

## The role of Chinese investments in the bilateral exports of new E.U. member states and Western Balkan countries

D. Jacimovic, R. Dragutinović Mitrović, P. Bjelić, K. Tianping & M. Rajkovic

To cite this article: D. Jacimovic, R. Dragutinović Mitrović, P. Bjelić, K. Tianping & M. Rajkovic (2018) The role of Chinese investments in the bilateral exports of new E.U. member states and Western Balkan countries, *Economic Research-Ekonomika Istraživanja*, 31:1, 1185-1197, DOI: [10.1080/1331677X.2018.1456357](https://doi.org/10.1080/1331677X.2018.1456357)

To link to this article: <https://doi.org/10.1080/1331677X.2018.1456357>



© 2018 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 22 May 2018.



Submit your article to this journal [↗](#)



Article views: 251



View Crossmark data [↗](#)

# The role of Chinese investments in the bilateral exports of new E.U. member states and Western Balkan countries

D. Jacimovic<sup>a</sup>, R. Dragutinović Mitrović<sup>b</sup>, P. Bjelić<sup>b</sup>, K. Tianping<sup>c</sup> and M. Rajkovic<sup>a</sup>

<sup>a</sup>Faculty of Economics, University of Montenegro, Podgorica, Montenegro; <sup>b</sup>Faculty of Economics, University of Belgrade, Beograd, Serbia; <sup>c</sup>Chinese Academy of Social Sciences, Institute of European Studies, Beijing, China

## ABSTRACT

This paper explores the economic relations between China and new E.U. member states and Western Balkan countries. China is an important trade partner for these countries, but in recent years the cooperation has been extended to include Chinese foreign direct investments (F.D.I.) inward investment. Using the Poisson pseudo-maximum likelihood (P.P.M.L.) method to estimate a gravity model of bilateral trade, this study analysed the export flows of these countries as a function of total inward F.D.I. and Chinese F.D.I. as well. The results imply that F.D.I. inflows from China significantly increase the bilateral exports of the investigated countries, where F.D.I. has a greater impact on the exports of new E.U. member states than on Western Balkan countries.

## ARTICLE HISTORY

Received 16 January 2017  
Accepted 6 December 2017

## KEYWORDS

Trade and F.D.I.; Chinese F.D.I.; C.E.E.C. export; China and C.E.E.C. relations; panel data

## JEL CLASSIFICATIONS

F21; F23; F63; F65; C33

## 1. Introduction

Large inflows of foreign direct investment (F.D.I.) into developing countries have influenced increases in efficiency, productivity, exports and dynamic economic growth. The most successful example of foreign investments inflows and export growth is China. Specifically, Chinese membership in the World Trade Organisation (W.T.O.), achieved in 2001, has contributed to huge inflows of F.D.I. into China, which have affected both trade dynamics and economic development (Drelich-Skulska, Bobowski, Jankowiak, & Przemyslaw, 2014; Zhang & Van Den Bulcke, 2014). In the early 2000s, China became the world's second largest destination of F.D.I., as reported in Fung, Korhonen, Li, and Ng (2008), where F.D.I.s were the most important tool of the economic transformation of China. Within a year of joining, China had taken the lead in export-led growth, based on learning by doing, adopting foreign know-how policies and practices and supported by industrial policy, as stated in Aizenman (2015) and Liang (2008). The huge export activity, in combination with low labour costs, led to increased productivity, which in turn resulted in the accumulation of significant foreign exchange reserves. This was the reason that China launched a simultaneous policy of opening up their economy. All these factors have led to increased Chinese

**CONTACT** D. Jacimovic  danijelaj@ac.me

© 2018 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

current-account surpluses and growing stockpiles of international reserves. The level of international reserves has reached impressive numbers. On the eve of the financial crisis, China's real G.D.P. growth was about 14%, its current-account surplus had grown to 10% of G.D.P., and Chinese international reserves had reached almost 45% of G.D.P. prior to the crisis, peaking at about 50% in 2010, as pointed out in Aizenman (2015). All of this has made China the most popular and active investor globally.

In the early 2000s, China implemented a strategy of internationalisation, whereby Chinese companies were encouraged to invest overseas. By launching the Going Global Strategy, it became a national policy priority (Shixue, 2014). China began to seek more investment opportunities in global markets, viewing the whole world as a market for its goods and investment. The economic and political conditions of the beginning of the twenty-first century, and the ongoing financial crisis have become a special stimulus for Chinese officials to increase investment opportunities, initially in the U.S.A. and the E.U., then in Central and Eastern European Economies and, most recently, in the Western Balkans.

The expansion of China's outward foreign direct investment in the first decade of this century was spectacular (MOFCOM, 2012). Chinese investment has been growing quickly in the U.S.A. and the E.U. since 2008. The main reasons were commercial, mainly driven by competition and structural changes inside China (Hanemann, 2014). However, over time, Chinese investors evaluated the business climate in the E.U. as more advantageous than in the U.S.A., despite the regulation obstacles they faced in dealing with the E.U. (European Union Chamber of Commerce in China, 2013).

Since 2010, China's strategy has been aimed towards strengthening its relations with emerging economies and Central and Eastern Europe (C.E.E.). The growing importance of multidimensional cooperation and financial relations with the 16 countries of C.E.E. is considered to be a source of potential economic benefits for all parties involved (Joia, Huidumac, & Tanase, 2011).

The main aim of this paper is to analyse the economic relations between China and C.E.E. countries, which include both new E.U. Member States and E.U. candidates from the Western Balkans. Our special focus will be to investigate the impact of F.D.I. inflows on the bilateral exports of the observed countries, identifying the difference between F.D.I. impacts on the bilateral exports of new E.U. and Western Balkan countries and considering whether the markets of new E.U. members are more attractive to Chinese F.D.I. than those in the Western Balkan region. China is an important trade partner for these countries and, in recent years, cooperation has mainly been achieved in the field of Chinese F.D.I. in relation to inward investment. These countries are interested in the inflow of Chinese investment, especially at a time of crisis, when the capital inflow from traditional investment partners has become scarce.

Using the gravity model of bilateral trade, we estimate the export flows of C.E.E. countries as a function of the inward total F.D.I., as well as Chinese F.D.I. The gravity model of international trade has been extensively used in the empirical literature since the 1960s. This explains the bilateral trade flows as a function of economic sizes of countries, trade impediment, i.e., distance between them and various other factors that affect trade (common border, common language, free trade area and currency union membership, customs regime of non-tariff trade barriers, etc.). Estimating this model, we investigate the attractiveness of the E.U. New Member States and potential E.U. countries (in the Western

Balkans) for Chinese investment, as well as the effects of this investment on the exports of C.E.E. countries.

The paper is organised as follows: after the introduction, Section 2 presents a literature overview. The third section discusses the economic indicators related to F.D.I. flows and the export performance of the observed countries. The fourth section presents the empirical model. The fifth section contains main conclusions.

## 2. Literature overview and background

In its first international strategy (2000–2005), China defined the following investment priorities: Hong Kong, Macao, North America and Western Europe. The Western European market, as one of the world's largest economic blocks, has become very interesting for Chinese investors. In the early 2000s, the E.U. declared China a 'strategic partner' (Fallon, 2014) and, since China's entry into the W.T.O. in 2001, the development of trade relations has been facilitated significantly.

In 2011, the E.U. market attracted more Chinese investment than the U.S. market (Hanemann, 2014) where, previously, the E.U. has not been the number one destination of Chinese investment and so the trend of rapidly increasing Chinese investment in the E.U. matters more than the absolute amount being invested. For China, it was particularly important to build closer economic ties with partners with powerful economies and high levels of technological innovation like the European market.

Chinese investors are present in a wide range of sectors, in almost all E.U. countries, where the number of individual greenfield investments is substantially larger than the number of Mergers and Acquisitions (M and A), but, in terms of the value of the investment, the situation is the opposite (Hanemann & Rosen, 2012; Jacoby, 2014). Chinese firms are traditionally oriented towards Energy, Utilities, Mining and Infrastructure (Nicolas, 2014), but, with regard to Chinese investment in the E.U., the aim is to try to acquire European technology, know-how, brands, distribution channels and strategic assets, benefiting from the weak financial position of European firms during the financial crisis. Some authors have pointed out that China sees the E.U. as a strategic partner in several key areas: (a) as a market for Chinese goods, (b) as a source for advanced technology and (c) as a means of food security (Clegg & Hinrich, 2011; Fallon, 2014).

The E.U. economy is open to Chinese investment and many of the E.U.'s national leaders and government officials have openly stated that Chinese investment is welcome (Shixue, 2014). However, in practice, Chinese companies face difficulties in investing in the E.U. market; this is partly due to China's unfamiliarity with the rules of the large E.U. market, but also because it has been difficult for China to find suitable investment opportunities in the region, in part a result of negative campaigning by the media and think tanks that has put pressure on Chinese investors (Zuokui, 2014).

The recent surge in Chinese investment expansion in E.U. markets has already raised concerns in many countries with respect to national security, and the political and economic impact of these changes (Hanemann, 2014; Nicolas, 2014). There are numerous worries that China may be taking control of European economies and arguments are often made in favour of establishing rules for the protection of local workers, wages and industries. On the other hand, there are issues connected with China's exceptional size, authoritarian political system, direct or indirect political and financial support for Chinese

F.D.I.s, the under-valued exchange rates of the Chinese currency and the implementation of capital controls (Amighini, Rabelotti, & Sanfilippo, 2013).

In 2011, China launched a new forum for cooperation with C.E.E. countries, the '16+1', which includes the 11 E.U. new member counties (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia) and five E.U. candidate countries (Albania, Bosnia and Herzegovina, FYR Macedonia, Montenegro and Serbia). These countries are different in many ways, but share the same need for investment and some common experience with China. The relationship between China and C.E.E. (the C.E.E.-16) entered a 'new era of cooperation' (Tianping, 2013), where China is becoming an increasingly important international investor (Pencea & Oehler-Sincai, 2014).

Accompanying this move, in 2013, China inaugurated the 'The New Economic Silk Road', leading from China to France, announcing a new wave of regional, political and economic cooperation. Since then, China has been investing in key infrastructure and logistic operations in the countries along this road.

With E.U. enlargement to incorporate C.E.E. countries, these countries have become interesting markets for Chinese investors, as these markets have become a 'window of opportunity' and China's gateway to the markets of the wider E.U. (Zuokui, 2014). With their recently revived E.U. aspirations, the countries of the Western Balkans are also becoming more and more interesting for China. Cooperation between these countries and China is a growing trend, both in terms of investment and trade. So far, there have been four consecutive summit meetings of the Heads of Government of China and of C.E.E. countries discussing possible investment opportunities and specific projects (Warsaw, 2012, Bucharest, 2013, Belgrade, 2014 and Suzhou, 2015).

There are important differences between Chinese investment behaviour in the C.E.E.-16 and the E.U.-15. First, there is a lower amount of investments in the C.E.E.-16, so the region is a destination for green-field activity, and investment which is product-oriented, efficiency seeking and which provides market access (Jacoby, 2014; Nicolas, 2014).

The Chinese motivation for C.E.E.-16 investment is complex: these countries are all former communist countries and, in their nature, are different from the western E.U.-15 countries. Studies have shown that countries that are politically, ethnically and economically close to China have stronger international business ties with the Chinese economy (Scott, 2014; Shan & Wang, 2015); that is in part why China has a particular interest in investing in the C.E.E. region.

The growth rates of C.E.E. counties are higher than in the E.U. generally, labour costs are more competitive and some of the countries can act as gateways for Chinese goods to the E.U. One very important dimension is that all the C.E.E.-16 countries have geographical access to major harbours, where China intends to invest in logistic centres and industrial projects. All the countries of C.E.E.-16 host Chinese investment, but the Visegrad group (V-4) is the biggest overall recipient (Palonka, 2010; Pencea & Oehler-Sincai, 2014).

The markets of C.E.E. countries have become very interesting for China, especially after the E.U. enlargement of 2004 (Tianping, 2013). This was particularly true as the C.E.E. counties and China have the same background in a centrally planned economy and Chinese investors began to realise the investment potential of the C.E.E. region, and especially the Visegrad countries, due to their specific industrial advantages when compared to other C.E.E. countries; this is made clear by the reports of the Ministry of Commerce of

**Table 1.** Chinese F.D.I. outward flows and exports to the E.U.15, new E.U. members and W.B. countries in millions of U.S.D., 2006–2015.

E.U.-15	2006	2009	2010	2011	2012	2013	2015
F.D.I. inward/inflows	108.95	2,928.9	5,548.9	7,341.8	5,966.7	4,356.5	5,318.75
% of total Chinese investments	1.2	3.1	4.8	5.9	4.9	3.5	4.2
Export	93,581	209,275	275,498	314,843	294,152	295,974	311,871
New E.U. members							
F.D.I. inward/inflows	19.2	37.5	414.2	219.0	153.2	167.0	160.6
% of total Chinese investments	0	0.04	0.36	0.18	0.13	0.13	0.13
Export	19,850	27,009	35,736	41,177	39,806	41,621	43,116
W.B.							
F.D.I. inward/inflows	n.a.	1.5	2.1	0.25	2.2	12.6	19.97
% of total Chinese investments	n.a.	0.002	0.002	0.00	0.002	0.01	0.02

Source: China Customs and U.N.C.T.A.D. F.D.I. database.

China, the National Bureau of Statistics of China and the State Administration of Foreign Exchange of China (2013).

With the global financial crisis, the relationship between China and C.E.E. countries has strengthened. While C.E.E. countries have been suffering from the global financial crisis, they have turned to China, seeking economic cooperation and trade promotion (Tianping, 2013). According to Belka (2012), the Chinese approach towards the Visegrad countries in particular is to move the whole industrial chain to these countries to build product upgrading and sales centres, regarding the localisation of production, with the final aim of selling Chinese goods on to the E.U., Russian and Turkish markets.

In addition to the increasing importance of Central Europe, the Western Balkan countries are becoming more interesting, both for Chinese investment and export. This is particularly relevant as they are countries outside the E.U., but which have signed trade agreements with the Union (for example Albania, Bosnia and Herzegovina, Macedonia and Serbia). They are attractive to Chinese companies, due to the fact that they can avoid anti-dumping and other similar E.U. regulations, while at the same time creating a springboard for free trade with the E.U. Therefore, the contribution of this paper is, in its unique research angle, that it observes effects of Chinese F.D.I. inflow on exports of host countries. Moreover, there is a lack of empirical literature on this topic.

### 3. China and C.E.E. countries-F.D.I. and export

Total Chinese F.D.I. inflows to the E.U.-15 in 2015 amounted to 5318 billion U.S.D., representing 4.2% of total Chinese F.D.I. The leading recipients were: The Netherlands and the U.K., followed by France, Germany and Sweden receiving 90% of total inflow. The recipients with the least Chinese F.D.I. were Austria, Finland and Portugal. Chinese investment is presented in Table 1, which shows F.D.I. outward investment and export value to the E.U.15, new E.U. members and Western Balkan countries (Bosnia and Herzegovina, Croatia, Montenegro and Serbia) in millions of U.S.D. The trends of these indicators have been observed for the period 2006–2015.

When we look at the export figures, China exported about 310 billion U.S.D. to the E.U.-15 in 2015 (The Ministry of Commerce of the People's Republic of China, The National Bureau of Statistics of China, The State Administration of Foreign Exchange, 2013 Statistical

**Table 2.** Export flows of the E.U.-15, new E.U. members and W.B. counties in billions of U.S.D. 2006–2015.

	2006	2009	2010	2011	2012	2013	2015
E.U.-15	3,802	4,088	4,572	5,345	5,091	5,309	4,672
New E.U. members	424	654	508	599	733	709	704
Balkan W.B. <sup>a</sup>	22	12	15	18	19	25	23

Source: U.N.C.T.A.D. trade database and national statistics.

<sup>a</sup>Data for Bosnia and Herzegovina, Croatia, Serbia and Montenegro.

Bulletin of China's outward foreign direct investment, China Statistics Press September 2014). The biggest of China's export markets were Germany, the Netherlands and the U.K., with 60% of the total, then France, Italy, Spain and Belgium, with their share at around 30%. Certainly, it can be seen that the most important partner countries from the E.U.15 are Germany, the Netherlands and the U.K.

When looking at Table 1, for new E.U. member states (Our analysis excludes Croatia as a recent E.U. Member), we can conclude that there is also an intensification of the relations between China and the C.E.E. countries. The number of investment projects and trade volume was constantly increasing in the period 2006–2015, but it still represents only 0.1–0.2% of total Chinese F.D.I., or 4% of the flow to more established E.U. Members States (E.U.-15). The total Chinese export to E.U.-12 countries is 1.2% of total export.

In 2006–2015, Hungary and Bulgaria received the largest volume of F.D.I., around 50% of total flows, followed by Poland, Romania and Cyprus, while Latvia, Lithuania and Slovenia had no Chinese F.D.I. China's exports to new member states represent 0.16% of their total imports. The number one destination of Chinese exports is Poland, while the Czech Republic is in second place, but in less significant amounts. They are followed by Hungary. The fact that there is no new E.U. member country that does not import from China speaks of the power of the Chinese economy, which is the world's largest exporter of goods.

The inflow of F.D.I. and imports from China to the Western Balkan (W.B.) countries achieved 0.02% of total F.D.I. flows in 2015. Data suggests that these countries are becoming the subject of attention from China. Bearing in mind investment activities in Montenegro and Serbia in 2014, it seems that the share of Chinese F.D.I. in this region will increase. So, when we talk about Chinese F.D.I., they are insignificant or absent in most countries, so that only Serbia stands out as a recipient. (Serbia has the largest inflow of F.D.I. of U.S.D. 11.5 million in 2013, and Macedonia of U.S.D. 11 million in 2015). China is the largest exporter to both Croatia and Serbia.

As for the structure of the investment in C.E.E. and W.B. countries, China invests most in the sectors of infrastructure and energy. Thus, China is trying to develop infrastructure and a distribution network in this part of the world suitable for the further penetration of Chinese products into the European market, in which the W.B. countries play an intermediary role, with the prospect that the Chinese companies will partly relocate their production facilities to this part of the world, due to the existence of free trade agreements with the E.U.. That is why the focus of our analysis is the investigation of the effects of China's F.D.I. on the exports of new E.U. and W.B. countries. Table 2 shows data for the exports of the E.U.-15, new E.U. members and W.B. in the period of 2006–2015 in billions of U.S.D.

The exports data are used in order to observe the dynamic of exports for each analysed group of countries as a function of Chinese F.D.I., which will be investigated using the gravity panel data model.

#### 4. Chinese F.D.I. and Central and Eastern European exports-empirical analysis

This part of the paper deals with the impact of China's F.D.I. in new E.U. members and Western Balkan countries on their own bilateral exports. Precisely, in the focus of our analysis are the following countries which received F.D.I. from China during the period 2006–2013: Bulgaria, The Czech Republic, Hungary, Poland, The Slovak Republic, Romania, Bosnia and Herzegovina, Serbia, Montenegro and Croatia. The bilateral exports of these countries toward their main foreign trade partners are observed in the period 2006–2013. Selected main partners for all the examined countries captured at least 90% of total countries' exports. This has resulted in a panel sample of 315 country-pairs (the above mentioned countries' trade flows to the E.U. countries (The E.U. sample does not include Malta and Cyprus due to low level of trade with C.E.E.) and other important trade partners such as Russia, China, Turkey, the U.S.A. and Switzerland), thus making 2520 panel observations in the 8-year period. The source of data is the World Trade Profiles 2014 published by W.T.O. The choice of 2006 as the starting year of the examined period is determined by the fact that data for Montenegro and Serbia as separate economies exist from that year.

Our main research hypotheses are that (1) F.D.I. inflows generally has an impact on the bilateral exports of the examined countries, (2) there is different magnitude of F.D.I. impact on the bilateral exports of new E.U. members and W.B. countries, and (3) the market of new E.U. members is more attractive to China's F.D.I. than the W.B. region.

##### 4.1. The model, data and variables

The empirical analysis is based on the gravity panel data model. Apart from the standard determinants of bilateral trade in this model (e.g., G.D.P. and number of population, distance, common language and border, and so on), the empirical literature is often focused on the effects of economic integration, currency unions, exchange rate volatility, F.D.I. or different trade impediments on bilateral trade flows (for instance, Baier & Bergstrand, 2007; Bussière, Fidrmuc, & Schnatz, 2008; Faruqee, 2004; Papazoglou, Pentecost, & Marques, 2006; Tenreyro, 2007). The basic model in its nonlinear form is as follows:

$$X_{ijt} = \alpha Y_{it}^{\beta_1} N_{it}^{\beta_2} Y_{jt}^{\beta_3} N_{jt}^{\beta_4} D_{ij}^{\beta_5} \exp(\delta A_{ij}) \varepsilon_{ijt} \quad (1)$$

where  $X_{ijt}$  is related to the export value from country  $i$  to country  $j$  in period  $t$ ;  $N_{it}$ ,  $Y_{it}$ ,  $N_{jt}$  and  $Y_{jt}$  are population and the G.D.P. of exporters and importers in the period  $t$ ,  $D_{ij}$  is the distance variable as a proxy for transport and transaction costs between exporter and importer main economic centres, a dummy variables set  $A_{ij}$  captures the effects of common borders, language, cultural similarities, preferential trade agreements, currency unions and  $\varepsilon_{ijt}$  represents the error term. (There are various alternatives to this basic gravity model, such as those used for analysis at a sectoral level or others that are based on different trade theories (e.g., Anderson & van Wincoop, 2003)).



The specification we start with in this paper is in the augmented form of model (1):

$$X_{ijt} = \alpha GDP_{ijt}^{\beta_1} FDIChn_{it}^{\beta_2} FDIr_{it}^{\beta_3} D_{ij}^{\beta_4} \exp(\phi B_{ij} + \mu_i + \mu_j + \lambda_t) \epsilon_{ijt} \quad (2)$$

Apart from variables included and explained in model (1), the model (2) includes variables F.D.I. inflow from China ( $FDIChn_{it}$ ) and F.D.I. from the rest of the world ( $FDIr_{it}$ ) toward selected W.B. and new E.U. member countries. In that way, the different magnitude of F.D.I. from China and F.D.I. from other countries on bilateral exports is measured. To alleviate the potential multicollinearity problem (between F.D.I. and the G.D.P. of the exporter country), instead of including both variables, the G.D.P. of the exporter and importer, we used a measure of the overall bilateral G.D.P. of the two trade partners ( $G.D.P.T_{ijt} = G.D.P._{it} + G.D.P._{jt}$ ; where  $G.D.P._{it}$  and  $G.D.P._{jt}$  are the gross domestic product of the exporter country  $i$  and the importer country  $j$  in the year  $t$ , respectively).

Additional variables in the model are the distance variable ( $D_{ij}$ ) and dummy variable representing the effects of common borders ( $B_{ij}$ ) on bilateral exports, taking value 1 for countries that share a common border and 0 otherwise. Model (2) includes exporter ( $\mu_i$ ) and importer ( $\mu_j$ ) specific effects, thus encompassing heterogeneity across countries due to various historical, cultural and other time-invariant specific variables (Matyas, 1997). Finally, the model contains time-specific effects ( $\lambda_t$ ) reflecting the effects of individual invariant variables not explicitly included in the model.

The expected sign of the bilateral G.D.P. variable is positive, meaning that the higher the overall G.D.P. of the two trade partners is, the higher the level of their bilateral trade will be. The same sign is expected when F.D.I. variables are observed. To be specific, F.D.I. is expected to have significantly positive effects on bilateral trade between countries, but the magnitude of the effects of China's F.D.I. inflows on new E.U. Member exports is expected to be higher than on W.B. country exports, due to the significantly higher amount of China's F.D.I. in new E.U. Members compared to W.B. countries. As expected, distance has a negative effect and a common border has positive effects on bilateral exports.

Bilateral export data, measured in millions of U.S.D., originate from the U.N. Comtrade database and G.D.P. data (in millions of U.S.D.) are from the I.M.F. World Economic Outlook. Data on F.D.I. inflows are taken from the U.N.C.T.A.D. database, while F.D.I. from China to the W.B. and new E.U. members are from the Ministry of Commerce of China, the State Administration of Foreign Exchange and the National Bureau of Statistics of China. Data on distance between the economic centres of two countries (in kilometres) are taken from the website: [www.worldatlas.com](http://www.worldatlas.com).

## 4.2. Methodology

The estimation of the gravity model in recent empirical literature is mostly based on panel data (e.g., Baier & Bergstrand, 2007; Bussière et al., 2008; Westerlund & Wilhelmsson, 2011). A review of panel data econometric methods for the gravity model is given in Baltagi, Egger, and Pfaffermayr (2014). Commonly used panel data specifications are based on fixed bilateral (or exporter and importer) and time effects (e.g., Baier & Bergstrand, 2007; Bussière

et al., 2008), various instrumental variable estimators, generalised least squares methods (Dragutinovic Mitrovic and Bjelic, 2013; Serlenga & Shin, 2007; Dragutinovic Mitrovic and Bjelic, 2013) and so on. In most empirical studies, the estimation of the gravity model is based on logarithms of both sides of the model. However, when the bilateral trade variable contains zero values not randomly distributed, this approach is not useful as it drops out zero trade flows. Hence, an alternative procedure in the presence of zero dependent variable values is to estimate the non-linear form of the gravity panel data model using the Poisson pseudo-maximum likelihood (P.P.M.L.) estimator. (This method is commonly used for count data, but recent papers confirmed its consistency, regardless of the distribution of the data, meaning that F.E. P.P.M.L. could also be applied to continuous variables (e.g., Silva & Tenreyro, 2006; Tenreyro, 2007; Westerlund & Wilhelmsson, 2011). The method is robust to the presence of heteroscedasticity.)

This method has often been used in recent empirical literature to solve zero trade problems and implicitly to estimate the gravity model in its original non-linear form (2). Since the sample in our empirical analysis contains zero trade flows to some extent, we also applied the P.P.M.L. method to estimate the gravity panel data model (2). Following the results of Westerlund and Wilhelmsson (2011), this model can be rewritten as:

$$X_{ijt} = \exp(\mu_i + \mu_j + \lambda_t) \lambda_{ijt} \varepsilon_{ijt} \text{ or } X_{ijt} = \exp(\mu_i + \mu_j + \lambda_t) \lambda_{ijt} + u_{ijt}, \quad (3)$$

where the conditional expectation:

$$\begin{aligned} \lambda_{ijt} &= E(X_{ijt} | G.D.P._{ijt}, F.D.I.Chn_{it}, F.D.I.r_{it}, D_{ij}, B_{ij}) = \exp(\alpha + \phi B_{ij}) G.D.P._{ijt}^{\beta_1} F.D.I.Chn_{it}^{\beta_2} F.D.I.r_{it}^{\beta_3} D_{ij}^{\beta_4} \\ &= \exp(\alpha + \phi B_{ij} + \beta_1 \ln G.D.P._{ijt} + \beta_2 \ln F.D.I.Chn_{it} + \beta_3 \ln F.D.I.r_{it} + \beta_4 \ln D_{ij}) \end{aligned}$$

and  $u_{ijt}$  is a zero mean disturbance independent of regressors and  $\varepsilon_{ijt} = 1 + \frac{u_{ijt}}{\exp(\mu_i + \mu_j + \lambda_t) \lambda_{ijt}}$  a heteroscedastic disturbance term with the conditional expectation:

$$E(\varepsilon_{ijt} | G.D.P._{ijt}, F.D.I.Chn_{it}, F.D.I.r_{it}, D_{ij}, B_{ij}, \mu_i, \mu_j, \lambda_t) = 1.$$

### 4.3. Estimation results

The empirical literature presented in the previous section also shows that other solutions to solve zero trade values, such as dropping the data with zero values (truncating the sample) or adding a small value to the zero value (before taking logs) are inappropriate (even in the case of a small percentage of zero values), since they lead to sample selection bias when zeros are not randomly missing data (Silva & Tenreyro, 2006; Westerlund & Wilhelmsson, 2011). That is why we applied P.P.M.L. in the estimation of the model, although the number of zero export values in our sample is rather small (less than 10%). The robustness of P.P.M.L. results in the estimation of gravity model was also checked in our recent paper (Dragutinović Mitrović & Bjelić, 2013), as well as in other previous empirical papers (for instance, Tenreyro, 2007), where it was shown that the magnitude of P.P.M.L. estimates is lower compared to those obtained by applying the fixed effects least squares estimator on linear gravity model taking logarithms.

The results of the P.P.M.L. method applied to Model (2) are presented in Table 3. Within the post-estimation procedure, we perform a RESET test to check whether the specification of the conditional expectation is correct or not. The test results (Table 3) indicate that the regression estimated using P.P.M.L. has no evidence of misspecification. Therefore, in the following we discuss the results obtained by P.P.M.L. estimation of the gravity model.

**Table 3.** P.P.M.L. estimation results dependent variable: bilateral exports.

Regressor	P.P.M.L. – F.E. (1)	P.P.M.L. – F.E. (2)	P.P.M.L. – F.E. (3)
<i>G.D.P.T</i>	0.49532 (0.000)	0.52346 (0.001)	0.52350 (0.001)
<i>F.D.I.Chn</i>	0.13517 (0.000)		
<i>F.D.I.r</i>	0.39659 (0.000)		
<i>F.D.I.Chn_E.U.</i>		0.12485 (0.000)	0.12486 (0.000)
<i>F.D.I.Chn_W.B.</i>		–0.01703 (0.566)	
<i>F.D.I.r_E.U.</i>		0.2409681 (0.000)	0.24093 (0.000)
<i>F.D.I.r_W.B.</i>		0.28758 (0.000)	0.29025 (0.000)
$D_{ij}$	–0.68639 (0.001)	–0.71789 (0.001)	–0.71786 (0.000)
$B_{ij}$	0.64785 (0.001)	0.60070 (0.000)	0.60071 (0.000)
Number of observations	2520	2520	2520
Fixed exporter effects	yes	yes	yes
Fixed importer effects	yes	yes	yes
Time effects	yes	yes	yes
Wald test	8668.60	6650.57 (0.000)	6299.39 (0.000)
Reset test <i>p</i> -value	0.085	0.112	0.121

Note: The *p*-value is reported in parentheses.

Source: Authors calculation.

Looking at the estimated regression coefficients of the standard regressors in the gravity model, the expected signs and significance are obtained. As stated previously, to alleviate the problem of a high positive correlation between the variable G.D.P. of the exporter country and its F.D.I. inflow, we used the overall bilateral G.D.P. of both the importer and exporter country. The income of both countries should positively determine their bilateral trade, which is confirmed by the positive regression coefficient of overall G.D.P. (significant at a 1% significance level). This means that the bilateral exports of W.B. and new E.U. member countries are positively affected by their incomes. Distance and common borders also have an important role in determining the bilateral exports of the examined countries: the distance impact on bilateral exports is negative and significant, while the border effect is significantly positive (Table 3).

Our investigation considered the effects of Chinese F.D.I. on the trade of W.B. and new E.U. members. Moreover, we compare their bilateral trade effects for the two groups of countries. Our results show that F.D.I. inflows from China (*F.D.I.Chn*) as well as from the rest of the world (*F.D.I.r*) significantly increase the bilateral exports of the examined European countries (the regression coefficients are 0.13517 and 0.39659, both significant at 1% significance level). In order to test whether and to what extent China's F.D.I. has different effects on the bilateral exports of new E.U. Members compared to W.B. countries, we extended the model by including the interaction of each of the two F.D.I. variables with dummy variables for new E.U. members and W.B. countries (*F.D.I.Chn\_E.U.* and *F.D.I.Chn\_W.B.*, as well as *F.D.I.r\_E.U.* and *F.D.I.r\_W.B.*). The estimation results are presented in column 2 of Table 3.

Our econometric analysis confirms all three of the main hypotheses stated at the beginning of this section. Generally, F.D.I. inflows have a significant impact on the bilateral exports of both groups of countries (with significant regression coefficient estimates for both *F.D.I.r\_E.U.* and *F.D.I.r\_W.B.* variables). Regarding China's F.D.I. effects, the regression coefficient estimate of the *F.D.I.Chn\_E.U.* variable is positive and significant at a 1% significance level, whereas that of *F.D.I.Chn\_W.B.* is not significant. This implies that the new E.U. market is more attractive for Chinese investment, that is Chinese F.D.I. has a greater impact on the exports of new E.U. members than they do on the exports of W.B. countries. There could be several reasons for such results. First, by investing in one E.U.

country, a newly established company can supply the whole E.U. market, and one part of its production can also be exported. Second, inward F.D.I. in the E.U., under the condition that the newly established company fulfils the rules of origin requirements for preferential treatment, can open doors to many markets, since the E.U. has a wide network of preferential trade agreements. Third, Chinese investment is often attracted by the technological knowledge of the companies in the developed economies in which they tend to invest, in order to control or acquire that advanced technology.

## 5. Conclusion

China has moved from being the biggest F.D.I. recipient, to one of the biggest F.D.I. investors globally since 2000. The opening strategy supported by the Chinese government, the low level of labour costs and under-valued currency have made China not only the outstanding exporter, but also the biggest investor over recent years. Many countries have faced the effects of financial crisis and a lack of financial resources and E.U. countries are experiencing an especially difficult time.

The E.U., as a big and developed market, has always been interesting for Chinese businesses, first as an export market and recently as a market for Chinese investments. With E.U. enlargement, the new E.U. Member States have become interesting markets for Chinese investors, as this market has become China's gateway to the E.U. market as a whole. The W.B. countries represent a growing area of interest for Chinese investors, due to their increasing integration perspectives towards the E.U.

Analysing the impact of F.D.I. inflows on the bilateral exports of the selected countries, the results from gravity model analysis show that F.D.I. inflows from China as well as from the rest of the world significantly increase the bilateral exports of both new E.U. member countries and W.B. countries, confirming our first hypothesis. Our second hypothesis is also confirmed since we identified a different magnitude of F.D.I. impact on the bilateral exports in the case of new E.U. member countries and W.B. countries. These results lead us to conclude that the market of new E.U. countries is more attractive for Chinese investment than the export markets of W.B. countries.

Economic theory suggests the following explanation for these results. When China invests in one E.U. country it aims to supply the whole E.U. market, since the E.U. is a unified market. If newly established companies in the E.U., created by Chinese F.D.I., fulfil certain conditions, they can export to many markets, benefiting from the preferential treatment enabled by the E.U.'s Common Trade Policy. Based on a experience of new E.U. member countries, we can expect that W.B. countries will be more attractive to Chinese F.D.I. as they move closer to the E.U. membership. Currently, a very important stimulus for Chinese investment is the acquiring of technological knowledge from F.D.I. recipient companies in developed countries.

The majority of financial outflows from China still consists of state credits that are used for investments in other countries. These credits have become especially significant for C.E.E. countries after 2012, but these flows are not captured by our research and they should be taken into consideration in any future research.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## References

- Aizenman, J. (2015). The internationalization of the RMB, capital market openness, and financial reforms in China (BOFIT Discussion Papers 4). *Pacific Economic Review*, 20(3), 444–460.
- Amighini, A., Rabellotti, R., & Sanfilippo, M. (2013). China's outward F.D.I.: An industry-level analysis of host-country determinants. *Frontiers of Economics in China*, 8(3), 309–336.
- Anderson, J., & van Wincoop, E. (2003). Gravity with Gravitas: A Solution to the Border Puzzle. *American Economic Review*, 93(1), 170–192.
- Baier, S. L., & Bergstrand, J. H. (2007). Do free trade agreements actually increase members' international trade? *Journal of International Economics*, 71(1), 72–95.
- Baltagi, B., Egger, P., & Pfaffermayr, M. (2014). *Panel data gravity models of international trade* (CESifo working paper, No. 4616). CESifo Group Munich.
- Belka, M. (2012). *Changing world and the China-C.E.E. relations*. Warsaw: Speech in the Institute of World Economics and Politics at the Chinese Academy of Social Science.
- Bussière, M., Fidrmuc, J., & Schnatz, B. (2008). E.U. enlargement and trade integration: Lessons from a gravity model. *Review of Development Economics*, 12(3), 562–576.
- Clegg, J., & Hinrich, V. H. (2011). Inside the China-E.U. F.D.I. bond. *China and World Economy*, 19(4), 92–108.
- Dragutinović Mitrović, R., & Bjelić, P. (2013). *International competitiveness and asymmetry in trade regime in the E.U. integration: Evidence from Western Balkans* (pp. 55–70). Presented at the The Tenth International Conference, Challenges of Europe: The Quest for New Competitiveness Split, Croatia.
- Drelich-Skulska, B., Bobowski, S., Jankowiak, A., & Przemyslaw, S. (2014). China's trade policy towards Central and Eastern Europe in the 21st century, example of Poland. *Filia Oeconomica Stetinensia*, 14(11), 149–174.
- European Union Chamber of Commerce in China. (2013). *Business confidence survey 2013*. Beijing: Author.
- Fallon, T. (2014). China's pivot to Europe. *American Foreign Policy Interests*, 36, 175–182.
- Faruquee, H. (2004). *Measuring the trade effects of EMU* (IMF Working Paper, WP 07/154). Washington, DC.
- Fung, K. C., Korhonen, I., Li, K., & Ng, F. (2008). *China and Central and Eastern European countries: Regional Networks, Global Supply Chain, or International Competitors?* (World Bank Policy Research Working Paper, 4689). Washington, DC.
- Hanemann, T. (2014). Chinese direct investment in the E.U. and the U.S.: A comparative view. *Asia Europe Journal*, 12, 127–142.
- Hanemann, T., & Rosen, D. H. (2012). *China invests in Europe*. New York, NY: Rhodium Group and Brunswick.
- Jacoby, W. (2014). Different cases, different faces: Chinese investment in Central and Eastern Europe. *Asia Europe Journal*, 12, 199–214.
- Joia, R. M., Huidumac, C. E., & Tanase, I. (2011). China's geostrategic position-F.D.I. flows and stock analysis. *Hyperion International Journal of Econophysics and New Economy*, 4(1), 129–139.
- Liang, Y. (2008). Why are China's exports special?: The role of F.D.I., regional trade, and government policies. *Chinese Economy*, 41(6), 99–118.
- Matyas, L. (1997). Proper econometric specification of the gravity model. *The World Economy*, 20(3), 363–368.
- Ministry of Commerce of China. (2013). National Bureau of Statistics of China, State Administration of Foreign Exchange of China.
- MOFCOM. (2012). *Statistical bulletin of Chinas outward foreign direct investment*. Beijing: Ministry of Commerce of People's Republic of China, National Bureau of Statistics of People's Republic of China and Sate Administration of Foreign Exchange.

- Nicolas, F. (2014). China's direct investments in the European Union: Challenges and policy responses. *China Economic Journal*, 7(1), 101–125.
- Palonka, K. (2010). Economic and trade relations between Poland and China since 2004. *Asia Europe Journal*, 8, 369–378.
- Papazoglou, C., Pentecost, E. J., & Marques, H. (2006). A gravity model forecast of the potential trade effects of E.U. enlargement: Lessons from 2004 and Path-dependency in integration. *The World Economy*, 29, 1077–1089.
- Pencea, S., & Oehler-Sincai, I. M. (2014). Chinese outward direct investment in Central and Eastern European Countries. A Romanian perspective. *Romanian Economic and Business Review*, 9(2), 45–73.
- Scott, D. (2014). Trust, structures and track-2 dialogue in the E.U.-China relationship: Resetting and resettling a 'strategic partnership'? *Asia Europe Journal*, 12, 21–34.
- Serlenga, L., & Shin, Y. (2007). Gravity models of intra-E.U. trade: Application of the CCEPHT estimation in heterogeneous panels with unobserved common time-specific factors. *Journal of Applied Econometrics*, 22(2), 361–381.
- Shan, W., & Wang, L. (2015). The China-E.U. BIT and the emerging 'global BIT 2.0'. *ICSID Review*, 30(1), 260–267.
- Shixue, J. (2014). Chinese investment in the E.U. *Working Paper Series on European Studies, Chinese Academy of Social Science*, 8(1), 1–23.
- Silva, J. S., & Tenreyro, S. (2006). The log of gravity. *Review of Economics and Statistics*, 88(4), 641–658.
- Tenreyro, S. (2007). On the trade impact of nominal exchange rate volatility. *Journal of Development Economics*, 82(2), 485–508.
- Tianping, K. (2013, February). *Changing World and the China-C.E.E. relations*, Speech given to the Meeting Point in Embassy of Republic of Poland, Poland
- Westerlund, J., & Wilhelmsson, F. (2011). Estimating the gravity model without gravity using panel data. *Applied Economics*, 43(6), 641–649.
- Zhang, H., & Van Den Bulcke, D. (2014). China's direct investment in the European Union: A new regulatory challenge? *Asia Europe Journal*, 12, 159–177.
- Zuokui, L. (2014, March). *The Analysis of China's Investments in V4*. The paper presented to the conference on Current Trends and Perspectives in Development of China-V4 Trade and Investments, Bratislava, Slovakia.