact of economic negative sanctions on Serbian corn exports will be provided. The study analyzes long- term trends in the regional structure of Serbian corn exports to assess the nature of the changes in its geographical pattern and existing scope, and to reveal what were the main drivers that designated the direction and intensity of the manifested trends.

Therefore the main purpose of this study is to identify and investigate factors that determine exports of Serbia using a gravity model approach. Another research question is whether there has been regional re-orientation of Serbian corn exports occurred after its integration into the international market. The expectation that this occurred is based on: (1) the breakup of trade relations among centrally planned economies and the shift by CEE countries to trade with the West (and the EU in particular) after the fall of communism; (2) Serbia's late integration economically and politically into the EU; and (3) the dissolution of the SFRY.

Furthermore, it seems interesting to investigate whether traditional trade relations are persistent - e.g. due to historical linkages, government relations, geographical proximity, and the liberalization process between Serbia and SEE region. Also, whether the links of common language, business networks and infrastructure, cultural similarities, the old economic ties and established marketing channels stayed relevant in regards to trade relations between Serbia and other former Yugoslav republics after the disintegration of SFRY as is argued in the literature.

### **1.3 The structure of the thesis**

The paper is organized in six chapters. Chapter one provides an introduction to the economic, political and territorial changes undergone in Serbia since the collapse of the SFRY and its relation to changes in the trade patterns given the process of economic reform in former centrally planned economies in CEE and the FSU. Chapter two provides a background of Serbia's agriculture and corn sector, in particular, for the three periods of study, emphasizing the situation that existed in the 1986-91 base period as a means to study the corn exports and the trading patterns that existed at that time. The main focus is on the changes in regional trade patterns of Serbian corn exports. Chapter three provide a theoretical background to analyze trade (as a means to study corn exports) and reviews the literature of work related to agricultural trade patterns of economies in transition and on gravity models aimed at analyzing trade integration. It will also present the effect of sanctions on Serbian trade and discuss the changes in price applying the partial equilibrium framework. Chapter four defines the data and reports the sources used, develops and describes the structure of the gravity model used and provides an extensive description of the method used to estimate Serbian corn exports. It explains all significant

variables in detail of the gravity equation applied in this study. Chapter five presents and discusses the results and main findings of the model estimated and chapter six provides the conclusions on the study, its limitations and suggestions for further study.

## **2 Background into Serbia's economic transition**

### **2.1 Historical background for the economic transition**

Serbia, officially the Republic of Serbia, is located on the Balkan Peninsula, on the Pannonian Plain in Southeastern Europe. Serbia borders Hungary, Bulgaria, Romania, Bosnia and Herzegovina, the Republic of Macedonia, Croatia, and Montenegro and also borders Albania through Kosovo, whose status as part of Serbia is disputed. Serbia is landlocked, although access to the Adriatic Sea is available through Montenegro, and the Danube River provides shipping access to the Black Sea and inland Europe (Volk, 2010). Serbia has over 7 million inhabitants and covers a total of 88.360 square kilometers.

After the Second World War Yugoslavia became a communist country comprising six republics until 1990: Bosnia and Herzegovina, Croatia, Slovenia, Macedonia, Montenegro and Serbia (Stosic, 2009). Slovenia and Croatia, and the northern Serbian province of Vojvodina, were relatively developed while Serbia proper (Serbia minus Vojvodina and Kosovo) was less developed (Rusinow, 2000). Serbian agriculture, under Tito, was not completely centrally planned, but had many market elements in many productions and sectors (USAID, 2010).

After Tito's death in 1980 and after five decades under Tito's communism, separatist and nationalist tensions emerged in multi-ethnic Socialist Federal Republic of Yugoslavia (SFRY) that led to dissolution of the country at the beginning of 1990s. The republics (Slovenia, Croatia, Bosnia and Herzegovina and FYR Macedonia) became independent states with the exception of Serbia and Montenegro which were the Union Republic of Yugoslavia -Federal Republic of

Yugoslavia (FRY) from 1992 until 2003, and the Union of Serbia and Montenegro until 2006, when Republic of Serbia was proclaimed<sup>6</sup> (Prokopijevic, 2002).

Thus since the fall of communism, unlike other transition countries in Eastern Europe which started their social and economic transition in the 1990s (and during the following 15 years became full members of the EU), the Serbian economy has experienced various challenges and difficulties that pushed back the start of real transition over a decade. In the 1990s the economy of the Republic of Serbia was faced by many problems, radically declined GDP down to 50% relative to the level reported in 1989<sup>7</sup>, price instability growing into hyperinflation in 1993, imposed sanctions, rising unemployment exceeding 30%, the development of a considerable grey economy, the NATO bombing, etc. The overall macroeconomic development was largely affected by these problems (Prokopijevic, 2002). International economic sanctions placed on the FRY by the United Nations in 1992 took away an important market, especially for the republic's agricultural products. NATO intervention further impeded already difficult economic position in the country (Crnomarkovic 2010).

Since the political changes in 2000, a larger part of sanctions was lifted, and Serbia has become involved again in many international organisations and institutions (Cvijanovic 2009). The Stabilization and Association Process (SAP), launched in 2000 by the European Union for Balkan integration, aims at preparing Western Balkan countries for future EU membership. (Montanari 2005). On 29 April 2008 Serbia signed the Stabilisation and Association Agreement (SAA) and the Interim Agreement on trade and trade-related matters with the EU. Serbia submitted the Memorandum on the foreign trade regime and association with the World Trade Organization (WTO) in 2005 and negotiations on membership in the WTO are at an advanced stage (EC Website)

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<sup>6</sup> In 1989, Slobodan Milosevic became president of the Republic of Serbia and his ultranationalist calls for Serbian domination led to the violent breakup of Yugoslavia along ethnic lines.

<sup>7</sup> By the end of the decade, in 1999, GDP was reduced down to 40% of its 1989 level and in the end of 2006 were achieved only 64% of GDP level of pre-transition 1989 (OECD 2002).

## 2.2 Serbian agriculture and the corn industry

According to demographic and economic indicators, agriculture and the agro-industry has always been one of the most important sectors in the overall development of the economy of Yugoslavia/Serbia (Jevtic, 2011). The sector is the largest export earner, the country's largest employer and the second largest contributor to Serbia's GDP. However, agriculture's performance in recent years has suffered from variable output and low productivity. The sector employed a large share of the labor force (around 20%), played a significant role in the external sector of the country (13-30% of total export)<sup>8</sup>, and contributed to the total value (9-29% of GDP) created in the society<sup>9</sup> (Antipolis, 2008).

After the disintegration of the SFRY the potential market was cut in half but most of the potential productive agriculture remained in Serbia. Around 25 percent of Yugoslavia's cultivated land is in Serbia and was farmed by one-fourth of the country's active agricultural population. One-fourth of the total cereal production of Yugoslavia was produced in Serbia. In 1987, cereals occupied 58% (4.1 million ha) of the cultivated land, with Serbia, Vojvodina and Croatia owned 75% of the total (Todorovic).

The most important cereals, in terms of area grown, were maize (54%) and wheat (36%). Serbia contributed 22% of the agricultural social product of SFRY. The private (individual) sector accounted for 94% of arable land in Serbia compared to 83% in SFRY (WB, 1983). The Federal Republic of Yugoslavia (FRY)/ Serbia and Montenegro's economy was dominated by Serbia, which accounted for 92% of agricultural land and about 95% of GDP.

In general, the agriculture of Serbia reached its peak during the 1980s. The sector development has been generally in decline since the early 1990's, impeded by socialist policies, internal wars and market loss of agricultural and food products in formal YU republics as well as by economic

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<sup>8</sup> Out of Serbia's total international trade, the agricultural-food products participate with around 10% in 2008 while these products account for a significant proportion of total Serbian exports (ranged from 15 to 25 % over the observation period) while the share of agricultural imports in total imports is lower (6-16%)

<sup>9</sup> Due to years of isolation and reduced efficiency of other sectors of the economy of Serbia it adds considerably to the total income of the country.

distortions and political problems of the Milosevic era ( international economic sanctions, NATO bombing) (WB, 2003). Since 2000, agriculture was recovering slowly. Between 2000 and 2009, the fluctuation in the growth rate of Serbian agriculture was extremely high which indicates the unpredictability of developments in this sector while the average annual growth rate of agricultural production was around 3.5 %. In 2009, the estimated agricultural rate of growth was 2,2%, which was contributed by the production of corn, wheat, sugar beet and fruit (Volk, 2010).

Although a surplus was recorded for agricultural and food products in 1992 in Serbia (FAO), the agro-food trade balance was mostly negative since the mid 1990's, which was the result of political and economic disturbances and of losing privileged status in export markets (status of the most privileged nation – WTO, preferential status in the EU and termination of a number of bilateral and multilateral agreements) (Miljkovic, 2011).

Since 2001, after the foreign trade system was liberalized, Serbian agriculture has recorded a constant rise in exports and imports and since 2005 the foreign trade balance has been positive, including the trade balance with the EU. These successful results of foreign trade in agricultural products are the result of the favorable trade regime which Serbia enjoys because of its asymmetric preferential status with the EU<sup>10</sup> and the US, as well as the free trade regime with the CEFTA countries, and the bilateral trade agreement with Russia. In 2008, exports reached a record; it is estimated that the exports realized about 30% of agriculture GDP (Volk, 2010).

The structure of the agricultural area in Serbia is dominated by cereals. The total value of agricultural production in 2009 of crop production was 69%, and livestock production was 31%. In terms of the production value, maize is by far the most important commodity in Serbia, followed by pig meat, cow milk, wheat, fruits and vegetables (Tomic, 2010).

When it comes to agricultural trade, traditionally main part of Serbian exports of agricultural products goes to the EU and countries in South Eastern Europe ( Bosnia, Macedonia, Croatia, Romania, Bulgaria, Albania, Moldavia), with which Serbia signed free trade agreements within

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<sup>10</sup> Serbia enjoyed preferential status in agricultural product exports to the EU since 2001, based on the Autonomous Trade Measures approved by the European Union for the Western Balkan countries (as part of the Stabilization and Association Process -SAP). Based on these measures, EU imports of agricultural products originating from Serbia are not burdened by customs duties.

the Stability pact for the SEE.<sup>11</sup> The share of SEE countries in Serbia's agricultural and food exports decreased relative to 1990s but still accounted for about 45% in the period 2000-2005. The EU –25 as a whole absorbed by far the largest share of Serbian agro-food exports, almost 55% of total exports in 2005. It appears that the FTAs with Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Romania and Russia have increased foreign trade with these countries and as a consequence increased the overall Serbian agro-food exports. Since 2005 the majority of Serbia's agricultural and food products were still exported to the CEFTA countries, around 50%. The EU also absorbed nearly half of the exports, while the remaining 6% to 7% of exports were destined for other countries, including the Russian markets.

Table 1. Share of agriculture in the economy of Serbia in comparison with EU (in %)

	Share of agriculture <sup>1</sup> in GDP (current prices)	Share of agriculture <sup>1</sup> in total employment	Share of agro-food exports <sup>2</sup> in total goods' exports	Share of agro-food imports <sup>2</sup> in total goods' imports	The rate of growth, the previous year = 100
1990	:	:	:	:	:
1991	11	:	13.0	:	:
1992	:	:	19.7	11	:
1993	:	:	:	:	:
1994	:	:	:	:	:
1995	:	:	:	:	:
1996	:	:	29.6	16.3	:
1997	29.4	:	17.9	16.0	:
1998	19.0	:	15.0	12.5	:
1999	20.0	:	23.0	12.2	:
2000	19.0	:	19.0	8.6	:
2001	19.3	:	18.3	10.7	:
2002	14.4	:	25.3	9.8	-3.2
2003	12.7	:	20.9	8.8	-7.0
2004	13.2	23.9	22.2	8.0	19.0
2005	11.5	23.2	20.3	7.4	-4.9
2006	10.6	20.5	19.4	6.9	-0.2
2007	8.7	20.8	18.9	6.1	-7.8
2008	9.1	21.4	18.0	6.5	8.6
2009*	13.1	19	23.3	8.4	2.2
EU 27 <sup>3</sup>	1.8	5.4	5.7	6.3	:

**Notes:** \* Provisional data; <sup>1</sup> Agriculture together with forestry, hunting and fishery.

<sup>2</sup> Agro-food trade according to Combine Nomenclature of Custom Tariffs (CNCT)

<sup>3</sup> Data for EU for share in gross value added (GVA), and for other share values are from 2008.

Source: *Statistical Office of the Republic of Serbia, EC Statistics, Eurostat Database*

<sup>11</sup> In 2001, under the auspices of the Stability Pact for South East Europe, a Memorandum of Understanding was signed on trade liberalisation and facilitation to encourage the development of a network of bilateral free trade agreements (FTAs).

### **2.3 The development of corn production and trade in Serbia**

The majority of corn production within the former Yugoslav republics can be found on the plains of northern Serbia and eastern Croatia. There were large differences in yields between Republics and Provinces (RAPs), and in 1987, the highest average wheat yield of 5.6 t/ha was in Vojvodina. During the 1980s about 75 % of the arable land in Yugoslavia was farmed by private producers, who accounted for about two thirds of all agricultural output. In 1989, the private sector accounted for 83 % of total corn output. However, private farmers were limited to 10 hectares and many private holdings consisted of several fragmented plots of land. The socialized sector was dominated by large, vertically and horizontally integrated Agrokombinats (AKs). Corn was an important export crop in Serbia from the beginning of the observation period. During 1987 and 1988, corn production highly declined, which forced Serbia to import in 1989. Corn, for which the country was generally self-sufficient, was highly protected during the 1980s. (WB, 1990).

During the 1990s, as a result of imposed sanctions, Serbian agriculture was reduced to a minimum of fertilizers, pesticides and herbicides. Yields in FRY of the production of grains suffered from a lack of fertilisers during the period of trade disruption. Consumption of mineral fertilisers in 2000 was less than one-third of its level a decade earlier. Between 1997 and 2001 yields in wheat, cereals, maize and vegetables all fell steadily. Nevertheless, in 1997 FRY was still a relatively efficient Balkan producer in terms of yield of wheat and cereals, compared to levels in Poland and Romania (OECD, 2001).

While Serbia participated with 28 % in corn production in South Eastern Europe (1998-2000), it accounted for around 8% in Europe and 0.86% in the world production of this commodity in 2009 (Statistical Office of the Republic of Serbia – Belgrade and FAOSTAT). Share of Serbia in total corn production of SFRY ranged between 60-65%.



The table below provides insight into development of corn sector in terms of its production and trade over the observation period.

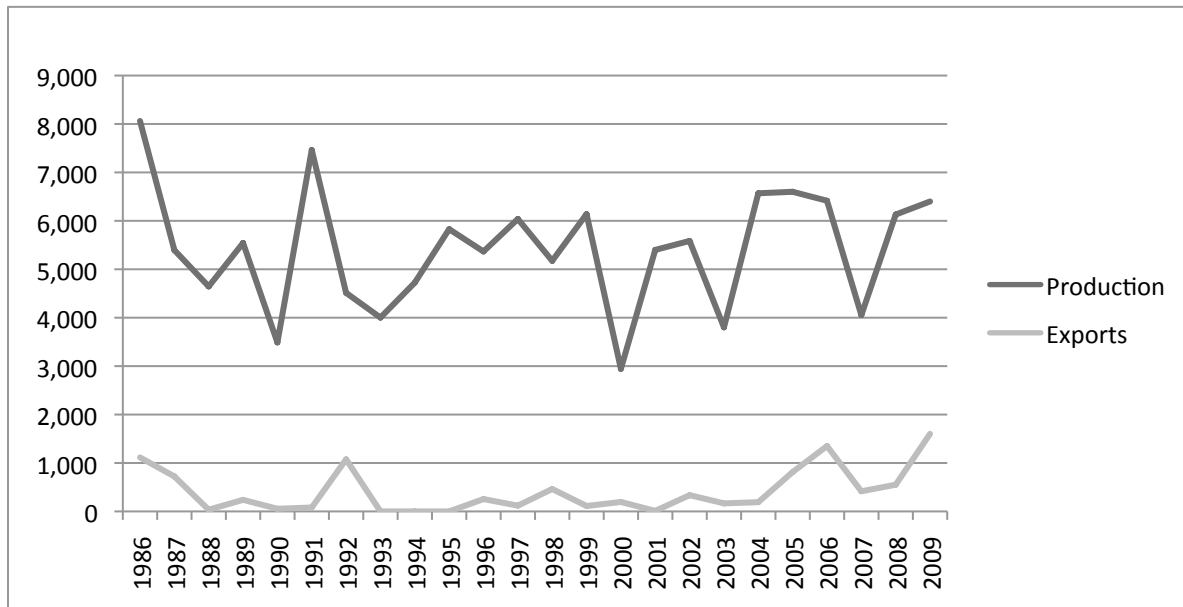
Table 2. Corn production and trade statistics in Serbia, 1986-2009

Year	Area harvested (1000 HA)	Production (1000 MT)	Yield (MT/HA)	Export (000 MT)	Import (000 MT)
1986	1,372	8,062	5.88	1,115	2
1987	1,273	5,396	4.24	723	123
1988	1,310	4,645	3.55	35	121
1989	1,305	5,543	4.25	239	38
1990	1,275	3,489	2.74	55	665
1991	1,253	7,463	5.95	80	68
1992	1,517	4,513	2.98	1,075	2
1993	1,389	4,002	2.88	0	0
1994	1,386	4,724	3.41	0	0
1995	1,372	5,828	4.25	0	28
1996	1,439	5,367	3.73	255	29
1997	1,366	6,039	4.42	119	11
1998	1,351	5,174	3.83	463	1
1999	1,267	6,140	4.85	111	15
2000	1,207	2,944	2.44	195	2
2001	1,200	5,400	4.50	11	213
2002	1,196	5,585	4.67	336	4
2003	1,200	3,800	3.17	166	1
2004	1,200	6,569	5.47	191	17
2005	1,220	6,600	5.41	813	2
2006	1,170	6,415	5.48	1,350	2
2007	1,207	4,054	3.36	416	1
2008	1,277	6,130	4.80	551	2
2009	1,200	6,400	5.33	1,602	3

Source: *Statistical Office of the Republic of Serbia; UN FAO, FAOSTAT on-line database*

The following figure showing erratic values of production and exports of corn commodity in Serbia over 1986-2009.

Figure 1. Serbian corn production and exports (1000 MT), 1986-2009



The obtained average annual production was approximately 5.8, 5.2 and 5.4 million tons in the first, second and third period defined, respectively. Total exports amounted for 2.4 million tons in period 1, 2.2 million tons in period 2 and 5.3 million tons while average trade balance was 205,188 tons, 242,521 and 538,353 tons respectively. At the beginning of the second period exports of corn over million tones was recorded in Serbia but after that due to sanctions 1993, 1994 and 1995 no exports was recorded. Export over million tons in 1992 contributed to suficit with almost the same quantity. Since then until the end of the second period an export of corn (as well as its production) was much or less stable with a 4-years average quantity of 237,000 over the period 1996-1999. At the turn of the last two periods corn production in Serbia considerably decreased from 6.1 million tons in 1999 to 2.9 million tons in 2000 as a result of bad weather conditions and NATO bombing. At the same time on exports side this change was recorded as a decrease from 195,046 tons in 2000 to 10,526 in 2001.

Total domestic corn consumption in Serbia for the last five years during the observed period varied between 4.1 and 5.4 million MT. About 80% of total consumption was used for animal

feed, while rest was used for human consumption, alcohol and starch production. Corn production is expected to continue at present levels as this crop is mainly grown for animal feed.

While Serbia is lagging behind the EU Member States when it comes to yields, the analysis of export price of corn shows that Serbia has a lower export price than the EU Member States. The export price of corn over the period 2005-2008 was \$223 per ton in the EU while in Serbia was \$140 per ton. Corn export prices in Serbia were also competitive with corn prices in other countries in the region since the price of Hungarian corn was higher in the observed period. On the one hand, this is the advantage of Serbian producers from the aspect of the increase of export and acceptability of the price at the foreign market, taking into account that the prices are more and more significant for consumers. However, such price may not be sufficiently motivating for producers to realise a satisfying income (Tomic, 2008).

In Serbia the state is implementing protectionist policy regarding the corn trade without the real need to do so. The level of customs protection, increased by accompanying costs, disables import. The existing customs duties had negative effect: customs on corn (both seed and feed corn) was 30%. Furthermore, the situation of domestic corn being replaced with imported corn is completely unrealistic, hence it remains unclear why the state insisted on high protection in the EU negotiations. The Stabilization and Association Agreement with the EU entered into force in February 2009. The liberalization based on the SAA with the EU will not affect this market segment significantly, as with regards to corn, the dynamics of customs rates decrease was slowed down, so in 2009 they will go from 30% to 24% for seed corn, and from 30% to 27% for feed corn (USAID, 2010). Such customs duties had their effects; there was no import of corn, because Serbia had lower prices of cereals than the countries in the surrounding region, from which the cereals could have been imported. When import was not affected by disparity in prices, it was affected by high customs duties and transport costs, which burdened the trade by an additional tax which disabled import. Hence, high customs rates had no direct influence over production and price, but had a significant impact primarily due to the manner in which it prevented competition in access to inputs, chiefly seeds. Such customs duties did not prevent access to seeds, but it made the price of imported seed more expensive, and therewith disrupted the establishing of equal competition which should have enabled for the best seed to be planted.

Bearing in mind the same determinants noted above let us now again have a look on how that has influenced the existing scope of exports of this sector between the periods studied. How did corn production and trade of Serbia change from the base period? Table 2 and figure 1 showed that production of corn, and consequently-its exports were characterized by erratic volumes. Trends in Serbian corn production and quantity of corn exports over the whole observation period showed that corn production was significantly reduced in 1986-2009 by 1,662,000 tons or 21% but this decrease was even more dramatic in the period between 1986 and 2000, which fell by 63.5%. On the other hand, in 2009 corn exports was 30% higher than in 1986.

By comparing periods we could notice the small decrease in the total quantity of Serbian corn exports from period 1 to period 2 (from 2,318,059 to 2,128,768 tons), while comparing these quantities for the last two periods we could notice a significant increase in volume of exports in period 3 (5,331,421 tons) compared to the export quantity in period 2. The modest change of export volume between first two periods is surprising since one could assume much higher deterioration in the second period due to sanctions, war, NATO aggression and all negative consequences as a result. On the one hand, if we take a look on production and export volume by year in the first period we could notice vast decrease in these quantities throughout the period. Exports quantity of corn decreased from 1.1 million tons in 1986 to 34,857 tons in 1988, due to decrease in corn production from 8.1 million tons in 1986 to 4.6 million tons in 1988. Until the end of this period volume of exports remained small resulting in modest volume of total exports for the first period as a whole. In year 1988 and 1990 Serbia even recorded a trade deficit in this sector. On the other hand, the unexpected high volume of corn exports in Serbia in the second period was partly due to the fact that pre-1992 figures did not record trade between former Yugoslav republics. The rather strong changes in this period therefore have to be interpreted with care.<sup>12</sup> The former Yugoslav republics received 330,000 tons from the total exports in period 2 and 1,360,000 tons in period 3.

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<sup>12</sup> Also, data referred to Serbian corn exports over the period 1986-1991 should be taken with caution since there are no available data for Serbian exports in total exports of SFR Yugoslavia (the study applies the assumption of Serbia's share of 62% in SFRY's corn exports which will be explained in chapter four.). Moreover, the exports were not recorded in 1993-1995 due to sanctions.

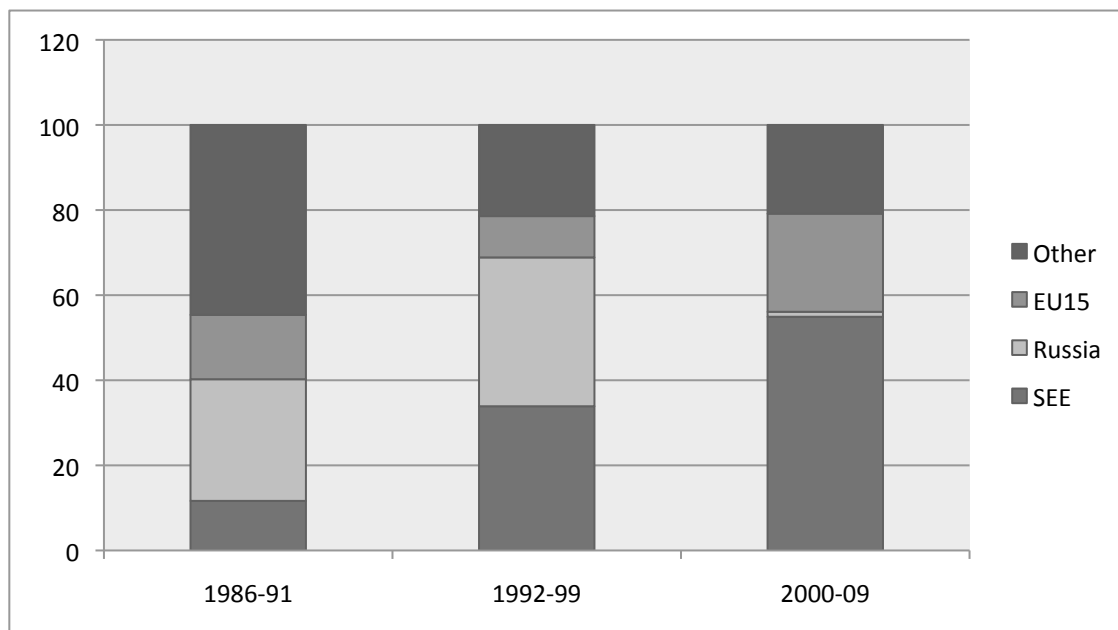
Nevertheless, based on the results achieved since 2000, there is no doubt that preferential status contributed to the growth of export to the EU and CEFTA which had corresponding effect on scope/volume of this exports as well. Thus, in the third period large quantities of Serbian corn were exported reaching levels of 5.3 million MT, about 60 percent higher than total exports in the second period.

#### **2.4 Serbia's corn trade and exports by trading partner**

While Serbia's agricultural and food trade balance has traditionally been negative (until the mid 2000s in the observation period), the trade balance of corn has been positive. An overview of the corn trade development among some of Serbia's trading partners shows whether the country was a net exporter or net importer of corn in the observation period. Given the high concentration of Serbian exports of corn in a few countries this insight into the strength of import demand for Serbian corn in these countries is of particular importance. Such a high concentration of Serbian corn exports to a few countries poses a risk to the domestic economy making Serbia dependent on the shift of demand in these markets. The decline in import demand of the main trading partners of Serbia would be reflected in the decline of Serbian exports. The case of Russia could be seen as an example of this kind of behavior. Changes in Russian corn trade development since 2002 and a shift from net importer to net exporter that it experienced in 2009 have reflected on decrease of Serbian corn exports to this country.

The average shares for the group of countries that were the main markets for Serbian corn exports and for the rest of the world are presented and summarized in Figure 2 and Table 5 for all three periods considered. Figure 6 stresses the relevance of four main regions as a destination for Serbian corn exports whereas Russia's share was not classified to any of the groups but presented separately due to its high significance. The countries that belonged to group 'Other' in the first period were: Algeria, Libya, Malta, Lebanon, Jordan, Turkey, Cuba and in lesser extent Egypt, Angola, Honduras, India, Israel, Kenya, Mexico, Morocco, Nicaragua, Oman, Panama, Senegal, Syrian Arab Republic, Tunisia, USA. The low and fluctuating level of the exports flow going to these countries leads to very erratic values over time and has been of minor relevance.

Figure 2. Geographical patterns of Serbian corn exports, 1986-2009 (in %)



Source: *FAOSTAT and UN comtrade*

In the first period we can see that the biggest share belonged to countries referred as ‘Other’, then to Russia (29%), followed by SEE (12%) and EU15(15%). Over the first two periods the highest share in Serbian corn exports was still revealed for Russia which as an individual market occupied around 29 and 35 percent on average, respectively, thus increasing its share in Serbian corn exports by 6.4 percent. Russia almost completely lost its relevance as a destination for Serbian corn exports in third period since this share sharply declined to 1.2 percent. That is also the greatest change observed in these markets among periods.

With an average share of 12 percent in the first, and 34 percent in the second period, SEE countries had also significant share in Serbian corn exports but still much lower than Russia as an individual market. SEE region includes Romania, Bulgaria and former Yugoslav republics – Bosnia and Macedonia (since 1992) and Montenegro (since 2006). The remarkable change over the last two periods is that these countries in SEE, unlike Russia, significantly increased their average aggregate share from 34% to 55% which made them the most important destination for Serbian corn exports for the last analysed period.

The significance of EU15 as a market for Serbian corn export dropped from already modest share of about 15 % in the first period to less than 10% in the second period . The EU increased its share from 10 to 23 % thereafter. With the dominant share of 45% in the first period, countries belonged to the rest of the world (named ‘Other’) continued to have considerable but decreasing share of around 21% in the last two periods.

More detailed picture could be perceived by looking at data in table 5 which presents individual market shares of leading countries of Serbian corn exports. Data in the table 3 referred to individual countries which are the major single markets for corn exports of Serbia. To smoothen annual fluctuation in exports flows five-year averages are presented in percents (1986-1991) and (1992- 1999)<sup>13</sup> for first and second, and nine-years (2000-2009)<sup>14</sup> for the third period considered. In table 5 observed average shares are presented by country and by period.

**Table 3. Averages shares of Serbia’s major export countries (% of total)**

Country/Region	1986-91	1992-99	2000-09
Bulgaria	3.48	1.47	1.56
Romania	8.17	16.84	28.48
Bosnia-Herzegovina		8.45	17.60
Macedonia		7.13	6.21
Montenegro			1.07
Cyprus	6.22	8.3	2.81
Switzerland	2.17	3.58	0.53
Russia	28.59	34.98	1.17
EU15	15.13	9.71	23.07
Other	36.24	9.54	17.50
<b>Total (in tons)</b>	<b>2,318,059</b>	<b>2,128,768</b>	<b>5,331,421</b>

Source: *FAOSTAT and UN comtrade*

<sup>13</sup> No data available for 1991 and 1993,1994,1995 due to sanctions.

<sup>14</sup> For 2003 no data available.

The dramatic change in exports to Russia is mainly due to the fact that Russia experienced a shift from net importer to net exporter of corn at the turn of the year 2008/2009. This was a result of Russian corn trade development over the period 2000-2009 where Russian corn exports sharply increased from 360 to 1,358,030 MT while imports decreased from 702,193 to 38,007 between 2000 and 2009, respectively. Therefore Russia's weakened import demand for corn required Serbia to find new markets for its exports. Other markets replaced the dominant position in Serbian corn exports which previously belonged to the Russian market.

The average share of total corn exports of Serbia going to Romania doubled in period 2 in comparison with first period. Romania more than tripled its share between the first and third period from 8% to 29%. Lower share that Romania had in the first period (in relative to the last two) was mostly due to Romanian side taking into account that during that time no import demand was recorded for the period 1987-1989.<sup>15</sup> During 2005-2009 Romania has gained a dominant position in Serbian corn exports. Nevertheless, Romania's corn import demand was particularly strong in the period between 2007-2009 and this opportunity Serbia used by increasing its exports to neighbouring country to extremely high quantities in 2008 and 2009. Hence 45% in 2008 and almost 70% in 2009 of all exported corn from Serbia had Constanta as its final destination. Thus Romania has rapidly replaced Russia as a major trade partner for Serbian corn exports.

The cereals production in Serbia, during the 1970s and 1980s, was primarily oriented towards satisfying its own needs and exports to Russia for barter trade. Ports built on the Danube during that period are still being used. A smaller part was exported to the Near East via sea port in Bar (Montenegro). This structure prevails even today. Due to these capacities, especially ports on the Danube, export of cereals is primarily oriented to Port Constanta in Romania, the biggest port in the Black Sea (USAID, 2010).<sup>16</sup> Transportation to neighboring countries is performed by trucks and rail while majority of the corn exports to Mediterranean countries and other EU countries are done by river transportation through Danube Ports, from Serbia to Port Constanta (USDA, 2009). Much of Serbia's recent trade with Russia and Romania has involved the

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<sup>15</sup> Those three years Romania was net exporter thus no exports was recorded from Serbia in this period to this market.

<sup>16</sup> The Port of Constanta should be Serbia's natural choice because the capacity of direct river connection through the Danube is, practically, unlimited making transportation of goods by river much cheaper than transportation of goods by road or railway.



exchange of wheat and maize for energy and fertilizer (barter trade). In Romania, Serbian seed of varieties of cereals are highly esteemed.

Serbia often finds itself competing with regional corn producers from Russia, Ukraine, Romania and Hungary (USAID, 2010). Serbian cereals are fully competitive in neighbouring former Yugoslav Republic of Macedonia, Bosnia and Herzegovina, Montenegro and Kosovo – all of which have large structural cereal deficits. Russia and Romania were the most important individual markets for Serbian corn exports together constituting around 37% and 52% in the first and second period respectively.

Trade with the EU countries, has not been so significant during the 1990s in general due to sanctions, war, political and overall macroeconomic instability as well as NATO aggression at the end of the second period in Serbia. Consequently, the EU15's share in Serbian corn exports experienced a decrease from 15 to 10% in average, over the period 1986-1999. Within EU 15 the main target for Serbian corn exports was Germany and Italy, following by Greece. The average share of EU countries in total Serbian exports of corn decreased over the 1992-1999 period but increases thereafter with economic development and economic integration, from 10% to 23% between period 2 and period 3. The trade openness of the Serbian market was recorded particularly since 2002, after recovery of the country from NATO aggression and after trade liberalization in Serbia started in 2001. As a result of these changes the EU market started to gain its relevance for the Serbian corn exports. A reorientation of Serbian trade since 2000 to the European Union was expected.

Since 1993, when the trade with former Yugoslav republics started to be recorded as an international transaction, these markets participated with their average share in Serbian corn exports by almost 16%. In this group Bosnia and Macedonia, with their average shares of 8.5% and 7%, respectively were the most important target for Serbian corn exports while Croatia and Slovenia had insignificant share. Macedonia experienced an increase in its share in Serbian corn exports from 8% in 1996 to 33% in 1997. The analysis reveals that the extent of Serbian trade integration with the former Yugoslav republics in total/agricultural and food products including corn is still among the most important. This clearly indicates the maintained historical trade

linkages that continued also after the border and trade barriers had been introduced. Several constraints were impeding trade flows in the 1990s, e.g. trade barriers, different currencies, deterioration of infrastructure and interrupted transport connections due to the war and NATO aggression. Between 2000 and 2001 an increase in exports to the former Yugoslav markets took place due to the political and economic stabilization of the Balkan region, and after isolation of the country followed by NATO aggression in 1999.<sup>17</sup> Over the whole period 2001 to 2009, the relevance of the traditional former Yugoslav markets as destination for Serbian corn export stayed significant.<sup>18</sup> It should be emphasized that historical and cultural linkages, common language, the old economic ties, government relations and established marketing channels, played significant role in determination of trade between Serbia and markets of former Yugoslavia.

## **2.5 Trade agreements**

The institutional framework for free trade in the region was established in 2001 when the Memorandum of Understanding on Trade Liberalization and Facilitation was signed, under the auspices of the Stability Pact for South Eastern Europe (SEE). Seven countries in SEE signed the Memorandum (Albania, Bosnia and Herzegovina, Croatia, Macedonia, Serbia and Montenegro, Romania and Bulgaria), while Moldova joined later. Moreover, CEFTA countries are a natural market for the Serbian economy in general, both because of the recognisable brands and because of proximity. Their importance sharply increased from the beginning taking into account that during the third period considered these traditional trade links have even strengthened again due to an increased overall stability of the Balkan region since the end of the 1990's, with the enforcement of bilateral agreements. The bilateral free-trade agreements of Serbia with FYR of Macedonia, Bosnia-Herzegovina and Croatia, permitted Serbia preferential access to these former Yugoslav markets and vice versa. In 2003 free trade agreement that Serbia signed with Bosnia came into force while in 2004 FTA was signed with Croatia. With Macedonia this kind

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<sup>17</sup> This resulted in an increase of share of these countries in Serbian corn exports from 15% in 2000 to 68% in 2001. These countries also increased their average aggregate share from 15% to 26% over the last two periods.

<sup>18</sup> Although dropped considerably from 68 percent in 2001 to 13.5 percent in 2009.

of agreement was signed earlier in 1996. Concessions of these bilateral free trade agreements were transferred to Central European Free Trade Agreement (CEFTA) in 2006.

Serbia signed the Free Trade Agreement with Russia (asymmetric agricultural concessions in favor of Russia) in 2000 which is then revised in 2009. In 2004 Serbia signed the free trade agreement with Romania which was in force until the accession of Romania to the EU in 2007.

<sup>19</sup> All preferences that Serbia gained from the EU market (0% of customs duty in case of corn as well) started to be implied from Romanian side and thus Serbia continued to have free trade relations with its neighbour. That was also a good opportunity for Serbia to integrate this important part of the agricultural sector into the EU and redirect its exports towards this market. Serbia enjoyed preferential status in agricultural product export to the EU since 2001, based on the Autonomous Trade Measures approved by the EU for the Western Balkan Countries (as part of the Stabilisation and Association Process, SAP).<sup>20</sup>

The analysis revealed that after the disintegration of the Soviet politico-economic system, Serbian corn exports remained mainly directed to former centrally planned economy of former Soviet Union, i.e. Russia and to other former centrally planned economies in South Eastern European countries. Romania together with former Yugoslav republics gained its relevance (Romania, Bosnia and Macedonia had highly dominant share). Together these three regions (Russia, CEECs and former countries of SFRY) took more than two thirds, on average, of Serbia's corn exports in the second period, and 60% in the third period. However, period 3 was characterized by some changes taking into account sharp fall of Russia's share in the Serbian corn exports on the one hand, and rise in share of Romania, Bosnia and EU 15 market. The EU 15 region started to gain its relevance which was still small in regard to participation of other regions as well as expectations. Hence the analysis clearly reveals the crucial importance of

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<sup>19</sup> Bulgaria and Romania joined the EU in 2007 and started to implement the same policy as EU applied for SEE countries / later Western Balkan from 2000/2006. But for the purpose of this analysis they stayed within group of CEECs during the whole observation period.

<sup>20</sup> Based on these measures, EU imports of agricultural products originating from Serbia are not subjected to customs duties. Serbia signed Stabilisation and Association Agreement and Interim Agreement on trade and trade-related matters with the EU in 2008.

South Eastern Europe as a main export destination for Serbian corn in which markets Serbian cereals are competitive.

The geographical structure of Serbian corn exports provides a first indication that Serbia did not succeed in redirecting its corn exports towards Western Europe as it was expected. Integration into the EU zone and world markets is generally weak. The rest of the world as market for Serbian corn exports showed a decreasing trend over the first two periods revealing that Serbia was during the second period observed even less integrated into the world and West European market than a decade ago but there are many reasons for this, including historical legacies. A small part of Serbian corn exports was exported to the Near East countries in the first period while some of these markets completely lost the relevance within the second or third period. Moreover, its unenviable position was further jeopardized taking into account that Serbia was excluded from other international and trade organizations and was isolated most of the second period (exclusion of Serbia from trade associations in the region). Thus, this case analysis as many other studies also found that since the beginning of market reforms in 1989, Serbia has been trading significantly less with the world economy. The fact that Serbia was not very integrated had been determined to a large extent by non-economic factors (historical, political etc.) which were clearly more important than any purely economic interests in determining economic relations and trade patterns of Serbia. In addition to historical factors, one must consider a large extent by non-economic factors- the recent military conflicts and embargoes, which have had a direct impact on Serbian trade, contributing to a much lower level of trade than otherwise could have been the case. In such a difficult position in which Serbia was during the entire decade it is understandable why neighbouring countries were Serbia's natural choice and explain Serbia's inability to redirect its exports to West or other far-regions with net import demand.

However, some changes have been observed in the third period since 2000 (relative to period 2 and to lesser extent to period 1). With economic development and economic integration and trade liberalization, Serbia started to integrate and establish its position in the international market. A number of studies stress the importance of free trade agreements (FTAs). Based on the results achieved since 2000, there is no doubt that preferential status contributed to the growth of

Serbia's corn export to the EU and thus to the increase in export volume by 60 percent from second to third period. It is expected that these changes will continue to contribute to the growth of export towards the EU. The main incentive for the current strong increase of corn exports has produced an asymmetrical trade arrangement with the EU, and to a lesser extent, with regional free trade zone. Liberalization of corn trade has numerous and complex effects on macro level.

CEFTA Agreement has already greatly helped the increase of Serbian corn export into the countries of the region. It is realistic to expect the trend of corn export rise into CEFTA countries to continue, which is certainly a positive effect of liberalization. However, this development is likely to be stopped or even reversed if Serbia join the EU. As an EU member Serbia would no longer eligible to rely on the bilateral free trade agreements with the markets of the former Yugoslav countries. The recent studies have already documented that almost 80% of corn exports in Serbia is directed towards EU market. Hence the largest trade potential for Serbia lies with the EU and CEFTA countries. Therefore due to all linkages with the countries of former Yugoslavia as well as the liberalization process, trade will be facilitated.

The implementation of the Interim Trade Agreement opened the possibility for Serbia of diagonal cumulating of origin of goods in trade with the EU, with countries of the CEFTA region, Turkey and EFTA Member States, which represents a new impulse to the development of trade and investments in the region. An obvious conclusion from this analysis is that the trade policy in the country- beside geographical proximity, historical and cultural linkages between countries but also by country-specific political, institutional and economic factors – has profound effect on regional trade patterns of the country.

### **3 Theoretical background**

International economic sanctions have become increasingly imposed since the collapse of the centrally planning system in 1990, by international organizations as well as by the United States. Since the fall of the Berlin Wall, sanctions have become a common instrument of the United Nations Security Council (Caruso, 2003). Small countries tend to be much more dependent on trade and their demands for and supplies of tradeable goods are price-inelastic. Thus, these countries can suffer heavily from the imposition of sanctions (Kaempfer, 2007).

Many studies usually distinguish between negative and positive sanctions. Negative sanctions are imposed in order to bring an economic damage to one or more countries while positive sanctions foster co-operation among countries. The focus of this study is on the impact of international negative sanctions on trade. Taking into account the object of sanctions, they are commonly distinguish into three categories: boycotts, embargoes and financial sanctions. A boycott restricts imports of one or more goods from the target country while an embargo restricts exports of certain products to the target country. An embargo is the most common measure where the prohibition on exports may be partial or complete (Caruso, 2003).

Hufbauer et al. (2003) divided sanctions into three categories: limited, moderated and extensive. The extensive sanctions are imposed on comprehensive trade such as those against Iraq or Serbia and show a large depressing effect on bilateral trade flows. In 1992 the UN Security Council imposed international sanctions on Serbia and Montenegro (which constituted the Federal Republic of Yugoslavia after 1991) (Hajdinjak, 2002).

The first impact which can be evaluated in the case of sanctions is the impact on trade. Sanctions theoretically imply decrease in trade/exports. This paper presents the effect of sanctions on Serbian trade and discuss the changes in price applying the partial equilibrium framework (section 3.1 and 3.2) and also provides, through a gravity model approach, an estimation of the impact of economic negative sanctions on Serbian exports (chapter 5).

### 3.1 Partial equilibrium

The partial equilibrium model provides a simple straightforward framework to analyse the impact of various policy regimes on production, consumption and trade. The model is sector or commodity specific, assuming no interactive effects with other sectors. This assumption simplifies the modelling, making it easier to understand and apply various policy measures used in international trade. The model is static, which is useful when analysing the effects of a shock in the market, such as changes in policy regime or trade impediments including sanctions. This framework is not able to capture interactions between commodities that in reality are interlinked by substitution, complementation and competition (Houck, 1986; Gaisford et al, 2001). Also, this approach assumes that the prices of all other goods stay constant looking at the price of just one good.

The partial equilibrium model presented in figure 3 uses three panel diagrams of two-region, consisting of an exporter (Serbia), an importer (the rest of the world) and the world market as a whole (world market).

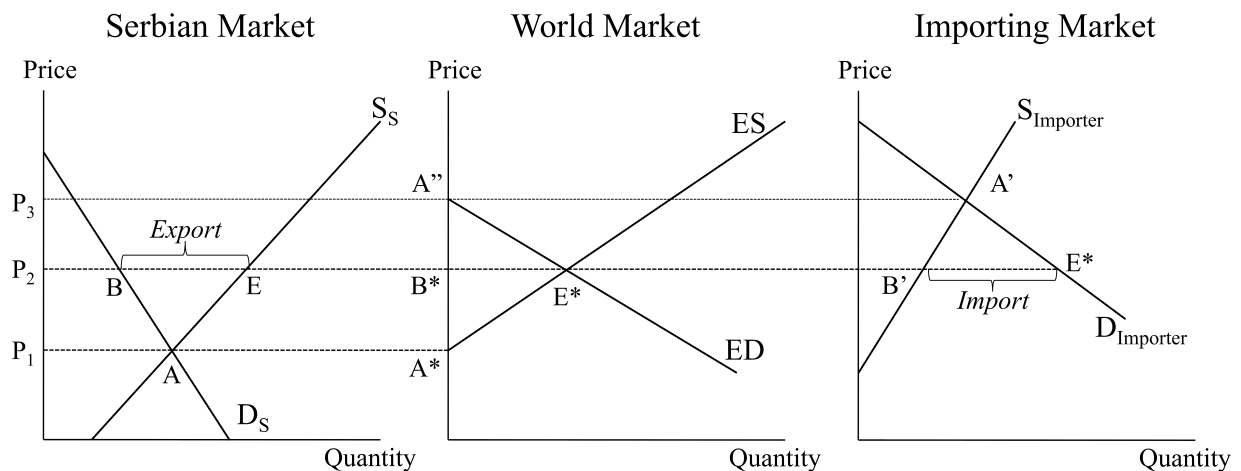


Figure 3 . The partial equilibrium framework: Deriving trade equilibrium in a commodity market  
Sources: Salvatore, 1998; Houck, 1986; Tweeten, 1982.

The left panel of figure 3 represents the countries with a comparative advantage in the production of the commodity considered. In a closed economy, this country will be in equilibrium in point A while the domestic equilibrium price will be  $p_1$ . The right panel of the same figure represents the countries with a relative disadvantage in the production of the commodity considered. The initial production, consumption and demand equilibrium is depicted as point A' while the domestic equilibrium price will be  $p_3$ . With the opening of trade, these two countries will adjust production, consumption and prices to the aggregate supply and aggregate demand of the commodity.

The excess demand curve (ED) in the world market represents the horizontal difference between the demand-and supply curve for the importer in the market. The excess supply curve (ES) shows the horizontal difference between the supply and demand curve for the exporter. These shows the amounts imported and exported, together with the world market price, and the ES and ED curves are usually more elastic than respectively the supply and demand functions in the domestic markets. (Houck, 1986). At a relative price above  $P_1$ , Serbia's excess supply of particular good increases Serbia's international supply of the commodity (ES in the world market). At a relative price lower than  $P_3$ , importer's excess demand for the commodity observed increases importer's demand for imports of that commodity (ED in the world market). Lines  $S_s$  and  $D_s$  represent initial supply and demand functions in the exporting country, and lines  $S_{importer}$  and  $D_{importer}$  represent initial supply and demand functions in the rest of the world. The intersection of the excess supply (ES) and excess demand (ED) functions derived from the two regions indicates the equilibrium world market price ( $P_2$ ) in the absence of trade interventions. Thus  $P_2$  is equilibrium-relative commodity price with trade where quantity of imports demanded equal quantity of exports supplied. At a commodity price of  $p_2$ , the excess supply in the exporting market will equal the quantity BE in the left panel while the excess demand will equal the quantity B'E\* in the right panel. (Salvatore, 1998; Houck, 1986; Tweeten, 1982).



### 3.2 Partial framework of the effects of a sanction against Serbia

Figure 4 is a partial equilibrium model depicting the effects of a sanction against Serbia's exports. The left-hand panel represents the target country's external market for exports. The target country's supply of exports to world markets is given by the curve  $ES_{Serbia}$ .

The model of impact of sanctions presented here follows that of familiar two panel diagrams, of Serbian market and world market as a whole. Lines  $S_s$  and  $D_s$  represent initial supply and demand functions in the exporting country, Serbia. The intersection of the excess supply ( $ES_{Serbia}$ ) and excess demand ( $ED$ ) functions derived indicates the equilibrium world market price ( $P_w$ ) in the absence of trade interventions. The domestic price is equal to the world price, and the quantity of world  $Q^*$  is equal to exports ( $X_S^* - X_D^*$ ) in the Serbian market.

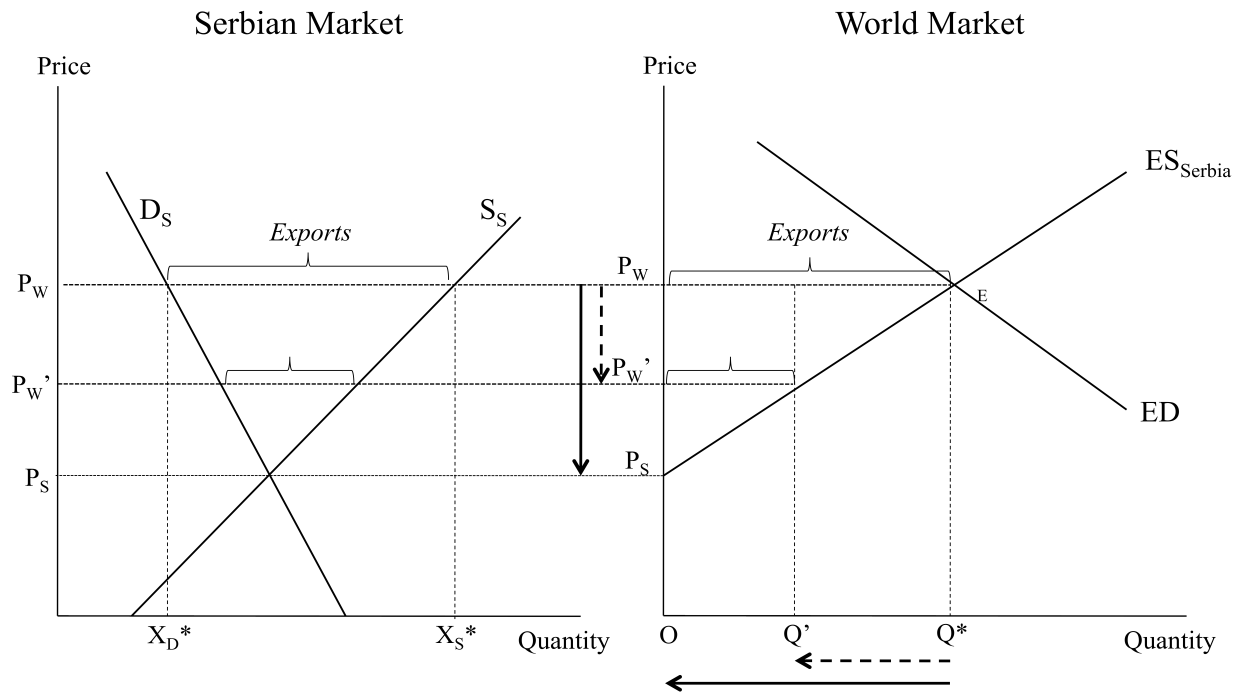


Figure 4. The impact of sanctions

The graph above simply presents the impact of sanctions on export volume and prices. An embargo restricts exports of certain products to the target country where these restrictions on exports may be partial or complete. Correspondingly, we can distinguish three scenarios: (i) free trade regime, (i) partial sanctions, and (i) complete (comprehensive) sanctions.

Let the curve  $ES_{\text{Serbia}}$  represent target country export supply curve. In the absence of any impediments or transportation costs the perfect competition equilibrium will be reached at point E ( $OQ^*$ ). Thus in a free trade regime Serbia's exports the quantity  $Q^*$  at the world price  $p_w$ . Suppose now that a sender country imposes an embargo on exports to the target country (Serbia), restricting them until  $Q'$ . The vertical line represents the quantitative restriction (from  $Q^*$  to  $Q'$ , case of partial embargo). Since the embargo restricts supply it also decreases export prices to  $p_w'$  in the exporting country. The wedge in the price ( $p_w - p_w'$ ) reflects the quantitative restriction. Thus in case of moderate/partial sanctions Serbia exports  $OQ'$  at the sanctions-depressed price  $p_w'$ . The embargo does not change the world price for this good but creates a wedge between prevailing world price and the lower price obtained by this country's exporters.

Assume now case of extensive/comprehensive sanctions. The exported quantity is reduced from initial  $Q^*$  to zero. That will affect price to be reduced from  $P_w$  to  $P_s$ , to the level of domestic Serbian price. The situation of comprehensive sanctions will be assumed in the regression model of this study.

This model is the general model for a partial equilibrium. When analysing a single country's market and trading situation, variables such as size and the elasticity of excess supply and excess demand have to be considered. Thus, if one of the countries is a small nation (if accounts for a small share of world trade in the commodity) it will face a different ES and ED curve. A small net importer will meet a flat, fully elastic ES curve and a small net exporter will correspondingly face a fully elastic ED curve, both positioned at the world price. The large nation model is the most general one, as the ES and ED curve becomes more price elastic the smaller effect a country has on world trade (Houck, 1986).

### 3.3 The changes in the geographical patterns of trade in transition economies

During the last two decades a number of empirical studies investigated the changes in the structure and volume of the foreign trade in the transition economies focusing on the changes in trade patterns after the collapse of the communist system, the role of free trade agreements in fostering trade reorientation, and the relevance of trade creation versus trade diversion. Understanding the changes in trade patterns provide information on potential welfare and adjustment implications following liberalisation which can be helpful in agribusiness planning (Bojnec, 2004). By looking in the trade patterns over time one could reveal the degree of distortion of the economies before independence and their success in adjusting their trade patterns after independence (Wyzan, 1999). Serbia fits into the common definition of a typical transition country, which can be described as a small and open economy often with a newly (re)gained independence.

The patterns in trade are influenced by geographical proximity, cultural and historical linkages between countries as well as by political and economic factors (Krugman, 1991; Greenway and Torstensson, 1998). However, the relative importance of these different factors altogether on international trade is unclear. In this case study, geographical proximity as well as historical and cultural linkages, and common language played significant role in trade between Serbia and markets of former Yugoslavia. When it comes to reorientation of trade in other CEECs, many studies also state that geographical vicinity played significant role in their process of integration into the EU market. Moreover, the factors behind the reorientation of trade flows in the transition countries in CEE and SEE and the FSU in the beginning of 1990s were quite specific. The factors that are commonly used in the literature in explaining changes in the trade patterns of a typical transition country in general at the beginning of transition to a market economy are: (i) the collapse of the COMECON<sup>21</sup>; (ii) the dissolution of multinational states like the USSR, Yugoslavia and Czechoslovakia; (iii) an increase in trade openness ratio (TOR) as a consequence of policies of stabilization, liberalization and privatization (Vujcic, 2001).

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<sup>21</sup> Although the former Yugoslavia was not a member of the Council for Mutual Economic Assistance ( COMECON, CMEA, or CAME), 1949–1991, its collapse, led to a diversion of excess trade with that block. (Vujcic, 2001).

### **3.4 A selective literature review on the gravity model**

This section presents theoretical and empirical developments on the gravity model reviewing the existing literature on the role of trade in the successful CEE transition economies (which are now members of the EU) as well as SEE countries, and to a lesser extent on CIS countries, focusing on the main findings of these studies. In the recent years the plenty of studies analyzed the trade development of CEECs during the pre-accession period in order to calculate the potential volumes of trade between CEECs and the EU-15 (Gros and Gonciarz, 1996; Nilsson, 2000; Bussiere, Fidrmuc and Schnatz, 2004). These studies reported that CEE managed to increase their trade with EU, and by now they are highly integrated into the EU market. The literature on the SEECs is scarce compared to the literature on CEECs. The only studies that analyse trade potentials for the entire SEE region are Christie (2002 and 2004) and Vujcic and Susic (2004). Empirical work has not been undertaken to explain Serbia's trade patterns using gravity model. Considering the importance of international trade in Serbia's economic development, it would be an important task to identify which are the determinant factors of Serbia's bilateral trade flows.

In general, existing studies concluded that unlike other transition economies in CEE which succeeded in integrating themselves into the world economy, the SEE countries and the CIS countries have been much less successful in reorienting their trade flows. The lack of institutional trade arrangement with western markets, less favourable geographical position, slower progress in macroeconomic stabilization were in general noted as reasons. They remain highly dependent on trade links with other transition economies, such as CIS countries on the Russian Federation (Mrak, 2000). Also applying a gravity model, Boussiere et al (2005) analysed the trade integration of the CEECs as well as the SEECs and concluded that international trade of these countries was low at the beginning of the transition process. The CEECs trade less than comparable countries with smaller or more distant economies, both in Europe and the world market. The smaller SEECs showed a low degree of trade integration in the EU and the world economy (Weyerstrass). The breakdown of Serbian corn exports by region showed a similar pattern.

Two of the most influential early studies in the field by Hamilton and Winters (1992) and Baldwin (1994), showed that trade of the CEECs with developed countries has been only a fraction of potential trade. Hvylyshyn and Al-Atrash (1998) showed that Romania achieved a significantly higher actual share of trade with the EU than the model was predicted in 1996. Fontagne et al. (1999) found that trade potentials were largely exhausted by the end of the decade while Egger (2003) and Fidrmuc and Fidrmuc (2003) found that trade between the EU-15 and the CEECs was close to the predicted level at the end of the 1990s.

Christie (2002 and 2004) suggested significant differences of the actual trade from the potential values, mainly because of the lack of transport infrastructure. On the assumption that GDP levels in the region are below their potential, Christie (2002) estimated a gravity model on 1999 data and found that there is significant potential to increase trade and enhance regional integration. Vujcic and Sosic (2004) estimated gravitz model for Croatia. However, these studies do not fully employ the panel dimensions of their datasets neither they present a broader comparison with other regions. Christie (2002) and Vujcic and Sosic (2004) identified significant trade potentials, to a large extent as a result of tariff and non-tariff trade barriers introduced during the 1990s. Especially they emphasized the EU's role for the countries, which liberalised trade with the Western Balkan region (Albania, Bosnia and Herzegovina, Croatia, Macedonia, and Serbia and Montenegro) in 2000.

Marco Montanari (2005) applied a gravity model to evaluate the potential for growth in trade between the EU and the Western Balkans. EU trade with the Western Balkans showed considerable room for growth in both imports and exports where trade policy and geographical proximity played an important role in shaping trade patterns. Toole and Lutz (2005) used multiple regression for six distinct regions of the former Communist world and found that a country's degree of political openness was the most important in determining relative openness to trade; alongside its geographic proximity to the world markets and its prospects for future accession to the EU.

Caetano and Galego (2005) in their gravity model used panel data from 1993 to 2001, and concluded that there is still scope for further expansion of the trade flows between some CEECs and some of the EU countries as well as among the CEEC. They emphasized that geographical and economic factors have to be considered when anticipating the trade impacts of enlargement.

Lamotte (2006) showed that a process of the establishment of free trade agreements between SEECs and the EU will lead to an increase of trade between the EU and the Western Balkans, while it may have a limited impact on intra-SEE trade. Romania and Bulgaria have liberalized their mutual trade in the framework of the CEFTA they signed respectively in 1997 and 1999. Bilateral free trade agreements have become effective between all the SEECs from the beginning of the 2000s.

Many of the conclusions of this study reflect the same picture as a case study of Serbian corn exports. First, trade flows between the SEECs and the rest of the world represent only one-third to one-fourth of their potential. In the case of the SEE countries, the trade deficit with the rest of the world can be partly explained by the periods of conflicts and sanctions and their late integration into international institutions, specifically the WTO. The fact that the Western Balkans has a higher trade deficit with the rest of the world than the Eastern Balkans confirms these assumptions. Second, this study showed that there was a potential for an increase of trade between the Western Balkans and the EU which was based on the ratio obtained for trade between the EU15 and the Eastern Balkans assuming that trade liberalization between the EU15 and the Western Balkans will have a similar impact. The ratio of intra-SFRY trade indicates that trade flows between the successor states of the former Yugoslavia are higher than their potential which is consistent with previous studies that showed trade flows between the successor states of the former federation remaining intense, several years after the political disintegration. These findings are also consistent with the case of Serbia and its corn exports. Finally, they argued that the trade flows between SEECs and the EU will likely to increase, whereas mutual trade flows will relatively decrease. They stressed that the impact of the recent regional free trade agreements would probably be limited and that priority should be given to the EU rather than sub-regional trade agreements.

Kucharcukova et al. (2010) confirmed that since the beginning of market reforms in 1989, the countries of SEE and the CIS have been trading significantly less with the world economy than those CEE countries which later joined the EU. The main finding of an augmented gravity model suggested that the low quality of economic institutions in many SEE and CIS countries represents the biggest obstacle to greater trade integration. The authors from this study suggested that improving the quality of institutions, improvements in infrastructure and opening-up to regional cooperation are complementary tools to stimulate the trade of the SEE and CIS regions with the rest of the world. WTO membership influences trade positively, but, on average, by less than membership in a free trade area.

Hufbauer (1997) used gravity model to estimate the impact of sanctions and distinguish whether their coverage was limited, moderate, or extensive. The dummy variables do not distinguish between target and sender and indicate whether sanctions exist between the pair of countries, and their severity.

Kernohan (2006) attempted to reveal World Bank's attention to three SEE countries (Bosnia-Herzegovina (BiH), Serbia-Montenegro and Macedonia) where the share of intra-SEE trade has remained static over the decade 1993-2003 and where integration into the EU zone and world markets is generally weak. This study uses the same explanatory variables and similar dummy variables as regards to the case study of Serbian corn exports - a set of dummy variables for whether a country pair are in a bilateral free trade agreement (FTA) and for former membership of Yugoslavia (FYR).

Fidrmuc (2003) and Boillot (2003) analysed trade among CEEC in particular after the collapse of the central planning. Fidrmuc found a decline on bilateral trade intensity among these countries following the collapse of COMECON. Also, they verified that trade between EU 15 and the CEEC close to the potential level at the end of the 1990s. On the other hand, Boillot have concluded that trade among the CEEC is intense within the several sub-regions such as the Baltic and Balkan areas.

Kernohan (2006), stressed that due to the fact that all remaining republics of FRY now have a Stabilisation and Association Agreement (SAA) in place, the main focus should be on extending

the present EU customs union (CU) with Turkey to encompass the entire SEE region arguing that this kind of trade regime could have a more significant impact on growth and welfare than either the proposed RTA or the present regime of bilateral trade relationships (FTAs).

Taking into account that apart from being the most significant exported agriculture product, corn is also among ten most significant domestic economy products when it comes to export value, it is important to determine export potential to different countries and put efforts to evaluate and identify the determinant factors of Serbia's corn export flows and effective ways to expand these flows.



## **4 Determinants of Serbia's corn exports: A gravity model approach**

The experience of Serbia's economy provides good example of the importance of exports to economic growth as well as the importance of agricultural exports in total exports. However, empirical research on the export of Serbia in general is limited. Given the importance of exports of corn in the overall agricultural exports and the role it plays in the Serbian agriculture in general, it is important to investigate the factors influencing export flows of corn between Serbia and its trading partners. A gravity model is a useful tool in determining trade or export potential of a country.

On the one hand, the collapse of centrally planned economies, disintegration of SFRY and sanctions against Serbia at the beginning of 1990s have raised questions about whether and the degree to which they distorted trade and on the other hand, the proliferation of free trade agreements in Serbia since 2000 have, in fact, opened markets, created trade and promoted economic growth. This study uses panel data from 1986 to 2009 and a gravity framework model to identify the influence of all these internal and external factors that aid or restrict Serbian corn exports in the world agricultural/corn market place.

### **4.1 The basic assumptions of the gravity model**

The gravity model of trade presents a more empirical analysis of trading patterns and an effective tool in the determination of the export potential of a country. The gravity model has proven to be a useful tool in explaining bilateral trade flows between exporter and the importer, together with factors that stimulate or restrict trade. Gravity models generally find that integration has a positive effect while borders have a negative effect on trade (Harri, 2003). The gravity model is a model derived from physics and applied to international trade theory which explains that bilateral trade flows are determined by countries' GDPs as well as geographical factors such as distance and population (Sohn, 2001). Gravity models, which were originally

introduced by Linder (1961) and Linnemann (1966), have become one of the most commonly used models to analyse patterns in international trade.

The gravity model was originally founded on Newton's physical theory which states that 'two bodies attract each other in proportion to their masses and inversely by the square of the distance between them' (Sohn, 2001). By applying the gravity model to international trade theory, the bilateral trade flows and patterns between two countries can be explained by regarding each of them as an organic body that attracts each other in proportion to their economic size and inversely to their distance. According to Brühlhart and Kelly (1999), and Kang (2003) the standard gravity models include four sets of variables as determinants of trade: (i) Variables indicating the export supply, captured by economic factors (GDP or GDP per capita) affecting trade flows in exporting countries; (ii) variables indicating the import demand, captured by economic factors (income or income per capita) affecting trade flows in the importing countries; (iii) Transportation costs, captured by geographical distance; (iv) Variables aiding or restricting trade between the importer and exporter. They are consistent with standard models of international trade (Deardorff, 1995, and Anderson, 1979, Anderson and van Wincoop, 2003).

The basic assumption of the gravity model, therefore, states that the bilateral trade flows are positively related to the product of the GDPs of two countries and negatively related to the distance between them. The distance is taken as an indication of the level of trade costs for the trading countries. The simplest version of the gravity model has following form (Sohn, 2001):

$$X_{ij} = A \cdot (Y_i Y_j / D_{ij}) \quad [1]$$

where  $X_{ij}$  is the value/volume of exports;  $Y_i$  is the national income of country  $i$  measured by the GDP of country  $i$ ;  $Y_j$  is the GDP of country  $j$ ;  $D_{ij}$  is the distance between the capital cities of countries  $i$  and  $j$ ; and  $A$  is a constant proportionality.

In addition to these primary basic variables, other variables, such as population (or per capita GDP) and land area, can be included in the gravity model as determinants of economic size. Dummy variables can also be included in the gravity equation to represent geographical and cultural factors/political and economic changes. In the following section 4.1.2 the basic gravity

equation for the regression analysis in this study is going to be presented. More detail on specification of the gravity model applied in this study will be provided in the section 4.1.4.

## 4.2 Modeling Foundations

The gravity model has long been disregarded by economists due to its lack of theoretical foundation. However, due to the successive works of Leamer, Krugman and Deardorff as well as many other economists, it has become a model with strong economic foundation. Since the 1990s, when reorientation of trade flows in transition economies occurred, the gravity model has emerged as a new tools in explaining and predicting international trade patterns (Sohn, 2001).

Tinbergen (1962) and Pöynönen (1963) were the first to apply the gravity model to international trade but the strong theoretical foundations were not produced until the end of the 1970s. They concluded that exports are positively affected by the income of the countries and negatively affected by the distance between trading countries. With the increasing importance of geographical factors in the theory of international trade, the gravity model started to attract attention in the 1980s. Krugman and Helpman (1985), Bergstrand (1989), Deardorff (1995) and Evenett and Keller (1998) showed that the gravity equation can be derived from a number of different international trade models. Anderson (1979) and Bergstrand (1985, 1989) further contributed to the theoretical foundation of the gravity model and confirmed that the gravity equation may be a good representation irrespective of the structure of product markets. Anderson (1979) applied product differentiation and assumed Cobb-Douglas preferences. Also, he applied the Armington Assumption that products are differentiated by country of origin.<sup>22</sup> Bergstrand (1985, 1989) included population size and Oguledo and Macphee (1994) included price variables.

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<sup>22</sup> Assumption implying that there is imperfect substitutability between imports and domestic goods, based on the country of origin.

Moreover, Deardorff (1995) derives the gravity model in the framework of a Heckscher- Ohlin model and simplified the Anderson's approach assuming that the same preferences hold, not only for traded goods like Anderson, but for all goods. Helpman (1998) argued that the gravity models should be useful tool to identify determinants influencing volume of trade and that the gravity equation worked best for similar countries with considerable intra-industry trade between them. He suggested that product differentiation can be considered above and beyond factor endowments. Some other studies analyzed the determinants of exports between different countries with models other than the gravity model. Finally, Deardorff (1998) concluded that the gravity equation was consistent with Ricardian and Heckscher-Ohlin trade model in homogenous goods with perfect competition.

Since this study is focused only on export side of Serbian corn I will further explain how gravity model can be used to explain export patterns of a particular exporting country and for a specific commodity. In its general form, exports from country  $i$  to country  $j$  are explained by their economic sizes (GDP), population, geographical distance and a set of dummy variables. The basic model is specified as (Martinez-Zarzoso and Nowak-Lehmann, 2003: 296; Jakab, Kovács and Oszlay, 2001: 280):

$$X_{ij} = \beta_0 Y_i^{\beta_1} Y_j^{\beta_2} N_i^{\beta_3} N_j^{\beta_4} D_{ij}^{\beta_5} A_{ij}^{\beta_6} u_{ij} \quad [2]$$

where  $X_{ij}$  is export of goods by country  $i$  to country  $j$ ,  $Y_i$  and  $Y_j$  are the GDP of the exporter and importer,  $N_i$  and  $N_j$  are the populations of the exporter and importer,  $D_{ij}$  is the distance between the two countries,  $A_{ij}$  represents the factors influencing trade between the countries and  $u_{ij}$  is the error term. For the purpose of estimation, the model in equation (2) is expressed in log form as:

$$\ln X_{ij} = \beta_0 + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 \ln N_i + \beta_4 \ln N_j + \beta_5 \ln D_{ij} + \beta_6 \ln A_{ij} + u_{ij} \quad [3]$$

In the literature on gravity models, three variables are considered for use as proxy for the country's size: GDP, GDP per capita and population. However all three can not be included due to multicollinearity and this paper takes into account the first two.

An alternative form of Equation (3) could be used when a exports estimate is made for a specific commodity, such in this case study of corn commodity, and is represented as:

$$\ln X_{ij} = \beta_0 + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 \ln Y_i / N_i + \beta_4 \ln Y_j / N_j + \beta_5 \ln D_{ij} + \beta_6 \ln A_{ij} + u_{ij} \quad [4]$$

where  $Y_i / N_i$  is the exporter's GDP per capita and  $Y_j / N_j$  is the importer's GDP per capita.

Equation (4), based on the standard gravity equation, applies per capita income instead of population and will be estimated in this study. A population variable was tested but it was not significant. A high level of GDP indicates a high level of production in the exporting country which increases the availability of exports, and a high level of GDP in the importing country indicates high imports. Thus,  $\beta_1$  and  $\beta_2$  are expected to have positive signs.

### 4.3 Data

The trade data with regards to regional distribution of Serbian corn exports (which reports both value and volume) used in both, qualitative and the quantitative (regression) analysis come from two sources, FAO/Food and Agriculture Organisation (FAOSTAT) and the United Nations Commodity Trade Statistics database, UN Comtrade. Other data in this study are based mainly on official national statistics, i.e. Statistical Office of the Republic of Serbia(SORS)/Federal Statistical Office of Yugoslavia and Ministry of Agriculture, Forestry and Water Management (MAFWM) but also on agricultural organizations including USDA FAS, USAID, FAO, EU Statistics and World Bank as well as on research results of major number of economists.

The panel dataset developed for this study includes export of corn from Serbia to eight countries during the observation period from 1986 until 2009. Various variables are taken into account to control for the influence of the many internal and external factors affecting Serbian export of corn. Summary statistics for the variables in the panel dataset are shown in the table below.

Table 4. Summary statistics for the variables in the panel dataset

Variable	Description	Mean	s.d.
<b>exps</b>	Corn exports between $i$ and $j$ ( in tons)	5.983806	6.930509
<b>gdprs</b>	GDP of exporter $i$ (millions of U.S. dollars)	10.33764	0.236335
<b>gdpr</b>	GDP of importer $j$ (millions of U.S. dollars)	11.32926	2.473592
<b>gdprscap</b>	GDP per capita of exporter $i$ (millions of U.S. dollars)	7.983159	0.253424
<b>gdprcap</b>	GDP per capita of importer $j$ (millions of U.S. dollars)	8.875655	1.140744
<b>dis</b>	Kilometers between exporter $i$ 's and importer $j$ 's major commercial cities	6.661383	1.004787
<b>ratio</b>	Ratio of export price of Serbian corn on other markets divided by world unit price	0.649548	1.076181
<b>sanctions</b>	Dummy variable : 1 for the years under sanctions	0.208333	0.407178
<b>collapse</b>	Dummy variable: 1 for the years capturing collapse of centrally planned system	0.125	0.331584
<b>language</b>	Dummy variable: 1 when both countries share a common language	0.125	0.331584
<b>fta</b>	Dummy variable: 1 for the years when both countries are members of the same fta	0.125	0.331584

Considering the significant territorial changes during the observed period of study, the availability of reliable and consistent data on the agricultural sector in Serbia is still limited. It was almost impossible to compare the data over the last two decades and to verify whether data

includes Montenegro and Kosovo or not. In this study where possible, analysis is based on data specific to Republic of Serbia (excluding Kosovo and/or Montenegro). In the case of corn consumption and trade statistics, analysis is based on data for the Federal Republic of Yugoslavia (FRY)/Serbia and Montenegro for the period 1992-2005 since data of FAO/ UN comtrade/SORS and MAFWM for the period before 2000 do not contain data only for Republic of Serbia. As Serbia accounts for more than 90 percent of the economy of FRY, this use of aggregate data does not substantially change the analysis. Moreover, Serbia accounts for 99.8% in total corn production of FRY/Serbia and Montenegro (Statistical yearbook of Yugoslavia, 2002) during the whole observation period. Taking this into account, most of the data which cover the period 1992-2005 are referred to Serbia and Montenegro, while data that capture the period since 2005 include only the Republic of Serbia. More detailed comments regarding lack of data will be included in limitations of the study.

For this analysis I provided information on Serbian corn exports by country where the review obtained from FAOSTAT/UN Comtrade covers more than 40 countries. Thus to keep the discussion more tractable, I calculated their participation in Serbian corn exports selecting the countries which together make up between 70-90% of total Serbian corn exports within the whole observation period. These countries are: Russia<sup>23</sup>, Romania, Bulgaria, Switzerland, Cyprus, two Former Yugoslav republics - Bosnia and Macedonia, and EU-15<sup>24</sup>. Thus the study covers main trading partners of Serbia with whom it had constant corn trade over the whole observation period. The flow of corn exports from Serbia towards the EU countries is not analyzed in detail by each country but on an aggregated level (within the group named EU-15). The low and fluctuating level of trade between Serbia and any of the countries of the group 'Other' (rest of the world) leads to very erratic values over time and has been of minor relevance.

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<sup>23</sup> From the former *USSR* Serbia recorded exports of corn to only 4 countries- Russia, Belarus, Ukraine and Kazakhstan. However, these three countries but Russia were of little relevance in the corn trade of Serbia, after the dissolution of *USSR*. Thus, the change in the country coverage of this region will very likely be of insignificant relevance for the results of this analysis so they are not presented separately. But they are of course included in group "Other" for the last two periods. While Russia in the first period actually referred to *USSR*.

<sup>24</sup> The *EU-15* covers the previous EU-15 members, including Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom. With two of these countries (Finland, Ireland) Serbia did not record corn trade, thus they are not included in the group EU-15 in this study. Since 2004 Slovenia, Poland, Czech Republic, Slovakia and Hungary and since 2007 Romania and Bulgaria joined the EU but they are not additionally considered in the aggregate of EU neither they are excluded from CEE for the purpose of this analysis.

However, 35 percent of the cells are “missing” in the origin Serbian corn trade/export matrix (obtained from FAOSTAT and UNcomtrade online database). To obtain a more appropriate panel data set for the regression analysis a few assumptions were made which in result provide ‘new’ trade matrix with 6.8 percent missing data.

In this study two questions arose: what to do with export volume in the years of sanctions, and what do do with missing data for a few years. The analysis of Serbian regional patterns of corn exports for the period 1992-2005 is based on data for the Federal Republic of Yugoslavia (FRY)/Serbia and Montenegro while the data referred to the period since 2006 include Republic of Serbia. The data for the first analysed period (1986-1991) are calculated using the assumption of Serbia’s share of 62% in SFR Yugoslavia’s corn exports. This assumption is based on the fact that Serbia participated with around 62% in total SFR Yugoslav corn production over the period 1986-1991 (for which data are available). Hence due to lack of data on participation of each former Yugoslav republics in total corn export of SFR Yugoslavia for the first period, this share is then used when calculating Serbian participation in total Yugoslav corn exports.<sup>25</sup>

Moreover, the reliability of data on foreign trade of Yugoslavia during the 1990s is highly questionable, not just due to the significant territorial changes during the study’s observation period. Economic sanctions have caused the UN ban on the use of data for 1993 and 1994. Many of the economic and statistical publications do not include Yugoslavia’s data over the period of sanctions (1992-1995). Correspondingly, data for regional structure of Serbian exports, obtained from FAOSTAT and UNcomtrade, for the year 1993, 1994 and 1995 are not available. More precisely, data for the year 1993-1995 referred to zero export volume. Data for the years 1991 and 2003 are also missing.

Trade with former Yugoslav republics since 1993 is recorded as a foreign trade, while by 1992 is recorded as a realization of the internal market making Serbian trade data before and after 1992 not comparable. Thus, the earliest figures in the tables with regards to regional pattern of corn exports date from 1993 since data before these years in the respective countries does not include

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<sup>25</sup> I further tested this assumption and calculated Serbian share in total corn exports of former Yugoslav republics (summarizing exports of Serbia/Montenegro, Croatia, Slovenia, Bosnia, Macedonia) over the period 1992-2009 and got similar share (around 65%).



trade with other former Yugoslav republics. However, to make the data set more tractable for regression analysis an assumption of Bosnia's and Macedonia's share in Serbian corn export for the period 1986-1992 is made (by using an average share of these two former Yugoslav republics in total Serbian corn exports for the period 1996-2009).<sup>26</sup> To fill a few other empty cells in this matrix the data of importing countries which are main export markets for Serbian corn are used (mainly for years 2003).<sup>27</sup>

The Serbian corn export data are based on FAOSTAT/UNcomtrade, which reports both value and volume. Thus under FAOSTAT, the export price is derived from the corn export value (1000 US\$) divided by quantity (metric tons) in respective years. Data for export prices of Serbian corn on other markets are missing whenever the export value/quantity are missing. In this case Romanian export price is used having in mind that Serbia and Romania share similar characteristics thus many studies usually compare those two net corn exporters. Sensitivity tests were made when it comes to using the export price and instead of the Romanian price the regression is run where in the place of export price this time I used Hungarian price which is also another main Serbian competitor in the region. Since the results did not change with putting different prices the Romanian price seemed to serve as an appropriate variable to compensate missing Serbian price for a few years. The total world corn unit price is based on the Food and Agriculture Organization of the United Nations FAOSTAT, obtained by dividing world export value by world export quantity of corn.

Most gravity models are specified in log-linear form because of ease of calculation and interpretation. However taking logarithms often removes observations from the sample because the log of zero is undefined. Omitting zero-flow or missing observations implies that data is lost due to no or very low trade and may produce downwardly biased and inconsistent parameter estimates. Thus another econometric issue is how to deal with those countries with which Serbia has zero export volume. There are several such observations, especially in the period of

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<sup>26</sup> Sensitivity test - when their share is calculated in 'created' SFRY 1992-2009 export (summarizing exports of Serbia/Montenegro, Croatia, Slovenia, Bosnia, Macedonia) over the period 1992-2009).

<sup>27</sup> While FAO does adjust/modify some official figures where there are evident inconsistencies the trade matrix data are un-reconciled. That is, a user may find that what country A officially declares as imports from country B will not correspond to what country B officially, and reciprocally, declares as its exports to country A, for a given commodity in a given year (in terms of quantity and/or value).

sanctions. Frankel (1997) proposed an alternative method. An observation with zero export value can be omitted but that may lead to selectivity bias. Arbitrary small numbers may be used in place of zeros. A semi-logarithmic formulation and Tobit estimator can be used with the loss of interpreting the estimated coefficients as elasticities (Havrylyshyn and Pritchett, 1991).

Hence for the observations with zero export volume, due to sanctions or due to missing data (assuming that empty cells are due to no trade actually having taken place), a value of 0.001 was used since log of zero is undefined. Moreover, I did a sensitivity test with the approximation of export flows ( $X_{ijt} \approx X_{ijt} + \epsilon$ ) for  $\epsilon$  equals to 1, 0.1, 0.01, and 0.001. The results do not change when compare with the situation where I left empty cells or put 0.001. Also, price theoretically cannot be zero thus I used Romanian price instead to calculate a price ratio.

The data for GDP real and GDP real per capita were taken from UNCTADStat (United Nations Conference on Trade and Development). Population data were obtained for the same source (absolute values in thousands). However, data for GDP of Serbia and Montenegro, Bosnia and Macedonia, Russia as well as their GDP per capita were not available for all years including in this study. Thus, a few assumptions were also made for those variables. Available data for the period before 1992 referred to SFRY and USSR. For 1986-1991 for these countries data are obtained by applying the shares of each individual constituent country. GDP for Serbia, Bosnia and Macedonia are obtained by applying the 1986-1991 shares in gross national product per capita broken down by constituent republic derived from the Yugoslav Statistics.<sup>28</sup> Real GDP for both Serbia and eight other countries are in US dollars at constant prices (2005) and constant exchange rates (2005) in millions. Real GDP per capita are in US dollars at constant prices (2005) and constant exchange rates (2005) per capita.

Distance data are taken from <http://www.distancefromto.net/countries.php>. The distance between Serbia and EU15 is calculated using the average distance between Serbia and all other 15 European countries. Data for the livestock variable were obtained by multiplying animal units taken from <http://66.173.241.168/nmp/calculator.cfm> with the production of livestock (pig,

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<sup>28</sup> GNP per capita in dinar (prices 1972) Source: Savezni zavod za statistiku, "Razvoj republika prethodne SFR Jugoslavije 1947-1990", Studije, Analize, Prikazi, Beograd, 1996, 237. With a constant proportion of 41.5% of the population, Serbia's share in GNP had declined from 39% in 1947 to 35.5% in 1988.

cattle and chicken) for each country/year. Data on bilateral/regional trade agreements and their date of entry into force were compiled by considering multiple sources.

#### 4.4 The gravity model

The basic gravity equation for the regression analysis in this study takes the following form:

$$\ln X_{ijt} = a + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln GDP_{cap_{it}} + \beta_4 \ln GDP_{cap_{jt}} + \beta_5 \ln dis_{ij} + \beta_6 \ln A_{ij} + u_{ijt} \quad [5]$$

where  $a$  is a constant;  $X_{ijt}$  is a volume of exports of corn commodity from country  $i$  (Serbia) to country  $j$  at time  $t$ ;  $GDP_i$  and  $GDP_j$  are the real GDP (in 2005 U.S dollars) of the exporter and importer, respectively and measures the size effect of the two economies; the next two items in the equation are per capita real GDP for Serbia and for the importing country, respectively; (Importer per capita income gauges the income effect on imports);  $dis_{ij}$  is the geographical distance between Serbia and country  $j$  (measured in kilometers as the direct line distance between the capital cities of the two countries);  $A_{ij}$  represents any other factors influencing exports between the countries (dummy variables) and reflects cultural, historical, economic and political factors affecting export and  $u_{ij}$  is the error term.

In the table below the expected signs of the coefficients are presented and explained.

Table 5. Expected signs of the coefficients

<b>Variable</b>	<b>Expected sign</b>	<b>Explanation</b>
gdprs	+	Potential export supply
gdpr	+	Economically larger countries import more
gdprscap	+/-	A higher output per person indicates a potential for higher exports, but a larger population may both increase and decrease exports
gdprcap	+/-	A higher output per person indicates a higher import demand, but a larger population may both increase and decrease exports
dis	-	Transportation costs
ratio	-	An increase in export price of exporter on other markets relative to world unit price will decrease exports of corn
sanctions	-	Sanctions theoretically imply decrease in trade/exports
collapse	-	Collapse of planned system may negatively affect trade/export
language	+	Common language facilitates exports
fta	+	Free trade agreements facilitate exports

The dependent variable is the natural log of corn exports ( $\ln X_{ijt}$ ) from Serbia to country  $j$  in year  $t$ . A high level of  $GDP_{it}$  represents the potential export supply of goods from Serbia and indicates a high level of production in Serbia which increases the availability of exports. Since only exports from Serbia to its trading partners are considered in this study, the coefficient of Serbia's real GDP acts as a time-varying shift parameter measuring the impact of economic growth in Serbia on its corn exports. This is expected to be positive.

The GDP of the importing country ( $GDP_{jt}$ ), reflects the potential demand of Serbian corn. The coefficient of real GDP for the importing country reflects that a high level of income in the importing country suggests high imports and is expected to have a positive effect on Serbian corn exports.

Per capita GDP is an explanatory variable as a proxy for the income level and purchasing ability of the exporter and importer. Aggregate price changes over time have taken into account by using real GDP variables. The coefficient of per capita real GDP is an income elasticity for the

importing country and its sign depends on whether the commodity is a necessity or luxury.<sup>29</sup> When the economy improves, consumers' income increase allowing consumers to spend and buy more. This should shift the demand curve for most commodities upward but 'inferior' goods are the exception to this rule. Taking corn as example, that means that if the income increases it will induce consumers to purchase less corn (they now buy more meat instead), in which case corn is an inferior good. However, feed corn cannot be inferior good because it is a source of protein. Therefore, the consumption of corn by humans probably makes it an inferior good, but if take into account that one of the largest uses of corn is as animal feed, in that case consumption of meat is definitely a normal good. Nevertheless, some studies found that among the cereals, rice and wheat have positive income elasticities, while corn was found to be an inferior good (Merlinda, 1991). Also, Bergstrand (1989) distinguished aggregate trade flows into industries and goods; the coefficient of the exporter's GDP per capita is a proxy for the exporting countries' capital-labor ratio while the coefficient of an importer's GDP per capita indicates that the products are a luxury or necessity in terms of consumption. In such an explanation, the coefficient of Serbia's per capita GDP measures the impact of capital intensity in Serbia on Serbia's agricultural exports. The exporter per capita income coefficient is positive for goods which are capital intensive in production and negative for labour-intensive goods.

Based on the standard gravity equation (5), I included the ratio as another explanatory variable to determine whether this factor is influential in determining Serbia's export flows of corn commodity. The coefficient of the ratio is expected to be negative, implying that increase in export price of Serbian corn on other markets relative to other competitors (world unit price) discourages demand of Serbian trading partners which will affect Serbian corn exports to decrease. The resulting equation takes the following form:

$$\ln X_{ijt} = a + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln GDPcap_{it} + \beta_4 \ln GDPcap_{jt} + \beta_5 \ln dis_{ij} + \beta_6 \ln ratio + \beta_7 \ln A_{ij} + u_{ijt} \quad [6]$$

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<sup>29</sup> Consumer's income, usually measured by per capita income depends on whether the commodity is a "normal" or "inferior" good

The coefficient of distance is expected to be negative because it is a proxy for transport costs, a longer distance is associated with a decrease in exports. The farther the country is from Serbia, the lower the export. Moreover, the distance factor in the gravity models is captured by various variables. Beside the geographical distance, which is the distance between Serbia and importing countries (capital or economic center) in km, some variables are included to take into account specific factors that make economic distance different from geographic distance. The variable *border* refers to neighboring countries, and *language* indicates cultural proximity. Because of possible collinearity of some of these variables they are estimated both together but also separately. The variables *distance* and *language* do not change with time and only vary across export destinations.

Therefore, in terms of explanatory variables, this study starts from a simple gravity model relating export flows to distance and economic size, to which are added ratio variable and nine other dummy variables accounting for a common language, countries that used to be part of the same territory, a common border, market economy, participation in a free trade agreement (EU, CEFTA), sanctions, dissolution of SRFY and collapse of planned economies. These additional variables allow discussing a wide range of issues related to the transition process in Serbia and the region. Accordingly, all these additional variables are expected to have a positive sign but the last three factors which expected to have negative sign. It is likely that countries sharing the same language trade more with each other than otherwise which may be partly related to historically established trade ties. A common language dummy could for explain the relatively high levels of Serbia's trade with other former Yugoslav republics. As more and more people in the importing country speak the same language as in the exporting country, communication costs decline, thus facilitating exports. There is evidence to suggest that a common language variable may also capture other effects such as cultural or institutional similarities between trading countries. This should be taken into consideration when interpreting the results of the model. The variable takes value 1 when everyone in the two countries speaks the same language and zero when the native languages are totally dissimilar. In this case study Serbia and Bosnia share the same language while Serbia, Bosnia and Macedonia share similar language.

Secondly, if two countries were part of the same territory (such as the countries of former Yugoslavia), they may still have closer trade ties than otherwise (i.e., history matters). Moreover, if countries share a common border, transaction costs may be reduced, inducing a higher exports. Serbia borders Romania, Bulgaria, Hungary, Macedonia, Croatia, Bosnia, Montenegro. Border is a dummy variable for countries that share borders with Serbia also takes the value of one and zero otherwise.

A number of studies emphasize the importance of free trade agreements (FTAs). According to Carrere (2006) membership of regional groupings can generate a significant increase in trade. Regional trade agreements and sharing a common border promote exports between countries. Based on the results achieved in the third period (since 2000) there is no doubt that preferential status contributed to the growth of Serbia's corn exports to the EU and CEFTA which had corresponding effect on scope (volume) of this exports as well. Variable 'free trade agreements'(fta) in the regression analysis capture this liberalization process and EU/CEFTA agreements. The accession to a free trade arrangement may stimulate trade among the constituent countries, as the rise of Serbian trade with other CEFTA countries in the second half of the 2000s indicates as well as with the EU since 2000. This study capture the effect of all free trade agreements that Serbia signed with their considered trading partners. This is done due to the fact that it is still too early to make a final evaluation of the effects of the implementation of free trade agreements in the region of SEE, since as previously emphasized, a majority of these agreements entered into force in 2004 while this study cover the period until 2009. The experiences of similar agreements suggest that real effects could be visible only a few years after implementation thus this multilateral agreement do not have much influence on this analysis. By choosing variable fta the effect of all free trade agreements that Serbia signed with its trading partners (mostly since 2000) were captured. Thus a dummy variable denoting mutual membership in free trade agreement equals 1 in year  $t$  when both the exporter and importer are members of the same bilateral/regional trade agreement and 0 otherwise. Trade agreements, whether multilateral, regional, or bilateral in scope, are policy instruments that can increase market efficiency, expand trade, and enhance economic welfare of participant countries. Thus, the coefficient of fta is expected to be positive.

Time dummies account for factors common to all countries, including for instance collapse of centrally planned economies. As the CMEA trading system<sup>30</sup> collapsed the reorientation of foreign trade of transition economies in CEE and its integration into the world economy began (Brine 1992) where the most pronounced trend was the strong expansion of trade with the European Union, due to its sheer size and geographical proximity whereas CMEA intraregional trade collapsed. This massive geographical reorientation of trade has determined also significant changes in the commodity composition of trade of CEE in the same period (Guerrieri, 1998). The members of the former bloc have changed from being major importers of grains to being self-sufficient. Moreover, the region became net exporter of grain. Thus, the study captures distorted demand patterns with the fall of communism accounting that distorted demand observed in the grain sector will affect imports associated with the distorted demand, which will negatively affect the exports to other former CMEA countries. Both factors - the shift which other former command agriculture economies experienced in transition to becoming a net exporter of grain/corn, and the shift by CEE countries to trade with the West (and the EU in particular) after the fall of communism, - were captured by the variable 'collapse', which should weaken their demand for Serbian corn exports and thus decrease exports of this commodity from Serbia.

The variable defined as market economy is a time dummy variable which takes the value of one since the transition started in the former centrally planned economies (since 1992) and value of zero for the period of communism and collapse of this system. The variable sanctions capture the years of sanctions against Serbia (1992-1996) and takes the value of one for these years and value of zero for the period since 1996, when the sanctions were lifted. Sanctions depress trade thus the expected sign of this variable is negative. Thus  $A_{ij}$  encompasses all cultural, historical and political factors, which are intrinsically difficult to measure in practice. The idea is to control for as many important effects on Serbian exports as possible, so that whatever is left over is mostly the result of artificial barriers to trade.

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<sup>30</sup> For over forty years, Comecon dominated the trading relations of these countries, profoundly influencing their domestic economic development, until the organization collapsed in 1991 after the revolutions in Eastern Europe.



Other factors, such as livestock production of countries j and production of corn of Serbia etc. were also tested in the form of explanatory variables but they are not presented in the main equation but will be estimated separately assuming collinearity with GDP variables.

After introducing the dummy variables, equation (6) is respecified as:

$$\ln X_{ijt} = a + \beta_1 \ln \text{GDP}_{it} + \beta_2 \ln \text{GDP}_{jt} + \beta_3 \ln \text{GDPcap}_{it} + \beta_4 \ln \text{GDPcap}_{jt} + \beta_5 \ln D_{ij} + \beta_6 \ln \text{ratio}_{it} + \beta_7 \ln \text{sanctions} + \beta_8 \ln \text{collapse} + \beta_9 \ln \text{language} + \beta_9 \ln \text{fta} + u_{ijt} \quad [7]$$

which is the final model.

The explanatory variables discussed above (exports, GDP, GDP per capita, distance and ratio) are all expressed in logarithmic form. The regression coefficient on a continuous logarithmic variable can be interpreted as an elasticity, that is, as the ratio of the percentage change in the dependent variable (Serbia's corn exports) for each one percent change in the independent variable. The dummy variables discussed (e.g., for a common border or language, or for the presence of sanctions) take the value 1 or 0. Because the dependent variable, exports, is expressed in logarithmic form, one must take the exponent of the coefficient of a dummy variable before interpreting it. The coefficient on a dummy variable can then be interpreted as a percentage shift in the dependent variable when the dummy takes the value 1.

## 5 Estimation procedure

### 5.1 Estimation results

In a gravity model the use of panel rather than cross-sectional data is generally preferred since panel-based models offer a better opportunity to account for changes (e.g., changes in income) taking place within and between countries over time. Moreover, they generate more efficient parameter estimates and give the opportunity to the researcher to augment the model specification with fixed effects that diminish omitted-variable and heterogeneity bias (Vollrath, 2011).

The study analysed the univariate characteristics of the data which entails panel unit root tests which is the first step in determining a potentially co-integrated relationship between the variables. If all variables are stationary, then the traditional estimation methods can be used to estimate the relationship between the variables. If the variables are non-stationary a test for co-integration is required. The variables in this model are stationary. There are three models that can be estimated in panel data estimation; pooled, fixed effects and random effects. Since individual effects are included in the regressions a decision should be made whether they are treated as random or fixed.

First, the study applies the Hausman test. The Hausman statistic is used to test the null hypothesis that the regressors and individual effects are not correlated to distinguish between fixed effects model and random effects model. Failure to reject the null hypothesis implies that the random effects model is preferred while in case the null hypothesis is rejected, the fixed effects model is considered appropriate. The Hausman test statistic shows that the null hypothesis is not rejected and this indicates that country-specific effects are not correlated with other regressors. This suggests that the random effects model is appropriate, and the random effects estimates are consistent.

Furthermore, the Breusch- Pagan test is applied to the random effect model, comparing it to the pooled ordinary least squares estimator. The null hypothesis is not rejected, indicating that OLS is a better estimator than random effect model. Since the OLS model is appropriate, the interpretation of the results will focus on the OLS model. Applying OLS regression analysis to the gravity model allows us to isolate i.e. the effect of sanctions on export while holding other factors constant, i.e. size and distance (Hufbauer, 1997).

The econometric results for the applied gravity models are displayed in table The results of the gravity model estimated using pooled OLS, found all variables to be highly statistically significant (at the 99/95 percent confidence level or better), except distance, and their coefficients take the signs that are expected from the standard gravity literature and consistent with economic theory. The equation as specified, including the dummies variables explains 44 percent of the variation in observed corn export flow.

Table 6. Estimation results

Variables	Symbols	Coefficients	RobustS.E.	P values
Importer GDP	lngdpr	1.0097	.2659	0.000
Exporter GDP	lngdprs	81.1057	25.231	0.002
Importer GDP per capita	lngdprcap	-1.897	.520	0.000
Exporter GDP per capita	lngdprscap	-67.217	23.263	0.004
Distance	Lndis	-. 3088	.540	0.568
Ratio	lnratio	-1.983	.299	0.000
Sanctions	sanctions	-3.697	1.512	0.015
Collapse of planned system	collapse	-2.747	1.469	0.063
Language	language	2.231	1.005	0.028
Free trade agreements	fta	2.924	.887	0.000
Constant	cons	-.287.24	77.504	0.000
No. Of observations	188			
Adjusted R <sup>2</sup>	0.4419			

The results show that an increase in increase in the importer's GDP and Serbia's GDP causes an increase in Serbia's exports. The coefficients for the two variables are positive and highly statistically significant (at the 99 percent confidence level or better) and are consistent with theoretical expectation. The estimated coefficient on the importer's GDP variable is 1.0097. This means that, holding constant for other variables, a 1 percent point increase in a country's GDP will result in, roughly, a 1.01 percent point increase in dependent variable, Serbia's corn exports. This result is consistent with the basic assumption of the gravity model that states the trade volumes/export will increase with an increase in economic size.

The regression results show that the coefficients of importer's GDP per capita and Serbia's GDP per capita are negative. This indicates that an increase in the GDP per capita of the importing country causes Serbian exports to decrease. The increase in Serbia's GDP per capita also causes exports to decrease. The estimated coefficient on log importer's GDP per capita is -1.897 which means that a 1 percent increase in a GDP per capita of the trading partners decreases Serbian corn exports by about 1.9 percent. Following Berggrstrand (1989), the exporter per capita income elasticities indicate that corn is labour intensive in production. In addition, the estimated elasticity of the importer's GDP per capita indicates corn exports are inferior goods for the importing country. As income grows, per capita corn consumption is expected to decline as consumers substitute corn with high-cost quality food containing more protein and vitamins such as processed rice, fish and meat.

The distance variable, as a time-invariant measure, appeared to be statistically insignificant but has the anticipated negative sign, which can be explained by taking into account that large quantities of corn exports were directed to neighbouring countries in SEE and former Yugoslav republics.

Similarly, the border dummy is found to be statistically insignificant and has negative sign, which contradicts the conventional wisdom that a common border will boost trade. Thus this variable is not included in the model. Also, it is correlated with distance variable.

The coefficient of the ratio of relative prices is statistically significant at 99 percent level and has an expected negative sign, implying that increase in export price of Serbian corn on other markets relative to the world unit price discourages import demand for Serbian corn which reduces Serbian corn exports. The estimated coefficient is 1.98, meaning a 1 percent increase in the relative price ratio decreases Serbia's corn exports by almost 2 percent.

The empirical results show that language has a expected positive sign and is significant at the 1-percent level in the corn sector. It is likely that countries sharing the same language trade more with each other than otherwise. In this model Serbian corn exports increases by 2 percent when export destination present the country which share the same language with Serbia.

The free trade agreement dummy variable (fta) is statistically significant at the 99 percent level and has the positive expected sign. This implies that trade gains from the regional trade agreements have been relevant.

The coefficient on the dummy variable representing the presence of sanctions in the years, 1992-1996, is significant statistically and has negative sign, implying that sanctions depressed Serbian corn export. Thus in the period of sanctions export decreased for 3.7 percent.

To investigate how Serbian corn export had been affected by the breakup of communism this study introduced a dummy variable for the collapse of centrally planned economies. This dummy variable accounts for factors common to all countries and can be interpreted that in the years of the collapse of communism Serbian exports decreased by 2.7 percent.

Therefore dummies variables sanctions and collapse of planned system appeared to have expected negative signs implying that those variables decreased import demand for Serbian corn which affected the export capacity of Serbian corn to decrease while two other dummies, a common language and fta, have positive impact on Serbian exports of corn.

As noted above, this study added and tested nine other dummy variables. However variables such as countries that used to be part of the same territory, a common border, market economy, dissolution of SRFY are not significant and thus they are dropped from the analysis.

The correlation between livestock variable and GDP<sub>r</sub> is high. Classic signs of multicollinearity arose when both *livestock* and *gdpr* variables were included in the same equation. The sign and statistical significance of these two variables often changed with removal of either one of them. I, therefore, ran two separate regressions, one by including livestock but not GDP<sub>r</sub> and other by including GDP<sub>r</sub> but not livestock. The livestock variable is also significant and has expected positive sign which implies that if livestock production increases in importing countries, then that will increase corn consumption used for animal feed, which increases demand for corn from these markets. However, no focus is given to the interpretation of the model which includes livestock because data for this variable were missing for few first years for three countries.

Finally, I did two sensitivity tests to test assumptions I made for the purpose of this analysis to fill the cells with missing data for the panel data set. Using the log-linear form of the regression equation requires that the observations where exports is reported as zero must be dropped, because the logarithm of zero is undefined. Eliminating these zero values reduces the number of available observations which might be expected to distort the regression results since some of the zero observations being dropped are likely to show no trade because of sanctions. Using an alternative method, I did a sensitivity test with the approximation of export flows ( $X_{ijt} \approx X_{ijt} + \varepsilon$ ) for  $\varepsilon$  equals to 1, 0.1, 0.01, and 0.001 (when export was zero due to sanctions I put 0.001 since log of zero is undefined). The result did not change when compared with the situation where I left empty cells or put in a value of 0.001.

Since price theoretically cannot be zero thus I used the Romanian price instead to calculate a price ratio. Another sensitivity test was made and instead of using the Romanian price (which I used instead of Serbian price for the missing values for a few years) the regression is run where in the place of export price this time I used Hungarian price which is also another main Serbian competitor in the region. Since the results did not change with putting different prices Romanian price seemed to present appropriate variable to compensate for the missing Serbian price data for a few years.

## **6 Concluding remarks**

### **6.1 Summary of the thesis**

This study investigates the regional structure of corn exports of Serbia over the period 1986 to 2009 with the main purpose to reveal how the Serbian corn sector has been affected by break-up of former centrally planned economies focusing on changes in the geographical patterns of its corn exports. The main part of the study is devoted to an in-depth analysis of the main drivers behind the manifested trends in the regional patterns of Serbian corn exports over the last 25 years. This was expected to be an interesting topic for investigation considering that the agricultural transition process had a significant effect on world agricultural markets and on world trading patterns in general. Understanding the changes in trade patterns provides information on potential welfare and adjustment implications following liberalisation which can be helpful in agribusiness planning (Bojnec, 2004). The factors behind the reorientation of trade flows in the transition countries in Central East and South East Europe in general and in Serbia in particular in the beginning of 1990s were quite specific. The collapse of central planning sets in motion big transformations in the structure and volume of the foreign trade in the transition countries, both in geographical and commodity structure, implying that foreign trade is a reflection of the economy (Dudzinski, 2008). The greatest impact of the transition in CEE and the FSU has been on agricultural production and the shifts in trade patterns, and within agriculture the grain sectors and their marketing systems were among the most affected (Brooks, 2003). Hence, it seemed interesting to view the position of Serbia in that overall shift which other former command agriculture economies experienced in transition to becoming a net exporter of grain. To simplify the analysis, Serbia's trade patterns are limited to a study of its trade in corn which can be seen as a microcosm of the entire agricultural sector considering its crucial role for the agricultural trade.

This study attempted to analyze Serbia's trade patterns of corn exports, with the aim on accounting for the relevant political, economic and social events that took place in Serbia since the collapse of communism and transition process in the whole region. A gravity model, one of the most efficient models in explaining international trade volume and trade patterns, was developed to empirically analyze the factors that affected Serbian corn exports for panel/pooled data of eight Serbia's major export destination countries over the 1986-2009 period. The study applied an ordinary least-squares (OLS) regression which can be used to estimate the independent effect of each factor, holding constant the effects of the other variables in the equation. Consideration was given to investigating the impact of GDP, per capita GDP, distance and relative price ratio, as explanatory variables. In addition, the model specification has been augmented through the addition of other variables that are thought to impact on Serbian corn export flows such as dummy variables for a sanction, collapse of central planning, common language and free trade agreements.

The results of the gravity model estimated using pooled OLS, found all variables to be highly statistically significant (at the 99/95 percent confidence level or better), except distance, and their coefficients take the signs that are expected from the standard gravity literature and consistent with economic theory. The variable distance appeared to be statistically insignificant which can be explained by taking into account that large quantities of corn exports were directed to neighbouring countries in SEE and former Yugoslav republics. The results showed that an increase in importer's GDP and Serbia's GDP is associated with an increase in Serbian exports. Importer's GDP per capita as well as Serbia's GDP per capita has a negative impact on export. One of the explanatory variables considered for this study is the ratio of relative prices, i.e., the export price of Serbian corn and the world unit price in other markets. Variable ratio has negative sign implying that in case of increase in Serbian corn export price relative to the world unit price will decrease Serbian export. Dummies variables sanctions and collapse of planned system appeared to have expected negative signs while two other dummies, a common language and free trade agreements (fta), have positive impact on Serbian exports of corn.



Chapter 2 provides a historical background of Serbia and economic assessment of its agriculture and corn sector in order to perceive the overall picture of the country's development which proved to be the decisive factor when it comes to regional distribution of Serbian exports. Thus macroeconomic situation of Serbia described in section 2 clarified why Serbia in the second period considered was even less integrated into the EU and world market than a decade ago. Many of the conclusions of this analysis are consistent with main findings of previous studies on the trade development of SEECs which argued that the trade deficit of these countries with the rest of the world can be partly explained by the periods of conflicts and sanctions and their late integration into international institutions. To capture these impediments, the analysis investigates impact of the collapse of centrally planned economies and sanctions showing that both of these factors had strong and negative impact on Serbian corn export. Moreover, the case study of corn exports in Serbia showed that the former Yugoslav republics remained important export destination, several years after the political disintegration which is also consistent with findings from a literature review.

## **6.2 Perspectives of Serbian corn exports and further suggestions**

After a decade of unfavourable environment concerning foreign trade activities in Serbia, conditions for further institutional integration into the international economy were finally re-established since 2000. It is still too early to make a final evaluation of the effects of the implementation of free trade agreements in the region of SEE since a majority of these agreements entered into force in 2004 while this study covers the period until 2009. The experiences of similar agreements suggest that real effects could be visible only a few years after implementation, thus this multilateral agreement does not have much influence on this analysis. The further studies should use gravity approach focusing on the recent period to evaluate impact of regional trade integration and impact of trade liberalization between Serbia and the EU.

However, based on the results achieved in the third period (since 2000) there is no doubt that the main incentive for the current strong increase of corn exports has produced an asymmetrical trade arrangement with the EU, and to a lesser extent, with regional free trade zone, which had

corresponding effect on scope(volume) of this exports as well. Liberalization of corn trade has numerous and complex effects on macro level. Variable 'free trade agreements' in the regression analysis captures this liberalization process and EU/CEFTA agreements.

It is expected that these changes will continue to contribute to the growth of export towards the EU. With Romania and Bulgaria now in the European Union, and the recent signing by all the countries of South East Europe of CEFTA, the Danube has even more potential for trade and travel. CEFTA countries are a natural market for Serbian economy in general, both because of the recognisability of brands and because of costs-cutting proximity. Thus CEFTA Agreement has already greatly helped the increase of Serbian corn export into the countries of the region and it is realistic to expect the trend of corn export rise into CEFTA countries to continue, which is certainly a positive effect of liberalization. However, this development is likely to be stopped or even reversed if Serbia join the EU. As an EU member Serbia would no longer eligible to rely on the bilateral free trade agreements with the markets of the former Yugoslav countries. The recent studies have already documented that almost 80% of corn exports in Serbia is directed towards EU market. However this data should be taken with caution considering how much of this share belonged to new member state-Romania. Integration with Western economies in the EU is still weak.

Empirical research on the export of Serbia is limited. Given the importance of corn exports and the role it plays in the Serbian agricultural trade in general, it is important to investigate the factors influencing export flows between Serbia and its trading partners and determine export potential to different countries. A useful tool in the determination of the trade patterns of a country is a gravity model. Because of the importance of the crop, it is imperative that rigorous studies of the corn market be initiated. The present study attempts to fulfill part of this need.

Further studies should put efforts to evaluate and identify other determinant factors of Serbia's corn export flows and effective ways to expand these flows. They should suggest possible ways to expand trade by identifying important factors determining Serbia's bilateral trade flows in the recent period and determine export potential to different countries. A more open trade policy is

needed to respond to the opportunities and priority should be given to the EU rather than sub-regional trade agreements.

### **6.3 Limitations of the study**

Mention should be made of the data problems encountered in the study. This lack of data reflects the fact that the observation period captured the years of considerable upheaval and reorganization within the government of Serbia as well as other former Yugoslav republics. Because of many missing values in the origin Serbian corn trade/export matrix, a few assumptions were made.

Using the assumption when calculating Serbian participation in total Yugoslav corn exports as well as other assumptions made for the purpose of this analysis are one of the main limitations of the study since the exact effects of these assumptions on the results and findings of the estimated model are unknown.

Many other studies referred to Serbian trade in general lack data since officially published foreign trade statistics of Serbia are still incomplete. Due to such state of Serbian foreign trade statistics, in various publications of international organizations reporting foreign trade in SEECS, a portion of Serbian trade, is not taken into account or the data is incomplete or out-of-date. The 'literature review' in theory section, consists of many different case studies analysed trade patterns of SEE countries after 1989 but they do not include Serbia. Also, the reported figures on mutual trade in SEE may not be fully exact, not only because different sources of data had to be combined but also because the quality of statistics on foreign trade of some other SEE countries beside Serbia, especially Bosnia and Herzegovina, is unsatisfactory. These and other omissions automatically distort total trade figures for all SEE countries, particularly Bosnia and FRY that are major trading partners in case of Serbia's corn exports. Also, due to the wars and sanctions imposed, there has been a substantial amount of smuggling in the SEE region, especially across borders between Serbia and Bosnia, for example. Consequently, a portion of the trade among some SEECS is illegal, sometimes occurring in the form of barter, which is not registered. These considerations have important implications for the level of intraregional SEE trade today (Uvalic

1992). When it comes to this study, these facts have also probably some implications considering share of two of the former Yugoslav republics in total Serbian corn exports (Bosnia and Macedonia).

Moreover, some of the data which referred to SFRY/Serbia, Bosnia and Macedonia <sup>31</sup> and the Soviet Union/Russia are not highly comparable between periods 1986-1991 and 1992-1999 due to disintegration of these countries over the years 1991-1993 and unavailability of data for Russia separately for the first period considered.

For all European transition countries, the study of the trade with the European Union is particularly important and instructive because very detailed and recent data are available from Eurostat on the EU's trade with all other countries in the world. Moreover, even for Balkan countries, including Serbia, that are not members of the EU and trade relatively little with the EU such data are highly valuable (Wyzan, 1999).

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<sup>31</sup> Czechoslovakia and later both, Czech Republic and Slovakia had a small share in Serbian corn exports during the whole observation period so they are not recorded separately after their independence in 1993 for the purpose of the analysis of regional structure. Nevertheless, additional information about the data considering those two countries will be further explained in table notes.

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