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Failure of an Export Promotion Policy? Evidence from Bonded Zones in Indonesia

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Abstract: *This study investigates the impact of the bonded-zone policy on firms' performance, employment, and extensive and intensive margins of exports, using Indonesia's medium–large manufacturing establishment database. We use modified difference-in-differences models to estimate the impact of the zones and exploit differences in the timing of zone approval as our identification strategy. Using a novel procedure to construct a data set of firms in bonded zones, we identified firms in bonded zones. We identified bonded-zone locations by using presidential, ministerial, and customs decrees that clearly lay out locations of the zones at the village level. We then linked this information with information from Statistik Industri. We consider the heterogeneity of factors that may bias the impact of the bonded-zone policy. Our research finds no consistent evidence that the zones promote exports either intensively or extensively. We do find, however, that bonded zones increase employment although not very robustly.*

***Keywords*:** Firm-level data; Productivity; Bonded zone.

***JEL Classification*:** D22; D24; O24; O25

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1. Introduction

Policy circles, particularly in developing countries, tend to have a favourable view of exports. Increased exports stimulate total factor productivity through capital formation and reallocation across industries. Exporting firms, with their global networks, are also able to accumulate knowledge and upgrade production technology, accelerating economic growth. Higher productivity can also lead to higher employment.

Empirical works suggest that exports have been instrumental to Indonesia's economic development. Despite export share being below 2% of world's total, exports have been the key source of economic growth and macroeconomic stability over the decades (Athukorala, 2006; Anas, 2011). Some point out that the remarkable export performance in 1985–1996 can be attributed mostly to the supply side, particularly the 1980s economic reforms to promote exports. Significant microeconomic reforms, including attracting foreign direct investments (FDI), underpinned export performance in this period (Athukorala, 2006).[1] FDI was found to be the key ingredient of long-term export performance (Anas, 2011), convincing policy circles of the importance of export-oriented policies.

Setting up special economic zones (SEZs) to attract investments is a key export strategy. The government provides substantial fiscal incentives ranging from tax exemption on imports of capital goods, raw materials, and other equipment, to licence exemption for firms willing to move their production to SEZs. These policies are common throughout developing countries (Farole and Akinci, 2011). In Indonesia, economic zones started growing following the success of the 1980s export-oriented reforms. Policymakers appear to believe that creating SEZs is the key to economic development in lagging regions (Damuri et al., 2015).

The extent to which place-based policies such as SEZs affect firms' export performance is much less known. SEZs potentially attract enough manufacturing activity to generate substantial productivity and create networks of productive firms. With fiscal incentives, SEZs may reduce the cost of entry and thus promote export participation. Through networks of firms, SEZs can also serve as a coordination point for potential or current exporters and thus decrease the cost of exporting. Firms with larger foreign networks are

[1] The reforms marked a significant shift from import substitution towards export orientation.

more likely to export (Sjoholm and Takii, 2008; Narjoko, 2009).[2] SEZs may encourage self-sustaining development of exporters, which will have aggregate impacts.

Theoretical and empirical works on international trade, however, suggest that firms actively participating in international markets tend to be larger and more productive. They are also able to bear greater sunk costs even before entering international markets than firms without exposure to international markets. Melitz (2003) suggests that exposure to trade induces only the more productive firms to export whilst simultaneously forcing the least productive firms to exit. That is, firm heterogeneity and fixed exporting costs mean that not all firms can export.

The fact that exporting firms are more productive than others and are able to shoulder the costs of entering export markets suggests important policy implications: whether export promotion policies such as SEZs have a substantial impact on export performance. SEZs provide firms with various fiscal incentives that come at a cost to taxpayers. Bernard and Jensen (2011) found no evidence that state export promotion expenditures increase the propensity for exporting amongst US firms. Whilst Rothenberg et al. (2017) concluded that the integrated economic development zone *(kawasan pengembangan ekonomi terpadu* [KAPET]) programme, which is similar to the SEZ, reduced production costs but had little impact on district productivity and employment. There is no study yet that evaluates the impact of location-based export policies on the export performance of firms in Indonesia.

This study attempts to fill the gap in the literature on evaluating export promotion policies in Indonesia. We investigate whether SEZs with various fiscal incentives have impacts on extensive and intensive margins of exports. Various factors and policies affect a firm's decision to export, such as trade liberalisation and tariff reduction, but research on place-based policies such as SEZs provides an interesting case. First, incentives provided to industries in SEZs are substantial – e.g. fiscal incentives, licencing, among others. Surprisingly, however, there is limited research that evaluates the impact of this policy on export performance of firms in those zones. Although they seem to point to an association between export performance and SEZs, studies using aggregate measures of trade are not quite able to disentangle the effect of SEZs from other confounding factors. Second, timing variation amongst SEZs identifies a way to evaluate the impact of the policy and potentially draw causal inference.

[2] SEZs provide fiscal incentives to FDI, including tax exemption on imports of capital goods and raw materials.

We focus on bonded zones,[3] which were introduced in the 1980s as part of a microeconomic reform package to attract FDI and promote exports; they grew significantly during the 1990s and peaked in 1998. The government then expanded the concept of bonded zones into larger place-based policies, covering not only manufacturing activities. KAPET and *kawasan ekonomi khusus* (KEK, a specific, not general special economic zone) are built upon the concept of bonded zones, which have become central in policy debates on place-based export promotion policies. Still, studies evaluating the programme remain limited.

Our paper exploits the variation in the timing of bonded zones' approval as our identification strategy. In 1990–2005, bonded zones spread across the country, growing rapidly in 1992–1993 and 1998–1999, then slowing down. Timing varies significantly between earlier and later bonded zones and between bonded and non-bonded zones. We use difference-in-differences and exploit variation in timing to evaluate the role of bonded zones in firms' performance.

Difference-in-differences assumes that later locations approved as bonded zones provide a valid counterfactual for what would have happened to the earlier bonded zones in the absence of bonded-zone approval. Yet, the timing of bonded-zone approval is not likely to be random. Earlier bonded zones might have different industrial characteristics, geographic locations, infrastructure, and other unobserved characteristics. We should also expect that heterogeneity stems from the plant level. For example, unobserved yet permanent productivity may affect firms' decision to join bonded zones and firms' performance. Failure to control for the heterogeneity will bias the impact of bonded zones.

To cope with the identification challenge, we imposed firm-level fixed effects to control for the arbitrary permanent heterogeneity between firms joining bonded zones earlier and later. We also imposed district fixed effects to control for permanent heterogeneity stemming from districts. To capture differential province-specific time effects such as macro-economic shocks, we include flexible province–year fixed effects. We also control for trends after bonded zones are granted.

Our empirical analysis reveals some important findings. First, the impact of bonded zones on firms' performance appears to be limited. They improve firms' productivity, measured by output per worker, but the impact is not immediate. It takes place 6 years or more after the bonded zones are approved and is only noticeable when we compare the

[3] Indonesia has four types of SEZs: 1) free-trade zones; 2) bonded zones; 3) KAPET; and 4) *kawasan ekonomi khusus* (KEK, which is translated as special economic zones). SEZ is a generic term referring to any place-based policy providing tax incentives. A KEK is a specific kind of SEZ.

medium–long-term effect 1 year before approval. As we control for the overall trend of post–bonded-zone approval, the impact of bonded zones on output per worker dissipates despite its positive trend.

Second, we find no consistent evidence that bonded zones promote exports' intensive or extensive margins. In the third year, bonded zones were granted to some locations, and the value of exports and the percentage of exported output of firms there increased significantly relative to a year before approval. In subsequent years, however, the impact of bonded zones diminished. As we control for the overall trend post–bonded zones, they do not have any impact on intensive and extensive margins of exports at all.

Third, bonded zones increase demand for workers. Our analysis suggests that bonded zones have a positive impact on employment, increasing firms' demand for workers by 4.5%. When we use non-bonded-zone exporters as the control group, however, there is no evidence that bonded-zone firms have higher demand.

The study contributes to a small but growing literature on the effect of export promotion policies on export performance in developing countries. An earlier study by Anas (2012) investigated the role of bonded zones in promoting exports, using Batam, arguably one of the oldest bonded zones in Indonesia. She showed that plants there had a higher probability of exporting than plants outside Batam. This present study builds on Anas (2012) to evaluate the effectiveness of place-based policies and bonded-zone expansion, and will have important policy implications for SEZ development. First, the study could inform policymakers on whether place-based policies to promote exports achieve their objectives, and provide insight on how to better design such policies. Second, the study provides knowledge on the extent to which firm heterogeneity responds differently to policy.

Another contribution of this study is that it is the first to build a data set of bonded-zone firms in Indonesia in the absence of administrative data. Specific information on bonded-zone firms is not publicly available. Our approach is novel because we identify bonded-zone firms through plant locations. We gather presidential, ministerial, and customs-office decrees on places approved to be bonded zones. Each decree clearly stipulates areas and locations approved to be bonded zones. We match the bonded-zone locations with a village-crosswalk dataset (or master file *desa*). This data consists of village names and codes across years. We then merge the location data with industry statistics. We assume that plants in villages designated as bonded zones are bonded-zone firms. The rationale of the assumption is based on decrees that define clear borders of bonded zones and use village borders as borders for bonded zones. Our approach recovers almost 93% of the number of

bonded-zone firms recorded by the customs office. The approach allows us to assess the output, employment, and productivity of bonded-zone firms.

2. Literature Review

Our study is part of extensive research on place-based policies and SEZs. Findings on the impact of SEZs on economic development have been mixed. Some observers point out that some firms take advantage of fiscal incentives without producing substantial employment or export products (Farole and Akinci, 2011; Pandya and Joshi, 2015). Other works show that many SEZs have generated exports and employment (Chen, 1993; Jayanthakumaran, 2003; Mongé-Gonzalez, Rosales-Tijerino, and Arce-Alpizar, 2005; Warr and Menon, 2016). Another study, however, proved that the externalities from SEZs to nearby areas were limited (Kaplinsky, 1993), raising the question of whether SEZs improve welfare beyond their regions. On Indonesia, Damuri et al. (2015) found that bonded zones have boosted exports: exports from firms within bonded zones initially performed better than those outside the zones. In recent years, however, export performance in bonded zones has been declining (Damuri et al., 2015).

Our paper is also related to the literature on firm heterogeneity and participation in international markets. Recent extensive research on international trade suggests that participation in trade is not random. A salient finding is that few firms participate in international markets. Exporters and importers account for a small fraction of firms in developed and developing countries (Bernard et al., 2012). Studies found that exporting and importing firms tend to be larger and more productive, employ high-skilled workers, and are capital intensive. They can bear larger sunk costs and pay higher wages before entering into international markets than firms without exposure to international markets. This evidence points to self-selection: exporting firms are more productive because the most productive firms are able to shoulder the costs of entering export markets.

The Melitz (2003) model provides insight on how firms' heterogeneity shapes aggregate outcomes. As trade constraints such as transportation costs ease, the more productive exporting firms survive and expand whilst less productive firms exit, leading to reallocation of economic activity, which then raises aggregate productivity.

In light of Melitz's theoretical predictions, firms in SEZs be self-selecting. Specifically, more-productive and export-oriented firms will move closer to or set up

business in SEZs and become more productive due to falling trade costs resulting from incentives provided by SEZs. The implication is that SEZs may have limited impact on creating new exporting firms. Another implication of firms' heterogeneity in the context of Melitz's model is that SEZs affect exporting firms in different ways. SEZs may have a greater impact on small rather than on large exporting firms. That is, small exporting firms may be more responsive to fiscal incentives offered by SEZs, but we have little empirical evidence on this matter.

3. Special Economic Zones

The government has introduced various economic zones, which have been growing. Each type has different incentives and regulations, but here we use 'economic zones' for all of them as most have export-oriented objectives.

Damuri et al. (2015) provides an excellent review of the evolution of economic zones in Indonesia. In 1970, the government introduced free-trade zones (*kawasan perdagangan bebas dan pelabuhan bebas).* In 1972, Indonesia launched bonded-warehouse zones (*kawasan berikat*). Due to the change of trade regime and the need to attract FDI, the government established industrial zones (*kawasan industri*) in 1989. The success of economic reforms in the 1980s created industrial concentrations in Java and Sumatra, the western part of Indonesia, while the outer Java islands, particularly the eastern part of Indonesia, lagged. The government introduced KAPET in 1996 to bridge the development gap between Java and Sumatra and the other parts of Indonesia by creating growth centres outside Java, such as KEKs, which were launched in 2009.

Table 1 summarises the incentives and objectives of the economic zones. KEKs receive the most generous incentives but all economic zones have export-oriented objectives. The economic zones were launched at different times and are in different districts, providing us with rich spatial and time variation, which we can exploit to assess the impact of SEZs on firms' export performance.

Table 1. Economic Zones

No	Zones	Year	Main Objectives
1	Free trade	1970	Develop tradeable sector and improve exports
2	Bonded	1972	Encourage high-value exports with focus on manufacturing
3	Industrial	1989	Improve growth and industrial competitiveness aimed at export and domestic demand
4	KAPET	1996	Create new centres of economic development and promote inclusive growth
5	KEK	2009	Combine all objectives of previous economic zones and promote inclusive growth

KAPET = integrated economic development zone, KEK = special economic zone.
Source: Damuri et al. (2015).

Regarding data limitations and policy timing, we focus on bonded zones. KAPETs provide an interesting case study: they were intended to be new growth centres but KAPET regions typically have worse infrastructure than other areas. Manufacturing is agglomerated in regions with better infrastructure, and KAPETs are not ideal for evaluating the performance of export policies. KEKs are more relevant to our case but they started to develop only in 2015.

4. Exporting Firms and Bonded Zones: Preliminary Insight

4.1. Characteristics of Exporting Firms

Many studies of developed countries suggest that exporting firms represent a small fraction of all firms. Bernard et al. (2012) find that exporting firms account for 18% of US manufacturing firms. We find similar evidence for Indonesia, where the overall share of manufacturing firms is also relatively small at 18% (Table 1). Food processors and manufacturers account for almost a quarter of all exporting firms (Table 2). Increasing demand for processed food, particularly from developed countries and emerging economies, is key in increasing the share of the food industry in exports. Technology innovation in the food industry, such as refrigeration facilities and better transport, increases exposure of products internationally. The contribution of the food industry to exports is followed by that of apparel, plastics and rubber, textiles, and non-metallic minerals. Indonesia's strong comparative advantage in natural resources and labour is reflected in the composition of exporting firms across industries (Athukorala, 2006).

Although food-exporting firms dominate, participation rates of exports across manufacturing industries vary considerably. Only 14% of food firms export their goods, while 45% of firms making furniture and related products and 38% of those making wood products do. Computer product and electrical equipment firms' exporting rates are substantial: 31% and 27%. The findings presented here are remarkably similar to findings from developed countries (Mayer and Ottaviano, 2007; Bernard et al., 2012).

Table 2. Exporting Firms by Industry, 2014

International Standard Industrial Classification of All Economic Activities		Share of all firms (%)	Share of firms that export (%)	Mean exports as share of total shipments (%)
10	Food manufacturing	24.36	14.03	53.11
11 – 12	Beverage and tobacco products	5.04	5.42	18.13
131	Textile mills	7.15	13.63	44.42
139	Textile product mills	3.27	9.24	48.55
14	Apparel manufacturing	8.73	16.44	89.38
15	Leather and allied products	2.83	18.01	77.94
16	Wood product manufacturing	4.51	38.43	77.58
17	Paper manufacturing	1.98	16.49	35.53
18	Printing and related support	2.15	3.98	24.94
19	Petroleum and coal products	0.33	18.75	52.53
20 – 21	Chemical manufacturing	5.06	22.32	34.37
22	Plastics and rubber products	7.31	18.39	66.72
23	Non-metallic mineral products	6.6	7.97	26.13
24	Primary metal manufacturing	1.32	25.70	50.29
25	Fabricated metal products	3.88	13.56	37.93
28	Machinery manufacturing	1.55	21.64	41.07
26	Computer and electronic products	1.39	30.99	80.86
27	Electrical equipment, appliances	1.37	26.79	51.39
29 – 30	Transportation equipment	2.9	19.55	29.93
31	Furniture and related products	5.41	44.91	86.10
32-33	Miscellaneous manufacturing	2.88	25.32	72.56
Aggregate manufacturing		100	17.84	49.07

Source: Statistik Industri, BPS (2014). Authors' calculation.

Almost all exporting firms' products are sent abroad. That is, the average share of products exported is 49.1%, but we find substantial variation across industries: 90% of apparel-exporting firms' products are exported, followed by furniture (86%) and computer

industries (81%), which suggests that exports are concentrated in a few firms and that exporting firms tend to ship abroad a large share of their products.

4.2. Do Firms in Bonded Zones Differ from Others?

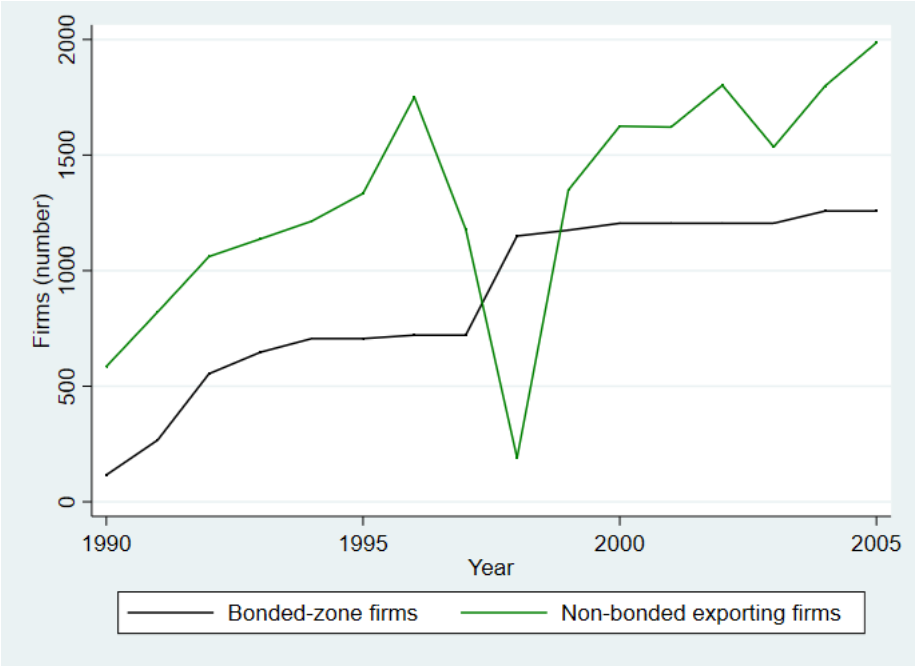
The government has provided incentives to firms in bonded zones, ranging from tax exemption on imports of capital goods, raw materials, and other equipment, to licence exemption for firms willing to move their production to SEZs. Do firms in bonded zones perform better than exporting firms outside bonded zones?

Data identifying firms in bonded zones is not publicly available. We therefore identify firms in bonded zones through a location-based approach. Approvals of bonded zones are stipulated through presidential or Ministry of Finance decrees. The decrees generally specify regions defined as bonded zones, and firms in those regions are eligible to receive incentives. Using this information, we merge data on locations approved as bonded zones with data on industry statistics. By doing so, we can estimate output per worker, exported value of output per worker, and employment of firms in bonded zones.

Figure 1 shows trends of bonded-zone firms and non-bonded-zone exporters. We can see that the number of bonded-zone firms increased rapidly in 1992–1993, levelled off in subsequent years, and jumped in 1998–1999. After the economic crisis, the number of firms in bonded zones was stagnant whilst exporters in non-bonded zones continued to increase.

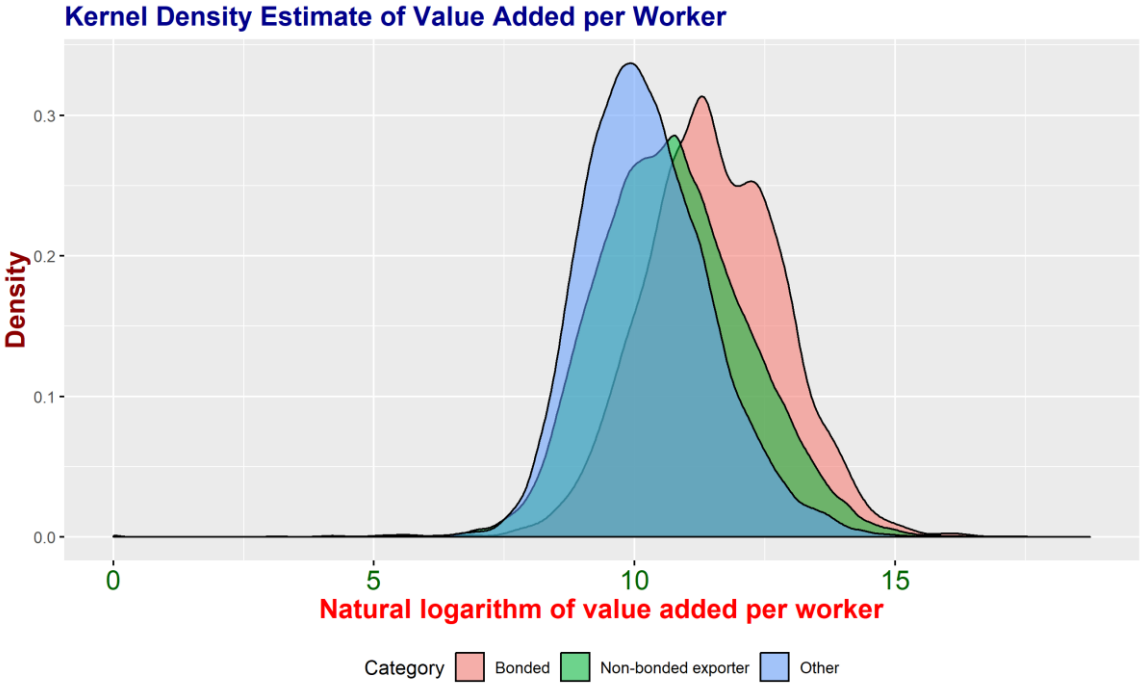
Figure 2 displays real output per worker distribution by export category and location. Although the figure describes unconditional distribution of output per worker, two findings stand out. First, exporting firms tend to produce higher output per worker in all segments of distribution. Even the median exporting firms produced output per worker equivalent to output per worker in the top 40% non-exporting firms. This is hardly surprising as many studies suggest that exporting firms produce higher valuable output. Bonded-zone firms typically have higher output per worker than exporting firms outside bonded zones.

Figure 1: Firms in Bonded Zones and Exporting Firms Outside Bonded Zones



Source: Statistik Industri, BPS (1990-2005). Authors' calculation.

Figure 2: Distribution of Output per Worker

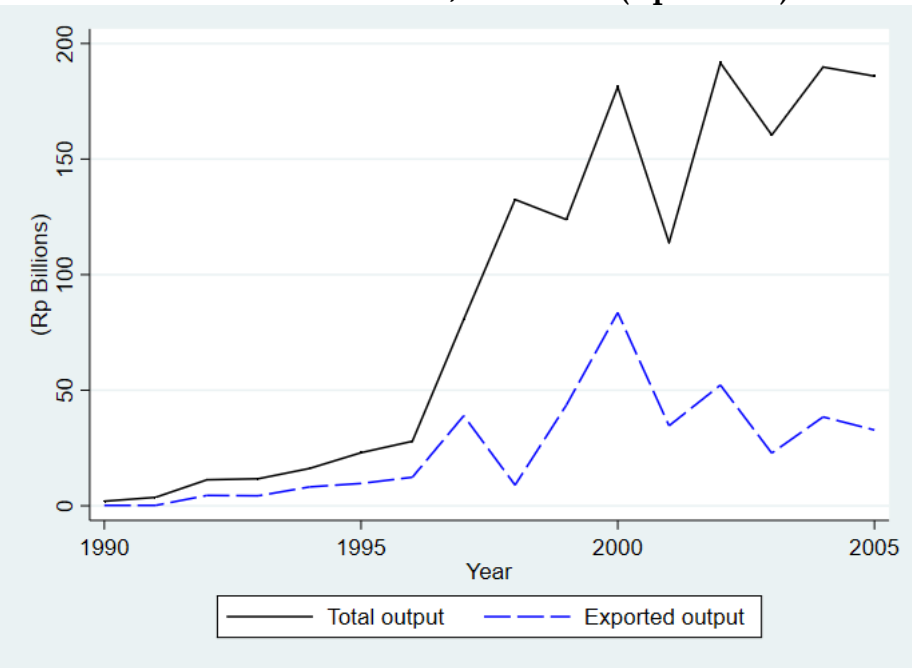


Note: 'Bonded' means firms in bonded zones. 'Non-bonded exporter' means exporting firms outside bonded zones. 'Other' means non-exporting firms outside bonded zones.
Source: Statistik Industri, BPS (1990-2005). Authors' calculation.

The second finding is that heterogeneity amongst exporting firms, including firms in bonded zones, is substantial. More than non-exporting firms, exporting firms tend to have large variations in output per worker, reflected in the wider curve. We observe a similar pattern in bonded-zone firms: distribution of output per worker displays a 'double hump', suggesting a bimodal distribution and large heterogeneity in output per worker.

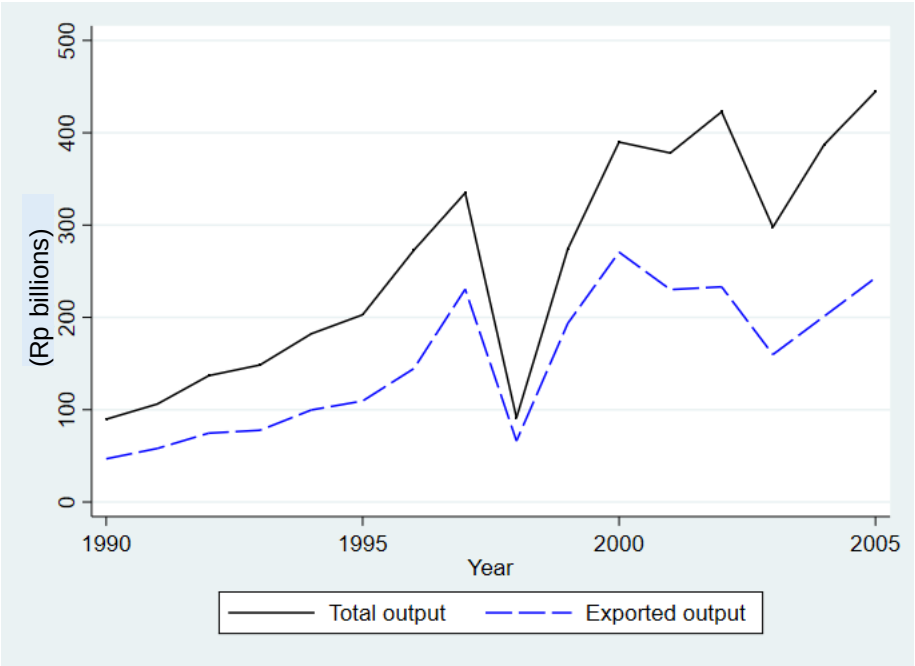
Figure 3a suggests that in 1990–1997, exported output was proportional to output. Following the 1998 economic crisis, output and exported output amongst bonded-zone firms diverged. Exported output after 2000 declined. The pattern is different from that of non-bonded-zone exporters (Figure 3b). Whilst we observe larger gaps between output and exported output after the 1998 crisis, they do not diverge.

Figure 3a: Total Output and Total Exported Output of Bonded-Zone Firms, 1990–2005 (Rp billion)



Source: Statistik Industri, BPS (1990-2005). Authors' calculation.

Figure 3b: Total Output and Total Exported Output of Exporting Firms in Non-Bonded-Zones, 1990–2005 (Rp billion)



Source: Statistik Industri, BPS (1990-2005). Authors' calculation.

The divergence between output and exported output suggests that not all firms in bonded zones export their products. This is plausible as a bonded zone is required to export at least 25% of total output of all firms in the bonded zone. A firm in a bonded zone does not need to export if total exports in the bonded zone account for more than 25% of total output. Firms in bonded zones can use the incentives but not export. This is a concern amongst policymakers, some of whom suspect that non-exporting firms in bonded zones enjoy incentives without exporting, and who talk about scrapping bonded-zone policies.

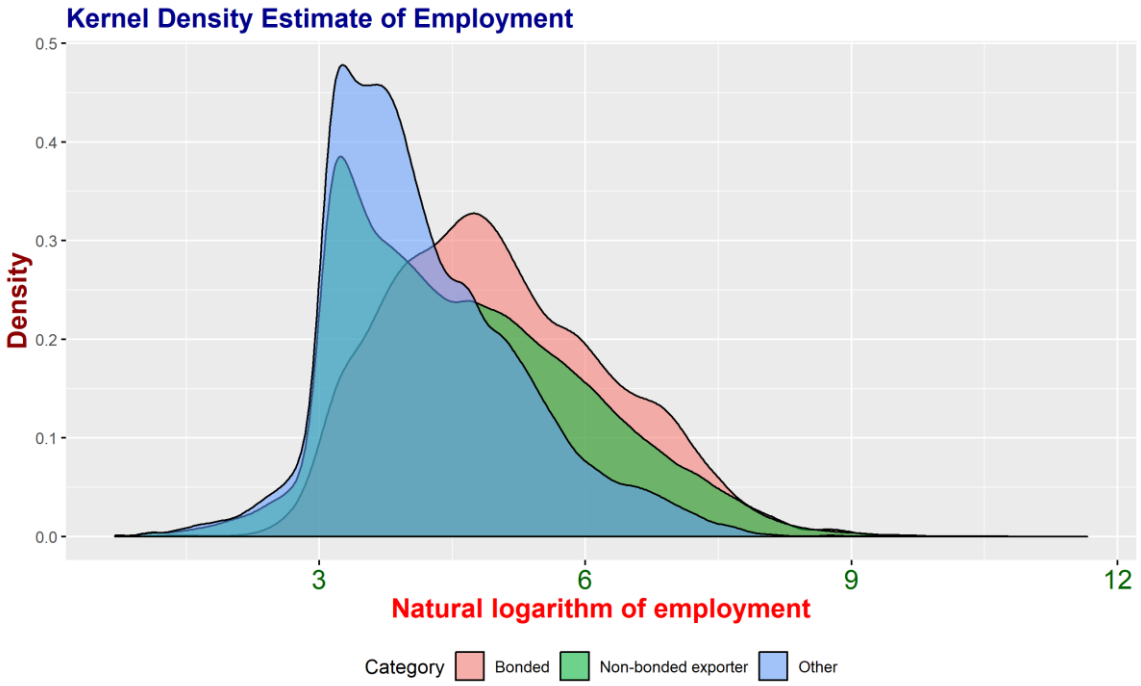
This finding, however, should be treated cautiously as our data is not based on administrative data. Measurement errors could have confounded the finding. Although we find non-exporting firms in bonded zones, we need to consider administrative data.

Most non-exporting firms have small workforces (Figure 4). There is no employment-specific pattern amongst exporting firms: their workforces range from small to large, which is surprising because exporting firms are typically large. This may be because the analysis of the mean misses important features of firms' characteristics. We find no strong evidence that bonded-zone firms employ more workers than non-bonded-zone exporting firms.

Some non-exporting firms are as productive as exporting firms, but exporting firms are generally more productive and bonded-zone firms are much more productive than others.

Figure 4 shows a simple measure of productivity in which we divide total output by number of workers. We find that the median bonded-zone firms are slightly more productive than the median exporting firms outside bonded zones. There is clearly heterogeneity amongst firms in bonded zones. However, the portion of firms in the top distribution of labour productivity is substantial, providing an avenue for further investigation of whether higher labour productivity positively promotes export intensity.

Figure 4. Bonded-Zone Firms Employ More Than Exporters Outside Bonded Zones



Note: 'Bonded' means firms in bonded zones. 'Non-bonded exporter' means exporting firms outside bonded zones. 'Other' means non-exporting firms outside bonded zones.
Source: Statistik Industri 1990–2005.

4.3. Characteristics by Sector

We look at recent data and break down our data into 10 manufacturing sectors. Electronics, rubber, and transportation account for most bonded-zone firms (Table 3). Of all firms in bonded zones, almost 13% make rubber and rubber products, followed by electronics (11.3%) and transportation (10.8%). A large portion of electronics and transportation firms are in bonded zones.

Table 3. Share of Firms In and Outside Bonded Zones, by Sector (%)

Industry	Bonded Zones (%)	Exporting Non-Bonded Zones (%)
Food and beverages	7.9	21.8
Textiles	3.6	7.6
Garment	5.7	8.6
Footwear	1.3	2.7
Wood-based	4.0	24.4
Rubber, rubber products, and plastics	12.6	7.0
Metal products	9.6	2.5
Electronics	11.3	1.2
Transportation	10.8	2.1
Others	33.2	22.3
Total	100.0	100.0
Number of firms	1,262	4,376

Source: Statistik Industri, BPS (2013). Authors' calculation.

Bonded-zone firms classified as garment, wood-based, metal product, and other manufacturers have higher value added than exporting firms outside bonded zones (Table 4). The value added of garment firms is 21% higher on average than those outside bonded zones. Other sectors such as textiles, footwear, and transportation manufacturing have much lower output per worker. It is important to note that bonded-zone firms receive tax incentives that clearly reduce production cost.

Another interesting finding is that, on average, the proportion of exported output amongst bonded-zone firms is much lower than amongst non-bonded exporting firms (Table 5), which can be partly attributed to the fact that a substantial fraction of firms in bonded zones do not export, such as food and textile firms. Manufacturers of footwear and metal products in bonded zones export a larger share of output than do manufacturers of the same products outside bonded zones.

Table 4. Average Output per Worker by Sector (Rp million)

Industry	Bonded	Exporting Non-Bonded
Food and beverages	919	1,614
Textiles	281	448
Garment	193	159
Footwear	457	227
Wood-based	385	165
Rubber, rubber products, and plastics	536	1,284
Metal products	1,181	453
Electronics	1,010	530
Transportation	1,960	1,321
Others	1,349	1,127
Total	1,069	831

Source: Statistik Industri, BPS (2013). Authors' calculation.

Table 5. Average Value and Percentage of Exported Output by Sector (Rp billion)

Industry	Bonded		Exporter Non-Bonded	
	Export Value	% Export	Export Value	% Export
Food and beverages	218	24	1,113	67
Textiles	52	18	227	47
Garment	124	53	125	75
Footwear	60	34	130	64
Wood-based	180	42	125	79
Rubber, rubber products, and plastics	147	22	881	63
Metal products	197	24	162	39
Electronics	263	36	321	58
Transportation	179	14	518	37
Others	226	20	526	49
Total	196	25	502	63

Source: Statistik Industri, BPS (2013). Authors' calculation.

5. Data and Methodology

Our plant-level data is gathered from the survey of medium-sized and large manufacturers (Statistik Industri or SI) from 1990 to 2005. The establishments employ 20 people or more. The information in Statistik Industri covers basic information on plants' characteristics such as International Standard Industrial Classification of all Economic Activities (ISIC) classification and location; ownership (foreign, domestic, or government);

production (gross output, stocks, capacity utilisation, share of output exported); material costs and various types of expenses; labour (head count and salary and wages); capital stock and investment; and sources of investment funds.

We use Statistik Industri data from 1990 to 2005 because bonded zones grew rapidly during this period and because focusing on it will allow us to evaluate the immediate impact of bonded zones on firms' export performance.

5.1. Identifying the Location of Special Economic Zones

Key to our analysis is the exact location and date of SEZ operations. To gather this information, we set up a new data set, drawing information from the customs office, which provides data locations and the dates bonded zones were granted. We then match locations by name from the customs office with the Statistics Agency (Badan Pusat Statistik [BPS]) official location codes. BPS provides master data on village (*kelurahan*) names and codes from 1990 to 2013. The master data allows us to identify provinces and districts. Once we establish the data set on bonded zones, we merge it with Statistik Industri data. BPS also collects detailed locations on plants that allow us to integrate bonded zones' location with plant-level data.[4]

5.2. Methodology

Our identification strategy consists of exploiting the variation in the timing of bonded zones. Indonesia's experimentation with bonded zones started in 1989 and peaked in 1998. Given that the timing of treatments is different, we are not able to use a simple difference-in-differences model. Instead, we follow Wang's (2010) empirical specifications. We first use an event study to evaluate the impact of bonded zones on plants' outcomes of interest. With an event study we use a series of dummy variables for the number of years before or after a plant was approved to be part of a bonded zone. This allows us to capture the impact of bonded zones each year after a group of plants is approved to operate as bonded zones. Specifically, to evaluate the impact of bonded zones on various outcomes of interest, y_{ict}, we estimate parameters of the following regression equation:

$$y_{ict} = \alpha_i + R_c + P_{ct} + x'_{ict}\beta + \sum_{k\geq -6, k\neq -1}^{6} D_{ict}^{k}\delta_k + \varepsilon_{ict} \quad (1)$$

[4] BPS provides detailed locations at the village level for some years of Statistik Industri. Since 1998, BPS has not publicly provided village-level locations.

Where i represents firm i; c = 1,2,…c represents village, t = 1,2,…T denotes year. The dummy variables, D_{ict}^{k}, jointly represent the bonded-zone designation event. Let s_i denote the year when a location i is approved as a bonded zone. We define $D_{ict}^{-6} = 1$, if $t - s_i \leq -6$, and 0 otherwise; $D_{ict}^{k} = 1$, if if $t - s_i = k$, and 0 otherwise, if $k = -5, -4, -3, -2, 0, 1, 2, 3, 4, 5$; $D_{ict}^{6} = 1$, if $t - s_i \geq 6$, and 0 otherwise. We exclude the dummy for $k = -1$, so the post-treatment effects are relative to the period of 1 year before the approval of bonded zones. Hence, the parameter of interest δ_k represents the causal effect of bonded zone *k* years after its approval.

The outcomes of interest y_{ict} are output per worker, number of products, employment, export values per worker, percentage of exported output, and number of exported products. The control variables x_{ict} include a dummy of foreign ownership (foreign = 1 if the foreign share accounts for at least 10%) and unit labour cost (total wages divided by output). Error term is denoted by ε_{ict}.

The model includes time-invariant plant-level heterogeneity, α_i. It captures permanent differences in observed and unobserved characteristics such as tacit knowledge and productivity, which might influence firms' export performance. We also include two sets of location-based fixed effects. The first is district fixed effects to capture all districts' time-invariant characteristics, denoted by R_c, and province–year fixed effects to capture trends at the province level.

Specification (1) suggests that bonded zones may affect levels and trends in the outcomes of interest. In the following specification, we modify specification (1) to capture a general trend post-approval of bonded zones. Let us define post-approval of bonded zones as follows: $post_{ict} = t - s_i$ if $t \geq s_i$ and 0 otherwise. s_{ict} denotes the year when the village is designated as a bonded zone. Thus, we estimate the following regression equation:

$$y_{ict} = \alpha_i + R_c + P_{ct} + x'_{ict}\beta + s_{ict}\delta + Post_{ict}\theta + \varepsilon_{ict} \qquad (2)$$

We have similar control variables as specification (1). Our coefficients of interest are δ and θ, which reflect the level and trend effects of bonded zones, respectively.

Table 6 shows that bonded-zone firms outperform non-bonded-zone firms. Bonded-zone firms are more productive than non-bonded-zone firms, that is, the average real output per worker of a bonded-zone firm is more than double that of a worker of a non-bonded-zone firm. Bonded-zone firms also export more products in larger quantities. It is important to

note, however, that the summary statistics are based on unconditional distribution without controlling for other characteristics.

Table 6. Summary Statistics: Differences in Characteristics of Bonded-Zone and Non-Bonded-Zone Firms

Variables	Bonded Zone	Non-Bonded Zone	Difference Between Bonded Zone and Non-Bonded Zone
Nat log output per worker	11.60	10.60	0.998***
Nat log number of products	0.584	0.517	0.067***
Nat log of employment	5.062	4.519	0.543***
Nat log of export value per worker	3.448	1.727	1.721***
Nat log of percent exported output	1.254	0.646	0.608***
Nat log of number of exported products	0.273	0.158	0.115***
Real output per worker (millions)	267.7	127.5	140.149***
Number of products	2.408	2.231	0.177***
Employment	362.7	265.1	97.684***
Real exported value	73.43	19.43	53.995***
Percent of exported output	23.03	10.69	12.344***
Number of exported products	0.565	0.320	0.245***

Note: Nat log = natural logarithm.
Source: Statistik Industri, BPS (1990-2005). Authors' calculation.

6. Results

Table 7 displays the regression results of the event study. Surprisingly, the immediate impact of bonded zones on output per worker (column 1) is negative. That is, the bonded zone, on average, reduced output per worker by 12.7% relative to 1 year before the bonded zone was approved (the coefficient on year of change). Immediately after it was approved, the bonded zone increased demand for employment by 15.4%. There is no evidence, however, that the bonded zone has impacts on exports' intensive and extensive margins. In the longer term, 6 years or more after approval, the bonded zone increased output per worker by 23.7%. It also increased employment by 9.1% and number of products by 9.8% relative to the year before the bonded zone was approved. The bonded zone positively affected extensive margin of export, that is, the number of exported products increased by 7.9%

relative to the period immediately before bonded-zone approval. There is no immediate effect of bonded zones on intensive margin (export value per worker and percentage of exported output). After year 3, exported value increased by 58.8% and exports amongst bonded-zone firms by 18.9% relative to the 1-year period before bonded-zone approval.

Table 8 exhibits the result of specification 2 and aims to capture the level effect and the overall-trend effect of bonded zones. We find evidence that the bonded zone increased employment by 4.5%; annual growth of employment is around 2.57% relative to non-bonded-zone firms. Both coefficients are statistically significant. We do not find evidence that the bonded zone has noticeable impacts on output per worker and export performance, yet the bonded zone has a positive impact: output per worker grew annually at a positive rate of 2.5% and is statistically significant at a confidence level of 99.99%. After approval of a bonded zone, export value per worker of a bonded-zone firm shrinks by 3.8% and is statistically significant. Nevertheless, there is no evidence that bonded zones affect the trend of extensive margin of export.

Table 7. An Event Study: Impact of Bonded Zones on Firms

Variables	Output per Worker	Products (number)	Employment	Exported Value added per Worker	Percentage of Exported products	Exported Products (number)
>=6 years before	-0.0586	-0.0382	0.0610**	-0.251	-0.0650	-0.0457**
	(0.0382)	(0.0260)	(0.0262)	(0.159)	(0.0595)	(0.0196)
5 years before	-0.0560	0.0315	-0.00161	-0.179	-0.0590	-0.0452**
	(0.0425)	(0.0277)	(0.0292)	(0.177)	(0.0662)	(0.0208)
4 years before	-0.0597	-0.000806	-0.0472*	-0.323*	-0.136**	-0.0591***
	(0.0406)	(0.0249)	(0.0279)	(0.169)	(0.0633)	(0.0198)
3 years before	-0.00535	0.00341	-0.0472*	0.267*	0.0847	-0.0164
	(0.0376)	(0.0231)	(0.0258)	(0.156)	(0.0585)	(0.0178)
2 years before	0.0173	0.0136	-0.0311	0.133	0.0545	0.00230
	(0.0353)	(0.0214)	(0.0243)	(0.147)	(0.0550)	(0.0156)
year of change	-0.127**	0.0428	0.154***	-0.239	-0.0408	0.0226
	(0.0524)	(0.0336)	(0.0360)	(0.218)	(0.0817)	(0.0249)
1 year later	-0.0594	0.0250	0.136***	-0.0741	-0.0352	0.0151
	(0.0502)	(0.0315)	(0.0345)	(0.209)	(0.0782)	(0.0243)

2 years later	0.0459	0.0333	0.121***	-0.0945	-0.0446	0.00515
	(0.0530)	(0.0335)	(0.0364)	(0.220)	(0.0825)	(0.0262)
3 years later	0.110*	0.0742**	-0.0435	0.580**	0.189**	0.0531*
	(0.0564)	(0.0364)	(0.0388)	(0.235)	(0.0879)	(0.0293)
4 years later	0.0444	0.0906**	-0.0443	0.00856	-0.0420	0.0758***
	(0.0536)	(0.0363)	(0.0369)	(0.223)	(0.0836)	(0.0285)
5 years later	0.165***	0.126***	0.0100	0.166	0.0121	0.0402
	(0.0520)	(0.0356)	(0.0357)	(0.216)	(0.0810)	(0.0285)
>=6 years later	0.237***	0.0982***	0.0908***	0.156	0.0189	0.0795***
	(0.0471)	(0.0348)	(0.0324)	(0.196)	(0.0733)	(0.0296)
Foreign owned	0.233***	-0.000358	0.144***	1.425***	0.486***	0.0843***
	(0.0151)	(0.0101)	(0.0104)	(0.0629)	(0.0236)	(0.00798)
Natural logarithm of unit labour cost	-3.245***	-0.0941***	0.145***	-1.132***	-0.256***	-0.0699***
	(0.0158)	(0.0107)	(0.0109)	(0.0657)	(0.0246)	(0.00761)
Observations	130266	107257	130266	130266	130266	87270
Adjusted R-squared	0.769	0.646	0.874	0.509	0.527	0.557

Note: All dependent variables are transformed into natural logarithm. Standard errors are in parentheses. Standard errors are robust to heteroscedasticity. *** significant at alpha 1%, ** 5%, *10%.
Source: Authors' calculation.

Table 8. Impacts of Bonded Zones on Firms

Variables	Output per Worker	Products (number)	Employment	Exported Value Added per Worker	Percentage of Exported products	Exported Products (number)
Bonded zones	-0.0209	0.0379*	0.0455**	0.0717	0.0248	0.0224
	(0.0311)	(0.0209)	(0.0214)	(0.129)	(0.0485)	(0.0194)
Post-bonded-zone trend	0.0252***	-0.00137	0.0257***	-0.0380**	-0.0140**	0.000675
	(0.00393)	(0.00259)	(0.00270)	(0.0163)	(0.00612)	(0.00204)
Foreign owned	0.233***	-0.000207	0.144***	1.422***	0.486***	0.0834***
	(0.0151)	(0.0101)	(0.0104)	(0.0628)	(0.0235)	(0.00797)
Natural logarithm of unit labour cost	-3.246***	-0.0942***	0.146***	-1.134***	-0.257***	-0.0702***
	(0.0158)	(0.0107)	(0.0109)	(0.0657)	(0.0246)	(0.00761)
Observations	130266	107257	130266	130266	130266	87270
Adjusted R-squared	0.769	0.646	0.874	0.509	0.527	0.557

Note: All dependent variables are transformed into natural logarithm. Standard errors are in parentheses. Standard errors are robust to heteroscedasticity. *** significant at alpha 1%, ** 5%, *10%.
Source: Authors' calculation.

6.1. Robustness Checks

One of the control groups in specifications 1 and 2 consists of firms that are never joining bonded zones. Simply comparing firms in bonded zones to firms outside bonded zones may be less appropriate given that heterogeneity is large across firms. Controlling for both observables and time-invariant unobservables through firm-level fixed effects potentially captures firm heterogeneity. However, we are concerned that time-variant unobservables are correlated with firms' characteristics and outcomes.

We therefore focus on particular control groups. First, we use firms in sub-districts with at least 20 firms. Ideally, we use firms in industry zones as the control group. However, this information is available starting only from survey year 2004. As a proxy for industrial zones, we construct a dummy variable indicating a sub-district with at least 20 firms. The second control group consists of other exporting firms not in bonded zones. Conceptually, exporting firms in non-bonded zones share characteristics with those in bonded zones, assuming that bonded-zone firms are export oriented. For each control group, we estimate specifications 1 and 2 separately (Tables 9 to 12).

Table 9 shows the result of an event study with the control group of firms in sub-districts with at least 20 plants. The immediate impact of a bonded zone on output per worker (column 1) is negative, that is, the bonded zone reduced output per worker by 12.9%. In the long-run – 6 years or more – the bonded zone increases output per worker by 22.9% relative to 1 year before the bonded zone was approved. We find that there is no immediate impact of bonded zones on exports. Impact is noticeable in year 3 and, in the long run, year 6. Table 10 shows the results from the event study and suggests qualitatively similar findings.

Table 10 displays results from specification 2 with a control group of firms in a sub-district with at least 20 plants. We find no evidence that bonded zones significantly affect outcomes of interest. Using firms that have exported at least once as a control group does not change the story: a bonded zone has no impact on firms' performance measured by output per worker and intensive and extensive margins of export.

Table 9. Event Study: Effects of Bonded Zones on Firms (Control Group: Firms in Subdistricts with at Least 20 Plants)

Variables	Output per Worker	Products (number)	Employment	Exported Value Added per Worker	Percentage of Exported products	Exported Products (number)
>=6 years before	-0.0425	0.00304	0.0631**	-0.238	-0.0653	-0.0482**
	(0.0399)	(0.0285)	(0.0259)	(0.173)	(0.0628)	(0.0211)
5 years before	-0.0277	0.0497	-0.00836	-0.218	-0.0817	-0.0572***
	(0.0444)	(0.0304)	(0.0287)	(0.192)	(0.0698)	(0.0222)
4 years before	-0.0315	0.0132	-0.0612**	-0.318*	-0.146**	-0.0658***
	(0.0423)	(0.0270)	(0.0274)	(0.183)	(0.0666)	(0.0212)
3 years before	0.0109	0.00886	-0.0573**	0.209	0.0575	-0.0272
	(0.0392)	(0.0249)	(0.0254)	(0.170)	(0.0617)	(0.0190)
2 years before	0.0248	0.0216	-0.0440*	0.202	0.0737	0.00132
	(0.0368)	(0.0230)	(0.0238)	(0.159)	(0.0579)	(0.0165)
Year of change	-0.129**	0.0499	0.152***	-0.312	-0.0730	0.0215
	(0.0542)	(0.0352)	(0.0351)	(0.234)	(0.0852)	(0.0254)
1 year later	-0.0801	0.0301	0.134***	-0.103	-0.0499	0.0138
	(0.0516)	(0.0333)	(0.0334)	(0.223)	(0.0812)	(0.0248)

2 years later	0.0497	0.0406	0.0935***	0.0363	-0.00461	0.00536
	(0.0546)	(0.0356)	(0.0353)	(0.236)	(0.0859)	(0.0268)
3 years later	0.113*	0.0621	-0.0704*	0.644**	0.206**	0.0470
	(0.0586)	(0.0391)	(0.0380)	(0.253)	(0.0923)	(0.0300)
4 years later	0.0501	0.0751*	-0.0871**	0.119	-0.0115	0.0801***
	(0.0556)	(0.0388)	(0.0360)	(0.240)	(0.0875)	(0.0295)
5 years later	0.162***	0.112***	-0.0175	0.253	0.0400	0.0466
	(0.0538)	(0.0381)	(0.0348)	(0.233)	(0.0846)	(0.0297)
>=6 years later	0.229***	0.0859**	0.0429	0.408*	0.101	0.0818***
	(0.0494)	(0.0374)	(0.0320)	(0.214)	(0.0777)	(0.0308)
Foreign owned	0.242***	-0.0213	0.156***	1.595***	0.547***	0.0942***
	(0.0196)	(0.0134)	(0.0127)	(0.0846)	(0.0308)	(0.0101)
Natural logarithm of unit labour cost	-3.273***	-0.0907***	0.0573***	-1.172***	-0.273***	-0.0674***
	(0.0215)	(0.0147)	(0.0139)	(0.0928)	(0.0338)	(0.0101)
Observations	61022	51799	61022	61022	61022	43382
Adjusted R-squared	0.757	0.636	0.883	0.470	0.488	0.516

Note: All dependent variables are transformed into natural logarithm. Standard errors are in parentheses. Standard errors are robust to heteroscedasticity. *** significant at alpha 1%, ** 5%, *10%.
Source: Authors' calculation.

Table 10. Event Study: Effects of Bonded Zones on Firms (Control Group: Firms That Have Exported at Least Once)

Variables	Output per Worker	Products (number)	Employment	Exported Value Added per Worker	Percentage of Exported products	Exported Products (number)
>=6 years before	-0.0374	-0.0442	0.0740***	-0.302	-0.0923	-0.0441**
	(0.0398)	(0.0269)	(0.0276)	(0.187)	(0.0699)	(0.0222)
5 years before	-0.0415	0.0323	0.00731	-0.215	-0.0780	-0.0384
	(0.0442)	(0.0287)	(0.0307)	(0.207)	(0.0778)	(0.0236)
4 years before	-0.0490	-0.000976	-0.0415	-0.345*	-0.148**	-0.0487**
	(0.0423)	(0.0258)	(0.0293)	(0.198)	(0.0744)	(0.0225)
3 years before	0.00741	0.000962	-0.0415	0.179	0.0486	-0.0184
	(0.0392)	(0.0239)	(0.0271)	(0.184)	(0.0688)	(0.0202)
2 years before	0.0163	0.0126	-0.0312	0.0784	0.0349	0.00152
	(0.0368)	(0.0221)	(0.0255)	(0.173)	(0.0647)	(0.0177)
Year of change	-0.144***	0.0419	0.133***	0.0193	0.0606	0.0131
	(0.0545)	(0.0347)	(0.0378)	(0.256)	(0.0958)	(0.0282)
1 year later	-0.0731	0.0263	0.109***	-0.0520	-0.0229	-0.00666
	(0.0522)	(0.0326)	(0.0362)	(0.245)	(0.0918)	(0.0276)
2 years later	0.0389	0.0359	0.0861**	-0.182	-0.0686	-0.0234
	(0.0551)	(0.0346)	(0.0382)	(0.258)	(0.0968)	(0.0297)
3 years later	0.107*	0.0745**	-0.0850**	0.545**	0.185*	0.0321
	(0.0586)	(0.0376)	(0.0406)	(0.275)	(0.103)	(0.0331)
4 years later	0.0349	0.0911**	-0.0907**	-0.00235	-0.0327	0.0550*
	(0.0557)	(0.0374)	(0.0386)	(0.261)	(0.0979)	(0.0323)
5 years later	0.151***	0.126***	-0.0383	0.214	0.0430	0.0192
	(0.0540)	(0.0367)	(0.0374)	(0.253)	(0.0949)	(0.0323)
>=6 years later	0.214***	0.0964***	0.0224	0.182	0.0485	0.0520
	(0.0491)	(0.0360)	(0.0340)	(0.230)	(0.0862)	(0.0335)
Foreign owned	0.244***	-0.00401	0.145***	1.527***	0.522***	0.0876***
	(0.0162)	(0.0108)	(0.0113)	(0.0761)	(0.0285)	(0.00923)

Natural logarithm of unit labour cost	-3.272***	-0.0905***	0.167***	-1.485***	-0.337***	-0.083***
	(0.0187)	(0.0121)	(0.0130)	(0.0877)	(0.0329)	(0.00940)
Observations	95625	82126	95625	95625	95625	68238
Adjusted R-squared	0.763	0.636	0.873	0.472	0.492	0.538

Note: All dependent variables are transformed into natural logarithm. Standard errors are in parentheses. Standard errors are robust to heteroscedasticity. *** significant at alpha 1%, ** 5%, *10%.
Source: Authors' calculation.

Table 11. Effects of Bonded Zones on Firms (Control Group: Firms in Subdistricts with at least 20 Plants)

Variables	Output per Worker	Products (number)	Employment	Exported Value Added per Worker	Percentage of Exported products	Exported Products (number)
Bonded zones	-0.0457	0.0329	0.0454**	0.0684	0.0254	0.0252
	(0.0318)	(0.0219)	(0.0206)	(0.138)	(0.0501)	(0.0198)
Post-bonded-zone trend	0.0284***	0.00335	0.0232***	-0.0111	-0.00489	0.000896
	(0.00423)	(0.00289)	(0.00274)	(0.0183)	(0.00665)	(0.00218)
Foreign owned	0.239***	-0.0213	0.156***	1.588***	0.545***	0.0922***
	(0.0196)	(0.0134)	(0.0127)	(0.0846)	(0.0308)	(0.0101)
Natural logarithm of unit labour cost	-3.275***	-0.0909***	0.0588***	-1.176***	-0.274***	-0.0678***
	(0.0215)	(0.0147)	(0.0139)	(0.0928)	(0.0338)	(0.0101)
Observations	61022	51799	61022	61022	61022	43382
Adjusted R-squared	0.757	0.636	0.883	0.469	0.487	0.516

Note: All dependent variables are transformed into natural logarithm. Standard errors are in parentheses. Standard errors are robust to heteroscedasticity. *** significant at alpha 1%, ** 5%, *10%.
Source: Authors' calculation.

Table 12. Effects of Bonded Zones on Firms (Control Group: Firms That Have Exported at Least Once)

Variables	Output per Worker	Products (number)	Employment	Exported Value Added per Worker	Percentage of Exported products	Exported Products (number)
Bonded zones	-0.0348	0.0388*	0.0178	0.164	0.0657	0.00497
	(0.0324)	(0.0216)	(0.0224)	(0.152)	(0.0568)	(0.0219)
Post-bonded-zone trend	0.0257***	-0.00243	0.0217***	-0.0452**	-0.0155**	-0.000642
	(0.00410)	(0.00270)	(0.00284)	(0.0192)	(0.00720)	(0.00232)
Foreign owned	0.243***	-0.00378	0.146***	1.526***	0.522***	0.0868***
	(0.0162)	(0.0107)	(0.0113)	(0.0761)	(0.0285)	(0.00923)
Natural logarithm of unit labour cost	-3.273***	-0.0907***	0.168***	-1.486***	-0.337***	-0.0835***
	(0.0187)	(0.0121)	(0.0130)	(0.0877)	(0.0329)	(0.00940)
Observations	95625	82126	95625	95625	95625	68238
Adjusted R-squared	0.763	0.636	0.873	0.472	0.492	0.538

Note: All dependent variables are transformed into natural logarithm. Standard errors are in parentheses. Standard errors are robust to heteroscedasticity. *** significant at alpha 1%, ** 5%, *10%.
Source: Authors' calculation.

7. Conclusions

Previous studies that examined the association between economic zones and export performance at an aggregate level were not quite able to disentangle economic zones and confounding factors. Our approach, using high-quality micro data and combined with official sources on locations of SEZs, is expected to provide better and more robust evidence on the impact of economic zones intended to promote exports.

Using an event-study approach and modified difference-in-differences, we find no strong evidence that bonded zones improve firms' productivity and intensive margin and extensive margin of export. We use various control groups to pin down the effect of bonded zones. The results from different control groups are qualitatively similar: there is no strong evidence on the effect of bonded zones on output and export, although they increase demand for workers. All in all, the analysis reveals that the impact of bonded zones is limited and appears to have no effect on export performance.

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Appendix

Our additional robustness check involves large plants (more than 100 workers) in the bonded zone as treatment, and other firms (large and small) outside bonded zones as the control group. We conducted estimations using event studies and the standard difference-in-differences model (Tables 13 and 14). The results reaffirm our previous findings.

Table 13. Event Study: Effects of Bonded Zones on Firms
(Large firms in bonded zones as treatment and other firms as control)

Variables	Output per Worker	Products (number)	Employment	Exported Value Added per Worker	Percentage of Exported Products	Exported Products (number)
>=6 years before	-0.0659	-0.0233	0.0304	0.00349	0.0317	-0.0371
	(0.0448)	(0.0320)	(0.0308)	(0.186)	(0.0699)	(0.0250)
5 years before	-0.0269	0.0423	-0.0428	0.111	0.0456	-0.0271
	(0.0495)	(0.0333)	(0.0340)	(0.206)	(0.0772)	(0.0256)
4 years before	0.0301	0.00418	-0.0554*	-0.0479	-0.0578	-0.0686***
	(0.0471)	(0.0290)	(0.0324)	(0.196)	(0.0734)	(0.0244)
3 years before	0.0168	0.00283	-0.0516*	0.528***	0.179***	-0.00882
	(0.0432)	(0.0267)	(0.0297)	(0.180)	(0.0673)	(0.0214)
2 years before	0.0640	0.0149	-0.0475*	0.273	0.0949	0.00768
	(0.0415)	(0.0253)	(0.0285)	(0.173)	(0.0647)	(0.0192)
year of change	-0.0750	0.0297	0.299***	-0.305	-0.0511	0.0219
	(0.0675)	(0.0439)	(0.0464)	(0.281)	(0.105)	(0.0324)

1 year later	0.0449	0.0188	0.298***	0.266	0.0791	0.0310
	(0.0652)	(0.0415)	(0.0448)	(0.271)	(0.102)	(0.0317)
2 years later	0.133**	-0.0170	0.252***	0.499*	0.150	0.0310
	(0.0670)	(0.0428)	(0.0461)	(0.279)	(0.105)	(0.0336)
3 years later	0.140**	0.0379	0.144***	0.682**	0.211*	0.0511
	(0.0711)	(0.0464)	(0.0489)	(0.296)	(0.111)	(0.0384)
4 years later	0.129*	0.0455	0.163***	0.507*	0.118	0.0757**
	(0.0677)	(0.0465)	(0.0465)	(0.282)	(0.106)	(0.0376)
5 years later	0.213***	0.116**	0.183***	0.372	0.0858	0.0482
	(0.0652)	(0.0456)	(0.0448)	(0.271)	(0.102)	(0.0370)
>=6 years later	0.244***	0.0704	0.267***	0.0321	-0.0266	0.113***
	(0.0575)	(0.0439)	(0.0395)	(0.239)	(0.0897)	(0.0379)
Foreign owned	0.220***	0.00836	0.137***	1.405***	0.479***	0.0886***
	(0.0155)	(0.0105)	(0.0107)	(0.0645)	(0.0242)	(0.00830)
Natural logarithm of unit labour cost	-3.228***	-0.0935***	0.143***	-1.099***	-0.244***	-0.0693***
	(0.0159)	(0.0108)	(0.0109)	(0.0661)	(0.0248)	(0.00769)
Observations	128069	105197	128069	128069	128069	85305
Adjusted R-squared	0.770	0.648	0.877	0.511	0.529	0.560

Note: All dependent variables are transformed into natural logarithm. Standard errors are in parentheses. Standard errors are robust to heteroscedasticity. *** significant at alpha 1%, ** 5%, *10%.
Source: Authors' calculation.

Table 14. Effects of Bonded Zones on Firms
(Large firms in bonded zones as treatment and other firms as control)

Variables	Output per Worker	Products (number)	Employment	Exported Value Added per Worker	Percentage of Exported products	Exported Products (number)
Bonded zones	0.00109	0.0243	0.213***	-0.0552	-0.0127	0.00749
	(0.0353)	(0.0240)	(0.0243)	(0.147)	(0.0550)	(0.0228)
Post-bonded-zone trend	0.0180***	0.000641	0.0254***	-0.0421**	-0.0146*	0.00476*
	(0.00478)	(0.00331)	(0.00329)	(0.0199)	(0.00745)	(0.00275)
Foreign owned	0.219***	0.00833	0.137***	1.404***	0.479***	0.0880***
	(0.0155)	(0.0105)	(0.0107)	(0.0645)	(0.0242)	(0.00830)
Natural logarithm of unit labour cost	-3.229***	-0.0934***	0.143***	-1.101***	-0.244***	-0.0693***
	(0.0159)	(0.0108)	(0.0109)	(0.0661)	(0.0248)	(0.00769)
Observations	128069	105197	128069	128069	128069	85305
Adjusted R-squared	0.770	0.648	0.877	0.511	0.529	0.560

Note: All dependent variables are transformed into natural logarithm. Standard errors are in parentheses. Standard errors are robust to heteroscedasticity. *** significant at alpha 1%, ** 5%, *10%.
Source: Authors' calculation.

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