Southern MNCs in Switzerland and regional productivity spillovers in services/construction industry

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Abstract: As more developing and transition market firms (southern MNCs) are engaged in outward FDI in European advanced economies, a fundamentally important question has to be addressed: whether this investment leads to positive productivity effects for host economies. Our paper addresses this issue by examining whether there are indicators of regional spillovers from the entry and the presence of southern MNCs in the service/construction industry. We suggest that: 1) regional spillovers from southern MNCs are co-determined by local and foreign characteristics, namely, FDI motivation and technological capacity of the local host country firms; 2) possible interaction effects between local technological capacity and FDI motivation would also influence the size and the extent of regional spillovers from southern MNCs. Using firms-level data from Switzerland, we found that knowledge-exploiting FDI (KE FDI) and knowledge-seeking FDI (KS FDI) have different amounts of spillovers. In addition, human capital development in local firms appears to be essential in gaining large regional spillovers. This allows for positive regional spillovers for high technology firms when southern MNCs are assigned KE mandates and for low technology firms when southern MNCs invest in KS FDI.

Keywords: Southern MNCs; productivity spillovers; regional effect; foreign and local characteristics; FDI motivation; service industry.

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1 Introduction

Outward foreign direct investment (FDI) expansion from developing and transition economies (called hereafter southern economies[1]) reached 39% in 2013 in terms of global outflows (UNCTAD, 2014). In addition, relating to the UNCTAD global ranking, southern economies are continuously ranked among the top-20 investors. These economies have witnessed an unprecedented rapid expansion of their outward FDI in developed countries, particularly, in Europe (UNCTAD, 2011). For example, "Overseas investment by BRICS countries is mainly in search of markets in developed countries or in the context of regional value chains. Over 40 percent of their outward FDI stock is in developed countries, of which 34 percent is in the European Union" [UNCTAD, (2013), p.5].

The international and rapid expansion of southern multinational corporations (MNCs) is viewed with a mixture of hope and fear from European host countries (Gorgoni et al., 2012), because southern MNCs have demonstrated economic success and inventive capacity by building new knowledge and practices (Duport, 2014). This new knowledge and practices could thereafter be disseminated in the host economy (Ben Hamida and Khairallah, 2014).

In this context, we need to investigate whether southern MNCs investment may benefit local economies in Europe. We concentrate on regional spillover effects from southern MNCs FDI activities and test these effects in the context of the Swiss service/construction industry[2]. To the best of our knowledge, very little attention has been given to spillovers from southern MNCs to developed host economies. The contribution of this study lies in demonstrating how local and foreign characteristics jointly determine spillover productivity outcomes in Swiss regions. We argue that, firstly, the effects of regional spillovers are significantly influenced by the type of FDI motivation of southern MNCs, and secondly, possible interactions between FDI motivations and local technological capacities may have different spillover effects on local firms productivity.

We posit that on the one hand, southern MNCs FDI motives impact regional spillovers the same way as conventional explanations. On the other hand, these effects are co-determined by the interaction between FDI motives and local technological capacities. High and low technology firms do not enjoy the same benefit from the presence of southern MNCs in their region. We hypothesise that:

a   spillover benefits from the presence of KE-southern MNCs in the region leads to higher productivity improvement in low technology firms

b   regional spillovers from KS FDI provide higher productivity improvement in high technology firms.

Our contribution lies in linking local inter-firm differences in productivity spillover effects to FDI motivations of southern MNCs and testing regional spillover effects in the service/construction industry.[3]

Following this introduction, the next section discusses theoretical and empirical frameworks underlying our hypotheses. In Section 3, we introduce the model we use to test spillovers from southern MNCs. Section 4 analyses Swiss data. Section 5 discusses regression results and Section 6 concludes the paper.

2   Theoretical framework

An increasing number of studies have analysed spillovers from northern or advanced economies to southern/northern economies, whilst, to the best of our knowledge, little attention has been paid by scholars to study these effects from southern MNCs to northern economies, particularly, concerning Europe. Our study focuses on the resultant effect of southern MNC investment in terms of regional spillovers in Switzerland. We use a theoretical framework linking local technological heterogeneity to knowledge mandates of southern MNCs affiliates. Sub-section 2.1 highlights the need to assess spillovers at the regional level. Sub-sections 2.2 and 2.3 discuss theoretical and empirical frameworks underlying our hypotheses.

2.1   On the role of regional effect

When spillover effects are measured for local firms in all regions (i.e. at a national level), the regional benefits might not be observed if they are too small to offset the overall negative effect across all regions[4] (Aitken and Harrison, 1999). Learning is expected to be highly localised (Yildizoglu and Jonard, 1999) and spillovers are geographically bound.

Technological interaction among firms is deeply rooted in regional space (Menghinello et al., 2010). Spillovers tend to be captured, firstly, by local firms located in the same region as foreign affiliates and may gradually spread to other, more distant ones (Aitken and Harrison, 1999). Firms in the same location/region tend to follow the same technological trajectory wherein technological disparities are expected to be smaller, since MNCs are more likely to establish affiliates in more competitive regions (Dunning, 1992). In addition, knowledge is transmitted more efficiently by local proximity and its transmission costs are assumed to increase with distance (Audretsch, 1998). Local firms in the same region observe and imitate foreign technology more efficiently than others. The channels of technological diffusion are reinforced at regional level (Crespo et al., 2008).

Despite these regional arguments, existing results for regional spillovers are rather mixed for country analyses. For example, Aitken and Harrison (1999), Driffield (2004), Higón and Vasilakos (2011), Liu and Wei (2006) and Xu and Sheng (2012) found evidence for regional spillovers; whereas, Halpern and Muraközy (2005), Sjöholm (1999), Kokko and Kravtsova (2012) and Lin and Kwan (2014) failed to confirm that regional dimension matters. This heterogeneity on regional spillover findings could be a result of misspecification of these effects which are conditional on a number of factors.

We argue that local and foreign firms characteristics, as well as, their interactions jointly determine regional productivity outcomes. In the following sub-sections we put forward the role of FDI motivations and local technological characteristics in assessing regional spillovers from southern MNCs.

2.2   On the role of foreign characteristics

MNCs make foreign investment that either assist them in exploiting existing technological capabilities or enable them to build new competences, new knowledge sources and augment their asset base. Foreign units which rely on the centralised knowledge pool of the MNC and focus on activities which are adaptive in nature, have

been referred to as knowledge exploiting (KE) or home base exploiting units (Kuemmerle, 1997; Cantwell and Piscitello, 2005). In contrast, units motivated by the objective to source available knowledge in foreign markets and create new technologies and capabilities have been referred to as knowledge seeking (KS) or home base augmenting units.

We posit that different types of FDI motives have markedly different sizes of spillovers. Foreign firms motivated by exploiting their existing knowledge abroad, actively contribute to the transfer of new technologies to the host country and then to the expansion of local spillover benefits. Such units usually attempt to adapt the technology created by the parent company or other units to meet needs and preferences in the host market. Therefore, they are less interested in identifying and using knowledge and technologies from the location in which they operate. However, MNCs' activities as a means of acquiring host country's knowledge enjoy the benefit of absorbing technology spillovers from local firms. The knowledge-seeking view suggests that firms may expand abroad in search of capabilities complementary to those available in their home markets (Ben Hamida and Piscitello, 2009, 2010; Cantwell, 1989). Southern MNCs compared to local firms in advanced economies are assumed to not possess strong tangible assets and often pursue strategic asset-seeking FDI in these markets. Awate et al. (2015) compared the R&D internationalisation of emerging market MNCs to that of advanced economy multinationals and found that they have different processes in which the strategy of the former is to catch up with industry leaders while the latter create competence and exploit activities. Makino et al. (2002) found that firms from newly industrialised economies tend to invest in developed countries when they have strategic asset-seeking and market-seeking motivations, moreover in least developed countries when they have labour-seeking motivations. The motivation to carry out strategic asset seeking FDI decreases or even disappears when local firms in the host country lag behind emerging market MNCs in technology (Wang et al., 2014) and when home country knowledge base is at a lower level (Elia and Santangelo, 2012).

Zhan (1995), Buckley et al. (2007) and Milelli and Hay (2008) pointed to a market-seeking objective before an asset-seeking one, as the main driver in the arrival of emerging market MNCs in Europe, in particular Chinese and Indian firms. However, Deng (2007) found that Chinese MNCs are broadly motivated by strategic resources and capability seeking activities in order to offset competitive disadvantages and to leverage their unique ownership advantages (Rui and Yip, 2008).

To sum up, southern MNCs seem to be primarily motivated by market seeking FDI in Europe. In this regard, since the literature considers the access to the market as knowledge exploiting motivation, southern foreign affiliates in this case are assigned knowledge exploiting mandates. In addition, the literature has shown that southern MNCs are broadly motivated by seeking knowledge in European host economies. They accumulate competences and offset competitive disadvantages in given host economies to leverage ownership advantages (Milelli and Hay, 2008). This catching-up process with advanced economy MNCs allows them to move as fast as possible from imitation to innovation by obtaining the appropriate lessons through repeated practices (Mathews, 2006). In doing so, southern MNCs would be able to develop new competences and technologies which could thereafter be a valuable source of knowledge for local European firms.

A great number of studies have analysed spillovers for the host economy according to FDI motivations, but without distinguishing between southern MNCs and advanced

economy firms and concerning mainly manufacturing industry. For example, Driffield and Love (2006) found that spillover effects are positive when FDI is motivated by the desire to exploit some competitive advantages possessed by the UK over the period 1984–1995 and negative when FDI is motivated by the desire to access the technology of UK manufacturing firms. This result seems to be confirmed by the work of Girma (2003), using more recent UK manufacturing data between 1989 and 1999. Both studies have used R&D intensity (RDI) as a proxy to identify KE and KS affiliates. That is if RDI of the home country is less than RDI of the host country, foreign firms are considered knowledge seekers; otherwise they are knowledge exploiters. Moreover, Driffield and Love (2007) showed, using datasets of FDI flows into the UK from 30 countries over the period 1987–1997, that technology-sourcing FDI led to no spillovers. UK firms gain substantial spillover benefits only from FDI motivated by a strong technology-based ownership advantage.

A similar differentiation between asset-seeking (technology sourcing) and asset-exploiting (technology exploiting) motivations was used by Marin and Sasidharan (2010) who found, however, that firms oriented to technologically creative activities have significant and positive effects in India, while firms oriented mostly to technologically exploitative activities generate negative effects in some circumstances. They distinguish between competence creating (CC) and competence exploiting (CE) firms using R&D and export intensities. They define competence creating firms as those investing heavily in R&D and having a high export intensity, otherwise firms are considered as competence exploiters. These findings seem to be confirmed by Ha and Giroud (2015) for Korea. In a similar vein, Cantwell and Smeets (2013) claimed that the productivity effects of technology seeking inward FDI may indeed be expected to be positive, and are at least as likely to occur as those of technology exploiting FDI. Their finding seems to support their claim at industry level data for 13 OECD countries from US MNCs.

In this context, our paper recognises that the nature of knowledge transferred from southern MNCs to the local economy would differ according to FDI motivations of these firms and consequently provide differences in learning and regional spillover results. This points to the following hypothesis:

H1   Regional spillovers from southern MNCs in Switzerland differ based on the motivations of the southern MNCs.

2.3   *On the role of local characteristics*

We believe that successful transfer of knowledge requires local receiving units to have a certain degree of technological capacity to be able to successfully absorb foreign knowledge. In other words, low technological capacity may thwart critical learning processes at the firm which in turn would not benefit from new technologies (Cohen and Levinthal, 1989; Michel and Narula, 2009; Piscitello and Rabbiosi, 2004). Technologies have a certain firm-specific aspect to them and then need to be decoded in order to be efficiently used by local firms, raising their productivity. In addition, the wealth of local human capital contributes significantly to successfully internalising foreign technologies and enhances the knowledge base of local firms (Borensztein et al., 1998; Meyer and Sinani, 2005).

Foreign affiliates are not only considered as purely technological containers of strategic assets, transferred by the parent company and other MNCs' units, but they are

supposed to adopt a more technologically active behaviour, particularly, when they have been assigned the role of knowledge seekers. Knowledge exploiting FDI units usually attempt to adapt the technology created by other MNCs' units to local preferences, whereas knowledge seeking FDI units tend to source new knowledge and augment their asset base.

Local firms are required to adapt their learning process to benefit from spillovers of foreign affiliates, which in turn depends on their technological level. Foreign firms from advanced economies which are active in knowledge exploiting activities contribute to augmenting the knowledge base of the host country by bringing the best new ideas and processes from the rest of the corporation. In this case local firms may need to have sufficient technological capacity to be able to recognise valuable new knowledge, integrate it into the firm and use it productively. Knowledge seeking FDI units may also contribute to the local knowledge base by developing new technologies and products based on the local knowledge reservoir. These competences and technologies could be a valuable source of knowledge for the host economy. Local firms in this case may also need to have sufficient technological capacities to benefit from spillovers.

Southern MNCs compared to advanced economy firms are assumed not to have ownership advantages since their home country knowledge base is smaller than that of developed European economies[5]. In this respect, we argue that local firms with high technological capacity do not have interest in looking at southern MNCs' knowledge. They would not abandon their existing pattern of innovation and imitate the technological knowledge of foreign competitors (Cantwell, 1999; Silverberg and Verspagen, 1994). They would rather work harder and gain spillovers through competition effects. However, low technology firms, which are at a similar knowledge level and/or lag far behind southern MNCs, try to find a way to acquire southern MNCs' new knowledge to be able to successfully compete with them in their region. Therefore, we expect that spillover benefits from the presence of KE-southern MNCs in the region with market seeking objectives leads to higher productivity improvement in low technology firms than high technology ones.

Conversely southern MNCs motivated by accumulating intangible assets need to absorb local knowledge by acquiring local firms and/or sourcing knowledge spillovers. In doing so, these firms are highly likely to become more efficient and develop new competences which could afterwards spill over to local firms. As stated by Ha and Giroud (2015, p.3), "CC subsidiaries maintain frequent and close contacts with local business partners, allowing a conduit for reciprocal knowledge exchange between the MNE and host-country firms, facilitating subsidiary learning from local entities and enhancing knowledge and technology spillovers from subsidiaries to local entities".

Accordingly, high technology firms which are in a position to compete fiercely with more efficient southern MNCs in their region are expected to gain higher benefits than low technology ones. Low technology firms may need to upgrade their human capital to be able to decode and successfully absorb foreign knowledge, since knowledge in the service industry is much more embedded in human capital (Ben Hamida, 2011).

We believe then that interactions between MNCs' investment motives and local technological capacities would be considered important in understanding how local firms benefit from the presence of southern MNCs in their region. These interactions might influence the size and the extent of the potential regional spillover benefit that local firms might enjoy.

These arguments are described in Table 7 and point to the following hypotheses:

H2   Interactions between different technological capacities of local firms and the motivations of southern MNCs to invest in Switzerland provides differences in how local firms benefit from regional spillovers.

    H2a   Spillover benefits from the presence of KE-southern MNCs in the region leads to higher productivity improvement in low technology firms than high technology ones.

    H2b   Spillover benefits from the presence of KS-southern MNCs in the region leads to higher productivity improvement in high technology firms than low technology ones.

3   The model

We model the effect of regional spillover from southern MNCs within the context of a production function, in which the natural log value added of the ith local firm is determined as follows;

$$\begin{aligned}
LnY_{i,j} = &\ \alpha_0 + \alpha_1 LnL_{i,j} + \alpha_2 LnK_{i,j} + \alpha_3 FP_{j,r} + \alpha_4 FP_{j,R-r} + \alpha_5 HC_{i,j} \\
&+ \alpha_6 FP_{j,r} * HC_{i,j} + \alpha_7 FP_{j,R-r} * HC_{i,j} + \alpha_8 Camp_{i,j} \\
&+ \alpha_9 Industry_j + \alpha_{10} Region_r + \varepsilon_{i,j,r}
\end{aligned} \tag{1}$$

where the subscripts i and j denote firm and industry, and α_0 to α_{10} are the parameters to be estimated. Table 1 describes the variables and their measurements.

Table 1   Variable definitions

Variable	Definition
$LnY_{i,j}$	The log in value added in a firm measured by the difference between total sales and intermediate consumption, calculated for 2010.
$LnK_{i,j}$	The log in physical capital, measured by gross capital income (the difference between firm's total sales and costs in terms of intermediate consumption and labour, 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.
$FP_{j,r}$	The share of total sales in an industry j within the region r accounted for by foreign firms, $r = 1 \ldots R$, with $R = 7$.
$FP_{j,R-r}$	The share of total sales in an industry j outside the region r accounted for by foreign firms.
$HC_{i,j}$	The labour cost of the firm, calculated for 2010 (in 100,000s of CHF).
$Comp_{i,j}$	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 labour productivity of foreign-owned firms to local firms' own labour productivity, calculated for 2010.
$K\text{-}motiv$	The average of external innovation-relevant knowledge sources, calculated for 2010 (five-point intensity scale).[a]

Note: [a]External sources could be rival firms, customers, suppliers, universities, and patent disclosures.

Y denotes value added at firm level, *K* its physical capital measured by the gross capital income, *L* its employment measured by the number of employees, and *HC* the level of its human capital proxied by the labour cost calculated for 2010, this measurement allows to test whether local firms succeed in absorbing foreign knowledge when they invest in human capital (namely, training and/or recruitment). The coefficients of these variables are expected to be positive and significant.

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

Following regional spillover studies, we include in equation (1) regional foreign share, $FP_{j,r}$, and that from outside the region, $FP_{j,R-r}$, in order to test for regional aspect. Regional foreign share is measured as the share of sales of foreign firms in the industry within the region, which is used as a proxy of regional spillovers. In addition, we employ two interaction terms $FP_{j,r} * HC_{i,j}$ and $FP_{j,R-r} * HC_{i,j}$ between the level of local human capital and the shares of foreign presence in the region and from outside the region, respectively. We expect that increases in skills will augment the productivity of local firms since this affects their knowledge capital and enhances their learning capacity (Griliches, 1998; Narula and Marin, 2003). The regions considered here are; the Lemanic region, Mittelland space, North West Switzerland, Zurich, Western Switzerland, Central Switzerland, and Ticino[6]. We also include regional dummies, Region, to account for agglomeration effects that may result in an upward bias of a region-specific spillover coefficient, since some foreign firms could be attracted to regions which benefit from agglomeration economies (Aitken and Harrison, 1999).[7]

We use price mark-up to capture the effect of competition which could be induced by the entry and presence of southern MNCs.[8] Following Narula and Marin (2003) and Chung (2001), we measure the firm's price mark-up by the difference between firm's sales and costs over total sales. When mark-up is high, i.e. a value near 1, competition is low and when mark-up is low, i.e. a value near 0, competition is high[9]. A negative estimated coefficient 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 1, we divide the full sample of local firms into two sub-samples characterised by the type of FDI motivation and we estimate equation (1) separately for local firms with knowledge exploiters and local firms with knowledge seekers. Prior studies have mostly used country R&D intensity (RDI) to distinguish between FDI motives, given that MNC represents, at least on average, the areas from which it originates. If RDI of home country < RDI of host country; foreign firms are considered knowledge seekers; otherwise they are knowledge exploiters[10]. Recently, Cantwell and Smeets (2013, p.177) recognised that "leaders, and not laggards, are more likely to engage in technology seeking FDI". They suggested that "distinguishing between technology seeking and technology exploiting FDI should preferably go beyond the use of relative R&D intensities" (p.179).

We agree with this argument and suggest in addition that firms investing in other types of FDI rather than R&D might use their foreign units to seek local knowledge. Accordingly, we prefer using a measurement 'K-motiv' that clearly points to the importance a southern MNC attaches to local knowledge sources.[11] This could indicate

whether they are looking for local knowledge. According to the KOF survey we use in this study, southern MNCs could source local knowledge from their counterparts, their customers, their suppliers, local universities, and patent disclosures. Firms, regardless of the type of their FDI, reveal high importance of local knowledge sources show high values of 'K-motiv' that are larger than the average five-point scale[12]. This demonstrates that foreign firms attach high importance to the knowledge reservoir of the host country and are expected to invest in knowledge seeking and learning. However, low importance (values smaller than or equal to the average five-point scale) indicates that foreign firms are not highly interested in sourcing local knowledge and that their FDI motive would be rather market seeking or knowledge exploiting activities.

In order to test the effect of the interaction between FDI motivations and local technological capacities, we employ technological gaps of local firms, *Gap*, compared to their foreign counterparts in order to measure existing technological capacities of local firms. *Gap* is defined as the ratio of the average labour productivity of foreign-owned firms in the relevant two-digit industry to a local firm's own labour productivity, calculated for 2010. *Gap* is equal to 1 if local firms operate at the same labour productivity as the average-level of its foreign rivals. We distinguish between high and low technological capabilities as follows; values that are smaller than 1 are interpreted as indicators of small productivity gaps (high technological capacity). Values that are higher than or equal to 1 are interpreted as signs of large productivity gaps (low technological capacity). Then we divide the two sub-samples of local firms with knowledge exploiting FDI and with knowledge seeking FDI into four sub-samples characterised by high and low existing technological capacities of local firms.

4   Data analysis

Data used in this paper is derived from innovation activity survey (2011) of service/construction firms, with at least five employees, conducted at the Swiss Institute for Business Cycle Research (KOF)[13]. Individual information covers the technological behaviour and productivity performance of local and foreign firms in 2010. It also includes data on the name of the firm's home country we used to determine southern foreign affiliates.

Tables 2, 3, and 4 present a summary of the sample and descriptive statistics of the relative FDI trend of all foreign firms in Switzerland versus southern firms. All these calculations are based on weighted datasets to give a representative picture of the Swiss economy[14]. Table 2 illustrates the importance of FDI for regional development in Switzerland in 2010. It shows some variations in the share of foreign firms across regions in total employment and total sales. When all foreign firms are considered, foreign share was pre-eminent in Zurich in total employment (22.9%) and in the Lemanic region in total sales (61.5%), while Mitteland space experienced the smallest share in both employment and sales. When focusing on southern MNCs, the regional distribution becomes different where the highest shares are reported by Ticino in total employment and by western Switzerland in total sales, while the smallest share remains in Mitteland space.

Table 2 FDI participation in services/construction in Switzerland: regional shares of foreign firms (percent)

Region	Total employment	Total employment	Total sales	Total sales
	All foreign firms	Southern firms	All foreign firms	Southern firms
Lemanic region[a]	18.047	0.799	61.573	1.004
Mittelland space[b]	4.371	0	10.977	0
North West Switzerland[c]	10.582	0.019	17.844	0.013
Zurich	22.863	0.637	27.643	0.341
Western Switzerland[d]	7.718	1.078	17.276	3.8
Central Switzerland[e]	14.287	0.110	57.174	0.049
Ticino	16.585	1.373	16.817	0.328

Notes: [a]Lemanic region includes the cantons of Vaud, Valais, and Geneva.
[b]Mittelland space includes the cantons of Bern, Fribourg, Jura, Neuchâtel, Solothurn.
[c]North West Switzerland includes the cantons of Aargau, Basel-Stadt, and Basel-Landschaft.
[d]Western Switzerland includes the cantons of Appenzell Ausserrhoden, Appenzell Innerrhoden, Glarus, Graubünden, Schaffhausen, St-Gallen, and Thurgau.
[e]Central Switzerland includes the cantons of Lucerne, Nidwalden, Obwalden, Schwyz, Uri, and Zug.

Source: Authors' calculations of data derived from KOF innovation surveys (2011) of services/construction firms

Table 3 Labour productivity and human capital development: difference between foreign and local firms (2010): ratio of the mean of the foreign variable to the mean of the corresponding local variable

Sector: services/ construction	Labour productivity	Labour productivity	Labour quality[a]	Labour quality[a]
	All foreign firms	Southern firms	All foreign firms	Southern firms
Services/construction	1.942	1.119	1.767	1.284
Wholesale trade	2.186	2.027	2.594	3.562
Retail trade	1.347	0	1.530	1.462
Hotels/catering	1.244	0.711	1.247	0.213
Transport	1.640	0.860	1.368	2.997
Telecommunication	1.807	1.465	0.420	0.797
Banking/Insurance	1.757	0.618	1.155	0.701

Note: [a]The ratio of professionals – engineers, mangers, and all other professionals in diverse firm's activities – to non-professionals.

Source: Authors' calculations of data derived from KOF innovation surveys (2011) of services/construction firms

Table 4   Importance of external innovation-relevant knowledge sources in Switzerland (five-point intensity scale)[a]

Industry	External innovation-relevant knowledge sources	External innovation-relevant knowledge sources
	All foreign firms	*Southern firms*
Services/construction	2.4	2.6
Construction	2.6	4
Wholesale trade	2.4	2.2
Retail trade	2.1	2.3
Hotels/catering	2	2
Transport	2.2	2.2
Telecommunication	2.5	3.2
Banking/insurance	2.7	3

Note: [a]External sources could be rival firms, customers, suppliers, universities, and patent disclosures.

Source: Authors' calculations of data derived from KOF innovation surveys (2011) of services/construction firms

Table 3 reported the relative position of foreign affiliates relative to local firms in terms of labour productivity and labour quality in 2010. The data for the aggregate suggests that foreign firms hired more professionals, the quality of their labour force was higher. The high level of labour quality was also perceived in southern affiliates relative to similar local firms. Across sectors, the results show that foreign firms hired more professionals in sectors such as wholesale trade, while local firms dominate in sectors such as telecommunication. These results remain relevant for samples with only southern MNCs. The high quality of labour of southern affiliates, at the aggregate level and in some sectors, confirm to some extent that these firms invest in human capital development by recruiting more professionals who could develop new knowledge and technologies. The difference at the aggregate level in terms of productivity denotes the industrial technological gap between local and foreign firms, which is in favour of foreign firms. This result also fits with southern firms showing their relative performance vis-à-vis local firms. Nevertheless, when sectors are considered individually the results using only southern MNCs change considerably and show that in some sectors the gap is small while in others is very high. In wholesale trade and telecommunication for example southern firms perform better than local ones while in transport and banking/insurance local firms perform better.

Table 4 shows the importance of external innovation-relevant knowledge sources in Switzerland as described by foreign firms in 2010. We use this variable to identify knowledge seeking and knowledge exploiting foreign firms. As previously explained, values higher than or equal to 2.5 (the average five-point scale) are interpreted as a sign of KS FDI, otherwise KE FDI. The data for the aggregate indicates that on average, all foreign firms invest in KE FDI while southern MNCs invest in KS FDI. However, across sectors, southern MNCs behave the same way as all foreign firms since the results reported in Table 3 are markedly the same for all foreign affiliates and for southern MNCs. Foreign firms, with strong intensity in southern MNCs, are seeking local knowledge in construction, telecommunication, banking and insurance. They are

exploiting their knowledge transferred from the home country or seeking new markets in sectors such as; wholesale trade, hotel and catering, and transport.

To sum up, southern MNCs invest in Switzerland in KS FDI in service industries that have achieved competitive technological levels and invest in KE FDI in other sectors[15]. We argue that the diverse FDI motivations of southern MNCs might provide differences in spillover results. We test these effects in the next section at the regional level since learning is highly localised.

5 Empirical results

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

In regression 5.1 of Table 5, we test the effect of regional spillovers from all southern MNCs on the productivity of local firms in the Swiss service/construction industry, while regressions 5.2–5.6 report regional spillover results according to FDI motivations of southern MNCs and technological capacities of local firms. For all regressions, the value added of local firms in the Swiss service/construction industry significantly increases with their employment, their physical capital and their human capital, except regressions 5.2, 5.4, 5.6, and 5.7 for physical capital.

Table 5 Spillover results for services/construction using OLS: the role of FDI motivation and local technological capacity

	Full simple	Knowledge exploiting FDI	Knowledge exploiting FDI low GAP	Knowledge exploiting FDI high GAP	Knowledge seeking FDI	Knowledge seeking FDI low GAP	Knowledge seeking FDI high GAP
	5.1	5.2	5.3	5.4	5.5	5.6	5.7
LnK	0.023**	0.028	0.501***	0.026	0.013*	0.007	0.025
LnL	1.001***	0.982***	0.5***	0.988***	1.011***	0.994***	1.01***
HC	0.83***	1.33***	0.6***	1.5***	0.708***	0.442***	0.96***
$FP_{j,r}$	0.011	0.112***	0.043**	0.074**	0.006	0.016**	0.137***
$FP_{j,R-r}$	−0.063***	−2.85***	−0.037	−0.608***	−0.063**	−0.33***	−0.144
$FP_{j,r} * HC$	0.043**	0.15	0.182***	0.143	0.036**	−0.025	0.21***
$FP_{j,R-r} * HC$	0.3***	0.47	−0.155	1.183**	0.356***	0.408***	0.25
$Comp$	1.514***	1.603***	−0.304**	1.509***	1.85***	1.527***	1.251***
$Industry$	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$Region$	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$\bar{R}^2$	0.966	0.978	0.998	0.974	0.975	0.986	0.98
N	627	253	82	171	374	200	174

Notes: All estimations include industry dummies. All standard errors (shown in parentheses) are corrected for heteroscedasticity. Variables (HC and FP) used for interactions are centred by subtracting the full sample means, so that multicollinearity 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).
*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 6   Hypotheses and estimated results

Hypotheses	Regressions	
	Services/construction	*Support(S)/not support(N) hypotheses*
H1	4.2, 4.5	S
H2	4.3, 4.4, 4.6, 4.7	S
H2a	4.3, 4.4	S
H2b	4.6, 4.7	N

Using the full sample of local firms in regression 5.1, the estimated coefficients of $FP_{j,r}$ is positive and insignificant, that of $FP_{j,R-r}$ is negative and significant, while those of $FP_{j,r} * HC_{i,j}$ and $FP_{j,R-r} * HC_{i,j}$ of are positive and significant. This indicates that local firms in the service/construction industry need to upgrade their human capital to reap the benefits from the presence of southern firms in their region and from outside the region.

To test our Hypothesis 1, we divide our full sample of local service/construction firms into two sub-samples of local firms where southern firms are assigned knowledge exploiting and knowledge seeking mandates. Compared to the regression results for the full sample of local firms, regressions 5.2 and 5.5 report different results in which the estimate of becomes positive and highly significant when FDI is defined to be KE type and remains insignificant with KS FDI[16]. This finding confirms the result of, among others, Driffield and Love (2006, 2007), Girma (2003), Higón and Vasilakos (2011) and Xu and Sheng (2012) demonstrates that only FDI with KE motive induce positive knowledge diffusion and regional spillover benefits. The benefit for local firms with KS FDI needs to be co-determined by the level of human capital and seems to be larger from southern firms located outside the region. These findings corroborate our Hypothesis 1, in which regional spillover effects are markedly different when southern MNCs invest in KE FDI or KS FDI.

In regressions 5.3 and 5.4, and regressions 5.6 and 5.7, we split up the two sub-samples of local firms with KE FDI and KS FDI into four sub-samples according to the level of the technological gap between foreign and local firms 'GAP' and we make various tests of regional spillover effects using equation (1). As it is clear from the table, high and low technology firms succeeded in capturing positive and significant regional spillover effects, and low technology firms enjoyed the highest benefit particularly when they increase their human capital. This finding holds true when southern MNCs invest in KE and when they invest in KS FDI (regression 5.4 and 5.7, respectively). Our finding confirms Hypothesis 2a however, not Hypothesis 2b.

The estimated coefficient of $FP_{j,R-r}$ remains negative for regressions 5.2–5.7, demonstrating that local firms do not benefit from the presence of southern MNCs outside their region. This negative impact could be interpreted as reverse spillovers (Chen et al., 2012). Productivity response with $FP_{j,R-r}$ becomes positive only when local firms upgrade the level of their human capital, particularly low technology firms with KE FDI and high technology firms with KS FDI.

In addition, we find in regression 5.3 that local firms with high technological capacities and KE FDI enjoy spillovers from competition mechanism since $Comp_{i,j}$ is negative and significant. They also take higher advantage from the presence of KE FDI in their region when they upgrade their human capital. These findings imply that KE FDI contributes to transferring new technologies to the host country and consequently force

high technology local firms to be more competitive by introducing these technologies and/or by working harder. By strengthening the skills and know-how of their employees (via training and/or recruitment), local firms might find a way to successfully absorb foreign knowledge and reap large benefits from the presence of southern KE FDI. These benefits could be interpreted as an indicator 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 experience in southern MNCs (Ben Hamida, 2007, 2011; Mody, 1989).

These findings confirm our Hypothesis 2 in which interactions between different technological capacities of local firms and the motivations of southern MNCs to invest in Switzerland provides differences in the way local firms benefit from regional spillovers.

6   Conclusions

The effect of FDI spillovers from southern MNCs on productivity performance of advanced host countries is a challenging research topic. Southern MNCs are increasingly investing in advanced countries, in particular Europe, moreover this investment is viewed with a mixture of hope and fear from European host countries. There is a need to analyse the contribution of this investment in local development, since many governments pay special attention to spillover benefits when measuring the successful performance of their FDI policies.

This paper argues that spillovers are highly localised and analyses these effects at the regional level of the Swiss service/construction industry. It suggests that

a   southern MNCs FDI motives impact regional spillovers

b   these effects are co-determined by the interaction between FDI motives and local technological capacities.

On average, our results support conventional theories and demonstrate that only FDI with KE motive induces positive knowledge diffusion and regional spillover benefits. However, when considering local technological heterogeneity, high- and low technology firms do not use the same trend to benefit from the presence of southern MNCs in their region. Spillover benefits from the presence of KE southern MNCs in the region lead to higher productivity improvements in low technology firms than high technology ones. Conversely, we do not have supportive results of the fact that regional spillovers from KS FDI provide higher productivity improvement in high technology firms than low technology ones.

On the policy front, suggestions with respect to attracting FDI, following such findings, must consider that FDI spillovers from southern MNCs occur in the region and outside the region and largely depend on the existing levels of local technological capacity and FDI motives. Meaning that high- and low technology firms do not follow the same learning process. Their technological behaviour vis-à-vis southern MNCs is co-determined by FDI mandates of foreign affiliates. In addition, local firms regardless of their technological capacities, need to upgrade the level of their human capital to absorb the knowledge of southern MNCs and gain larger effects. Actions should then consider this technological heterogeneity of local firms and support their learning process by helping them to upgrade their level of local human capital. Encouraging collaborations

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, so as to contribute to successful local learning.

Table 7   Regional spillovers and the interaction between FDI motivation of southern MNCs and local technological capacity

		Southern MNCs FDI motivations	
		Knowledge exploiting FDI	*Knowledge seeking FDI*
Local technological levels	High technological level	Small regional spillovers	High regional spillovers
	Low technological level	High regional spillovers	Small regional spillovers

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Notes

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 income (transition and developing countries) based on the classification of the World Bank in 2011. Latvia has changed in July 2011 from high income to upper middle income country (World Bank, 2011). Israel registered in 2010 the highest relative income poverty rate in developed countries (OECD, 2013). This is the reason why it appears among these economies.

2   It is argued that foreign direct investment of southern MNCs in Europe is in services (Sauvant et al., 2009).

3   Our study tries to bridge the gap by testing spillovers for services/construction industry since a small number of studies have analysed spillovers in the service industry (namely, Hale and Long, 2006; Svejnar et al., 2007; Mariotti et al., 2013, 2015).

4   Kokko and Kravtsova (2012) highlighted the need to take into account regional differences when analysing the impact of inward FDI on the local economy. Girma and Wakelin (2002) indicate in addition that more-developed regions gain more from spillovers than others.

5   It is argued that home country characteristics determine FDI motivation of foreign affiliates (Buckley et al., 2007).

6   We use the regional classification of the KOF institute.

7   We use seven regional dummies.

8   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 operate through either a more productive use of existing technologies and resources or an assimilation of foreign technologies (competition-related spillovers). The latter may result from demonstrating new foreign knowledge and/or trained local workers who later work for local firms (demonstration and worker mobility-related spillovers).

9   It is worth noting that in some cases a higher mark-up may be due to industry specificities (Narula and Marin, 2003).

10   We argue that, in the case of southern economies, RDI would not be a good measurement of FDI motivation since the RDI of these economies is often lower than that of developed countries, which imply that southern MNCs are naturally knowledge seekers when investing in developed countries.

11   'K-motiv' is based on the question number 9.1 of the questionnaire, which clearly asks the firm about the importance it shows in external knowledge sources in Switzerland that could influence its innovation capacity. Different knowledge sources are listed in the survey.

12   Based on 'K-motiv', all knowledge sources have been used to calculate the average five-point scale in order to classify southern firms according to their FDI motivations. However, various robustness tests have been performed using different mean values and with only knowledge sources considered important by southern firms for their innovation capacities. The classification results remain constant.

13   Questionnaire can be downloaded from http://www.kof.ethz.ch (Industrieökonomik), however, the firm-level data is unpublished and highly confidential.

14   The weights used to correct for the selection bias resulting from 'unit' non-response and for the deviations of the sample structure from that of the underlying population.

15   Switzerland has achieved competitive technological levels in many service industries such as; insurance and banking (Robinson and Schweizer, 2006).

16   We tested regression 5.2 and 5.5 using the share of highly qualified workers as a measurement of human capital. Our finding holds true, in which only FDI with KE motive induces positive knowledge diffusion and regional spillover benefits.

Appendix

The model

Equation (1) is derived from a Cobb-Douglas production function with value-added Y a function of two inputs, capital and labour,

$$Y_{i,j,t} = A_{i,j,t} L_{i,j,t}^{\alpha_1} K_{i,j,t}^{\alpha_2} \tag{A1}$$

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 ith firm, we can rewrite equation (A1) for $t = 2010$

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

The hypothesis that productivity is affected by the shares of foreign presence in the region and outside the region, their interactions with human capital of the ith firm, and the level of industry competition, is tested as;

$$\begin{aligned} a_{i,j,t} = &\ \alpha_3 FP_{j,r,t} + \alpha_4 FP_{j,R-r,t} + \alpha_5 HC_{i,j,t} \\ &+ \alpha_6 FP_{j,r,t} * HC_{i,j,t} + \alpha_7 FP_{j,R-r,t} * HC_{i,j,t} \\ &+ \alpha_8 Comp_{i,j,t} + \alpha_9 Industry_j + \alpha_{10} Region_r + \varepsilon_{i,j,r} \end{aligned} \tag{A3}$$

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