FDI spillovers and firm productivity during crisis: Empirical evidence from transition economies

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Abstract

Most studies on foreign direct investment (FDI) are nested within periods of economic prosperity. Our study investigates the impact of FDI spillovers on productivity during the global financial crisis (2006–2014) and the accompanying credit shortage. A dynamic panel analysis of firm-level data from two neighbouring but distinct transition economies, Croatia and Slovenia, reveals that the impact of the crisis may go as far as halting the process of learning through spillovers if firms have difficulties in accessing external funds. The implications of the study may prove particularly beneficial to policy makers grappling with the economic crisis following the COVID-19 pandemic.

Keywords: FDI, knowledge spillovers, productivity, transition economies, economic crisis.
JEL: F23, D24, G01

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1. Introduction

Foreign direct investment (FDI) in transition economies (TEs) has increased significantly over the past three decades. In addition, FDI has gradually shifted towards the services sector, which now accounts for over two-thirds of world FDI, and 70% of FDI in TEs (UNCTAD, 2017). In advanced economies, FDI is viewed as a potential driver of change and development, and the view applies equally to TEs. Entering transition with outdated capital stock and inefficient production structures, these countries believed that FDI would facilitate the modernisation of their production technology and enhance the transfer of skills and expertise. While the evidence on the effects of FDI on firm entry, growth, and productivity in TEs is ambiguous (Stojcic and Orlic, 2020), it continues as a dominant catching-up strategy in these countries. This was particularly evident during the economic crisis of 2008–2009 and, more recently, in the context of the current crisis brought about by the COVID-19 pandemic.

This study aims to estimate the effects of FDI spillovers on the productivity of domestic firms in the manufacturing and services sectors of two TEs, Croatia and Slovenia, that constitute a particularly interesting case study. Sharing much of their 20th century history, these neighbouring countries ended the socialist system at the same time, with the expectation of being among the forerunners of transition (Lavigne, 1999). However, their paths diverged, with Slovenia joining the process of regional and European integrations earlier and more quickly than Croatia, which, three decades later, is reflected in their different economic performance (Stojcic et al., 2018). However, due to a somewhat conservative approach towards foreign investors in Slovenia, and the late engagement in economic integrations in Croatia, FDI inflows in both countries have been more modest than in other Central and East European (CEE) TEs. Empirical studies have analysed the effects of FDI in these countries within groups including other TEs (e.g. Stojcic and Orlic, 2020); however, individual country analyses that could reveal the distinct nature of country-level FDI effects have been rare and mostly limited to the early transition period and the manufacturing sector only.

Our study aims to analyse the effects of FDI spillovers on domestic firms' productivity in Croatia and Slovenia during the 2006–2014 period. These countries have been investigated to a less extent in the context of FDI spillovers than other economies. We analyse these effects in manufacturing and services, separately, as the nature of the knowledge and production process differs in the two sectors. Our main research question asks whether the financial crisis reversed the trend in the spillovers, and what the role was of access to bank finance by firms in this process. We hypothesise that a reversal might indeed have occurred, given the stringent bank policies and limited external funding that was available during and after the financial crisis. We argue that small and medium sized enterprises (SMEs) and those facing high competition could be in particular danger, as their revenues are more severely affected during macroeconomic downturns (OECD, 2020).

Therefore, the study contributes to the existing literature in at least three ways. First, the study focuses on less FDI-intensive countries, where the effects of foreign investment are less clear than in other TEs. Second, the study sheds more light on the differences between spillovers in manufacturing and services. While FDI spillovers in manufacturing have been investigated before (Javorcik, 2004; Resmini and Nicolini, 2007; Jordaan, 2008; Ferragina and Mazzota, 2014), only a few authors have investigated FDI spillovers in services (Gorodnichenko et al., 2014; Stojcic and Orlic, 2020). Third, the study addresses the impact of the global financial crisis on the spillover process. The (post-)financial crisis period is marked by two underlying forces—lower firm growth and lower access to external financing—which are quite different from the pre-crisis period. It is expected that the FDI spillover effects will be subject to these two forces. Understanding the pattern of FDI spillovers during the crisis has practical implications that stretch beyond the period under consideration in this study, and may prove particularly beneficial to policy makers at a time when the world is grappling with the economic crisis due to the COVID-19 pandemic.

The paper has six sections. Section 2 explores the theoretical framework and the empirical literature on the influence of FDI spillovers. Section 3 discusses the modelling strategy. Section 4 explains the empirical issues in the investigation of spillovers, while Section 5 presents the dataset and the results. Section 6 concludes.

2. Literature review

Multinational corporations (MNCs) have increasingly decentralised their activities abroad (Dunning and Lundan, 2008). They enter a foreign market equipped with often better knowledge of the technological process that compensates for the disadvantage of operating in a foreign market (Hymer, 1970; 1976). This knowledge can be transmitted to local firms in the form of technological spillovers. 'The spillovers occur when local firms benefit from the MNC affiliate's superior knowledge of product or process technology or markets, without incurring a cost that exhausts the whole gain from the improvement.' (Blomström and Kokko, 1997, p.12).

FDI affects domestic firms through horizontal and vertical spillovers. Horizontal spillovers apply to rival firms in the same industry, mostly through 'disciplinary' market access externalities (Hamida, 2013; Crescenzi et al., 2015), reverse engineering, labour mobility (Greenaway et al., 2004; Dasgupta, 2012), and 'competitive disciplinary effects' (Blomström et al., 2001; Haskel et al., 2007; Hamida, 2013). MNCs employ domestic workforce; some workers may move to domestic firms and take the foreign firm's knowledge with them. Knowledge can also be shared through pure interaction between employees of domestic and

foreign firms. However, the evidence on horizontal spillovers remains ambiguous and calls for further research. Foreign firms have also been found to harm the performance and learning ability of incumbents by seizing their market and poaching their talented employees (Lin and Kwan, 2016).

Vertical spillovers refer to backward and forward linkages between foreign firms and their respective suppliers and customers. To qualify as eligible suppliers to foreign firms, domestic firms must improve production technology and meet new quality standards (Newman et al., 2015). Evidence suggests that foreign firms have the motive to facilitate backward spillovers by offering training and guidance to local suppliers, particularly if their home country is not in geographical proximity (Blalock and Gertler, 2008; Javorcik and Spatareanu, 2011). Forward spillovers take place through the supply of better-quality inputs and services to their local customers. Evidence has been found of both positive (Stojcic and Orlic, 2020) and negative (Gorodnichenko et al., 2014) forward spillovers on domestic firms. The latter seem to be present when the technological gap between foreign and domestic firms is too wide, or when foreign suppliers use their supremacy in local supply markets to increase the costs of inputs to downstream sectors.

In the context of TEs, FDI horizontal spillovers have been shown to be mostly insignificant (Javorcik, 2004; Halpern and Muraközy, 2007; Kosová, 2010; Javorcik and Spatareanu, 2011) or negative (Konings, 2001; Sabirianova et al., 2005; Kokko and Kravtsova, 2012; Damijan et al., 2013). Vertical spillovers in TEs are mostly positive through backward linkages (Javorcik, 2004; Halpern and Maraközy, 2007; Nicolini and Resmini, 2010; Du et al., 2011; Gorodnichenko et al., 2014) and insignificant or negative through forward linkage (Javorcik, 2004; Barrios et al., 2006; Javorcik and Spatareanu, 2011; Damijan et al., 2013). An exception is a study by Stojcic and Orlic (2020) that considers the spatial dimension of FDI spillovers and finds positive forward and negative horizontal spillover effects in CEE countries at regional level.

While informative in many ways, none of the above studies analyses the phenomenon of FDI during the global financial crisis, which was marked by sluggish growth and stringent bank lending. The latter made it more difficult for firms to obtain external financing that was necessary to fund the absorption of technological spillovers. Studies on the implications of external financing for spillover effects have been rare and fairly recent (Agarwal et al., 2014; Eapen et al., 2019); furthermore, these have related to the manufacturing sector in China. They point out that absorptive capacity, which drives spillovers in TEs, is contingent on firms' finances in two ways. First, firms need substantial financial resources (this was true even in the pre-crisis period) to upgrade their technology, which incurs high fixed costs. Even if firms adopt new technology without external financing, their market position may be inferior to that of those rival firms that have been supported financially by credit institutions. Second, lending inefficiencies have a negative effect on spillovers.

Not all firms are equally dependent on external sources of financing, nor do the banks have the same lending standards for all firms. Banks are generally less willing to finance smaller firms because they have smaller collateral to offer and less internal resources to repay the debt (Beck and Demirguc-Kunt, 2006; De and Nagaraj, 2014). In contrast, larger firms rely more on their internal resources than on bank loans. Likewise, Schumpeter's (1942) and Cohen and Levin's

(1989) theories[1] suggest that firms in competitive industries may have financial resources to fight off competition, and to induce technological improvement via spillovers. This is a less likely scenario for firms that share markets with relatively few competitors. To date, studies have not shown how FDI spillovers vary across different levels of firm indebtedness. The present study responds to this shortcoming and investigates the spillover effects at different levels of leverage in Croatia and Slovenia. In addition, it investigates whether access to finance was the reason that small size firms and firms facing high competition benefited less from spillovers.

Finally, this study highlights the importance of spillovers in the services sector, where empirical evidence is extremely scarce (Gorodnichenko et al., 2014). One study suggests that the level of knowledge spillover is relatively lower among firms in the services industry, as it is harder to detect new knowledge (Toivonen and Touminen, 2009) due to the more tacit nature of knowledge in the industry. Manufacturing is characterised by tangible outputs that are easily observable anywhere; this is not true for services, where production and consumption occur simultaneously, and only observers close to the process (such as the users) can acquire the relevant knowledge. In addition, Schmidt (2015) finds that collaboration is extremely rare in knowledge-intensive services. This is because there is a high incidence of mentorship, rivalry, competition, and immersion prevailing in some service industries (Ibert and Muller, 2015). This leads to better protection from knowledge leakage. In addition, knowledge in services is characterised by actions, practices, and decisions (Ibert, 2007); it is thus valid to assume that it is more difficult to copy such knowledge than that in manufacturing, which has a more tangible form (i.e. blueprints, text, product). Hence, we expect that there will be less horizontal spillovers from FDI in the services sector.

To test the above hypothesis, we develop a comprehensive empirical strategy that comprises three steps. First, using a panel data approach, we show how FDI spillovers affect the productivity of firms in manufacturing and services in Croatia and Slovenia, separately. Second, using two-way interactions, we investigate how horizontal spillovers vary over time. We find that the financial crisis hampered learning through spillovers. Third, using three-way interactions, we explore whether access to finance prevented firms from absorbing spillovers during and after the crisis. The results show that small size firms in Slovenia and firms facing high competition in Croatia suffered the negative effects of horizontal spillovers due to lower access to finance.

3. Modelling strategy

The most common methods of estimating FDI spillovers are cross-sectional (Javorcik, 2004; Haskel et al., 2007) and static panel models (Sinani and Meyer, 2004; Smeets and de Vaal, 2015). Dynamic panel techniques have rarely been utilised (Damijan et al., 2013; Orlic et al., 2018). Panel techniques are better suited to account for the fact that spillovers take time to diffuse through the economy. This study applies a dynamic panel method—the system general method of moments (GMM) (Arellano and Bover, 1995; Blundell and Bond, 2000)—to a firm-level dataset derived from Bureau van Dijk's Amadeus databases for Croatia and Slovenia to explore the impact of spillovers on the productivity of domestic firms.

Amadeus is one of the most comprehensive pan-European, firm-level datasets commonly used in FDI-related studies (Altomonte and Colantone, 2008; Javorcik and Spatarenau, 2008;

[1] These theories trigger innovative activities and their dependence on industry competition; however, the concept of competition and available resources can still apply to FDI spillover knowledge absorption in general.

Monastiriotis and Jordaan, 2010; Monastiriotis and Alegria, 2011; Merlevede and Purice, 2016; Stojcic and Orlic, 2020). The quality and representativeness of the dataset have been addressed by several studies (Merlevede et al., 2015; Kalemli-Ozcan et al., 2015; Stojcic and Orlic, 2020). The general message from these studies is that Amadeus covers fewer firms than official statistics, due to underrepresentation of smaller firms. It is prone to missing values in variables such as material costs, tangible assets, or employment and revenue. However, all the studies agree that Amadeus follows firm size and sectoral distributions (between manufacturing and services) in output and employment closely in the overall sample and the reduced sample used to calculate TFP. Comparisons between the Amadeus and official statistical sources (e.g. Eurostat) in terms of value added and employment shares have shown high correlation at national and regional levels.

The system GMM model that was applied separately to manufacturing and services has the following form:

$$TFP_{ijrt} = TFP_{ijrt-1} + \alpha_1 horizontal_{jt} + \alpha_2 backward_{jt} + \alpha_3 forward_{jt} + \beta HHI_{jt} + \gamma X_{ijrt} + Industry_j + Region_r + Year_t + \varepsilon_{ijrt} \quad (1)$$

TFP_{ijrt} refers to total factor productivity of firm *i* in industry *j* in region *r,* at time *t; $horizontal_{jt}$*, *$backward_{jt}$*, and *$forward_{jt}$* refer to the three types of spillovers described earlier; *HHI_{jt}* refers to the Hirschman-Herfindahl index, the degree of concentration (competition) in each industry; *X_{ijrt}* refers to a vector of control variables, while γ is the vector of their corresponding parameters; *Industry*, *Region*, and *Year* refer to a set of dummy variables, denoting the 2-digit industry of each firm and the region in which each firm is located;[2] ε_{ijrt} is the error term, which is assumed to be normally distributed with zero mean.

For a further investigation of FDI spillovers, the baseline model in Equation (1) is augmented by the interactions of spillovers and other variables, such as access to external sources of funds and year dummies which, respectively, reflect the dependence of spillovers on external funds and their variability over the studied period.

TFP estimation

The outcome variable, TFP, measures how efficiently input factors (i.e. capital, labour, and material) are combined to produce a firm's output (Barnett et al., 2014). TFP is estimated as the residual of the Cobb-Douglas production function after the effect of explicit inputs are accounted for. However, the productivity estimation is impeded by the endogeneity issue caused by the fact that decisions on input are made based on the productivity shock observed only by a firm (which is why it is part of the error term).[3] Specifically, a firm makes decisions on employment based on its productivity. This causes simultaneity bias, and is circumvented through Wooldridge's (2009) one-step GMM estimators, a technique superior to some earlier approaches estimated in two stages, e.g. OP by Olley and Pakes (1996), LP by Levinsohn and Petrin (2003) and Ackerberg et al. (2006). Wooldridge (2009) describes the two-step estimators as inefficient because they ignore contemporaneous correlation in the error terms across the two stages, as well as heteroskedasticity and serial correlation, which are not adequately

[2] Regional controls (*$Region_r$*) proxy for the main regions of Croatia (Slavonia - region1, Zagreb - region2, Kvarner - region3, Istra – region4 and Dalmatia – region5) and Slovenia (region1 – East, region2 – West).
[3] For details of productivity estimation, see the Appendix (page 1-5).

addressed, with bootstrapped standard errors used both under OP and LP. We propose a one-step GMM estimator, which estimates capital and labour simultaneously with robust standard errors. Wooldridge's (2009) approach has the additional advantage of the Sargan-Hansen test for the validity of instruments.

Productivity is estimated separately for each two-digit industry to account for industry homogeneity in production technology, prices, and other industry specific factors in the estimate on inputs. Furthermore, following Gal's (2013) suggestion, the estimation is limited to those industries with at least fifty firms. Where this condition was not met, industries were merged with others serving similar markets, with demand for similar technological competencies. The TFP descriptive statistics (in logarithmic form) for foreign and domestic firms in the sample are presented in Table 3A in the Appendix (page 5). Foreign firms are substantially more productive than domestic firms in both countries and in both sectors. Foreign and domestic firms in Slovenia are, on average, more productive than their counterparts in Croatia. Interestingly, in both countries, service firms are less productive than manufacturing firms (for both foreign and domestic firms).

Construction of FDI spillovers

The variables $horizontal_{jt}$, $backward_{jt}$, and $forward_{jt}$ refer to the main variables of interest—horizontal, backward, and forward spillovers, respectively, in industry j and year t. Horizontal spillovers in each 3-digit industry are measured by the weighted share of employees in foreign firms in total industry employment, capturing the knowledge spillover effect transmitted through labour mobility:

$$Horizontal_{jt} = \frac{\sum_{i\ for\ all\ i \in j} Foreign\ share_{ijt} * Y_{ijt}}{\sum_{i\ \ for\ all\ i \in j} Y_{ijt}} \quad (2)$$

where Y represents employment in firm i in industry j. A foreign firm is defined as one with at least 10% of foreign equity, which is consistent with most relevant literature on FDI spillovers (Javorcik, 2004; Nicolini and Resmini, 2010; Monastiriotis, 2014). Different studies use different measures of Y in Equation 2: sales (Abraham et al., 2010; Javorcik and Spatareanu, 2011; Du et al., 2011), employment (Kosová, 2010; Nicolini and Resmini, 2010; Crespo et al., 2012), and equity (Javorcik, 2004; Gorodnichenko et al., 2014; Kokko and Kravtsova, 2012). Using employment for Y captures the knowledge spillover effect that is transmitted through labour mobility. On the other hand, using sales in Equation (2) captures the knowledge spillovers that are transmitted through a foreign firm's products and services. Hence, our choice of spillovers reflects the first mechanism.

However, this approach has limitations. The measure fails to consider knowledge intensive activities of foreign firms (i.e. foreign firms' innovation sales or mobility of skilled and educated workforce). The measure in this research accounts for the mobility of all incumbent workers that can contribute to a firm's stock of knowledge, rather than only educated employees. Another study has shown that the latter measure can better proxy for learning between firms (Todo and Miyamoto, 2006). This is, however, a common limitation in this research area that has thus far not been addressed.[4]

Vertical FDI spillovers are calculated as follows:

[4] The results with the alternative calculation of horizontal spillovers (using sales instead of employment) are available upon request.

$$Backward_{jt} = \sum_{k\ if\ k \neq j} \alpha_{jkt} * Horizontal_{kt} \quad (3)$$
$$Forward_{jt} = \sum_{k\ if\ k \neq j} \alpha_{kjt} * Horizontal_{kt} \quad (4)$$

where α_{jkt} represents the proportion of industry *j*'s output supplied to industry *k* in year *t*, while α_{kjt} is the proportion of inputs of industry *j* purchased from industry *k*. The industry-specific parameters α_{jkt} and α_{kjt} are obtained from Input-Output tables and reflect the customers-supplier relationship prevailing between all industries. Unlike horizontal spillovers, vertical spillovers are clustered at a higher level of aggregation for Croatia than for Slovenia.[5]

Control variables

The control variables included in Model (1) are the Hirschman Herfindahl index, HHI_{jt}, and various firm-level characteristics (X_{ijrt}). Firms in competitive markets are more inclined to cooperate with their supply chain to lower production costs (Fynes et al., 2005). Yet, monopolistic firms might have[6] more funds to invest in R&D, as suggested by Schumpeterian theory, due to lower market uncertainty and more secure cash flow (Heirati et al., 2016). The HHI is calculated for each 3-digit industry. Other variables used in the model are absorptive capacity, firm size, age, and leverage. These variables are briefly discussed below.

Absorptive Capacity. The absorptive capacity, or the ability to absorb external knowledge, is controlled for by two measures: the average wage and the intangible assets ratio of a firm. The former is a crude proxy for the quality of human capital, a rough measure of employees' educational and skill levels, which facilitate learning and innovation, both important for productivity (Backman, 2014).[7] Of course, it is not a direct measure of the level of education of employees.[8] The intuition is that the higher the average salary, the greater the average education and skills of employees. The intangible asset ratio corresponds to a firm's investment in non-physical assets, such as technology, human resources (i.e. training), organisation (e.g. new working methods), and marketing (e.g. goodwill and brands) (OECD, 1998).

Size and *Age.* Large firms enjoy economies of scale, have more intangible assets, and can therefore be more productive (Kokko and Kravtsova, 2012). This is supported empirically by Resmini and Nicolini (2007), Lasagni et al. (2015), and Smeets and De Val (2016). On the other hand, small size firms have more flexible management structures and can be more productive. Firms are not expected to perform the same over their life cycle. Firms may enjoy better performance with experience (Acemoglu et al., 2007), but may also have sluggish productivity performance due to inertia. Firm size is proxied by the logarithm of a firm's assets, and firm age by the logarithm of years since establishment.

[5] Because IO tables are not disaggregated sufficiently for Croatia.

[6] The Hirshman-Herfindahl index is calculated as $\sum_i^k s^2$, the sum of the squared shares (*s)* of firms' sales in total industry sales, aggregated at 3-digit NACE industry level *k*.

[7] The two measures are also not correlated. The correlation coefficients for the two variables in manufacturing and services are 0.08 and 0.10, respectively, in Croatia, and 0.13 and 0.24, respectively, in Slovenia.

[8] There are superior measures of human capital used by other authors (Huergo, 2006; Girma et al., 2008; Ayyagarri, 2011; Gorodnichenko, 2010; Ning et al., 2016), such as educational level and experience of the workforce, share of skilled workers and workers with university degree, employee training expenditure, the ratio of residents with secondary education divided by the total urban population, etc. However, the Amadeus dataset does not contain information that would allow construction of such variables.

Leverage. Productivity also depends on a firm's ability to raise finance for its activities. Firms can finance their short and long-term activities using internal and/or external sources of financing (banks and micro-credit institutions) (Gabrijelcic et al., 2016). A firm's leverage ratio (debt to total assets or total liabilities to total assets), which indicates its financial position, can positively influence its productivity (Huynh and Petrunia, 2010). However, an extremely high leverage ratio could hamper a firm's productivity (Coricelli et al., 2012); this implies a non-linear relation between productivity and leverage. Firms may be exposed to financial constraints, especially after a credit boom (Aghion et al., 2010), such as a shortage of external funds, which may threaten their operations. Therefore, it is important to investigate the effect of this variable in the post-crisis period, as research on the issue is limited. We measure a firm's leverage by the logarithm of the ratio of total liabilities to total assets. To account for a possible non-linear relationship, we also include the squared value of leverage in the estimation.

The model also contains the dummy variable, $Year_t$, to control for macroeconomic (policy) shocks and the onset of the financial crisis. The industry dummy $Industry_j$ is added to control for the technological sophistication of production (in manufacturing, whether the firm belongs to high-tech, medium-high, medium-low, or low-tech industries, and, in services, whether it belongs to high-knowledge intensive or less-knowledge intensive industries, classified based on the Eurostat classification). The variable $Region_r$ indicates a firm's location in different NUTS3 regions in Slovenia and Croatia, to control for regional diversities in respect of their institutional quality, infrastructure, regional development, and other location-specific factors in productivity and the level of FDI contemporaneously (Newman et al., 2015). The precise definitions of all the variables (apart from industry, time, and regional dummies) and their descriptive statistics for the two sectors and two countries are presented in Tables 4A and 5A in the Appendix (pages 5 and 6).

Econometric strategy

Several econometric concerns may arise when investigating FDI spillovers. First is the issue of endogeneity. Foreign firms may target highly productive industries to derive benefits from local firms' knowledge spillovers, or less productive ones to gain comparative advantage over other firms. The former reverse causality would lead to overestimation, while the latter would lead to underestimation of FDI spillovers. In line with several related studies (Haskel et al., 2007; Barbosa and Eiriz, 2009; Stojcic and Orlic, 2020), we use lagged values of FDI spillovers, as they are predetermined with respect to contemporaneous firm productivity, thereby also accounting for the fact that spillovers take time to filter through the economy.

The second issue is sample selection bias. The entry of foreign firms increases competition in an industry, which may lead to some domestic firms leaving the market or shutting down (Jovanovic, 1982; Kosová, 2010). To fight foreign competition better, some firms may merge. The more efficient firms, with superior characteristics, remain in the market. In addition, new firms may enter the market due to the lower barriers to entry that result from increased foreign competition. These market changes can cause selection bias, as a particular group of firms dominates the sample—the most profitable firms, in the case of mergers and bankruptcies (exit), or firm-starters, in the case of new business entry. Furthermore, the decision to leave (or stay) in the market is endogenously determined, depending on productivity. A firm equipped with better capital will stay in the market (survive) when the productivity shock is negative. Similarly, when the productivity shock is positive, new firms with a low capital stock will enter the market. The spillover effects may be biased when the sample is dominated by certain groups of firms.

Studying the final samples of firms in Croatia and Slovenia reveals that the selection bias due to firms' entries/mergers[9] seems to be negligible. During the period under consideration, the final sample of domestic firms comprised only 125 (198) manufacturing (service) firm entrants/mergers in Croatia and 97 (80) manufacturing (service) firms in Slovenia. However, it is harder to detect the number of firms that exited the market. This is because firms with missing observations during the sample period cannot be labelled as firms that went bankrupt.

The attrition of the sample by the possible departure of less efficient firms due to the entry of foreign firms may also cause a degree of sample selection bias. This is rarely addressed in the empirical literature (with the exception of Kosová, 2010, who studied the influence of FDI spillovers on firm's survival and growth, which directly considered this issue). The model estimated in this study cannot address this issue, due to the absence of data on firms that exit the market. Therefore, this caveat should be kept in mind when interpreting results.

4. Results

Table 1 presents the main results from the estimation of Equation (1) and the model diagnostics for the two sectors in Croatia and Slovenia. The first and second lags of TFP were used in most of the estimations (to deal with strong persistence in the data and autocorrelation), apart from the specification for services in Slovenia, where only the first lag was used. The predetermined lagged dependent variable is treated as endogenous. The Sargan-Hansen test for over-identifying restrictions fails to reject the null hypothesis of the validity of the instruments. The difference-in-Hansen test for the levels equation suggests that the instruments in the levels are valid and Roodman's (2009) assumption of steady state is confirmed: the lagged TFP is uncorrelated with the current unexplained change in TFP. Hence, the system GMM is preferred to the difference GMM. There is first order autocorrelation in the differenced error term, but no second order serial correlation, pointing to the validity of the instruments.

Having interpreted these effects based on the baseline model presented in Table 1, the dependence of the spillovers (particularly the horizontal spillovers) on the financial crisis and external source of financing are investigated further by introducing two- and three-way interactions in the model. The two-way interactions involve the horizontal spillovers and year dummies, which may reveal the variation of the effects of the spillovers over the sample period. The three-way interactions involve the FDI spillovers on the one hand, and firm size and indebtedness on the other. The margins plots of these interactions are presented in the text.

Table 1 System GMM estimation of the baseline model[10]

	MANUFACTURING		SERVICE	
	CROATIA	**SLOVENIA**	**CROATIA**	**SLOVENIA**
TFP				
L.TFP	0.412***	0.711***	0.934***	0.589***
	(0.0359)	(0.0394)	(0.200)	(0.0497)
L2.TFP	0.148***	0.0604*	0.00638	
	(0.0251)	(0.0334)	(0.170)	

[9] When two firms merge, their identification numbers are deleted and a new identification number is created (Kejzar, 2016). This logic helped in detecting the potential number of new firm entries/exits.
[10] For the sensitivity check, please see the Appendix, pages 11-12.

Horizontal spillover	0.151***	-0.0340	-0.0910***	-0.131***
	(0.0491)	(0.0320)	(0.0351)	(0.0416)
Backward spillover	-0.470*	0.392***	-1.072**	1.370***
	(0.243)	(0.117)	(0.462)	(0.354)
Forward spillover	-0.548	0.0595	1.586**	1.064***
	(0.364)	(0.147)	(0.673)	(0.253)
Industry concentration	-0.0488	0.0936**	0.0166	0.0110
	(0.0475)	(0.0447)	(0.0239)	(0.0546)
Human capital	0.479***	0.321***	0.214***	0.425***
	(0.0402)	(0.0433)	(0.0332)	(0.0397)
Intangible assets ratio	0.00566***	0.00324**	0.000921	0.00421***
	(0.00152)	(0.00135)	(0.00105)	(0.00129)
Age	-0.0448***	-0.0257***	-0.0308	-0.0620***
	(0.00888)	(0.00748)	(0.0190)	(0.00884)
size	0.0905***	0.0653***	-0.00208	0.0886***
	(0.0136)	(0.0166)	(0.0157)	(0.0119)
Leverage	-0.112***	-0.0153	0.00107	0.0503**
	(0.0204)	(0.0263)	(0.0175)	(0.0205)
Leverage^squared	-0.0353***	-0.0155*	0.00212	-0.00588
	(0.00633)	(0.00834)	(0.00517)	(0.00634)
DIAGNOSTICS				
First order autocorrelation	2.57e-42	3.62e-27	0.00225	2.39e-25
Second order autocorrelation	0.840	0.147	0.463	0.739
Sargan-Hansen test	0.787	0.576	0.216	0.398
Number of observations	12339	8256	20852	12313
Number of groups-firms	2226	1548	3803	2170
Number of instruments	62	34	30	55

Note: The full table of results, which includes the constant term and industry, year and regional dummies is available upon request.

a) FDI horizontal spillovers

Croatian manufacturing firms benefit from foreign rivals' horizontal knowledge spillovers, while the Slovenian firms are unaffected by this type of spillovers. These results are consistent with the findings of Damijan et al. (2013), who studied FDI spillovers in Croatia (for the 1995–2005 period) and Slovenia (for the 1995–2003 period), including eight other TEs. The insignificant results for Slovenia are also consistent with most research on manufacturing in TEs, which reports either insignificant effects (Halpern and Maraköz, 2007; Kosová, 2010; Javorcik and Spatareanu, 2011) or negative horizontal spillover effects (Kokko and Kravtsova, 2012; Sabirianova et al., 2005; Damijan et al., 2013; Stojcic and Orlic, 2020). Unlike manufacturing, service firms experience negative and significant FDI horizontal spillovers in both countries. As in manufacturing, the economic significance of this change is not high. The reason behind the negative effects may suggest that it is much more difficult to detect the change and novelties in services than in manufacturing. This is because, as mentioned earlier, services are characterised by less tangible knowledge that can be better protected from leakage (Ibert, 2007; Ibert and Muller, 2015).

b) FDI backward spillovers

Regarding learning through the customer-supplier linkage, the effects are diverse, both in the two countries and in the two sectors. Learning from foreign customers (backward linkage) is country specific. Irrespective of sector, domestic suppliers in Croatia suffer negative productivity effects from FDI in downstream sectors, while suppliers in Slovenia benefit from these spillovers. The economic impact of these linkages is high. If backward spillovers increase by 1 percentage point, the productivity of Croatian domestic firms in upstream manufacturing and services sectors decreases by roughly 0.5% and 1.1%, respectively. On the contrary, the same change in Slovenia will lead to an increase in the productivity of Slovenian upstream manufacturing and service sector firms by approximately 0.4% and 1.4%, respectively. The results reveal that suppliers in both countries are sensitive to changes in foreign presence in downstream sectors. This is expected, in particular, for services in which collaboration with customers is critical (Wang et al., 2016).

c) FDI forward spillovers

Unlike backward spillovers, which display country heterogeneity, forward spillovers show sectoral heterogeneity. They are positive in services but insignificant in manufacturing, in both countries. The insignificant effect in manufacturing is consistent with most research on TEs. Manufacturing firms may not be able to absorb the knowledge embodied in better quality inputs supplied by foreign firms to improve their production processes. Furthermore, foreign suppliers may need extended time to acquaint themselves with the tastes and preferences of local manufacturing customers, to allow for knowledge transmission. In contrast to manufacturing firms, firms in services experience statistically significant and positive forward spillovers in both countries. As explained earlier, such impact is logical, considering the measure of vertical spillovers, which accounts for the combined effects of inter-industry learning in the entire economy.

The difference in the results between the two sectors could reflect the nature of the production processes. Services are characterised by the simultaneity of production and consumption and, unlike in manufacturing, customers in services directly participate in the production process, which facilitates knowledge spillovers (Kloosterman, 2008; Bishop, 2009). The literature has recognized that cooperation with clients enables service providers to produce services that are most suitable for their customers (Li and Guisinger, 1992; Matthing et al., 2004). This is less likely to occur in manufacturing, where there is a clear division between the production process and the consumption of the produced goods.

d) Control variables

The control variables reveal heterogeneous country- and sector-specific effects. Industry competition has, in most cases, an insignificant effect, which supports one strand of the literature (Vahter, 2011; Keller and Yeaple, 2009) which, patently, is based on manufacturing. The quality of human capital positively affects productivity in both sectors and countries, supporting the vast empirical evidence for the relation (Backman, 2014; Gorodnichenko et al., 2014; Seyoum et al., 2015; Baltagi et al., 2016). The more direct measure of absorptive capacity—the intangible assets ratio—has a positive and significant impact in manufacturing in both countries, and in services in Slovenia. Younger firms are more productive in manufacturing in Croatia and in both sectors in Slovenia, possibly because they have better technology. Large size firms display higher productivity, consistent with most of the literature

(De and Nagaraj, 2014; Lasagni et al., 2015; Smeets and De Vaal, 2016), with the exception of insignificant effects in the Croatian service sector.

A greater focus is given to the interpretation of the effects of variable *leverage* because we examine the financial crisis period, when firms faced lower liquidity and had lower access to external financing. The effects on productivity and spillovers have not yet been well explored. The impact of leverage, which is included in the model in quadratic form, is demonstrated using margins plots presented in Figures 1A and 1B in the Appendix (page 6). For the manufacturing sector in both countries, the impact of leverage on productivity is positive at lower levels of leverage. However, while in Croatia we observe negative effects at higher levels of leverage, the effect in Slovenia is insignificant at high levels. The figures suggest that the effect converges to zero for Slovenia, whereas we clearly observe a decline in Croatia, the negative effect increasing in absolute terms. During the sample period, Croatia experienced a financial crisis, decreased exports, and faced a financial squeeze, while a new business cycle did not begin until 2013. Using bank data on Croatia, Broz and Ridzak (2017) found that, during crises and recessions, banks rolled over loans to borrowers that struggled to pay off their debt, to keep them solvent and to avoid declaring the loans non-performing. This is so-called 'zombie' lending. Evidence shows that recipient firms of such loans experience productivity drag (Caballero et al., 2008). Therefore, this practice may justify the negative effect of leverage, at its higher levels, in manufacturing in Croatia.

Leverage has an insignificant effect across all distributional levels for services in Croatia, suggesting that firms' external sources of financing have no effect on productivity. Conceivably, these firms did not use their external resources appropriately to enhance productivity. It is also possible that these firms were subject to the credit constraints that marked the period under the study. It is argued that bank constraints hinder growth (Aghion et al., 2010) as they prevent firms from financing their investment activities and working capital. In the service sector in Slovenia, however, firms' indebtedness has a positive and significant impact on productivity across all levels of indebtedness. As in manufacturing, the impact declines slowly, although, from the confidence intervals, we may conclude that the marginal effects are not statistically different from each other. The positive effect of *leverage* is also found in CEE countries (Coricelli et al., 2012), Canada (Huynh and Petrunia, 2010), and the Baltic countries (Avarmaa et al., 2013). Hence, one can infer that external sources of financing were used for productivity-enhancing activities in this sector in Slovenia.

5. Extension of the baseline model

We must note that the impact of spillovers may be different at different levels of some other variables or at different times. This can be tested by considering the interaction of the horizontal variables with other variables. The overall impact can be demonstrated by a margins plot or marginal effect table. The baseline model of Equation 1 is augmented to explore several factors that may moderate the impact of spillovers on firm productivity through horizontal linkage. [11] These take the form of two- or three-way interactions.[12]

First, we interact horizontal spillovers with variables that can influence knowledge transmission during the financial crisis. We first present the estimation results for the interaction with year dummies. The margins plots for these interactions are presented in Figures

[11] Interactions with vertical spillovers lead to interesting results; however, for the sake of brevity, they are not presented.

[12] The regression results for these interactions are presented in the Appendix, Tables 6.A-8.A.

1a and 1b for the manufacturing sector, and Figures 2a and 2b for the service sector, in the two countries. These plots show that horizontal spillovers in manufacturing in Croatia have a diminishing positive and significant effect from 2009 onwards and turn insignificant in 2013 and 2014. The downward trend of horizontal spillover effects matches the period of the financial crisis, during which Croatia experienced negative GDP growth in both goods and services (Croatian Bureau of Statistics, 2017).

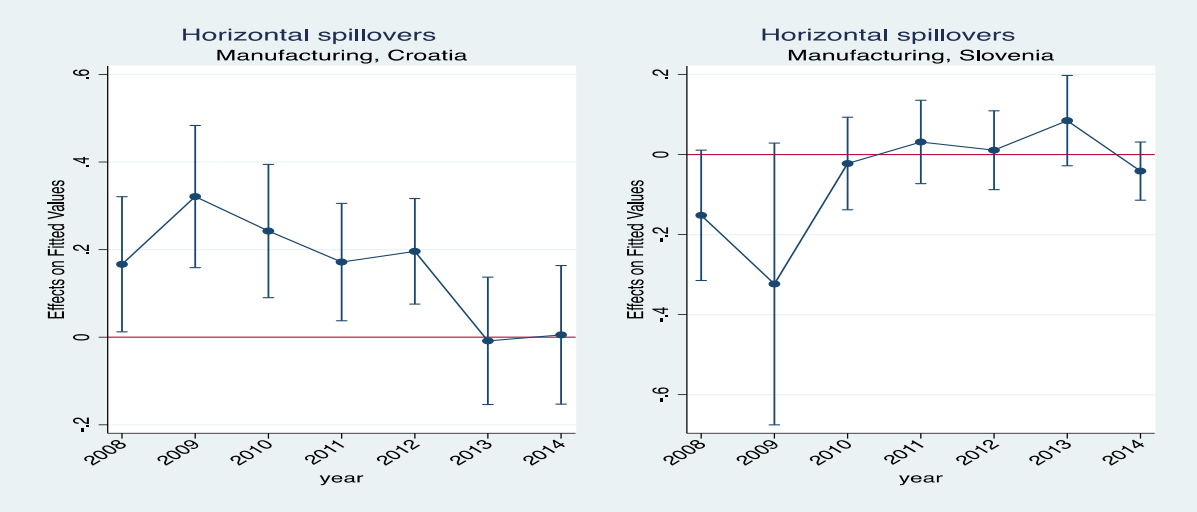

Figure 1a Croatia, manufacturing: FDI horizontal spillovers during 2008-2014 period (average marginal effects, with 90% CI)

Figure 1b Slovenia, manufacturing: FDI horizontal spillovers during 2008-2014 period (average marginal effects, with 90% CI)

Note: Values above (below) the red line represents positive (negative) and significant marginal effects.

In contrast, horizontal spillovers in manufacturing in Slovenia are insignificant throughout the period. A drastic decline in horizontal spillovers (albeit of borderline statistical significance) occurs in 2009 in Slovenia, during which the economy experienced a sharp decline in GDP (-7.8%) and in manufacturing output (-19.1%) (Statistical Office of Slovenia, 2018), marking the beginning of the financial crisis.

Figures 2a and 2b show, in Croatia, a negative trend from 2008 onward, and significant negative effects in 2012 and 2013. In Slovenia, the spillovers were more volatile, with a significant negative effect only in 2012, the year in which Slovenia experienced a fall in GDP growth (from 2.7% in 2012 to 1.1% in 2013).

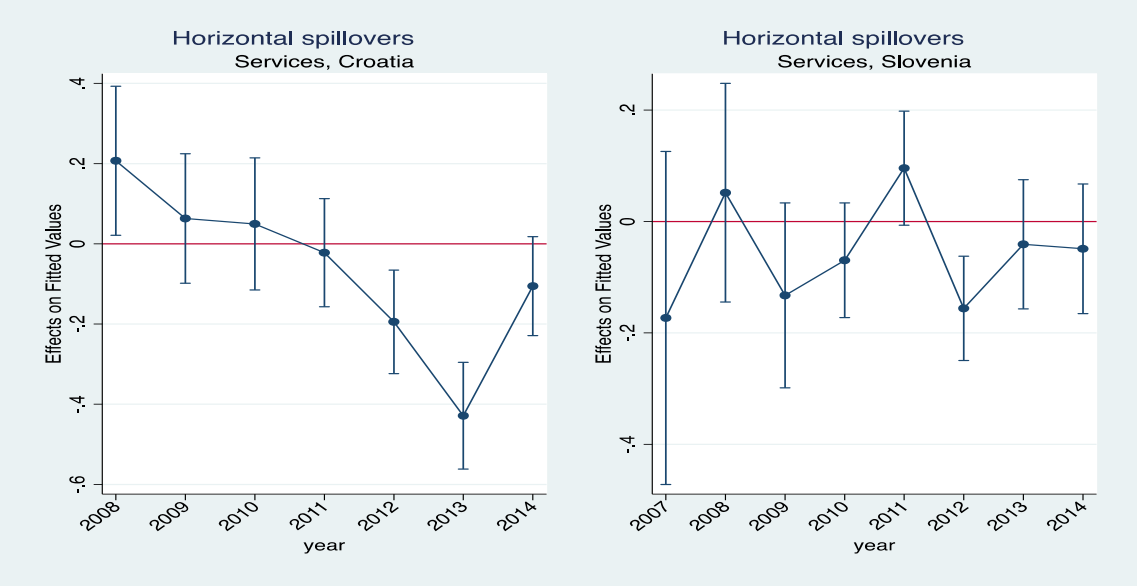

Figure 2a Horizontal spillovers in services in Croatia, 2008-2014 (average marginal effects, 90% CI)

Figure 2b Horizontal spillovers in services Slovenia, 2007-2014 (average marginal effects, 90% CI)

Note: Point estimate of the effect above (below) the red line represents positive (negative) marginal effects. The effect is insignificant if the zero line is within the confidence interval.

Considering the sensitivity of the results to the period of the financial crisis, we explore whether the availability of external sources of financing, largely restricted during and after the financial crisis, affected spillovers. Since the main source of funds for innovation and technology improvements in these countries remain bank loans (EBRD, 2018), we investigate how access to external sources of financing may affect horizontal spillovers in particular. Given that access to external sources of financing is different for firms of different size and for firms facing different levels of competition, horizontal spillovers are interacted with leverage (*leverage*) and industry concentration index (*HH*) on the one hand, and with firm size (*size*) on the other.

When interacted, the variables need to be demeaned,[13] as suggested by Aiken and West (1991), to avoid '*collinearity that can lead to numerical instability of the estimated and inflated standard errors'* (Mitchell, 2012; p. 158). Access to finance seems to influence the absorption of foreign firms' knowledge via the competition channel in Croatia, and via the firm size channel in Slovenia.[14] Figures (3) for manufacturing and (4) for services show the average marginal effects of horizontal spillovers across varying levels of industry concentration (*HH* index) and leverage levels (the blue line denotes low leverage, the red line denotes medium leverage, and the green line denotes high leverage) chosen at consecutive intervals, ranging from minimum to maximum. The intervals were chosen to ensure that a sufficient number of firms had these variables' values.

[13] Subtracting a sample mean from observations.

[14] Only the significant effects derived from the models that pass the diagnostics tests are presented here. We augmented the baseline model in Equation (1) with the same set of interactions; however, only the interactions that included industry competition in Croatia and firm size in Slovenia yielded significant results.

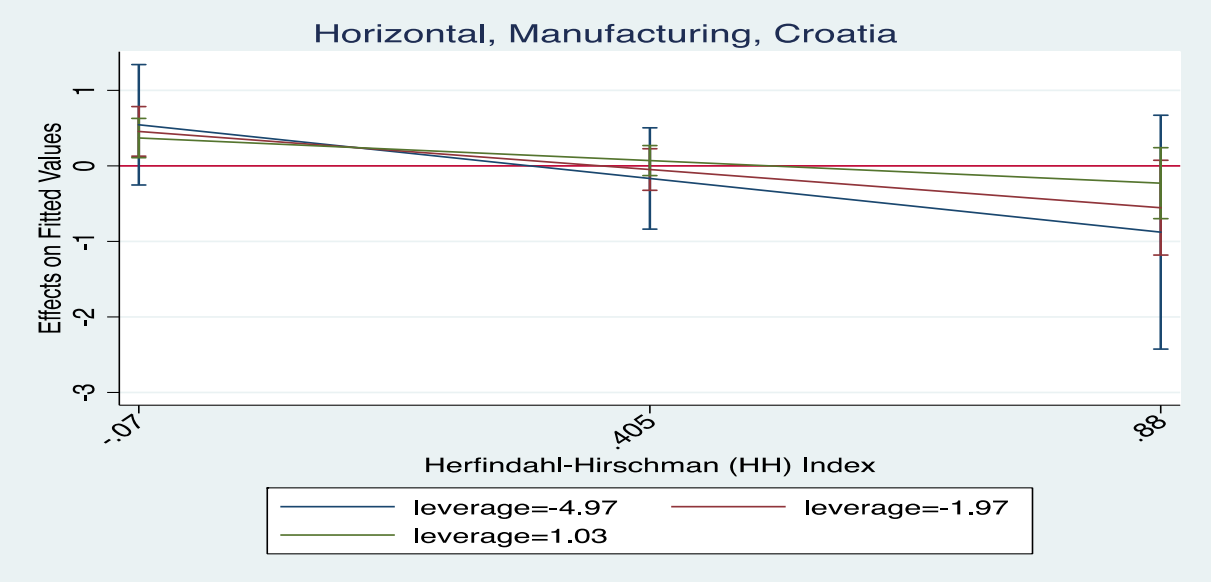

Figure 3 Horizontal spillovers at different competition and leverage levels, manufacturing, Croatia (average marginal effects, 90% CI)
Note: Logarithm of leverage and Hirschman-Herfindahl index are demeaned for the purpose of three-way interactions, thus their negative values. Point estimate of the effect above (below) the red line represents positive (negative) marginal effects. The effect is insignificant if the zero line is within the confidence interval.

Positive horizontal spillovers in manufacturing (Figure 3) are driven by firms operating in competitive industries (low values of the HH index) that are highly leveraged (green and red lines); in other words, those that have sufficient external sources of financing. Other firms that face medium to low levels of industry competition (medium and high values of the HH index) face insignificant spillover effects. The latter may be because firms operating in concentrated industries are less inclined to improve their technology, and more focused on protecting their financial interest (Arrow, 1972; Geroski, 1990), regardless of leverage level.

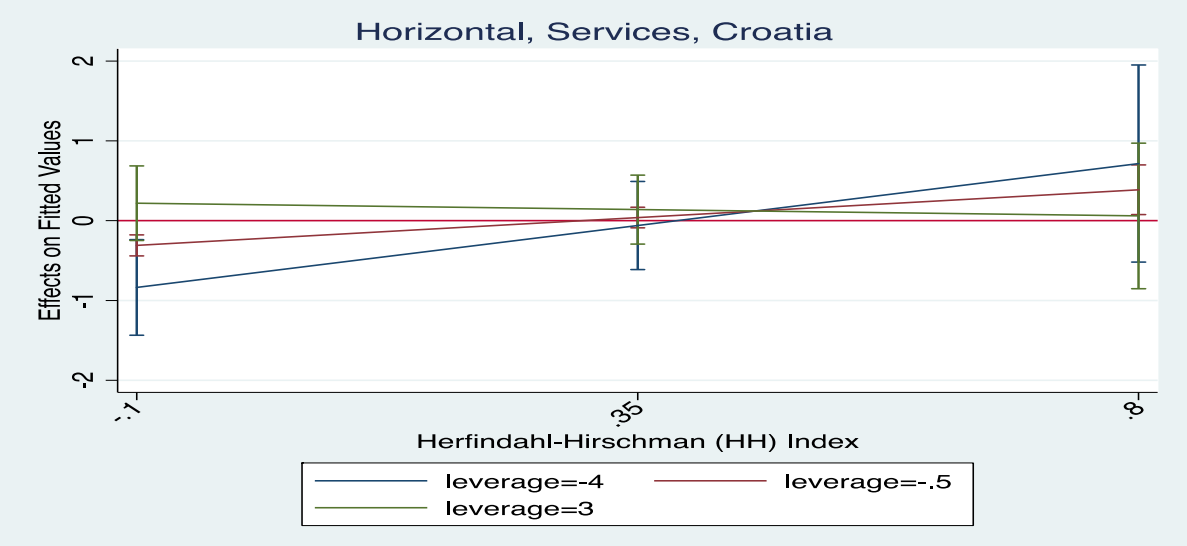

Figure 4 Horizontal spillovers at different competition and leverage levels, services, Croatia (average marginal effects, 90% CI)
Note: Logarithm of leverage and Hirschman-Herfindahl index are demeaned for the purpose of three-way interactions, thus their negative values. Point estimate of the effect above (below) the red line represents positive (negative) marginal effects. The effect is insignificant if the zero line is within the confidence interval.

On the other hand, negative horizontal spillovers in services in Croatia are driven by firms with low leverage (the blue line, Figure 4) operating in highly competitive industries (low HH index). This supports the theory that firms in competitive industries have fewer resources to fight off competition via knowledge absorption. Conversely, firms with resources–highly leveraged firms (the green line)–do not gain any significant horizontal spillovers, irrespective of the level of competition.

When horizontal spillovers are interacted with leverage and firm size, the results are insignificant for both manufacturing and services (Figures 5 and 6). This implies that it is the industry competition in Croatia that renders the absorption of foreign knowledge sensitive to access to finance, irrespective of firm size. This mechanism, however, operates differently in Slovenia, where firm size moderates the access to finance that is available for knowledge absorption.

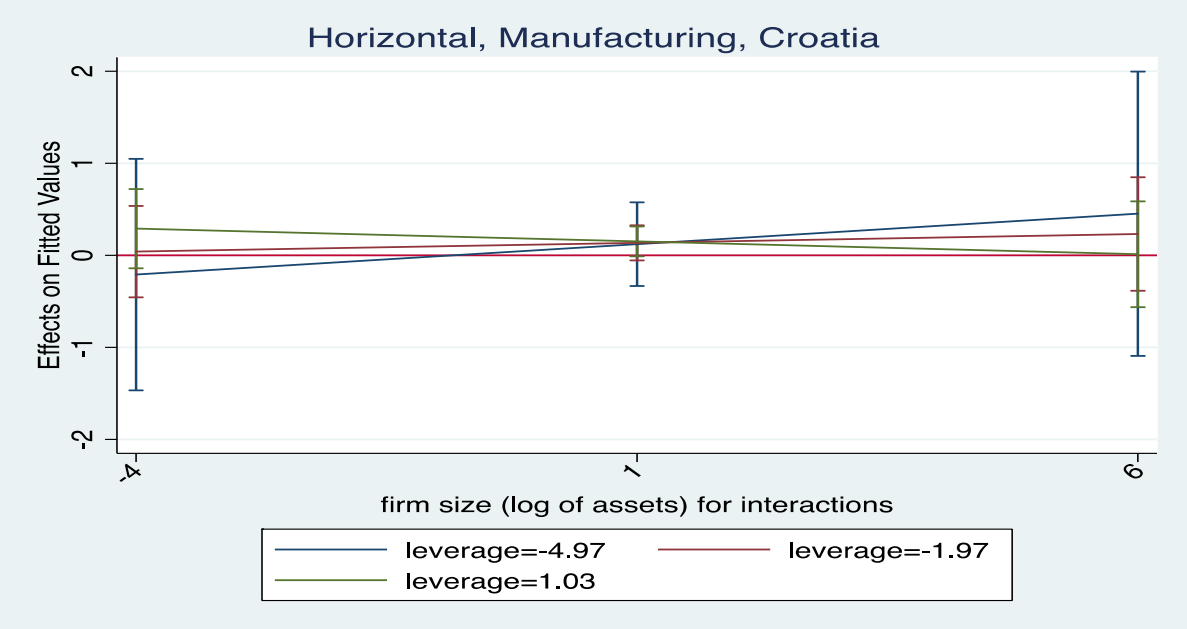

Figure 5 Horizontal spillovers at different firm size and leverage levels, manufacturing, Croatia (average marginal effects, 90% CI)
Note: Logarithm of leverage and firm size are demeaned for the purpose of three-way interactions, thus their negative values. Point estimate of the effect above (below) the red line represents positive (negative) marginal effects. The effect is insignificant if the zero line is within the confidence interval.

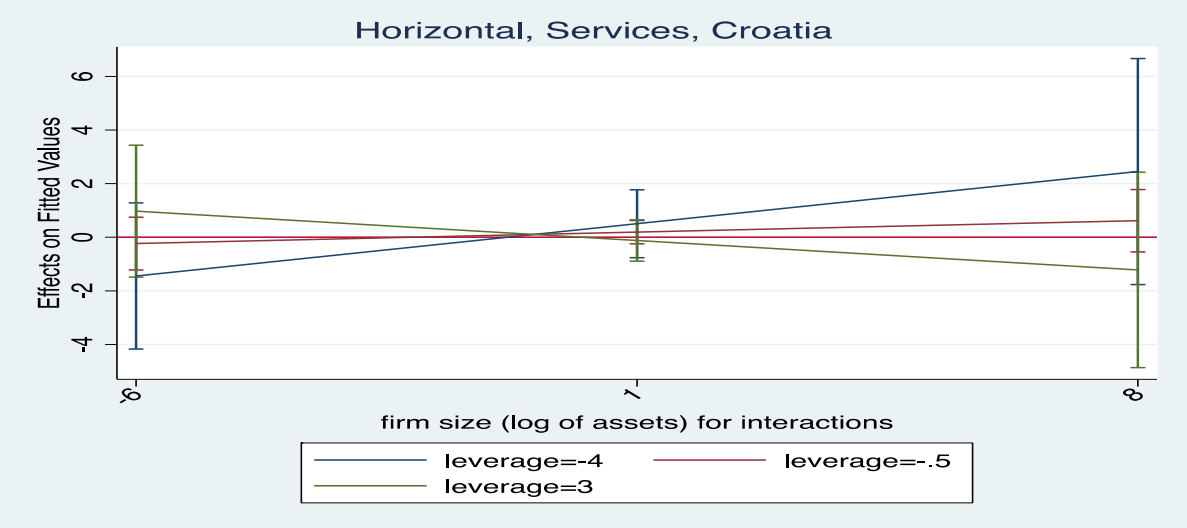

Figure 6 Horizontal spillovers at different firm size and leverage levels, services, Croatia (average marginal effects, 90% CI)

Note: Logarithm of leverage and firm size are demeaned for the purpose of three-way interactions, thus their negative values. Point estimate of the effect above (below) the red line represents positive (negative) marginal effects. The effect is insignificant if the zero line is within the confidence interval.

Horizontal spillover effects vary over the range of firms' leverage and size in Slovenia too, although only in services, while manufacturing firms do not seem to benefit from horizontal spillovers, regardless of their access to external sources of financing. Figure 7 shows the average marginal effects of horizontal spillovers across different firm sizes (horizontal axis) and different leverage ratios (the blue line indicates low leverage, the red line medium leverage, and the green line high leverage) in manufacturing.

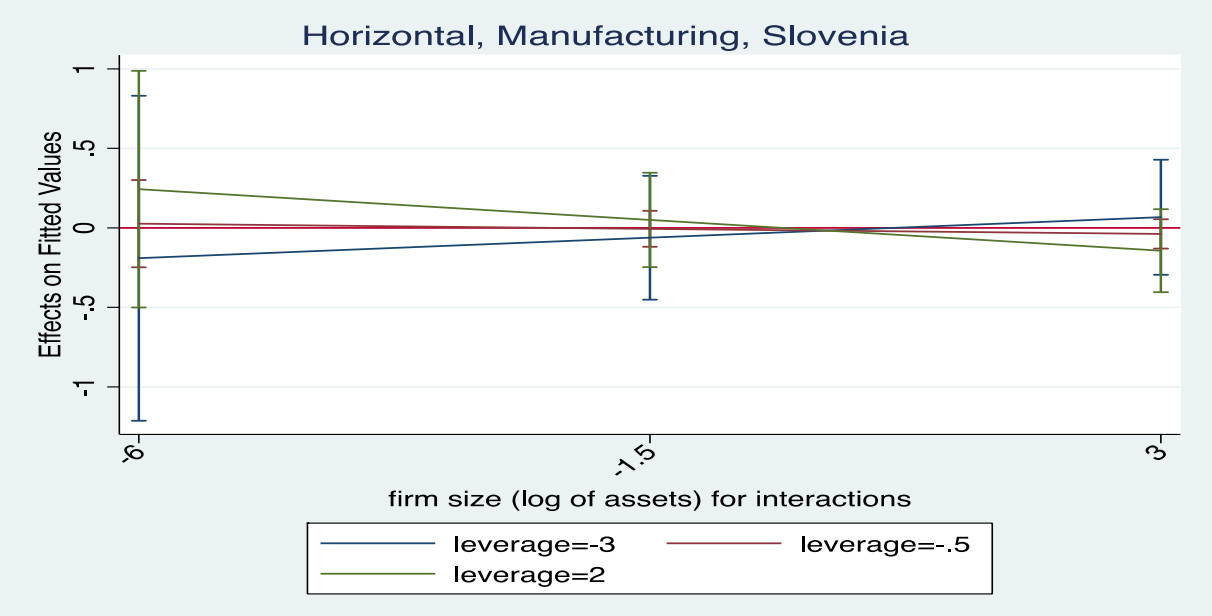

Figure 7 Horizontal spillovers at different leverage and firm size levels, manufacturing, Slovenia (average marginal effects, with 90% CI)

Note: Point estimate of the effect above (below) the red line represents positive (negative) marginal effects. The effect is insignificant if the zero line is within the confidence interval.

On the other hand, negative horizontal spillovers in services are driven by small size firms with low access to external funds (Figure 8, the blue line). This supports the view that small firms

have less access to external funds and thus are less able to absorb knowledge from foreign firms.

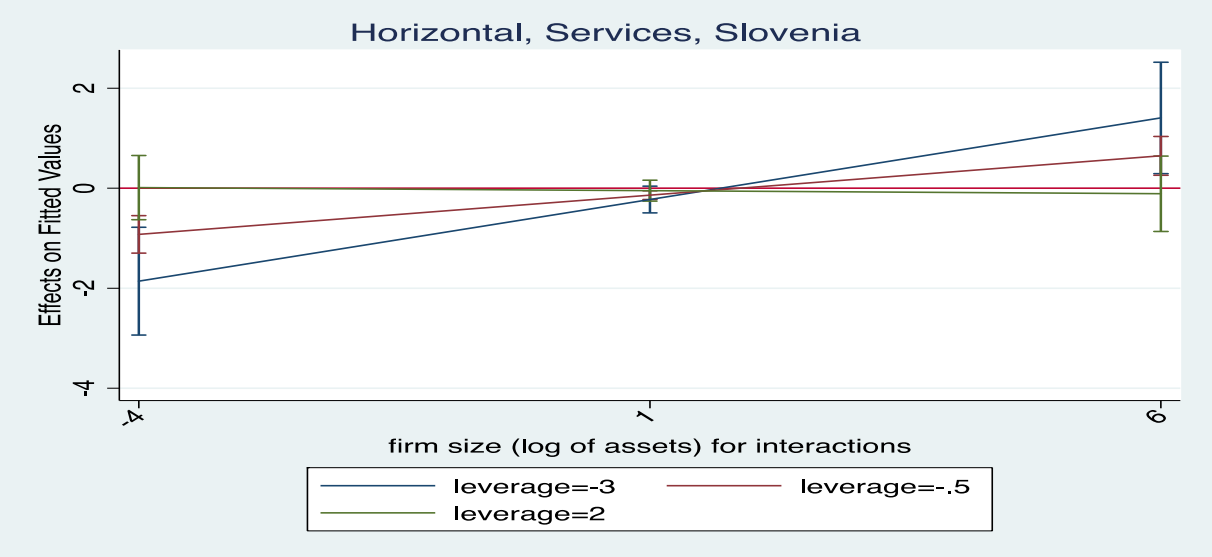

Figure 8 Horizontal spillovers at different levels of leverage and firm size, services, Slovenia (average marginal effects, with 90% CI)
Note: Point estimate of the effect above (below) the red line represents positive (negative) marginal effects. The effect is insignificant if the zero line is within the confidence interval.

Larger firms in Slovenia, however, successfully absorb foreign rival's knowledge, even if they have low leverage (Figure 8, the blue line). The result could reflect economies of scale, as firm size is related to the '*availability and stability of internally generated funds'* (Cohen and Levin, 1989; p. 1067). To improve their production technology, in line with that of foreign competitors, these firms may rely on their own internal funds.[15] Figure 8 also reveals that highly leveraged large firms (the green line) do not enjoy positive spillovers, regardless of their size, possibly because very high indebtedness can also harm firm productivity, which is consistent with the non-linear effects of leverage (Coricelli et al., 2012).

Again, unlike in Croatia, greater industry competition does not help the absorption of foreign knowledge from rival firms due to lower access to finance in Slovenia. Interaction terms between competition measures, horizontal spillover, and level of indebtedness are insignificant in both sectors (see Figures 9 and 10). Hence, the access to external sources of financing matters for the absorption of foreign rival's knowledge in the two countries; however, this mechanism operates differently, via the competition channel in Croatia and via firm size in Slovenia.

[15] Nicolini and Resmini (2010) argue that larger firms enjoy greater spillovers due to economies of scale and test this presumption by splitting the sample according to firm size. They find evidence for this hypothesis for Romania.

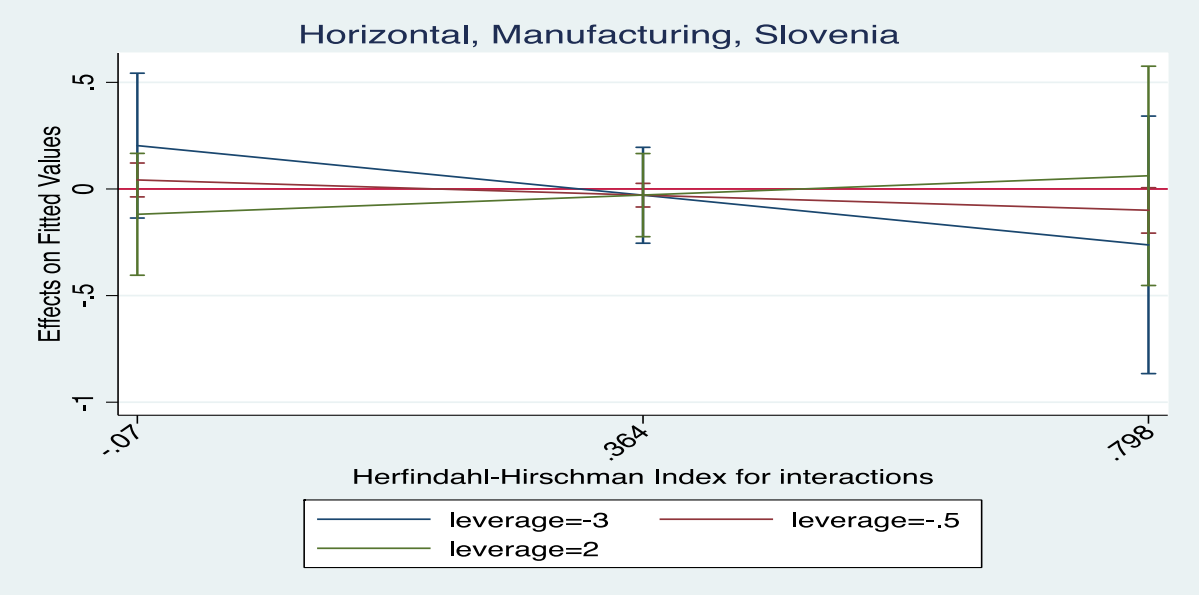

Figure 9 Horizontal spillovers at different competition and leverage levels, manufacturing, Slovenia (average marginal effects, 90% CI)

Note: Logarithm of leverage and HH index are demeaned for the purpose of three-way interactions, thus their negative values. Point estimate of the effect above (below) the red line represents positive (negative) marginal effects. The effect is insignificant if the zero line is within the confidence interval.

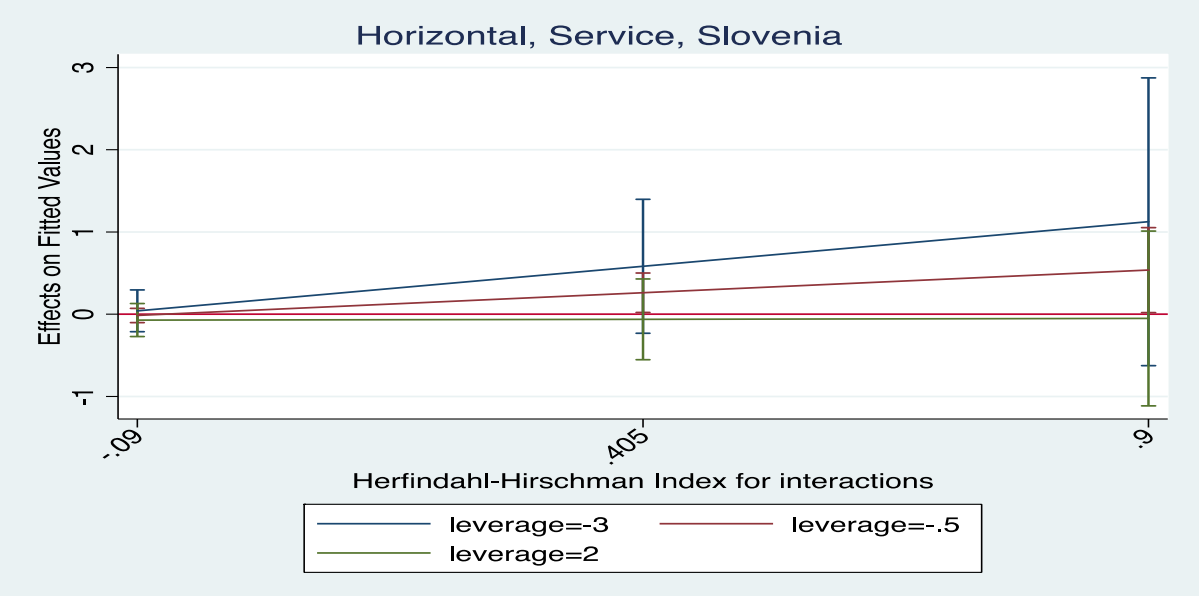

Figure 10 Horizontal spillovers at different competition and leverage levels, services, Slovenia (average marginal effects, 90% CI)

Note: Logarithm of leverage and HH index are demeaned for the purpose of three-way interactions, thus their negative values. Point estimate of the effect above (below) the red line represents positive (negative) marginal effects. The effect is insignificant if the zero line is within the confidence interval.

6. Conclusion

The study investigates the spillover effects of FDI on the productivity of domestic firms in Croatia and Slovenia, considering the (post-) financial crisis period. Unlike the bulk of previous empirical literature, which focuses on manufacturing, this study investigates these effects in the service sector. Furthermore, it explores how factors such as the period of the financial crisis, access to external sources of financing, competition levels, and firm size moderate the effect

of FDI knowledge spillovers and the ability of firms to absorb foreign knowledge. These aspects are missing in the current literature.

The evidence shows that, while FDI horizontal spillover effects in manufacturing are different across the two countries, they are similar in services. Croatian manufacturing firms benefit from horizontal spillovers, while Slovenian firms do not. In Croatia, these spillovers were driven by the pre-crisis period, and their effects are diminishing in its aftermath. However, in Slovenia, the FDI horizontal spillover effects are insignificant, regardless of the years of observation. In contrast to manufacturing, services experience negative FDI horizontal spillovers in both countries, implying that it may be more difficult to detect the new knowledge in the sector. These results are largely driven by difficulties with accessing external financing in both countries, which were especially pronounced in the post-financial crisis period, when banks adopted restrictive credit policies. However, the dependence of the transmission of horizontal spillovers on firms' access to finance seems to operate via different channels in the two countries: industry competition in Croatia and firm size in Slovenia.

Learning from foreign customers (backward spillover) is country specific too. Croatian domestic suppliers suffer negative effects from their foreign customers, while Slovenian firms benefit from the presence of foreign firms in downstream industries, irrespective of sector. On the other hand, forward spillovers display sectoral heterogeneity. They are positive in services but insignificant in manufacturing, in both countries.

Overall, FDI spillover effects seem to be driven by both sector and country specific factors. Different economic conditions in, and the recent transition experiences of the two countries could justify these differences. The spillovers in Croatia may have been affected by the periods of macroeconomic changes resulting from joining NATO and the EU and experiencing greater FDI inflows. Additionally, the study shows that the financial crisis had a determining effect on the spillover process in the two countries. The study reveals that FDI spillovers in TEs may show a different pattern during difficult economic times and restrictions on external sources of financing.

The implications of this study are particularly important in the current period, when the COVID-19 pandemic has led to the worst global recession since WWII (World Bank, 2020), marked by exceptionally challenging operating, market, and financial conditions. Firms' profits, even those of multinational firms, are expected to drop dramatically (UNCTAD, 2020). Many firms will face liquidity issues and financial distress, constraining the technology upgrade associated with FDI spillovers. The banking sector, based on the experience of the financial crisis, is expected to employ stringent credit policies following the pandemic, further impacting the spillovers negatively. This study shows that the impact of the crisis may go as far as halting the process of learning through spillovers for firms that have difficulties accessing external funds. Small size firms are in particular danger. Future policies should focus greater attention and special support programmes on these firms in the coming periods.

Since learning from foreign firms is contingent on FDI, the governments in these countries should complement their policies on FDI with policies for fostering learning and technological advancement that can boost firms' absorptive capacity. The importance of complementary policies has of course been raised by other authors too (Radošević and Kaderbkov, 2011; Guimon et al., 2018). This could be particularly important in times of crises, when expenditure on innovation decreases due to lower external finance at a time when access to external knowledge is important. Hence, during and in the aftermath of the crisis, policy makers should

have favourable support programmes for small size firms in services and firms facing high competition, as the research shows that these firms suffer from negative knowledge spillovers due to shortage of bank financing. Such programmes may take the form of a tax concession: favourable tax treatment or financial subsidies and grants for these firms. In addition, the sector specific effect from spillovers suggests that policy makers should have different policy agendas for services and manufacturing firms, as these are characterised by considerably different production processes.

The study is the first to shed light on how a crisis affects the knowledge spillovers from foreign to domestic firms. The results are generalisable beyond Croatia and Slovenia: the COVID-19 pandemic has caused a severe decline in the revenues of small and medium size enterprises, who face liquidity shortage (OECD, 2020a), particularly in some services (Gourinchas et al., 2020). SMEs will also need greater resources to support learning potential. The service sector attracts most of the global FDI; although the issue has not received adequate scholarly attention, the results from this study offer important insights into the differences in spillovers across the two sectors worldwide. In particular, the study has shown that, in both countries, learning horizontally in services is more challenging, possibly due to the tacit nature of the knowledge in this sector.

However, only one aspect of the crisis was investigated: access to finance. Other detriments faced during the crisis, such as loss of human capital and intangible assets, and an overall decline in firm performance should be investigated. Finally, the study did not address the detrimental effects of the crisis and indebtedness on learning through vertical linkages. Future research could fill these gaps.

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