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Industrial Development and manufacturing in Chinese territories: the contribution of special economic enclaves policies

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ABSTRACT

This paper aims to analyse the role of Special Economic Zones in the development of industry in China, focusing on Guandong counties. Special Economic Zones have often been used by governments with the goal of stimulating industrialization. The international literature has analyzed these special zones from both a theoretical and an empirical perspective and has yet to come to a shared view on their desirability. In particular, there is a debate in literature that discusses if the establishment of Special Economic Zones is effective in producing spillover effects across any territories, or whether these only take place if the receiving area has already a high level of economic performance. After an extensive description of the types and aims of the special zones existing in China, we turn our attention to test, through a quantile regression methodology, if the role of special zones is changing depending upon the level of industrialization already existing in the counties. In this sense, our work is an empirical attempt to shed some light on the possible uneven distribution of the gains coming from the establishment of development zones.

Keywords: Development Zones; Special Economic Zones; Industrialization; China; Policy; Distribution.

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1. Introduction

The idea of making some selected local areas "special" with the goal of stimulating industrial development is not new in the history of policymaking. The purpose of these policies is to modify the incentives faced by companies when making location choices, as well as to stimulate entrepreneurial activities that would not emerge otherwise.

Space and location matter for companies. In the last few decades of economic and business studies, research has brought new attention to the geography of industry and entrepreneurship. Since ancient times different areas have offered advantages or disadvantages for the development of entrepreneurial activities. Intuitive examples are locations with better access to natural resources, infrastructure, knowledge or human capital. Similarly, if companies can choose localities according to the advantages that they seem to appreciate, they may congregate in locations suited to their needs. Therefore, in many countries and in many different historical periods governments have decided to offer additional advantages to companies, in order to attract them to "special economic enclaves" with the goal of boosting economic development and industrialization. In these cases, the ultimate policy target is not only the selected zone, but also the economic growth of a wider region or the whole nation. In other words, the perspective is one of national industrial policy and not strictly one of local development policies (Di Tommaso et al., 2013; Di Tommaso-Bellandi, 2006).

This economic policy rationale can be found in the history of industrialization (World Bank, 2008; Rubini et al., 2013). Similarly, looking at this practice nowadays, it still appears to be very popular, given that in the last few decades many kinds of "special" economic areas have been promoted both in developing and highly industrialized countries (Farole, 2011). In the past as in the present, the common and very basic idea is that in some circumstances it could be important to "isolate" some local areas and offer some "special conditions" to companies, with the goal of stimulating industrial development, innovation and competiveness.

One of the most quoted typologies of these special economic enclaves is the so-called Special Economic Zones (SEZ): these are normally intended as locations where the rules that govern local economic activities are different from the rest of the country. The SEZ are characterized by a development-friendly setting that is able to attract capital, investment, production and companies (Aggarwal, 2007; Rubini et al., 2013). Other common and similar typologies of economic enclaves are those special areas where *particular* economic activities are promoted as distinctive characteristics of the areas. This is the case for the Free Trade Zones (FTZs), the Export Processing Zones (EPZs), the High Tech Development Zones, and the Science and Technology Parks.

We can identify all of these special economic enclaves with the generic term of "development zones" to highlight a marked intention to promote economic development through the attraction of specific activities (export-oriented, high-tech, sector specific, etc.). All these areas can be special, and thus different from other alternative business locations, due to a long list of possible policy-induced advantages offered only to those actors operating within their boundaries. Among the most frequent "special policies" for "economic development zones" are the concessions related to the prices of factors (i.e. land, energy), production costs (i.e. subsidies and incentive for R&D), laws and regulations (i.e. fiscal exemptions) and infrastructure (i.e. ports, laboratories, service providers).

Focusing on the most recent policy practices in this field, the experience of China is

particularly relevant. There are two main reasons. First, in recent years no other country has experienced such successful performance in terms of growth and industrialization. Second, no other country has launched a comparable number of special economic enclaves. In section 2, we will continue our analysis focusing the literature discussing China's experience, and zooming in on different Chinese territories. In section 3 an empirical analysis will be carried out in order to relate local industrial performances to the presence of economic zones and to test the hypothesis of the uneven distribution of gains coming from the establishment of the zones. Section 4 presents our conclusive remarks.

2. International literature review

As we argued, the range of different policy-induced economic enclaves is wide and includes a number of different types of incentives and goals. A great deal of the international literature has focused on the Export Processing Zones (EPZ), which refer to zones specifically aimed at attracting export-oriented activities. Particularly since the establishment of the first EPZ in Shannon, Ireland (1959), EPZ have become of interests as a tool to promote industrialization and structural adjustment mainly in unindustrialized nations, through the promotion of exports (Rubini et al., 2013). Most theoretical contributions on EPZ up to the 1990s built upon H-O-type trade models and analysed the circumstances under which EPZ could change production patterns and affect national income. While earlier contributions were very skeptical on the effects of EPZ (Hamada, 1974; Hamilton and Svensson, 1982; Young, 1987), later ones found more theoretical cases for the establishment of EPZ in less industrialized nations (Din, 1994; Devereux and Chen, 1995). Subsequent cost-benefit perspectives and evolutionary theories (Madani, 1999; Warr, 1990; Johansson and Nilsson, 1997) have encouraged to take the distance from earlier theoretical trade models since they neglected a number of issues, such as the international mobility of capital goods and the foot-lose character of firms operating within EPZ. For these reasons, recent contributions have focused much more on the description of case studies and experiences across the globe and have addressed specific empirical questions (see among others Farole and Akinci, 2011; Aggarwal, 2006; WB, 2008).

In parallel to the abovementioned contributions, a different and more recent strand of literature has developed, which analyses a more generic form of "placed-based policies". The theoretical debate is still ongoing, with new contributions addressing the desirability of zone-types of incentives. This literature focuses by and large on the experience of place-based policies within already industrialized nations. Theoretical contributions are either based on spatial equilibrium models and investigate the effects on local welfare (wages, housing prices, cost of living, etc) or they model the effect of place-based subsidies on investment, employment or wages at the plant-level (see among others Busso et al., 2013; Glaser and Glottieb, 2008; Criscuolo et al., 2012; Lynch and Zax, 2011). Most theories on "place-based policy" cast doubts on the desirability of such zones due to the displacement effects that might occur within an economy. However, the degree to which such zones are effective is recognized to be essentially an empirical question. Therefore, most models translate into multiple linear regressions, including a binary policy variable, usually estimated exploiting time differencing and spatial differencing (Meyer et al., 2012; Einio, 2012; Busso, 2013).

Place-based policies and EPZ share the "geographically bounded" character, but it is

important to note that they seem to differ substantially in the objectives. The main aim of place-based policies in places like the USA or Europe is to move growth poles within already industrialized nations and improve the territorial distribution of economic activities, therefore stimulating lagging-behind regions. EPZ on the other hand serve as first attraction poles for initial economic activities that are expected to set-off and trigger a wider growth process. In this context displacement effects or growth imbalances are not major concerns in the case of EPZ as they are in the case of place-based policies, at least in the initial phases. In fact, as it happened in the experience of China, some degree of displacement or territorial disequilibrium was accepted as part of the programming process of growth through industrial zones (Di Tommaso et al., 2012).

Going back to the EPZ literature, in the present paper we wish to concentrate on the ability of EPZ to actually attract economic activity. Following Nam and Radulescu (2004) we want to recall that EPZ incentives (mainly in the form of tax breaks and concessions) are not necessarily attractive for investment. In other words, as the authors explain, a "true" incentive to investment occurs only under certain conditions and, despite the tax concessions, investment might not be truly profitable within an EPZ. This could explain why some zones may fail in attracting firms and therefore increase industrial output. In principle, therefore, we cannot be sure that a zone-type incentive will increase industrial production. It could happen - and it has been the case in many countries - that zones remain empty enclaves. Whereas most of the literature focuses on welfare and employment gains, here we focus, as a first step, on the ability to actually increase production. Welfare and employment are left for future research, since they have not been the main objectives of Chinese EZ. Economic zones have been by and large used as laboratories to increase the manufacturing base, stimulate industrial growth and set off a structural adjustment process (Di Tommaso et al., 2012). So the relevant question to the present study is: were they successful in increasing industrial output?

Focusing on the Chinese case, it is interesting to note that EPZ are scarcely studied and empirically investigated by the international literature. The main reason for this gap is probably that although a wide range of policy-induced economic enclaves have been promoted in the last few decades of Chinese industrialization, there are very few cases of EPZs. More material could be found on other types of enclaves (Ge, 1999; Demurger, 2002; OTA, 2003; Cheung&Lin, 2004; Fu&Gao, 2007; Yeung, 2009; Li&Yang, 2010; Zeng, 2011). Therefore, in this case there seems to be space for further investigations. Among the few international studies available, a great deal focuses on the uncommon and very big Special Economic Zones, overlooking other types of special economic enclaves. In addition, the literature on the Chinese case appears incomplete because it tends to take a "whole China" perspective, where the Chinese provinces are treated as a single unit of analysis without including the details of vast and heterogeneous territories.

The above-mentioned international literature does not share a consensus view on the desirability of economic enclaves. While there is a general consensus that they have played an important role in promoting Chinese industrial development, some contributors suggest that the rapid growth that often accompanies SEZ or other enclaves can occur at the expense of a huge amount of land resources, intensive capital investment and loss of public benefits

(Cartier, 2001; Wong&Tang, 2005; Gopalakrishnan, 2007; Yang&Wang, 2008; Yan, 2008).

To summarize, we see large unexplored aspects of the debate over the effectiveness and desirability of economic enclaves in China. We contribute to this debate in different ways: we build empirical evidence on the effectiveness of Chinese special economic enclaves focusing on specific case studies; and we zoom in on the territories of China.

2.1. The Chinese experience

In the early 1980s, China first established four Special Economic Zones, three of which were located in Guangdong: Shenzhen, Zhuhai and Shantou. Even though much of the literature has identified them as "deregulation" tools, it can be argued that they were used as "laboratories" in which to experiment accelerated economic development through a controlled import of foreign technology and capital. Among the main aims of the SEZ were: to observe and understand capitalism, to test different policies, to acquire technology and managerial methods, to accelerate exports and generate foreign exchange and to create job opportunities (Rubini et al., 2013). The process of foreign technology acquisition had to be controlled in order to "selectively absorb the good things and boycott the bad things from abroad" (as cited in Carter, 2011: 61; Di Tommaso et al., 2013) and therefore it was guided in the very first phases by means of a carefully planned FDI attraction policy based on the creation of special economic zones (SEZs) and the definition of specific conditions for FDI to be accepted. Moreover, the establishment of the Shenzhen SEZ was preceded by important investment by the national, provincial and local governments that aimed at strengthening the infrastructure system: almost 48 percent of the capital investment realized in the area in 1979 was funded by the central government (Di Tommaso et al., 2013).

However, if SEZs have been undoubtedly important in the history of China's successful industrialization, Chinese national and provincial governments have also employed other typologies of special economic enclaves to promote growth, development and innovation. The most relevant and frequent typologies are the following ones: economic and technological development zones; high tech development zones; free trade zones; export processing zones and industrial parks (Di Tommaso et al., 2013 for a more thorough review; see also Zhang, 1999; Siu-Wai and Bo-Sin, 2005; OECD, 2010; Zeng, 2011; Guo and Feng, 2007).

The *economic and technological development zones* (ETDZs) are often located in the suburbs of a major city and offer favorable fiscal treatment, usually tax reductions or tax holidays on foreign investment. These zones are approved by the government (national or provincial) and are organized into functional areas according to the types of activities carried out within the zone. They aim at attracting foreign direct investment in harmony with local firms in order to introduce and diffuse advanced technologies and managerial techniques[i]. While SEZs are *de facto* independent cities, ETDZs' autonomy in administration and policy-making is much more limited: an administrative committee, usually selected by the local government, controls the economic and social management of the zone on behalf of the local administration.

The *high-tech development zones* (HTDZs) are also approved by the central (provincial or local) government and have a similar degree of autonomy as ETDZs. The main characteristic of HTDZs is that they specifically aim at increasing the value added of products by supporting specialized service firms that help firms to adopt new technologies and processes. Most of the HTDZ were born in the late 1980s as tools to implement the national "Torch Program" under the Ministry of Science and Technology. Its main objective was to use the technological capacity of research institutes, universities and large- and medium-sized firms to develop new and high-tech products and to accelerate the technology transfer processes.

Differently from ETDZ and HTDZ, which have similar aims and degrees of autonomy, FTZ and EPZ have been promoted with a slightly different rationale. The *free trade zones* (FTZs) had the specific aim of experimenting with free trade before China's inclusion into the WTO. They are approved by the Duty Office and deal mainly with the management of: export processing, foreign trade and logistics and bonded warehousing. Even if they are physically located inside China, they function as if they were outside of China's customs regulations. Companies that operate within a FTZ can benefit from tax refunds on exports, import duty exemptions and a concessionary value-added tax.
Export processing zones (EPZs) are also approved by the Duty Office, and were created to develop export-oriented production and to increase foreign exchange earnings. They provide similar incentives as FTZs; however, given their main objective, they normally imply strict rules on the amount of products that have to be exported, which is usually above 70 percent of total production. Therefore there are specific limitations on the share of production that can go to the domestic market.
Finally, SEZs should not be confused with industrial parks. The latter are authorized mainly by local governments. They generally include only part of a city and are not autonomous from an administrative point of view.
Compared to other emerging economies, China has made more extensive use of Economic and Technology Development Zones rather than traditional EPZs, which is reflected in the experiences of the provinces we analyze in this paper. As of 2011, there are approximately 2000 ETDZs in China, 130 of which are at the national-level (thus approved directly by the national government), while the rest are at the provincial-level (CADZ, 2011).

The choice of location of economic zones in China is an important aspect that needs to be taken into account. The very first Special Economic Zones where established in Shenzhen, Zhuhai and Shantou because they where very close to potential sources of foreing capital (Hong Kong for Shenzhen, Macau for Zhuhai and Taiwan for Shantou). Similarly, the choice of location of other zones is very much guided by geographical considerations (on the process of governing the geography of production see Di Tommaso and Bellandi, 2005; Di Tommaso et al., 2012; Barbieri et al., 2009; 2010; 2012; 2013; Rubini et al., 2015). In particular, coastal areas and the Pearl River Delta region have been preferred destinations for economic zones, because of their accessibility to FDIs. In addition, economic zones have been mainly located in the suburb of major cities so as to take advantage of urbanization economies.

Coupled with the international literature on economic zones, there is a growing body of Chinese literature that is very little explored by western scholars. Such debate does not seem to reach a shared view on the desirability of economic zones in China (FIAS, 2008; Dong, 2010; Hu, 2005; Tang, 2005; Kuang, 2009; Li&Yang, 2010; Li, 1998; He, 1999; Long&Meng, 2004; Zhang&Li, 2007; Luo&Lin, 2003; Hong, 2004; Chen&Yao, 2005; Pi, 2000; Liu, 2010).

3. Empirical analysis on Guangdong Province

3.1 Methodology and data-set

As highlighted, the few available empirical studies on special economic enclaves in China are either specific case studies or macro analysis that compare different Chinese provinces (see among others Demurger et al., 2002). With a few exceptions, most macro-level analyses focus on the specific tool of SEZ and much less on the other forms of special economic areas. If it is true that Chinese provinces differ in terms of industrialization, growth and development, it is also true that substantial differences remain within each province. Meso-level (within provinces and counties) types of analyses still seem to be largely missing in the international debate on Chinese industrial development (Fan, 1995; Di Tommaso et al., 2013; Barbieri et al., 2012).

Our methodological choice is to investigate the relationship between special economic enclaves and industrial performances at the local level. The unit of analysis is counties and districts within Guangdong Province, the assumption being that the potential effects of special economic enclaves on industrial performance are better captured at the local level in the specific counties and districts where the zones are located. The second choice is to concentrate on types of special economic zones other than SEZs, given the inherently different natures, objectives and uses that characterize the two categories.

The database is an original panel data-set that registers information on a number of economic and policy indicators for 88 counties and districts of Guangdong Province for the period of 2000-2008 (for further details see Di Tommaso et al., 2012; Barbieri et al., 2013; Barbieri et al., 2010). As for the specific information on economic zones it covers all the main special economic enclaves that are the economic zones officially recognized at the provincial or national level in Guangdong. For each county and each year, the number of development zones as well as the overall land area covered by development zones was computed. To obtain this information different sources were merged and crosschecked.[1]The zones included Economic and Technology Development Zones, High-tech Development Zones, Free Trade Zones, Export Processing Zones and Industrial Parks. Double relocation parks that are very recent are not included in the analysis.

A brief summary table of the different zones (other than SEZ) by type, land area and main geographical location is provided below (Table 1). It is worth noting that the data collected suggests a much higher use of Economic and Technology Development Zones and High-tech Development Zones by the national and provincial governments, with respect to EPZs and Free Zones. ETDZs and HTDZs together accounted for 98% of the total land area designated within national and provincial special economic areas, with ETDZs being by and large the

[1]Ministry of Commerce Guangdong Province (http://english.mofcom.gov.cn/aarticle/zt_business/lanmuf/200704/20070404627423.html), Hong Kong Trade Development Council (http://china-trade-research.hktdc.com/business-news/article/Fast-Facts/China-Industrial-Parks/ff/en/1/1X39VTUR/1X06BOS8.htm), Guangond Government prefectures' documents and websites, specific development zones official websites; rightsite.asia.

preferred tools of industrial promotion. The empirical analysis should therefore be read bearing in mind the extremely high contribution to industrial development policies of these two specific types of economic development zones.

As a whole there are 74 economic development zones in Guangdong Province. More than 60 % of these were established before 2000 and only a few of them date back to the 1980s. In the high-growth prefecture level cities of Guangzhou, Shenzhen, Dongguan, Foshan and Zhuhai, there has been extensive use of economic enclaves other than SEZs. In the next paragraph we investigate the existence of a statistically significant relationship between economic development zones and industrial performances at the local level.

Table 1. National and provincial special economic enclaves, Guangdong Province (2008)

Zone ype	Number	Average land area (sqkm)	Total land area (sqkm)	% on total land special economic areas	Top locations by land area
ETDZ	50	16	805	66,29	Jieyang, Guangzhou, Foshan
HTDZ	13	30	391	32,20	Zhaoqing, Dongguan, Yangjiang
EPZ	3	2,4	7,4	0,61	Guangzhou, Shenzhen
FZ	7	1,3	10	0,82	Zhuhai, Shenzhen, Shantou
IZ	1	1	1	0,08	Shenzhen
TOT	74	10,4	1214,4	100	

Source: Authors' elaboration

3.2 Empirical Model

Our empirical analysis estimates an aggregate production function type of model (see among others Barro and Sala-i-Martin, 1991 and 2004; Rosenthal and Strange, 2004; World Bank, 2009) at the county-level. We augment the classical model by including a policy-variable that takes into account the existence of special economic enclaves in the county. We also include a number of controlling factors that take into account geographical and institutional aspects that might influence the designation of economic enclaves in specific counties.

The model takes the following form:

$$lnY_{it} = \alpha_i + \beta_1 * lnDZ\_DENSITY_{it} + \beta_2 * lnLOCALINVEST_{it-3} + \beta_3 * lnFDI_{it-3} + \beta_4 * lnWORKERS_{it} + \beta_4 * URBAN_i + \beta_5 * PRD_i + \beta_6 * COAST_i + \beta_7 * YEAR + e_{it}$$

Where:

Y_{it} is the industrial output per squared kilometer in county/urban district$_i$ at time *t*;

DZ_DENSITY$_{it}$ measures the percentage of the area of county/district *i* covered by an economic development zone (which, as said, is mainly ETDZs and HTDZs). If β_1 turns out positive and significant we conclude that economic development zones have positively contributed to industrial output in Guangdong;

LOCAL*INVEST*$_{it}$ is the amount of national capital investment and capital renovation /maintenance in county/district *i* at year *t-3*, per squared kilometer;

FDI$_{it}$ is the amount of foreign direct investment[2] in county *i* at year *t-3*, per squared kilometer;

WORKERS$_{it}$ is the number of employed people in county i at year t, per squared kilometer;

URBAN$_i$ is a dummy variable equal to one for urban districts within prefecture-level cities, and is used as a proxy to capture the different contexts in terms of institutions, market functioning, infrastructure development and services available that supposedly characterize highly urbanized districts with respect to less urbanized areas (OECD, 2009; Barbieri et al. 2010; Tödtling and Wanzenböck, 2003);

PRD$_i$ is a dummy variable that identifies counties and districts within the Pearl River Delta area,[3] which is historically the region that developed at a faster pace due to its location around the capital city, in front of Hong Kong and with access to external trade through the Pearl River. It is also a region that has been targeted with specific incentives for industrial development (for further details see Di Tommaso et al., 2012; Barbieri et al., 2012; Enright et al., 2005);

COAST$_i$ is a dummy variable that identifies coastal counties and districts that have geographical characteristics that make them more easily accessible than the inner, more mountainous regions of the province. We expect all of these variables to display a positive association with industrial output. That is, all else held equal, higher output values should be registered within the PRD, coastal region, urban districts and in places where investment in innovation and FDI have been higher;

YEAR is a dummy variable employed to control for time effects that can be read as changes in the macroeconomic scenario affecting the whole region.

3.3 The estimation strategy

As mentioned, the empirical evidence on the ability of economic zones to trigger industrial growth is quite diverse. Part of the literature has stressed the idea that economic zones may fail in producing spillover effects and backward linkages with local economies. This has been mostly noted in cases where the zones where located in very marginal areas, with low economic performances (Johansson and Nillson, 1997; Killick, 1993; Miyagiwa, 1993;

[3]According to the official definition the PRD area includes the prefectures of Guangzhou, Shenzhen, Zhuhai, Foshan, Jiangmen, Dongguan and Zhongshan, part of Huizhou (the urban district of Huizhou, Huiyang County, Huidong County and Boluo County) and part of Zhaoqing (the urban district of Zhaoqing, Gaoyao and Sihui).

Madani, 1999). At the same time economic zones wish to precisely trigger growth in areas where it is lagging. We therefore might expect, with reference to this literature, to observe different effects of economic zones on production not only according to their geographical location but also according to the level of economic performance observed in the specific location. Our research is an attempt to verify explicitly if the effect of development zones is unequal and growing as we move from counties with lower output to those with higher output, while being ineffective in low-output areas. To do so, we use quantile regression in order to account for possible heterogeneity of the effect that the density of special zone may have on industrial output.

Quantile regression aims at identifying a conditional quantile function: that is, a model in which the quantiles of the conditional distribution of the outcome of interest - in our case of counties' industrial output – results as a function of the independent variables (Koeneker & Hallock, 2001).

Technically, while we obtain OLS estimator by minimizing a particular function of the residuals – the sum of squares – the quantile regression estimator for the τth quantile comes from:

$$\hat{\beta}_\tau = argmin \sum_{i=1}^{n} \rho_\tau(y_i - \boldsymbol{x}_i\beta_\tau)$$

Where $\rho\tau$ is a "check" function that weights positive and negative residuals asymmetrically:

$$\rho_\tau(u) = 1(u > 0) \cdot \tau|u| + 1(u \leq 0) \cdot (1 - \tau)|u|$$

The quantile regression estimator, therefore, estimates the τth conditional quantile of Y given x:

$$Q_\tau(Y|\boldsymbol{x}) = \boldsymbol{x}\beta_\tau$$

Indeed, while OLS and other estimators are concerned with the evaluation of the average effect, quantile regression allows us to account for heterogeneous effects (Angrist & Pischke, 2009).

As a downside, quantile regression suffer for all possible issues that affects OLS, in particular those related to unobservables. While for the estimation of average effects there are methods for correcting for endogeneity – as panel data and instrumental variables - solving such issues in estimating conditional quantile effects is not trivial (see Koeneker, 2004 for a review). Therefore, while our model tries to control for all possible elements affecting industrial output performances, we should reward the reader that, although still very informative, the result coming from the quantile regressions may not to be interpreted as identifying a causal relationship. To avoid further the possibility of omitted unobservables, we decided to include in the quantile regressions "prefecture" and year effects to control for

time and territory-specific effects.[4] We leave the treatment of an application of the quantile regression on longitudinal data to further development of our research.

In order to compare the conditional effect on the quantiles with the average effect we present also the pooled OLS results. Moreover, we present results for a random effect model and a fixed effect model to estimate the average effect in presence of endogeneity. The two models are grounded on a different hypothesis about the behavior of the unobservables: while using fixed effects model one assumes that the unobservables don't change over time, in the case of random effects these are treated as random variables. That is, the choice between the two widely depends on the assumptions of the researcher about the phenomenon she is going to analyse. In our case, although the tests we ran give us some evidence in favor of a fixed effects modelling, we present both estimates. If both the parameters are significatively different from zero, we may reasonably conclude that the effect of the regressor on the outcome of interest is, indeed, significant.

3.4 Empirical results

In appendix A, we report the correlation among our explanatory variables, together with the main summary statistics. Table 2 shows the results of the regression we run for the main covariates.

The first three columns shows the quantile regression results, that estimates the parameters at the 25^{th}, the 50^{th} and the 75^{th} quantile. The fourth column shows the OLS estimates, while those for fixed and random effects are reported in the last two columns. All the regressions report a positive and significant effect of our main variable of interest (lnDZ_density): indeed, the elasticity of the industrial output with respect the special zones density is very near to one in the more robust estimates (fixed and random effects). As expected, the coefficients for labour are also positive, high and significant in both models, while for what concerns capital only local investments seems to have an effect on the industrial output.

However, if we turn our attention to the results of the quantile regression, we obtain some interesting evidence that needs a closer analysis. In fact, the effect of the special zones density at the median is pretty larger than that reported on the average by OLS, indicating a left-tailed asymmetric distribution. On the other hand, although the positive effect of the density on the output seems to be decreasing as we move from the lower quantiles of the distribution to the higher ones. A Wald test we performed demonstrates that the three estimates are significatively different among each other. In order to explore further the asymmetry, we plotted the value of the estimated β_1 for the whole distribution. The results are displayed in Fig 1.

[4] The choice of the prefecture as a territorial unit to be used as a dummy is a theoretical second best: the use of dummies for the counties would be in fact more appropriate to our case. However, we avoided to include them to save in efficiency, being the number of observations limited and that of counties high.

	Quantile regression			OLS	Random Effects	Fixed Effects
Logskoutput	Quantile .25	Quantile .50	Quantile .75			
lnDZ_density	0.75	0.81	0.577	0.695	1.054	0.97
	*(3.20)***	*(3.13)***	*(3.07)***	*(6.55)***	*(8.45)***	*(5.36)***
ln_workerssq	0.857	0.963	0.583	0.72	0.898	0.792
	*(2.83)***	*(2.56)**	*(-1.95)*	*(5.53)***	*(5.15)***	*(4.98)***
local_sqkmz_l3	0.268	0.205	0.269	0.287	0.208	0.195
	*(4.67)***	*(2.74)***	*(2.94)***	*(5.79)***	*(4.02)***	*(6.07)***
fdi_sqkmz_l3	0.06	0.042	0.033	-0.006	-0.025	-0.026
	(-1.37)	*(-0.7)*	*(-0.67)*	*(-0.15)*	*(-0.64)*	*(-1.08)*
Urban	0.762	0.787	1.32	0.824	0.292	
	(-1.18)	*(-1.39)*	*(3.01)***	*(3.19)***	*(-0.98)*	
Prd	0.65	0.652	1.183	0.115	1.192	
	(-0.95)	*(-0.92)*	*(-1.52)*	*-0.85*	*(5.04)***	
Coast	0.578	0.117	-0.346	1.013	-0.082	
	*(2.04)**	*(-0.3)*	*(-0.72)*	*(2.21)**	*(-0.37)*	
Obs		235		235	235	235
q25 pseudo-R2		0.803				
q50 pseudo-R2		0.7963				
q75 pseudo-R2		0.7844				
R2						0.7014
R2_a				0.9437		0.6243
R2_o				0.9344	0.8774	0.8077
R2_b					0.8972	0.8261
R2_w					0.6985	0.7014
Rmse				0.4798	0.2889	0.2861
F				102.0827		36.4066
chi2						557.6341
Corr						0.5271
sigma_u					0.5980	0.9181
sigma_e					0.2868	0.2861

Standard errors in brankets. Legend: *significance at 10% **significance at 5% ***significance at 1%

Table 1 - Estimations results

As it is clear from the graph, the effect of the density of special zones is highly asymmetric as we move across the distribution, being it larger for lower quantiles and smaller for higher

ones.[5] To see if this effect is significant, we run a Wald test comparing the quantile for which the estimated β_1 is maximum (the 13th) and that for which it is minimum (the 91st). The result is positive in the sense of a difference between the values at a significance level of 0.34%, far smaller than 1%. If not else, this evidence at least questions the hypothesis that the effect of the development zones is not differentiated across areas with different development levels. It seems also that our results are not supporting the thesis of some stream of literature that special zones would not be effective in economic depressed areas. Indeed, in our case the poorer the territory, the larger the effect of special zones on its industrial output (Fig. 1), even though this conclusion calls from some caution.

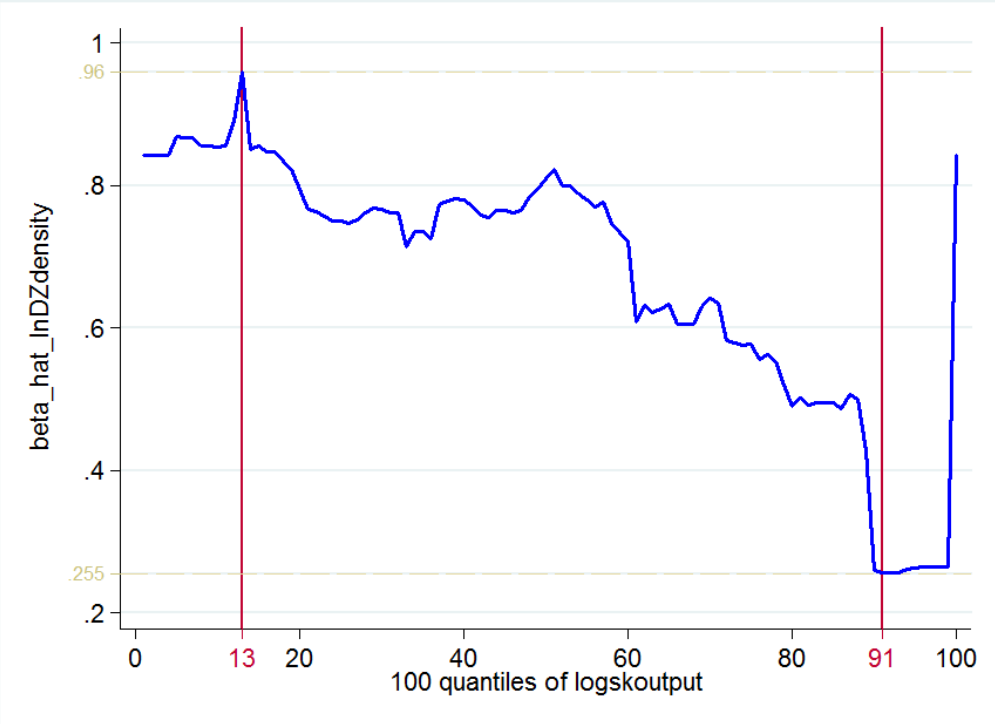

Fig 1 - Effect of lnDZdensity at each percentile

In fact, this is a *ceteris paribus* effect. In particular, the territorial dummies we introduced in the model (prd, urban, coast), isolate the effect of the density of special zones from effects that already identify a difference in the level of development of a territory. What Fig. 1 is showing is a result being the level of urbanization, the coastal position and the position in the Pearl River Delta equal. These are areas where the economic performances are historically higher than in the rural, inland prefectures. In a sense, these dummies already capture an *unequal economic performance pre-condition*. To verify if this is true and if it is related to the effect of the density across different level of output, we run a second regression excluding the territorial dummies (here included also those related to the prefectures). Although we are not controlling for territorial-specific effects, the graph we obtain (Fig. 2) helps in identifying more specifically the effect of the zones density on very poor areas. Indeed, the estimates are higher in the mid-high part of the distribution –

[5] We are excluding from these considerations the very low and the very high part of the distribution: in this cases the estimates become much more unreliable given the lack of observations

between the 40th and the 80th percentiles – while the fall far lower in the depressed areas around the 20th percentile. This result would support part of the literature on economic zones, that stresses the effectiveness of the zones only in areas that have at least some degree of industrialization and urbanization. However, the Wald test we run on the quantile with maximum estimated β and on the one with minimum estimated β for these last estimates suggest that the difference is not significant, and the value of the estimate at its minimum is still high and significant.

Fig 2 - Effect of lnDZdensity without territory-dummy

4. Concluding remarks

This paper contributes both to academic research and policy-making on special economic enclaves in several ways. For academic research, the contributions are as follows:

First, it deepens the knowledge on the functioning of economic zones in China highlighting the existence of different types of zones - other than Special Economic Zones - that have remained largely unexplored by the literature. Among these, the Economic and Technology Development Zones emerge as the preferred tool of investment attraction in China. Due to the implications behind infrastructure investment, definition of strategic locations, incentives, priority sectors and specific conditionalities on FDI, these should not be seen only as "deregulation" enclaves where the rules for investment are less stringent than in the rest of the country.

The empirical analysis allows us to focus on provinces and prefecture-level cities by relating local industrial performance with policy tools in specific counties and districts to investigate the linkage between Chinese industrial development and industrial policy. The results of the

empirical analysis on territories in Guangdong Province suggest a positive and significant relationship between local industrial output and the use of economic development zones once other relevant factors are taken into account. We also tried to verify the difference in the effects of development zones on different levels of economic and industrial development using quantile regression. The results suggest different effects of the economic zones depending upon the level of industrial development of the areas where they are located: considering a *ceteris paribus* effect, they tend to be higher in less developed zones, but as we take out from the estimations the territorial dummies, the effect seems to be larger in those areas that are already industrialized. In this sense, this paper is an empirical attempt to shed some light on the possible uneven distribution of the gains coming from the establishment of development zones.

A few things to note: 1) more empirical work to be done to test the causal relationship. Even though some of the models, such as the fixed effects and random effects ones, deal with potential omitted variables and selection biases, more could be done with more data. In particular data covering the '80s and '90s when the policy of opening economic zones actually began are missing; 2) also, more robustness checks and application of methodology concerning endogeneity issues are needed to be developed in the future to strengthen the results coming from the quantile regressions.

The most interesting feature of special economic enclaves in China therefore seems to be related first of all to their capacity to accelerate growth in specific locations. Secondly, it is related to their capacity to connect this growth to long-term objectives such as the transfer of knowledge and technology to the local economy. Finally, it is related to the specific policy mechanism (under the form of sector priorities, conditionality, and local cooperation requirements) that ensures that these long-term objectives are part of the overall strategy of investment attraction.

APPENDIX A

Table A1 – Correlation among main explanatory variables

	lnDZ_density	ln_workerssq	loc_inv_sqkmz_l3	fdi_sqkmz_l3	urban	prd	Coast
lnDZ_density	1						
ln_workerssq	-0.4992	1					
loc_inv_sqkmz_l3	-0.2046	0.7391	1				
fdi_sqkmz_l3	-0.107	0.4748	0.6613	1			
urban	0.3991	0.4742	0.4298	0.4094	1		
Prd	0.1813	0.2519	0.3284	0.5175	0.2824	1	
Coast	0.0904	0.2379	0.2075	0.0525	0.3018	0.2305	1

Table A2 – Main summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lnDZ_density	338	-4.4315	1.313839	-8.094885	-0.97078
ln_workerssq	338	8.323517	1.159314	5.598649	11.46259
loc_inv_sqkmz_l3	334	18.40886	1.563016	14.22413	22.17601
fdi_sqkmz_l3	305	5.476027	1.780629	0.420503	10.06963
Urban	792	0.239899	0.4272915	0	1
Prd	792	0.2146465	0.4108363	0	1
Coast	792	0.3181818	0.4660648	0	1

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[i] Source: Guangzhou Development Districts, www.getdd.gov.cn, accessed 2 September 2011.