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Are There Productivity Spillovers from Southern MNCs in the Swiss Service/Construction Industry?

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Abstract: Although developing and emerging market firms (southern MNCs) are increasingly engaged in outward FDI in European advanced economies, we have an incomplete and inconsistent understanding of whether, and under what conditions, this investment may benefit the local economy. Our paper addresses this issue by examining whether local firms may benefit from the entry and the presence of southern MNCs in services/construction industry. We argue that analyzing spillovers from southern MNCs needs to distinguish these effects according to how they take place as well as the technological characteristics of local knowledge receivers. Using firms-level data from Switzerland, we found that local firms need to upgrade their human capital to take benefit from the entry and presence of southern MNCs in their industry; otherwise the presence of southern MNCs reduces the productivity of local services/construction firms in Switzerland. No benefit is found from competition effects. Moreover, interactions between different technological capacities of local firms and the ways they benefit from spillovers from southern MNCs provide differences in spillover results.

Keywords: Southern MNCs; Productivity spillover; Local technological characteristics; Spillover mechanisms; Service industry

JEL Classifications: F21, F23, F62

1. Introduction

Investment by MNCs from developing and transition economies (called hereafter southern economies) [1] are continuously growing, reaching 35% in 2012 in terms of global outflows (UNCTAD, 2013). According to UNCTAD (2015), p.5, "*nine of the 20 largest home economies were developing or transition economies, namely Hong Kong (China), China, the Russian Federation, Singapore, the Republic of Korea, Malaysia, Kuwait, Chile and Taiwan Province of China*". Southern economies have witnessed an unprecedented rapid expansion of their outward FDI in developed countries, particularly, in Europe (UNCTAD, 2011). For example, over 40% of BRICS outward FDI stock is in developed countries, of which 34 per cent is in the European Union. (UNCTAD, 2013, p.5).

Southern MNCs are broadly motivated by seeking knowledge in European host economies (Deng, 2007; Makino *et al*., 2002; and Awate *et al*., 2015). They accumulate competences and leverage ownership advantages (Milleli and Hay, 2008), allowing them to move as fast as possible from imitation to innovation by building new competences and technologies (Mathews, 2006 and Duport, 2014). These competences and technologies could be a valuable source of knowledge for local European firms, raising their knowledge reservoir and productivity performance.

In this context, we need to investigate whether southern MNCs investment is a valuable source of knowledge which could benefit the local economy in Europe. Therefore, we could give insights to local managers and policy makers about how to benefit from southern MNCs' new knowledge. Our paper attempts to analyze this benefit and particularly, aims to examine spillover benefits from southern MNCs' FDI activities on the Swiss economy – to the best of our knowledge, scholars have paid very little attention to analyzing spillovers from southern MNCs to European economies. In doing so, we rely on FDI spillover literature to build our theoretical framework and argue that spillovers are not equally beneficial for all host country firms (Cantwell, 1989; Dimelis, 2005; Ben Hamida and Gugler, 2008; and Ben Hamida, 2013). The way local firms benefit from spillovers is not unique and it depends on their technological capacity in order to employ foreign knowledge productively (Kokko, 1996; Ben Hamida 2013; and Chen *et al*., 2010).

Generally, spillover effects are said to take place when the entry and the presence of MNC affiliates lead to efficiency benefits in the host country's local firms and the MNCs are unable to internalize the full value of these benefits (Blomström and Kokko, 1998). MNC literature distinguishes two groups concerning spillovers: the effect of increased competition following the entry and/or presence of foreign affiliates and the effect of knowledge spillovers. The former operates through either a more productive use of existing technologies and resources or an assimilation of foreign technologies. The latter may result from demonstrating new foreign knowledge and/or trained local workers who later work for local firms.

Switzerland is a particularly interesting example for this study, given that firstly it experiences increasing flows of inward FDI over time. It is ranked among the top 20 host economies of inward FDI in 2014 (UNCTAD, 2015), with increasing inflows in services (BNS, 2014). Secondly, Swiss

1. Southern economies used for empirical analysis of this study are China, Egypt, India, Israel, Latvia, Lebanon, Taiwan, and Ukraine. Southern economies include countries with low and middle incomes (transition and developing countries) based on the classification of the World Bank in 2011. Latvia changed in July 2011 from high income to an upper middle income country (World Bank, 2011). In 2010 Israel registered the highest relative income poverty rate in developed countries (OECD, 2013). This is the reason why it appears among these economies.

firms are being acquired more and more by MNCs from Southern economies particularly Chinese MNCs. As mentioned in Hebdo (2016), in less than ten years, more than 20 Swiss firms have been acquired by Chinese MNCs in both manufacturing and services (for example, Corum, Syngenta, Swissport, etc.). Thirdly, to date, there has been no investigation of potentially beneficial spillover effects of southern MNCs on the Swiss service/construction industry. Therefore, it is interesting to study these effects and assess their key determinants for Swiss service firms, in order to give insights for Swiss managers and policy makers about how to promote these benefits and draw general conclusions.

We argue that not all local firms in Switzerland benefit in the same way from spillovers from southern MNCs. Following spillover literature, we assume that their technological capacities influence the size and extent of spillover benefits and determine the way they benefit from the presence of southern MNCs. By doing so, we suggest that spillovers from southern MNCs are dependent on the spillovers take place as well as on technological capacities of local firms. Our contribution is correlating local inter-firm differences in their productivity effects of spillovers from southern MNCs and how they take place.

The structure of the paper is as follows. Following this introduction, section 2 discusses the theoretical and empirical frameworks underlying our arguments. Section 3 introduces the model. Section 4 analyses Swiss data. Section 5 discusses regression results, and section 6 concludes the paper.

2. Theoretical Background and Conceptual Framework

Existing literature has broadly discussed spillovers from northern or advanced economies to southern/northern economies, whilst, little attention has been paid to studying spillovers from southern MNCs to northern economies, particularly, European economies. This study focuses on the resultant effects of southern MNC investment in terms of FDI spillovers on the productivity performance of Swiss service/construction firms. We argue that spillovers from southern MNCs are co-determined by the ways they happen and the technological capacities of local host country firms. Possible interaction effects between both factors may also impact spillovers from southern MNCs. In the following two sub-sections, we discuss the theoretical and empirical frameworks underlying these arguments.

2.1 Concerning the role of spillover mechanisms in assessing spillovers from southern MNCs

FDI spillovers can take place according to three main mechanisms. Firstly, there are demonstration effects, i.e., local firms learn through imitation from MNCs (Das, 1987 and Wang and Blomström, 1992). Secondly, there are competition effects following the entry and/or presence of foreign affiliates, which increases competition and forces local firms to work harder or absorb new technologies. Thirdly, there are worker mobility effects when local workers who were previously trained by and/or worked in foreign affiliates may leave the firm to join an existing local firm or open a new one. The latter mechanism is particularly interesting in service industries, since training in services is focused more directly on strengthening the skills and know-how of employees.

According to the claims above, the value of spillovers depends broadly upon the mechanism by which they happen. For example, spillovers from worker mobility can lead to substantial improvements in productivity throughout the local economy, by transferring not only public

technology, but also the tacit element that is unlikely to be transferred through informal contacts between firms. Therefore, assessing spillovers then needs to analyze these effects according to how they arise. In addition, firms differ in their technological competence and in turn they differ in their choice of how to benefit from the presence of FDI. Consequently, the relevance of each spillover mechanism, as shown in the following section, varies with the technological characteristics of local firms.

In existing literature, spillover effects have largely been measured in by the share of foreign presence in the corresponding industry – e.g. foreign employment/sales/equity share, displays conflicting evidence in the scant empirical evidence available (among others, Aitken and Harrison, 1999; Karpaty and Lundberg, 2004; Buckley *et al*., 2007; Haskel *et al*., 2007; Tian, 2007; and Castellani and Zanfei, 2007). Along with Kokko (1996) and Ben Hamida (2013), this measurement, in our point of view, cannot contain information concerning competition and labor mobility effects.

In this paper, we use the share of foreign presence to assess spillovers from demonstration effects and employ other variables for competition effects and worker mobility-related spillovers.

The above discussion points to the following hypothesis:

H1: *The magnitude of spillover benefits from southern MNCs differ according to the ways in which these effects take place.*

2.2 Concerning the role of local technological capacity in assessing spillovers from southern MNCs

The literature suggests that not all local firms should expect to benefit from spillovers from FDI. In fact local firms need to have sufficient levels of technological capacity to be able to recognize valuable new knowledge and use it productively. Technological capacity is therefore a prerequisite to facilitate absorptive capacity of local firms; i.e. the ability of the firm to decode, acquire, assimilate, transform, and efficiently exploit foreign knowledge (Lane and Lubatkin, 1998; Cohen and Levinthal, 1990; and Cantwell, 1989). This local characteristic has been broadly included in most empirical studies seeking to determine significant spillover effects.

Various proxies have been used to measure local technological capacity when testing FDI spillover effects. For instance, using panel data for UK manufacturing industries, Liu *et al*. (2000) found that spillovers happen more in industries with low technology gaps and high technological capacities (proxied by intangible assets per worker). Based on cross-sectional data for manufacturing firms operating in Greece, Dimelis (2005) also provided evidence that only local firms with a small technology gap experience positive spillovers. Girma *et al*. (1999) supported the evidence that spillovers are positive and significant for all firms with low technology gaps (measured by the individual firm's total factor productivity (TFP) gap relative to the 90th percentile TFP of the corresponding industry, the previous year).

We argue that it is important to consider technological capacity of local firms when assessing spillovers. In addition, based on their level of technological capacity, local firms do not all benefit from foreign MNCs in the same way. We expect that local firms with high technological capacity are highly likely to benefit from spillovers through more efficient use of their existing technology and resources, while small technology firms, which are not in a position to fiercely compete with foreign firms, need to absorb foreign knowledge through demonstration and/or worker mobility (Mody, 1989). In fact, by training local employees, local firms might benefit from some (technical, managerial, and so on) assistance which can help them to understand and implement foreign knowledge better. This is particularly interesting, when local firms need to absorb southern MNCs'

knowledge in services since (1) knowledge in services is much more embedded in human capital than in machinery and equipment and tends to be highly specific to the originating firm and tacit in nature; and (2) southern MNCs, particularly, Asian and African firms tend to manage their knowledge and their employees using different practices relating to their home countries' cultures and traditions (Fjellström and Zander, 2016). We assume therefore that local European firms may need to train their employees and develop their human capital to be able to decode and productively absorb southern knowledge and practices.

This points to the following hypothesis:

H2: *Spillover benefits from southern MNCs to local Swiss firms vary according to the diverse interactions between local technological capacities and how these benefits take place.*

3. The Model

We model spillover effects from southern MNCs within the context of a production function [2], in which the change in the natural log value added of the i th local firm is determined as follows.

$$LnY_{i,j} = \alpha_0 + \alpha_1 LnL_{i,j} + \alpha_2 LnK_{i,j} + \alpha_3 FP_j + \alpha_4 HC_{i,j} + \alpha_5 FP_j * HC_{i,j} + \alpha_6 Comp_{i,j} + \alpha_7 Industry_j + \varepsilon_{i,j} \quad (1)$$

where the subscripts i and j denote firm and industry respectively, and α_0 to α_7 are the estimated parameters. Table 1 describes the variables and their measurements.

Table 1. Variable definitions

Variable	Definition
$LnY_{i;j}$	The log in value added at firm level, calculated for 2010.
$LnK_{i;j}$	The log in physical capital, measured by gross capital income, calculated for 2010.
$LnL_{i;j}$	The log in total number of employees in a firm, calculated for 2010.
FP_j	The share of total sales in an industry j accounted for by foreign firms, calculated for 2010.
$HC_{i,j}$	The labor cost of the firm, calculated for 2010 (in 100,000s of CHF).
$Comp_{ij}$	The price markup at firm level measured by the difference between firm's total sales and costs over total sales, calculated for 2010.
$Gap_{i,j}$	The ratio of the average labor productivity of foreign-owned firms to local firm's own labor productivity, calculated for 2010.

Y denotes value added at the firm level, *K* its physical capital measured by gross capital income, *L* its employment measured by the number of employees, and *HC* the level of its human

[2] The derivation of this model is explained in the appendix.

capital proxied by the labor cost calculated for 2010. The co-efficients of these variables are expected to be positive and significant. We expect that increased skills will augment the productivity of local firms since these affects their knowledge capital (Griliches, 1998; Narula and Marin, 2003).

The inclusion of industry dummies, *Industry* , in equation (1) control for the industry-specific productivity differences; it is corrected for the omission of unobservable variables which might undermine the relationship between spillover variables and the productivity of local firms.

We test equation (1) for the sample of Swiss service/ construction firms to estimate spillovers that take place, firstly, from all foreign affiliates in the industry and, secondly, from only southern affiliates. It will be valuable to demonstrate whether the effects of spillovers from foreign affiliates in the Swiss service/construction industry are to some extent the outcome of the entry and presence of southern MNCs.

Different control variables are employed to take into account different spillover channels when assessing spillover effects in the industry. Firstly, the main effect [3] of the share of foreign presence at two-digit industry level, *FP*, reflects spillovers from demonstration effects, resulting from the technology transfer that occurs from direct contact between local agents and foreign affiliates operating at different technological levels. *FP* is the share of total sales in the industry accounted for by foreign affiliates. Secondly, we use an interaction term $FP*HC$ between the share of foreign presence and the firm's human capital to determine the effects of foreign presence associated with the level of the local firm's human capital. It is argued that human capital increases the ability of local firms to benefit from spillovers (Borensztein *et al*., 1998; Meyer and Sinani, 2005) – the sign of the interaction effect is then expected to be positive. The amount that local firms invested in training their employees contribute to improving their ability to absorb foreign knowledge. Local firms tend also to invest in recruiting local employees who are already trained or employed by foreign firms by offering them a higher salary than foreign firms do – it is assumed that when leaving MNCs these employees will take some or all of the firm-specific knowledge with them (Blomström and Kokko, 2002). Therefore, this could be interpreted as a sign of worker mobility related to the presence of foreign firms on the market.

Regarding competition-related spillovers, price mark-up or the Lerner index is used as a measure of competition, the difference between firm's price (p) and its marginal cost (mc) over its total price (Tybout, 2003; Baye, 2006). Following Narula and Marin (2003) and Chung (2001), we measure the firm's price mark-up by the difference between a firm's sales and its costs over its total sales. When mark-up is high, i.e. a value near 1, competition is low. Whilst, when mark-up is low, i.e. a value near 0, competition is high. A negative estimated co-efficient attracted by the mark-up is consistent with the expectation that decreased mark-up (increased competition) is followed by an increase in productivity.

In order to test our hypothesis 2, we divide the full sample of local firms into two sub-samples characterized by the size of their existing technological capacities and equation (1) was estimated separately for local firms with high, and small technological capabilities. The existing technological capacities of local firms are measured by their technological gaps, *Gap* , compared to their foreign

[3] We recognize that it is better to have the data on the number of employees in the local firm who have previously trained or worked at an MNC's affiliates in order to measure worker mobility effects. Unfortunately, our data does not allow for such information.

counterparts. *Gap* is defined as the ratio of the average labor productivity of foreign-owned firms in the relevant two-digit industry to local firm's own labor productivity, calculated for 2010. Hence, *Gap* is equal to 1 if the local firm operates at the same level of labor productivity as the average of its foreign rivals. Values that are smaller than 1 are interpreted as signs of small productivity gaps. Values that are higher than or equal to 1 are interpreted as signs of large productivity gaps.

4. Data and Descriptive Statistics

Since, the composition of inward FDI has shifted to services (Blomström and Kokko, 2002) and most foreign direct investment of southern MNCs in Europe is in services (Sauvant *et al*. 2010), the potential spillover benefits which might take place from southern MNCs investment need to be explored.

This paper analyzes spillovers which might take place from southern MNCs in the Swiss service/construction industry. We use data derived from the innovation activity survey (2011) of service/construction firms, with at least five employees, conducted at the Swiss Institute for Business Cycle Research (KOF). Individual information covers the technological behavior and productivity performance of local and foreign firms in 2010. It also includes data on the name of the firm's home country, which we used to determine southern foreign affiliates.

Tables 2 presents a summary of the sample of all foreign firms versus southern affiliates. All these calculations are based on weighted data sets in order to give a representative picture of the Swiss economy [4]. As shown in this table, considering all foreign firms, the share of foreign direct investment in total employment service/construction, in 2010 accounted for approximately 13.8% (33.7% in total sales). The foreign share of southern affiliates accounted for about 0.42% in total employment (0.59% in total sales).

Table 2. FDI participation in services/construction in Switzerland:
Sectoral shares of foreign firms (per cent)

Sector: services/construction	Total employment (All foreign firms)	Total employment (Southern firms)	Total sales (All foreign firms)	Total sales (Southern firms)
Services/construction	13.805	0.426	33.713	0.586
Wholesale Trade	35.711	1.278	65.034	1.156
Retail Trade	9.625	0.388	12.075	0.237
Hotels/ catering	11.268	0.862	14.628	0.649
Transport	15.366	0.748	33.412	1.422
Telecommunication	3.198	0.072	7.195	0.059
Banking/Insurance	10.012	0.0106	18.963	0.035
Construction	6.497	0.272	12.083	0.499

Source: Author's calculations based on data derived from KOF innovation surveys (2011) of services/construction firms.

[4] The weights are used to correct for the selection bias resulting from "unit" non-response and for the deviations of the sample structure from the underlying population.

These shares hide significant differences across sectors, in which wholesale trade reported the highest share (35.7% in total employment and 65% in total sales), followed by transport (around 15% in total employment and 33% in total sales) and (only 3.2% in total employment and 7.2% in total sales) telecommunication. In this vein, the foreign share of southern firms is pre-eminent in wholesale trade (1.28% in total employment and 1.2% in sales), while banking and insurance experienced the smallest share (0.01% in employment and 0.03% in sales).

5. Empirical Results

The models are estimated using ordinary least squares. All estimations are robust and all standard errors are corrected for heteroskedasticity.

In regressions 3.1, 3.3, and 3.5 of Table 3, we tested the effects of spillovers from all foreign firms (including southern MNCs) on the productivity of local firms in the Swiss service/ construction industry, while regressions 3.2, 3.4, and 3.6 report spillover results from only southern foreign affiliates. In doing so, some conclusions concerning the differences in results could be drawn and the contribution of southern MNCs in terms of spillovers will be better identified. For all regressions, the value added of local firms in the Swiss service/construction industry significantly increases with their employment, physical capital and human capital.

Table 3. Spillover results for services/construction using OLS: the role of southern firms

Variables	Regression 3.1 (All foreign firms)	Regression 3.2 (Southern firms)	Regression 3.3 (All foreign firms Small Gap)	Regression 3.4 (Southern firms Small Gap)	Regression 3.5 (All foreign firms High Gap)	Regression 3.6 (Southern firms High Gap)
LnK	0.02**	0.018**	0.601***	0.012*	0.017**	0.021*
LnL	1.005***	1.01***	0.39***	0.992***	1.01***	1.01***
HC	0.775***	0.804***	0.315***	0.529***	0.801***	1.078***
FP_j	0.004***	-0.106***	-0.001	-0.356***	0.10***	-0.01
$FP_j * HC$	0.009***	0.351***	0.003	0.393***	0.006**	0.4
comp	1.692***	1.613***	0.111	1.318***	1.405***	1.292***
Industry	Yes	Yes	Yes	Yes	Yes	Yes
$\bar{R}^2$	0.974	0.972	0.993	0.983	0.979	0.974
N	825	630	87	322	738	308

Notes: (1) All estimations include industry dummies.
(2) All standard errors are corrected for heteroskedasticity.
(3) Variables (HC and FP) used for interactions are centered by subtracting the full sample means, so that multi-collinearity between the variables and their product is reduced, good estimates of (HC and FP) with accurate size and sign are ensured, and more meaningful interpretations of those estimates are granted (Aiken and West,1991).
(4) *, * *, and * * * respectively, denote significance at the level of 10 per cent, 5 per cent, and 1 per cent.

Using the full sample of local firms, the estimated co-efficient of *FP* in regression 3.1 is positive and highly significant, indicating that local firms benefit from the presence of foreign firms. This effect is higher when it is co-determined by the level of human capital since the estimated co-efficient of the interaction term $FP*HC$ is more than doubled, showing that the response with *FP* increases with the level of human capital. Competition seems to impede local firms' productivity as the *Comp* estimate is positive and highly significant. The effect of competition remains the same only when southern foreign affiliates are considered (regression 3.2). However, the significant and positive effect of *FP* in regression 3.1 does not seem to be the outcome of spillovers from demonstration effects of southern MNCs. *FP* estimate in regression 3.2 is significantly negative. This demonstrates that local service/construction firms do not benefit from southern affiliates from demonstration effects, instead their productivity is reduced with the presence of these foreign firms. This finding could be interpreted as a sign of reverse spillovers as highlighted by Chen *et al*. (2012); where southern firms seem to acquire the best local knowledge via demonstration resulting from their direct contact with local agents.

Meanwhile, the positive interaction effect in regression 3.2 denotes that local service/ construction firms appear to benefit from the foreign presence of southern MNCs but only when investing in human capital development. This is done by strengthening the skills and know-how of their employees (via training and/or recruitment), local firms might find how to successfully exploit foreign knowledge of southern affiliates. This could be interpreted as a sign of worker mobility spillovers from southern MNCs if local firms succeeded in upgrading their human capital by attracting local employees who are already trained or have worked in southern MNCs. The results in regression 4.2 seem to confirm our hypothesis 1 in which the analysis of spillovers from southern MNCs dependent on how these effects arise provides differences in spillover results.

In regressions 3.3 and 3.4, the full sample of local firms is divided into two sub-samples characterized by the values for the variable *Gap*. This division is reproduced in regressions 3.5 and 3.6 wherein results from southern MNCs are reported. In regression 3.3, *FP*, *FP *HC*, and *Comp* estimates are not significant, indicating that local firms with low technological gaps do not benefit from any spillover mechanisms. However, when only using southern affiliates, the results for high technology firms change considerably since the three estimated coefficients become significant. The negative effects of southern affiliates found in regression 3.2 seem to be absorbed by local firms with high technological gaps since *FP* estimate in regression 3.4 is significantly negative and even higher than the estimated coefficient in regression 3.2. This demonstrates that southern MNCs seem to be particularly interested in learning from high technology local firms. Whilst the latter succeeds in benefiting from southern MNCs however, only when investing in human capital. Whereas, no benefit is expected from competition.

Regressions 3.5 and 3.6 report results for the sub-sample of local firms with high technological gaps. We found that local firms with low technology benefit from spillovers from demonstration as well as from interaction, *FP*HC*, but only when all foreign firms are considered. They are unable to significantly benefit from southern affiliates even if they upgrade their level of human capital. The estimated co-efficient of *FP* in regression 3.6 is negative, but insignificant, indicating that southern MNCs are uninterested in approaching local firms that lag behind in terms of productivity performance.

The findings in regression 3.5 and 3.6 corroborate hypothesis 2, in which interactions between local firms with different technological capacities and the ways they benefit from spillovers from southern MNCs provides differences in spillover results.

6. Conclusion

This study analyzes spillover effects from Switzerland. It seeks to add to our understanding of the value of FDI in the service/construction industry where foreign firms emerge from southern economies. It suggests that these effects depend on the ways local firms benefit from southern MNCs, as well as, their technological capacities which facilitate the successful absorption of foreign knowledge. Our findings confirm our hypotheses to a large extent.

Based on a sample of the Swiss service/construction industry, we found evidence that spillovers from southern MNCs are determined by how they take place. Meaning that local firms need to upgrade their human capital to benefit from the entry and presence of southern MNCs in their industry; otherwise the presence of southern MNCs reduces the productivity of local services/ construction in Switzerland. This finding could be interpreted as evidence of worker mobility-related spillovers if local firms succeeded to develop their human capital by attracting local employees who are already trained or have worked in southern MNCs. In addition, competition effects resulting from the entry and/or presence of foreign firms in the local market do not contribute to improvements in local firms' productivity.

Looking separately at two sub-samples of local firms characterized by the size of the technological gap between local and foreign firms yields differences in spillover results, where only high technology firms benefit from spillovers from southern MNCs when investing in upgrading their human capital. Low technology firms do not benefit from the entry and the presence of southern MNCs in their industry, neither from competition effects nor from knowledge transfer effects. Moreover, the negative effects of demonstration-related spillovers from southern MNCs are absorbed by high technology local firms. It seems that southern MNCs learn from local knowledge of high technology firms, which could be interpreted as a sign of reverse spillover effects. It is argued that southern MNCs investment in advanced European countries is particularly motivated by seeking knowledge and local strategic asset capabilities (Filippov and Saebi, 2008; Buckley, *et al*. 2011; and Elia and Santangelo, 2012) and therefore their foreign affiliates are assigned the role of acquiring the best local knowledge and technological practices and transfer them back home (Chen *et al*. 2012; and Giuliani *et al*. 2014 **).**

Based on these findings, it is difficult to formulate general policies to maximize FDI spillovers from southern MNCs in services/construction. In fact the behavior of local firms appears to be a key determinant of spillovers, where the amount that local firms, particularly, high technology firms, invested in upgrading their human capital contribute largely to understanding foreign southern knowledge and using it productively. Technological heterogeneity of local firms should then be taken into consideration in policy actions when local firms need support in their learning process by helping upgrade their level of human capital. Encouraging collaboration between local and foreign southern firms could also be included in a policy package to promote the flow of knowledge between firms and facilitate the assimilation and absorption processes, in order to contribute to successful local learning.

It could be promising for future research to control for the type of FDI motivation of foreign MNCs, when assessing spillovers from southern MNCs to European economies. In addition, it is argued that national cultural differences could contribute to greater or lesser knowledge transfer and consequently influence spillovers. Exploring how to manage these differences may provide different spillover results, which could therefore be promising to analyze in the future.

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Appendix: The model

Equation (1) is derived from a Cobb-Douglas production function with value added $Y_{i,j,t}$, a function of two inputs, capital and labor

$$Y_{i,j,t} = A_{i,j,t} L_{i,j,t}^{\alpha_1} K_{i,j,t}^{\alpha_2} \quad \text{(A1)}$$

The level of productivity is given by $A_{i,j,t}$ which is assumed to vary across firms within each sector j and across time t.

After taking logarithms of the variables to get equation (A1) into a linear form and adding a stochastic disturbance term $u_{i,j,t}$ to account for variations in the productive capabilities of the i th firm, we can rewrite equation (A1) for t = 2010

$$LnY_{i,j,t} = a_{i,j,t} + \alpha_1 LnL_{i,j,t} + \alpha_2 LnK_{i,j,t} + u_{i,j,t} \quad ; (a_{i,j,t} = LnA_{i,j,t}) \quad \text{(A2)}$$

The hypothesis that productivity is affected by the share of foreign presence at the industry level, its interaction with human capital of the i th firm, and the level of industry competition, is tested as

$$a_{i,j,t} = \alpha_3 FP_{j,t} + \alpha_4 HC_{i,j,t} + \alpha_5 FP_{j,t} * HC_{i,j,t} + \alpha_6 Comp_{i,j,t} + \alpha_7 Industry_{i,j} \quad \text{(A3)}$$

Finally, combining equations (A2) and (A3) yields equation (1).