



The embeddedness of transnational corporations in Chinese cities: Strategic coupling in global production networks?



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A B S T R A C T

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The embeddedness of transnational corporations (TNCs) in metropolitan economies has become a central issue in the research on globalization and local development. This paper attempts to enhance understanding of FDI embeddedness by assessing TNCs' backward and technological linkages with domestic firms. Through a case study of the information and communication technology (ICT) industry in Suzhou, a frontier globalizing city in the Yangtze River Delta in China, it was found that strategic coupling between TNCs and domestic Chinese firms rarely exists and global production networks (GPN) have not brought substantial benefits to the development of domestic firms in the region. Regression analysis further reveals that TNCs' backward and technological linkages with domestic firms are highly selective and contingent upon market potential in the host region, TNCs' research and development (R&D) orientation and to a lesser extent subsidiary autonomy. It is also found that the booming and sizable domestic market and the development of domestic firms have potential to pave the way for upgrading. These findings suggest that there is a need to develop a broader conceptualization of the upgrading pathways of local firms beyond the notion of strategic coupling in the GPN perspective.

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Introduction

Intensified capital flows at the global scale and the rising power of transnational corporations (TNCs) are vivid indicators that economic globalization is an important feature of the world economy (Dicken, 2003). TNC-led globalization leaves spatial imprints on cities and is a crucial driver of the globally-connected city network (Brown et al., 2010). Global cities provide the settings for globalization and global–local interface, serving as command centers to better organize complex global production (Sassen, 2001). Governments in emerging global cities, or globalizing cities, tend to regard foreign direct investment (FDI) as a critical generator of economic growth. These cities increasingly compete for investment from TNCs and actively participate in global value chains (GVCs), global commodity chains (GCCs), and global production networks (GPNs) (Hess, 2004; Humphrey & Schmitz, 2002; Wei, Li, & Ning, 2010). Heightened globalization has also made globalizing cities more vulnerable to capital mobility and external shocks (Pike,

Rodriguez-Pose, & Tomaney, 2006). The issue of FDI embeddedness has therefore become a major concern of governments as regards the benefits of integration into global production networks (Wei, Liefner, & Miao, 2011). The GPN perspective emphasizes the importance of strategic coupling with GPNs for the upgrading of local firms in developing countries (Coe, Hess, Yeung, Dicken, & Henderson, 2004), and advances the GVC approach by unpacking the complex firm–region nexus in the GPN (Coe & Hess, 2011). From the GPN perspective, regional development, or upgrading, is a product of strategic coupling between specialized regional assets such as specific kind of knowledge, skills, or expertise with the strategic needs of extra-local actors coordinating GPNs (Coe et al., 2004).

The GPN perspective and, in particular, the notion of strategic coupling have rarely been critically evaluated with respect to the effect on the development of domestic firms in such emerging economies as China. Empirical evidence, focusing on the industrial upgrading of developing regions, which are at low levels of the GPNs, has shown that strategic coupling between local firms and TNCs rarely exists (e.g., Murphy & Schindler, 2011; Wei, 2010; Wei, Zhou, Sun, & Lin, 2012). It also has been found that the development of domestic firms is not necessarily subject to the strategic needs of TNCs. Moreover, strategic coupling is only a specific type of inter-firm collaboration between TNCs and local firms (Wei, 2010, 2011).

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Keeping these conceptual issues in mind, this paper contributes to the literature on local embeddedness of FDI in globalizing cities by means of a case study of TNCs in the information and communication (ICT) industry in Suzhou, China. Suzhou is a key city in the Yangtze River Delta (YRD), which is China's economic powerhouse and probably the largest emerging global city region in the world. Drawing upon a recent high-quality survey, this paper offers a detailed quantitative and critical assessment of TNCs' local embeddedness in Suzhou's ICT industry.

The notion of embeddedness has multiple dimensions (e.g., societal, territorial and network), and operates at different scales. In this paper, we analyze the local embeddedness of FDI through the lens of TNCs' backward and technology linkages with local firms. Backward linkages, or domestic sourcing, form an important channel that connects TNCs with local firms and have potentially extensive benefits for the domestic sector (e.g. UNCTAD, 2001; Williams, McDonald, Tüselmann, & Turner, 2008). Technological linkages between TNCs and local firms also offer substantial benefits arising from connections within the GPNs (e.g. Yeung, 2007). The current paper differs from the previous publications that were based on the same survey (Wei, 2010; Wei et al., 2011; Zhou, Sun, Wei, & Lin, 2011), in two significant ways. First, it pays particular attention to why strategic coupling between TNCs and domestic firms is difficult to achieve in specific contexts. Second, it explores the potential of 're-coupling' with TNCs given the sizeable domestic market and the development of domestic firms in China. The remainder of the paper is organized as follows. After a critical appraisal of the perspective of GPN and the notion of strategic coupling, we will analyze the local embeddedness of TNCs in Suzhou with an emphasis on TNCs' backward and technological linkages with domestic firms. This is followed by a multivariate regression analysis of the determinants of TNCs' local backward and technology linkages. The final part presents our conclusion and discusses the theoretical and policy implications.

Theoretical issues and research framework

The debate on globalization and local places has stimulated research on the nature, process, and uneven geographic impact of globalization (Amin & Thrift, 1994). The hyper-globalization thesis emphasizes a borderless world and the free flow of capital, arguing for global integration and convergence in a context of the declining significance of nation states, history, and geography. Scholars influenced by dependency theory, the world system perspective and, more recently, the GVC/GCC approaches (e.g., Amin & Thrift, 1994; Gereffi & Korzeniewicz, 1994; Taylor & Thrift, 1982) hold that FDI can induce structural displacement, financial instability, and external control of developing economies (Agenor, Miller, Vines, & Weber, 2000). Geographers and planners tend to celebrate the power of local assets and processes and the efficacy of local institutional capacities (Micek, Neo, & Gorecki, 2011; Phelps & Waley, 2004). They argue for the continued significance of the state in FDI location decisions, the localization and embeddedness of global capital, and the reemergence of industrial districts and clusters (e.g., Cox, 1997; Dicken, 2003).

The recent literature on production globalization and regional development has employed the concepts of "chains" or "networks" to improve our understanding of the regional development process in the context of globalization (Henderson, Dicken, Hess, Coe, & Yeung, 2002). The GPN approach aims to glean more insights into the geographical organization of global production. It differs from the earlier theories on FDI that emphasize trade between countries (e.g., Dicken, 2003) and the location decisions of TNCs (e.g., Dunning, 1981). The GPN approach addresses the 'organizational innovation' of global operations and "the transition from

multinational corporations with their focuses on stand-alone overseas investment projects, to global network flagships that integrate their dispersed supply, knowledge and customer bases into global (and regional) production networks" (Ernst & Kim, 2002). In comparison with the "model-based" GVC perspective (e.g., Gereffi, Humphrey, & Sturgeon, 2005; Mahutga, 2012), the GPN perspective proposes a different way of understanding the relationship of global buyers with the regional governance structure. It emphasizes the 'territory-based' and geographically sensitive process of TNCs' embedding into regional economies and appreciates the complex and dynamic interdependence between key dimensions of "embeddedness," "power," and "value," and the unique spatiality of production networks (Henderson et al., 2002). GPN scholars also criticize the new regionalism perspective for its narrow focus on endogenous assets, or institutional thickness, and emphasize the trans-local dynamics of development by 'strategic coupling' with TNCs (Coe & Hess, 2011).

The spatial organization of GPNs or GVCs is undoubtedly related to the world city network (Brown et al., 2010). World cities, closely linking with globalizing cities in developing countries, also become control points of global production networks. This is particularly relevant for the case of China where many globalizing cities, such as Beijing and Shanghai, have increasingly been integrated into global networks. Yang (2009) argued that the successful strategic coupling between Suzhou and the GPN in the ICT industry led by Taiwanese TNCs has reshaped Suzhou into an important production node in the global ICT industry. Yang and Coe (2009) also maintain that the embedding of the GPN in Suzhou, Taipei and Dongguan resulted in a new mini-GPN controlled by Taiwanese ICT manufacturers. In these regional GPNs, TNCs have taken advantage of the diverse local institutions and assets in Chinese cities, and respond strategically to the changing factors of cost, speed and flexibility in the transformation of global ICT industry.

The contribution of the GPN perspective to the understanding of the upgrading process in the context of economic globalization, however, has not been evaluated thoroughly and critically (MacKinnon, 2012). This perspective has noticeable limitations when applied to explain the upgrading of local firms in China (Wei, 2010; Wei et al., 2011). Firstly, the GPN perspective tends to over-emphasize the exogenous factors of development. Wei (2011) has found that in Wenzhou, integration with GPNs is not a major upgrading strategy, while the huge domestic market of China has played an important role in the development of the clothing industry.

Secondly, the GPN perspective, while it is multi-scalar and sensitive to places, over-generalizes the experiences of newly industrialized economies in East Asia, where TNCs develop cooperative relationships with local suppliers and thus contribute substantially to the upgrading of domestic suppliers (Ivarsson & Alvstam, 2005a). The empirical work that draws upon the notion of strategic coupling also focuses on successful coupling that has already been created in developing regions (e.g. Yeung, 2007), without offering adequate explanation for why strategic coupling has come into being. Murphy and Schindler (2011) have argued that the GPN approach overlooks 'the need for developing regions to first achieve scale, scope, and localization economies and adequate institutional capacity before value can be created, enhanced and captured through ties' (p. 65). Wei (2010) identifies two situations in which such coupling can be observed. First, it occurs when local firms have strong capabilities to drive global-local production networks. Kim and Zhang (2008) have found the domestic giant companies such as Haier electronics have the power to incorporate foreign-owned suppliers in a domestically oriented electronics cluster in Qingdao. Second, coupling may also emerge when TNCs seek to exploit the network reach and capabilities of indigenous

enterprises in host markets where the state has the power to bargain with TNCs and local firms are capable of producing for TNCs (Depner & Bathelt, 2005; Sun & Zhou, 2011). For example, the ties between domestic Chinese auto firms and TNCs are enhanced through powerful state institutions. However, the above two situations do not commonly exist in many globalizing cities in China where TNCs' local linkages are thin and local states must satisfy the interests of TNCs (Liefner, Bromer, & Zeng, 2012; Meyer, Schiller, & Diez, 2012; Wei et al., 2011; Zhou & Wei, 2011). As Dawley (2011) points out, TNCs continue to exercise structural power as profit-seeking economic agents and, in some cases, TNCs are able to reorient regional institutions to serve their interests at the expense of other actors such as indigenous firms and workers.

Thirdly, the notion of strategic coupling also underplays the dynamic process of coupling, recoupling and decoupling between TNCs and changing regional assets. In this regard, MacKinnon (2012) highlights the promising potential for cross-fertilization between the evolutionary economic geography (EEG) and GPN perspectives so as to develop a deeper conceptualization of the evolving firm-region nexus in the context of economic globalization. Recent research has shown the need for a deeper conception of the processes of coupling, recoupling and decoupling that goes beyond the notion of strategic coupling (MacKinnon, 2012).

Notably, GPN scholars also acknowledge the 'dark sides' of strategic coupling and hold that strategic coupling is time- and space- contingent, and transcends territorial boundaries (Coe & Hess, 2011). As Coe and Hess (2011) explain, "although the articulation of regions in global production networks can produce significant economic gains on an aggregated level, in many cases, it also causes intra-regional disarticulations." Furthermore, they note that "some local firms may benefit from their insertion into GPNs, contributing to regional economic growth and innovation, while other actors within the region may only receive marginal benefits or become excluded in the process" (p. 134). This observation echoes the 'classic' FDI literature on quiescent subsidiaries in Asia (Poon & Thompson, 2003; Vind, 2008). It is also consistent with the research in the Central and Eastern Europe and Latin America that lamented the weakness of TNC embeddedness and the external dependence of local economies (Hardy, 1998; Lowe & Kenney, 1999).

Based on the above critical assessment of the GPN perspective, we adopt a more eclectic approach to the local embeddedness of TNCs in Suzhou's ICT industry. We focus on TNCs' backward and technological linkages with local firms, which are central issues in the literature on embeddedness and are key components in the process of coupling with TNCs in the GPN (Dunning, 1993; Sun & Du, 2011; Williams et al., 2008). We hypothesize that the backward and technological linkages between TNCs and local firms are not automatic. Moreover, the extent of local embeddedness in production and technology development is influenced by several sets of variables, beginning with such TNC characteristics as national origin, sectors, strategies, and comparative advantages, among others. Regional assets are also significant, especially the market potential in the host region. Finally, firm-level research and development (R&D) strategies, and to a lesser extent, subsidiary autonomy and local policies, must be taken into account.

Local embeddedness of FDI is dynamic and sensitive to regional settings and assets. TNCs tend to disembed from current areas of operations to take advantage of regional assets elsewhere. Reduction of cost is important due to the profit maximization of TNCs (Perkmann, 2006). TNCs will also localize and deepen embeddedness when they penetrate domestic markets and develop client linkages with domestic firms (Sun & Du, 2011). TNCs' local embeddedness is also conditioned by their comparative advantages and R&D strategies. On one hand, the literature maintains that the

collaboration between TNCs and domestic firms is constrained by the technology gap between domestic firms and TNCs since technological learning is not easy and requires the ability to absorb sophisticated technologies (Ivarsson & Alvstam, 2005b; Sun, Zhou, Lin, & Wei, 2013). Moreover, one of the competitive cores from the perspective of TNCs is their superior technological capability and R&D capacity. They have little incentive to transfer these core technologies to firms in developing countries (Gertler, 2003). They are also not willing to agglomerate with domestic firms, as they perceive knowledge inflows to be lower than potential leakages (Mariotti, Piscitello, & Elia, 2010). On the other hand, the expertise of local firms in domestic markets can be a positive factor of FDI embeddedness especially when TNCs value the reverse transfer of local knowledge (Chew & Yeung, 2001).

TNCs' embeddedness is also sensitive to the firm-specific subsidiary autonomy. Subsidiary autonomy mainly refers to the power of decision-making granted by the headquarters to subsidiaries (O'Donnell, 2000). Because less time is needed for local partners to gain familiarity and build trust with TNC subsidiaries than with remote corporate headquarters, subsidiary autonomy can be regarded as a positive factor for TNCs' local linkages by generating closer local network relationships (Teresa & Young, 2006; Williams, 2005). The firm-specific decentralization of decision-making is also heterogeneous. The decentralization of routine production arrangement and factory management may only produce marginal benefits in comparison with having autonomy in such strategic decisions as R&D, product design, branding and marketing (Williams et al., 2008).

Last but not the least, local institutions also play a role in this process. The capability of states to promote indigenous development and to bargain with TNCs is crucial in shaping the structural and network characteristics of FDI (Kaminski & Smarzynska, 2001). In China, the state has tried to implement such policies as a local-content requirement to embed TNCs in the Chinese auto industry (Liu & Dicken, 2006). However, with China's entry into WTO, local-content requirements have largely been eliminated and local states have increasingly relied on other policy instruments to protect their markets and develop endogenous capacities. The cut-throat competition for FDI, on the other hand, has forced local governments to provide better infrastructure and services to attract FDI. Local states have even been transforming local institutions to couple with the strategic needs of TNCs (Yang, 2009). Given the asymmetric power between TNCs and local states, TNCs enjoy a range of options in locational decision-making, based on their global-local networking, local settings and firm-specific strategic considerations. In general, we attempt to assess local embeddedness of FDI in Suzhou by scrutinizing the interaction between TNCs, local firms and regional settings. We will particularly focus on TNCs' local backward and technological linkages. We will also quantitatively test the significance of TNCs' market orientation, R&D strategies, and decentralization of decision-making as well as local policies in the embeddedness of TNCs in Suzhou's ICT industry.

Research setting, data and methodology

This paper aims to enhance understanding of FDI embeddedness, especially TNCs' local backward and technological linkages in Chinese globalizing cities through a case of Suzhou Municipality. Given its industrial capability, proximity to Shanghai, and competent local state, Suzhou is a good destination for foreign firms seeking to invest in China (Fig. 1). The volume of FDI in Suzhou has been the largest in Jiangsu province and second only to Shanghai in the YRD. In 2010, Suzhou Municipality attained a gross domestic product (GDP) of 922.89 billion yuan, accounting for 22.3% percent of the provincial total (SSB, 2011). Among the various special

investment areas in Suzhou are the China-Singapore Suzhou Industrial Park (CSSIP), Suzhou New District (SND), and Kunshan Economic and Technological Development Zone. The ICT industry is the most important industry in Suzhou, receiving the largest amount of FDI. The ICT industry in 2010 realized 33.85% of Suzhou's industrial output and 63.44% of total exports and imports by value in 2010 (SSB 2011). With a massive inflow of FDI and the development of CSSIP and SND, the issue of external control and FDI embeddedness has drawn substantial scholarly and governmental attention (Wei, Lu, & Chen, 2009). And since Suzhou, like other leading cities of China, is intensifying its efforts to enhance innovation, scholars have also debated the role of FDI in innovation and regional development (Wei et al., 2011).

This paper relies on a high-quality survey of Suzhou ICT enterprises in 2007 (Wei et al., 2012; Zhou et al., 2011), as well as interviews with government officials and foreign ventures. We conducted a survey of the ICT industry in Suzhou, including both domestic and foreign firms. The survey was conducted mainly through a professional consulting company affiliated with the national statistical bureau in China, and followed by face-to-face firm interviews. The survey generated questionnaires from 158 firms (108 TNCs). According to the survey results, most of the TNCs established their factories in Suzhou after 2000. Wholly foreign-owned ventures are the majority ownership form (96%). The size distribution of TNCs is heterogeneous: 23% of TNCs are large size firms with over US\$25 million in terms of assets and also nearly 50% of firms are small and medium-sized enterprises. Most of the ICT firms come from Taiwan (67.6% by the number of firms), and nearly half of the surveyed TNCs in Suzhou (46.3%) focus on electronic components and parts while others specialize in the manufacture of end products such as computers, MP3 players and digital camera, etc.

Based on the above literature review, we summarize four sets of explanatory factors to capture the market potential, R&D strategies, subsidiary autonomy, and local policies to explain TNCs' decisions

concerning establishing backward and technological linkages with local firms (Table 1).

First, market orientation was evaluated by three variables including increase of domestic clients in domestic sales (SalesTODomesticChg) (coded 1 if the sales to domestic clients in last three years before the survey significantly increased; otherwise 0, share of selling to domestic enterprises in total domestic sales in China in 2006 (SalesTODomestic) and the share of exports in total sales in 2006 (Export).

Second, collaboration between TNCs and domestic firms also depends on TNCs' R&D strategies. Collaboration can be encouraged by the local expertise of domestic firms but is likely to be constrained by the fact that TNCs have little incentive to transfer core or sophisticated technologies to domestic partners. Accordingly, we derived three indicators from the questionnaires as the proxies of TNCs' R&D orientation. The frequency of using domestic business consulting services (LCS) (coded 1 if the TNC frequently used local business consulting services; otherwise, 0) was used to reflect TNCs' interests in domestic firms' ground-based knowledge. The other two related indicators were constructed based on the reported functions of TNC subsidiaries in Suzhou (NewPD and NewPE). NewPD denoted that the TNC subsidiary focused on new product development for the Chinese market (coded 1 if one of the reported functions of TNCs was to develop new products for the domestic market in China; otherwise, 0). We also assumed that TNCs specializing in the development of more sophisticated processes and equipment-related technologies (NewPE) had a lower likelihood of establishing linkages with domestic firms (1 if one of the reported functions of TNCs was to develop new process- and equipment-related technologies, otherwise 0).

Third, five indicators were selected to represent subsidiary autonomy; they measure the degree to which the affiliate took charge of 1-investment planning (S_InvestPlan), 2-product design (S_ProductDesign), 3-marketing (S_Market), 4-component sourcing (S_ComponentSourcing), and 5-production management

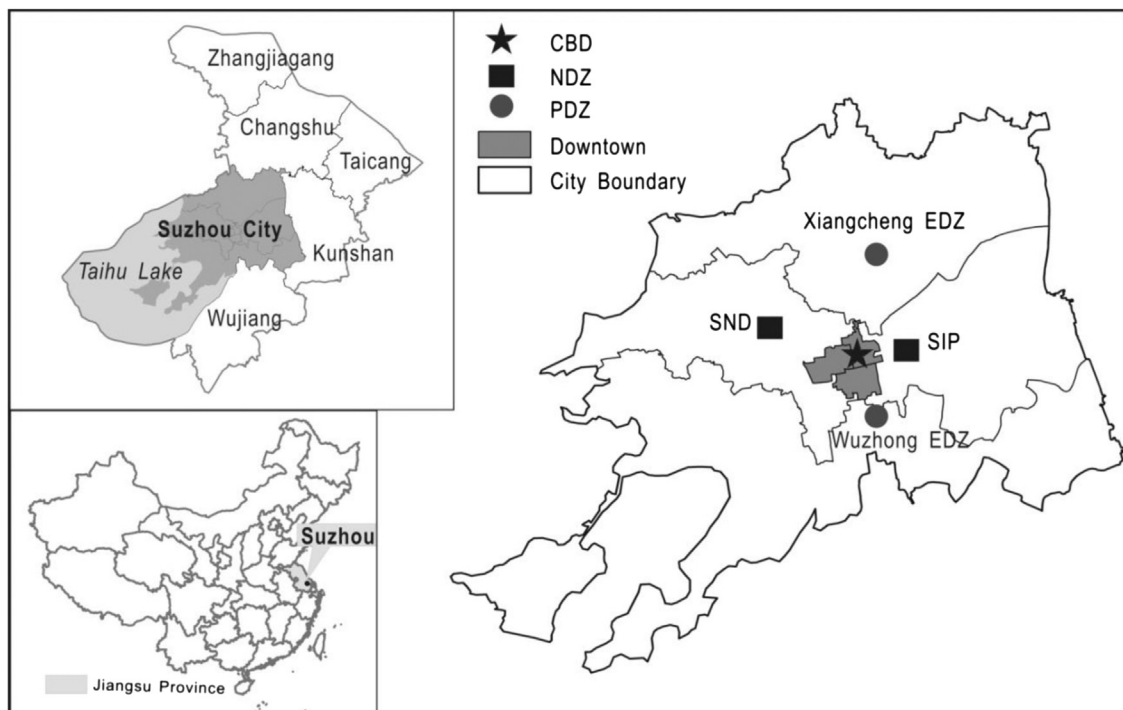


Fig. 1. Location of Suzhou and Suzhou City.

Table 1
Determinants of TNCs' backward and technology linkages with domestic firms.

Variables	Description	Measurement	Mean
Dependent variables			
Backward linkages	Backward linkages with domestic suppliers	Factor scores of backward linkages between domestic firms and TNCs	0 ^a
Technology linkages	Technology linkages with domestic firms	Factor scores of technological linkages between domestic firms and TNCs	0 ^a
Independent variables			
<i>Market orientation</i>			
Exports	Ratio of exports in total sales	%	43.5
SalesToDomestic	Share of domestic enterprises in domestic sales	%	37.7
SalesToDomesticChange	Change of domestic sales in total sales from 2004 to 2006 (dummy variable)	Significant Increase = 1 No Change/Decline = 0	N of increase: 22 (20.4%)
<i>R&D orientation</i>			
LCS	Whether or not the TNC frequently used local business consulting services	Yes = 1 No = 0	13 (12.2%)
NewPD	Whether one of the reported functions was new product development facility for the Chinese market (dummy variable)	Yes = 1 No = 0	38 (35.2%)
NwePE	Whether one of the reported functions was developing new processing or equipment for the Chinese market (dummy variable)	Yes = 1 No = 0	29 (26.9%)
<i>Subsidiary autonomy</i>			
S_InvestPlan	Autonomy in investment plan	10 = subsidiary fully control	1.45
S_Market	Autonomy in marketing	0 = foreign side fully control	4.07
S_ProductDesign	Autonomy in product design		2.27
S_ComponentSourcing	Autonomy in component sourcing		7.59
S_ProductionManagement	Autonomy in local manufacture		8.08
<i>Local policy</i>			
DZ	whether located in national development zones (dummy variable)	Within = 1 Out of = 0	N of Yes: 24 (22.2%)
<i>Control variables</i>			
EMP	Number of employees	In 1000 person	1.90
HOME	Dummy variable for the home country	From Taiwan = 1 Others = 0	N of Yes: 73 (67.6%)
AGE	Duration since the Year of Establishment	year	5.24
RDExp_P ^b	Share of R&D expenditure in total budget	%	6.88

^a The mean value of factor scores on the basis of regression method is zero.

^b Only input in the regression for technological linkages.

(S_ProductionManagement). A ten-point Likert-type scale from 0 (foreign parent takes full charge) to 10 (the subsidiary takes full control) was used to measure the degree of autonomy. Fourth, scholars and policy makers also advocate 'cluster policies' at the local level in order to promote spillover effects and local linkages (Alecke, Alsleben, Scharr, & Untiedt, 2006). China's national-level development zones provide a wider range of preferential policies and tax exemptions, and aim at the development of high-tech industries and innovative clusters. The effect of development zone policies on domestic supply and technological linkages between TNCs and domestic firms was measured by a dummy variable (DZ). If the TNC was located in the two national level development zones including CSSIP and SND, the number was 1; otherwise it was 0.

We also employed some control variables including firm size and age, as well as home region and technological capabilities of TNCs in the model of determinants of TNCs' backward and technology linkages. First, firm size was captured by the number of employees (EMP). Large firms tend to have more flexibility in handling the Chinese and international markets and, therefore, their local embeddedness changes and varies greatly from firm to firm (Sun & Du, 2011; Teresa & Young, 2006). Second, the duration from establishment to 2006 was used to measure the age of firm (AGE). In general, there is a trend of increasing local embeddedness over time, including increasingly using local personnel for top management positions (Iguchi, 2008; Williams, 2005; Williams et al., 2008). Third, firms with more R&D capacities in China tend to have more resources and incentives to develop local technological linkages (Sun & Du, 2011). The technology capacity of TNCs was measured by the share of R&D expenditure in total budget (RDExp_P). Fourth, the previous literature has shown that the

geographical origin or home effect matters in TNCs' localization efforts (Teresa & Young, 2006; Young & Lan, 1997). Since the majority of surveyed TNCs are from Taiwan (67.6%), the home effect is measured by a dummy variable (HOME, coded 0 if TNC is from Taiwan; coded 1 for TNCs from other regions). Specifically, previous studies also indicated that Taiwanese firms tend to network among themselves and their backward linkages with domestic firms are scarce (Wei et al., 2011; Yang & Liao, 2010). We also conducted an independent-sample *T*-test to quantitatively test whether there are significant differences between Taiwanese firms and non-Taiwanese firms in terms of backward and technological linkages with domestic Chinese firms.

TNCs' backward and technological linkages with domestic firms

This section focuses on how TNCs embed in production activities and establish backward and technological linkages with local firms in Suzhou. Our survey has shown very limited embeddedness during the localization of production activities. Although 44.4% of purchasing has been carried out in China and 49.0% of these purchases were within a distance of a two-hour drive, only 37.7% of the domestic purchases were from domestic Chinese firms and only 32.8% of the equipment purchased was from local Chinese firms. Notably, only 14% of TNCs reported their sourcing from domestic firms increased in the three years before the survey, indicating the stable structure of TNCs' production networks and limited backward linkages with local firms (Table 2). We do not find significant differences between Taiwanese firms and non-Taiwanese firms in their organization of production networks. Taiwanese firms had

Table 2
TNCs' backward and technological linkages with domestic firms.

	Mean			T value
	All TNCs	TW TNCs	Non-TW TNCs	
Backward linkages				
Percentage of domestic purchase	44.4	45.3	42.7	-0.372
Share of local purchase (2 h)	49.0	50.3	46.3	-0.627
Percentage of domestic equipments	32.8	34.1	31.5	-0.627
Percentage of purchase from domestic firms in total domestic purchase in the past three years	37.7	38.0	37.1	-0.150
Change of domestic firms in domestic purchase				
Significant increase	15 (13.9)	9 (12.3)	6 (17.1)	n.a.
Not much change	78 (72.2)	55 (75.3)	23 (65.7)	n.a.
Significant decline	15 (13.9)	9 (12.3)	6 (17.1)	n.a.
Technology linkages				
Technology alliance (0–4)	0.39	0.40	0.38	0.086
Technology cooperative research (0–4)	0.55	0.56	0.51	-0.218
Technology transfer (0–4)	0.47	0.56	0.29	-1.712*
Technology advising (0–4)	0.65	0.71	0.51	-1.036
Staff exchange (0–4)	0.76	0.79	0.69	-0.503
Information exchange (0–4)	0.82	0.84	0.80	-0.144

Notes: *significant at 0.1 level, **significant at 0.05 level. T value is calculated based on independent sample *t*-test. TW stands for Taiwanese.

recorded more local sourcing in the mainland China (45.3%), whereas over the period from 2004 to 2006, fewer Taiwanese firms (12.3%) had reported an increase of sourcing from domestic firms. In short, the backward linkages of TNCs, especially Taiwanese TNCs, are highly exclusive of domestic firms and the 'pseudo location' of TNCs in Suzhou is evident (Wei et al., 2011; Yang, 2009).

Besides backward production linkages, another critical issue related to the local embeddedness of FDI is the question of technological linkages between TNCs and domestic firms. Whether the firms are Taiwanese or non-Taiwanese, the technological interactions between TNCs and domestic firms are extremely weak (Table 2). As shown in Table 2, technological alliances and cooperative research rarely existed, and the frequencies of technology transfer, information and staff exchanges were low (the Likert-scale points were less than 1 in a 4-point measurement). However, some differences between Taiwanese firms and non-Taiwanese firms can be identified. In contrast to the restrictive backward linkages of non-Taiwanese firms with local Chinese suppliers, Taiwanese firms have a higher propensity to cooperate with domestic firms in terms of technology transfer, as indicated by a significant *T* value (Table 2). This result echoes what Young and Lan (1997) found in the case of TNCs in Dalian, that Japanese TNCs (the majority of non-Taiwanese TNCs in our survey) feature a higher technology level than Taiwanese TNCs, but their willingness to engage in technology spillover to domestic firms is the lowest, partly because of the large technology gap between Japan TNCs and domestic firms in China. In general, technological interactions between TNCs and domestic firms and TNCs' domestic sourcing from local firms are limited. The integration with the GPN has not brought substantial benefits to domestic firms through explicit firm–firm coupling. This finding affirms the view that the 'dark sides' of strategic coupling are prevalent in many developing regions where local industry is weak (Coe & Hess, 2011).

Determinants of TNCs' backward and technological linkages with domestic firms

For the multivariate regression analysis, the dependent variables are two composite scores from factor analyses representing

Table 3
Factor analysis of TNCs' backward linkages with domestic firms.

Variables	Mean (%)	Extraction	Principle component1 loading
Share of domestic purchase	44.44	0.680	0.825
Share of domestic enterprises in domestic purchases in the past two years	37.66	0.642	0.801
Share of domestic equipments	32.77	0.662	0.814
Total variance explained	66.16%	Bartlett's test of sphericity	70.749***

Notes: Factors with Eigen values greater than 1 were extracted. ***Significant at 1% level.

TNCs' backward and technology linkages with domestic firms. First, we conduct factor analysis for the three indicators of local sourcing including the share of domestic purchase in the total purchase, the share of domestic enterprises in the domestic purchase from 2004 to 2006, and the percentage of equipment made by domestic Chinese firms. We have found that the three indicators can be summarized into a common factor with the total extraction of 66.2% where each indicator's loading is higher than 0.8 (Table 3). Second, as technological linkages are explicitly measured by 6 indicators in our survey, factor analysis is used to extract the common principle component of technology linkages. The result shows that the 6 indicators can be abstracted into one principle component which can explain 72% of the total variance and each factor's loading is higher than 0.7 (Table 4).

The results of the regression analysis are shown in Table 5. Both regression models are significant at 0.01 levels, and the *R* squares are satisfactory. VIF values are all smaller than 2, indicating that multicollinearity among the independent variables does not pose a serious problem. The model focusing on backward linkages first shows that sourcing from domestic suppliers is largely driven by the sales to domestic Chinese market. A possible interpretation for this result can be related to the characteristics of products sold in the Chinese market. The consumers in the Chinese market are sensitive to price and producers need to adapt their products to Chinese consumers. Our follow-up interviews further indicate that the reason TNCs would like to hire Chinese suppliers is mostly related to their lower prices. In order to reduce the cost and compete in the Chinese market, TNCs are more likely to hire domestic firms. Second, it should be noted that subsidiary autonomy also plays a role in the domestic sourcing. It is natural that autonomy in component sourcing has a positive impact on domestic sourcing. Moreover, decentralization in product design has a significant impact on domestic sourcing. This is because product

Table 4
Factor analysis of TNCs' technology linkages with domestic firms.

Variables	Mean	Extraction	Principle component1 factor loading
Tech alliance	0.39	0.544	0.738
Tech cooperative research	0.55	0.617	0.785
Tech licensing	0.47	0.659	0.812
Tech advising	0.65	0.838	0.916
Staff exchange	0.76	0.874	0.935
Information exchange	0.82	0.79	0.889
Total variance explained	72.04%	Bartlett's test of sphericity	529.294***

Notes: Factors with Eigen values greater than 1 were extracted. ***Significant at 1% level. A five-point Likert-type scale from 0 (not exist) to 4 (very important) (0: not exist; 1: not important/few; 2: OK/a few; 3: important/frequent; 4: very important/very frequent) was used to measure the degree of research and technology collaboration between foreign and domestic firms.

Table 5
Estimates of TNCs' backward and technology linkages with domestic firms.

Variable	Backward linkages (BL)		Technology linkages (TL)	
	Coefficient	Std error	Coefficient	Std error
Backward linkages (Domestic sourcing)			0.016	0.087
<i>Export</i>	−0.003	0.003	0.001	0.002
<i>SalesTODomestic</i>	0.010***	0.003	0.002	0.003
<i>SalesToDomesticChange</i>	0.215	0.216	0.782***	0.197
<i>LCS</i>	0.034	0.288	0.543**	0.258
<i>NewPD</i>	0.080	0.194	0.339*	0.196
<i>NewPE</i>	0.129	0.200	−0.435**	0.182
<i>S_InvestPlan</i>	−0.040	0.031	0.011	0.029
<i>S_Market</i>	0.006	0.020	0.033*	0.019
<i>S_ProductDesign</i>	0.077***	0.026	0.004	0.025
<i>S_ComponentSourcing</i>	0.049*	0.029	0.031	0.027
<i>S_ProductionManagement</i>	−0.031	0.025	0.006	0.023
<i>DZ</i>	−0.261	0.236	0.062	0.210
<i>HOME</i>	−0.035	0.205	0.061	0.185
<i>EMP</i>	−0.004	0.011	0.019*	0.010
<i>AGE</i>	0.012	0.027	0.009	0.013
<i>RDExp_P</i>			0.022	0.025
Constant	−0.593	0.387	−1.089	0.353
Number of observations	108		108	
R^2	0.289		0.425	
Adjusted R^2	0.170		0.314	
F-value	3.26***		3.82***	

Note: *, **, *** denote variables that are significant at 10%, 5% and 1% levels, respectively.

designs that TNCs developed in Suzhou are more likely to be related to the manufacture of low-price products for the Chinese market, driving up TNCs' sourcing components from domestic suppliers. However, locating in development zones has no impact on the domestic sourcing and the coefficient is even negative. This result confirms the observation of Wei et al. (2011) that the establishment of national-level development zones is an important policy instrument to entice TNCs, but these zones are green-field development in areas with few domestic firms to establish linkages with TNCs. Our fieldwork in Suzhou also showed that the national development zones, i.e., CSSIP and SND, attract most of the FDI, but have few domestic firms to network with TNCs.

The model for technological linkages succeeds in explaining the technological interactions between domestic firms and TNCs because of their higher R -squares. In contrast to the study by Sun and Du (2011) using the national level dataset, it is surprising that we could not confirm the positive relationship between backward linkages and TNCs' technology linkages with domestic firms. The likely interpretation is related to the characteristics of Taiwanese firms, which are the majority of the surveyed TNCs in Suzhou. As mentioned above, Taiwanese TNCs tend to source from their follow-up suppliers in Taiwan rather than domestic firms, a practice that has been dubbed 'the hen brought little chickens together' (Hsu, 2006). In fact, some Taiwanese firms also tried to source locally but, given the inadequate skills and quality in the local environment, they prefer to work with Taiwanese firms. Their domestic sourcing from local firms, if any, is more focused on low-end components. Interestingly, our model reveals a significant impact of increased sales in the domestic market on the technological linkages between TNCs and domestic firms. It means that the technological interactions between TNCs in Suzhou and domestic firms are more likely to be driven by their forward or client linkages with domestic Chinese clients. Our follow-up interviews further indicate that, in addition to big-name global lead firms such as HP and Dell, many Taiwanese firms that are mostly second- and third-tier of OEM/ODM suppliers have been increasingly supplying the largest domestic OBM (original brand manufacturing) firms in

China such as Lenovo and Aigo. Such client linkages tend to play a more important role in their business given the booming consumption of IT products in China, which is consistent with Zhou's (2008) case study of Lenovo. Our model also highlights that subsidiary autonomy in marketing has significant influences on technological interactions between TNCs and domestic firms. This also confirms our finding noted above about the importance of capturing market opportunities in China for TNCs' technological linkages with domestic Chinese firms.

It is worth noting that the variables in the model about the R&D orientation of TNCs are significant. First, TNCs interested in local business services (LCS) and focusing on new product development for the Chinese market (NewPD) are more likely to have technological linkages with domestic firms. In other words, most of the TNCs' R&D activities emphasize new product development for the Chinese market. Hence, TNCs are also interested in domestic firms' expertise in the Chinese market, as our survey and interviews indicate. However firms specializing in new processing technologies or equipment are less likely to cooperate with domestic firms; in this case the coefficient is negatively significant. This result, to some extent, reflects that technological cooperation between TNCs and domestic firms is highly selective. Sophisticated technologies remain internalized within TNCs to avoid leaking to domestic Chinese firms. Our interviews with Taiwanese firms further confirm that they are reluctant to cooperate with domestic Chinese firms in the development of advanced technologies because intellectual property (IP) is poorly protected in China and the inter-firm trust between domestic and Taiwanese firms is still hard to establish. Again, we could not identify a positive or significant relationship between locating in national development zones and extensive technological interactions between TNCs and domestic firms.

With respect to control variables, we find that firm size has a significant impact on technological cooperation between domestic firms and TNCs. Larger and high-tech firms, which have more R&D resources, would like to set up a cooperative relationship with domestic firms. Some interesting findings also emerge based on the coefficients of other control variables, in spite of their formal insignificance. First, firms with longer history tend to have more local linkages. Second, firms spending more in R&D also reported a higher likelihood of working with local firms. Third, consistent with the comparison between Taiwanese and non-Taiwanese enterprises above, Taiwanese firms tend to have limited backward linkages with Chinese suppliers but are more likely to develop technological linkages with their domestic clients. Fourth, in contrast to the positive impact on technology linkages, firm size had a negative effect on backward linkages, which implies that smaller-size TNCs that are searching for low-price components are more likely to source from domestic Chinese suppliers.

Discussion and conclusion

Much of the work on GPNs focuses on the benefits to local firms arising from the strategic coupling with the GPN, but deemphasize the critical conditions that must be met to ensure that strategic coupling occurs. Echoing the critical question about the upgrading pathways in the GPN or GVC (e.g., Murphy & Schindler, 2011; Wei, 2010), this paper investigates the extent and the ways in which TNCs establish backward linkages and technologically interact with domestic Chinese firms based on a more eclectic concept of embeddedness (disembeddedness). A high-quality survey in Suzhou demonstrates limited backward and technological linkages between TNCs and domestic firms in this cluster. TNCs in Suzhou have not formed extensive linkages with local suppliers, which has limited the benefits for domestic firms and also imposed challenges for their upgrading. In China, globalizing cities with strong local

states and more resources, such as Shanghai and Beijing, tend to have more power and leverage in demanding for local embeddedness (Marton & Wu, 2006; Wei et al., 2012; Wu, 2007). However, in second-tier cities like Suzhou, the institutions and bargaining power of local governments are still weak and local firms are facing more challenges to overcome the institutional, structural, technological, and even spatial barriers in coupling with TNCs (Wei et al., 2011).

Our study also echoes recent research on the complexity of FDI embeddedness and calls for a deeper and broader conceptualization of the upgrading paths of local firms in the context of global production networks (Murphy & Schindler, 2011; Wei, 2011). As this research shows, TNCs from different countries have different ways of organizing their GPNs and home country effects also play an important role in global–local linkages. The network-based, cross-border production network of Taiwanese TNCs in Suzhou differs from the GPNs in other newly industrialized Asian economies, where TNCs (mostly global leading firms) establish extensive linkages with local suppliers (Iguchi, 2008). Moreover, the coupling between TNCs and firms in developing countries can be very selective; it is highly focused on new product development without basic R&D. Therefore, besides the linkage forms (either production/backward or technological), the content and quality of linkages are also crucial for our understanding of the relationship between TNCs and regional development in developing countries. We also find that domestic firms in China, given the booming national economy and huge domestic markets, have potential to pave a new way of ‘re-coupling’ with TNCs but not through the conventional backward linkages or export oriented strategies. The indigenous development of Chinese high-tech firms, such as Lenovo, has provided more incentives for Taiwanese firms, who are mostly the second- or third-tier suppliers in the GPN, to develop cooperative relationship with domestic Chinese firms. More recent interviews also indicated that, from the perspective of Taiwanese ICT firms, capturing market opportunities in China has become more important in their business strategies in the context of the global economic downturn.

Suzhou’s policies to remake the Sunan model centered on township and village enterprises have been centered on the attraction and retention of FDI. The local state has even established ‘strategic coupling’ relationships with Taiwanese TNCs (Wang & Lee, 2007). TNCs are therefore able to re-orient regional institutional capacities to enhance their profit-making capabilities at the expense of other actors such as indigenous firms and workers (MacKinnon, 2012; Phelps & Waley, 2004). Recent institutional reforms in China promote indigenous development and equalize tax policies for domestic and foreign firms. The limited embeddedness of TNCs also has prompted the Suzhou government to support the development of networks between TNCs and local firms. But due to the weak capacities of local firms, the strategic coupling between TNCs and local firms is still missing. This suggests that promoting the development of local firms and capacities should always be a key component of regional development, even when attracting FDI is the leading strategy.

This study does not intend to downplay the role of TNCs in China’s regional development, because they have made a substantial contribution to economic growth and become a central force behind Chinese cities’ emergence as global cities (Wei, 2012). Given the diversity of developmental processes in the context of globalization, the research mainly calls for more attention to the ‘dark sides’ of strategic coupling (Coe & Hess, 2011). As Murphy and Schindler (2011) point out, the three conditions (economies of scale and scope, localization economies for local knowledge spillover, and institutional capacity) for realizing the benefits of coupling with GPN identified by Coe et al. (2004) are sometimes hard to fulfill in developing countries with weak local absorptive and

innovation capacities (Schiller, 2011; Wei, 2010). This is particularly relevant to the case of Suzhou. However, studies have also found that in other globalizing Chinese cities, such as Qingdao, competitive Chinese companies such as Haier have successfully integrated TNCs in their production networks (Kim & Zhang, 2008); TNCs have played a supporting role in local firms’ technological upgrading and are also a mediator between large-size local firms and small- and medium- scale firms (Kim, 2011).

Given the complex and dynamic interactions between TNCs and local firms, scholars have argued for moving beyond the notion of strategic coupling in the GPN perspective, and for a more eclectic and middle-ground approach to industrial development and upgrading in China (Wei, 2011). More empirical studies of regional development processes under globalization in developing countries are of great significance to illuminate the variety of pathways of regional development and upgrading (e.g., Kelly, 2013). Finally, as evidenced in the case of Suzhou, the coupling between firms and regions can be time-specific and sensitive to such dynamic changes of regional contexts as the growth of the domestic market and the rise of domestic high-tech firms. There is also a need to better conceptualize this process by looking at coupling, decoupling, and recoupling in different stages of globalizing development (MacKinnon, 2012).

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