Local firms spillovers from multinationals' exports in Switzerland

Efectos indirectos de las exportaciones de las multinacionales en Suiza en las empresas locales

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Abstract

This paper aims to examine how local firms can learn from the export activities of large multinational corporations (MNCs). Arguing that MNCs' export activities could act as catalysts for local firms, allowing them to start exporting or intensify their export volume, we hypothesize that the size and extent of export spillovers depend on the linkage between local firms and MNCs, the geographical distance between them in the home country, and the foreign export market destination in terms of psychic distance from the home market. Using Swiss manufacturing firm-level data, we found support to this learning by exporting effect through which local firms benefit from the presence of MNCs' exporter counterparts and the export activities of their upstream MNCs' suppliers, with particular effects of the nature and the physical location of destinations. From these findings, several important academic and practical implications are exhibited and discussed

Keywords: MNCs; local firms; export spillovers; regional effect; export destination; horizontal and vertical linkages
JEL Classification: F14; F23; F63

Resumen

El objetivo de este artículo es examinar cómo las empresas locales pueden aprender de las actividades de exportación de las grandes empresas multinacionales (MNCs). Argumentando que las actividades de exportación de las MNCs pueden actuar como catalizadores para las empresas locales, permitiéndoles empezar a exportar o intensificar su volumen de exportación, planteamos la hipótesis de que el tamaño y el alcance de los efectos indirectos de la exportación dependen de la vinculación entre las empresas locales y las MNCs, la distancia geográfica entre ellas en el país de origen y el destino del mercado de exportación extranjero en términos de distancia psíquica del mercado de origen. Utilizando datos de empresas manufactureras suizas, hemos hallado pruebas de este efecto de aprendizaje mediante la exportación, a través del cual las empresas locales se benefician de la presencia de empresas exportadoras homólogas de las multinacionales y de las actividades de exportación de sus proveedores de multinacionales, con efectos particulares de la naturaleza y la ubicación física de los destinos. A partir de estos resultados, se exponen y discuten varias implicaciones académicas y prácticas importantes

Palabras clave: MNCs; empresas locales; efectos indirectos de las exportaciones; efecto regional; destino de las exportaciones; vínculos horizontales y verticales
Clasificación JEL: F14; F23; F63

1. Introduction

The theory of endogenous growth suggests that international trade is a driving force for the diffusion and creation of knowledge (Coe et al., 1997). Specifically, knowledge gained by firms from experiencing foreign markets through exports could be transferred to other local firms. This knowledge, in turn, may encourage local firms to export by, for example, reducing the cost of accessing foreign markets—a factor recognized in the international trade literature as crucial in determining firms' export decisions (Wagner, 2007). In this context, multinational corporations (MNCs) are particularly well-positioned to initiate export operations and overcome fixed costs associated with these activities, benefiting from the international network of the entire company (Blomström & Kokko, 1998).

Contacts between local firms and export-oriented multinationals provide knowledge of product technologies, processes, and international market conditions, along with access to foreign marketing and distribution networks. For example, insights into foreign preferences in product design, packaging, and quality contribute to reducing the cost of accessing foreign markets (Blomström & Kokko, 1998). The export operations of multinationals can thus be a valuable source of knowledge for local firms, enhancing their export performances through export spillovers.

This paper investigates the existence of spillovers from local and foreign MNCs' export activities to local firms[1], enabling them to start exporting or intensify their export activities, and subsequently improve their local export performance. Blomström and Kokko (1998) define export spillovers as benefits resulting from the export operations of foreign MNCs, paving the way for local firms to export to the same destination.

Export spillover effects from foreign MNCs have been studied by a number of scholars (Aitken et al., 1997; Choquette & Meinen, 2015; Conti et al., 2014; Greenaway et al., 2004; Koenig et al., 2010; Ruane & Sutherland, 2005). However, the empirical results are rather mixed, and evidence on this kind of spillovers is not conclusive (Harasztosi, 2016; Kinuthia, 2017). For example, Greenaway et al. (2004) supported the finding of positive export spillovers from the foreign affiliates' export operations on the export decision of local firms in the United Kingdom. They also tested export spillover effects on the local firms' export volume but failed to find a significant effect. Ruane and Sutherland (2005) found that the decision by local firms in Ireland to enter the export market is positively associated with the presence of foreign affiliates in their sector, while their export intensity is negatively associated with the export sales ratios of foreign affiliates. Additionally, Barrios et al. (2003) and Park et al. (2003) failed to find evidence supporting the likelihood that local manufacturing firms in, respectively, Spain and Ukraine, will export following the export activities of MNCs' affiliates in the same sectors. Only other foreign affiliates benefit from export spillovers. Barrios et al. (2003) also failed to find evidence on export spillovers from MNCs or from other local firms in Spain between 1990 and 1998.

The mixed results in existing studies can be attributed to the fact that the transfer of knowledge from MNCs' exporters to local firms is not an automatic process. The resulting learning and spillover benefits depend on a variety of key factors. First, it depends on the contact between the sender and the recipient of the knowledge (Choquette & Meinen, 2015). Local firms can enhance their exports by investing in learning activities, such as observing and imitating MNCs' counterparts and/or reinforcing vertical linkages with MNCs' suppliers and customers. Export learning is more likely to be vertical than horizontal. When local products are exported, foreign customers can suggest improvements to the manufacturing process (Grossman & Helpman, 1993). By doing so, foreign customers transmit tacit knowledge and sometimes knowledge from other suppliers (Wei & Liu, 2004). They also tend to transmit prototypes of exported products, knowledge of foreign markets, and provide technical assistance to local users (Minska-Strusik, 2012). The knowledge received by local users would then spill over to other local forms (suppliers or customers) through vertical linkages.

Second, we believe that higher distances (in terms of culture, language, geography, etc.) for some destinations may hamper the path of local international expansion, since export costs increase with destination distances (Conti et al., 2014; Lawless, 2010). The local receiver needs to be located near the MNC sender to be able to observe and effectively absorb foreign knowledge to start exporting to the same distant destinations. Nearby local firms learn more efficiently than more distant ones (Aitken & Harrison, 1999) because the channels of knowledge diffusion are reinforced with proximity (Crespo et al., 2009).

This paper examines how local firms can leverage the export activities of MNCs, particularly in terms of spillovers. We test spillovers in local export propensity and intensity using Swiss manufacturing firm-level data. Switzerland is a compelling subject for our study for several reasons. Firstly, the nation has consistently increased its export volumes over time (BFS, 2023). Secondly, there is a notable absence of research into the potentially beneficial spillover effects of MNCs' exports in the Swiss context. Investigating these effects and understanding their key determinants for Swiss firms holds great promise, providing valuable insights for policymakers in Switzerland on how to foster these advantages and yielding broader conclusions for consideration. We therefore propose components for a research agenda on export spillover benefits from MNCs, underscoring aspects that merit heightened attention.

Following this introduction, Section 2 discusses theoretical and empirical frameworks of export spillovers and introduces our hypotheses. In Section 3, we present the model used to test spillovers from the export activities of foreign and Swiss MNCs to local firms. Section 4 analyzes Swiss data. Section 5 discusses the regression results, and Section 6 concludes the paper by presenting some policy prescriptions derived from our results.

2. Theoretical framework

In this section, we explain the role of international trade as a vehicle for disseminating knowledge and describe how the export operations of Swiss and foreign MNCs could encourage local firms to export or improve their export volume. To do so, we argue that knowledge transfer is not an automatic process, and the resultant spillover benefits from MNCs' exports depend on different key factors. First, it hinges on the nature of linkages between the sender and the recipient of the knowledge. Second, knowledge is transmitted more efficiently when local receivers are located near the MNC sender, allowing them to absorb and effectively use the received knowledge, especially when the export destination is quite distant from the home market.

2.1 On the role of linkages between the sender and the receiver of export knowledge

Local firms can enhance their exports by investing in learning activities, such as observing and imitating MNCs' counterparts and/or reinforcing vertical linkages with MNCs' suppliers and customers.

First, vertical linkages stimulate knowledge transfer. When local goods are exported, foreign customers can suggest improvements to the manufacturing process (Grossman & Helpman, 1993) — they seek suppliers who offer better quality products at a low cost. To achieve this, foreign customers transmit tacit knowledge and sometimes knowledge from other suppliers (Wei & Liu, 2004). They also tend to transmit prototypes of exported products, knowledge of foreign markets, and provide technical assistance to local users (Minska-Strusik, 2012). This knowledge received by local users tends to flow to other local companies (suppliers or customers) through vertical links. Local exporting firms, therefore, create learning opportunities for local suppliers or customers, enabling them to strengthen their export capacity.

Second, increased competition following the presence of MNCs' exporters forces local competitors to work harder, consequently increasing their probability of exporting (Perez, 1997). They seek to exchange knowledge with MNCs' exporters to reduce individual fixed costs for exporting. Knowledge about international markets can be transferred through demonstration-imitation links. Local competitors can also learn to succeed in foreign markets through observation (Ben Hamida, 2013). By having direct contact with exporting MNCs through seminars, working meals, product demonstrations, etc., local competitors can recognize, decode, acquire, assimilate, transform, and efficiently exploit valuable new knowledge (Cantwell, 1989; Cohen & Levinthal, 1989), enabling them to export to the same markets.

Regarding the effects of linkages on export spillovers, Buck et al. (2007) found that the exports of MNCs generate positive export spillovers for China, supporting the hypothesis that knowledge on international markets can be transferred through production links and imitation by local firms. This holds true for both export propensity and intensity of Chinese local firms. Blyde et al. (2004) and Albornoz and Kugler (2008) suggest that spillovers from MNCs' export activities occur mainly across industries and found evidence of export spillovers for local upstream suppliers in Venezuela and Argentina, respectively. Venezuelan local firms also seem to benefit from horizontal spillovers. The evidence for Argentina is more significant from MNC affiliate exporters than local exporters.

Kinuthia (2017) analyzed export spillovers in Malaysia and Kenya. He found evidence from backward linkages on the export decisions of local firms in Malaysia and from demonstration and competition channels in Kenya. However, Nguyen (2008) showed that horizontal and forward linkages are the two main mechanisms of export spillovers from foreign affiliates in Vietnam, whereas local firms did not benefit from backward linkages to enter the export markets or to increase their export value. He also found that export-oriented foreign firms are the unique source of export spillovers in Vietnam. Koenig et al. (2010) added that spillovers on the decision of French local firms to start exporting are stronger when specific by product and destination, and are not significant when considering all products or all products-all destinations. Conti et al. (2014) confirmed that export spillovers through backward linkages are only active when they are destination-specific.

According to the above arguments, we expect the following hypotheses:

H1.a. *Export spillovers on the export decision of local firms are more likely to be vertical (from MNCs' suppliers and customers) than horizontal (from MNCs' counterparts).*

H1.b. *Export spillovers on the export volume of local firms are more likely to be vertical (from MNCs' suppliers and customers) than horizontal (from MNCs' counterparts).*

The next section introduces the importance of considering export destination when assessing export spillovers and highlights the role of geographical proximity in enhancing the exchange of information between MNC's exporter and local firm. These factors are particularly important when local firms need to export to distant destinations (Linnemann, 1996).

2.2 On the role of geographical proximity between the sender and the receiver of export knowledge

Knowledge is transmitted more efficiently when the local receiver is located near the MNC sender. This efficiency is attributed, first, to the assumption that costs associated with transmitting knowledge tend to rise with increased geographical distance (Audretsch, 1998). Geographical closeness between the sender and receiver not only facilitates a smoother exchange of information but also mitigates the challenges and expenses linked to transmitting knowledge across greater distances.

Second, local firms situated in the same region exhibit heightened efficiency in observing and integrating foreign knowledge (Aitken & Harrison, 1999). This efficiency is further accentuated by the tendency of firms within the same region or locality to follow a similar technological trajectory, fostering an environment conducive to more effective learning and adaptation than their counterparts in different regions.

In fact, the concentration of businesses within a region on a comparable technological path not only streamlines knowledge absorption locally but also fortifies channels for regional knowledge diffusion (Crespo et al., 2009). The exchange of international know-how and experience, facilitated by mechanisms such as labor mobility, is more prone to take place within regional borders than beyond them. This regional interconnectedness becomes a catalyst for the seamless exchange of knowledge, establishing a network where the flow of international expertise is more robust and localized. This, in turn, contributes significantly to the overall growth and advancement of businesses within the regional context. Knowledge dissemination is then strengthened at the regional level, and learning becomes even more important.

The importance of proximity to MNC exporters is accentuated for local firms endeavoring to expand into distant markets, considering factors such as cultural differences, language disparities, and geographical distance. The sum of these factors gives rise to the concept of psychic distance, influencing the exchange and interpretation of information between countries (Håkanson & Dow, 2012). This concept, first introduced by Beckerman (1956) and later endorsed by Linnemann (1996), highlights the significant impact of geographic distance on psychic distance. Scholars examining the internationalization patterns of Swedish firms, notably Vahlne and Wiedersheim-Paul (1973), have incorporated additional facets of the target market, including culture, economic development, and the educational profile of its workforce.

We argue that the expenses associated with exporting, especially sunk costs, escalate in proportion to psychic distances. Increased cultural and geographical disparities can impede the trajectory of local international expansion, as noted by Conti et al. (2014) and Lawless (2010). Initial capture of export spillovers typically occurs among local firms situated in the same region as MNCs, gradually extending to more distant entities. Both foreign and local MNC exporters with a multi-market presence serve as valuable sources of knowledge on foreign markets and transport infrastructure. This, in turn, enables neighboring local firms to navigate the challenges of exporting to destinations with significant psychic distances. We argue, therefore, that the magnitude and significance of export spillovers depend on the chosen export destination of the firm.

A few empirical studies have analyzed regional export spillovers. Aitken et al. (1997) led the way in exploring the export spillovers associated with inward foreign direct investment. Using panel data on Mexican manufacturing firms, they found evidence consistent with the role of foreign affiliates as 'catalysts' for local exporters when they are in close proximity. However, the local concentration of export activity in Mexico did not seem to influence the probability that a local firm will export. Koenig et al. (2010) also corroborated the existence of export spillovers influencing export decisions in France from neighboring exporters; however, their findings did not extend to exerting an impact on the volume of exports. On the other hand, Hu and Tan (2016) found positive evidence for nearby local firms in China in terms of the decision to start exporting and the export volume. Hong and Wu (2018) confirm this finding in China, indicating that the probability of Chinese local firms entering new foreign markets increases with the presence of neighboring exporters.

Further investigation is necessary to analyze export spillovers at the regional level in greater detail. In light of the aforementioned arguments, we posit the following hypotheses:

H2.a. *The presence of export spillovers on the export decision of local firms is more pronounced with neighboring MNCs.*

H2.b. *The presence of export spillovers on the export volume of local firms is more pronounced with neighboring MNCs.*

H3.a. *Export spillovers on the export decision of local firms are higher as the export destination's psychic distance increases.*

H3.b. *Export spillovers on the export volume of local firms are higher as the export destination's psychic distance increases.*

3. The model

Following existing empirical studies (Aitken et al., 1997; Choquette & Meinen, 2015; Koenig et al., 2010; Nguyen, 2008), we model the effect of export spillover for the ith local firm as follows:

Regarding the firm's export decision:

$$PR(Export_i = 1) = \phi(\beta + \alpha\, X_i + \gamma\, export\_spillovers_j + \varepsilon_{ij})\ (1)$$

Regarding the firm's export volume:

$$ExportVolume_{ij} = \beta + \alpha\, X_i + export\_spillovers_j + \varepsilon_{ij}\ (2)$$

where the subscripts *i* and *j* denote firm and industry, and *α*, *β*, and *γ* are the parameters to be estimated. Table 1 describes the variables and their measurements.

X_i denotes the vector of firm-level controls, including *I,* the gross investment of the local firm in equipment and structure; *L,* its employment; *Age,* its age[2]; *Invest,* the level of its investment in absorbing foreign knowledge (namely, employees' training and/or recruitment, innovation process, technology); *Comp,* the degree of competition on its principal market as perceived by the firm[3]; and *Gap,* its existing technological capacities. *Gap* and *Invest* control for the absorptive capacity of local firms (Ben Hamida, 2013; Kokko et al., 1996). The coefficients of these controls, except *Gap*, are expected to be positive and significant. We expect the estimated coefficient of *Gap* to be negative and significant since local firms need to have sufficient technological capacities to absorb and use productively foreign market knowledge.

The inclusion of industry and regional dummies, *Dummies*, in equation (1) controls for industry- and regional-specific productivity differences; it corrects for the omission of unobservable variables that might undermine the relationship between export spillover variables and the export decision of local firms (Aitken & Harrison, 1999). Regional dummies also account for agglomeration effects that may result in an upward bias of a region-specific spillover coefficient, as some foreign firms could be attracted to regions benefiting from agglomeration economies (Aitken & Harrison, 1999). The Swiss regions considered here are: the Lemanic region, Mittelland, North West Switzerland, Zurich, Western Switzerland, Central Switzerland, and Ticino.

In equations (3) and (4), we incorporate the export spillover variables *HorizIndExp* (to assess horizontal effects from MNCs' counterparts), *BackIndExp* (to assess spillovers from downstream customers), and *ForwIndExp* (to assess spillovers from upstream suppliers). Additionally, we include *HorizRegExp*, *BackRegExp*, and *ForwRegExp* to capture horizontal and vertical spillovers in the region from neighboring MNCs.

In equation (3), *HorizIndExp* for industry *j* is determined by calculating the share of foreign and local MNCs in the same industry as local firms. Conversely, in equation (4), *HorizIndExp* is quantified as the proportion of export volume attributed to foreign and local MNCs within the same industry.

The backward effects for industry *j* are computed as:

$$BackIndExp_j = \sum_{\forall\, k \neq j} \theta_{j,k}\, HorizIndExp_k\ (3)$$
$$ForwIndExp_j = \sum_{\forall\, k \neq j} \mu_{j,k}\, HorizIndExp_k\ (4)$$

where *μj,k* is the proportion of sector *k*'s output supplied to industry *j*. This measure captures the extent of forward linkages between local firms in downstream customer sectors and foreign firms in upstream supplier sectors. The values of $\theta_{j,k}$ and $\mu_{j,k}$ are obtained from the Input-Output Table of the Swiss economy published by the Federal Statistical Office of Switzerland (BFS).

We examine export spillovers according to the destination market (Hypotheses 3a and 3b). For this purpose, we consider European Union markets, which share closer ties with Swiss firms in terms of culture, language, and geographical proximity, owing to their longstanding economic and cultural relations, as well as more distant markets such as the United States and Asia[4]. Our rationale is that export spillovers may impact local propensity and intensity differently based on the destination market. We anticipate stronger positive effects as

the distance to the export destination increases, particularly when local firms are in close proximity to the MNC's exporter.

Table 1. Variable measurements

Variables	Definition
Dependent variable for export decision	
$Export_i$	Equal to 1 if local firm exports in 2014, 0 otherwise.
Dependent variable for export volume	
$ExportVolume_i$	Total export sales of the firm in 2014.
Firm control variables	
I	Firm's gross investment in structure and equipment, calculated for 2012 (in 10,000,000s of CHF).
L	Firm's total numbers of employees, calculated for 2012 (in 103).
Age	The age of the firm.
Comp	Equals 1 if the firm assesses a high degree of competition (in terms of price, new products, technology, etc.) on its primary market.
Gap	The ratio of the average labor productivity of foreign and Swiss MNCs in the three-digit industry to the labor productivity of local firms, calculated for 2012.
Invest	The level of investment expenditures in new equipment and training activities for product/process innovation from 2012 to 2014.
Spillover variables	
HorizIndExp	Horizontal spillover from MNCs' competitors, calculated as the share of MNCs in the same manufacturing sector as local firms in 2012.
ForwIndExp	Forward spillover from MNCs' suppliers, calculated as the share of MNCs in upstream manufacturing sectors in 2012.
BackIndExp	Backward spillover from MNCs' customers, calculated as the share of MNCs in downstream manufacturing sectors in 2012.
HorizRegExp	Horizontal regional spillover from MNCs' competitors, calculated as the share of MNCs in the same manufacturing sector and region of local firms in 2012.
ForwRegExp	Forward regional spillover from MNCs' suppliers, calculated as the share of MNCs in upstream manufacturing sectors and in the same region of local firms in 2012.
BackRegExp	Backward regional spillover from MNCs' customers, calculated as the share of MNCs in downstream manufacturing sectors and in the same region of local firms in 2012.
$HorizIndExp^{EU}$	Horizontal spillover from EU MNCs' competitors, calculated as the share of EU MNCs in the same manufacturing sector as local firms in 2012.
$ForwIndExp^{EU}$	Forward spillover from EU MNCs' suppliers, calculated as the share of EU MNCs in upstream manufacturing sectors in 2012.
$BackIndExp^{EU}$	Backward spillover from EU MNCs' customers, calculated as the share of EU MNCs in downstream manufacturing sectors in 2012.
$HorizIndExp^{US}$	Horizontal spillover from US MNCs' competitors, calculated as the share of US MNCs in the same manufacturing sector in 2012.
$ForwIndExp^{US}$	Forward spillover from US MNCs' suppliers, calculated as the share of US MNCs in upstream manufacturing sectors in 2012.
$BackIndExp^{US}$	Backward spillover from US MNCs' customers, calculated as the share of US MNCs in downstream manufacturing sectors in 2012.
$HorizIndExp^{AS}$	Horizontal spillover from Asian MNCs' competitors, calculated as the share of Asian MNCs in the same manufacturing sector as local firms in 2012.
$ForwIndExp^{AS}$	Forward spillover from Asian MNCs' suppliers, calculated as the share of Asian MNCs in upstream manufacturing sectors in 2012.
$BackIndExp^{AS}$	Backward spillover from Asian MNCs' customers, calculated as the share of Asian MNCs in downstream manufacturing sectors in 2012.
$HorizRegExp^{EU}$	Horizontal regional spillover from EU MNCs' competitors within the same region, calculated as the share of EU MNCs in the same manufacturing sector and region of local firms in 2012.
$ForwRegExp^{EU}$	Forward regional spillover from EU MNCs' suppliers within the same region, calculated as the share of EU MNCs in upstream manufacturing sectors and in the same region of local firms in 2012.
$BackRegExp^{EU}$	Backward regional spillover from EU MNCs' customers within the same region, calculated as the share of EU MNCs in downstream manufacturing sectors and in the same region of local firms in 2012.
$HorizRegExp^{US}$	Horizontal regional spillover from US MNCs' competitors within the same region, calculated as the share of US MNCs in the same manufacturing sector and region of local firms in 2012.
$ForwRegExp^{US}$	Forward regional spillover from US MNCs' suppliers within the same region, calculated as the share of US MNCs in upstream manufacturing sectors and in the same region of local firms in 2012.
$BackRegExp^{US}$	Backward regional spillover from US MNCs' customers within the same region, calculated as the share of US MNCs in downstream manufacturing sectors and in the same region of local firms in 2012.
$HorizRegExp^{AS}$	Horizontal regional spillover from Asian MNCs' competitors within the same region, calculated as the share of Asian MNCs in the same manufacturing sector and region of local firms in 2012.
$ForwRegExp^{AS}$	Forward regional spillover from Asian MNCs' suppliers within the same region, calculated as the share of Asian MNCs in upstream manufacturing sectors and in the same region of local firms in 2012.
$BackRegExp^{AS}$	Backward regional spillover from Asian MNCs' customers within the same region, calculated as the share of Asian MNCs in downstream manufacturing sectors and in the same region of local firms in 2012.

Source: Authors

4. Data analysis

Switzerland serves as an intriguing case study, particularly due to the prominence of export activities in its economy (BFS, 2016). In 2015, over a third of the turnover for Swiss manufacturing firms (34.4%) was attributed to exports, establishing the manufacturing sector as the most export-oriented industry in the country.

Table 2. Descriptive statistics

| Variable	Obs	Mean	Std.	Min	Max
$Export_i$	408	0.67	0.467	0	1
$ExportVolume_i$	369	2.06	7.67	0	93.7
I (in 10,000000s of CHF)	953	0.32	1.59	0	39.8
Age	1,044	63.41	44.5	0	495
Comp	736	0.71	0.451	0	1
Gap	890	3.59	16.7	0.00027	411.2
L (in 103)	1,062	0.18	0.7116015	0	15
Invest	430	2.47	0.748	1	4.8
For export decision					
HorizIndExp	2,518	29.76	13	5.55	52.1
ForwIndExp	2,518	37.07	5.34	25.43	49.01
BackIndExp	2,518	34.09	4.8	27.51	48.06
HorizRegExp	2,518	29.43	22.4	0	100
BackRegExp	2,518	34.96	5.35	26.69	50.69
ForwRegExp	2,518	37.57	6.39	25.07	51.35
For export volume					
HorizIndExp	2,518	51.49	25.8	2.80	95.6
BackIndExp	2,518	51.66	10	34.56	67.8
ForwIndExp	2,518	62.42	7.9	40.72	76.5
HorizRegExp	2,518	47.45	37	0	151.02
BackRegExp	2,518	54.42	5.27	46.09	69.92
ForwRegExp	2,518	54.69	8.57	31.8	68.4

Source: Authors' calculations based on KOF data, innovation survey 2015

The data used for the regression analysis is extracted from the 2015 Innovation Activity Survey of manufacturing firms, each employing at least five individuals. This survey was conducted by the Swiss Institute for Business Cycle Research (KOF)[5]. Table 2 provides the descriptive statistics for the regression variables.Individual information encompasses the technological behavior and export activities of both local and foreign firms (MNCs and local firms) in 2014 and 2012. Additionally, it includes data on the firm's export market, which we used to determine export destinations. Figures 1 to 3 and Table 3 provide a summary of the export trends for all foreign and local firms (MNCs and local firms) in Switzerland's manufacturing sector. All these calculations are derived from data collected in the KOF Innovation Survey 2015 and the Federal Customs Administration 2019.

Table 3. Shares of local firms' and MNCs' total export sales by destination

| Destination	Local firms (%) 2014	MNCs (%) 2012
Europe	4.15	13.01
USA	0.21	11.62
Asia	1.15	1.28

Source: Authors' calculations based on KOF data, innovation survey 2015

Figure 1. Shares of MNCs' Total Export Sales in 2012
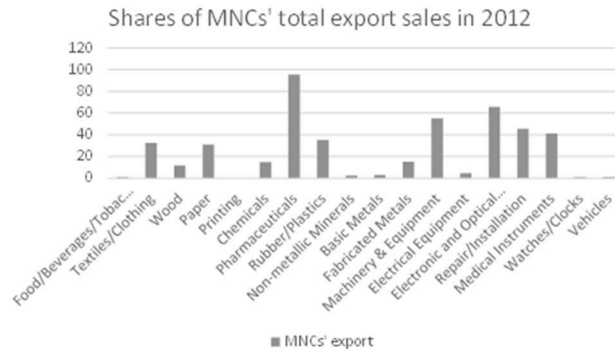
Source: Authors' calculations based on KOF data derived from KOF innovation survey 2015 of manufacturing firms.

Figure 2. Shares of Local Firms' Total Export Sales in 2014
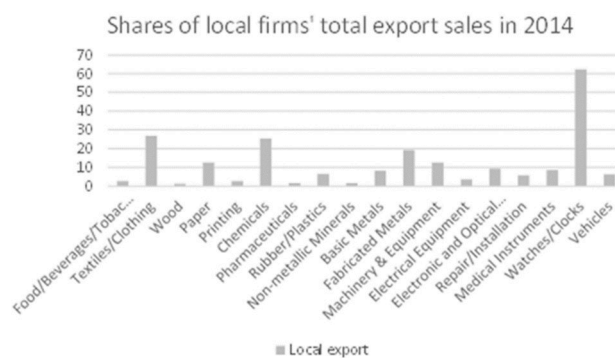
Source: Authors' calculations based on KOF data, innovation survey 2015.

Figure 3. Total Exports by Swiss Regions
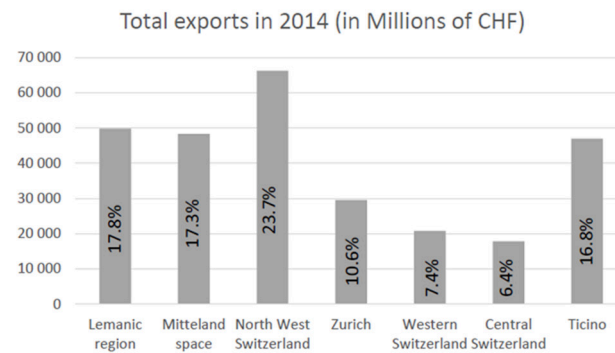
Source: Authors' calculations of data derived from Federal Customs Administration 2019
The Lemanic region includes the cantons of Vaud, Valais, and Geneva.
The Mittelland region includes the cantons of Bern, Fribourg, Jura, Neuchâtel, Solothurn.
Northwest Switzerland includes the cantons of Aargau, Basel-Stadt, and Basel-Landschaft.
Western Switzerland includes the cantons of Appenzell Ausserrhoden, Appenzell Innerrhoden, Glarus, Graubünden, Schaffhausen, St. Gallen, and Thurgau.
Central Switzerland includes the cantons of Lucerne, Nidwalden, Obwalden, Schwyz, Uri, and Zug.

Figure 1 illustrates the distribution of MNCs' total export sales across two-digit manufacturing industries in Switzerland in 2012, while Figure 2 presents the distribution of local firms' total export sales for the same industries in 2014. The data depicted in these figures reveal that both MNCs and local firms engage in exports across all industries. However, there are notable distinctions in the distribution of exports between MNCs and local firms. MNCs dominate in pharmaceuticals, electrical and optical products, and machinery and

equipment, whereas local firms excel in watches, textiles, and chemicals. Combining MNCs and local firms, pharmaceuticals and chemicals, watches, precision instruments, and electronic products and machinery continue to be prominent in Swiss exports in 2018. Figure 3 provides an overview of total exports in Swiss regions for manufacturing industries, utilizing the regional classification of the KOF Institute. The data indicates an uneven distribution of exports across Swiss regions, with Northwest Switzerland leading at 23.7%, followed by the Lemanic and Mittelland regions. This aligns with the concentration of leading export industries in these regions, while Central Switzerland reports the lowest total export level at 6.4%.

Table 3 provides a breakdown of exports by destination for both MNCs and local firms. The aggregated data reveals that, on average, MNCs consistently hold higher export shares compared to local firms. Notably, the European Union stands out as the most significant export market for both MNCs and local firms in Switzerland. Furthermore, Swiss products from local exporters exhibit a robust presence in Asian markets, surpassing their presence in the US market. In contrast, MNCs export more to the USA than to Asian markets.

In summary, export is a prominent activity in Switzerland, with the European Union countries holding the largest share. However, Asian and American markets have gained significance, especially following the economic crisis of 2008 (Ben Hamida & Ischer, 2019). We anticipate that export spillovers vary by destination, with the effects differing across market destinations. In the next section, we empirically test these effects at both the national and regional levels, while also considering knowledge transfer linkages and export destinations as control variables.

5. Empirical results

This section presents the empirical results. Model (1) is estimated using the probit method, and the outcomes are reported in Table 4. To assess the magnitude of spillover effects on local export propensity, we present the estimated coefficients of marginal effects. Model (2) is estimated using the ordinary least squares method, and the results are reported in Table 5. All estimations in Tables 4 and 5 are robust. Additionally, the predicted probabilities of our models in Table 4 (Columns 1 to 8) are notably high, correctly predicting about 83% of the data.

In Tables 4 and 5, the first and second columns present estimation results when considering the export market as a whole. Column 1 reports horizontal and vertical export spillovers at the national level, while Column 2 reports these effects at the regional level. Subsequent columns in both tables provide spillover measurements specific to different destinations. Columns 3 to 5 detail horizontal and vertical spillovers concerning the European Union, the United States, and Asia, respectively, while Columns 6 to 8 report these effects at the regional level according to the same destinations.

The estimated coefficients of *HorizIndExp*, *BackIndExp*, and *ForwIndExp* are both positive and significant in Column 1 of Tables 4 and 5. This suggests that the export propensity and intensity of local firms are significantly and positively influenced by the presence of MNCs' exporters, both in their industry and related industries from their upstream suppliers. Notably, the benefit from forward linkages is three times larger than that of horizontal effects. This finding aligns with Hypotheses 1a and 1b, indicating that export spillovers on the export decision and volume of local firms are more likely to be vertical than horizontal.

It appears that MNCs' upstream suppliers play a crucial role in transferring knowledge about export markets to their local customers, facilitating the initiation or enhancement of export activities. However, MNCs' downstream clients do not seem to contribute to the improvement of local export learning, as evidenced by the negative estimated coefficient of *BackIndExp* in Column 1 for both tables.

In Column 2 of Tables 4 and 5, only the estimated coefficient of forward linkages (*ForwIndExp*) retains a statistically significant positive value at the regional level. However, it does not appear to be markedly higher when compared to the national level in Column 1 of these tables. This result contradicts Hypotheses 2a and 2b, suggesting that export spillover effects do not seem to become larger when MNCs are located close to local firms.

Regarding the remaining columns in Tables 4 and 5, it is evident that the positive and significant export spillovers stemming from horizontal and vertical linkages are notably enhanced when specifically tailored to the destination. Local firms appear to exhibit a discerning approach, not uniformly applying the same linkage when exporting to diverse destinations, as the unique characteristics of each destination significantly influence their strategic choices.

For the European Union destination, the decision of local firms to enter this market is positively influenced by the export activities of their MNCs' counterparts and suppliers attending the same market, as evidenced in Column 3 of Table 4. However, it is noteworthy that only the export activities of their MNCs' suppliers contribute to an improvement in export volume to this market, as highlighted in Column 3 of Table 5.

Table 4. Probit regression for decision of local firms to export

	Exporter$_i$	Exporter$_r$	Exporter$_i$ EU	Exporter$_i$ US	Exporter$_i$ AS	Exporter$_r$ EU	Exporter$_r$ US	Exporter$_r$ AS
I	0.0358	0.034	0.0326	0.0328	0.0328	0.0166	0.0258	0.0329
L	0.057	0.0485	0.0592	0.0500	0.0500	0.0487	0.0612	0.0437
Age	-0.0002	-0.0002	-0.0003	-0.0003	-0.0003	-0.0002	-0.0003	-0.0002
Comp	0.130**	0.118**	0.129**	0.155*	0.115*	0.139**	0.134**	0.1267**
Gap	-0.013***	-0.016***	-0.0142***	-0.0155*	-0.0155*	-0.0215***	-0.022***	-0.0043
Invest	0.0126	0.0207	0.0126	0.0113	0.0113	0.0462	0.0496	0.0336
HorizIndExp	0.0123***							
ForwIndExp	0.033**							
BackIndExp	-0.047							
HorizRegExp		0.0014						
ForwRegExp		0.0378***						
BackRegExp		0.0009						
HorizIndExp^{EU}			0.016***					
ForwIndExp^{EU}			0.0517**					
BackIndExp^{EU}			-0.0377					
HorizIndExp^{US}				0.155***				
ForwIndExp^{US}				0.050				
BackIndExp^{US}				-0.016				
HorizIndExp^{AS}					-0.338***			
ForwIndExp^{AS}					1.696***			
BackIndExp^{AS}					-1.587***			
HorizRegExp^{EU}						0.0008		
ForwRegExp^{EU}						0.0615***		
BackRegExp^{EU}						-0.0104		
HorizRegExp^{US}							0.0008	
ForwRegExp^{US}							0.188**	
BackRegExp^{US}							0.278	
HorizRegExp^{AS}								0.006
ForwRegExp^{AS}								0.214***
BackRegExp^{AS}								-0.113
Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	188	194	188	189	189	197	197	189
Pseudo-R^2	0.197	0.224	0.198	0.197	0.197	0.248	0.235	0.229
Wald Chi^2	28.68	42.41	38.09	421.57	406.15	43.21	43.21	41.29
Log-likelihood	-88.22	-86.67	-88.04	-85.00	-85.99	-84.64	-86.17	-82.49

Notes: All estimations include industry or region dummies. All estimates are robust. *, ** and *** denote significance at the 10%, 5%, and 1% levels, respectively

In the context of the American market, local firms engaged in exporting to the USA appear to derive benefits from the export activities of their MNC counterparts, particularly evident in terms of enhanced export propensity, as indicated in Column 4 of Table 4. Additionally, these local firms strive to leverage their relationships with MNC customers, contributing to increased export volumes to the American market, as reflected in Column 4 of Table 5.

In relation to the Asian destination, local firms experience benefits in initiating exports through the activities of their upstream MNCs' suppliers exporting to the same Asian market, as illustrated in Column 5 of Table 4. Furthermore, these firms leverage horizontal effects to augment their export volumes, as demonstrated in Column 5 of Table 5.

Spillover benefits appear to be three times more significant when local firms choose to enter or enhance their presence in Asian markets, while the magnitude of spillover benefits from MNCs with experience in European Union and American markets exhibits a comparable level. These findings align with Hypotheses 3a and 3b, supporting the notion that export spillovers are more pronounced as the psychic distance to the export destination increases.

Columns 6 to 8 in Tables 4 and 5 provide insights into destination-specific export spillovers at the regional level, revealing a notable increase in magnitude, particularly in spillover intensity, when MNCs are located in close proximity to local firms. These findings, associated with export destinations, partially affirm Hypotheses 2a and 2b, suggesting an intensified effect of export spillovers at the regional level when specific to a destination.

Furthermore, we observe that the impact of certain linkages becomes significant when MNCs and local firms share the same geographical region. Specifically, (1) the presence of MNCs exporting to the Asian market in the same region appears to facilitate local customers in intensifying their export volumes to that market; (2)

Similarly, the presence of MNCs exporting to the US market in the same region appears to support local customers in initiating exports to the same market.

Table 5. OLS regression for export volume of local firms

	Exporter$_i$	Exporter$_r$	Exporter$_i$ EU	Exporter$_i$ US	Exporter$_i$ AS	Exporter$_r$ EU	Exporter$_r$ US	Exporter$_r$ AS
I	-0.8902	-11.250	-0.9828	-0.5659	-0.8849	-0.6812	-0.6876	-10.522
L	5.5716*	5.8288**	5.4155*	51.058	5.3935**	5.1092*	51.402	6.1668**
Age	0.0391*	0.0356	0.0391	0.0375*	0.0384*	0.0364	0.0376	0.0388
Comp	-16.762	-19.819	-18.218	-12.811	-17.039	-15.008	-17.816	-15.603
Gap	-0.0964*	-0.1246**	-0.1107**	-0.1032*	-0.1458**	-0.1323**	-0.0765**	-0.0207
Invest	1.3004*	1.0260*	12.654	1.3265*	1.3394*	0.9459	1.1975*	1.3515*
HorizIndExp	0.0866***							
ForwIndExp	0.2327***							
BackIndExp	-0.1892**							
HorizRegExp		-0.0277						
ForwRegExp		0.2182*						
BackRegExp		0.2145						
HorizIndExp^{EU}			-0.0197					
ForwIndExp^{EU}			0.2723**					
BackIndExp^{EU}			-0.0388					
HorizIndExp^{US}				0.0730				
ForwIndExp^{US}				-0.4445***				
BackIndExp^{US}				0.2832**				
HorizIndExp^{AS}					0.1372**			
ForwIndExp^{AS}					0.3609			
BackIndExp^{AS}					0.3332			
HorizRegExp^{EU}						-0.0507**		
ForwRegExp^{EU}						0.3389**		
BackRegExp^{EU}						-0.4246***		
HorizRegExp^{US}							0.1058	
ForwRegExp^{US}							-1.1151**	
BackRegExp^{US}							0.7169**	
HorizRegExp^{AS}								0.0463**
ForwRegExp^{AS}								1.8319**
BackRegExp^{AS}								-1.2303**
Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	203	203	203	203	203	203	203	203
R^2	0.2963	0.2629	0.2462	0.2756	0.2987	0.2569	0.2358	0.2622

In all probit estimates, the coefficients of firm-level characteristics are generally insignificant, except for *Gap* and *Comp*. *Gap* consistently exhibits negative and significant values across all regressions, excluding column 8 of Table 4. Additionally, it maintains a negative and significant association in all OLS regressions, except for column 8 of Table 5. These findings suggest that the propensity and intensity of local exports increase with the technological level of local firms. Notably, high-technology local firms appear to derive more substantial benefits from the presence of MNCs' exporters within their industry and region. *Comp*, on the other hand, is positive and significant in Table 4, indicating that local firms are more inclined to initiate export activities when they perceive an increase in the level of competition within their market.

The variable *Invest* exhibits a positive and significant estimated coefficient in columns 1, 2, 4, 5, 7, and 8 of Table 5. This indicates that local firms need to invest in learning activities to absorb foreign knowledge and enhance their export volume. This is particularly true when exporting to distant destinations, such as the United States and Asia. High technological capacities seem sufficient to decode and integrate European export market knowledge. Finally, the estimated coefficients of *Age* are positive and significant in columns 1, 4, and 5 of OLS regressions, showing that older local firms derive larger benefits from export spillovers when exporting to the United States and Asia.

6. Conclusion

This paper aims to contribute to the evolving body of knowledge on export spillovers from MNCs by comprehensively examining their presence and extent concerning local manufacturing firms in Switzerland. Existing empirical findings, while informative, present a somewhat inconclusive picture, contributing to a mixed understanding of these spillovers. Moreover, a notable research gap exists in investigating the potential beneficial spillover effects of MNCs' exports within the specific context of Switzerland.

We posit that investigating the influence of export spillovers from MNCs on the export performance of local firms constitutes a complex and intricate research undertaking. This complexity arises from the non-automatic nature of knowledge transfer between the sender and the receiver, where the resulting spillover benefits hinge on various critical factors. These factors encompass the intricate nature of linkages between local firms and MNCs, the geographical proximity between them, and the specific characteristics of the foreign market destination. Investigating these multifaceted elements is crucial for gaining a comprehensive understanding of the nuanced dynamics shaping export spillovers and their implications for local manufacturing firms in the Swiss context.

Our results reveal significant advantages for local firms in the Swiss manufacturing sector. The export activities of MNCs' suppliers and counterparts contribute significantly to the benefits experienced by local firms. This holds true for both the propensity and intensity of exports among Swiss manufacturing local firms. These findings underscore the noteworthy impact of horizontal and upstream linkages with MNCs on shaping the export dynamics of local firms in Switzerland. Additionally, export spillovers from both horizontal and vertical linkages exhibit an increase when they are destination-specific. Nonetheless, local firms demonstrate a nuanced approach, diverging in their linkage strategies when exporting to different destinations. This suggests that the distinct characteristics of each destination significantly influence and shape the strategic choices made by these local firms. For example, we found that the decision of local firms to enter the European market is positively shaped by the export activities of their MNC counterparts and suppliers operating within the same market. Conversely, entering the USA appears to predominantly benefit from the export activities of their MNC counterparts, while entry into the Asian market derives advantages primarily from the export activities of their upstream MNCs' suppliers engaged in the same Asian market.

The accumulation of spillover benefits becomes more evident when local firms strategically decide to either enter or strengthen their presence in both the American and Asian markets. The geographical proximity between MNCs' exporters and local firms impacts export spillovers when they are specific by destination, especially in terms of bolstering export volumes. This close proximity not only streamlines the exchange of information, fostering a dynamic knowledge flow but also serves to alleviate financial burdens, particularly when exporting to distant markets. The geographical closeness acts as a catalyst, not only enhancing the effectiveness of spillover effects but also promoting a more cost-efficient transmission of valuable knowledge between local firms and MNCs' exporters.

Finally, the likelihood and magnitude of spillover exports exhibit an upward trajectory corresponding to the technological advancement of local firms. This implies that as local firms enhance their technological capabilities, they are more inclined to both initiate and intensify their engagement in exports. In addition, to intensify their export volumes, local firms should strategically allocate resources to learning activities when assimilating foreign knowledge, particularly when targeting distant markets such as Asia.

In terms of policy recommendations aimed at fostering exports based on these findings, it is crucial to acknowledge the pivotal role that MNCs play as key catalysts for the export performance of local firms. Emphasizing strategic horizontal and vertical linkages with MNCs becomes key, as these connections significantly influence the export intensity and propensity of local businesses. Horizontal linkages involve collaborative efforts within the same industry, while vertical linkages focus on vertical connections. By fostering these partnerships, local firms can access resources, technologies, and global markets, enhancing their export capabilities.

Policy measures should actively promote collaborations between local firms and MNCs to foster the exchange of knowledge and facilitate the assimilation and absorption processes. However, it is essential for these measures to account for the diversity among local firms, especially concerning the type of linkage they opt for when exporting to a particular destination. Recognizing the heterogeneity among local firms ensures that policy measures are adaptable and responsive to the diverse needs and capabilities of different businesses.

Additionally, local firms seeking to expand their market presence need to invest proactively in the absorption of foreign knowledge, especially when targeting destinations with significant psychic differences. Successfully intensifying export volumes to distant markets (in terms of cultural, language, geographical distance, etc.) necessitates a strategic commitment to learning and adapting to the unique challenges posed by such destinations. Policymakers should encourage and support initiatives that enhance the absorptive capacity of local firms, enabling them to effectively leverage export spillovers and thrive in diverse markets.

Footnotes

[1] In addition to foreign MNCs, local MNCs could serve as valuable sources of knowledge regarding foreign markets and information about the transport infrastructure that local firms might utilize when exporting to the same market (Ben Hamida & Ischer, 2019).

[2] As older firms may be more efficient (Sinani & Meyer, 2004).

[3] We anticipate a positive and statistically significant coefficient, signifying that local firms are more inclined to engage in exports when they perceive an increase in the level of competition within their market.

[4] Cultural considerations are informed by the Hofstede cultural diversity scores, available at https://www.hofstede-insights.com/product/compare-countries/.

[5] The questionnaire is available for download from https://kof.ethz.ch/ (Industrieökonomik); however, the firm-level data remains unpublished and is highly confidential.

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