AUTHORS' PRE-PRINT COPY. PLEASE CITE THIS AS:

Barbieri, E., Di Tommaso, M.R., Pollio, C., Rubini, L. (2019), Industrial Policy in China: The Planned Growth of Specialised Towns in Guangdong Province, *Cambridge Journal of Regions, Economy and Society*, 12(3): 401-422. DOI:10.1093/cjres/rsz012

Industrial Policy in China: The Planned Growth of Specialised Towns in Guangdong Province

Elisa Barbieri
elisa.barbieri@unive.it
Affiliations: Department of Economics, University of Venice Ca' Foscari (Italy); c.MET05 - National Centre for Applied Economic Studies: http://www.cmet05.it
Address: Department of Economics, University of Venice Ca' Foscari, Fondamenta S. Giobbe, 873, 30100 Cannaregio, Venezia (Italy)

Marco Rodolfo Di Tommaso
marco.di.tommaso@unife.it
Affiliations: Department of Economics and Management, University of Ferrara (Italy); c.MET05 - National Centre for Applied Economic Studies: http://www.cmet05.it
Address: Department of Economics and Management, University of Ferrara, Via Voltapaletto, 11, 44121 Ferrara (Italy)

Chiara Pollio
(Corresponding Author)
chiara.pollio@unife.it
Affiliations: Emilia^{Lab} – The network of the Departments of Economics of Emila-Romagna Region; Department of Economics and Management, University of Ferrara (Italy); c.MET05 - National Centre for Applied Economic Studies: http://www.cmet05.it
Address: Department of Economics and Management, University of Ferrara, Via Voltapaletto, 11, 44121 Ferrara (Italy)

Lauretta Rubini
lauretta.rubini@unife.it
Affiliations: Department of Economics and Management, University of Ferrara (Italy); c.MET05 - National Centre for Applied Economic Studies: http://www.cmet05.it
Address: Department of Economics and Management, University of Ferrara, Via Voltapaletto, 11, 44121 Ferrara (Italy)

Abstract

We analyse one of the most important policy experiences for industrial clustering in Southern China—the Specialised Towns programme—that has transformed some Chinese clusters into the backbone of global production chains. We offer a long-term, detailed overview of the policy programme and of Guangdong's specialised towns, classifying them as endogenous or exogenous according to their features, and investigate their contribution to local growth and rebalancing. This analysis of the Specialised Towns programme contributes to the international debate on revisiting industrial policy, and suggests that the discussion should conceive them as articulated processes to reach long-term societal objectives.

JEL CODES: O25, R58, R12, O18

Introduction

China is today at the centre of several global networks of production. Starting from the launch of the open-door policy in 1978, the country's growth and structural change have been remarkable and fast. While for some scholars this happened despite of state intervention (Nee and Opper, 2007; Parish and Michelson, 1996), recent contributions emphasise the role of planning and policy activities of national and provincial governments (Yueh, 2013; Veeck et al., 2016). This process has assumed a precise spatial shape. The open-door policy intentionally favoured the initial growth of

selected areas in a sort of "controlled" industrialisation. The underlying idea was that such development would have then triggered the rest of the country (Knight, 2013; Groenenwald et al., 2008).

Simultaneously, since the early 1980s, policy actors have interacted with overseas capitals, allowing them to build large and globally relevant production bases in the country. The Guangdong Province, Southeast China, offers a special viewpoint on this interplay. Half as large as Germany but with 20 million more people, Guangdong is the first province for its contribution to national GDP—10.8%, corresponding to 1.3bln US$ in 2017. A feature of the province's growth is its outward orientation. In 2017, Guangdong accounted for nearly 30% of China's national exports[i] and 15% of its total foreign direct investment (FDI)[ii]. It had a leading role during the open door policy. When in 1978 Deng Xiaoping launched it, Guangdong and Fujian were the first provinces to experiment the "special policies, flexible measures" (Di Tommaso et al., 2013; Li, 1997). Such initiatives were at the core of Xiaoping's plan of Chinese socialist economy modernization, based on gradual opening up to the global capitalistic market, via trade and FDI, and power delegation to local governments. Guangdong was chosen as a pilot area for two reasons: (1) its strategic location, in front of Hong Kong and Macao, which was considered a booster to FDI and to the diffusion of entrepreneurial practices (Barbieri et al., 2009a; Yeung and Chu, 1998; Enright et al., 2005). Indeed, between 1988

and 1999, Hong Kong and Macao accounted for more than 66 percent of total FDI directed to the region[iii], detaching themselves by far from the other Asian contributors; and (2) its initial low economic performance, reducing the risk to test the opening-up process here with respect to other more powerful areas, such as Shanghai (Di Tommaso et al., 2013; Chung, 1998). In this context, national and local governments devoted special attention to the spatial organisation of production through spatially targeted incentives (Zeng, 2010; Zeng, 2012; Rubini et al., 2015, and so on). As a result, Guangdong's industrialisation pattern is today largely based on industrial agglomerations (Lai et al., 2005; Zeng, 2010).

In this paper, we focus on a crucial industrial policy initiative for industrial clustering in Guangdong—the so-called Specialised Towns[iv] (STs) programme. By July 2017, there are 416 STs, accounting for 40% of the provincial GDP. In some prefectures, such as Dongguan or Foshan, STs represent 90% of GDP. Furthermore, 70% of the European and U.S. mass-market luggage is produced in the ST of Shiling; 30% of the toys manufactured globally come from the ST of Chenghai (Jankowiak, 2017); and 20% of smartphones manufactured globally every year comes from Dongguan City (where 93% of the total townships participate in the programme).[v] This means that a significant part of consumption in the West is today possible *because* these Chinese clusters have emerged, with the support of this programme.

Gradually, Guangdong has become economically polarised (OECD, 2010). To correct this, since 2008 policymakers have used the STs programme also to promote within-province rebalancing (Di Tommaso et al., 2013), encouraging specialisations more related to existing local economic and social contexts (Su and Sun, 2016).

International scholars have increasingly focused on China's clustering and spatial industrial agglomerations (e.g., Barbieri et al., 2010; Wang et al., 2010; Long and Zhang, 2012; Butollo, 2015; Zhu et al., 2018). However, the literature on the specific case of Guangdong's ST programme is surprisingly small (cf. Bellandi and Di Tommaso, 2005; Bellandi and Caloffi, 2010; Barbieri et al., 2012). To the best of our knowledge, there is no systematic up-to date overview of the phenomenon as a whole, and no international contribution with empirical evidence on the linkages between the ST programme and local economic performances.

We attempt to fill this gap by offering a long-term, detailed overview of the ST programme, which we believe being worth of investigation for its distinctive features:

1. *Number of towns involved*. As far as we know, no other place worldwide has supported such a high number of clusters over such a long time with a unique and coherent policy program[vi].
2. *Evolution from industrial park to cluster promotion*. The policy originally fostered industrial parks, but, after learning from the

successful experiences of other countries' clusters, the Chinese government restructured it to support, drive and accelerate clusters growth (Rubini et al. 2015).

3. *Central role of the Department of Science and Technology of Guangdong Government (DSTGG)*. Since the launch of the programme, innovation has been at the centre of the policy through publicly-funded innovation platforms for the specialised sector (also when low-tech productions).

4. *Changing long-term aims*. From promotion of specialization, competitiveness and investment rationalization, to territorial rebalancing.

Next to encouraging local growth, STs have also been used as means for structural transformation, economic upgrade, and promotion of general economic and societal objectives (DSTC, 2011a, 2011b; DSTGG, 2003, 2006a, 2006b, 2008). In this sense, these tools have a broader industrial policy interpretation. Hence, our contribution is also valuable for the international debate on revisiting industrial policies (Chang, 1994; Rodrik, 2004; Cimoli et al., 2009; Bailey and Cowling, 2006; Vicente, 2018), which, we argue, needs to look to new economic giants' experience, such as that of China, often neglected by Western scholars (Heilmann and Shih, 2013).

This paper focuses on two empirical research questions: (1) Is the ST programme associated with improved territorial economic performances?;

(2) Can it contribute to territorial rebalancing within the province? With the first question, we investigate the capability of local industrial policy to promote local growth; with the second, we tackle the relationship between industrial policy and territorial rebalancing (Bellandi and Di Tommaso, 2005; Bianchi et al., 2000). In doing so, we focus on the so-called *endogenous* clusters, as they might be interpreted to some extent as a form of place-based policy (Bailey et al., 2015).

The paper is organised as follows. After discussing the international literature useful to interpret the STs' experience, we describe data and methodology. Next, we offer a detailed analysis of the programme and its evolution, and we analyse the features of *endogenous* versus *exogenous* STs; then, we present and discuss the empirical analysis. The paper ends with some implications for policy design and for the international debate on industrial policy, next to future research lines.

Specialised towns in the context of industrial clusters

Since Marshall (1890), the economic advantages related to industrial clusters[vii] have been widely discussed (e.g., Porter, 2000; Martin and Sunley, 2003; Boschma and Fornahl, 2011; Delgado et al., 2014; Vicente, 2018).[viii] Recently the debate has interested experiences from both the industrialised world (Slaper et al., 2018; Eisingerich et al., 2010) and emerging economies (Van Dijk and Rabellotti, 2005; Nadvi, 1999; Kesidou and Szirmai, 2008). Although scholars do not unanimously agree on these

effects, there seems to be growing consensus that clusters' contribution to local economic performance is idiosyncratic to the hosting context (Puig and González-Loureiro, 2017).

Since Becattini's seminal contributions (1987, see also Becattini et al., 2014) on industrial districts and Schmitz's (1999) on clusters, a well-established literature has asserted the relevance of joint actions and trust to foster collective efficiency and produce positive effects of clustering on performance (Porter, 2000). To achieve collective efficiency, co-located economic actors need to engage in joint actions, either spontaneously or following policy incentives.

A specific literature has focused on clustering as a target of industrial policies, given their potential economic gains (Humphrey and Schmitz, 1996; Rodriguez-Clare, 2007). Some scholars have also warned that without proper design and implementation, cluster policies might even produce negative consequences (Brakman and van Marrewijk, 2013). Within such literature, some papers use case studies to analyse the effect of clustering policies (Elola et al., 2017; Kiese, 2017). However, the evidence is still too limited and difficult to interpret given the complex design of these schemes and the variety of their effects (Uyarra and Ramolgan, 2016; Vicente, 2018).

Within this debate, China is particularly interesting, for the widespread use of spatially targeted initiatives (Wang, 2013), heterogeneous for types and

aims (Barbieri et al., 2012). In the case of the STs, Chinese policymakers have drawn on previous international clustering experiences to enhance existing industrial agglomeration and specialisation, typical of clustering policies (Ketels, 2013).

In doing so, policymakers have been focusing on promoting upgrading starting from local production contexts. In this sense, the STs' experience recalls the current debate about place-based policies (OECD, 2011; Barca et al., 2012; Hildreth and Bailey, 2014; Bailey et al., 2015), which recognises the importance of places' *context* in shaping and promoting development (Garretsen et al., 2013; Hildreth and Bailey, 2013). The recognition of local productive specialties at the centre of the ST programme is in line with place-based and space-tailored programmes. However, STs detach from place-based policies in many regards. While the interaction between local and provincial governments is consistent with the multilevel governance strategy of place-based approaches, there is no proof that other relevant stakeholders, such as firms and workers, participate in the design and implementation of the STs scheme. Additionally, although Guangdong policymakers have considered the experiences of Italian districts in designing the programme (Di Tommaso et al., 2013), the evolution of these places misses some districts' key elements, in particular the existence of a community of firms and people giving rise to the industrial atmosphere (Becattini, 1987). In Guangdong, in fact, clusters often result from a joint

action of planned policies and external forces, such as foreign capitals and migrations. In this context, STs can be classified as *exogenous* or *endogenous* (Barbieri et al., 2009; Di Tommaso and Bazzucchi, 2013; Lyu and McCarthy, 2015; Zeng, 2010; Zhu et al., 2017). The exogenous clusters mainly grew attracting FDI, and policies aimed at facilitating the relationships between foreign and local firms. The endogenous clusters stemmed either from the development of local firms, the evolution of ancient productive systems, the privatisation of town and villages enterprises, or some locational and geographical advantages.

The few studies on STs in English illustrate the rationale and the content of the policy (Barbieri et al., 2012; Bellandi and Di Tommaso, 2005; Eng, 1997; Long and Zhang, 2012) but not its possible effects on the territory and, in particular, the possible heterogeneity of endogenous vs exogenous clusters. In particular, we expect two integrated processes to be at stake in endogenous STs:

(1) being rooted in the local territory, history and values, cluster actors are more likely to engage in mutual trust relationships and collaboration – key success factors of industrial districts (Mistri and Solari, 2003; Becattini, 1987; and many more);

(2) Instituting some forms of collective action initiatives, such as innovation platforms, will reasonably have higher additional impact in terms of

collective action on endogenous rather than exogenous clusters, thanks to the embeddedness of relevant actors to the local context.

A note on data and methodology

The remainder of the paper adopts a mixed-method approach (Hesse-Biber and Johnson, 2015; Goertz, 2017; Cairns, 2018) by using both qualitative and quantitative data.

To analyse the STs, we built a novel database, containing information about the year of recognition, location, and specialisation on 399 towns established by 2016.[ix] It results from several fieldworks—from 2004 to mid-2017—allowing us to collect official documents and statistics; to interview provincial and local policymakers, economic actors, scholars and think tanks; as well as to visit some STs.[x]

In the empirical part, we matched this database with county and district-level data on economic performances from the Guangdong Statistical Yearbooks (NBS, 2001–2016). The result was a panel dataset of 75 counties and districts in Guangdong from 2000 to 2015.

The experience of Guangdong's specialised towns

The ST programme consists of an ex-post official certification by the provincial government, provided that the applicant town meets three criteria (Di Tommaso et al., 2013): (1) it must be a township from an administrative point of view or, less frequently, a county or urban district; (2) at least 30%

of its industrial output (or employment) must be concentrated in one "specialized sector" (defined to the three-digit-level equivalent of international classification systems); (3) the annual industrial output value has to exceed 2 billion yuan.

With the certification, the specialised town receives a 30,000 yuan subsidy from the DSTGG, provided an additional proportion be financed by the local government[xi] (Wang and Yue, 2010). These funds are to establish the so-called technology innovation platforms - the core of the STs policy -, to assist firms in developing new technologies and upgrading production. They also encourage cooperation among the town's firms, private and public engineering centres and public research institutions in innovative activities, to improve the reputation of the town's entire productive system (Barbieri et al., 2010; GDASS, 2017; DSTGG, 2003, 2006a, 2017; Wang, 2004). The policymakers we interviewed have stressed that, to increase efficiency, the DSTGG has pushed the innovation centres to operate following a competitive market logic: several centres are created and encouraged to compete for serving the companies in the town. Meanwhile, their general strategies are policy-driven: the political funding actors keep control over their operations through the board of directors, which is in charge of defining the strategic priorities and areas of intervention. In 2015, the innovation platforms have developed 620 projects for a total value of above 3 million yuan (Su and Sun, 2016).

According to the most recent data, the average degree of specialisation of the existing 416 towns exceeded by about 10% the minimum 30% required by law (GDASS, 2017). Figure 1 shows their localisation and some data about their growth in numbers over time.

[FIGURE 1 ABOUT HERE]

Specialised towns' development and growth

We identify four phases in the ST programme's evolution. The first dates back to the 1990s, before the initiative's official launch. The programme stemmed from a previous national government intervention—the Spark Plan—which founded several Technology Investment Zones in rural areas to upgrade agriculture production and promote a gradual structural shift towards manufacturing (Zhang and Ling, 2003; DSTGG, 2006b; Barbieri et al., 2009). The underlying idea was that strengthening the innovative capacity of agriculture would have positive spill-over effects on the whole economy, including industrial production (Di Tommaso et al., 2013). In the Spark Plan zones, firms could benefit from subsidies and loans (Barbieri et al., 2010). Some DSTGG experts realized that most of them tended to specialise in specific sectors—a process now known as 'one city, one product' (Wang and Yue, 2010; Su and Sun, 2016) which rests at the foundation of the ST programme.

From 2000 to 2003, the second phase—a pilot development of the programme—took place, introduced by two formal documents: 'Plan for the ST Technological Innovation: Pilot Test' and 'Managerial Methods for the ST Technological Innovation: Pilot Test' (DSTGG, 2008b). Most of the STs recognised in this phase are in the Pearl River Delta (PRD), at the centre of Guangdong industrial growth since the beginning of China's open door policy (Figure 2[a]) (Zheng et al., 2016).

[FIGURE 2 ABOUT HERE]

The concentration of STs in the PRD reflected policymakers' effort to rationalise this area's fast—and often chaotic—growth (Enright et al., 2005; Chen, 2007). Such economic expansion must be related with the career incentives given by national rules to local officials. Indeed, up to the beginning of 2000s local officials were mainly promoted according to their ability to produce economic improvements (mainly GDP growth) at the local level (Li, 2014). To this aim, local officials often used transactions in the land market, which indeed boomed between 1988 and 1992.Land conveyance fees generated by such transactions were used for infrastructural financing and upgrading, ending in GDP growth (Ahmad et al., 2018; Cao and Zhao, 2011). Hence, this phase of the STs programme served the promotion of industrial growth and upgrading, while rationalising industrial development (Barbieri et al., 2009). The sectoral specialisation of these first towns reflected the features of Guangdong's—and the PRD's—

manufacturing systems at the time, mainly based on low-tech production (Figure 3).

[FIGURE 3 ABOUT HERE]

In the third phase (2003–2008), the STs programme extended to some non-PRD cities and, along with upgrading, it started to be used to encourage development of lagging areas (Barbieri et al., 2012; Sarcina et al., 2014). The new STs were established in the so-called Great PRD and on the coast and peripheral areas through 2006 (Figure 2[b]), with rural bases and mountainous territory through 2009 (Figure 2[c]). They had different productive peculiarities, such as being focused on agriculture-related, resource-based activities, or services (Figure 3).

Some official documents[xii] highlighted the double path behind the policy implementation of this phase and recognised the strategic value of STs in Guangdong's development (Lin, 2006; Barbieri et al., 2010; Su and Sun, 2016). They stressed how provincial and local institutions started to collaborate in clustering processes to avoid sectoral overlap and to coordinate the regional innovation system. This is reflected also in the establishment of the Guangdong Provincial ST Development Promotion Association (POTIC) (Su and Sun, 2016). Furthermore, many of these documents pointed to the diffusion of good practices related to knowledge

diffusion and protection, and territorial branding. Finally, they emphasised collaboration between local actors and universities and research institutions.

Since 2008, a fourth phase has begun with a new emphasis on endogenous growth and innovation, in line with the whole change in post-crisis Chinese policy orientation. The most important measure in this framework is the 'One Town, One Policy' (2010), incentivising each town to find its own developmental path while supporting the coordinated economic development of Guangdong Province (DSTC, 2011a, 2011b). This implies the following actions: (1) to further decentralize the economic management of STs to local authorities; (2) to optimize the industrial and urban structure of STs; (3) to restore public accounts and realize infrastructural investments; (4) to promote quality upgrading of traditional industries; and (5) to increase GDP, innovation potential, and, more generally, competitive capacity (Tsai, 2013). Similar to this is the 'One Town, One Institute' initiative (2012), aimed at founding a third-level degree institution in each township (Su and Sun, 2016). Finally, the initiatives issued by the provincial agencies stress two elements to empower endogenous sources: 1) promoting micro, small, and medium enterprises and establishing dedicated public innovation services; 2) enhancing the quality and innovative performances of those towns specialised in locally-rooted productions (Di Tommaso et al., 2013; Su and Sun, 2016; DSTGG, 2017).

Nowadays, almost all Guangdong counties host at least one ST, and while a high number is still in the PRD (particularly in Dongguan), many others are also localised in the north-eastern peripheral prefectures of Meizhou and Chaozhou (Figure 2[d]). While keeping a good proportion of agriculture-related STs, the sectoral distribution of towns has changed towards low-, medium, and high-tech specialisation (Figure 3).

The programme has inspired a twofold sectoral specialisation of the townships. On the one hand, the specialisation in resource-based and agriculture-related activities, consistent with the policy's aim to upgrade traditional production in areas less involved in manufacturing development. On the other, the growth of mid- to high-tech manufacturing, to promote technological upgrading and innovative activities in core manufacturing clusters in Guangdong.

Endogenous and exogenous specialised towns

Notwithstanding the common policy framework, STs are heterogeneous for size, urbanisation degree, development period, etc..

An in-depth analysis of the townships shows that some of them, which we call *endogenous*, followed an industrial development rooted in their own economic and cultural history; in some others, which we call *exogenous*, external forces as foreign capital and national policies triggered their growth.

To identify the two groups, we referred to Becattini's (2015) contribution about industrial districts as originated by the historical profile of the production atmosphere of the hosting areas. We classified each township as *endogenous* if its specialisation had at least one of these features[xiii]:

- rooted in the history of the town;
- based on local resources (e.g., aquaculture in townships next to waters);
- traditional, typical or mainly oriented towards national markets (e.g., rice cookers or pottery);
- derived from a production rooted in town's history (e.g., machinery for stones processing in areas previously used as quarries); and
- linked to the territory's physical characteristics (e.g., port logistics on coastal areas).

Some specific productions (such as ICT) are considered per se exogenous, as they stemmed from the activity of foreign actors. Conversely, it is likely that some activities, naturally oriented to serve the local or national market (as the agriculture-related), are automatically endogenous. Nonetheless, the distinction between these two groups only partially overlaps with sectoral distribution (Table 1).

[TABLE 1 ABOUT HERE]

Endogenous STs are 209 out of the total 399, and have grown since the mid-2000s, in correspondence with the shift of policy towards endogenous sources (Figure A1 in the online supplementary materials). Their geographical distribution confirms different specialisation paths between PRD and non-PRD (Figure 4). Endogenous townships are mainly concentrated in non-PRD inner and mountainous areas, testifying to a larger policymaking investment to promote these prefectures by focusing on the local market and existing productions. The predominance of exogenous specialisation in the PRD, conversely, clearly indicates its exogenous economic growth path, based on foreign capital and national migrations, although with some notable exceptions that founded their economic growth on traditional productions.

[FIGURE 4 ABOUT HERE]

Empirical analysis

We now turn to investigate the two empirical research questions:

- RQ1: Is the ST programme associated with improved territorial economic performances?
- RQ2: Can the policy contribute to territorial rebalancing within the province?

We use data at the most detailed territorial level– that is, counties and districts –, which is yet above the township one. We mainly use panel fixed-

effects models, to test for robust correlations between the policy and local economic performance. Given the structure of the data and considering that policy implementation, continuously changes through time and involves the great majority of Guangdong counties, there are obstacles in building proper counterfactuals to explore causality.[xiv] However, to address some causal interpretation, we add a robustness check based on latest techniques to estimate dose-response effects, particularly fit for analysing non-binary treatments as in our case. We use Cerulli (2015)[xv] fixed-effect dose-response method which, compared with usual General Propensity Scores methods (Hirano and Imbens, 2004; Bia and Mattei, 2008), allows to include non-treated units in the analysis and to consider increasing treatment intensity across time.

Our outcome variables are industrial and agricultural output in county *i* at time *t* ($INDOUT_{i,t}$ and $AGROUT_{i,t}$) used as a proxy of economic performance.[xvi]

We test the association of clusters with economic performances at the local level (RQ1) first with panel data fixed-effects with robust standard errors.[xvii] Our independent variables of interest are: 1) the number of STs in county *i* (SP_TOWN_i), 2) the ratio of endogenous towns on the total number of STs ($RATIO\_ENDOG_i$). Finally, we introduce the number of full-time workers in county *i* ($WORKERS_i$), to control for the economic activity, and year dummies. The variables enter the model with one or three lags to account

for lagged effects. We also perform a subgroup analysis (Boyd-Swan et al. 2016) to study possible heterogeneous effect between PRD and non-PRD areas.

We then support the results with the dose-response analysis,[xviii] including the variable of interest: 1) as a dummy variable (value= 0 if the unit is not treated and 1 otherwise); 2) as intensity of the treatment–the dose–normalized in order to range from 0 (minimum dose in the sample) to 100 (maximum dose in the sample). The latter is assumed to have a parametric polynomial form (Cerulli, 2015; Filippetti and Cerulli, 2018) that can be investigated through graphical representation. We run two series of models, one for specialized towns (SP_TOWN_i) and the other for endogenous towns ($ENDOG_i$)[xix]. The outcomes of interest are industrial output (*INDOUT)* and agricultural output (*AGROUT)* forwarded by 1 and 3 years.[xx] Summary statistics for the relevant variables are in Table A1 in the online supplementary materials.

To analyse the association between STs and territorial rebalancing (RQ2), we divide the counties into four groups (low, medium-low, medium-high, and high) according to the level of industrial output in 2000 (t_0), using the distribution's quartiles as thresholds. We observe through a fixed-effects panel subgroup analysis whether the effects of *SP_TOWN* and of *RATIO_ENDOG* is heterogeneous according to the initial level of local output. Specifically, if we find that the effects are stronger on lower than on

higher groups, we may conclude that STs help territorial rebalancing. We also support these results with the evidence found in relation to RQ1. We summarise information on the subgroups in Table A2 in the online supplementary materials.

The effects of specialised towns and endogenous specialised towns on economic performances (RQ1)

Table 2 shows the results of the fixed-effects estimation. For industrial performances for the whole sample, there is a positive association between the ratio of endogenous towns, at *t-1*, and industrial output. Additionally, in the PRD endogenous towns show positive effects at *t-3*. For the whole sample, there is also quite robust evidence that agricultural output benefits from higher levels of endogenous STs one-year lagged. The gains related to endogenous towns, in this case, appear to be stronger in non-PRD counties. In all such cases, there is no observable effect of specialisation per se.

[TABLE 2 ABOUT HERE]

Figures 5 and 6 show graphically the results of the dose-response models (the coefficients are in Tables A3 and A4 in the online supplementary materials). The first focuses on STs total number. Regarding industrial output, both at *t-1* and *t-3* the response is (rather) flat or non-significant up to a certain dose of the treatment, and then it increases. The curves shapes for agricultural output are similar, although flatter in correspondence with

intermediate doses. These results suggest a positive and significant relation between STs and output, when STs are sufficiently numerous (50-60% of the dose, corresponding to about 20 towns).

Figure 6 reports the dose-response related to endogenous towns. The first results (6[a]) suggest that the relation with industrial output is flat and non-significant up to 60% of the dose (about 5 towns), and then it significantly increases. This relation becomes U-shaped including the total number of STs as a control (6[b]): for small amounts of endogenous STs the relation is decreasing – and negative — becoming then positive and increasing.

For agricultural output (in both cases), the relation between endogenous towns and output is positive and increasing, particularly for doses' amounts above 60% (again, 5 towns).

[FIGURE 5 AND 6 ABOUT HERE]

Our interpretation of the results comes from the combination of the panel fixed-effects estimations and the dose response models. First, we observe significant and positive results in both models only for endogenous towns. Particularly for industrial output, these results are relevant for PRD counties (Table 2) and for large numbers of endogenous towns (Figure 6). The results concerning the PRD can be read in the light of its economic development history (OECD, 2010; Zeng, 2010; Di Tommaso et al., 2013). They are further reinforced by the fieldwork interviews to local policymakers and

scholars about specific STs cases. Specifically, PRD's STs have followed two different paths. One is based on FDI and exports that generated some of the most important national production and export hubs. An example is Dongguan, whose specialization has been mainly linked to FDI-led ICT production (Wang and Lin, 2008; Zhou et al., 2011, and our interviews). The second development pattern, conversely, has been more based on local firms and traditional products for internal demand. This is the case, for example, of Foshan, whose industrialisation was based more on local forces than foreign capitals but becoming, however, a core Guangdong's manufacturing centre (NBS, 2010; Di Tommaso et al., 2013; Zeng, 2010; and our interviews). The positive relation between endogenous towns and industrial output seems to reflect the performance of this second group of clusters.

We also find positive association between industrial output and large numbers of endogenous townships. Excluding Foshan, all the counties hosting numerous endogenous townships are in few non-PRD peripheral counties. This would suggest that, for high numbers of endogenous clusters, positive effects could be observed also in remote areas.

The evidence related to agricultural output, consistent across the models, shows a possible positive effect of endogenous towns. This is linked with the pattern of specialisation of more marginal, non-PRD areas, engaged in agriculture-related and resource-based productions.

The effects of specialised towns and endogenous specialised towns on territorial rebalancing (RQ2)

Table 3 reports the subgroup analysis results. The only persistent positive association is related to *t-1* and *t-3 RATIO_ENDOG* for areas with initial medium-low levels of output (all outside the PRD). Coupled with previous evidence of the dose-response, this result reinforces that, also for some non-PRD areas, large amounts of endogenous towns might promote industrial development. Therefore, although PRD may particularly benefit from the establishment of endogenous towns, under some circumstances such types of clusters might be desirable also for marginal areas in a territorial rebalancing perspective.

[TABLE 3 ABOUT HERE]

Final remarks

Guangdong ST programme is perhaps one of the largest-scaled experiments of policy-supported territorial industrial transformation worldwide. It has contributed to the province's widespread industrial growth, shaping its geography of production, and placing some of its towns at the centre of global production chains.

We believe this experience draws some useful lessons for the international debate about industrial policy.

1) The evolution of Guangdong clusters calls for attention on the relationship between policies' objectives and tools, rather than only on the tools. Indeed, we have highlighted how the same tool, i.e. specialised clustering promotion, was used for accommodating different evolving goals (e.g. from mere industrialisation to territorial rebalancing). The ST experience reinforces the statement made in a number of academic contributions: industrial policy should no longer be viewed as a mere discussion on the best tools to achieve well-established aims. Conversely, it is a complex process entailing considerations on a society's long-term broad aims (Chang, 1994; Cimoli et al., 2009; Di Tommaso and Schweitzer, 2013; Andreoni and Scazzieri, 2014; Andreoni and Chang, 2016). In this view, industrial policy is not just a set of instruments to achieve fixed purposes. It should be rather conceived as a process that drives structural economic and social change.

2) China's ability to implement industrial policies is founded on a well-defined institutional architecture, with agencies and personnel dedicated to design, experiment, and apply policies, and whose functioning has been changing. In particular, career incentives have been lately aligned with new long-term industrial policy goals, shifting from mere economic growth to social and environmental issues.[xxi] This would suggest that revitalised industrial policies must include investments in government capacity-building.

3) Concerning clustering policies, our evidence suggests that using different types and combinations of specialisation and localisation can produce different results, corresponding to different policy aims. Additionally, STs experience confirms that, as for mature economies (Bailey et al., 2015), also for developing countries an approach to sectoral specialisation and upgrading tailored to local contexts might improve local economic performances better than exogenous-driven growth. It appears to us that policymakers might have followed this path, passing from a place-neutral attitude in the beginning to a more place-based perspective later.

Finally, the STs programme is not free from important limitations, which also draw general policy implications and set the line for future research. Indeed, environmental and social sustainability issues have become increasingly serious in Guangdong, also given its fast industrialisation. These aspects have recently generated growing concerns and some first policymaking reactions. Accordingly, it seems necessary that future studies realign researches on China with recent reflections about sustainability and industrial development (Aiginger, 2016). Focusing particularly on human development and capabilities (Sen, 1999) future empirical analysis may deepen the interactions between place-based policies, clusters and human development indicators in emerging countries, an aspect that has been neglected so far.

Acknowledgements

We are grateful to the reviewers, the editors of the special issue and the commenters at the two *Back on the Agenda? Industrial Policy revisited* Conferences (Bath, April 26, 2018 and Cambridge, July 12-13, 2018) for the insightful comments and suggestions on the paper. We would also like to thank Paolo Rizzi for the valuable support in the translation of Chinese official policy documents.

References

Ahmad, E., Niu M., & Xiao, N. (2018), *Fiscal Underpinnings for Sustainable Development in China*. Springer, Singapore.

Andreoni, A., & Chang, H.-J. (2016). Industrial policy and the future of manufacturing. Economia e Politica Industriale, **43**:no. 4: 491–502.

Andreoni, A., & Scazzieri, R. (2014). Triggers of change: structural trajectories and production dynamics. *Cambridge Journal of Economics*, **38**:no. 6: 1391–1408.

Aiginger, K. (2016), *New Dynamics for Europe: Reaping the Benefits of Socio-ecological Transition*. Synthesis Report Part I. European Commission, Brussels

Bailey, D., & Cowling, K. (2006) Industrial policy and vulnerable capitalism. *International Review of Applied Economics*, **20**:no. 5: 537-553.

Bailey, D., Hildreth, P., & De Propris, L. (2015) Mind the gap! What might a place-based industrial and regional policy look like? In D. Bailey, K. Cowling, & P. Tomlinson (Eds.) *New Perspectives on Industrial Policy for a Modern Economy*, Oxford, OUP: 287–308.

Bailey, D., Tomlinson P. and Cowling, K. (2015) *New Perspectives on Industrial Policy for a Modern Economy*, Oxford, OUP.

Barbieri, E., Di Tommaso, M. R., & Bonnini, S. (2012) Industrial development policies and performances in Southern China: Beyond the specialised industrial cluster program. *China Economic Review*, **23**:no. 3.

Barbieri, E., Di Tommaso, M. R., & Huang, M. (2010) Industrial Development Policy and Innovation in Southern China: Government Targets and Firms' Behaviour. *European Planning Studies*, **18**: 83–105.

Barbieri, E., Di Tommaso, M. R., & Rubini, L. (2009) *Industria contemporanea nella Cina Meridionale: governi, imprese e territori*, Roma, Carocci.

Barca, F., McCann, P., & Rodríguez-Pose, A. (2012) The case for regional development intervention: Place-based versus place-neutral approaches. *Journal of Regional Science*, **52**:no. 1.

Becattini, G. (1987) *Mercato e forze locali - il distretto industriale*, Bologna, Il Mulino.

Becattini, G. (2015) *La coscienza dei luoghi*, Roma, Donzelli.

Becattini, G., Bellandi, M., & De Propris, L. (Eds.) (2014) A handbook of industrial districts, Cheltenham and Northampton, Edward Elgar.

Bellandi, M., & Caloffi, A. (2010) Forms of industrial development in Chinese specialized towns and types of challenges to European manufacturing SMEs: an Italian perspective, in Lenihan, H., Andreosso-O'Callaghan, B., & Hart, M. (Eds.) *SMEs in a Globalised World. Survival and Growth Strategies on Europe's Geographical Periphery*, Cheltenham and Northampton, Edward Elgar: 113–132.

Bellandi, M., & Di Tommaso, M. R. (2005) The case of specialized towns in Guangdong, China. *European Planning Studies*, **13**: 707–729.

Bia, M., & Mattei, A. (2008). A Stata package for the estimation of the dose-response function adjustment for the generalized propensity score. *The Stata Journal*, **8**:no. 3: 354–373.

Bianchi, P., Di Tommaso, M. R., & Rubini, L. (2000) *Le api audaci. Piccole imprese e dinamiche industriali in Estremo Oriente*, Milano, Franco Angeli.

Boschma, R., & Fornahl, D. (2011) Cluster Evolution and a Roadmap for Future Research. *Regional Studies*, **45**:no. 10.

Boyd-Swan, C., Herbst, C. M., Ifcher, J., & Zarghamee, H. (2016) The earned income tax credit, mental health, and happiness. *Journal of Economic Behavior and Organization*, **126**: 18–38.

Brakman, S., & van Marrewijk, C. (2013) Reflections on cluster policies. *Cambridge Journal of Regions, Economy and Society*, **6**:no. 2.

Butollo, F. (2015) Growing against the odds: Government agency and strategic recoupling as sources of competitiveness in the garment industry of the Pearl River Delta. *Cambridge Journal of Regions, Economy and Society*, **8**:no. 3.

Cao, C., & Zhao, Z. (2011). Funding China's urban infrastructure: Revenue structure and financing approaches. *Center for Transportation Studies, University of Minnesota*.

Cairns, M. R. (2018). Metering water : Analyzing the concurrent pressures of conservation, sustainability, health impact, and equity in use. *World Development*, **110**: 411–421.

Cerulli, G. (2015). Ctreatreg: Command for fitting dose–response models under exogenous and endogenous treatment. *The Stata Journal*, **15***:no.* 4: 1019-1045.

Chang, H. J. (1994) *The Political Economy of Industrial Policy*, New York, Macmillan.

Chen, X. (2007) A tale of two regions in China: Rapid economic development and slow industrial upgrading in the Pearl River and the Yangtze River Deltas. *International Journal of Comparative Sociology*, **48**: 2-3.

Cimoli, M., Dosi, G., & Stiglitz, J. E. (2009) *Industrial policy and development: The political economy of capabilities accumulation*, Oxford, OUP.

Delgado, M., Porter, M. E., & Stern, S. (2014) Clusters, convergence, and economic performance. *Research Policy*, **43**: 10.

Di Tommaso, M. R., & Schweitzer, S. O. (2013) *Industrial policy in America: Breaking the taboo,* Cheltenham and Northampton, Edward Elgar.

Di Tommaso, M. R., Rubini, L., & Barbieri, E. (2013) *Southern China. Industry, Development and Industrial Policy*, London and New York, Routledge.

Di Tommaso, M.R., & Bazzucchi, L. (2013) Cina contemporanea: un'analisi sulle politiche per la promozione della specializzazione industriale a livello territoriale. *L'Industria*, **3**: 417–432.

DSTC (Department of Science and Technology of China) (2011a) 'Specialized towns: the importance of sustaining wealth in Guangdong. Report on the innovation capacity building in Guangdong specialized towns', *Science and Technology Daily* (in Chinese)

DSTC (2011b) 'The economy of specia- lized towns in Guangdong: "a third of the world", *Science and Technology Daily* (in Chinese).

DSTGG (Department of Science and Technology of Guangdong) (2003) 'The Innovation of Industrial Clusters in Guangdong', Internal Report (in Chinese).

DSTGG (2006a) Report on the Summary of the five-year Implementation of the Plan of ST Technology Innovation Pilot Test and an Overview of the Development of the STs,

DSTGG Magazine on Specialized Towns Technology Innovation Dynamics, **115**:no. 6.

DSTGG (2006b) *Suggestion on the Promotion of the Development of Specialized Towns*. Retrieved from www.zhyz.gov.cn/ (accessed 15 January 2007, in Chinese)

DSTGG (2008) *Policy and Instruments on Specialized Town Technology Innovation in Guangdong, Department of Science and Technology of Guangdong Province.* Retrieved from: http://www.zhyz.gov.cn (accessed 18 March 2009, in Chinese)

DSTGG (2017). A data analysis of the development of Specialized towns (in Chinese). Internal Report

Eisingerich, A. B., Bell, S. J., & Tracey, P. (2010). How can clusters sustain performance? The role of network strength, network openness, and environmental uncertainty. Research policy, **39**:no. 2: 239-253.

Elola, A., Valdaliso, J. M., Franco, S., & López, S. M. (2017) Public policies and cluster life cycles: insights from the Basque Country experience. *European Planning Studies*, **25:no.** 3.

Eng, I. (1997) The rise of manufacturing towns: externally driven industrialization and urban development in the Pearl River Delta of China. *International Journal of Urban and Regional Research*, **21**: no 4: 554-568.

Enright, M. J., Scott, E. E., & Chang, K. M. (2005) *Regional powerhouse: the greater Pearl River Delta and the rise of China*, Chichester, Wiley.

Filippetti, A., & Cerulli, G. (2018). Are local public services better delivered in more autonomous regions? Evidence from European regions using a dose-response approach. *Papers in Regional Science*, **97**:no. 3: 801-826.

Garretsen, H. et al., 2013. The future of regional policy. *Cambridge Journal of Regions, Economy and Society*, **6**:no. 2.

GDASS (Guangdong Academy of Social Sciences) (2017), 'The Pattern and Path of Collaborative Innovation of Guangdong Industrial Clusters', *Internal Report*, July (in Chinese).

Goertz, G. (2017) *Multimethod Research, Causal Mechanisms, and Case Studies. An integrated approach*. Princeton and Oxford: Princeton University Press.

Groenewald, N., Chen, A., & Lee, G. (2008) *Linkages between China's regions. Measurement and Policy.* Cheltenham, UK: Edward Elgar.

Heilmann, S., & Shih, L. (2013) The rise of industrial policy in China, 1978-2012. Harvard-Yenching Institute Working Paper Series, 17/7: 1-24.

Hervas-Oliver, J.L. et al. (2015) Clusters and Industrial Districts: Where is the Literature Going? Identifying Emerging Sub-Fields of Research. *European Planning Studies*, **23**:no. 9, 1827–1872.

Hesse-Biber, S., & Johnson, R. B. (Eds.) (2015) *The Oxford Handbook of Multimethod and Mixed Methods Research Inquiry*. *Oxford Library of Psychology*. Oxford, New York, OUP.

Hildreth, P., & Bailey, D. (2013) The economics behind the move to “localism” in England. *Cambridge Journal of Regions, Economy and Society*, **6**:no. 2.

Hildreth, P., & Bailey, D. (2014) Place-based economic development strategy in England: Filling the missing space. *Local Economy*, **29**:no. 4–5.

Hirano, K., & Imbens, G. W. (2004). The propensity score with continuous treatments. In Gelman, A., & Meng, X. L. (Eds.). *Applied Bayesian modeling and causal inference*

from incomplete-data perspectives. Chichester, John Wiley & Sons: 73-84.

Humphrey, J., & Schmitz, H. (1996) The triple C approach to local industrial policy. World Development, **24**:no. 12: 1859-1877.

Jankowiak, A.H. (2017) Cluster-Based Development: a Chinese Cluster Policy. *Research Papers of Wroclaw University of Economics*, **486**: 71–79.

Kesidou, E., & Szirmai, A. (2008). Local knowledge spillovers, innovation and export performance in developing countries: empirical evidence from the Uruguay software cluster. The European Journal of Development Research, **20**:no. 2: 281-298.

Ketels, C. (2013) Recent research on competitiveness and clusters: What are the implications for regional policy? *Cambridge Journal of Regions, Economy and Society*, **6**:no. 2.

Kiese, M. (2017) Regional cluster policies in Germany: challenges, impacts and evaluation practices. *The Journal of Technology Transfer*, 1–22.

Knight, J. (2013) Inequality in China: An overview. Policy Research Working Paper Series, n. WPS6482, Washington.

Lai, H.-C., Chiu, Y.-C., & Leu, H.-D. (2005) Innovation Capacity Comparison of China's Information Technology Industrial Cluster: The Case of Shanghai, Kushan, Shenzhen and Dongguan. *Technology Analysis & Strategic Management*, **17**: no, 3.

Li, J. (2014). Land sale venue and economic growth path: Evidence from China ' s urban land market. *Habitat International*, **41**: 307–313.

Li, L.C. (1997) Provincial discretion and natural power: investment policy in Guangdong and Shanghai. *The China Quarterly*, **152**: 778-804.

Lin, P. (2006) What is “coordinated promotion plan between province and (prefecture) city”? *Journal of Guangdong Science and Technology*, **14**:no. 8 (in Chinese)

Long, C., & Zhang, X. (2012) Patterns of China’s industrialization: Concentration, specialization, and clustering. *China Economic Review*, **23**: no.3.

Lu, R., Ruan, M., & Reve, T. (2016) Cluster and co-located cluster effects: An empirical study of six Chinese city regions. *Research Policy*, **45**:no. 10.

Lyu, L., & McCarthy, L. (2015) “Logalization”: local–global processes and the Shiling leather industrial district in Guangzhou, China. *Asian Geographer*, **32**: no.1.

Marshall, A. (1980) *Principles of Economics*, Basingstoke: Palgrave Macmillan.

Martin, R., & Sunley, P. (2003) Deconstructing clusters: chaotic concept or policy panacea? *Journal of Economic Geography*, **3**: no.1.

Mistri, M., & Solari, S. (2003) Behavioural rules in industrial districts: loyalty, trust and reputation, In F. Belussi, Gottardi, G. and Rullani E. (eds.), *The technological evolution of industrial districts*, Boston: Springer: 245-267.

Nadvi, K. (1999) The cutting edge: collective efficiency and international competitiveness in Pakistan. *Oxford Development Studies*: **27**: no.1: 81-107.

NBS (National Bureau of Statistics) (Ed.) (various years) *Guangdong Statistical Yearbook*.

Nee, V., & Opper, S. (2007). On politicized Capitalism. In V. Nee & R. Swedberg (Eds.), *On capitalism*. Stanford University Press. 93−120

OECD (Organization of Economic Cooperation and Development) (2010) *OECD Territorial Reviews: Guangdong, China 2010*. Paris: OECD Publishing.

OECD (2011) *OECD Regional Outlook 2011*. Paris: OECD Publishing.

Parish, W. L., & Michelson, E. (1996). Politics and markets: Dual transformations. The

American Journal of Sociology, **101**:no. 4: 1042−1059.

Porter, M. E. (2000) Location, competition, and economic development: Local clusters in a global economy, *Economic Development Quarterly*, **14**:no. 1.

Pu, Z., & Fu, J. (2018) Economic growth , environmental sustainability and China mayors' promotion. *Journal of Cleaner Production*, **172**, 454–465.

Puig, F., & González-Loureiro, M. (2017) Clusters, Industrial Districts and Strategy. *Investigaciones Regionales-Journal of Regional Research*, **39**.

Rodriguez-Clare, A. (2007). Clusters and comparative advantage: Implications for industrial policy. *Journal of Development Economics*, **82**:no. 1: 43-57.

Rodrik, D. (2004) Industrial policy for the twenty-first century. *Harvard University*, (September), 1–57.

Rubini, L., Di Tommaso, M.R., & Barbieri, E. (2015) Special economic zones and cluster dynamics: China. In J.D. Wright (ed.) *International Encyclopedia of the Social and Behavioural Sciences*, 2nd edition.

Sarcina, A., Di Tommaso, M. R., & Bonnini, S. (2014) China: industrialization, growth and territorial disparities. A challenge to the sustainability of the process of change and development. *L'industria*, **35**:no. 3.

Schmitz, H. (1999) Collective efficiency and increasing returns. *Cambridge Journal of Economics*, **23**: 465-483.

Sen, A. (1999) *Development as Freedom*. Oxford: OUP.

Slaper, T. F., Harmon, K. M., & Rubin, B. M. (2018) Industry Clusters and Regional Economic Performance: A Study Across U.S. Metropolitan Statistical Areas. *Economic Development Quarterly*, **32**:no. 1.

Su, W., & Sun, T. (Eds.) (2016) Development Path, *Guangdong Specialized Towns*, **21**: 4–5 (in Chinese).

Tsai, M. (2013) 'Interpretation of the "One Town, One Policy" Policy for Guangdong Specialized Towns', Retrieved from: http://www.potic.org.cn (last access on 25 May 2018)

Uyarra, E., & Ramolgan, R. (2016) The impact of cluster policy on innovation. *In Edler, J., Cunningham, P., Gök, A. and Shapira, P. (eds) Handbook of Innovation Policy Impact,* Cheltenham and Northampton, Edward Elgar: 196–225**.**

Van Dijk, M.P., & Rabellotti, R. (eds.) (2005) *Enterprise clusters and networks in developing countries*. London: Frank Cass.

Vicente, J. (2018) *Economics of clusters: A brief history of cluster theories and policy*. Cham: Palgrave McMillan.

Wang, C. C., Lin, G. C. S., & Li, G. (2010) Industrial Clustering and Technological Innovation in China: New Evidence from the ICT Industry in Shenzhen. *Environment and Planning A*, **42**:no. 8.

Wang, J. (2004) Developing innovation based industrial clusters: policy recommendation. *Economic Geography*, **7**:no. 433 (in Chinese).

Wang, J. (2013) The economic impact of Special Economic Zones: Evidence from Chinese municipalities. *Journal of Development Economics*, **101**: 133–147.

Wang, J., & Yue, F. (2010) Cluster development and the role of government: the case of Xiqiao textile cluster in Guangdong. In Zeng D. Z. (Ed.) *Building engines for growth and competitiveness in China: Experience with special economic zones and industrial clusters*, Washington, World Bank Publications.

Wang, C., & Lin, G. C. S. (2008). The Growth and Spatial Distribution of China's ICT Industry: New Geography of Clustering and Innovation. *Issues & Studies*, **44**:no. 2: 145–192.

Yueh, L.Y. (2013) *China's growth: the making of an economic superpower*. Oxford: OUP.

Zeng, D. Z. (2010), *Building Engines for Growth and Competitiveness in China. Experience with Special Economic Zones and Industrial Clusters*, Washington, World Bank Publications.

Zeng, D. Z. (2012) China's special economic zones and industrial clusters: the engines for growth. *Journal of International Commerce, Economics and Policy*: **3**, no.3: 1250016.

Zhang, M., & Ling, H. (2003) Building Specialized Town Technology Innovation Platform with Rich Content: A Interview to Mr. Ma Xianmin, Vice Director of Department of Science and Technology of Guangdong. *Journal of Guangdong Science and Technology*, **2**: 15–18 (in Chinese)

Zheng, G., Barbieri, E., Di Tommaso, M. R., & Zhang, L. (2016) Development zones and local economic growth: Zooming in on the Chinese case. *China Economic Review*, **38**: 238–249.

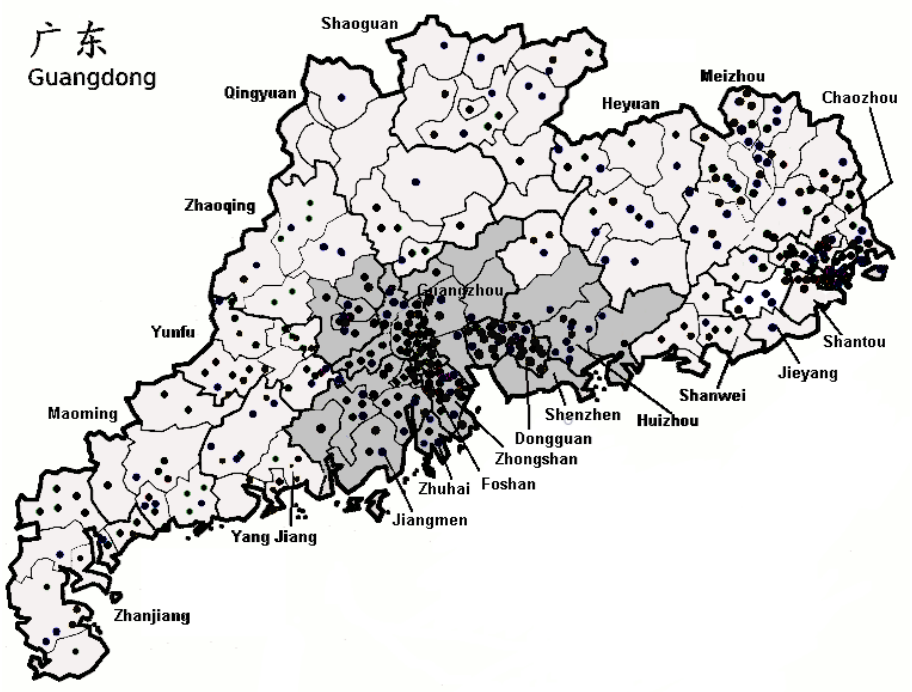
Zhou, Y., Sun, Y., Dennis Wei, Y. H., & Lin, G. C. S. (2011). De-centering 'spatial fix'-patterns of territorialization and regional technological dynamism of ICT hubs in China. *Journal of Economic Geography*, **11**:no. 1: 119–150.

Zhu, S., Pickles, J., & He, C. (2017) Global and Local Governance, and Industrial and Geographical Dynamics: A Tale of Two Clusters, *In Geographical Dynamics and Firm Spatial Strategy in China*, Berlin and Heidelberg, Springer.

Zhu, X., Liu, Y., He, M., Luo, D., & Wu, Y. (2018) Entrepreneurship and industrial clusters: evidence from China industrial census. *Small Business Economics*: 1–22.

Figures

Figure 1. Specialised towns in Guangdong



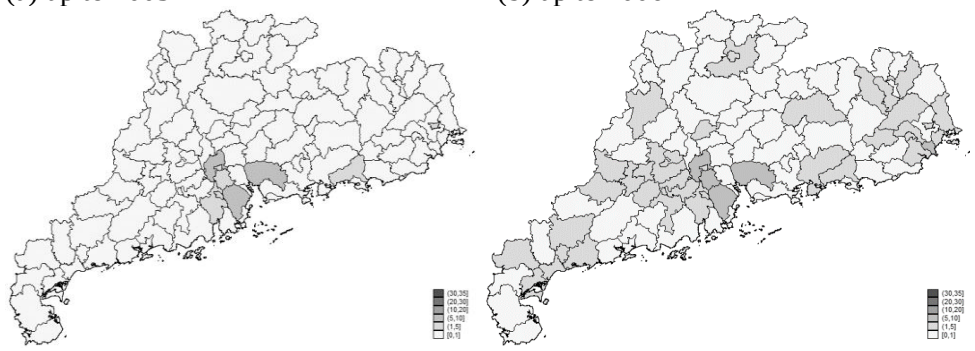
Up to 2003	Up to 2006	Up to 2008	Up to 2015	Up to 2018*
69	200	277	399	416

* The 17 new towns recognized from 2015 to 2018 are not reported in the map due to unavailability of data

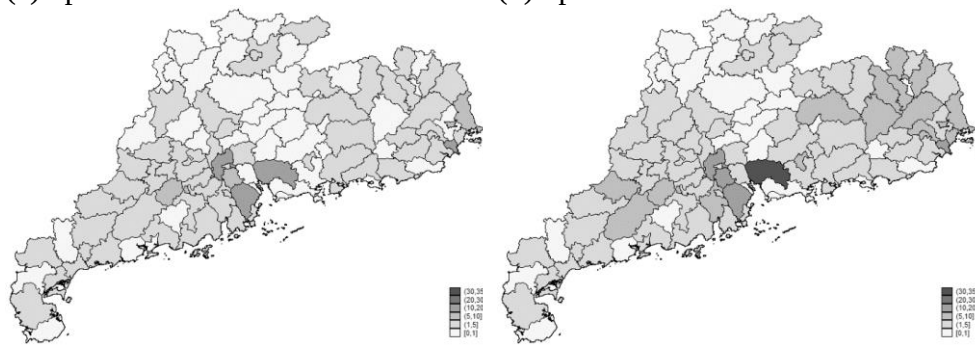
Source: Authors' elaborations on data from Guangdong Provincial ST Development Promotion Association

Figure 2. Geographical distribution of specialised towns

(a) up to 2003 (b) up to 2006

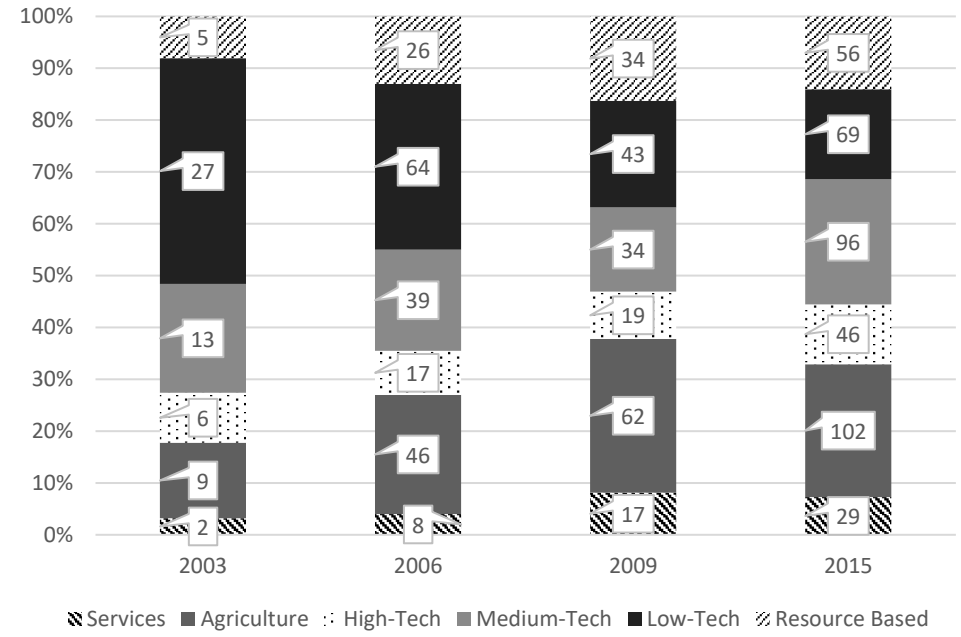


(c) up to 2009 (d) up to 2015



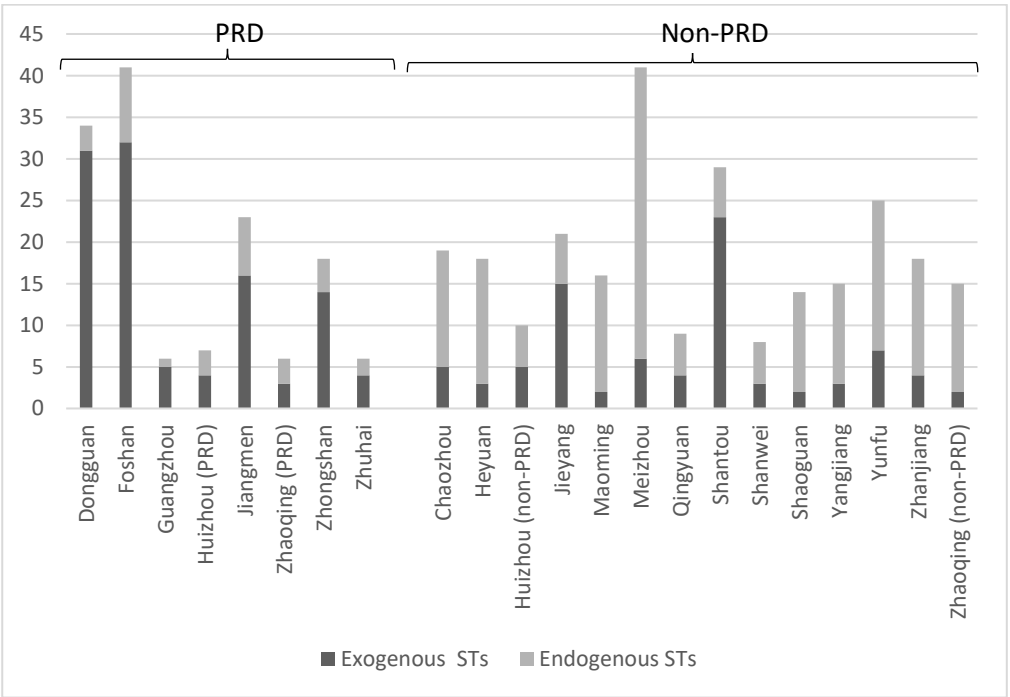
Source: Authors' elaborations on data from Guangdong Provincial ST Development Promotion Association

Figure 3. Sectoral distribution of specialised towns



Source: Authors' elaborations on data from Guangdong Provincial ST Development Promotion Association

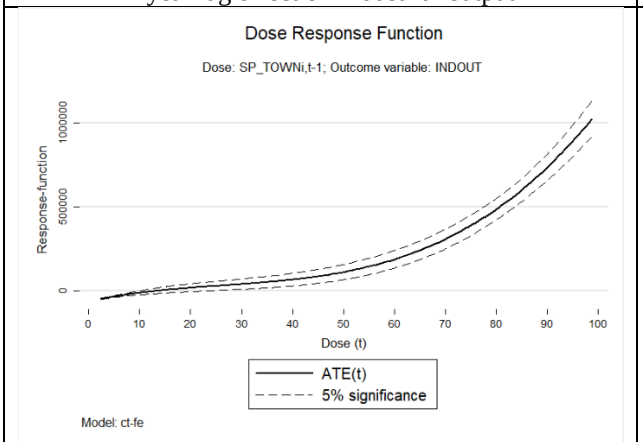
Figure 4. Geographical distribution of endogenous and exogenous specialised towns, year 2015



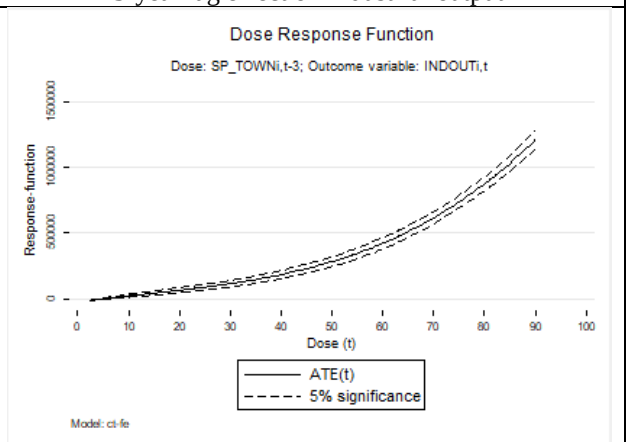
Source: Authors' elaboration.

Figure 5. Dose response function of number of STs on industrial and agricultural output

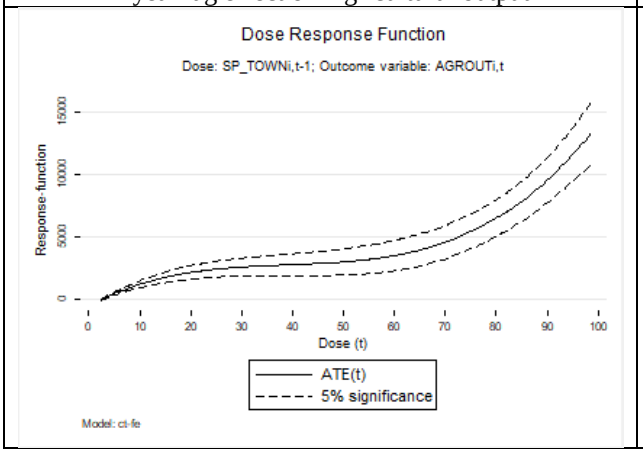
1-year lag effect on Industrial output



3-year lag effect on Industrial output



1-year lag effect on Agricultural output



3-year lag effect on Agricultural output

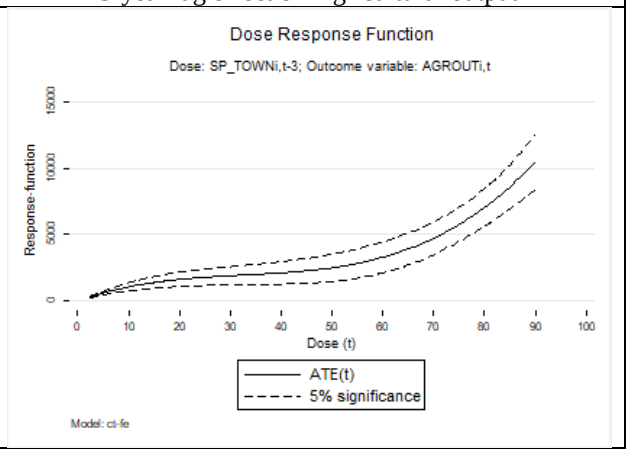
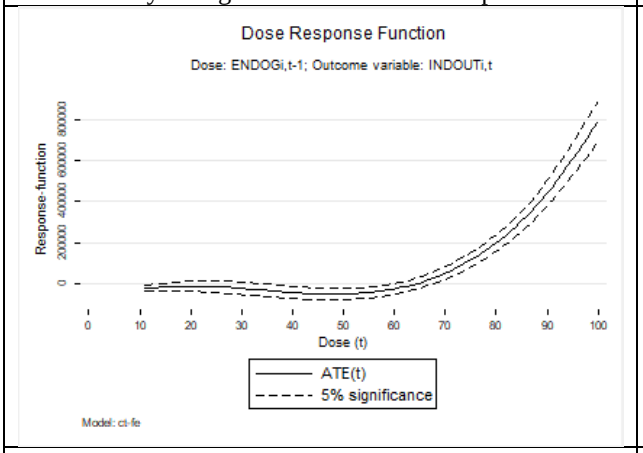


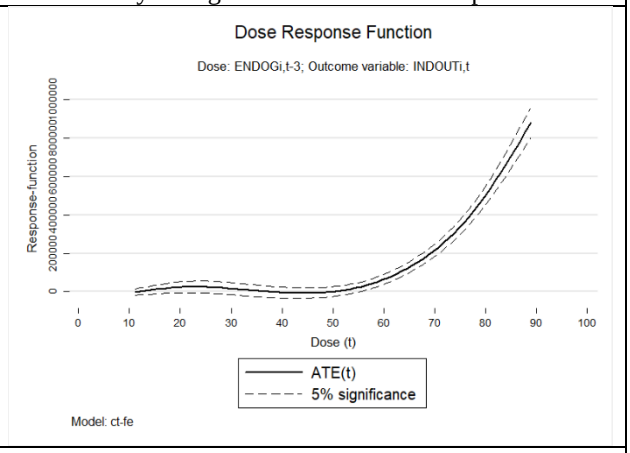
Figure 6. Dose response function of number of endogenous towns on industrial and agricultural output

a. Without SP_TOWN as control

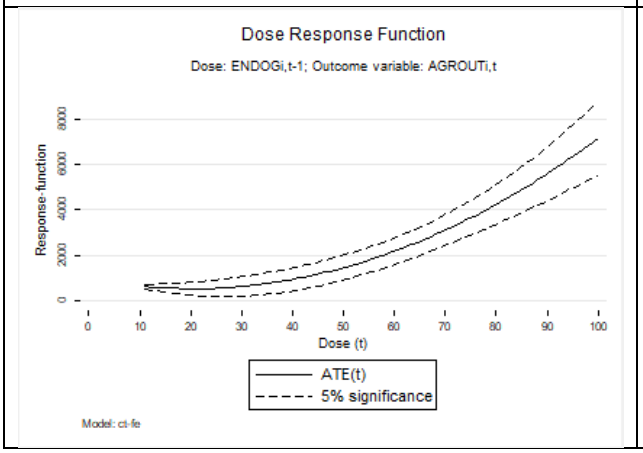
1-year lag effect on Industrial output



3-year lag effect on Industrial output



1-year lag effect on Agricultural output



3-year lag effect on Agricultural output

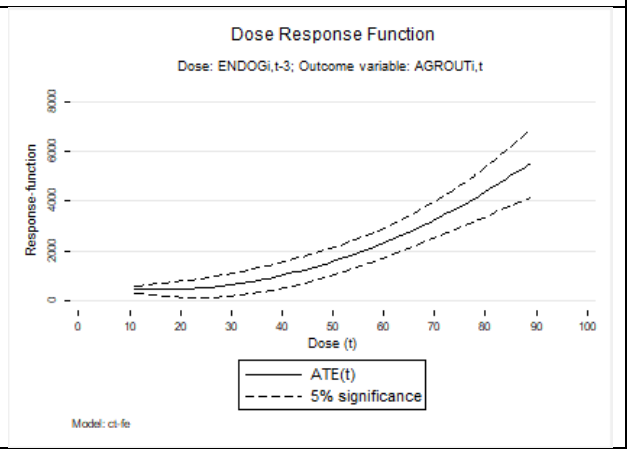
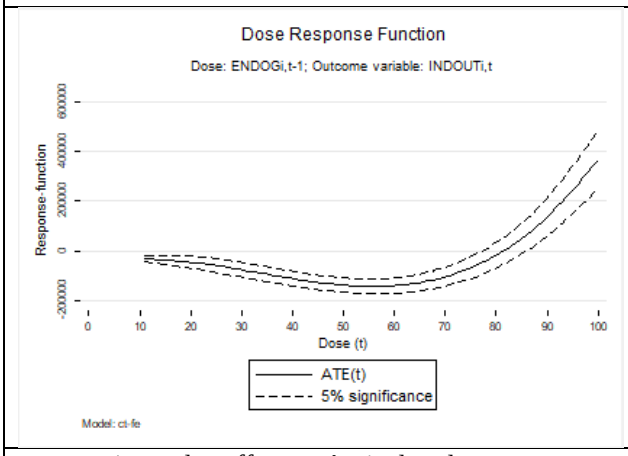


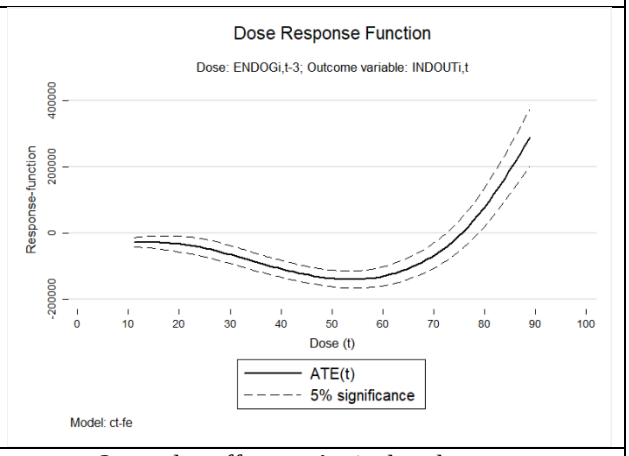
Figure 6 (cont.d). Dose response function of number of endogenous towns on industrial and agricultural output

b. **With SP_TOWN as control**

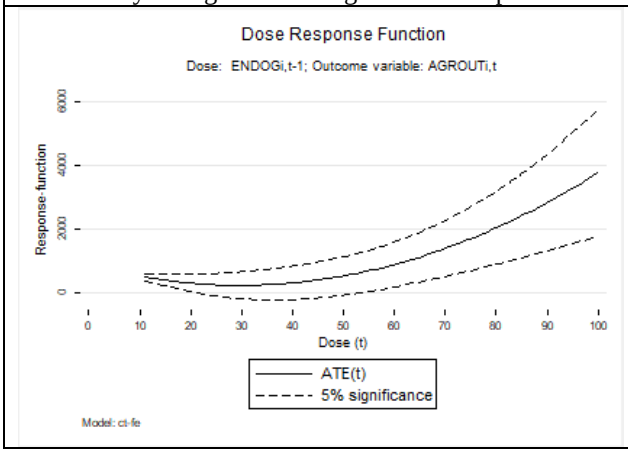
1-year lag effect on Industrial output



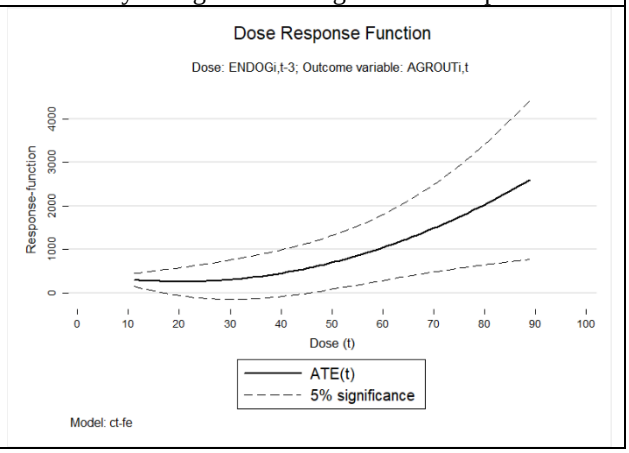
3-year lag effect on Industrial output



1-year lag effect on Agricultural output



3-year lag effect on Agricultural output



Tables

Table 1. Sectoral distribution of endogenous versus exogenous specialised towns

	Sectors						
	Agriculture-Related	**High-tech**	**Low-tech**	**Mid-tech**	**Resource-based**	**Services**	**Tot**
Endogenous	102	3	37	8	41	18	209
Exogenous	0	43	32	88	15	12	190
Totals	102	46	69	96	56	30	399

Source: Authors' elaborations.

Table 2. Effects of specialization and endogenous clusters on performances

	Whole sample		**Only PRD**		**Only non-PRD**	
Dependent variable: *ln_INDOUT$_{i,t}$*						
hs_SP_TOWN$_{i,t-1}$	-0.097		-0.054		-0.072	
	(-1.34)		(-0.57)		(-0.86)	
hs_RATIO_ENDOG$_{i,t-1}$	0.222**		0.054		0.148	
	(2.21)		(0.23)		(1.20)	
ln_WORKERS$_{i,t-1}$	0.342**		0.055		0.874***	
	(2.39)		(0.47)		(5.87)	
hs_SP_TOWN$_{i,t-3}$		-0.047		-0.042		0.031
		(-0.72)		(-0.52)		(0.38)
hs_RATIO_ENDOG$_{i,t-3}$		0.109		0.467*		-0.071
		(1.01)		(1.86)		(0.55)
ln_WORKERS$_{i,t-3}$		-0.098		-0.293		0.326
		(-0.49)		(-1.17)		(1.44)
Constant	18.54***	22.89***	23.87***	27.76***	12.43***	17.72***
	(12.11)	(10.63)	(17.47)	(9.40)	(7.97)	(7.60)
year dummies	Y	Y	Y	Y	Y	Y
N	1,050	900	238	204	812	696
N counties/districts	75	75	75	75	75	75
Adjusted R2	0.771	0.821	0.776	0.84	0.793	0.834
Dependent variable: *ln_AGROUT$_{i,t}$*						
hs_SP_TOWN$_{i,t-1}$	-0.020		0.124		-0.051	
	(-0.46)		(1.28)		(-1.05)	
hs_RATIO_ENDOG$_{i,t-1}$	0.140**		0.046		0.136*	
	(2.06)		(0.52)		(1.71)	
ln_WORKERS$_{i,t-1}$	-0.055		-0.188		0.221	
	(-0.40)		(-1.58)		(1.10)	
hs_SP_TOWN$_{i,t-3}$		-0.017		0.122		-0.151
		(-0.41)		(1.13)		(-0.91)
hs_RATIO_ENDOG$_{i,t-3}$		0.056		0.099		0.001
		(1.18)		(1.21)		(0.01)
ln_WORKERS$_{i,t-3}$		-0.292*		-0.124		-0.151
		(-1.94)		(-0.58)		(-0.91)
Constant	21.33***	24.41***	23.52***	23.43***	18.26***	22.64***
	(10.84)	(15.06)	(16.79)	(9.31)	(8.76)	(13.09)
year dummies	Y	Y	Y	Y	Y	Y
N	1,050	900	238	204	812	696
N counties/districts	75	75	75	75	75	75
Adjusted R2	0.820	0.711	0.820	0.65	0.841	0.741

Notes: Significance levels: * 10%, ** 5%, ***1%. *T*-statistics in parenthesis.

Table 3. Effects of specialization and endogenous clusters on rebalancing (Dependent Variable – *ln_INDOUT*)

	Low performing subgroup		**Medium-low performing subgroup**		**Medium-high performing subgroup**		**High performing subgroup**	
$hs\_SP\_TOWN_{t-1}$	0.184		-0.115		0.126		0.100	
	(1.21)		(-1.00)		(0.62)		(1.09)	
$hs\_RATIO\_ENDOG_{t-1}$	-0.248		0.410**		0.211		-0.083	
	(-1.17)		(2.65)		(0.70)		(-0.31)	
$hs\_SP\_TOWN_{t-3}$		0.102		-0.128		-0.045		0.107
		(0.71)		(-0.90)		(-0.31)		(1.59)
$hs\_RATIO\_ENDOG_{t-3}$		-0.037		0.378*		-0.016		-0.0923
		(-0.16)		(1.76)		(-0.06)		(-0.55)
$ln\_WORKERS_{t-1}$	0.717*		1.425***		0.428*		0.180*	
	(1.94)		(5.68)		(1.90)		(2.07)	
$ln\_WORKERS_{t-3}$		0.088		0.626**		-0.043		-0.400
		(0.18)		(2.42)		(-0.14)		(-1.25)
Constant	13.04***	19.20***	6.671**	14.45***	18.09***	22.41***	22.47***	29.22***
	(3.54)	(4.06)	(2.56)	(5.49)	(7.31)	(6.98)	(22.67)	(7.68)
year dummies	Y	Y	Y	Y	Y	Y	Y	Y
N	252	216	280	240	266	228	252	216
N counties/districts	18	18	20	20	19	19	18	18
Adjusted R2	0.864	0.852	0.833	0.832	0.778	0.849	0.791	0.832

Notes: Significance levels: * 10%, ** 5%, ***1%. *T*-statistics in parenthesis.

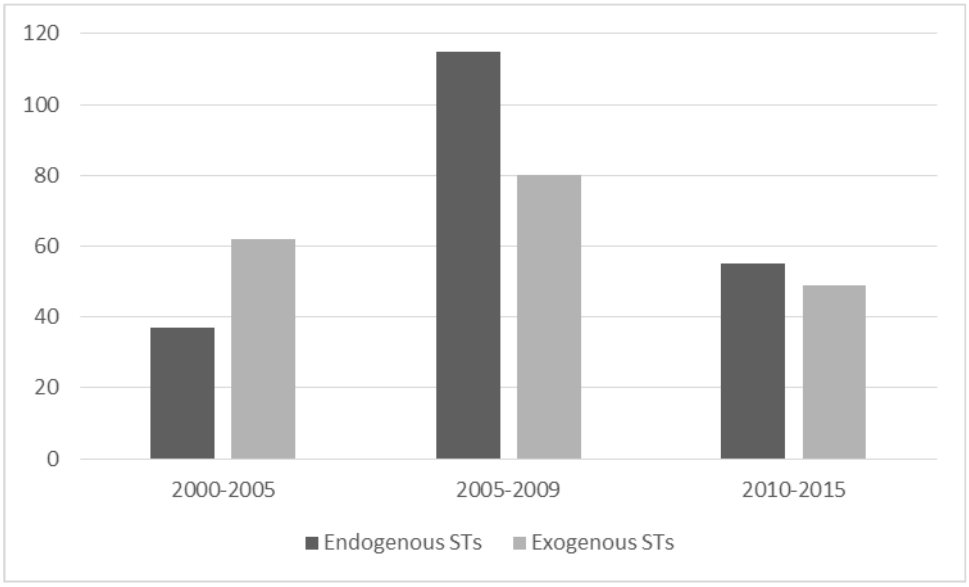
SUPPLEMENTARY MATERIALS

List of institutions:

- Department of Commerce of Guangzhou City
- Guangdong Association of Professional Towns (Potic)
- Guangdong Provincial Department of Science and Technology
- Development and Reform Commission of Guangdong
- Guangdong Academy of Social Sciences
- Guangzhou Academy of Social Sciences
- South China University of Technology (School of Business Administration, School of Economics)
- Department of Economics of Shenzhen University (Guangdong)
- Songshan Lake Hi-Tech Industrial Development Zone representatives
- Local representatives from various STs

FIGURES

Figure A1. Endogenous and exogenous specialised towns established by period



Source: Authors' elaborations.

TABLES

Table A1. Summary statistics of variables

Variable	*N*	Mean	Std. dev.	Min.	Max.	Definition	Source
Outcomes of interest							
AGROUT	1,125	3,604.94	3,891.88	120.13	39,830.15	Agricultural Output (Mln yuan)	NBS, various years*
INDOUT	1,125	75,883.58	253,015.80	30.45	2,477,759	Industrial Output (Mln yuan)	NBS, various years
In PRD							
AGROUT	*255*	*5,580.04*	*5,682.94*	*642.58*	*39,830.15*		
INDOUT	*255*	*285,398.60*	*472,462.5*	*2,523.69*	*2,477,759.00*		
In non-PRD							
AGROUT	*870*	*3,026.03*	*2944.92*	*120.13*	*19,232.23*		
INDOUT	*870*	*14,474.00*	*30,007.75*	*30.45*	*276,918.60*		
Variables of interest							
SP_TOWN	1,125	2.40	4.72	0	41	Number of STs per county	Authors' elaboration
RATIO_ENDOG	1,125	0.38	0.44	0.00	1	Ratio of endogenous towns on the total number of STs, per county	Authors' elaboration
ENDOG	1,125	1,14	1.63	0	9	Number of endogenous towns per county	Authors' elaboration
Controls							
WORKERS	1,125	135,341	392,170.20	5,284	4,489,272	Number of full-time employees	NBS, various years

Note: NBS = National Bureau of Statistics.

Table A2. Subgroups counties on industrial output and agricultural output

Group	Outcome: INDOUT	
	Range (Mln Yuan)	***N* units, t_0**
Low	117.67–1,046.54	18
Medium-Low	1,046.55–3,414.99	20
Medium-High	3,415.00–12,328.02	19
High	1,2328.02–26,8921	18

Table A3. Dose response function of number of STs on industrial and agricultural output

	INDOUT		*AGROUT*	
treatment ($SP\_TOWN_{i,t-1}$)	-30826.61***		284.3	
	(-3.70)		(1.47)	
treatment ($SP\_TOWN_{i,t-3}$)		4537.7		400.8**
	(-4.67)	(0.76)		(2.45)
Polynomial Degree 1 (Tw_1)	6459.7***	5339.4***	221.5***	144.5***
	(-4.67)	(4.38)	(6.78)	(4.35)
Polynomial Degree 2 (Tw_2)	-172.1***	-80.09**	-5.277***	-3.831***
	(4.15)	(-1.97)	(-5.49)	(-3.46)
Polynomial Degree 3 (Tw_3)	2.193***	1.921***	0.0451***	0.0391***
	(6.69)	(5.47)	(5.94)	(4.09)
Constant	-21311.81***	-68152.0***	1445.9***	2335.0***
	(-2.61)	(-11.88)	(7.64)	(14.94)
Controls	Year FE, County FE, $WORKERS_{i-t-1}$	Year FE, County FE, $WORKERS_{i-t-3}$	Year FE, County FE, $WORKERS_{i-t-1}$	Year FE, County FE, $WORKERS_{i-t-3}$
Polynomials Joint significance test - Prob>F	0.000	0.000	0.000	0.000
N	1124	900	1124	900

N counties/districts	75	75	75	75
Adjusted R_2	0.736	0.836	0.542	0.532

- Notes: Significance levels: * 10%, ** 5%, ***1%. *T*-statistics in parenthesis.

Table A4. Dose response function of number of endogenous towns on industrial and agricultural output

	INDOUT				*AGROUT*			
treatment ($ENDOG_{i,t-1}$)	-50904.6***		-53494.4***		920.3***		668.2***	
	(-4.25)		(-4.76)		(4.55)		(3.24)	
treatment ($ENDOG_{i,t-3}$)		-58780.7***		-64321.5***		689.7***		432.4**
		(-5.20)		(-6.92)		(3.78)		(2.27)
Polynomial Degree 1 (Tw_1)	9234.9***	16091.0***	3918.0**	8356.6***	-41.48**	-27.67	-42.85**	-19.8
	(4.75)	(7.90)	(2.09)	(4.86)	(-2.42)	(-1.58)	(-2.53)	(-1.13)
Polynomial Degree 2 (Tw_2)	-334.2***	-555.6***	-229.3***	-374.2***	1.035***	0.929***	0.718***	0.494*
	(-6.93)	(-10.21)	(-4.97)	(-8.19)	(4.83)	(3.89)	(3.25)	(1.92)
Polynomial Degree 3 (Tw_3)	3.295***	5.638***	2.318***	3.675***				
	(9.76)	(13.81)	(7.08)	(10.49)				
Constant	-28495.4***	-70835.2***	-26084.7***	-70520.2***	1395.8***	2324.6***	1424.4***	2327.1***
	(-3.33)	(-10.43)	(-3.25)	(-12.63)	(7.24)	(14.68)	(7.48)	(14.85)
Controls	Year FE, County FE, $WORKERS_{i,t-1}$	Year FE, County FE, $WORKERS_{i,t-3}$	Year FE, County FE, $WORKERS_{i,t-1}$, $SP\_TOWN_{i,t-1}$	Year FE, County FE, $WORKERS_{i,t-3}$, $SP\_TOWN_{i,t-3}$	Year FE, County FE, $WORKERS_{i,t-1}$	Year FE, County FE, $WORKERS_{i,t-3}$	Year FE, County FE, $WORKERS_{i,t-1}$, $SP\_TOWN_{i,t-1}$	Year FE, County FE, $WORKERS_{i,t-3}$, $SP\_TOWN_{i,t-3}$
Polynomials Joint significance test - Prob>F	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.024
N	1124	900	1124	900	1124	900	1124	900
N counties/districts	75	75	75	75	75	75	75	75
Adjusted R_2	0.709	0.767	0.743	0.842	0.521	0.513	0.532	0.523

Notes: Significance levels: * 10%, ** 5%, ***1%. *T*-statistics in parenthesis

[i] Calculated according to the place of origin and not to the location of exporters.
[ii] Data on Guangdong Province are from NBS (2018), while data on other countries are from OECD.com, last retrieved 04 May 2018.
[iii] Authors' calculation based on data retrieved from various editions of the China Statistical Yearbook
[iv] Towns, or townships, are the fourth-level administrative units of political divisions in China. The higher administrative levels are provincial (first level), prefecture or city (second level), and county or district (third level).
[v] http://www.hktdc.com/web/featured_suppliers/dongguan/index.html
[vi] Even if there are other areas in China characterised by the presence of industrial clusters (such as Zhejiang Province), these are not the target of a specific policy program.
[vii] The industrial clusters category includes very heterogeneous realities, ranging from agglomerations of high tech companies in advanced countries (such as Sophie-Antipolis in France, the Cambridge region in the UK or the Silicon Valley in the U.S.), to groups of SMEs specialised in traditional sectors located in developing areas, such as the garment cluster in Nairobi (Van Dijk and Rabellotti, 2005) or the knife cluster in Pakistan (Nadvi, 1999).
[viii] The debate is wide and cannot be treated here. For a thorough literature review, see Ketels, 2013; Hervas-Oliver et al., 2015.
[ix] From fieldwork interviews with DSTGG officials, we know that by July 2017 there were 416 officially recognised STs. However, as of the writing of this paper, there are no official data available about the 17 new towns recognized in 2017.
[x] In the online supplementary materials we list the main institutions that we visited.
[xi] For each yuan granted from the province, a city should provide 10 yuan and a town 50 yuan.
[xii] We mainly refer to 'Thoughts and Strategies for the Development of Clusters in Guangdong and for Brands Creation' (2005), the 'Coordinated Promotion Plan between Province and (Prefecture) City' (2005), and 'Guangdong Province Government's Suggestion on the Promotion of the Development of ST' (2006) (Sun and Su, 2018)
[xiii] The identification of endogenous STs has followed different steps: first, a content analysis of POTIC website and the official websites of every specialised town in order to retrace the history of their development and identify possible traditional productions; second, a dedicated literature review, including documents provided by local and provincial institutions, on some specific townships; third, for those cities that were classified as endogenous for their proximity to natural resources or the physical characteristics of their territory, a further check by means of geo-localisation.
[xiv] This is in line with some international contributions that acknowledge the difficulties in making proper policy evaluation of clustering initiatives (Brakam & van Marrewik, 2013; Vicente, 2018).
[xv] We use the fixed-effects version of the model. Compared to its OLS version (Filippetti and Cerulli, 2018), the results are equivalent to that obtained by adding individual fixed effects to a pooled OLS estimation.
[xvi] The main variable on which we analyse the possible effects of agglomerations is industrial output. With reference to the first part of the empirical analysis, however, we also observe the effects on agricultural output for two reasons: first, one-fourth of the specialised towns specialise in agricultural products; second, many of the inner or peripheral areas count on its agricultural sector for a large part of their total output.

[xvii] The outcomes of interests and the controls are used in log form in the regression (we add the prefix ln_ to the variables in the results tables); the variables of interests, instead, are used in hyperbolic sine form to include the cases when they are zero (we add the prefix hs_ to the variables in the results tables).

[xviii] The dose response is embedded in a counterfactual design and, similarly to general propensity score, it yields consistent estimates of causal relations provided that the hypothesis of unconfoundedness is tenable (Cerulli, 2015). Therefore, some precautions are needed in terms of causal interpretation.

[xix] In the first, the binary treatment is having/not having at least one specialised town, and the number of STs is used as a dose. In the second, the binary treatment is having/not having at least one endogenous town and the number of endogenous towns is the dose.

[xx] The doses enter the model in a 3-degree polynomial form. When the joint significance tests on the parameters points towards accepting the null hypothesis, the dose is modelled as a 2-degree polynomial. Additionally, when measuring the number of endogenous towns as dose, we run the model both with and without the total number of STs as a control.

[xxi] More precisely, from the end of 1990s China has undertaken a reform in the cadre management system, based on rigid performance evaluation mechanisms which, especially in experimental areas such as Guangdong, has conferred to local public officials more and more formal responsibility for the accomplishment of priorities and targets fixed on a mutual agreement basis (Di Tommaso et al., 2013). While up to the mid-2000s officials were evaluated mainly in relation to the economic performance of the administrative unit they were responsible for, since 2007 the State Council has issued specific measures explicitly including environmental protection among the objectives under evaluation (Pu and Fu, 2018)