International Production Networks and Economic Growth: The Case of the Western Balkan Countries

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The globalization of the world economy has given rise to new trade patterns through the intensification of international production networks (IPNs). This phenomenon has enabled countries to undertake more in-depth specialization in niche parts of the production chain, with important benefits for their economic activity and growth. The Western Balkan countries are no exception. With their recent integration into global markets, an increasingly large share of their trade flows entail intermediate goods that are eventually processed and exported. This article analyzes the impact of different degrees of participation in IPNs on the economic performance of the Western Balkan countries, thereby testing the hypothesis that trade created by international fragmentation of production may generate effects on economic growth beyond the beneficial influence of total or final goods trade. The article focuses on the period 2002–2013. The results, using a set of panel data models, show that the degree of involvement in IPNs significantly affects economic performance, which partly explains the observed differences in the growth rates of the Western Balkan countries. We also find that the positive influence of processing trade on economic growth is greater than the traditional gains of an increase in foreign demand.

Keywords: economic growth, international production networks, inward processing trade, panel data models, Western Balkan countries

JEL Classification: C33, F14, F15
As a consequence of the increasing globalization and integration of the world’s markets, there has been an intensive process of international fragmentation of production over the last few decades. This phenomenon, whereby productive activities are segmented into several stages taking place in different countries, allows firms to select the best-suited locations in terms of factor endowments, scale, or productivity for each stage. Multinational firms may thus adopt more complex strategies involving the export of intermediate goods to and from third countries and intrafirm trade. According to a recent report, trade in intermediate products reached more than $7 trillion USD in 2011, accounting for around 40% of the total world trade. Moreover, this type of trade has been increasingly important for developing countries, as their share has experienced constant growth over the past decade (UNCTAD 2013).

As Athukorala and Yamashita (2006) mention, the international division of the production process may give a country a comparative advantage in one or more production stages even when it is not the most efficient producer of the final good. Greater participation in international production networks (IPNs) may, therefore, have important implications for a country’s trade pattern and economic behavior. In this process, the Western Balkan countries—Albania, Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, and Serbia—have proven to be no exception. The recent economic modernization and increasing openness of these countries have led to a significant expansion of processing trade in their economies (Eurostat 2014). This article examines precisely the impact of this phenomenon on their economic performance.

Increased sophistication of production, declining service-link costs, and foreign direct investment by multinational enterprises have been the main driving forces for reorganizing the production process in a setting of increasing competition and economic growth. Firms are constantly exposed to new opportunities for cutting costs and improving productivity by adapting their strategies to new business models through innovation, technological spillovers, and catch-up. Likewise, the comparative advantages of the countries in which firms operate also undergo continuous change (Mudambi and Venzin 2010). A highly integrated world economy thus derives new opportunities from cross-country differences, which results in a process whereby each country specializes in a specific stage of the production process, and intermediate and capital goods are actively traded (Arndt 1997; Deardorff 1998, 2001; Jones and Kierzkowski 1990, 2001). The increased trade in intermediate and capital goods leads to increased output and economic growth, as indicated by Baldone, Sdogati, and Tajoli (2007) and by Foster, Stehrer, and Timmer (2013). According to these authors, integration in international production networks enables countries to achieve better economic performance.

Following the fall of the Soviet Union and subsequent events in Eastern Europe in the early 1990s, the countries of the Western Balkan region began a process of economic transition, to replace their former planned economic systems with market economies, and of renewing trade integration both within the region and with the world (especially the EU). They embarked on extensive reform programs that pursued the aims of liberalization, stabilization, and privatization. They opened up to global trade and became increasingly export-oriented, expanded the role of the private sector, dismantled regulations that stifled business development, and began to build the institutions needed to support a market system (IMF 2015). Under a European Union (EU) initiative to promote political stability and economic growth, new institutional arrangements were created to deliver this policy agenda: the Stability Pact for South East Europe and the Stabilization and Association Process. Cooperation was further enhanced with the extension
of the Central European Free Trade Agreement to the Western Balkans in December 2006 and the beginning of accession negotiations with the EU by most of the region’s countries.  

The general purpose of these measures was to build a business-friendly environment with minimal disruption to transport and communication between production segments, allowing the countries of the Western Balkans a chance to integrate into the pattern of international productive specialization. This economic transformation resulted, indeed, in a significant increase in both economic growth and processing trade. According to the IMF (2015), the results of the transition process were strong economic growth, a significant rise in incomes and living standards, and enhanced macroeconomic stability. Moreover, during this period, the rise of trade in parts and components in these countries outpaced the rate of increase in final goods trade, with the former growing at more than twice the rate of the latter (see Shimbov, Alguacil, and Suárez 2013, p. 373, for more detail). The countries of the Western Balkan have thus become more integrated into production-sharing networks, especially with the European Union, which accounted for more than 80% of the region’s overall processing trade exports. Nevertheless, to the best of our knowledge, the impact of the integration process on output growth in these countries has yet to be examined.

In this article, we try to fill this gap by analyzing the links between the increasing internationalization of production and the economic performance of the Western Balkan countries. In doing so, we elaborate an index that captures the involvement of the different countries in the process of international fragmentation of production. This allows us to evaluate more precisely the specific effects of this phenomenon on divergences in economic growth and to test the hypothesis that the degree of involvement in international production networks influences the economic performance of the Western Balkan countries, even if the beneficial influence of final goods trade is taken into account. Our results suggest that the international division of production has a significant and positive effect on economic growth. More precisely, we find that the diverse economic growth paths of these countries may be partly explained by their different degrees of participation in IPNs.

The rest of the article is organized as follows. The next section provides a brief overview of the literature analyzing the links between participation in IPNs and the related impact on economic growth. The following section contains some relevant stylized facts about the ongoing process of international fragmentation of production in the Western Balkans. We present several indicators to show the scope and the distribution (in both geographical and industrial terms) of processing trade and to reveal similarities and differences across the Western Balkan countries in this respect. The econometric specification and estimation results are then presented. The final section concludes with a policy discussion and suggestions for future developments on the topic.

RELATED LITERATURE

It is a well-known fact that international trade is not limited to situations in which each partner country specializes in products from a different industry, as explained by traditional comparative advantage theories, based on its relative endowments or technological differences. The traditional model of inter-industry trade flows between developing and developed economies neglects the international fragmentation of production and therefore the shipment of intermediate goods between countries. To properly understand the growing share of trade in intermediate
goods within the same industry even between countries with similar levels of development, and the consequent implications for their economies, we need to rely on other theories that take into account the division of the production process across countries.

The publication of the seminal work by Grubel and Lloyd (1975) and the development of the “new” trade theory, which introduced scale economies and product varieties, shed light on the notion that different products within the same industry are produced and traded by different countries, giving rise to intra-industry trade (IIT). The understanding of this type of trade was further formalized in theoretical terms by Krugman (1980) and Helpman and Krugman (1985), who provided seminal contributions along the lines of Dixit and Stiglitz (1977). According to these models, trade flows between industrialized countries should not be characterized by comparative advantages. On the contrary, the exchange of differentiated goods (horizontal IIT) is driven by imperfect competition and variety preferences. However, these early models do not fully explain the international trade flows in intermediate and unfinished goods that result from IPN participation. This type of trade seems to be better explained by the literature on vertical IIT and international production networks (or global value chains—GVCs). According to this literature, international production, trade, and investments are increasingly organized within so-called global value chains where the different stages of the production process are located across different countries.

The first general framework to analyze the international fragmentation of production processes was introduced by Jones and Kierzkowski (1990). They argued that by segmenting production into several stages, firms have an opportunity to match and optimize the different factor endowments and productivities with the specific requirements of each production stage. Thus, the international fragmentation of production implies that a certain product may not be entirely produced in one country and then exported as a finished good to another country. Rather, it is likely that the production process and consequently the final product will be characterized by an increasing share of inputs from other countries and by offshoring parts of the production, allowing firms to specialize in niche parts of the production (value) chain. International production networks allow for more in-depth specialization to take place within a single industry or product, and for increasing trade in intermediate goods (Deardorff 1998, 2001). Feenstra (1998) takes this idea one step further by explicitly connecting the “integration of trade” with the “disintegration of production” in the global economy. This has led to a growing proportion of international trade occurring in components and other intermediate goods (WTO 2011; Yeats 2001). For Baldwin (2014), goods are packages of many nations’ productive factors, technology, social capital, and governance capacity. The rising internationalization of production may therefore have important implications for the growth of a country’s trade and output, facilitating technology dissemination, skills building, and industrial upgrading (Baldwin 2014; Geraffii, 1999).

Several theoretical articles have emphasized the importance of trade in intermediate goods for output growth. Feenstra (1998), for instance, argues that over and above the traditional gains from increased specialization and exchange across countries, trade in intermediate inputs brings efficiency gains that amount to an outward shift in the production frontier for final goods in each country. In a seminal work, Samuelson (2001) developed a Ricardian model of international trade in which either of two final goods could be used as an intermediate good in the production of the other good. The model shows that international trade results in a much larger expansion of output than would otherwise be obtained if goods could not be used as intermediate inputs. This
model was further extended by Shiozawa (2007) with a multicountry and multicommodity study that obtained similar findings. More recently, Ramondo and Rodríguez-Clare (2009), in a multicountry general-equilibrium Ricardian model, confirmed this outcome, showing that the gains from trade, including multinational production, have a positive effect on expanding output and growth, much greater than what is obtained if only trade in final goods is considered. For Jones (2011), intermediate goods provide links between sectors that have a multiplier effect similar to the one associated with capital accumulation in neoclassical growth models. According to his model, the share of intermediate goods in the economy is a crucial parameter that enables a country to achieve a substantially larger output and income, thus helping to explain differences in economic performance across countries.

These theoretical developments have been accompanied by empirical works that, in general, confirm the growth-enhancing role of the international fragmentation of production. For instance, using a panel data approach, Egger, Pfaffermayr, and Wolfmayer-Schnidzer (2001) find that outsourcing to the east by Austrian manufacturing firms significantly improves domestic growth and productivity in the origin country. For Helg and Tajoli (2005), it is not only trade flows that are affected by the international fragmentation of production, because the industries involved may also increase their total output and productivity due to growth in the relative demand for the abundant factor. Similarly, Amiti and Wei (2009) find that services offshoring has a positive impact on the productivity of manufacturing industries in the United States. According to Baldone, Sdogati, and Tajoli (2007), participating in an international production network is a powerful contributor to growth, complementing the impact generated by final goods trade. This is confirmed by Foster, Stehrer, and Timmer (2013), who analyzed the effects of international fragmentation on forty advanced and emerging economies. For Goldberg et al. (2010) and for Miroudot, Lanz, and Ragoussis (2009), access to a range of competitively priced foreign intermediate goods has been crucial to the achievement of higher productivity and output growth in both OECD and emerging countries. In this line, OECD calculations show that most world regions, including both developed and emerging economies, have increased the value added they create and capture in the global value chains of manufactured goods (OECD 2013). Another stream of the literature focuses on the social benefits and upgrading from international fragmentation of production and participation in IPNs that, together with the above-mentioned economic upgrading, contribute to more sustainable growth and development (Barrientos, Gereffi, and Rossi 2011).

Nevertheless, to the best of our knowledge, the effects of participation in IPNs and the processing trade on growth performance have never been empirically tested for the Western Balkan countries. Thus, in an effort to shed more light on this subject, in the remaining part of the article we will empirically investigate the influence that this form of international division of production has on their economic activity.

DATA AND STYLIZED FACTS

To analyze empirically the role played by international fragmentation of production in the Western Balkan region, we employ data on the processing trade (i.e., information about trade in goods that are exported or imported for reasons of processing). We include the following countries in the region: Albania, Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, and
The analysis of the processing trade is based on their bilateral trade relations with the rest of the world. Specifically, we use data collected by Eurostat for the following four trade flows: (1) imports of goods for processing in a Western Balkan country that come from another country; (2) the consequent exports of the processed goods to the country of origin; (3) exports of goods for processing from a Western Balkan country; and (4) the resulting imports of the processed goods by the Western Balkan country. The first two flows represent the so-called inward processing trade (IPT), while the latter two are defined as outward processing trade (OPT). Thus, this dataset allows us the possibility of assessing each country’s relative position in the production chain as both a receiver and a source of processing trade, and also enables us to see the importance of this kind of trade across sectors.

Scope and Distribution of Processing Trade

Table 1 shows the relevance of IPT and OPT flows in the Western Balkans during the period 2002–2013. On the one hand, these figures clearly show that the countries of the region are far more likely to be the destination of processing trade than a source, as can be seen by the significantly greater weight of IPT compared to OPT with respect to final goods trade. Moreover, this tendency remains largely the same throughout the analyzed period, with a minor decline during 2010–2012 as a result of the international economic crisis, before rebounding in 2013. It is also worth noting that IPT exports have represented more than 40% of the corresponding amount of final trade exports every year, with rates exceeding 100% in the first years of the sample period. This reveals the importance of this type of trade for these countries.

| TABLE 1 | Processing and Final Goods Trade in Western Balkan Countries, 2002–2013 |
|-----------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
|                | 2002                | 2003                | 2004                | 2005                | 2006                | 2007                | 2008                | 2009                | 2010                | 2011                | 2012                | 2013                |
| Inward processing trade (millions of EUR) |                |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    |
| Imports         | 2,084               | 2,221               | 2,268               | 2,881               | 3,404               | 3,973               | 5,501               | 3,882               | 4,328               | 4,016               | 4,310               | 3,687               |
| Exports         | 3,434               | 3,237               | 3,451               | 4,003               | 4,781               | 5,762               | 7,531               | 6,050               | 7,046               | 7,361               | 7,790               | 7,092               |
| As % over corresponding final goods trade flow |                |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    |
| Imports         | 16.63               | 16.34               | 15.26               | 11.39               | 11.35               | 10.85               | 11.13               | 10.50               | 11.12               | 9.96                | 9.95                | 10.97               |
| Exports         | 141.41              | 111.29              | 91.13               | 53.77               | 48.77               | 47.07               | 51.17               | 49.92               | 44.67               | 41.86               | 41.77               | 46.49               |
| Outward processing trade (millions of EUR) |                |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    |
| Imports         | 40                  | 35                  | 30                  | 69                  | 83                  | 83                  | 151                 | 94                  | 94                  | 118                 | 109                 | 83                  |
| Exports         | 133                 | 302                 | 241                 | 257                 | 363                 | 456                 | 596                 | 166                 | 213                 | 98                  | 101                 | 96                  |
| As % over corresponding final goods trade flow |                |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    |
| Imports         | 0.32                | 0.26                | 0.20                | 0.27                | 0.28                | 0.23                | 0.30                | 0.26                | 0.24                | 0.29                | 0.25                | 0.25                |
| Exports         | 5.49                | 10.39               | 6.37                | 3.46                | 3.71                | 3.72                | 4.05                | 1.37                | 1.35                | 0.56                | 0.54                | 0.63                |
| Final goods trade (millions of EUR) |                |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    |
| Imports         | 12,528              | 13,596              | 14,860              | 25,291              | 29,990              | 36,602              | 49,406              | 36,968              | 38,917              | 40,304              | 43,331              | 33,609              |
| Exports         | 2,428               | 2,908               | 3,787               | 7,446               | 9,803               | 12,241              | 14,719              | 12,120              | 15,775              | 17,583              | 18,651              | 15,253              |

Source: Authors’ calculations based on Eurostat Comext database.
Additionally, looking in Table 1 at the difference between IPT imports and their consequent exports (which represent the value added in the country by processing the goods), we observe that the gap has increased significantly over time. In fact, it has more than doubled in the observed period, reaching more than 3% of GDP in recent years. This provides an additional insight into the relevance of this trade for the economies of the Western Balkans.

On the contrary, the above figures show a much lower weight of OPT than IPT as compared to final goods trade. Furthermore, we observe a constant decline over the past decade, reaching historic lows in the last three years. This may be a consequence of the relatively low level of technological complementarity between the Western Balkan countries and their main partner, the European Union (which accounts for two-thirds of total OPT in this area, on average, over the analyzed period). As indicated by Görg (2000), OPT usually plays a more significant role when there are technological similarities between trading partners, especially in relatively more knowledge-intensive industries. For that reason, the empirical analysis that follows treats IPT exports as representative of the processing trade.

Table 2 gives a detailed picture of the geographical distribution of the processing trade in the Western Balkans. As can be seen, EU countries are by far the most important destination and source of processing trade, with Germany and Italy, the main trading partners, accounting for around half of all processing trade with the EU. Throughout the analyzed period, the EU accounted, on average, for more than 80% of this type of trade. The second most important destination and origin of processing trade in the Western Balkans is represented by other European countries, with percentages around 10% during the last years of the considered period. The same distributional pattern is maintained, in general, when we look at the individual countries of the Western Balkans.

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Similar concentration is observed in the industrial structure of the region’s processing trade. Figure 1 shows that the processing trade largely centers on apparel, basic metals, electrical and mechanical machinery, and more recently, to a certain extent, on furniture and motor vehicles. Nevertheless, it can be seen that the countries that started with a relatively high share of low value added industries (such as apparel, leather, and footwear), managed to increase their share of processing trade in higher value added industries over the years, giving them the possibility of reinforcing the sharing of know-how, productivity, and output, as indicated by Stehrer and Wörz (2009). Behind this shift are the multinational firms that located part of their production chain in the region and were basically represented by industries such as electrical machinery, machinery and mechanical appliances, and motor vehicles. At the level of individual countries, we observe that the biggest shift in industrial structure occurred in Serbia and Montenegro, where there was an approximately fourfold decrease in the share of apparel, while at the same time the share of higher value added industries, such as electrical machinery, motor vehicles, and rubber products, increased. Macedonia and Croatia also experienced a rise in the share of industries, such as basic metals in the former, and machinery and mechanical appliances in the latter stage (see Eurostat 2014).

These stylized facts clearly show three important features about the processing trade in the Western Balkans. First, these countries are far more important as a destination of the processing trade than as a source. Second, the processing trade in these economies has increased significantly over the past years, with the EU being by far the most important
### TABLE 2
Geographical Structure of Western Balkan Countries Inward Processing Trade Exports

| Year | EU-27 | Other Europe | North America | North Africa | Central and South America | Near and Middle Eastern countries | Other Asian countries | As % of total processing trade |
|------|-------|--------------|---------------|-------------|---------------------------|----------------------------------|----------------------|-----------------------------|
| 2002 | 2,798 | 333          | 135           | 10          | 72                        | 33                               | 52                   | 81.5                        |
| 2003 | 2,688 | 282          | 139           | 11          | 11                        | 23                               | 82                   | 83.1                        |
| 2004 | 2,889 | 239          | 162           | 10          | 75                        | 30                               | 47                   | 83.7                        |
| 2005 | 3,362 | 296          | 192           | 13          | 42                        | 51                               | 66                   | 84.0                        |
| 2006 | 4,468 | 443          | 184           | 24          | 40                        | 63                               | 122                  | 82.8                        |
| 2007 | 5,909 | 678          | 183           | 20          | 158                       | 134                              | 166                  | 77.5                        |
| 2008 | 4,907 | 1,042        | 239           | 32          | 69                        | 73                               | 167                  | 78.5                        |
| 2009 | 5,590 | 709          | 98            | 36          | 49                        | 83                               | 180                  | 81.1                        |
| 2010 | 5,508 | 828          | 79            | 47          | 49                        | 106                              | 350                  | 79.3                        |
| 2011 | 5,909 | 1,129        | 63            | 38          | 217                       | 77                               | 437                  | 74.8                        |
| 2012 | 5,944 | 1,011        | 121           | 25          | 196                       | 100                              | 275                  | 75.9                        |
| 2013 |       | 734          | 49            | 38          | 187                       | 37                               |                      | 83.8                        |

**Source:** Authors’ calculations based on Eurostat Comext database.
trading partner. Finally, we observe a positive structural shift toward relatively higher value
added industries. In order to properly understand the relevance of these facts in terms of the
economic behavior of the Western Balkan countries, we need to look more closely at their
capability of participating in production-sharing networks.

Measuring the Participation in the Processing Trade

With the aim of analyzing the impact of involvement in IPNs on the Western Balkan countries,
following Baldone, Sdogati, and Tajoli (2007), we elaborate an index that captures the relative
tendency of each country to participate in this process. The index is defined as

$$IIF_{ij} = \frac{PT_{ij}}{FT_{ij}} = \frac{PT_{WBC_j}}{FT_{WBC_j}}$$

where $IIF_{ij}$ is the index of international fragmentation ($i$ and $j$ refer to the corresponding country
and trade flows [i.e., exports or imports, respectively]), $FT$ represents final trade flows, and $PT$
measures processing trade. This index captures the tendency of a country to participate in
processing trade, using the average countries level as a benchmark.

The $IIF$ is, in fact, a country-specific Balassa-type revealed comparative advantages
index in which the emphasis is on measuring the fragmentation in production for a given
country. The index as defined, however, shows a biased range. Values higher than one
express levels of fragmentation above the regional (Western Balkan) average, whereas the
opposite is true for values between one and zero. The nonsymmetric outcome of the results
from the calculation introduces an evident difficulty when interpreting the index. This
methodological shortcoming can be overcome by using a logarithmic conversion (log
IIF. The resulting range of values will be symmetric: positive when the country has a comparative propensity to undertake processing trade, and negative if the reverse is true. Furthermore, index values which are the same but with different signs can be understood as equivalent but opposite behavior in terms of fragmented production and trade specialization.

As can be observed in Table 3, although most of the countries have a comparative propensity to undertake processing trade, there are noticeable differences between individual countries. Albania and Bosnia-Herzegovina, for instance, are the only two countries that managed to maintain a higher propensity to participate in the IPN throughout the analyzed period (even though the period for Bosnia and Herzegovina is shorter), yet we observe a gradual decline of the index values over the years. A similar decrease can be observed in Macedonia’s index over the analyzed period, but contrary to Albania and Bosnia-Herzegovina, the index turns negative in the last years of the sample. Croatia’s index varies from year to year, but it also clearly declines in the last few years. Finally, the index of Serbia and Montenegro rose significantly and rapidly caught up to that of the other countries, showing an increasing differential-trend with respect to other WBC.

Next, in order to shed more light on the higher relevance of some industries as compared to others (such as that shown by the previous sectoral distribution analysis of IPT exports), we look at the industrial distribution of the index of international fragmentation among the Western Balkan countries. From Table 4, we observe a common pattern of having a comparative advantage in the production of textile, apparel, and leather and footwear (with the exception of Serbia and Montenegro). Apart from this, each county appears to have specialized in different industries, although with a gradual shift toward industries with higher value added.16

In short, the preceding discussion reveals that processing trade has been playing an increasingly important role in the Western Balkan region, especially in recent years (when the value added of trade in these economies has increased significantly). However, in terms of their comparative propensities to undertake processing trade, there are significant differences across countries during the analyzed period. Accordingly, a natural extension is to establish the extent to which participation in IPNs affects the growth performance of these countries.
| Country          | Industry                          | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|------------------|-----------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| **Albania**      | Food products                     | 3.86 | 0.40 | 0.20 | 1.02 | 1.27 | 1.32 | 1.90 | 2.14 | 2.04 | 1.90 | 2.01 |      |
|                  | Textile                           | -0.55| 1.09 | 1.19 | 1.23 | 2.23 | 2.02 | 0.56 | 1.91 | 2.60 | 2.35 | 1.72 | 1.39 |
|                  | Apparel                           | 1.08 | 1.61 | 1.66 | 0.50 | 2.34 | 2.94 | 1.54 | 2.74 | 3.14 | 3.62 | 3.84 | 3.70 |
|                  | Leather and footwear              | 0.35 | 1.40 | 1.74 | 1.10 | -1.98 | 1.08 | 0.69 | 1.26 | 1.19 | 1.66 | 1.41 | 1.48 |
|                  | Wood                              | -0.64| 1.20 | 1.82 | 2.25 | 3.05 | 3.98 | 2.33 | 2.58 | 3.19 | 3.24 | 3.16 | 3.20 |
|                  | Paper                             | 2.26 | 2.56 | 2.83 | 4.39 | -1.38 | 4.49 | 3.08 | 4.56 | 4.17 | 4.11 | 3.65 | 4.06 |
|                  | Chemicals                         | -1.73| -2.16| -2.60| -2.41| -2.21| -4.20| -3.08| 0.66| 1.44| 0.32| -0.74| 0.75|
|                  | Rubber and plastics               | -0.17| -0.27| 1.53 | 1.06 | 0.72 | 0.75 | 0.01 | 0.48 | 1.17 | 0.80 | 0.41 | 0.38 |
|                  | Nonmetallic products              | 1.33 | 0.66 | 0.79 | 0.62 | 0.06 | 1.14 | 1.15 | 2.01 | 1.97 | 3.05 | 2.94 | 2.77 |
|                  | Basic metals                      | -2.21| -1.49| -0.66| -1.40| -0.36| 0.54 | -1.07| -0.22| 1.03 | 0.24| -0.34| -1.05|
|                  | Machinery and mechanical appliances| -2.73| -0.32| 0.92 | -0.70| 2.06 | -3.18| -3.33| -4.81| -1.60| -2.09| -3.13| -0.66|
|                  | Electrical machinery              | -0.25| -0.26| 2.03 | 1.39 | 0.10 | 2.26 | 1.33 | 1.50 | 1.48 | 1.37 | 1.46 | 0.97 |
|                  | Medical and optical instruments   | -0.56| 0.16 | -0.28| 0.28 | 1.41 | 0.65 | -0.56| 0.11 | 1.16 | 0.51| -1.31| 0.20 |
|                  | Motor vehicles                    | -2.00| -0.53| 1.79 | -0.07| 3.61 | 0.45 | -0.77| N/A | -1.17| -2.40| N/A | -2.09|
|                  | Furniture                         | -0.91| -0.01| 0.62 | 0.98 | -2.71| 0.31 | -1.18| -0.99| -0.97| 0.20 | 1.15 | 0.95 |
|                  | Other manufactured articles       | 2.16 | 2.54 | 3.39 | 3.51 | 3.85 | 2.60 | 1.51 | 0.80 | 0.97 | 1.11| 1.44 | 1.52 |
|                  | Other products, NEC               | -4.49| -3.14| -1.98| -1.67| 2.41 | -1.83| -2.13| -1.26| -2.15| -2.27| -1.87| -1.39|
| **Bosnia and Herzegovina** | Food products                      | N/A | N/A | N/A | N/A | N/A | N/A | 0.91 | 0.74 | 0.95 | 1.28 | 1.12 | 0.85 |
|                  | Textile                           | N/A | N/A | N/A | N/A | N/A | N/A | 1.21 | 1.86 | 2.17 | 2.26 | 2.29 | 1.99 |
|                  | Apparel                           | N/A | N/A | N/A | N/A | N/A | N/A | 1.46 | 1.30 | 1.24 | 1.70 | 1.87 | 1.99 |
|                  | Leather and footwear              | N/A | N/A | N/A | N/A | N/A | N/A | 0.49 | 0.33 | -0.05| 0.00 | -0.21| 0.11 |
|                  | Wood                              | N/A | N/A | N/A | N/A | N/A | N/A | -0.24| -0.11| 0.39 | 0.40 | 0.34 | 0.26 |
|                  | Paper                             | N/A | N/A | N/A | N/A | N/A | N/A | -1.77| -2.22| -2.74| -2.08| -2.09| -1.77|
|                  | Publishing and printing           | N/A | N/A | N/A | N/A | N/A | N/A | 0.43 | 0.89 | -0.36| -4.15| -3.55| -4.50|
|                  | Chemicals                         | N/A | N/A | N/A | N/A | N/A | N/A | 2.16 | 2.19 | 2.17 | 1.64 | 1.95 | 2.55 |
|                  | Rubber and plastics               | N/A | N/A | N/A | N/A | N/A | N/A | 0.02 | -0.54| -0.26| -0.33| -0.46| -0.63|
|                  | Nonmetallic products              | N/A | N/A | N/A | N/A | N/A | N/A | 0.05 | -1.36| -0.64| -0.78| -0.78| -1.45|
|                  | Basic metals                      | N/A | N/A | N/A | N/A | N/A | N/A | 0.97 | 0.73 | 0.78 | 0.40 | 0.23 | 0.18 |
|                  | Fabricated metal products         | N/A | N/A | N/A | N/A | N/A | N/A | 1.32 | 0.93 | 1.08 | 1.77 | 1.11 | 1.07 |
|                  | Machinery and mechanical appliances| N/A | N/A | N/A | N/A | N/A | N/A | 1.50 | 1.23 | 0.77 | 0.60 | 0.37 | 0.39 |
|                  | Electrical machinery              | N/A | N/A | N/A | N/A | N/A | N/A | 1.38 | 1.00 | 0.96 | 0.63 | 0.62 | 0.06 |
|                  | Machinery and mechanical appliances| N/A | N/A | N/A | N/A | N/A | N/A | 2.05 | 2.17 | 1.95 | 1.83 | 1.94 | 1.47 |
|                  | Motor vehicles                    | N/A | N/A | N/A | N/A | N/A | N/A | 0.38 | 0.23 | 0.32 | 0.33 | -0.79| -1.73|

(Continued)
|           | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|-----------|------|------|------|------|------|------|------|------|------|------|------|------|
| **Furniture** | N/A  | N/A  | N/A  | N/A  | N/A  | N/A  | N/A  | 1.07 | 0.82 | 0.87 | 0.91 | 0.85 | 0.81 |
| **Toys and sports products** | N/A  | N/A  | N/A  | N/A  | N/A  | N/A  | 0.80 | 0.51 | 0.45 | 1.33 | 0.10 | 0.33 |
| **Other manufactured articles** | N/A  | N/A  | N/A  | N/A  | N/A  | N/A  | 1.09 | 0.66 | −0.23 | 0.24 | −1.33 | −1.36 |
| **Other products, NEC** | N/A  | N/A  | N/A  | N/A  | N/A  | N/A  | 0.62 | 0.11 | 0.43 | 0.32 | 0.46 | 0.88 |
| **Croatia** |      |      |      |      |      |      |      |      |      |      |      |      |
| **Food products** | 0.21 | 0.01 | 0.11 | 0.75 | 0.73 | 0.65 | 0.63 | 0.62 | 0.62 | 0.47 | 0.38 | 0.77 |
| **Textile** | 0.27 | −0.01 | −0.10 | 0.54 | 0.66 | 0.63 | 0.30 | 0.12 | 0.71 | 0.85 | 0.90 | 1.29 |
| **Apparel** | 0.15 | −0.27 | −0.49 | −0.46 | −0.69 | −0.91 | −0.96 | −1.09 | −0.98 | −0.67 | −0.51 | −0.43 |
| **Leather and footwear** | 0.06 | −0.31 | −0.47 | 0.05 | 0.37 | 0.14 | 0.17 | 0.04 | 0.47 | 0.85 | 0.67 | 0.03 |
| **Wood** | 0.02 | −0.07 | −0.11 | 0.01 | −0.65 | −1.48 | −2.35 | −2.47 | −1.17 | −0.14 | −0.53 | −0.80 |
| **Paper** | 0.03 | −0.01 | −0.06 | 0.74 | 0.57 | 0.04 | 0.34 | 0.53 | 0.73 | 0.71 | 1.01 | 1.36 |
| **Publishing and printing** | 0.04 | 0.13 | 0.00 | −0.21 | −2.11 | −1.51 | −2.62 | −2.75 | −1.87 | −1.29 | −1.11 | −1.01 |
| **Chemicals** | 0.14 | 0.10 | 0.07 | 0.46 | 0.47 | 0.63 | 0.16 | −0.42 | 0.01 | 0.46 | 0.35 | 0.32 |
| **Rubber and plastics** | 0.06 | 0.07 | 0.04 | 1.32 | 1.02 | 0.30 | 0.12 | 0.07 | 0.47 | 0.27 | −0.45 | −0.63 |
| **Nonmetallic products** | 0.13 | 0.11 | 0.11 | 0.39 | 0.51 | 0.48 | 0.25 | 0.17 | 0.25 | 0.00 | −0.55 | −0.59 |
| **Basic metals** | −0.31 | −0.41 | 0.14 | 0.18 | −0.02 | −0.08 | −0.57 | −0.66 | −0.90 | −0.96 | −1.35 | −1.37 |
| **Fabricated metal products** | −0.90 | −1.02 | −1.14 | −0.86 | 0.48 | −0.75 | −1.26 | −1.29 | −1.59 | −1.10 | −1.95 | −1.87 |
| **Machinery and mechanical appliances** | 0.05 | 0.04 | 0.00 | 0.24 | 0.12 | 0.07 | −0.26 | −0.13 | −0.15 | −0.06 | 0.06 | 0.19 |
| **Electrical machinery** | 0.14 | 0.10 | 0.11 | 0.27 | 0.29 | 0.12 | −0.09 | −0.17 | −0.22 | −0.30 | −0.73 | −1.07 |
| **Medical and optical instruments** | −0.02 | 0.01 | 0.02 | 0.21 | 0.10 | −0.10 | −0.13 | −0.15 | −0.11 | 0.01 | −0.27 | −0.41 |
| **Motor vehicles** | 0.48 | 0.33 | 0.23 | 0.59 | 0.26 | −0.20 | −0.44 | −0.16 | −0.47 | −0.50 | −0.88 | −2.07 |
| **Furniture** | 0.10 | 0.04 | 0.02 | 0.10 | 0.30 | 0.29 | −0.20 | −0.26 | −0.29 | −0.33 | −0.28 | −0.80 |
| **Toys and sports products** | −0.24 | −0.52 | −0.90 | −0.56 | −5.08 | −6.28 | N/A | −5.06 | −4.43 | −1.63 | −1.04 | −0.64 |
| **Other manufactured articles** | −0.09 | −0.11 | −0.24 | 0.25 | 0.25 | 0.10 | 0.56 | 0.50 | 0.48 | 0.62 | 0.56 | 1.15 |
| **Other products, NEC** | 0.21 | 0.19 | 0.14 | 0.45 | 0.10 | 0.48 | 0.39 | 0.55 | 0.75 | 0.70 | 0.68 | 0.63 |
| **Macedonia** |      |      |      |      |      |      |      |      |      |      |      |      |
| **Food products** | −1.31 | −0.70 | −1.68 | −0.85 | −2.45 | −3.38 | −3.25 | −3.17 | −4.16 | −3.88 | −3.48 | −2.81 |
| **Textile** | −0.88 | 0.03 | 0.35 | 0.26 | 0.21 | 0.23 | −0.14 | −0.22 | −0.80 | −1.28 | −1.67 | −1.50 |
| **Apparel** | −0.39 | 0.14 | 0.52 | 1.01 | 1.02 | 1.22 | 1.33 | 1.12 | 0.57 | 0.96 | 1.10 | 1.03 |
| **Leather and footwear** | −0.77 | −0.60 | −0.05 | −0.14 | 0.24 | 0.08 | 0.07 | 0.05 | 0.04 | 0.07 | 0.07 | 0.18 |
| **Wood** | −0.31 | 0.58 | −0.59 | −0.28 | 0.21 | 0.69 | 0.42 | 0.52 | 0.26 | 0.08 | −0.91 | −2.39 |
| **Paper** | −3.07 | −2.81 | −1.47 | 0.12 | 0.00 | −0.76 | −0.53 | −0.78 | −1.72 | −1.28 | −2.16 | −2.63 |
| **Publishing and printing** | −0.71 | −1.97 | N/A | 3.47 | −0.29 | −3.14 | −3.83 | −4.33 | −4.51 | −3.36 | −4.25 | −4.99 |
| **Chemicals** | −8.07 | −3.97 | −6.19 | −3.90 | −5.67 | −7.23 | −7.73 | −7.51 | −3.90 | −4.59 | −4.82 | −3.88 |
| **Rubber and plastics** | −2.47 | −3.51 | −3.46 | −2.84 | −2.98 | −4.02 | −4.84 | −5.05 | −5.68 | −5.44 | −5.69 | −5.93 |
| **Nonmetallic products** | −1.86 | −2.23 | −3.47 | −2.56 | −8.07 | −7.03 | −7.14 | −4.43 | −8.89 | −4.05 | −3.68 | −4.90 |
| Category                                      | 2000  | 2001  | 2002  | 2003  | 2004  | 2005  | 2006  | 2007  | 2008  | 2009  | 2010  | 2011  | 2012  | 2013  | 2014  | 2015  | 2016  |
|----------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Basic metals                                 | 0.55  | 0.50  | -0.11 | -0.30 | -0.97 | -1.08 | -0.65 | -0.09 | -0.32 | 0.67  | 0.67  | 0.72  |       |       |       |       |       |
| Fabricated metal products                    | -3.25 | -1.41 | -2.29 | -1.16 | -2.96 | -3.55 | -2.97 | -3.15 | -4.12 | -3.10 | -4.01 | -3.23 |       |       |       |       |       |
| Machinery and mechanical appliances          | -0.78 | -2.99 | -1.18 | -0.31 | -1.24 | -2.06 | -2.99 | -5.98 | N/A   | -5.19 | -6.61 | -9.13 |       |       |       |       |       |
| Electrical machinery                         | -2.09 | -1.47 | -1.19 | -1.53 | -2.42 | -2.04 | -1.01 | -0.81 | -3.28 | -2.04 | -2.44 | -3.47 |       |       |       |       |       |
| Medical and optical instruments              | 1.12  | -4.35 | -3.88 | -7.91 | N/A   | -4.14 | N/A   | -2.23 | -3.31 | -2.28 | -1.31 | -1.32 |       |       |       |       |       |
| Motor vehicles                               | -2.82 | -3.30 | -3.02 | -3.52 | -5.27 | -5.65 | -4.10 | -5.55 | -6.08 | -5.29 | -5.67 | -5.88 |       |       |       |       |       |
| Furniture                                    | -3.23 | -2.29 | -2.20 | -1.89 | -2.05 | -1.50 | -1.39 | -1.50 | -1.28 | -1.16 | -0.50 |       |       |       |       |       |       |
| Other manufactured articles                  | 1.54  | -2.50 | 0.05  | 1.21  | 0.35  | 0.67  | 1.18  | 1.70  | 0.15  | 0.81  | -0.37 | -0.51 |       |       |       |       |       |
| Other products, NEC                          | -3.07 | -2.79 | -3.48 | -3.54 | -4.05 | -4.80 | -5.05 | -5.11 | -5.33 | -5.51 | -4.15 | -4.15 |       |       |       |       |       |
| **Serbia and Montenegro**                    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| **Food products**                            | N/A   | N/A   | N/A   | -2.35 | -1.07 | -0.79 | -1.47 | -1.48 | -1.39 | -0.82 | -1.02 | -0.80 |       |       |       |       |       |
| **Textile**                                  | N/A   | N/A   | N/A   | -1.33 | -1.26 | -0.92 | -0.46 | -0.59 | -1.50 | -1.31 | -1.17 | -0.93 |       |       |       |       |       |
| **Apparel**                                  | N/A   | N/A   | N/A   | -0.40 | -0.24 | -0.06 | -0.21 | -0.17 | -0.13 | -0.39 | -1.15 | -1.28 |       |       |       |       |       |
| **Leather and footwear**                     | N/A   | N/A   | N/A   | -0.83 | -0.40 | -0.77 | -0.87 | -1.06 | -1.13 | -0.86 | -1.17 | -0.99 |       |       |       |       |       |
| **Wood**                                     | N/A   | N/A   | N/A   | -1.50 | 0.34  | 0.21  | 1.25  | 1.25  | 0.06  | -0.33 | -0.88 | -0.73 |       |       |       |       |       |
| **Paper**                                    | N/A   | N/A   | N/A   | -3.78 | -0.70 | -0.22 | -0.01 | -0.16 | -0.12 | -2.26 | -1.55 | -1.39 |       |       |       |       |       |
| **Publishing and printing**                  | N/A   | N/A   | N/A   | -0.04 | -2.21 | 0.64  | 0.65  | 0.67  | 0.77  | 0.60  | 0.65  | 0.64  |       |       |       |       |       |
| **Chemicals**                                | N/A   | N/A   | N/A   | -2.05 | -1.18 | -1.66 | -1.21 | -0.54 | -0.49 | -0.72 | -0.66 | -0.74 |       |       |       |       |       |
| **Rubber and plastics**                      | N/A   | N/A   | N/A   | -2.32 | -0.80 | -0.15 | -0.01 | 0.14  | -0.21 | 0.02  | 0.28  | 0.25  |       |       |       |       |       |
| Nonmetallic products                         | N/A   | N/A   | N/A   | -1.96 | -1.46 | -1.67 | -0.46 | -0.11 | -0.66 | 0.36  | 0.60  | 0.43  |       |       |       |       |       |
| **Basic metals**                             | N/A   | N/A   | N/A   | 0.08  | 0.23  | 0.29  | -0.04 | -0.07 | -0.19 | -0.21 | 0.03  | -0.20 |       |       |       |       |       |
| Fabricated metal products                    | N/A   | N/A   | N/A   | -2.31 | -1.07 | -1.58 | -1.14 | -1.22 | -1.26 | -0.54 | -1.22 | -1.48 |       |       |       |       |       |
| Machinery and mechanical appliances          | N/A   | N/A   | N/A   | -0.88 | -0.51 | -0.05 | -0.36 | -0.38 | 0.02  | 0.09  | 0.26  | 0.29  |       |       |       |       |       |
| Electrical machinery                         | N/A   | N/A   | N/A   | -1.64 | -0.70 | -0.24 | 0.01  | 0.21  | 0.38  | 0.58  | 0.87  | 0.90  |       |       |       |       |       |
| Medical and optical instruments              | N/A   | N/A   | N/A   | -1.42 | -0.46 | 0.31  | -0.18 | -0.28 | -0.08 | -0.29 | -0.02 | 0.07  |       |       |       |       |       |
| Motor vehicles                               | N/A   | N/A   | N/A   | -1.33 | -0.51 | 0.56  | 0.61  | 0.29  | 0.50  | 0.47  | 0.99  | 1.01  |       |       |       |       |       |
| Furniture                                    | N/A   | N/A   | N/A   | -0.30 | -0.70 | -0.72 | -1.41 | -1.09 | -1.28 | -1.48 | -1.58 | -1.20 |       |       |       |       |       |
| Toys and sports products                     | N/A   | N/A   | N/A   | -3.04 | -1.07 | 0.11  | -0.54 | -1.23 | -0.16 | 0.52  | -1.16 | -1.97 |       |       |       |       |       |
| Other manufactured articles                  | N/A   | N/A   | N/A   | -2.17 | -2.03 | -1.90 | -1.42 | -0.88 | -1.04 | -1.01 | -1.76 | -1.48 |       |       |       |       |       |
| Other products, NEC                          | N/A   | N/A   | N/A   | -2.20 | -1.27 | -1.06 | -1.12 | -0.79 | -1.54 | -1.57 | -1.01 | -0.57 |       |       |       |       |       |

*Source: Authors’ calculations based on Eurostat Comext database.*
IMPACT OF INTERNATIONAL FRAGMENTATION ON GROWTH

In this section, we rely on panel data estimation methodology to test the effects of the international fragmentation of production on economic activity in the Western Balkans. In particular, following the recent literature, we assume that the relative intensity of processing trade constitutes a separate item in the overall aggregate demand in a given country, and thus its changes will affect the level of economic activity and GDP growth. Based on this idea, we seek to verify whether or not the divergences in their degree of participation in IPNs help us to explain the observed differences in the various countries’ GDP growth rates and to determine the distinctive influence of this participation on their economic behavior.

Accordingly, we initially estimate, through several regression models, the differential GDP growth rate of the considered countries with respect to the region’s average. We next estimate the GDP growth rate of each country separately. These two endogenous variables are explained by the propensity index of international fragmentation (in logs), defined in the previous section, as our main regressor. Additionally, to control for other factors that might influence aggregate demand and, thereby, GDP growth rates, we consider elements of both domestic and foreign demand. In particular, we include the levels of final consumption and gross capital formation to capture changes in domestic demand, and the levels of exports to account for variations in foreign demand. We have also added FDI inflows to evaluate the positive influence that the establishment of multinational firms may exert on the recipient country’s economic performance, as has been broadly highlighted in the literature (e.g., Alguacil, Cuadros, and Orts 2011).

More specifically, the estimating equation takes the following form,

\[ gdpg\text{d}_{it} = \beta_0 + \beta_1 liif_{it} + \beta_2 exp_{it} + \beta_3 fincons_{it} + \beta_4 capform_{it} + \beta_5 fd\text{i}_{it} + \lambda_t + \mu_i + \epsilon_{it} \]

where \( i \) stands for each country, and \( t \) denotes time. The level of capital formation, \( capform \), total and final exports, \( exp \), and net inflows of foreign direct investment, \( fd\text{i} \), are all expressed as a percentage of GDP. The variable \( fincons \) represents the difference between the final consumption growth rate of country \( i \) and the weighted average of the growth rate of final consumption in the

| TABLE 5 |
|---|---|---|
| **Abbreviation** | **Definition** | **Data source** |
| gdprealdiff | Differential between GDP growth rate with respect to regional average | World Development Indicators and authors calculations |
| liif | Log of Index of International Fragmentation | Eurostat and authors calculations |
| totalexp | Total exports as percent of GDP | UN Comtrade |
| finexp | Final exports as percent of GDP (final exports are defined as goods exported definitely) | World Development Indicators |
| fincons | Difference between final consumption growth rate of country \( i \) and weighted average of growth rate of final consumption in Western Balkan countries | World Development Indicators and authors’ calculations |
| capform | Gross capital formation (or gross investment) as percent of GDP | World Development Indicators |
| fd\text{i} | Foreign direct investment as percent of GDP | World Development Indicators |
Western Balkan countries. The terms $\lambda_t$ and $\mu_i$ comprise time effects and unobserved bilateral effects, respectively. The remaining error $\varepsilon_{it}$ is assumed to be independent across countries and over time. The analyzed period is from 2002 to 2013. The definitions and sources of all variables are detailed in Table 5.

As previously mentioned, the above equation is estimated using a panel data approach. This methodology allows us to account for unobserved individual heterogeneity. The effects of this heterogeneity can be constant and correlated with independent variables (fixed-effects model) or random and uncorrelated with independent variables (random-effects model). Moreover, it is a well-known fact that panel data provide more degrees of freedom, less collinearity, and therefore more efficiency. For the sake of robustness, we employ different specifications and estimation methods.

As a first assessment of the impact on growth of the propensity to participate in international production networks, we initially run a baseline model, with the index of international fragmentation as the sole regressor. Next, and in line with previous empirical works, an extended model is estimated by considering the effects of domestic and foreign factors of demand on economic growth. In Table 6, we present the results obtained from the estimation of these models using the random-effects methodology. The decision regarding whether to consider unobserved country-specific effects as random was made on the basis of the Hausman test.

| TABLE 6 | Estimation Results Using Random Effects, 2002–2013 |
|---|---|---|---|---|---|
| Dependent variable | GDP real growth difference | GDP real growth |
| Explanatory variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
| liif | 1.136*** (0.450) | 1.399*** (0.561) | 1.710*** (0.403) | 1.123** (0.470) | 1.373** (0.564) | 1.680*** (0.405) |
| toalexp | 0.060* (0.032) | 0.106*** (0.027) | 0.103*** (0.027) |
| finexp | 0.084 (0.068) | 0.069 (0.059) | 0.083 (0.069) | 0.103*** (0.027) |
| fincons | 0.163*** (0.059) | 0.139*** (0.052) | 0.164*** (0.059) | 0.140*** (0.052) |
| capform | 0.279*** (0.084) | 0.272*** (0.061) | 0.277*** (0.085) | 0.270*** (0.061) |
| fdi | −1.314 (1.032) | −7.487*** (1.929) | −6.459*** (1.771) | 3.055*** (1.177) | −3.093 (1.946) | −2.088 (1.797) |
| const | −1.498 (1.032) | −7.487*** (1.929) | −6.459*** (1.771) | 3.055*** (1.177) | −3.093 (1.946) | −2.088 (1.797) |

Notes: Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. All estimations include year effects. For Hausman test and overidentifying restrictions test, we report the $p$-values.
For the sake of comparison and to deal with the problem of reverse causality or simultaneity, we also show in Table 7 the coefficients of the extended model using two-stage least squares (TSLS) and generalized method of moments (GMM) instrumental variable (IV) techniques. The plausibility of both the potential positive impact of an increase in trade and FDI on GDP growth and the possibility of these external factors being enhanced by a higher rate of economic growth is well documented in the literature. According to Irwin and Terviö (2002), efforts to estimate the effects of international trade on a country’s real income have been hampered by a failure to account for the endogeneity of trade. Similarly, for Borensztein, De Gregorio, and Lee (1998), the correlation between FDI and growth rate could arise from an endogenous determination of FDI, as foreign investment in itself may be influenced by innovations in the stochastic process governing growth rates. Ignoring these effects might lead to the impact of these variables being overstated and to significant relationships being found where they do not in fact exist.

TABLE 7
Estimation Results Using TSLS and GMM Instrumental Variables, 2002–2013

| Dependent variable | GDP real growth difference | GDP real growth |
|--------------------|---------------------------|----------------|
|                    | IV                        | GMM            | IV                        | GMM            |
|                    | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 |
| liif               | 1.888*** (0.456)          | 2.228*** (0.514) | 1.818*** (0.482)          | 2.072*** (0.510) | 1.864*** (0.458) | 2.202*** (0.516) | 1.797*** (0.484) | 2.052*** (0.513) |
| toalexp            | 0.087*** (0.026)          | 0.084*** (0.023) | 0.086*** (0.027)          | 0.083*** (0.023) |
| finexp             | 0.138*** (0.041)          | 0.129*** (0.037) | 0.136*** (0.041)          | 0.128*** (0.038) |
| fincons            | 0.090* (0.049)            | 0.074 (0.041)   | 0.090* (0.049)            | 0.074 (0.041)   |
| capform            | 0.098 (0.066)             | 0.102* (0.068)  | 0.098 (0.066)             | 0.069 (0.068)   | 0.102* (0.060) | 0.078 (0.061)   |
| fdi                | 0.446*** (0.109)          | 0.434*** (0.103) | 0.418*** (0.132)          | 0.381*** (0.121) | 0.445*** (0.110) | 0.433*** (0.104) | 0.419*** (0.134) | 0.383*** (0.123) |
| const              | −6.187*** (1.590)         | −5.169*** (1.481) | −6.137*** (1.359)         | −5.107*** (1.379) | −5.323*** (1.597) | −4.325*** (1.487) | −5.271*** (1.374) | −4.259*** (1.399) |
| Number of observations | 46 46 46 46 | 46 46 46 46 |
| Adjusted R²       | 0.563 0.566 0.574 0.580 | 0.851 0.852 0.854 0.857 |
| Overidentifying restrictions test | 0.08 0.05 0.04 0.03 | 0.08 0.05 0.04 0.02 |

Notes: Robust standard errors are in parentheses. *p < 0.10, **p < 0.05, ***p < 0.01. All estimations include year effects. The methods used for the overidentifying restrictions tests are the Sargan test for the IV estimations and the Hansen test for the GMM estimations. The figures reported for the overidentifying restrictions tests are the p-values for the null hypothesis indicating that all instruments are uncorrelated with errors (cannot be rejected in any of the cases). The methods used for the endogeneity tests are the Durbin-Wu-Hausman test for the IV estimations and the difference-in-Sargan test (C test) for GMM estimations.
The problem of regressors correlated with the error term due to the simultaneous nature of the model results in inconsistent ordinary least square (OLS) estimates. Therefore, with endogenous explanatory variables, we must resort to TSLS and GMM methods (see Biørn and Krishnakumar 2008). However, one of the major problems with the TSLS estimation method is the difficulty of identifying instruments that are highly correlated with the explanatory variables but not with the error terms. This problem is solved in the standard GMM estimator (Arellano and Bond 1991), as the lagged levels of all the right-hand-side variables are used as instruments, which eliminates the arbitrariness in the selection of instruments.

As can be seen from the tables, our outcomes support the hypothesis that greater participation in the international fragmentation of production exerts a beneficial influence on the economic behavior of countries in the Western Balkans. This is a very robust result, as the variable liif is positive and highly significant in all regressions for both the economic growth differences and the country’s GDP growth rate. Our findings also sustain the hypothesis that the degree of involvement in international production networks positively influences the economic performance of the Western Balkan countries, even once the gains of total or final goods trade are considered. Thus, the countries’ higher degree of participation in IPNs gives them the possibility of achieving higher productivity and is a powerful contributor to growth, complementing the impacts generated by the total and final goods trades. Similar results are obtained by Baldone, Sdogati, and Tajoli (2007) for the EU countries, and by Foster, Stehrer, and Timmer (2013) for forty advanced and emerging economies. Therefore, the estimates corroborate the idea that the growth-enhancing impact of this phenomenon exceeds the underlying growth effect of an increase in total trade.

Our results also show the importance of taking into account the role played by multinational firms in the Western Balkans. Regardless of domestic and foreign demand, foreign direct investment appears to be an important factor in the explanation of their differences in terms of economic growth. As can be seen in Table 6 and Table 7, fdi has a positive and very significant coefficient in all models considered. In contrast, the coefficients of the domestic demand variables, despite having the expected sign, are not always statistically significant. According to the results of the estimation of random effects, capform has a significant and positive effect on the economic growth of these countries. However, in the regressions by instrumental variables, the significance of this variable disappears once the endogenous nature of the explanatory variables is considered. Conversely, domestic consumption is insignificant in the random-effects estimation, but is significant in most specifications of the IV estimation. The endogeneity and overidentification tests reported at the bottom of Table 7 confirm both the endogenous character of some of our regressors and the correct specification of the different models.

CONCLUSION

As part of their recent modernization and economic development, the countries of the Western Balkan region have begun to play an active role in international production networks. Data clearly show that these countries are a far more important destination of processing trade than a source thereof. In fact, inward processing trade reaches as much as 40% of the corresponding amount of final trade exports, with the EU being the main partner. Therefore, it is of particular interest to analyze the impact of a higher degree of participation in international fragmentation of production on the economic performance of these countries.
To capture the relative tendency of each country to participate in international production networks, we have elaborated a Balassa-type index of international fragmentation that considers both types of trade: processed and final. A descriptive analysis of this index has revealed two relevant facts. First, it confirms the increasing role played by inward processing trade in the Western Balkans during the analyzed period, although with different magnitudes depending on country and sector. Second, a more disaggregated analysis of this index reveals that the region’s countries have undergone a positive structural shift in industrial distribution toward higher value added industries.

The econometric analysis undertaken confirms the positive influence of the increased processing trade in these countries. Through the estimation of a set of panel data models, our results reveal that the relative tendency of each country to participate in this globalization process significantly affects its economic performance, as measured in terms of both differential and absolute GDP growth. Moreover, the effects of processing trade appear to be present together with the positive influence of traditional trade. The beneficial impact of the establishment of multinational firms on economic growth is also verified by the sign and magnitude of our estimates. This outcome shows how relevant multinational firms’ global strategies are for the trade patterns and economic activity of these countries.

Overall, our findings support the idea that policies designed to promote the openness and participation of the Western Balkan countries in the international division of production could be considered an important stimulus for the development and growth of these countries. The promotion of economic policies of a certain type may induce these countries to better exploit their comparative advantages and so improve their likelihood of successful economic modernization. Further research should focus on a more disaggregated approach, considering the increased relevance of sectors with higher valued added.

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Notes

1. The same process has been labeled differently by different authors. For example, slicing up the value chain (Krugman 1995), outsourcing (Feenstra and Hanson 1997), disintegration of production (Feenstra 1998), intraproduct specialization (Arndt 1997), vertical specialization (Hummels, Ishii, and Yi 2001), and fragmentation (Deardorff 2001; Jones and Kierzkowski 1990).
2. Barriers to trade, including nontariff barriers, were removed, and customs systems and legal practices were aligned with those in the EU. The trade and transport facilitation program for Southeastern Europe helped customs reforms and improved coordination between border control agencies, and, as well, eliminated bottlenecks at border crossings in the region.

3. At the same time that the Stabilisation and Association Process was launched, the EU granted a comprehensive set of Autonomous Trade Preferences to the Western Balkan countries that provided for the unilateral dismantling of import tariffs and duties for almost all goods emanating from these countries.

4. Of the six countries, Croatia became a member of EU in July 2013; Serbia and Montenegro are in the accession negotiating process; Albania and Macedonia are in the status of EU candidate countries; while Bosnia and Herzegovina is considered a potential candidate country.

5. Vertical IIT is defined as the simultaneous exporting and importing of products in the same industry but at different stages of production.

6. A theoretical framework for the value chain analysis was recently provided by Gereffi, Humphrey, and Sturgeon (2005).

7. Other important contributions to the theory of fragmentation can be found in Arndt (1997), Arndt and Kierzkowski (2001), Jones and Kierzkowski (2001), and Deardorff (1998, 2001).

8. Three main data sources and methodological approaches have been used in empirical works to measure the scope and impact of the international fragmentation production and GVCs: (1) trade in parts and components, (2) customs statistics on processing trade, and (3) a relatively new line of research involving global input-output matrices and trade in value added. General findings from these works are that intermediate goods trade has been expanding faster than trade in finished goods, and that fragmentation trade and participation in GVCs is a powerful driver of growth.

9. According to Locke et al. (2007) and Rossi (2011) economic upgrading can result in social upgrading, but this does not happen automatically and in all cases.

10. The authors are thankful to an anonymous referee for pointing out this important implication of international fragmentation of trade and participation in IPNs.

11. We include Montenegro and Serbia together because they were one country during half of the analyzed period.

12. However, as an anonymous referee mentioned, we should be conscious that a part of the final goods trade can be in-bounds of the processing trade. This is especially true in the automobile-assembly activity of multinational firms (especially important in Serbia and Croatia).

13. This agrees with the findings of Los, Timmer, and De Vries (2015), who show that international fragmentation trade flows resumed quickly after the 2009 crisis, with emerging economies playing a growing role as suppliers of intermediate goods.

14. These figures might be explained by the high amount of processing trade in apparel, textiles, and leather, especially in Albania, but also in Croatia and Macedonia.

15. Data are available on request.

16. Further extension of this analysis should concentrate on a sectoral approach to the phenomenon we are studying here. Productive specialization logically implies different patterns of processing trade for specific sectors or products.

17. See, for example, Helg and Tajoli (2005), Ramondo and Rodriguez-Clare (2009), or Samuelson (2001).

18. Given the data limitations, we include in the regression the country-specific version of the index. No sectoral data for the rest of the variables are available for Albania, Bosnia, and Herzegovina, and Montenegro.

19. See Baltagi (2013) for more detailed information about panel data models.

20. The results of this test are presented at the bottom of Table 6. As can be seen, the random-effects estimation is preferred to the fixed-effect estimation in all cases.

21. Their work is based on Frankel and Romer (1999). These authors employed countries’ geographical attributes to control for endogeneity of trade in the identification of the effects of this variable on income.

22. Following the literature (e.g., Alfaro and Charlton 2009; Borensztein, De Gregorio, and Lee 1998; Makki and Somwaru 2004), we use the lagged values of FDI and the log of the real effective exchange rate as instruments for FDI.
23. Indeed, the terms IV and GMM can be used indistinctly, as all IV estimators can also be interpreted as GMM estimators using the corresponding moment conditions.

24. The correlation matrix already revealed a positive correlation coefficient between the index of international fragmentation and GDP growth (on request).

25. Following the recommendation of an anonymous referee, we have included a test of overidentifying restrictions at the bottom of Table 6. The results of this test confirm that the random-effect models satisfy the required orthogonality condition. Although initially, given the idiosyncrasy of each country, we can think in terms of time-invariant individual effects, the influence of these variables may have time-varying effects, so the orthogonality assumption, and thus the convenience of using random-effects estimation instead of a fixed-effects model, remains.

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