

Enclaves without Engines: The Local Gains and Costs of China's Export Processing Zones

Kai Gu*

Abstract

China opened 52 export processing zones in 2001–07, customs-fenced enclaves meant to be engines of local development. With customs and manufacturing-survey records in 0.1-degree cells, 1998–2007, we compare cells at each distance from the first zone with never-exposed cells matched on region, port access and 1998 size. Near the zones, no growth separable from earlier trends and no spillover appears; entry of new domestic establishments falls in a step across productivity, while land prices do not rise. A model in which parent development zones ration land by coarse signal cells, with the land multiplier as the price, values the excluded entry at 18.6 or 36.8 percent of applicants' four-year value, depending on how the applicant pool changed. Scarcity accounts for 14 to 24 percent; an auction on information available at application would recover about two fifths. Output rose by 11 log points 40 to 100 km away inside the province.

1 Introduction

Export processing zones can succeed as export platforms and fail as local development policies. Governments build them as engines of development (Zeng 2010): a zone is to bring export production to a place, and the place is to grow around it through the purchases, hiring and know-how of the zone's firms. Behind a customs fence, however, firms import inputs free of duty and assemble exports worth billions of dollars while buying little from the producers around them, the mark of an enclave. This paper asks whether China's export processing zones (EPZs) worked as engines or remained enclaves, and what they cost the places around them. It measures what crosses the fence, what the zone takes from its neighbors, and where

*University of Wisconsin–Madison. Job market paper.

its effects on manufacturing land: next to the fence, in the surrounding region, or nowhere. A model of how the land around a zone is allocated then prices what the zone's claim on that land cost, and shows who bore the cost.

Hirschman (1958) argued that an investment develops its host through linkages, and Rodríguez-Clare (1996) showed that a foreign production site leaves its host unchanged when it buys little locally. China's EPZs are a sharp case. Their firms import materials in bond and export the output, and domestic sales are restricted, so whatever the zones did to the economy around them ran through workers, ideas, and the industrial land and admission decisions they absorbed, or through the purchases that the fence still allows. We call a zone an engine if manufacturing outside its fence grows because of the zone through these channels, and we look for that growth at each distance from the fence. The program was large and concentrated: in 2006, 588 fenced firms exported about US\$54 billion, 5.6 percent of China's exports, and five zones produced 91 percent of it.

We link the customs records of fenced firms to the annual survey of manufacturing firms (1998–2007), place firms in 0.1-degree cells of about 11 by 11 km, and estimate how manufacturing outside the fence changes after the first EPZ opening within 150 km, by distance from the zone. Zones were put in places that were already industrial (Figure 1): nine in ten cells within 10 km of a future zone had manufacturing above the survey threshold in 1998, against fewer than three in ten of the cells never near a zone. We therefore compare each cell with cells that looked like it before the openings, by giving each stratum of region, port access, and 1998 firm count and output its own year effects.

Judged as engines, the zones fall short next to the fence. Little crosses the fence, and next to it the rise in production is hard to separate from growth already under way. Among fenced firms matched to the survey, which make 15.5 percent of fenced exports, the median sells 3 percent of its output in China, and a dollar of fenced exports carries about a third of a dollar of domestic value added. Within 10 km of the fence, output rises by 0.15 over the first four years, but the rise is concentrated in zones that opened into places already growing. Around the zones opened in 2003–05, where activity showed no detectable trend before the opening, production shows no detectable change and the entry of new domestic establishments falls by 33 percent.

Near the fence, the zone changes who enters more than how many. Across all zones, the number of new domestic establishments within 10 km shows no detectable change, but entry of the least productive fifth falls by about a third, mostly in the two years after the opening year, while entry of the most productive fifth stays at its earlier level. Land around later zones was neither sold in larger amounts nor dearer, as allocation by admission rather than by price would produce.

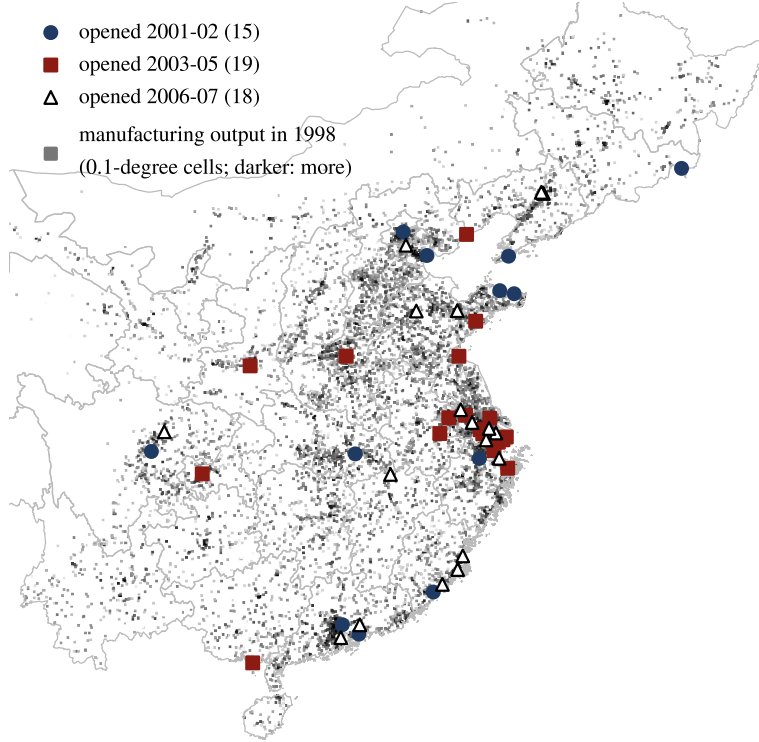


Figure 1: Export processing zones open by 2007. Symbols mark the year of customs acceptance (approval year plus two where acceptance is not recorded). Shading shows manufacturing output in 1998 in 0.1-degree cells with manufacturing above the survey threshold; darker cells produce more. The shading describes the places before the openings; it is not an estimated effect.

The fence's purchases and hiring leave no distinct trace around the zone, and the evidence on ideas is an association confined to related products. The output of the fence's supplier industries is higher around zones with a thick supplier base, but a thick industrial base of any kind produces a similar contrast, and the average wage of nearby manufacturers shows no detectable change. Exporters enter fenced firms' markets no more often than the firms' next-year exports predict; they do enter products that fenced firms exported the year before more than products that fenced firms export the year after. The association holds for products that fenced firms keep as well as for those they drop, lies mostly 30 to 100 km from the zones, and is about half as large among exporters near a zone.

The growth that accompanies the zones appears farther away than an engine of local linkages would put it: 40 to 100 km away, inside their provinces. There output rises by 11 log points, with no movement before the opening and a rise that builds after it. Places at the same distance in other provinces and the rest of the province show no detectable rise; compared only with places at the same distance from the province's central cities, the rise is 57 percent as large. The growth comes mostly from non-state firms expanding capacity, in new plants on empty land and in established industrial towns. We find no sign that it moved

there from elsewhere in the province, and the fence’s purchases could account for a sixth to a quarter of it at most. The design locates this growth; it does not attribute it to the zone, nor rule out that it moved from elsewhere in China.

To price the change in entry, we model how the parent development zone that surrounds each fence allocates its industrial land. We ask of it the question that [Khandelwal et al. \(2013\)](#) ask of China’s export quotas: when a fixed quantity is allocated by rule rather than by price, how much of the loss is due to scarcity and how much to the rule? Potential entrants form a fixed pool ([Chaney 2008](#)) and choose among the areas of their prefecture ([Arkolakis et al. 2018](#)). The parent zone sees only a coarse signal of each applicant. It admits a high cell for sure and the rest at random until the land is used, as the colleges of [Fu \(2014\)](#) admit students, and it reviews plots already held with the same rule. The multiplier on land then does the work of a price, as in the matching markets of [Azevedo and Leshno \(2016\)](#). The entry of new domestic establishments and the retention of incumbents, each by productivity fifth, fall in a step rather than a ramp: the lower fifths fall alike and the top fifth does not. Ten such moments identify the rule. The high cell holds about the top 27 percent of applicants by productivity, and the parent zones admitted between 0.39 and 0.62 of the rest, depending on how the pool of applicants changed; the rationing fell on industries outside the zones’ supply chains. Allocating the same land by value, by first-year sales or by value predicted at application would have produced a ramp, and the data reject each.

Valued with the survival and growth of comparable entrants, the applicants turned away would have created 18.6 or 36.8 percent of the four-year value of all applicants near the zones, under two readings of how the pool of applicants changed, 2.8 to 7.1 billion yuan of operating profit a year. Scarcity accounts for 2.6 to 8.7 percentage points of this; the rest is the rule, because a coarse signal treats the low cell as interchangeable and turns away entrants of every size, including those that would have grown fastest. An auction on first-year sales predicted at application would have cut the cost by about two fifths without returning any land. The level of the cost rests on parallel trends in the ten moments and on how the pool changed. Measured against the mean of the years before the opening rather than the year before it, the cost is 15.9 or 27.2 percent. The rule’s share of it hardly moves: 76 to 86 percent, or 83 to 89 percent on that baseline.

We find no local gain that we can attribute to the zones, and a cost that no data on surviving firms record. By the test that the place-based literature applies, the zones’ local gains did not cover this cost unless the new jobs drew migrants across a sizeable wage gap, and the dominant cost is the government’s rule for allocating land, not a subsidy. We find no sign that the local cost was paid from the budget. Within 10 km, subsidies, tax rates and the cost of credit show no detectable change, and taxes rose with sales; subsidies rose 40 to 100

km away. Because the landowner is the government and allocates land by rule, the scarcity rent that a market would capitalize into land prices stays with those admitted: the admitted establishments kept it, and the potential entrants turned away bore the loss. Workers, whose wage did not move, gained only to the extent that the new jobs drew migrants across a wage gap, which our data do not measure.

The paper contributes to three literatures. For the literature on enclaves and linkages and on China’s zones (Hirschman 1958; Rodríguez-Clare 1996; Javorcik 2004; Wang 2013; Alder, Shao and Zilibotti 2016; Lu, Wang and Zhu 2019), it measures each channel through which a sealed zone can reach its neighbors and shows that the measured local effect depends on whether the comparison resembles the places zones were put in. In the evaluation of place-based policies, net creation versus displacement remains an open question and the evidence comes mostly from the United States and Europe (Greenstone, Hornbeck and Moretti 2010; Busso, Gregory and Kline 2013; Freedman and Neumark 2024). For this literature the paper provides distance-resolved evidence from a developing economy, separates the fence’s own activity from its surroundings with customs identifiers, and tests whether distant growth relocated within the province. For the literature on the allocation of land and on misallocation (Hsieh and Klenow 2009; Tao et al. 2010; Khandelwal, Schott and Wei 2013; Tian, Wang and Zhang 2024), it shows that a rule that replaces the price of land can be read as a price, the multiplier of an admissions problem (Fu 2014; Azevedo and Leshno 2016). That price can be estimated from the step in entry and retention across productivity when transaction prices do not move. The cost of such a rule is first order when the signal is coarse, because applicants of every size are turned away and value accrues over the life cycle, and an implementable auction would recover about two fifths of it. Following Fajgelbaum and Gaubert (2025), we treat local growth as distinct from welfare: we value the efficiency cost of the land condition and its incidence, not local growth.

2 Setting: China’s export processing zones and the land around them

For a zone to work as an engine, something has to cross its fence. An export processing zone (EPZ) restricts one channel through which a zone could affect the economy around it, trade in goods, and leaves three others open: workers, ideas, and land and admission. We describe the rules that do this and then use the customs records of all fenced firms to measure how separate the firms inside the zones were from the local economy: they exported on a large scale and bought and sold little around them.

An EPZ is a customs-supervised area inside an existing economic and technological development zone. Its firms import materials and components without duty or value-added tax, process or assemble them, and export the output; sales into China are treated as imports, and domestic goods sold into the zone are treated as exports and declared at customs. We call the customs boundary of an EPZ its fence and the firms inside it fenced firms. Transfers of intermediate goods to processing firms elsewhere in China (deep-processing carry-over), piloted in two zones in 2002, were extended to all zones in 2005.

EPZs opened in three waves. Fifteen pilot zones, the first wave, were approved together in 2000 and opened in 2001–02 in the country’s leading industrial and port cities. Later approvals extended EPZs to other provincial cities, with a second wave opening in 2003–05 and a third in 2006–07, and by 2007, 52 zones had opened (Figure 1).

Four channels connect an EPZ to the economy around it. Through *goods*, fenced firms could buy from local suppliers and sell to local customers; the customs rules restrict this channel by design. Through *workers*, fenced firms hire from the local labor market, which in the 2000s was fed by an elastic supply of migrants. Through *ideas*, fenced firms know products, buyers and standards that neighboring firms may acquire. Through *land and admission*, the zone occupies industrial land and draws on the local government’s infrastructure budget and admission decisions. Local governments supply industrial land; the conversion of rural land to construction use is limited by annual construction-land quotas set by higher levels of government, and the zone is served from the same quotas. Admission to development zones is governed by minimum investment per unit of land. A zone can therefore change which firms are able to enter near it without changing what anyone pays for labor.

2.1 Fenced exports and the local economy

Fenced exports were large and new. In 2006 fenced firms exported about US\$54 billion, 5.6 percent of China’s exports; five zones account for 91 percent of fenced exports, and 87 percent of fenced export value in 2006 came from customs identifiers with no earlier customs record (Table 1, panel A; the series is in Appendix Figure A1).

The separation shows in what fenced firms sold and in what they bought (Table 1, panel B). Among fenced firms linked to the survey of manufacturers (Section 3), which account for 15.5 percent of fenced export value, the median firm sells 3 percent of its output in China, against 22 percent for processing exporters outside zones, and when deep-processing carry-over was extended to all zones in 2005, the domestic-sales share of fenced firms shows no detectable change.

Sales say little about purchases, so the relevant measure is the domestic value added ratio

(DVAR), domestic value added over gross exports. Following Kee and Tang (2016), the DVAR of a processing exporter is one minus its processing imports over its processing exports. It counts everything the exporter adds or buys in China, directly or through domestic suppliers, including its own wages and profits, and is therefore an upper bound on its domestic purchases. Computed from customs records for all fenced firms over the first four years of each zone, the DVAR is 0.30 in the median zone and 0.34 weighted by exports; in the most generous variant, which drops firms that import more than they export, it is 0.57 in the median zone. Wages of fenced firms matched to the survey are about 6 percent of those firms' exports in the median zone.

In the same-product comparison the fence does not detectably lower domestic content: within six-digit product and year, the DVAR of fenced firms differs from that of processing exporters outside the fence by 0.026 (0.058). That comparison still allows the fence's procedure to add a cost of up to 0.35 in ad valorem terms to domestic inputs. Domestic content also rises with a zone's age, from 0.21 in the opening year to 0.52 in the sixth among the zones observed that long, so the low average reflects what fenced firms make, mostly computers assembled from imported parts, and how new their operations were.

2.2 The land around a zone

The industrial land next to a fence belongs to the parent development zone, and the government of the host prefecture allocates it. Land, investment promotion and infrastructure for an EPZ are the host prefecture's responsibility, so the fence occupies land and admission capacity that the prefecture could otherwise have allocated to other firms (Appendix C). The prefecture sells industrial plots at administered prices. For most of the period they were negotiated plot by plot, and from 2007 industrial land had to be sold by tender, auction or listing at no less than national minimum prices (Tian et al. 2024). Prices set this way do not clear the demand for sites, and local governments have used cheap industrial land to attract investment (Tao et al. 2010). Who obtains a plot is decided instead by admission. Parent zones screen applicants on investment and output per hectare and on the floor-area ratio of the plot, and from 2004 the central government imposed a minimum investment per hectare on development zones. The fence therefore tightens a quantity that is allocated by rule rather than by price. Where it binds, the zone can change which firms enter next to it without changing what anyone pays for land or labor; Section 4 looks for this change, and Sections 6 and 7 ask what it cost.

Table 1: Fenced exports and their separation from the local economy

<i>Panel A. Scale of fenced exports</i>	
Fenced exports, 2006	US\$54 billion (5.6% of China's)
Share of fenced exports in the five largest zones	91%
Share from customs identifiers new to customs	87%
<i>Panel B. Domestic sales and domestic content: fenced firms against processing exporters outside zones</i>	
Median domestic-sales share (fraction): fenced firms / processing exporters outside zones	0.03 / 0.22
Difference in domestic-sales shares, regression-adjusted (industry $\times$ year effects)	-0.24 (0.03)
Change after the 2005 extension of deep-processing carry-over	-0.007 (0.022)
DVAR of fenced exports (Kee and Tang 2016), median zone / export-weighted	0.30 / 0.34
Most generous variant (firms importing more than they export dropped), median zone	0.57
Fenced minus unfenced processing firms, same six-digit product and year	0.026 (0.058)
Local wages per unit of fenced exports, median zone (survey-matched firms)	0.06

DVAR is one minus processing imports over processing exports of all fenced firms, first four years of each zone, 32 zones (customs). The same-product comparison bounds each firm's DVAR to $[0, 1]$. Sales shares and wages from fenced firms matched to the survey (15.5 percent of fenced export value); the regression-adjusted difference is a mean difference conditional on industry and year, not the difference between the two medians. Standard errors in parentheses.

3 Data and design

An engine would show up as growth of manufacturing outside the fence. How does manufacturing change at each distance from an EPZ once it opens, relative to cells that looked like its surroundings before any zone opened? We answer with customs records and the annual survey of industrial firms placed on a grid of 0.1-degree cells (Section 3.1); an event-study design that estimates the response of each distance group by year since the opening, with year effects specific to strata of similar cells (Section 3.2); and a comparison of the cells near future zones with those never near a zone (Section 3.3).

3.1 Data

Customs transactions (2000–2016) record every exporter's products, destinations and trade regime, and the imports and exports of the firms inside each fence. Those firms are identified by their customs identifiers (the enterprise codes under which customs records a firm's trade), which carry a code for EPZs. The annual survey of industrial firms (1998–2007) covers all state-owned firms and all non-state firms with sales above 5 million RMB (the survey threshold); it reports output, value added, employment, wage bill, fixed capital, profits, taxes, export deliveries (the value of output delivered for export), ownership and founding year. Its reporting unit is the legal-person firm; we refer to a firm at its location as an establishment.

We locate each firm by its exact coordinates where available and otherwise by the centroid of its town or county; the share of firm-years located by exact coordinates rises from 33 percent in 1998 to 90 percent in 2007 (Appendix Table F1). We assign each firm to one of

19,149 cells of 0.1 degrees and remove fenced firms, so that outcomes are cell-year totals of manufacturing (two-digit industries 13–43) outside the fence.

A domestic firm is one without foreign or Hong Kong, Macao and Taiwan capital. A *new establishment*, or entrant, is a domestic firm that first appears in the survey within a year of its founding, and entry in a cell and year is the number of its new establishments. A domestic *exit* is a firm present in year $t - 1$ and absent in t , assigned to its cell in $t - 1$; a firm that falls below the survey threshold also exits. Firms that first appear in 2004 but were founded earlier are *census additions*, existing firms that the 2004 economic census brought into the survey (22 percent of firm-years in 2004–07); none of the results depends on them. A zone’s opening year is the year it passed customs acceptance, after which bonded operations may begin; for zones without a recorded acceptance year (23 of the 59 EPZs in the directory, 52 of which opened by 2007), it is the approval year plus two, the median lag among the others.

3.2 Design

We estimate how each outcome in a cell responds to the first EPZ opening within 150 km, separately by distance from the zone and by years since the opening. Let g_c be the year in which the first EPZ within 150 km of cell c opens, and let $r(c)$ be the cell’s distance group relative to that zone: 0–10, 10–20 and 20–40 km; 40–100 and 100–150 km inside the zone’s province; and 40–150 km in another province (Figure 2). For each outcome y_{ct} we estimate

$$y_{ct} = \exp \left(\alpha_c + \lambda_{q(c),t} + \mathbf{x}'_c \boldsymbol{\mu}_t + \sum_r \sum_{e=0}^3 \beta_{re} \mathbf{1}[r(c) = r, t - g_c = e] + \chi_{ct} \right) \eta_{ct} \quad (1)$$

by Poisson pseudo-maximum likelihood (Santos Silva and Tenreyro 2006), which requires only that η_{ct} have mean one conditional on the regressors.

The indicator marks a cell of group r in year e after the opening, and α_c are cell effects. The term χ_{ct} collects the exposure terms for the years four and later and for the opening of a second, closer zone: zones cluster, many cells lie near more than one, and a later zone gets its own terms rather than being attributed to the first (Section 4.1 shows what counting zones reveals). The year effects $\lambda_{q(c),t}$ are specific to the cell’s matched stratum $q(c)$, defined by macro-region, terciles of distance to the nearest port, and bins of the cell’s number of surveyed firms and output in 1998 (Appendix G); $\mathbf{x}_c$ are baseline firm density, output, electronics share and port distance, with year-specific coefficients $\boldsymbol{\mu}_t$. We report $\bar{\beta}_r = \frac{1}{4} \sum_{e=0}^3 \beta_{re}$, the mean of the four post-opening coefficients, without subtracting the leads, and, where levels matter, the level change $\sum y_{ct}(1 - e^{-\beta_{re}})$ over the exposed cell-years. Coefficients are changes in logs throughout: a coefficient of 0.10 is a rise of about 10 percent. Standard errors are

clustered by prefecture (329 clusters).

Every cell enters in every year. The comparison consists of cells never within 150 km of a zone and, for each cell, the years before its first opening; each distance group has its own exposure terms, so no cell serves as a comparison after an opening. A binary design, which marks only the cells close to a zone as exposed, differs in this respect. If cells 40 to 100 km from a zone respond, as they do, that design puts responding cells into the comparison and biases the estimate for cells close to the zone (Butts 2023); Appendix Table I2 shows by how much.

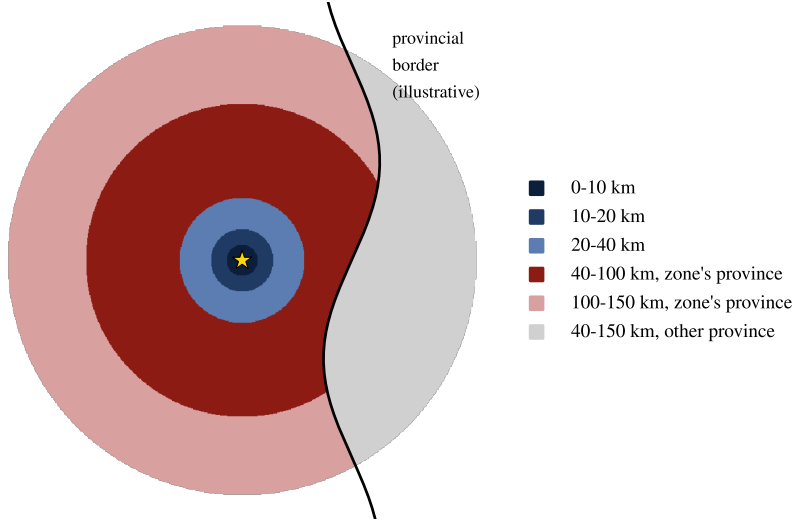


Figure 2: Distance groups around a zone (schematic). Rings at 10, 20, 40, 100 and 150 km from the first zone to open within 150 km of a cell; beyond 40 km, cells are split by whether they lie in the zone's province. Distance groups are discrete categories, not points on a continuous distance function.

3.3 Comparison cells

Before the openings, the cells around future zones were industrial places and most comparison cells were not (Table 2). Within 10 km of a future zone, 92 percent of cells had manufacturing above the survey threshold in 1998, against 28 percent of never-exposed cells, and log output was 6.2 against 1.1; the mean standardized difference over baseline characteristics is 1.21. Within matched strata it falls to 0.21, and the remaining differences in baseline size enter the equation through $\mathbf{x}'_c \boldsymbol{\mu}_t$. One difference remains that the strata do not remove: cells around future zones lie closer to their provincial capital than their matched comparisons, by about half a standard deviation within 10 km and three quarters of one 40 to 100 km away. Section 4.5 therefore also compares hinterland cells only with cells at the same distance from the province's central cities.

Employment growth in 1999–2000 is similar under either comparison; levels are not, and in the 2000s cells with different baseline manufacturing grew at different rates. Comparing an industrial core with the national average of mostly rural cells would attribute that difference to the zone. The strata therefore use bins of baseline firm counts and output rather than terciles, because 79 percent of cells had at most one surveyed firm in 1998 and terciles separated little more than cells with two or more firms from the rest.¹

Table 2: Cells near future zones and comparison cells before the openings

		Comparison cells		Standardized difference	
	Cells near zones	All	Matched	All	Matched
<i>A. Within 10 km of a future zone</i>					
Any manufacturing in 1998	0.92	0.28	0.92	+1.74	+0.02
Firms in 1998 (log)	2.26	0.19	1.98	+1.76	+0.24
Output in 1998 (log)	6.22	1.10	5.56	+2.25	+0.29
Electronics share of output	0.07	0.00	0.01	+0.63	+0.51
Employment 1999–2000 (log)	8.12	2.10	7.72	+2.05	+0.14
Employment growth 1999–2000	0.11	0.14	0.09	-0.03	+0.02
Distance to port (km)	369	615	389	-0.47	-0.04
Distance to provincial capital (km)	127	246	201	-0.73	-0.45
Mean absolute standardized difference				1.21	0.21
<i>B. 40–100 km from a future zone, in its province</i>					
Any manufacturing in 1998	0.49	0.28	0.49	+0.45	+0.01
Firms in 1998 (log)	0.60	0.19	0.56	+0.50	+0.05
Output in 1998 (log)	2.29	1.10	2.20	+0.52	+0.04
Electronics share of output	0.01	0.00	0.01	+0.15	+0.07
Employment 1999–2000 (log)	3.70	2.10	3.61	+0.48	+0.03
Employment growth 1999–2000	0.22	0.14	0.16	+0.08	+0.05
Distance to port (km)	361	615	407	-0.58	-0.11
Distance to provincial capital (km)	124	246	230	-0.86	-0.75
Mean absolute standardized difference				0.45	0.14

Cells within 10 km (panel A) and 40–100 km in the zone’s province (panel B) of the first zone to open, against the cells never within 150 km of a zone open by 2007: all of them, and reweighted to the exposed cells’ distribution over matched strata. Firms: log of the number of surveyed manufacturing firms in 1998 (at least one); output and employment: logs of one plus the value. Standardized difference: difference in means over the pooled standard deviation.

To trace the timing, we replace the post-opening terms with one coefficient for every year from four years before to three years after the opening (event-study coefficients), with the year before the opening as reference, and test that the three leads are jointly zero.

¹We adopted the matched-strata comparison after estimating the design with cell and year effects alone, which showed how different the cells around zones were. Appendix H reports the results with cell and year effects alone in full, Appendix Table I1 adds the controls one at a time, and Appendix Table G2 shows how each step moves the estimate of entry within 10 km of the zone.

4 Main results: where the zones' effects land

This section reports where the openings changed manufacturing outside the fence, and two results organize it. Within 10 km, the zones changed who entered more than how much was produced: production rose mainly where it was already rising, and entry of the least productive domestic establishments fell for about two years, while land around later zones was neither sold in larger amounts nor dearer (Sections 4.1–4.4). Forty to 100 km away inside the province, output rose with no movement before the openings (Sections 4.5 and 4.6). Section 5 asks why the zone did not work as an engine next to its fence, and Sections 6 and 7 price the change in entry.

4.1 Within 10 km of the zone

The first place to look for an engine is next to the fence: if a zone made the places around it more productive, incumbents within a few kilometers would expand and new establishments would arrive. Manufacturing within 10 km of a zone grows after the first opening, but the growth is concentrated around zones that opened into places that were already growing. Where the comparison has no detectable pre-opening trend, production shows no detectable change over four years and the entry of new domestic establishments falls; across all zones, the least productive entrants are deterred for about two years. We estimate equation (1) for every outcome of manufacturing outside the fence within 10 km, first for all zones and then by wave of openings (Section 4.2); we then trace the number and productivity of new domestic establishments (Section 4.3), and the area and price of industrial land sold near later zones and the effect of further openings (Section 4.4).

Table 3 reports the effect of the first opening on every outcome of manufacturing outside the fence within 10 km, for all zones and for each wave of openings. Across all zones, output rises by 0.15 (0.03) and value added by 0.21 (0.05) over the first four years, and employment, the wage bill, fixed capital, profits and taxes rise with them, export deliveries less precisely. Between 10 and 40 km the estimates are small and almost all are not statistically significant (Figure 3; Appendix Table A1). The rise is not an artifact of fenced firms that the customs match missed and that therefore appear outside the fence: output rises as much 5 to 10 km from the zone as within 5 km, and the estimate for foreign-invested firms is larger 5 to 10 km from the zone than within 5 km.²

Production rises within 10 km and again 40 to 100 km away inside the zone's province; at the other distances out to 150 km the estimates are smaller and mostly not statistically

²The estimate for foreign-invested firms is +0.18 (0.11) 5 to 10 km from the zone and +0.04 (0.10) within 5 km (Appendix Table J2); neither is distinguishable from zero on its own.

Table 3: Manufacturing outside the fence within 10 km of the zone, all zones and by wave of openings

	All zones	Zones opened in		
		2001–02	2003–05	2006–07
<i>A. Production</i>				
Output	+0.15 (0.03)	+0.16 (0.04)	+0.08 (0.06)	+0.16 (0.03)
Value added	+0.21 (0.05)	+0.23 (0.05)	+0.16 (0.12)	+0.13 (0.06)
Fixed capital	+0.11 (0.04)	+0.10 (0.04)	+0.07 (0.05)	+0.25 (0.10)
Profits	+0.18 (0.08)	+0.21 (0.10)	+0.20 (0.15)	+0.08 (0.07)
Taxes	+0.16 (0.05)	+0.16 (0.07)	+0.12 (0.08)	+0.17 (0.06)
<i>B. Labor</i>				
Employment	+0.18 (0.05)	+0.29 (0.06)	+0.04 (0.05)	−0.01 (0.07)
Wage bill	+0.19 (0.04)	+0.20 (0.04)	+0.10 (0.06)	+0.25 (0.05)
<i>C. Firms and exports</i>				
Number of firms	+0.06 (0.05)	+0.15 (0.05)	−0.18 (0.07)	+0.14 (0.08)
New domestic establishments	−0.08 (0.11)	+0.08 (0.21)	−0.41 (0.11)	−0.01 (0.18)
Domestic exits	+0.13 (0.11)	+0.25 (0.16)	−0.06 (0.12)	+0.18 (0.13)
Export deliveries	+0.15 (0.08)	+0.16 (0.09)	+0.23 (0.23)	+0.01 (0.09)
Exporting firms	+0.11 (0.05)	+0.14 (0.06)	+0.04 (0.10)	−0.08 (0.09)
Pre-opening test, output (p)	0.20	0.02	0.11	0.00
Pre-opening test, employment (p)	0.00	0.00	0.25	0.03
Cells within 10 km	89	40	29	20

Equation (1): mean of the coefficients for the first four years after the opening, in changes in logs; columns 2–4 give the cells within 10 km of zones opened in each period their own exposure terms, where a cell’s wave is that of the first zone opened within 150 km of it; for zones opened in 2006–07 the mean covers the available post-opening years, at most two. Standard errors clustered by prefecture (329 clusters) in parentheses. All manufacturing firms outside the fence; new establishments and exits are domestic. Pre-opening tests: joint p-values of the leads at -4 , -3 , -2 (reference -1). 19,149 cells, 1998–2007.

significant (Figure 3). Within 10 km the figure also shows the estimate for the zones of 2003–05, whose surroundings had no detectable trend before the opening: it is smaller than the pooled estimate and not distinguishable from zero, for output and for value added. Section 4.5 returns to the rise 40 to 100 km away.

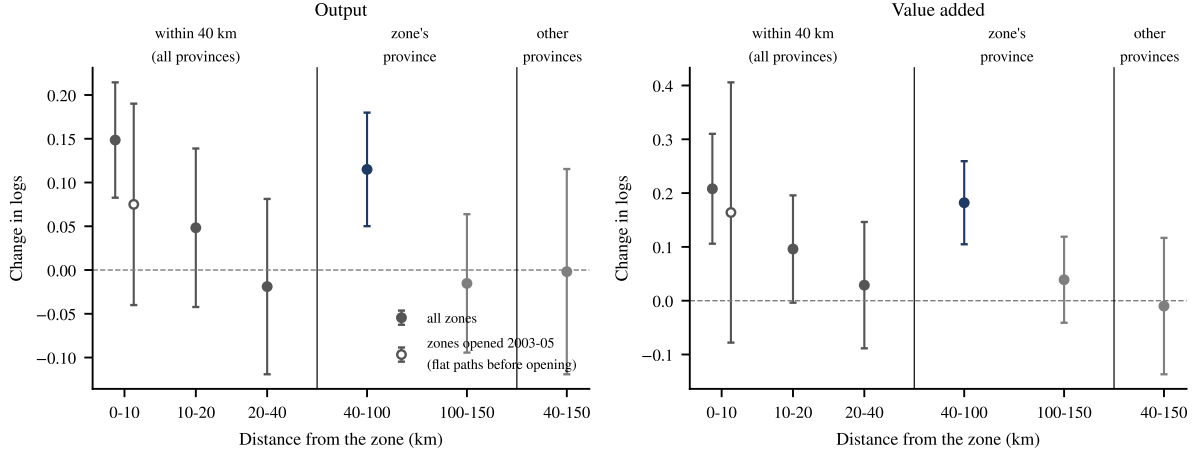


Figure 3: Effect of the first opening within 150 km on output and value added of manufacturing outside the fence, by distance group: mean of the first four years after the opening. Filled markers: all zones. Hollow marker at 0–10 km: zones opened in 2003–05, the wave without a detectable trend before the opening (Table 3). PPML estimates of equation (1), with cell effects, matched-stratum-by-year effects and baseline characteristics by year; 95 percent confidence intervals, standard errors clustered by prefecture.

4.2 Production by wave of openings

The pooled rise within 10 km mixes zones that opened into different local economies (Table 3, columns 2–4; Figure 4). Each cell belongs to the wave of the first zone opened within 150 km of it, so the waves are waves of first openings: a zone opened in 2003–05 near an earlier zone counts as a second exposure of that zone’s cells, not as part of the second wave. Pooled over all zones, output and value added show no detectable difference from the comparison before the opening (joint p-values of the leads 0.20 and 0.17), while employment was already rising (joint $p = 0.001$; Appendix Figure A2). The flat pooled leads conceal different waves. The first wave, the fifteen pilot zones approved in 2000 and opened in 2001–02 in the leading industrial cities, arrived where employment and output were already rising (joint p-values of the leads 0.000 and 0.02); around these zones output rises by 0.16 and employment by 0.29 over the four years, continuing the earlier path. The third wave, opened in 2006–07, has at most two post-opening years, and its leads are jointly different from zero (p-values 0.000 and 0.026). The second wave, opened in 2003–05 in nine prefectures, opened where output and employment show no detectable pre-opening trend (p-values 0.11 and 0.25), so

the comparison around these zones does not rely on extrapolating earlier growth. Around them output shows no detectable change over the four years, $+0.08$ (0.06), and the number of firms falls.³ The output coefficient of the fourth year is 0.17 (0.08), so a later rise cannot be excluded.

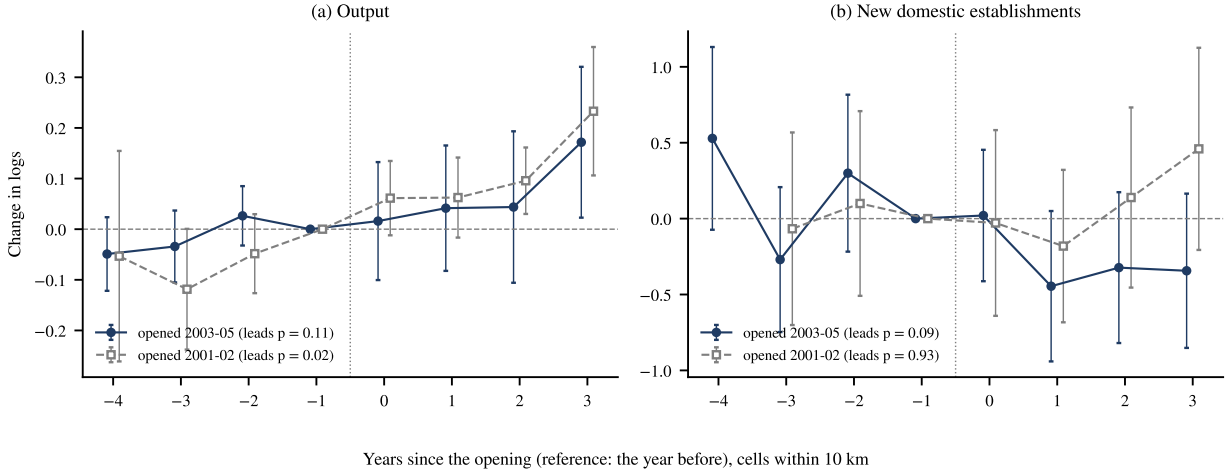


Figure 4: Output and new domestic establishments within 10 km, by wave of openings: zones opened in 2003–05 (no detectable trend before the opening) and in 2001–02 (placed where activity was already rising). PPML estimates of equation (1), with cell effects, matched-stratum-by-year effects and baseline characteristics by year, one term per year from four years before to three years after the opening and separate terms for each wave; reference: the year before the opening; 95 percent confidence intervals, standard errors clustered by prefecture; joint p-values of the leads in the legends.

4.3 Entry and who enters

Around the second wave, new domestic establishments within 10 km fall by 0.41 (0.11) over the first four years relative to comparison cells, 33 percent of the entry that would otherwise have occurred (Figure 4b). Entry before the opening is noisier than output: the joint p-value of its leads is 0.09 , mostly because of a high value four years before the opening. Measured against its own path before the opening, the fall is -0.46 (0.10). With only nine treated prefectures, the wild cluster bootstrap gives a p-value of 0.023 ; the fall holds without any one of the nine and around zones with an official opening date (Appendix G), and its t -statistic exceeds that of every placebo zone built from never-exposed cells.⁴ The estimates for the first and third waves are imprecise and show no detectable change in entry. Across the full

³Value added changes by $+0.16$ (0.12) and employment by $+0.04$ (0.05); neither is distinguishable from zero.

⁴The placebo zones were specified in advance; comparing their t -statistics rather than their coefficients was added after the first placebo run, because placebo cells are sparser and their estimates noisier (Appendix Q).

set of outcomes in Table 3, output, value added, fixed capital, the wage bill and taxes rise around the first and third waves; around the second, no outcome rises at the 5 percent level and the number of firms falls.

Across all zones, the number of new domestic establishments within 10 km shows no detectable change, -0.08 (0.11), but their composition does (Figure 5); the fall around the second wave does not show up in this pooled estimate.⁵ Pooling all waves and ranking entrants within the national distribution by revenue productivity relative to their industry and year, entry of the least productive fifth falls by 0.42 (0.17) relative to comparison cells over the first four years. The event path shows when (Figure 5a): relative to the year before the opening, its coefficients average -0.23 in the three years before that and -0.51 after the opening, with a trough of -1.03 in the year after the opening year and -0.21 by the fourth year. For the most productive fifth the four-year estimate is positive, 0.26 (0.14), but not significant at the 5 percent level, and its path shows no rise at the opening: its coefficients average 0.38 before and 0.45 after. The zone deters the least productive entrants for about two years; it does not detectably draw in more productive ones.

Entry differs more by productivity than by capital, though the difference between the two gradients is not statistically significant (Figure 5b). When entrants are cross-classified by halves of productivity and of capital at entry, within their industry and year, the productivity gradient, the average difference in the effect between entrants above and below the median, is 0.43 (0.14) and the capital gradient is 0.14 (0.17). Admission rules that set a minimum investment per unit of land would screen on capital; instead, the point estimates are negative for low-productivity entrants at either level of capital and positive for high-productivity entrants at either level.

4.4 Land and several zones

Industrial land next to an EPZ belongs to the construction-land quota of its parent development zone, which local governments allocate establishment by establishment at administered prices (Section 2). If demand for sites near a new zone were cleared by price, land there would become dearer or be sold in larger amounts. Land transactions are recorded from 2007, so we test this on the 49 special customs supervision zones, mainly comprehensive bonded zones (the zone type into which EPZs were later converted), that opened on new sites in 2008–2016 (Appendix Figure O1).

Three to 10 km from these zones, the area of industrial land sold changes by -0.19 (0.16) and its price per hectare by -0.02 (0.06), relative to land 40 to 100 km away in the same

⁵Domestic exits change by 0.13 (0.11) and the output of domestic firms present in 2000 by $+0.01$ (0.08); neither is distinguishable from zero.

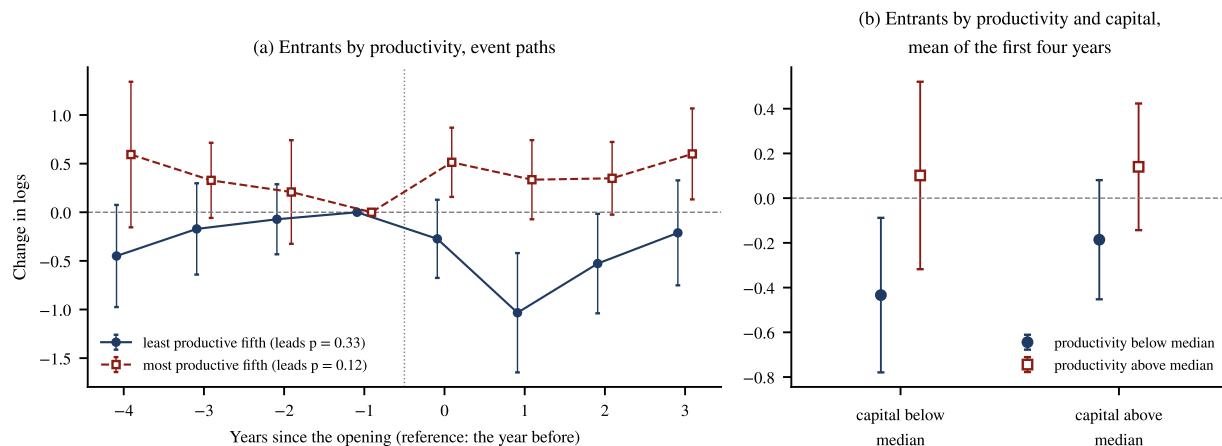


Figure 5: Who enters within 10 km of the zone, all zones. (a) Entrants in the least and the most productive fifth of the national distribution of new domestic establishments (revenue productivity relative to the mean of the entrant’s industry and year), one term per year; reference: the year before the opening; joint p-values of the leads in the legend. (b) Entrants by halves of productivity and of fixed capital at entry, each relative to the median entrant of the same two-digit industry and year: mean of the first four years after the opening. PPML estimates of equation (1), with cell effects, matched-stratum-by-year effects and baseline characteristics by year; 95 percent confidence intervals, standard errors clustered by prefecture.

prefecture; the upper end of the 95 percent confidence interval for price is a rise of 9 percent. Neither quantities nor prices show a detectable change. This is what admission rather than price clearing demand for sites near a zone would produce, but also what no shift in demand would produce; it is informative only together with the finding that, across all zones, the composition of entry changes without a detectable change in its number. Land around these later zones was sold under the auction rules of 2007, so the test is indirect evidence on allocation around the 2001–07 zones, not a measurement of it.

Zones cluster, and 739 cells receive a second zone within 40 km by 2007. Each additional zone within 40 km lowers new domestic establishments by -0.36 (0.06), while output shows no detectable change (-0.02 (0.04)); entry around the additional zone shows no detectable difference from the comparison before it opens (joint p-value of the leads 0.80). Where zones accumulate, domestic entry is lower with each additional one. A binary design, which marks whether a zone has opened within 40 km of a cell and treats every other cell as a comparison, finds no detectable change in entry or output within 40 km (Appendix Table A2), because it puts the growing places 40 to 100 km away into the comparison and averages places near one zone with places near several.

4.5 Growth 40 to 100 km away

The growth that accompanied the zones appears farther away than an engine of local linkages would put it. Manufacturing grew 40 to 100 km from the zones, inside their provinces, a ring we call the provincial hinterland. Within the province the evidence is consistent with new activity rather than relocation, and most of the growth did not run through the purchases of fenced firms. The estimates are the effect of an opening together with whatever else changed in the province when it opened, which the design cannot separate from the zone. Between 40 and 100 km from the zone, inside its province, manufacturing grows: averaged over the first four years after the opening, output rises by 0.11 (0.03) and value added by 0.18 (0.04) in logs, and employment, fixed capital, profits and taxes rise as well (Figure 3; Appendix Table J1).⁶ Before the opening, output and value added there do not differ detectably from the comparison cells (joint p-values of the leads 0.89 and 0.47); after it they rise year by year, output by 0.07, 0.11, 0.12 and 0.16 and value added by 0.11, 0.17, 0.20 and 0.25 (Figure 6). At the same distance in other provinces, output and value added show no rise after the opening; their output leads are jointly different from zero at the 10 percent level ($p = 0.07$), because of the earliest year.

The response does not extend beyond this ring. Output changes by -0.02 (0.04) 100 to 150 km away and by -0.04 (0.03) in the rest of the province beyond 150 km, neither detectably different from zero.

The hinterland's point estimates also exceed those 10 to 20 km away and those at the same distance in other provinces, although most of these differences are less than twice their standard errors.⁷ The difference between the response in the hinterland and the response within 10 km is -0.03 (0.04), not statistically distinguishable from zero.

The choice of comparison decides whether places 100 to 150 km away appear to grow; it changes the size of the hinterland's response but not its sign. With a single year effect for all of China, places 100 to 150 km from a zone also appear to grow (employment $+0.15$), and the apparent gain disappears once they are compared within their macro-region, which is consistent with its reflecting the difference between coastal and inland China. The response 40 to 100 km away stays between 0.09 and 0.20 for output under every comparison in the upper block of Appendix Table I1. It falls to 0.06 (0.04) only when the comparison is restricted to 241 cells around zones that open after 2007 and geography is interacted with year; those cells are the cores of places that were about to receive zones.

⁶Employment rises by 0.08 (0.04), fixed capital by 0.15 (0.06), profits by 0.16 (0.06) and taxes by 0.19 (0.06), all in logs. Estimates in this section are in logs: 0.11 is a rise of 11 log points.

⁷The differences from the response 10 to 20 km away are 0.07 (0.05) for output and 0.09 (0.06) for value added; the differences from the response at the same distance in other provinces are 0.12 (0.07) and 0.19 (0.07).

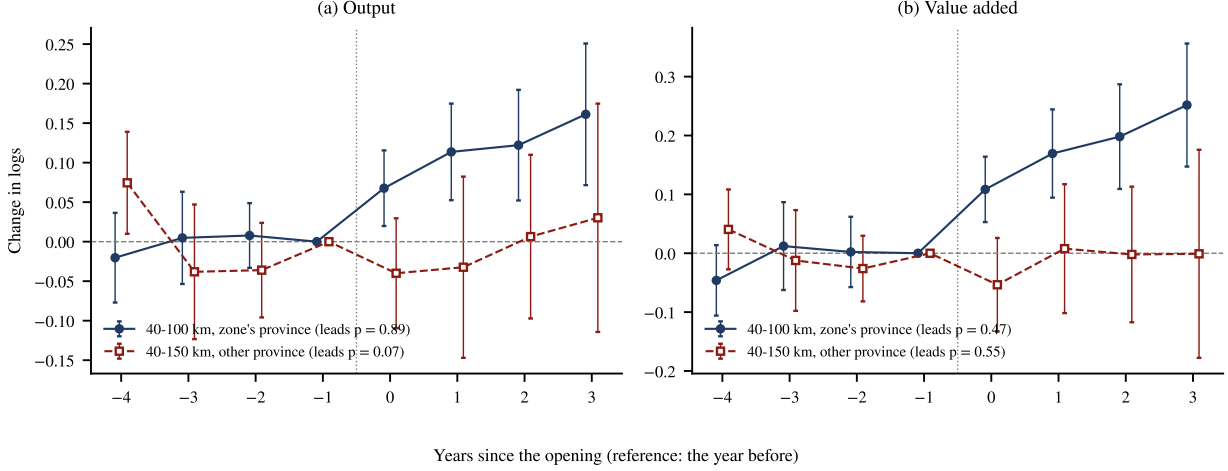


Figure 6: Output and value added 40–100 km from the zone inside its province, against 40–150 km from it in other provinces, by years since the first opening. PPML estimates of equation (1), with cell effects, matched-stratum-by-year effects and baseline characteristics by year, one term per year; reference: the year before the opening; 95 percent confidence intervals, standard errors clustered by prefecture; joint p-values of the leads in the legends. The path 100–150 km away inside the province is in Appendix Figure A5.

4.6 What the hinterland is, and who grows there

The hinterland comprises the 2,709 cells 40 to 100 km from a zone inside its province, beyond the zone’s commuting zone but within its province and trucking range. Two thirds of them are in neighboring prefectures and one third in the outer counties of the host prefecture; half had no manufacturing above the survey threshold in 1998.

The growth is not one city’s (Table 4). Its size is similar in neighboring prefectures and in the outer counties of the host prefecture (+0.12 and +0.10 for output, respectively), and it is present both near and far from the economic core of the cell’s own prefecture. It takes two forms. In cells with no manufacturing above the survey threshold in 1998, firms enter: the number of firms rises by 0.23 (0.09) and the number of new domestic establishments by 0.30 (0.11). In cells of high industrial density in 1998, activity expands: value added rises by 0.20 (0.04).

Non-state firms account for more of the growth than of the output. We classify firms by who controls their paid-in capital rather than by registration type, which counts corporatized state firms as limited-liability companies. The point estimates for output are 0.10 in foreign-controlled firms, 0.19 in privately controlled firms and 0.13 in firms controlled by other corporate (legal-person) shareholders, against 0.08 in state-controlled and 0.04 in collective firms (Appendix Table K2). Non-state firms held about half of the hinterland’s output before the openings and account for about two thirds of its growth. Among non-state groups, foreign firms founded before 1995 contribute the largest share, 19 percent of the growth from 16

Table 4: The provincial hinterland: where the growth is and which firms account for it

<i>A. Where: cells 40–100 km away in the zone’s province, by pre-opening trait</i>				
	Output	Value added	Employment	Firms
<i>Jurisdiction</i>				
Host prefecture, outer counties	+0.10 (0.06)	+0.19 (0.07)	+0.09 (0.04)	+0.03 (0.06)
Neighbouring prefectures	+0.12 (0.04)	+0.18 (0.04)	+0.08 (0.04)	+0.06 (0.03)
<i>Land in 1998</i>				
No manufacturing (greenfield)	+0.23 (0.12)	+0.24 (0.11)	+0.21 (0.11)	+0.23 (0.09)
Low industrial density	−0.04 (0.06)	−0.00 (0.06)	+0.02 (0.05)	−0.06 (0.05)
High industrial density	+0.13 (0.04)	+0.20 (0.04)	+0.08 (0.04)	+0.06 (0.04)
<i>Distance to own prefecture’s core</i>				
Near (median 23 km)	+0.16 (0.04)	+0.24 (0.05)	+0.07 (0.04)	+0.05 (0.04)
Far (median 76 km)	+0.14 (0.06)	+0.19 (0.05)	+0.12 (0.05)	+0.07 (0.06)
<i>B. Who: domestic firms 40–100 km away, by status at first record</i>				
	Output	Employment	Firms	
Not exporting at first record	+0.13 (0.04)	+0.09 (0.04)	+0.06 (0.04)	
Exporting at first record	+0.06 (0.06)	+0.04 (0.05)	+0.02 (0.05)	
New establishment (founded ≤ 1 year before)	+0.12 (0.06)	+0.10 (0.05)	+0.10 (0.04)	
Founded 10 or more years before	+0.14 (0.07)	+0.11 (0.04)	+0.04 (0.04)	

Equation (1); cells 40–100 km from the zone of the first opening, inside its province, split by traits fixed before the opening (panel A), or domestic firms split by export status and age at their first record (panel B). Mean of the first four years after the opening; standard errors clustered by prefecture. Firms by who controls their paid-in capital: Appendix Table K2.

percent of the output.

The point estimates for output are positive in almost every product class, from 0.06 to 0.23, with no class carrying more than 22 percent of the gain and general and special-purpose machinery flat (Appendix Table K4). Electronics, 87 percent of fenced exports by value but 21 percent in the median zone (Appendix C), is measured poorly in the hinterland: its output there lies well below the comparison both before and after the opening. The foreign electronics firms that resemble fenced firms are too few to show whether they moved: their output changes by −0.21 (0.62).

The growth is also not concentrated in the development zones listed in the national Catalog of Development Zones. Output of firms inside listed zones changes by −0.10 (0.15), with no detectable growth. Firms around those zones, outside their cores, account for 71 percent of the growth. Firms that report a zone address absent from the catalog, most likely county and township industrial parks, have a larger output response, +0.23 (0.36), but one too imprecise to be distinguished from the rest.

5 Mechanisms: why the zone was not an engine nearby

Why did the zones not work as engines next to their fences? The customs fence restricts trade in goods and leaves three channels open: hiring, learning and the land the zone occupies. We take the channels in turn. Purchases and hiring leave no distinct trace within 10 km (Sections 5.1 and 5.2); learning appears only in related products 30 to 100 km away (Section 5.3); and the change in entry near the fence fits admission to land rather than a price (Section 5.4). Section 5.5 then asks how the hinterland grew.

In the classic account, an enclave becomes an engine through what it buys and whom it hires (Hirschman 1958; Rodríguez-Clare 1996). Neither the purchases of fenced firms nor their hiring leaves a distinct trace on output or pay around the zone. The output of supplier industries differs by the thickness of the zone’s supplier base, as purchases from existing suppliers would produce, but so does that of industries in general, and the average wage within 10 km shows no detectable change. We test purchases by comparing the output of the fence’s supplier industries around zones with thick and thin supplier bases (Section 5.1), and hiring by the average wage of manufacturing firms within 10 km (Section 5.2).

5.1 Goods: the response depends on the industrial base

If purchases are the only link in goods between fenced firms and the economy around them, they should matter only where the zone has suppliers to buy from. We divide zones into terciles by the 1998–2000 output, in the cells around them, of the industries that supply fenced firms’ inputs, and estimate the effect within 20 km for each tercile (Appendix Figure A3). The output of supplier industries is higher around zones with a thick supplier base than around zones with a thin one, by 0.22 (0.09).⁸ The output of unrelated industries shows no detectable difference between the two, 0.02 (0.11).

This is the pattern that purchases from existing suppliers would produce: where a supplier base exists, fenced firms can buy from it, and where it does not, which is the typical case, they would have little to buy locally and would import their inputs. The survey does not record transactions, so the evidence is the pattern of output rather than the purchases themselves.

The contrast is absent before the openings, but a thick supplier base is also a thick industrial base, and splitting zones by the output of unrelated industries gives a similar contrast (Appendix Table G5). The data therefore show which industries respond, but not whether it is the supplier base or the industrial base as a whole that conditions the response.

⁸The point estimates are a fall of 0.13 (0.08) around zones with a thin base and a rise of 0.09 (0.07) around zones with a thick one; neither is distinguishable from zero on its own.

5.2 Workers: more jobs, no detectable change in pay

If the labor demand of the zone’s firms raised what neighboring employers pay, the average wage of manufacturing firms outside the fence within 10 km should rise. When the wage bill and employment are estimated in one regression, the average wage per worker of surveyed firms within 10 km shows no detectable change, 0.00 (0.04). This is consistent with an elastic supply of migrant workers: the zone’s labor demand can be met without raising what neighboring employers pay. The measure is an average over surveyed firms, so it does not rule out higher pay for particular workers or in firms below the survey threshold. Employment within 10 km rises by 0.18 (0.05) over the first four years (Table 3), but it was already rising before the openings (joint p-value of the leads 0.001; Section 4.2). Section 7.4 returns to what these jobs are worth to workers when the wage does not move.

5.3 Learning: related products, not copied markets

Ideas are the channel through which a zone that buys little locally could still work as an engine. Capability acquired from fenced firms is, of the channels that the customs rule leaves open, the one the literature on foreign investment expects most and the one hardest to see. Fenced firms hold buyer relationships, product know-how and compliance experience, and a neighboring exporter could acquire some of it in two ways: by following fenced firms into the markets they serve, or by moving into products close to what they make. Exporters enter products close to those that fenced firms of zones within 100 km exported the year before more than products close to what fenced firms export the year after. This association holds for products that fenced firms keep exporting as well as for those they drop, lies mostly 30 to 100 km from the zones, and is about half as large when the comparison is limited to exporters near a zone. They enter the markets that fenced firms serve in the same years as those firms do, as a common market shock would make them do. We test both ways with the entry of non-fenced exporters into the product–destination pairs that fenced firms within 20 km served and into new four-digit products close to the portfolios of zones within 100 km, comparing what fenced firms exported the year before with what they export the year after (Section 5.3). Finally we ask where and for whom the association holds (Section 5.3), whether the entries last (Section 5.3) and how large it is (Section 5.3).

What fenced firms hold and what neighbors could observe. Fenced firms are foreign assemblers in a few products. In 2006, 99 percent of the 588 fenced firms were foreign-invested and 97 percent wholly foreign-owned, and automatic data-processing machines (Harmonized System code 8471) made up 61 percent of fenced exports. Their customs operations were new: 94 percent of fenced firms, followed across changes of customs identifier, had no customs record

outside a fence before they entered one.

Few neighboring exporters were directly exposed to the markets that fenced firms serve. New fenced firms enter markets that fenced firms elsewhere already serve far more often than markets served by fenced firms in their own customs district. Of the product-destination markets that new fenced firms entered in 2006, 94.5 percent were already served by a fenced firm somewhere in China and 16 percent by an incumbent fenced firm in the same customs district. Direct exposure was rare for non-fenced exporters: of the product-destination entries open to them, 0.17 percent had a fenced firm within 20 km exporting the same product to the same destination in the previous year, and 5.3 percent had one anywhere in China.

Copied markets or related products. Following fenced firms into their markets implies entry into the product-destination pairs that they served the year before. Acquiring capability from them implies entry into products close to what they make, wherever those products are sold.

In a panel of every non-fenced exporter, six-digit product, destination and year from 2002 to 2006, with firm-by-product-by-year and product-by-destination-by-year effects, entry into the pair is 2.9 percentage points (0.8) higher when a fenced firm within 20 km exported it the year before, against a baseline of 6.0 percent (Table 5, panel A).

If neighbors followed fenced firms into markets, only the previous year’s fenced exports of a pair should predict entry into it; a common market shock would make the following year’s fenced exports predict it too. When the fenced exports of the same pair in the following year are added, the coefficient on the previous year falls to 0.9 points (1.1) and the coefficient on the following year is 3.5 points (0.9). Neighbors and fenced firms enter the same markets at the same time, as a common market shock would make them do; we find no evidence that neighbors follow fenced firms into their markets, although the previous-year coefficient is imprecise.

Consider an exporter that has never sold product p . If it acquires capability from fenced firms, it should be more likely to enter p when p is close to what fenced firms nearby exported last year, and no more likely when p is close to what they will export next year. For exporter i , four-digit product p that i has not exported since 2000, and year t , we estimate

$$E_{ipt} = \sum_{\ell} b_{\ell}^{\text{prev}} \mathbb{1}[\kappa_{ip,t-1} \in \ell] + \sum_{\ell} b_{\ell}^{\text{next}} \mathbb{1}[\kappa_{ip,t+1} \in \ell] + \sum_m c_m \mathbb{1}[o_{ip,t-1} \in m] + \alpha_{it} + \alpha_{pt} + u_{ipt}, \quad (2)$$

where E_{ipt} marks entry and ℓ indexes four mutually exclusive proximity bins (0.05–0.10, 0.10–0.20, 0.20 or more, and the product itself, which takes precedence over the others), with proximity below 0.05, or no zone within 100 km, as the reference. The proximity $\kappa_{ip,t-1}$ is the largest proximity between p and any product exported in $t - 1$ by the fenced firms of zones

whose center, the mean location of their fenced firms, lies within 100 km of i : the previous-year portfolio. $\kappa_{ip,t+1}$ is the same for exports in $t + 1$, the next-year portfolio. Proximity between two products is the smaller of the two conditional probabilities that an exporter of one also exports the other, as in Hidalgo et al. (2007) but computed from firm-level co-exporting among non-fenced exporters in 2000–2002, before the window. The terms c_m are effects for bins m of $o_{ip,t-1}$, the largest proximity between p and the products i exported in $t - 1$, and α_{it} and α_{pt} are firm-year and product-year effects, so the comparison is between products of the same firm in the same year, and between firms for the same product in the same year. Exporters with no zone within 100 km are in the reference group: they help estimate the product-year effects against which the others are compared. We estimate the equation by weighted least squares, weighting sampled non-entries by the inverse of their sampling rate, and report each b in percent of the weighted entry rate, 0.146 percent.

The next-year portfolio serves as a timing test. Regional specialization or demand that moves fenced firms and their neighbors together should make the next-year portfolio predict a neighbor’s entry as well as the past portfolio does; capability acquired from what fenced firms already make should run from the past portfolio. The two portfolios overlap, so the test compares their incremental predictive power rather than separating two independent shocks. Neither portfolio nor the fixed effects of equation (2) absorb shocks specific to a province, product and year.

The sample is a quarter of the non-fenced, non-intermediary exporters with known locations near 36 zones, with all entries and 3 percent of non-entries (reweighted); entry years are 2003–05, and standard errors are clustered by the nearest zone (36 clusters).

Entry rises with proximity to the past portfolio: by 17, 51, 95 and 134 percent of the baseline rate across the four bins (Table 5, panel B; Figure 7a). The next-year portfolio predicts -3 , -4 , $+19$ and $+36$ percent. We call the excess of the past portfolio’s prediction over the next-year portfolio’s the asymmetry. In the two highest bins it is 76 (36) and 98 (38) percent of the baseline rate ($p = 0.04$ and 0.015 from the t distribution with 35 degrees of freedom; 0.077 and 0.011 with a wild cluster bootstrap).

Shared regional trends could produce the asymmetry, so we compare it with other portfolios and with a placebo. Portfolios of development zones without EPZ status predict nothing or less (Appendix Table A3, panel E). A sharper placebo uses only the products that fenced firms will export for the first time in the following year, which the past portfolio cannot contain. In the regression that also includes both full portfolios, these new products predict entry into related products, by 29 (12) and 62 (25) percent of the baseline in the 0.10–0.20 and highest-proximity bins, which is consistent with part of the gradient for related products reflecting trends that fenced firms and their neighbors share.

For fenced firms’ own products the new products predict 7 percent (26), and the past portfolio exceeds them by 111 percent of the baseline rate (27; bootstrap $p < 0.001$), although the test cannot rule out an effect as large as the next-year portfolio’s 36 percent.

Three checks qualify this reading (Appendix Table N2). The first concerns the comparison. Exporters with no zone within 100 km are in the reference group and help set the product-year effects. Among exporter-years with a zone within 100 km in the previous year, 55 percent of the weighted observations and 64 percent of the entries, the same-product asymmetry is 51 (28) percent of that sample’s baseline rate ($p = 0.080$), about half the full-sample estimate: the next-year coefficient is unchanged and the previous-year coefficient falls. The asymmetry for proximity of 0.20 or more, 26 (28), is not statistically significant there. About half of the full-sample asymmetry therefore reflects product trends that differ between places near zones and places far from them. Clustering by groups of nearby zones, by province, or two-way by zone and product leaves the full-sample same-product asymmetry statistically significant (p from 0.015 to 0.020).

The second check concerns the timing test, which rests on the products that fenced firms stop exporting. In the same-product bin, products in the previous-year portfolio but not in the next-year one are 0.38 percent of the observations, with 1,321 entries, and 85 percent of the products in a previous-year portfolio are still in it a year later. A handover of products, such as a foreign buyer moving orders from a fenced firm to a firm outside the fence or a firm moving a product line out of the fence, would also make the previous-year portfolio predict entry, but only through the products that fenced firms drop. When the previous-year portfolio is split by whether fenced firms still export the product in year t , the association is 142 (39) percent of the baseline for the products they keep and 96 (47) for the products they drop, and the products they keep exceed the next-year portfolio by 110 (38; $p = 0.006$). The association does not run only through handovers. With the year- t portfolio added, the coefficients on the previous, current and next-year portfolios are 119 (37), 31 (12) and 21 (14).

The third check concerns distance. With exposure separated into rings around the zones, each with its own previous- and next-year terms, among exporters with a zone within 150 km, the same-product asymmetry is -24 (55) within 30 km, 60 (40) at 30–60 km, 106 (55; $p = 0.062$) at 60–100 km and 7 (28) at 100–150 km. The point estimates place the association 30 to 100 km from the zones rather than next to them, the range in which the hinterland grows (Section 4.5), which points to diffusion within the region more than to learning between neighbors.

The clearest evidence therefore concerns fenced firms’ own products: entry into them is predicted by the past portfolio beyond what fenced firms’ next moves predict, and does so

for products that fenced firms keep exporting, not only for those they drop; the association is about half as strong among exporters near a zone as in the full sample, and it lies mostly 30 to 100 km from the zones. We call this a time-ordered association, meaning that what fenced firms exported the year before predicts entry better than what they export the year after. It is consistent with capability acquired from fenced firms; it is not an estimate of how much of the gradient learning explains.

Table 5: Entry of non-fenced exporters into fenced firms’ markets and into related products

<i>Panel A. Markets: entry into a product–destination pair a fenced firm within 20 km exported (percentage points; baseline 6.0)</i>				
	Previous year, alone	Previous year, given next year	Next year, given previous year	
Fenced exports of the pair	+2.9 (0.8)	+0.9 (1.1)	+3.5 (0.9)	
<i>Panel B. Related products: entry into a new product, by its proximity to the fence’s portfolio within 100 km (percent of baseline)</i>				
	0.05–0.10	0.10–0.20	≥0.20	Same product
Fenced firms’ exports, previous year	+17 (7)	+51 (20)	+95 (45)	+134 (39)
Fenced firms’ exports, next year	−3 (3)	−4 (6)	+19 (15)	+36 (14)
Difference (percent of baseline)			+76 (36)	+98 (38)
Wild cluster bootstrap p-value			0.077	0.011
Fences’ new products of the next year	−1 (5)	+29 (12)	+62 (25)	+7 (26)
Baseline entry rate (percent)	0.146			

Panel A: entry into a six-digit product–destination pair, non-fenced exporters, 2002–06; a fenced firm within 20 km exported the pair in the previous (next) year; firm $\times$ product $\times$ year and product $\times$ destination $\times$ year effects; standard errors clustered by firm. Panel B: equation (2), entry into a new four-digit product, entry years 2003–05, percent of the baseline entry rate (0.146 percent); standard errors clustered by nearest zone (36 clusters). Wild cluster bootstrap: null imposed, Rademacher weights, 9,999 draws. Last row: products that fenced firms of zones within 100 km first export in $t + 1$ (not exported in $t - 1$ or t), in a regression that also includes both full portfolios. The panels differ in design: panel A uses a 10 percent sample of exporters, six-digit product–destination pairs and fenced firms within 20 km; panel B a quarter of exporters, four-digit products and zones within 100 km. Other portfolios, the split by province and persistence: Appendix

Table A3; checks of the comparison group, inference, timing and distance: Appendix Table N2.

Where and for whom. The point estimate of the asymmetry is largest among exporters registered in the same province as the fenced firms (Figure 7b; Appendix Table A3, panel C). For the same product, the past portfolio of fenced firms in the same province within 100 km is associated with entry higher by 141 percent of the baseline rate, against 54 percent for their next-year portfolio, an asymmetry of 87 (41). For fenced firms in other provinces at the same distances the two are 27 and 24 percent, an asymmetry of 3 (30).

The two asymmetries differ by 84 (50) percent of the baseline rate, which is not statistically significant ($p = 0.10$; bootstrap 0.11): the evidence places the asymmetry within provinces but does not show that it stops at their borders.

Point estimates of the asymmetry are larger for ordinary-trade and domestic exporters than for processing and foreign-invested ones, but the subgroup differences are imprecise (Appendix Table N1). The splits in this subsection and the next were chosen after the main

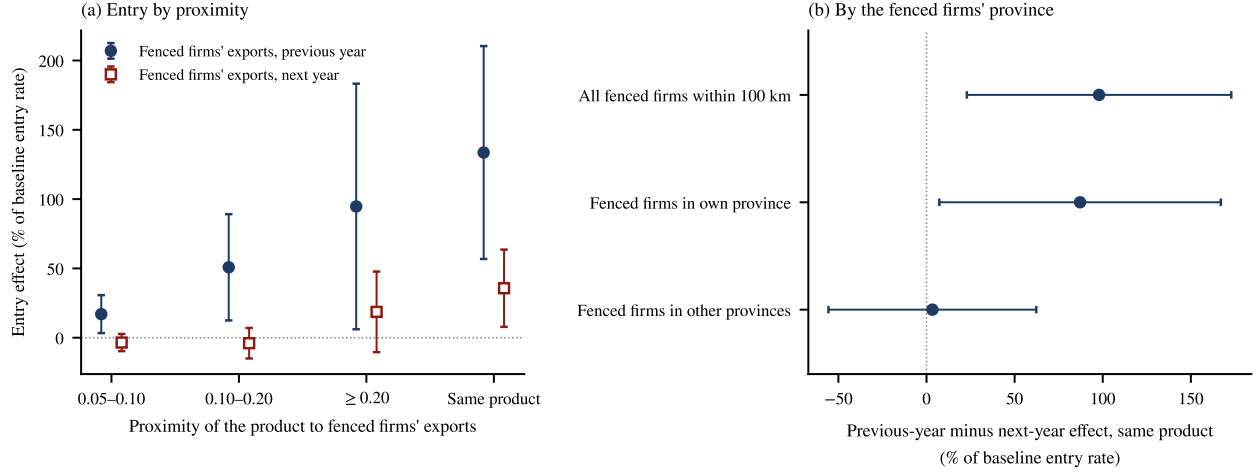


Figure 7: Entry of non-fenced exporters into new products. (a) By the product's proximity to what fenced firms of zones within 100 km exported in the previous year and in the next year: percent of the baseline entry rate. (b) Previous-year minus next-year portfolio for the same product, by the province of the fenced firms. Equation (2); the baseline entry rate is 0.146 percent; 95 percent confidence intervals, clustered by nearest zone. Splits by trade regime and ownership: Appendix Figure A4.

specification.

The pattern is consistent with diffusion mediated by geography or by provincial institutions, which the data cannot tell apart; registration provinces need not be where decisions are made. The province also bounds the hinterland's growth (Section 4.5), but the firms differ: the point estimate for firms that were not exporting when first recorded is larger than for exporting firms (Table 4, panel B), so we do not take the shared boundary as evidence of a shared mechanism.

Entry, scale and persistence. The gradient is present among entries that last as well as among entries that do not (Appendix Table A3, panel D). For entries still exported the next year, the same-product gradient is 197 percent of the baseline, and the past portfolio exceeds the next-year portfolio by 117 percent of the baseline rate (45).

Conditional on entry, which selects on success, entries into fenced firms' own products start 0.23 (0.10) larger in first-year export value; the difference in the probability of exporting the product again the next year, 3.7 percentage points (2.3), is imprecise.

How large? Taken at face value, the asymmetry corresponds to about 5,500 additional entries into firm-product pairs a year in the estimation sample (standard error 2,000), 15 percent of its new-product entries, or about 22,000 a year among all the exporters the sample represents. This is an association, not a count of entries that fenced firms caused, and the data do not show whether these entries raised total exports. Among exporters with a zone within 100 km

the asymmetry, and with it the count, is about half as large.

The number of exporting firms rises by 0.11 (0.05) in logs within 10 km (Table 3), where the rise in production comes mainly from zones placed in places already growing, and changes by 0.03 (0.05) 40 to 100 km away. Counts of exporters and entries into firm-product pairs are different margins, so neither estimate settles whether fenced firms raised exports around them.

5.4 Admission rather than price

The channel that the fence leaves open by construction is land. The zone sits inside a parent development zone, whose industrial land the host prefecture allocates establishment by establishment at administered prices, under minimum standards of investment and output per hectare (Section 2.2). When the fence takes part of that land, a price would ration the rest by raising what entrants pay; administered prices leave the rationing to the admission decision. Two facts from Section 4 fit admission rather than price, and a third is consistent with it. Entry fell at the bottom of the productivity distribution and not at the top (Section 4.3). It fell more by productivity than by capital, the reverse of what a standard on investment per hectare alone would produce, with gradients of 0.43 (0.14) and 0.14 (0.17). Around the zones opened after 2007, whose land was sold under the auction rules of 2007, land was neither sold in larger amounts nor dearer (Section 4.4); admission predicts this, but so does an unchanged demand. Section 6 builds this reading into a model in which the parent zone rations land by coarse signal cells and the multiplier on land is its price, and Section 7 prices what it cost.

5.5 How the hinterland grew

Within firms, the growth is an expansion of capacity with no detectable change in profit rates. Among the firms present in 2000, relative to the years before the opening, sales rise by 0.12, fixed capital by 0.20, and employment and intermediate inputs by 0.09 and 0.09, with profits in step with sales (Appendix Table K5). The profit rate, the subsidy rate, the tax rate, the interest rate, leverage and the export share each change by less than one standard error of the numerator's response, and the decline in the share of new products is smaller than two standard errors (Appendix Table K5, panel B). We find no detectable change in subsidy or interest rates and no shift into new products or exports; the firms sold more of what they already made.

The output of non-state firms begins to rise in the year of the opening and builds up over four years. Entry of new private firms behaves differently. It shows a rising path before the opening (coefficients of -0.28 , -0.19 and -0.10 four to two years before, relative to the year

before; joint $p = 0.15$) and no further rise after it (Appendix Table K3).

The additional output appears to have been sold in the broader domestic market. Output of household goods rises by +0.17 against +0.09 for goods bought by firms, and the estimates for necessities are similar to those for goods with high income elasticities, which are imprecisely estimated. Export value changes by +0.03 against +0.11 for output as a whole. The data show no sign of local buyers: retail sales, wages and savings in the hinterland’s own cities show no detectable change, and neither does their registered population (Appendix Table K6). Nor were fenced firms the buyers, as the calculation of their purchases below shows.

New activity or relocated activity? Growth in the hinterland could be new, or it could be activity that would otherwise have located within 40 km of the zone or elsewhere in the province. Relocation leaves the province’s manufacturing unchanged and new activity does not, and the two make different predictions (Table 6).

Table 6: What the hinterland’s growth is not: relocation or the purchases of fenced firms

Test	Estimate	Prediction
<i>Panel A. Rest of the zone’s province, more than 150 km away (log points)</i>		
Output	−0.04 (0.03)	negative
Value added	−0.01 (0.04)	negative
Employment	−0.03 (0.04)	negative
<i>Panel B. Whole province: value added gained per RMB of fenced exports</i>		
Sum over all distance groups	+2.6 (1.3)	about zero
<i>Panel C. Industry fingerprint (28 two-digit industries)</i>		
Correlation of entry effects within 40 km and 40–100 km away	+0.28 [−0.10, +0.59]	negative
<i>Panel D. Purchases of fenced firms (RMB per RMB of fenced exports)</i>		
Value added gained 40–100 km away, zone’s province	2.1 [1.3, 2.9]	at most 0.34–0.57

Panels A–C test relocation; the last column gives what relocation predicts. Relocation would also lower output within 10 km, where it rises instead (Table 3). Panel A: cells of the zone’s province more than 150 km away, timed by the province’s first opening; comparison: provinces without an EPZ by 2007. Panel B: sum of the level effects of every distance group of the province with their joint covariance, divided by fenced exports; each cell belongs to the group of its first zone. Panel C: correlation across 28 two-digit industries of the effects on new domestic establishments within 40 km and 40–100 km away; 95 percent interval from Fisher’s transformation. Panel D: value added gained 40–100 km away per RMB of fenced exports, against the DVAR of fenced exports (Kee and Tang 2016; 0.34 export-weighted, 0.57 in the most generous variant in the median zone), an upper bound on what the purchases of fenced firms could add. Standard errors in parentheses; 95 percent intervals in square brackets.

Relocation within the province would lower activity elsewhere in it. The places of the zone’s province more than 150 km away show no detectable decline when the zone opens: output changes by −0.04 (0.03) and value added by −0.01 (0.04). Output within 10 km of the zone does not fall either.

For the province as a whole, adding the level effects of every distance group with their joint covariance gives a rise in value added of 2.6 RMB (1.3) per RMB of fenced exports, of

which 1.8 (0.7) comes from cells 40 to 150 km away inside the province (Appendix Table J2).

The industries do not line up as relocation would require. Across 28 two-digit industries, the correlation between the effect on new establishments within 40 km and 40 to 100 km away is +0.28 (95 percent interval -0.10 to 0.59), whereas relocation of entrants from places within 40 km of the zone to the hinterland implies a negative correlation. The interval includes zero but excludes a negative correlation stronger than -0.10 ; the positive point estimate is consistent with industry-wide conditions common to both places.

Dropping the census additions changes the hinterland’s response little (output +0.10, value added +0.17). Within the province, the evidence is consistent with the hinterland’s growth being new activity rather than relocated activity; whether some of it would otherwise have gone to other provinces the design cannot show.

Not the purchases of fenced firms. Value added gained 40 to 100 km away is 2.1 RMB (1.3 to 2.9) per RMB of fenced exports; it is 1.8 for all cells 40 to 150 km away inside the province and 2.6 for the province, in the regression that adds up all the province’s distance groups (Table 6). The DVAR of fenced exports, domestic value added per RMB of exports, is 0.34 weighted by exports and 0.57 in its most generous variant, a median-zone value (Table 6, panel E); it is an upper bound on the domestic purchases of fenced firms because it also contains their wages, profits and indirect domestic content. Even if every RMB of that value added were bought in the hinterland and were additional, it would account for about a sixth of the point estimate of the gain at the weighted value and a little more than a quarter at the most generous one. Against the lower end of the gain’s interval, even the most generous variant would account for less than half. Spending by the workers and owners of fenced firms is not bounded by this calculation, but local wages per unit of fenced exports, measured for survey-matched fenced firms, are about 6 percent. Most of the hinterland’s growth therefore did not run through the supply chain of fenced firms.

What the design identifies. The design identifies where the growth occurs and in which firms. The hinterland’s growth is measured relative to places of the same kind elsewhere, and it begins at the opening and builds after it. Its point estimates are larger inside the zone’s province than at the same distance outside it, and it is absent beyond 100 km. The evidence is consistent with its not being relocation from the zone’s neighborhood or from the rest of the province.

Hinterland cells lie in larger, denser cities, closer to ports and megacities, than their matched comparisons, but controlling for that leaves most of the response intact (Appendix Table K1). Adding each cell’s baseline industry mix interacted with year leaves the output response at 0.10 to 0.11 (0.04), net of the leads. Adding the size, administrative rank and

urban core of its city keeps 74 to 85 percent of the baseline response, and replacing the matched-stratum year effects with province $\times$ year effects on top of these keeps 87 percent, with an output response of 0.10 (0.04).

Comparing only cells within the same province and year at the same distance from the provincial capital, the nearest megacity and the city core reduces the response substantially: to 0.06 (0.04) for output, 57 percent of the baseline response, and to 0.12 (0.05) for value added, 69 percent. Part of what distinguishes the hinterland is its position around the province’s central cities.

What the design cannot separate is the zone from anything else that changed in the province when it opened. We do not observe such changes, so we do not attribute the hinterland’s growth to the zone. The estimates are the effect of an opening together with whatever accompanied it, and the evidence on channels is consistent with fenced firms’ own transactions not having carried it: the fence’s purchases are too small to account for the added output, and the industry pattern of entry shows no sign that entrants deterred near the fence moved to the hinterland.

6 Admission to Industrial Land: Model and Estimation

The reduced-form evidence identifies a distortion of entry next to the zones; it does not show that the growth farther away in the province was caused by them. The model values the first, and the evidence on the hinterland remains a separate assessment of the zones’ reach. To value what the zones’ claim on land cost and to say who bore the cost, we model how the industrial land around a zone is allocated among the firms that want it. The question is the one [Khandelwal et al. \(2013\)](#) ask of China’s export quotas: when a fixed quantity of a necessary input is allocated by an administrative rule rather than a price, how much of the loss is due to scarcity and how much to the rule? We answer it with published components. The firms are those of [Melitz \(2003\)](#) with a fixed pool of potential entrants in each prefecture ([Chaney 2008](#)); they choose among the areas of their prefecture, with profits correlated across areas as in equation (4) of [Arkolakis et al. \(2018\)](#). This is the location margin of [Gaubert \(2018\)](#) and [Fajgelbaum et al. \(2019\)](#), through which a policy in one place can move firms rather than create them. The allocation follows the admissions problem of [Fu \(2014\)](#). An institution with a fixed number of seats sees only a coarse signal of each applicant. It admits signal cells in order of priority until the seats are filled, and it admits the marginal cell at random. The multiplier on capacity is the shadow price of a seat. Industrial land in China is sold at administered prices ([Tao et al. 2010](#); [Tian et al. 2024](#)), so this shadow price, not the price of land, rations the land.

Two features come from [Khandelwal et al. \(2013\)](#). Plots already held are reviewed with the same rule, as China’s export-quota licenses were reallocated on each firm’s past performance, and the signal cells coarsen a signal correlated with productivity, the form they give the government’s allocation of those licenses. Workers choose where to work with Fréchet-distributed tastes, which gives labor supply a closed form ([Fajgelbaum et al. 2019](#)), and exporters elsewhere in the province share the fixed cost of entering foreign markets ([Krautheim 2012](#)).

The model serves two purposes. It turns the entry pattern of Section 4.1 into an efficiency cost, the value that the potential entrants turned away would have created. It also says who bears that cost, dividing it, as [Busso et al. \(2013\)](#) and [Kline and Moretti \(2014\)](#) do for other place-based policies, among the excluded entrants, the admitted establishments, the government and workers. Both can be approximated with a few reduced-form quantities: the signal cells, the share of the marginal cell admitted, the value of entrants and the response of wages. The central trade-off concerns the signal. If the signal ranks applicants by the value they would create, rationing turns away only marginal entrants and costs a Harberger triangle. If it sorts them into coarse cells and rations the marginal cell at random, it turns away entrants of every size within that cell, and the cost is first order.

6.1 Environment

Time is discrete. A prefecture contains several areas, indexed by ℓ : the land within 10 km of the zone ($\ell = E$), the prefecture’s other development zones and the rest of the prefecture. The fence encloses part of the parent development zone, and $\bar{K}$ denotes the industrial land outside the fence that the parent zone still allocates within 10 km. Each establishment produces a differentiated variety and sells it under monopolistic competition with elasticity of substitution σ , so its operating profit is the share $1/\sigma$ of its sales. The prefecture is small: national and foreign demand and wages outside the prefecture are given. We compare the years after a zone opens with the same years without the fence’s claim on land and do not model the transition between them.

6.2 Potential Entrants

Each year the prefecture has a pool of J potential entrants, the fixed pool behind equation (7) of [Chaney \(2008\)](#): most entrepreneurs start firms where they already live and work ([Michelacci and Silva 2007](#)). Potential entrant j knows its operating profit $\pi_{j\ell}$ in every area. Producing costs a fixed amount F per period. The potential entrant applies for land within 10 km if that is its most profitable area. The parent zone admits it with a probability that depends on

its signal cell, described below; if refused, the potential entrant chooses among the remaining areas. With admission uncertain, the value of applying is $\delta_{\iota(j)} V_{jE} + (1 - \delta_{\iota(j)}) V_j^{\text{alt}} - C_j^{\text{app}}$, as in the application stage of [Fu \(2014\)](#). We observe neither applications nor their cost, so we take the pool of applicants as given and let its size change with the opening, as below. The potential entrant solves

$$\max \left\{ \max_{\ell \in \mathcal{A}_j} \pi_{j\ell} - F, 0 \right\}, \quad \mathcal{A}_j = \begin{cases} \text{all areas,} & \text{if admitted,} \\ \text{all areas except } E, & \text{if refused.} \end{cases} \quad (3)$$

Profits across areas follow the multivariate Pareto distribution of equation (4) of [Arkolakis et al. \(2018\)](#),

$$\Pr(\pi_{j1} \leq x_1, \dots, \pi_{jL} \leq x_L) = 1 - \left[\sum_{\ell} (T_{\ell} x_{\ell}^{-\zeta})^{1/(1-\rho)} \right]^{1-\rho}, \quad (4)$$

where T_{ℓ} measures how attractive area ℓ is, through the demand it reaches and its costs. The tail $\zeta = \theta/(\sigma - 1) > 1$ is the Pareto exponent of firm sales, with θ the Pareto shape of productivity. The correlation $\rho \in [0, 1)$ measures how much a firm that would do well in one area would do well in the others. When $\rho = 0$, a potential entrant's profit is high in at most one area, so one turned away from its best area does not enter elsewhere; as ρ approaches one, it enters its next-best area instead.

The parent zone does not see profits. It sees a signal

$$s_j = \tau z_j + \sqrt{1 - \tau^2} \xi_j, \quad (5)$$

where z_j is the normal score of the applicant's productivity rank within its industry and year, and ξ_j is standard normal and independent of z_j . This is the form [Khandelwal et al. \(2013\)](#) give the Chinese government's allocation of export-quota licenses (their footnote 28). The parent zone uses the signal only coarsely: it sorts applicants into a high cell, $s_j \geq \bar{s}$, and a low cell. What the signal records, the investment, output or taxes an applicant commits to, is not observed; the correlation τ measures how closely it tracks productivity. The share of productivity fifth b that falls in the high cell is

$$h_b(\bar{s}, \tau) = 5 \int_{(b-1)/5}^{b/5} \Phi\left(\frac{\tau \Phi^{-1}(q) - \bar{s}}{\sqrt{1 - \tau^2}}\right) dq. \quad (6)$$

The opening may also change how many potential entrants find the area most profitable. We let the number of applicants change by the factor $\exp(\nu)$, through the attractiveness T_E in (4), and we estimate ν rather than model its source.

After entry, an establishment's profit evolves and it survives to age t with probability S_t . Its value at entry is

$$V_j = \sum_{t \geq 0} \beta^t S_t \mathbb{E}[\pi_{jt}], \quad (7)$$

where β is the discount factor. We measure the growth and survival of new establishments rather than model them. They matter because the parent zone records the signal at entry, while the value accrues over the life cycle. Value is gross of fixed costs; Section 7 reports it in sales, in operating profit and net of a bound on fixed costs.

6.3 Incumbents

An incumbent within 10 km holds a plot. The parent zone reviews some plots, when leases are renewed, when firms apply to expand and when plots are reallocated; let ω be the share of plots reviewed in the years we study. An incumbent under review faces the same signal cells and the same rule as an applicant. It keeps its plot if it is in the high cell, and with the probability that the low cell is admitted if it is in the low cell. One block of land thus has one shadow price. China's export-quota licenses were reallocated in the same way, on each firm's performance in the previous year (Khandelwal et al. 2013, Section 3), so for an incumbent the signal records its past performance. An incumbent that keeps its plot stays if its profit covers the fixed cost, the exit condition of Melitz (2003). One that loses its plot solves

$$\max \{ \pi_{jo} - F - F_R, 0 \}, \quad (8)$$

where π_{jo} is its profit in its best area elsewhere and F_R the additional cost of setting up away from its current location: it relocates or exits. As with investment abroad in Helpman et al. (2004), the mode with the larger fixed cost is chosen only by the most profitable.

6.4 The Parent Development Zone

The parent development zone allocates the land within 10 km among applicants and the plots it reviews. It observes each one's signal cell $\iota \in \{H, L\}$ but not its profit, and it ranks cells by its own score γ_ι , the output, taxes and investment it expects from a member of the cell. It sells each admitted applicant its plot at an administered price p^L . Following the admissions problem of Fu (2014, equations 12–14), it chooses the probability $\delta_\iota \in [0, 1]$ of admitting or keeping a member of cell ι to solve

$$\max_{\delta_H, \delta_L \in [0, 1]} \sum_{\iota} \delta_{\iota} n_{\iota} \gamma_{\iota} \quad \text{subject to} \quad \sum_{i \in \mathcal{I}} \bar{a} [1 - R_i + R_i \delta_{\iota(i)}] + \sum_{j \in \mathcal{J}} \bar{a} \delta_{\iota(j)} \leq \bar{K}, \quad (9)$$

where n_ι counts the applicants and reviewed holders in cell ι , $\mathcal{I}$ the incumbents, $R_i = 1$ if incumbent i 's plot is reviewed, $\mathcal{J}$ the applicants and $\bar{a}$ the plot an establishment uses. Incumbents and applicants thus draw on one block of land, and the land balance closes. Let Λ be the multiplier on land. The solution admits cells in order of their score per hectare: $\delta_\iota = 1$ if $\gamma_\iota > \Lambda\bar{a}$, $\delta_\iota = 0$ if $\gamma_\iota < \Lambda\bar{a}$, and $\delta_\iota \in [0, 1]$ if the two are equal. With $\gamma_H > \gamma_L$ and land that binds, the high cell is admitted and the low cell is admitted at random with the probability $\delta \equiv \delta_L$ that exhausts the land. The price p^L does not clear the market. It is set by rule, with a national floor from 2007 (Tian et al. 2024), and the parent zone grants discounts to the buyers it favors.

We state the parent zone's problem to show where the rule comes from. Only the ranking of the cells matters for admission, so the score γ_ι , like the colleges' valuation in Fu (2014, Appendix E2), is not identified, and we do not estimate it. The score need not be the social value V_j of (7); Khandelwal et al. (2013) likewise do not assume that the actual allocation of licenses was efficient. Welfare is computed with V_j , never with γ_ι .

The three parties see different things. At application the parent zone sees the cell and the commitments of investment and employment; the applicant also knows its profit; we observe the establishment's realized sales after entry. A rule the parent zone can implement uses only what it sees at application, or, through bids, what applicants know. Rules that rank applicants by realized values serve only as benchmarks.

6.5 Workers

A worker chooses the area in which to work, maximizing the wage w_ℓ times an amenity B_ℓ times an idiosyncratic taste drawn from a Fréchet distribution with shape ε , as in Fajgelbaum et al. (2019). Employment in area ℓ and a worker's expected utility are then

$$L_\ell = \bar{L} \frac{(B_\ell w_\ell)^\varepsilon}{\sum_k (B_k w_k)^\varepsilon}, \quad U = \Gamma(1 - \frac{1}{\varepsilon}) \left[\sum_k (B_k w_k)^\varepsilon \right]^{1/\varepsilon}, \quad (10)$$

where $\bar{L}$ is the prefecture's labor force and Γ the gamma function. An area that is small in the prefecture faces a labor supply with elasticity ε . By the envelope theorem, a change in wages changes workers' welfare by $d \ln U = \sum_\ell (L_\ell / \bar{L}) d \ln w_\ell$, the employment-weighted change in wages. Workers gain from the zone only if wages rise somewhere, and the gain is measured by the wage bill times the change in the log wage.

6.6 Exporters in the Province

Firms already producing elsewhere in the province decide whether to start exporting a product p . A firm starts when its export profit π_{jp}^X covers the fixed cost f_p of finding buyers and meeting their standards, solving $\max\{\pi_{jp}^X - f_p, 0\}$. Across the province's potential exporters of a product, export profits are Pareto with the same tail ζ (Chaney 2008). Following Krautheim (2012), the fixed cost falls with the number of firms that already export the product or a related one, $f_p = \bar{f}_p(1 + N_p)^{-\kappa}$ with $\kappa \geq 0$, where N_p includes the exporters admitted to the zone. The zone's exporters thus lower the fixed cost of the products they make for firms elsewhere in the province.

6.7 Equilibrium

Given the land $\bar{K}$, the administered price p^L and the pools of potential entrants, an equilibrium consists of the admission probabilities (δ_H, δ_L) , the decisions of potential entrants, incumbents and the province's exporters, and wages. These satisfy five conditions.

- (i) Each potential entrant solves (3), and each incumbent that loses its plot solves (8).
- (ii) The admitted applicants and the incumbents that keep their plots use no more than $\bar{K}$, with equality whenever some applicant is turned away.
- (iii) The admission probabilities solve (9).
- (iv) Each firm in the province exports a product exactly when its export profit covers the fixed cost, given the number of exporters.
- (v) Each labor market clears, with labor supply given by (10).

Industrial land within 10 km is cleared by the multiplier Λ and goods by national and foreign prices. Plots freed by incumbents that exit or relocate add to the land available in the following year.

6.8 Results

Five results connect the model to the data and to welfare. All are stated for an area that attracts a small share of the prefecture's potential entrants. Let $r = \bar{h} + (1 - \bar{h})\delta$ be the share of applicants admitted, where $\bar{h} = \Phi(-\bar{s})$ is the share in the high cell.

Where do potential entrants locate, and whom does the rule turn away?

Proposition 1 (Location, admission and composition). *Let profits follow (4) and the signal (5).*

- (a) *The area a potential entrant chooses is independent of the profit it earns there, and entry into each area is proportional to that area's share of the pool.*
- (b) *Entry within 10 km of productivity fifth b changes by*

$$\Delta \ln n_b = \nu + \ln [h_b + (1 - h_b) \delta], \quad (11)$$

with $h_b = h_b(\bar{s}, \tau)$ from (6). Fifths that lie wholly in the low cell fall by the same amount, $\nu + \ln \delta$.

- (c) *A potential entrant turned away enters elsewhere in the prefecture only if $\rho > 0$; when $\rho = 0$, none does.*

Part (a) is Lemma 1 of [Arkolakis et al. \(2018\)](#), and it is what makes the model tractable: the rule decides who among the applicants is admitted, while the pool, the attractiveness of the areas and the fixed cost decide how many apply. Part (b) is the signature that Section 6.9 inverts. Coarse cells give a step, not a ramp. Fifths in the low cell lose the same share of applicants and the top fifth loses almost none; Proposition 4 shows that the same step appears among incumbents, scaled down by the share of plots reviewed. A hard cutoff on productivity is the limit $\tau \rightarrow 1$ with $\delta = 0$, which gives a step at a single fifth; a smooth score is the limit with a single cell, which gives a ramp. Part (c) is the location margin of [Fajgelbaum et al. \(2019\)](#) and [Gaubert \(2018\)](#): whether the rule near the zone moves entry within the prefecture or removes it depends on ρ . Figure 8 shows why the signal matters for what the rule costs.

When the signal tracks value, the applicants turned away are those whose value barely exceeds the fixed cost, and their exclusion costs little. When the signal is only weakly related to value, or when a whole cell is rationed at random, the rule turns away the same number of applicants, but some of them would have been large. The next two results make this precise: one says what the rule's multiplier is, the other what the rule costs and who pays.

Proposition 2 (The cutoff as a price). (a) *The multiplier Λ is the shadow price of land in units of the parent zone's score. While the low cell is rationed, $\Lambda = \gamma_L/\bar{a}$: the fence's claim on land lowers δ and leaves Λ unchanged, and Λ rises only once rationing reaches the high cell. Plots freed by exits raise δ .*

- (b) *Let $\rho = 0$ and let the signal rank applicants by profit. A cutoff that admits the share r , a charge that takes the share λ of operating profit with $(1 - \lambda)^\zeta = r$, and a minimum size*

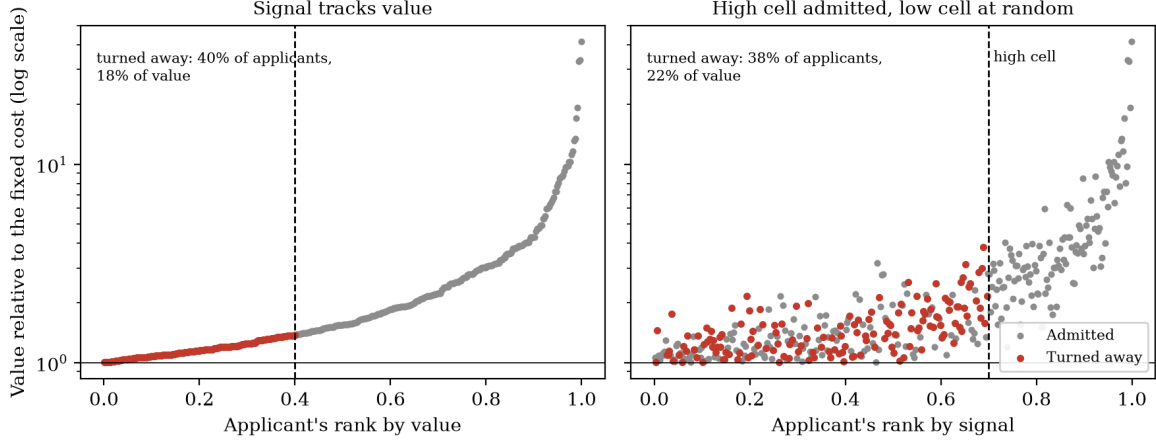


Figure 8: Applicants turned away when the signal tracks value and when a coarse cell is rationed at random

Notes: Illustration with simulated applicants, not estimates. Each dot is an applicant; the vertical axis is its value relative to the fixed cost, Pareto with shape 1.5. Both rules admit 60 percent of applicants. Left: applicants are admitted in order of value. Right: the top 30 percent by a signal with correlation 0.9 with log value form the high cell and are admitted; the rest are admitted at random.

that admits the same share produce the same entry, the same composition of entrants and the same output.

(c) *They differ in transfers. In units of the operating profit potential entrants would earn without the fence's claim on land, the charge transfers $C = r\lambda/(1 - \lambda)$ to the parent zone. The cutoff and the minimum size transfer nothing, and the admitted establishments keep the scarcity rent.*

(d) *A charge collected in the price of land raises the transaction price of land; a cutoff, a minimum size and a charge collected in non-price commitments leave it unchanged.*

Part (a) is the first-order condition of Fu (2014, equations 13–14); with a continuum of applicants it is the supply-and-demand lemma of Azevedo and Leshno (2016), by which a cutoff that exactly fills a fixed capacity is a market-clearing price. With coarse cells the quantity adjusts rather than the price: the fence's claim on land shows up in the share of the low cell admitted. Part (b) is the equivalence of a quota and its license price. In the auction allocation of Khandelwal et al. (2013, Section 2.1), a common license price clears a fixed quota, the allocation that Anderson (1985) shows to be the efficient one. It explains why the entry data alone cannot tell whether land near the zone was rationed by a standard or priced through commitments of investment and output. Parts (c) and (d) explain where the two readings differ: in who keeps the rent, and in whether the transaction price of land moves. Section 4.1 finds no change in that price around the zones.

How large is the efficiency cost, and who bears it?

Proposition 3 (Welfare and incidence). *Hold wages outside the land within 10 km fixed, and let $\mathcal{V}$ be the value (7) of all potential entrants within 10 km without the fence's claim on land. Under an allocation rule R that fills the same land:*

- (a) *Relative to entry without the claim, and in units of $\mathcal{V}$, the excluded potential entrants lose $\mathcal{L}_R$, the admitted establishments pay the transfer $\mathcal{R}_R$ that the rule collects, the parent zone receives $\mathcal{R}_R$, and workers gain $\sum_{\ell} w_{\ell} L_{\ell} \Delta \ln w_{\ell} / \mathcal{V}$, where*

$$\mathcal{L}_R = \frac{1}{\mathcal{V}} \sum_{j \text{ turned away}} (V_j - V_j^F - V_j^{\text{alt}}), \quad (12)$$

V_j^F is the value of the fixed costs entrant j would have paid, and V_j^{alt} its value in its best alternative net of the fixed costs there.

- (b) *Transfers cancel, so when wages do not move the efficiency cost of rule R is $\mathcal{L}_R$.*
- (c) *Let $\mathcal{L}^{\text{eff}}$ be the cost of admitting applicants in order of value per hectare with the same land. Then $\mathcal{L}_R = \mathcal{L}^{\text{eff}} + (\mathcal{L}_R - \mathcal{L}^{\text{eff}})$ with $\mathcal{L}^{\text{eff}} \leq \mathcal{L}_R$: a cost of scarcity, which only more land removes, and a cost of the rule, which another allocation of the same land removes. This is the decomposition of [Khandelwal et al. \(2013, Section 6\)](#), who compare a political allocation of quota licenses with an auction of the same quota and with no quota; [Glaeser and Luttmer \(2003\)](#) make the same split for rent control.*
- (d) *With Pareto profits, no relocation and the land per establishment equal across applicants, a signal that ranks applicants by profit costs*

$$\mathcal{D} = \frac{1-r}{\zeta} + r - r^{1-1/\zeta} \approx \frac{(\zeta-1)(1-r)^2}{2\zeta^2}, \quad (13)$$

second order in $1-r$, while a signal unrelated to profit, or random rationing within a cell, costs $(1-r)/\zeta$, first order.

Equation (12) is the core of the welfare analysis, and every counterfactual in Section 7 evaluates it. The loss depends on three things: how many applicants the rule turns away, $1-r$; how the signal cells rank them relative to their value; and how their value evolves after entry. Part (d) is the analog of the Harberger triangle in [Busso et al. \(2013\)](#): restricting the land by $1-r$ costs a triangle whose height is the gap between the value of the marginal admitted entrant and the fixed cost, and with Pareto profits that gap is small. A rule that turns away entrants with values far above the fixed cost adds a rectangle, first order in $1-r$.

Under a charge the burden on potential entrants is $(1 - r)/\zeta = \mathcal{C} + \mathcal{D}$, so the cost of a signal unrelated to profit equals the whole burden of a charge, but a burden that is lost rather than transferred. The incidence follows from part (a): under a cutoff the admitted keep the rent and the excluded bear the whole cost; under a price the admitted pay the rent to the parent zone. Workers enter only through wages, as in the incidence calculations of [Kline and Moretti \(2014\)](#) and [Suárez Serrato and Zidar \(2016\)](#).

Which incumbents leave, and who relocates?

Proposition 4 (Review, exit and relocation). *Let the share ω of plots be reviewed with the cells and the rule of (9).*

(a) *The number of incumbents of productivity fifth b that keep their plots changes by*

$$\Delta \ln n_b^I = \ln [1 - \omega (1 - \delta) (1 - h_b)], \quad (14)$$

so incumbents in the high cell keep their plots and those in the low cell lose them in the same proportion.

(b) *An incumbent that loses its plot relocates only if $\pi_{jo} - F \geq F_R$. Relocating incumbents are the largest among those displaced, and because review reaches incumbents of every size within the low cell, they can be larger than the average incumbent.*

Part (a) ties incumbents to applicants. Both face the same cells and the same δ , so incumbents in the top fifth, which lies in the high cell, should keep their plots, and the loss among the other fifths measures the reach of the review, $\omega(1 - \delta)$. A review on past performance only changes who stays: the sales of incumbents that keep their plots do not move. Part (b) ties the share of relocation to the cost of moving: if few displaced incumbents relocate, F_R exceeds the profit of most of them, and the same is true of the applicants turned away, who are smaller.

What do the zone's exporters do for firms elsewhere in the province?

Proposition 5 (Exporters in the province). *Let export profits be Pareto with tail $\zeta > 1$, and let the fixed cost of a related product change by $\Delta \ln f$. The number of the province's exporters of that product changes by $-\zeta \Delta \ln f$ in logs. Their net export profits, in units of their base exports X_0 of the product, change by*

$$\frac{\Delta V^X}{X_0} = \frac{e^{-(\zeta-1)\Delta \ln f} - 1}{\sigma \zeta}, \quad (15)$$

of which the fixed costs saved by incumbent exporters are $(\zeta - 1)(1 - e^{\Delta \ln f})/(\sigma \zeta)$ and the remainder is the surplus of new exporters.

The saving of incumbent exporters is first order in the change of the fixed cost, and the surplus of new exporters is second order. If the fixed cost is the channel, the gain accrues to exporters 40–100 km from the zone, where Section 5.3 finds that other exporters enter the products related to those of the fenced firms. It is a conditional gross benefit to the province’s exporters, and the welfare account of Section 7 does not net it against the cost next to the zone.

Table 7 lists what the five results need. The welfare results do not need the size of the pool, the level of the fixed cost, the parent zone’s valuation v or the land $\bar{K}$ itself; these cancel or enter only through the cells and δ .

Table 7: Inputs of the five results

Input	Role	Source	Status
High cell $\bar{s}$, correlation τ	who is in the cell admitted for sure	entry and retention within 10 km by productivity fifth	estimated; τ profiled
Low-cell admission δ	how many in the low cell are turned away	same	estimated
Change in the pool ν	how many apply	entry of the top fifth	estimated, two readings
Review share ω	incumbents’ exit	retention of incumbents by fifth	estimated
Value of entrants	value of those turned away; scarcity and rule	new domestic establishments, 1999–2004 cohorts	measured
Survival S_t and growth	value over the life cycle	same cohorts	measured
Pareto tail ζ	Harberger benchmark; exporters’ gain	upper tail of new exporters’ exports	estimated
Relocation cost F_R	where the excluded go	share of incumbents that move	bounded
Correlation ρ	where the excluded go	entry in the rest of the prefecture	bounded
Fixed-cost change $\Delta \ln f$	exporters’ gain	export entry and size 40–100 km away	estimated
Wages	workers’ incidence	average wage within 10 km	measured
Valuation v , land $\bar{K}$	set the multiplier Λ	not needed	not estimated

6.9 Estimation

Our empirical tasks are threefold. First, we estimate the allocation rule: the cell admitted for sure, the share of the other cell admitted, the change in the pool of applicants and the reach of the review. Propositions 1(b) and 4(a) tie these to ten moments, the entry of new

domestic establishments and the retention of incumbents within 10 km, each by productivity fifth, and we fit them jointly by minimum distance. This is the second step of Fu (2014), with difference-in-differences moments in place of his first-step admission probabilities, which require data on individual applications. Second, we measure entrants' value over their first years, which together with the rule gives the welfare results of Proposition 3 in Section 7. Third, we estimate the exporters' fixed cost of Proposition 5 and the Pareto tail. Moments not used in estimation test the model.

Table 8 lists each moment, the estimator that produces it in the data and its counterpart in the model. The entry and incumbent moments come from the event-path version of equation (1), estimated by Poisson pseudo-maximum likelihood on cell-year counts. The specification has cell effects, matched-stratum-by-year effects and leads two to four years before the opening, and standard errors are clustered by prefecture. Each change is the mean of the first three post-opening coefficients net of half the coefficient two years before the opening, the window of Section 4.3. In the model, the counterpart of each moment is the same statistic computed for the same group of establishments, distance and years.

Three measurement assumptions connect these moments to the model. First, the data rank entrants by revenue productivity, and the signal (5) is correlated with that rank. The entry response is steeper across productivity than across capital (gradients of 0.43 and 0.14), so the signal tracks output per unit of input rather than investment. Second, an incumbent's signal records its past performance, so we classify incumbents by their revenue productivity in 1999 or 2000. Revenue productivity ranks are weakly persistent, with a rank correlation of 0.37 over three years; if the review used current productivity instead, the high cell would be blurred among incumbents, and we report that case as a robustness check. Third, the survey covers firms with sales above 5 million yuan. Above any threshold a Pareto distribution keeps its shape, so the decline in surveyed entrants measures the decline among applicants if the survey threshold lies below the entry cutoff without the fence's claim on land.

Allocation rule. Let m be the ten fifth moments and $m(\theta; \tau)$ their model counterparts, with $\theta = (\bar{s}, \delta, \nu, \omega)$. We estimate θ by

$$\hat{\theta}(\tau) = \arg \min_{\theta} (m - m(\theta; \tau))' \hat{\Omega}^{-1} (m - m(\theta; \tau)), \quad (16)$$

where $\hat{\Omega}$ is the covariance of the ten moments, obtained by stacking the prefecture influence functions of the ten regressions. The step pins down the parameters. The three lowest fifths of entrants lie in the low cell and fall alike, by $\nu + \ln \delta$. The top fifth lies in the high cell and changes by ν . The fourth fifth, partly in each cell, places the cell boundary $\bar{s}$. The incumbents, whose top fifth also lies in the high cell, give the reach of the review, $\omega(1 - \delta)$.

Table 8: Moments, data estimators and model counterparts

Moment	Data estimator	Model counterpart
<i>Panel A. Targeted</i>		
Entry, by productivity fifth	event path on counts of new domestic establishments in each fifth of revenue productivity, ranked nationally within two-digit industry and year	$\nu + \ln[h_b + (1 - h_b)\delta]$
Retention of incumbents, by productivity fifth	event path on counts of domestic firms observed in 1999 or 2000, by fifth of their revenue productivity in that year, present in each cell	$\ln[1 - \omega(1 - \delta)(1 - h_b)]$
Related-export entry, 40–100 km	linear probability of starting to export a four-digit product in 2003–05, with firm-year and product-year effects; the moment is $\ln(1 + b_{\text{prev}}) - \ln(1 + b_{\text{next}})$, where b is the effect of products fenced firms exported the year before or a year later relative to the base rate of entry	$-\zeta \Delta \ln f$
New exporters' log exports, first year	same sample and comparison, outcome the log exports of a new exporter	$\Delta \ln f$
Pareto tail	rank-size regression (Gabaix and Ibragimov 2011) on the top 5 percent of new exporters' first-year exports	ζ
<i>Panel B. Not targeted</i>		
Total entry	as in Panel A, all new domestic establishments	$\nu + \ln r$
Sales of incumbents that remain	event path on the sales of domestic firms present in their 2000 cell in every year 2000–07	0
Sales per surviving incumbent, top minus bottom fifth	event path on sales minus that on counts of incumbents by fifth; difference by stacked influence functions	0
Truncated share of entrants' productivity	quantile approach of Combes et al. (2012) on entrants' log revenue productivity after versus before the opening; jackknife by prefecture	0
Price of industrial land, wage	Sections 4.4 and 5.2	0; 0
New exporters' log exports, second year	as in Panel A	$\Delta \ln f$

Notes: Event paths use Poisson pseudo-maximum likelihood on 0.1-degree grid cells within 10 km of the zones with cell effects and matched-stratum-by-year effects; the comparison is cells never within 150 km of a zone and cell-years before the first opening; standard errors are clustered by prefecture. Export moments use the customs records of Section 5.3 for firms within 150 km, with standard errors clustered by zone.

The correlation τ governs how sharp the step is; we profile the objective over τ and report the estimates at its minimum. Standard errors come from the Jacobian by the delta method.

Separating ν from δ needs an assumption about how the pool changed, because admission can only remove applicants and the top fifth rises. Our benchmark lets the pool change by the same proportion in every fifth. The opposite extreme lets the pool change only in the high cell, which attributes the rise at the top to more high-cell applicants and the fall at the bottom to rationing alone. The two readings bracket the share of the low cell turned away.

Table 9 reports the estimates. The high cell holds the top 27 percent of applicants by productivity, and the profile accepts correlations τ of 0.95, 0.99, 0.999. A correlation at the top of the grid makes the high cell close to a sharp cut in measured productivity. Productivity in the first year is not observed at application, so we read the high cell as a priority status that coincides with high measured productivity; Section 6.10 identifies one such status. The parent zone admits the share $\delta = 0.39$ (0.072) of the low cell, turning away 61 percent of it and 45 percent of all applicants. The effective pool of applicants within 10 km, which we do not observe and infer from the top fifth, grows by 59 percent. The review reaches the share $\omega = 0.22$ (0.044) of the plots. The overidentification statistic is 8.99 on five degrees of freedom ($p = 0.11$). When the pool changes only in the high cell, $\delta = 0.62$, so the low cell loses between 38 and 61 percent of its applicants. A smooth signal without cells, the form Khandelwal et al. (2013) use for quota licenses, fits the same ten moments poorly ($J = 34.1$ on 5 degrees of freedom, $p < 0.001$): it predicts a ramp across the fifths where the data show a step. The estimates are similar in the four-year window ($\delta = 0.34$, $J = 4.99$, $p = 0.42$). If the review used current rather than past productivity, $\delta = 0.45$ and $J = 14.34$ ($p = 0.01$).

The step also rejects an allocation of the same land by value. Khandelwal et al. (2013, Section 2) derive what an auction allocation of quota licenses predicts and reject it in the data before they calibrate the political allocation. We follow the same order. For each value-based rule, we compute the share of each productivity fifth it would admit with the land the estimated rule uses (Section 7.2) and ask whether, with the change in the pool free, it reproduces the five entry moments. Ranking applicants by four-year value per hectare gives $J = 11.4$ on four degrees of freedom ($p = 0.022$); by first-year sales per hectare, $J = 12.4$ ($p = 0.015$); by value predicted at application, $J = 28.7$ ($p < 0.001$). The estimated cells give $J = 1.3$ ($p = 0.87$). Value-based rules predict a ramp across the fifths, and the data show a step. The four parameters of the rule are separately identified: the largest absolute cosine between columns of the weighted Jacobian of the ten moments is 0.56.

Exporters and the tail. Given the tail, the fixed-cost change $\Delta \ln f$ minimizes

$$\left(\frac{\hat{\mu}_N + \zeta \Delta \ln f}{\text{se}(\hat{\mu}_N)}\right)^2 + \left(\frac{\hat{\mu}_S - \Delta \ln f}{\text{se}(\hat{\mu}_S)}\right)^2 \quad (17)$$

over the related-export entry $\hat{\mu}_N$ and the first-year exports of new exporters $\hat{\mu}_S$. The weights are diagonal because the two moments come from different regressions whose covariance we do not estimate jointly; the standard error comes from the Jacobian by the delta method. The tail is the rank-size slope of new exporters' first-year exports. The same tail describes domestic firms: rank-size slopes of domestic sales in 2000 are 0.93, 1.02 and 1.10 above 5, 10 and 20 million yuan, the range near the entry cutoff.

Values. The value (7) of each new domestic establishment of the 1999–2004 cohorts, 58,666 establishments, is its discounted sales at ages zero to three, with $\beta = 0.95$ and zero sales after it leaves the survey. Operating profit is the share $1/\sigma$ of sales with $\sigma = 4$, so value shares equal sales shares. Survival to ages one, two and three is 84, 76 and 68 percent, and survivors' sales grow by 0.31 log points a year.

Table 9 maps each parameter to the variation that pins it down and to the result that would reject the model's reading of it.

6.10 Fit and Validation

The model reproduces the step in both groups (Figure 9). Among new domestic establishments, the three lowest fifths fall alike and the top fifth rises; among incumbents, the four lowest fifths lose plots alike and the top fifth keeps them. Table 10 lists every moment. Of the 7 moments not used in estimation, 7 lie within 1.96 standard errors of the model's value.

The held-out moments separate the rule from three alternatives. A fall in local demand would also cut entry from the bottom, since it raises the profit a potential entrant needs to cover the fixed cost; it would also lower the price of land and the sales of incumbents that remain. The price of land changes by -0.02 (0.06), and the sales of incumbents that remain change by -0.05 (0.06). Sorting by complementarity between productivity and place, the mechanism of [Gaubert \(2018\)](#), would raise the sales of the more productive incumbents that remain; if it produced the tilt in entry, the top fifth's sales would rise at least 0.27 log points more than the bottom fifth's. They rise by 0.10 (0.14). A hard cutoff on productivity would truncate the distribution of entrants' productivity, and the quantile approach of [Combes et al. \(2012\)](#) finds no truncation; random rationing within a cell, as estimated here, thins the distribution without truncating it. Relocation, the margin of [Fajgelbaum et al. \(2019\)](#), is rare: 0.35 percent of domestic firms changed location between 2000 and 2007, holding 0.51

Table 9: Identification and estimates

Parameter	Moment or variation	Estimator	Estimate	Rejected if
High cell $\bar{s}$	entry of the fourth fifth relative to the third and the fifth	(16)	0.62 (0.083); top 27 percent	incumbents of the top fifth lose plots
Low-cell admission δ	entry of the three lowest fifths relative to the top	(16)	0.39 (0.072); 0.62 if the pool changes in the high cell only	the three lowest fifths fall unequally
Change in the pool ν	entry of the top fifth	(16)	0.47 (0.181)	neither pool reading fits the top fifth
Review share ω	retention of incumbents below the top fifth	(16)	0.22 (0.044)	survivors' sales fall
Correlation τ	sharpness of the step	profile of (16)	0.999; accepted: 0.95, 0.99, 0.999	—
Pareto tail ζ	upper tail of new exporters' exports	rank-size regression	1.08 (0.02)	domestic sizes near the cutoff follow another slope
Fixed-cost change $\Delta \ln f$	related-export entry; size of new exporters	minimum distance (17)	−0.54 (0.16)	new exporters are larger, which indicates a demand shift
Relocation cost F_R	share of incumbents that move	Prop. 4(b)	0.35 percent move	movers are smaller than stayers
Correlation ρ	entry in the rest of the prefecture under a charge	minimum distance	0; below 0.66	entry elsewhere rises by more than ρ allows
Survival, growth	cohorts 1999–2004	sample means	68 percent; 0.31 a year	—

Notes: Standard errors in parentheses, by the delta method from the minimum-distance Jacobian. The rule's parameters are estimated jointly on the ten fifth moments with the stacked covariance; the pool changes in the same proportion in every fifth, except where stated. The accepted correlations τ are those on the profile grid whose objective is within 3.84 of the minimum. The correlation ρ is estimated under the charge reading of Proposition 2 (Appendix P.2); the bound is the profile value rejected at the 5 percent level. Fixed parameters: $\sigma = 4$, $\beta = 0.95$.

percent of sales. Movers are about 1.4 times as large as the average firm, as Proposition 4(b) predicts when review strikes firms of every size within the low cell and only the largest can afford to rebuild. Few of the applicants turned away can have rebuilt elsewhere either, and we set $V_j^{\text{alt}} = 0$; Section 7.7 relaxes this.

Five further checks probe the rule. First, the step is not an artifact of the survey threshold. Among entrants with first-year sales of at least 10 million yuan, twice the threshold, re-ranked within that group, the three lowest fifths fall by -0.62 (0.30) log points more than the top fifth. The estimated rule predicts -0.85 for that group, because each re-ranked fifth mixes members of several national fifths. Above 20 million yuan, a quarter of entrants, the data

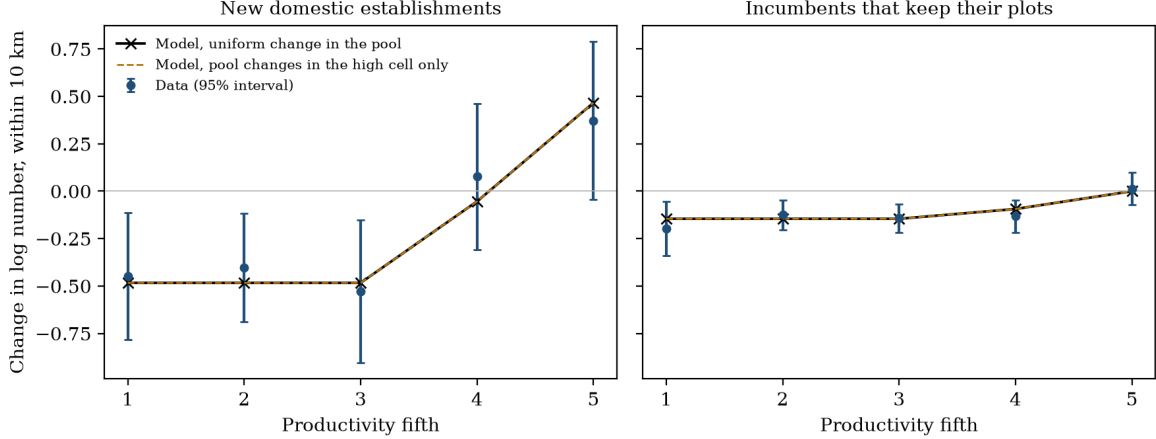


Figure 9: Entry and retention by productivity fifth, data and model

Notes: Dots are event-path estimates within 10 km with 95 percent intervals (net window, Table 8). Solid line: the model at the estimates of Table 9, with the pool changing in the same proportion in every fifth. Dashed line: the model re-estimated with the pool changing only in the high cell; the two readings fit the ten moments identically and differ in the share of the low cell admitted. Fifths rank establishments by revenue productivity within two-digit industry and year; incumbents are ranked in 1999 or 2000.

show no step (0.07, 0.37) against a prediction of -0.77 . Second, the low cell is not defined by ownership: private and other domestic entrants in the three lowest fifths fall alike (difference -0.09 , 0.25). Third, the rationing of the low cell falls on industries without input-output links to the zone's industries. The three lowest fifths fall by -0.92 in unlinked industries and by -0.17 in linked ones, a difference of 0.75 (0.28), while the top fifth rises in both. The parent zone thus appears to give priority to applicants in the zone's supply chains, an attribute it sees at application.

Fourth, the low cell is not selected on value. After the openings, the admitted entrants near the zones survive to age three more often than comparable entrants elsewhere, by 0.28 (0.10) in the low cell and 0.31 (0.18) in the high cell. The two cells do not differ (-0.02 , 0.21), and survivors in the low cell grow as fast as comparable survivors (-0.08 , 0.20). A screen on value within the low cell would raise its survival more than the high cell's. The common rise suggests instead that establishments admitted near the zones fare better, so valuing the applicants turned away at nationwide comparables understates their loss.

Fifth, the step among incumbents is the rule's, not the ordinary exit of young firms. Incumbents already in the survey in 1998 and those first observed in 1999 or 2000 lose plots in the same step: the three lowest fifths fall by -0.16 (0.04) and -0.18 (0.08) log points more than the top fifth, a difference of 0.01 (0.08). If young firms simply exited more often, the step would appear among them alone.

Table 10: Data and model

Moment	Data	Model	t
<i>Panel A. Targeted</i>			
Entry, fifth 1	−0.45 (0.17)	−0.48	0.2
Entry, fifth 2	−0.40 (0.15)	−0.48	0.6
Entry, fifth 3	−0.53 (0.19)	−0.48	−0.2
Entry, fifth 4	0.08 (0.20)	−0.05	0.7
Entry, fifth 5	0.37 (0.21)	0.47	−0.4
Retention of incumbents, fifth 1	−0.20 (0.07)	−0.15	−0.7
Retention of incumbents, fifth 2	−0.13 (0.04)	−0.15	0.5
Retention of incumbents, fifth 3	−0.14 (0.04)	−0.15	0.1
Retention of incumbents, fifth 4	−0.13 (0.04)	−0.09	−0.9
Retention of incumbents, fifth 5	0.01 (0.04)	0.00	0.3
Related-export entry, 40–100 km	0.64 (0.20)	0.58	0.3
New exporters’ log exports, first year	−0.29 (0.38)	−0.54	0.7
<i>Panel B. Not targeted</i>			
Total entry	−0.14 (0.12)	−0.13	−0.1
Sales of incumbents that remain	−0.05 (0.06)	0.00	−0.8
Sales per surviving incumbent, top minus bottom fifth	0.10 (0.14)	0.00	0.8
Truncated share of entrants’ productivity	0.01 (0.04)	0.00	0.2
Price of industrial land	−0.02 (0.06)	0.00	−0.3
Average wage	0.00 (0.04)	0.00	0.0
New exporters’ log exports, second year	−0.84 (0.42)	−0.54	−0.7

Notes: Standard errors in parentheses; t is the data minus the model value, divided by the standard error. Estimators, samples and clustering are in Table 8. Model values use the estimates of Table 9, $\zeta = 1.08$ and $\Delta \ln f = -0.54$.

7 Decomposition, Welfare and Counterfactuals

Did the zones’ local gains cover their local costs, who bore the costs, and could the same land have been allocated better? We answer in the accounting of the place-based literature (Busso et al. 2013; Kline and Moretti 2014). The gains are the spillovers that Sections 4 and 5 measure; the costs are the efficiency loss of the land condition and the fiscal outlays; the incidence is how both fall on firms, the government and workers. The gains and the fiscal flows are reduced-form estimates. The efficiency costs evaluate Proposition 3 at the estimates of Section 6, so they are model predictions.

Costs are in percent of $\mathcal{V}$, the value over the first four years of all applicants within 10 km, including those the opening attracted. For one year’s cohort of applicants, $\mathcal{V}$ is 17.7 billion yuan of operating profit when the pool grows in every fifth and 13.7 billion when it grows

only in the high cell. The pool, wages and the fence’s own activity are held fixed, and so is the land, except where the land is restored. Every cost is reported under both readings of the pool, since the data cannot tell them apart (Section 6.9); the two readings are scenarios, not a confidence interval.

7.1 Gains near the Zone and beyond It

Near the zone, no spillover large enough to detect reached the firms around it. Incumbents’ revenue productivity within 10 km changes by -0.009 (0.015), which bounds a productivity spillover at 0.020 in logs. The average wage shows no detectable change, and the output of the fence’s supplier industries moves with the local industrial base rather than with the fence (Section 5). Output within 10 km does rise, by 0.15 (0.03), but the rise is concentrated around zones placed where activity was already growing (Section 4.2), so we do not count it as a gain of the zones.

Learning is the one channel with a positive estimate, and it lies 30 to 100 km away. If the zone’s exporters lowered the fixed cost of related products by $\Delta \ln f = -0.54$, the number of the province’s exporters of those products rose by 79 percent and their net export profits by 1.02 percent of their base exports of those products (Proposition 5). Section 5.3 shows that part of the association reflects trends that fenced firms and their neighbors share, so this is an upper bound on the gain through this channel. Output 40 to 100 km away rises by 0.11 (0.03); the design locates this growth but cannot attribute it to the zone, and we count it neither as a gain nor as a cost.

7.2 Scarcity, Information or the Rule

Most of the efficiency cost lay in how the remaining land was allocated, not in how much land the fence took. We decompose the cost into three nested frontiers, following the comparison of Khandelwal et al. (2013, Section 6) between a political allocation of quota licenses, an auction of the same quota and no quota, and the benchmarks of Kleinberg et al. (2018) and Abdulkadiroğlu et al. (2017). Let $W^*(\bar{K}, V)$ be the value admitted when the land the rule uses is filled in order of realized four-year value per hectare. Let $W^*(\bar{K}, I)$ be the value admitted when it is filled in order of the value predicted from what the parent zone sees at application, and W_R the value the estimated rule admits. Then

$$\underbrace{\mathcal{V} - W_R}_{\text{cost of the rule as applied}} = \underbrace{\mathcal{V} - W^*(\bar{K}, V)}_{\text{scarcity}} + \underbrace{W^*(\bar{K}, V) - W^*(\bar{K}, I)}_{\text{information}} + \underbrace{W^*(\bar{K}, I) - W_R}_{\text{rule given information}}. \quad (18)$$

The first term is what only more land removes, the second what no rule at application can remove, and the third what another rule using the same information would remove. The terms add up because each frontier is nested in the one before it, on the same land and the same pool; the order is that of [Khandelwal et al. \(2013\)](#), who move from no quota to an auction to the political allocation. More land under the current rule removes the whole loss only when there is land for every applicant, so the decomposition asks what is lost with the land the parent zones had.

Table 11: The cost of allocating the land around the zone by alternative rules

Rule (applicants ranked by)	Applicants turned away, percent of all				Land used (percent)
	Establish- ments	First year		Four-year value	
		Sales	Employment		
<i>Panel A. Pool grows in every fifth; same land as the estimated rule</i>					
Estimated rule: high cell, low cell at random	44.8	32.0	45.1	36.8	55
Random	45.3	45.3	45.3	45.3	55
Auction: first-year sales predicted at application, per ha				23.0	
Feasible frontier: value predicted at application, per ha				22.5	
Auction: first-year sales predicted with first-year data, per ha	49.2	19.0	28.6	19.6	55
Feasible frontier: value predicted with first-year data, per ha	50.3	19.1	26.9	19.1	55
Benchmark: realized first-year sales per ha	47.7	11.3	33.1	18.1	55
Ex post frontier: realized four-year value per ha	48.1	16.9	32.5	8.7	55
<i>Panel B. Pool grows in the high cell only</i>					
Estimated rule	24.2	15.6	24.3	18.6	75
Auction: first-year sales predicted at application, per ha				11.2	
Auction: first-year sales predicted with first-year data, per ha	26.9	8.7	15.1	9.3	75
Ex post frontier	26.5	7.1	16.8	2.6	75
<i>Panel C. The fence's land restored</i>					
Any rule	0	0	0	0	100

Notes: New domestic establishments of the 1999–2004 cohorts nationwide, ranked within two-digit industry and year, as the pool of applicants. The estimated rule admits each productivity fifth with the probability of Proposition 1(b); the land it uses, with plot area proportional to employment to the power 0.24, is the capacity that the other rules fill in their own order. Predictions use five-fold cross-fitting. Rows predicted at application use industry, year, and first-year employment and capital, which stand in for the commitments of employment and investment in the land contract; rows predicted with first-year data add first-year assets and leverage, which the parent zone does not see at application, and overstate what it could achieve. For rows predicted at application only the four-year value is reported. With a common plot for every establishment the ranking of rules is unchanged: the ex post frontier turns away 7.3 percent and the auction at application 18.3 percent. Rows marked realized use information no rule at application has and serve as benchmarks. Four-year value is discounted sales at ages zero to three (5 percent a year, zero after an establishment leaves the survey). Panel B re-estimates the rule with the pool growing only in the high cell and reweights the pool accordingly.

Table 11 fills in (18). When the pool grows in every fifth, the estimated rule turns away applicants holding 36.8 percent of $\mathcal{V}$: scarcity accounts for 8.7 points, information for 13.7, and the rule given information for 14.3. When the pool grows only in the high cell, the rule's cost is 18.6 percent, scarcity 2.6, information 8.7 and the rule given information 7.3.

Under either reading, with the land and the pool held fixed, better information and a better rule could remove 76 to 86 percent of the cost. The estimated rule lies closer to a random allocation of the same land (45.3 percent) than to the feasible frontier (22.5 percent), because it treats the low cell as interchangeable: within that cell, applicants of every size are turned away alike.

A rule the parent zone could implement would recover about two fifths of the cost. Suppose applicants bid in proportion to the first-year sales predicted from their industry, the year and the employment and capital they commit. Such an auction turns away 23.0 percent of $\mathcal{V}$ (11.2 percent under the other reading), 38 to 40 percent less than the estimated rule, and it comes within 0.5 points of the feasible frontier. That bids track predicted sales is an assumption about how applicants bid. With first-year assets and leverage, which the parent zone does not see, the same auction would recover 47 to 50 percent. With industry and year alone, no rule can rank applicants within an industry and year, and none does better than random allocation. Ranking by realized first-year sales would do slightly better, 18.1 percent, but uses information that no rule at application has, and we report it only as a benchmark. The remaining gap to the ex post frontier is the value of foreseeing which entrants will grow.

The cost is first order because the signal is taken at entry, while value accrues over the life cycle. The applicants the rule turns away account for 32.0 percent of entrants' first-year sales and 36.8 percent of their four-year value. The less productive half of new establishments survives as often as the more productive half, 69 percent to age three, and grows faster, by 0.37 against 0.24 log points a year. Measured in first-year sales, the loss looks smaller than it is. For comparison, [Khandelwal et al. \(2013\)](#) attribute 14 to 18 percent of the productivity gain from removing China's textile export quotas to the end of their political allocation. They measure exporters' weighted productivity rather than the value of the firms turned away, and their allocation signal is correlated with productivity at about 0.7.

7.3 The Fiscal Ledger

We find no sign that the zones' local cost was paid out of the budget. Table 12 estimates equation (1) for the subsidies, taxes and interest that firms outside the fence report, within 10 km and 40 to 100 km away in the same province, in totals and per unit of sales or liabilities. Within 10 km, no fiscal instrument shows a detectable change. Subsidies change by 0.18 (0.20), and the interest paid per unit of liabilities, the mark of cheap credit, by 0.03 (0.05). Taxes rise by 0.12 (0.05), 2.73 billion yuan a year, in proportion to sales: the tax rate changes by 0.03 (0.04). Discounts on industrial land within 10 km amounted to about 0.30 billion yuan a year in 2007–13, 53 percent of them to foreign-invested buyers.

Fiscal flows appear in the hinterland. Subsidies 40 to 100 km away rise by 0.26 (0.10), 1.27 billion yuan a year, partly beyond what sales growth would bring (the subsidy rate rises by 0.16, standard error 0.10). Taxes rise by 13.64 billion yuan a year, in proportion to sales, and the interest rate shows no detectable change, -0.02 (0.03). Subsidies and growth thus appear in the same places, but the design cannot say which caused which. The duty and value-added tax exemptions inside the fence are not recorded in the survey; processing exporters outside the fence import in bond as well, so the fence’s own tax expenditure relative to processing trade is likely small, but we do not measure it.

Table 12: The fiscal ledger: subsidies, taxes and credit of firms outside the fence

	Within 10 km			40–100 km, same province		
	Total (log)	Billion yuan a year	Rate (log)	Total (log)	Billion yuan a year	Rate (log)
Subsidies	0.18 (0.20)	0.26	0.09 (0.20)	0.26 (0.10)	1.27	0.16 (0.10)
Taxes	0.12 (0.05)	2.73	0.03 (0.04)	0.15 (0.05)	13.64	0.05 (0.04)
Interest paid (domestic firms)	0.07 (0.08)		0.03 (0.05)	0.08 (0.05)		-0.02 (0.03)
Sales	0.09 (0.03)	49.52		0.10 (0.03)	198.85	

Notes: Equation (1) by Poisson pseudo-maximum likelihood on cell-year totals of all surveyed firms outside the fence (interest: domestic firms), with cell effects, matched-stratum-by-year effects and leads; the change is the mean of the first three post-opening coefficients net of half the coefficient two years before the opening. Rate: the change in the total minus the change in sales (for interest, minus the change in liabilities), with standard errors from stacked prefecture influence functions; standard errors clustered by prefecture in parentheses. Billion yuan a year: the group’s total two years before the opening times the exponentiated change minus one.

7.4 Who Bore the Cost when the Multiplier Replaced the Price

In the place-based literature a policy’s gains are capitalized into land rents and accrue to landowners, while workers gain through wages (Busso et al. 2013; Kline and Moretti 2014). Around the zones the landowner is the government, and it allocates land by rule. The scarcity is then not capitalized into the price of land, and around later zones we find no sign that it was (Section 4.4); the incidence is redistributed.

The applicants turned away bore the efficiency cost, which never appears in data on surviving firms. Under the rule no admitted establishment paid for scarcity, as holders of quota licenses kept the rent of the quota (Khandelwal et al. 2013); favored buyers received the land discounts on top of it. For scale, a price that cleared the same land would have collected 21.3 percent of $\mathcal{V}$ (14.8 percent under the other reading) from the establishments it admits, which are not the same establishments as those the rule admits. Review took plots from about 14 percent of the incumbents in the low cell over the years we study, and most

of those who lost plots exited rather than moved (Section 6.10). Valued at four years of their sales before the openings, the incumbents that lost plots held 6.1 percent of the value of incumbents within 10 km. If none rebuilt elsewhere, their loss was 13.5 billion yuan of operating profit, or 1.9 billion a year over the 7 years of openings; if they rebuilt elsewhere at no loss with probability 0.33 or 0.66, it was 1.3 or 0.7 billion a year. This loss adds to the entrants', because the land the incumbents gave up is already part of the land the rule allocates. The government forwent the rent, paid the discounts, and collected more taxes as sales grew.

Workers bore none of the cost at the point estimate, and they may have gained. The wage per worker within 10 km shows no detectable change, 0.03 (0.03) in the net window of Table 12 and 0.00 (0.04) in the joint estimate of Section 5.2. A flat wage is not a zero gain for workers, since the Fréchet account of (10) is a partial-equilibrium incidence. Employment rises by 0.10 (0.04) in the net window, about 218 thousand jobs; the rise is concentrated where employment was already growing before the openings (Section 4.2). A migrant from a place with a lower wage gains the difference net of the cost of moving, the margin through which Tombe and Zhu (2019) find large gains from lower migration costs in China. If that difference is a quarter of the wage, the gain is 0.95 billion yuan a year. This gain lies outside the model, which holds wages and amenities fixed, and we report it as a scenario.

7.5 Welfare and Fiscal Reconciliation

Table 13 puts the model's costs and the measured fiscal flows on one page, in the same places, years and prices. Two conventions keep the entries comparable. The entrants' loss and the rent are present values of one cohort's first four years; in a steady state of identical cohorts the annual flow is the undiscounted sum over ages. We compute that ratio among the applicants each rule turns away, 1.10 for the estimated rule and 1.07 for the ex post frontier, and report both units. Transfers and efficiency costs sit side by side and are not netted, since a yuan of tax is not a yuan of surplus and the rent is a transfer.

The table carries the paper's main accounting point. The allocation cost, 2.8 to 7.1 billion yuan a year for entrants and up to 1.9 billion for incumbents, is of the same order as the extra taxes the government collected near the zones, 2.73 billion, and several times the land discounts it paid. It appears in no budget.

7.6 Counterfactuals

Table 14 lists the counterfactuals, what each holds fixed and how much weight each can bear. The main policy conclusion is the comparison of rules for the same land; restoring the

Table 13: Welfare and fiscal reconciliation within 10 km

Account	One cohort, present value	Annual flow	Nature and status
Applicants turned away: operating profit lost	−6.50 to −2.55	−7.1 to −2.8	efficiency cost; model, two pool readings
of which scarcity under an implementable auction	−1.55 to −0.35	−1.7 to −0.4 −4.4 to −1.7	removed only by more land counterfactual, information at application
Incumbents that lost plots at review		−1.9	efficiency cost; model, upper bound with no relocation
Scarcity rent a clearing price would collect, not collected	3.77 to 2.03	4.1 to 2.2	transfer forgone by the parent zone; model, price allocation
Government: taxes on growing sales		2.73	measured; tax rate unchanged
Government: land discounts paid		−0.30	measured, 2007–13; not counted again in the rent
Workers: migrants' gain if the wage gap is 10 to 50 percent		0.38 to 1.91	scenario; jobs rising before the openings

Notes: Billion yuan of 1999–2007 prices. The entrants' loss and the rent are operating profit, the share $1/\sigma$ of sales; netting a bound on fixed costs lowers the loss by at most 3.3 points of $\mathcal{V}$ (Appendix P.5). The annual flow of the applicants' rows is the present value times the ratio of undiscounted to discounted four-year sales among the applicants the rule turns away (1.10 for the estimated rule, 1.07 to 1.05 for the ex post frontier, 1.09 for the auction). The incumbents' row spreads their one-time loss, four years of operating profit valued with nationwide incumbents of the same productivity fifth, over the 7 years of openings. Measured rows are from Table 12. Rows are not additive, and taxes and loss do not form a benefit–cost ratio: the taxes are measured near the zones, while the loss is a model value for a fixed pool of applicants.

land is a capacity benchmark, not the net welfare effect of having no zone. A price on land and a charge levied in commitments of investment and output allocate the land alike. They differ in the form of the transfer and in whether the transaction price of land moves, as in Proposition 2(c)–(d).

A second layer of government can pool land but cannot change the rule. Provinces allocate construction-land quotas to prefectures. If a province moved quota toward the prefectures that host zones, the scarcity near each zone would fall and spread across the province. Pooling land can therefore remove at most the scarcity part of the cost, 2.6 to 8.7 percent of $\mathcal{V}$, and not the rule's part. This is a gain near the zones only; the loss in the prefectures that give up quota is not counted.

Table 14: Counterfactuals and their credibility

Counterfactual	Changed; held fixed	Cost after (percent of $\mathcal{V}$)	Identified by	Credibility
Restore admission capacity	land; pool, wages, applications	0 (from 18.6–36.8)	the opening itself, in sample	conditional benchmark
Implementable auction	rule; land, pool	11.2–23.0	bids predicted at application, out of sample	medium
Feasible frontier	rule; land, pool	11.2–22.5	cross-fitted predictions	medium
Clearing price on land	rule and transfer; land, pool	2.6–22.5; rent 14.8–21.3 to the parent zone; land price rises	applicants' information, not observed	medium-low
Clearing charge in commitments	form of the transfer	as the price; land price unchanged	as above	medium-low
Random allocation	rule; land, pool	24.5–45.3	mechanical	high
Ex post frontier	rule and information	2.6–8.7	realized values	benchmark only
Exporters' fixed cost	$\Delta \ln f$; everything else	exporters' net profit +1.02 percent	difference in differences	medium-low; upper bound

Notes: Ranges run from the reading with the pool growing only in the high cell to the reading with the pool growing in every fifth. A clearing price or charge admits applicants by what they know of their own value. Its cost lies between the ex post frontier, if they know their four-year value, and the feasible frontier, if they know only what the parent zone sees, and it takes 15 to 25 percent of the admitted establishments' operating profit. Applications are held fixed in every counterfactual; if more applicants applied when admission became likelier, as in [Fu \(2014\)](#), restoring land or improving the rule would bring back discouraged applicants as well, so the gains are understated.

7.7 What Is Estimated and What Is Assumed

The ten fifth moments estimate the rule: the high cell, the share of the low cell admitted and the reach of review. Across the correlations between signal and productivity that the data accept (0.95, 0.99, 0.999), the cost ranges from 36.8 to 40.2 percent of $\mathcal{V}$ and the rule's share from 75 to 76 percent. The welfare numbers built on the rule need five further conditions. The first is how the pool of applicants changed, which the data cannot reveal: the two readings move the cost between 18.6 and 36.8 percent of $\mathcal{V}$ but keep the rule's share between 76 and 86 percent.

The second is parallel trends for the ten fifth moments. Before the openings, entry of the low cell rose relative to the top fifth up to the year before the opening (Table [P1](#)), and the net window measures the change against that year. Measured instead against the mean of

the four years before the opening, the step is -0.58 (0.22) rather than -0.83 (0.22), while the incumbents' moments hardly move. Re-estimated on those moments, the rule admits 0.58 of the low cell, and its cost falls to 27.2 percent of $\mathcal{V}$ (15.9 percent under the other reading), of which better information and a better rule could remove 83 to 89 percent. A common shift in the five entry moments would move the change in the pool and leave the step unchanged; the incumbent moments do not involve the pool.

The third is that the applicants turned away did not build elsewhere. The relocation rate of incumbents, 0.35 percent, describes incumbents, not entrants. Suppose the entrants turned away had built elsewhere at no loss with probability equal to the correlation of profits across areas in the multivariate Pareto model. The cost would then fall from 36.8 to 24.6 percent at a correlation of 0.33 and to 12.5 percent at 0.66, the largest correlation the data allow; the ranking of rules would not change. The fourth is random rationing within the low cell, which the survival check of Section 6.10 supports. Had the parent zone ranked the whole low cell by the value predicted at application, the cost would have been 21.1 percent (9.3 percent under the other reading). Ranking part of the cell gives a cost between that and the estimate, so the estimate is an upper bound given the cells. The same check shows that admitted establishments near the zones survived more often than comparable establishments elsewhere, so valuing the applicants turned away at nationwide comparables makes the cost a lower bound in that respect.

The fifth is the value of an entrant. We use four years of discounted sales of comparable entrants nationwide, converted to operating profit. If the smaller entrants kept growing faster after age three, the cost of every rule that ranks applicants at entry would rise; netting out fixed costs lowers each cost by at most 3.3 points (Appendix P.5).

8 Conclusion

China's export processing zones were built to bring export production to a place and to work as engines of development for the economy around it. They did the first. On the second they were closer to enclaves. Little crossed the fence; next to it, no growth can be separated from growth already under way, and neither purchases, hiring nor learning left a detectable trace on the firms around it. The one positive association with the fenced firms' activity, entry into related export products, lies 30 to 100 km away, and the output growth 40 to 100 km away inside the province is located by the design but not attributed to the zones.

What the zones did change next to their fences was who could enter and who could stay. The parent development zones allocate industrial land by rule rather than by price. When the fence took part of that land, entry of new domestic establishments fell in a step

across productivity: the lower fifths fell alike and the top fifth did not. Incumbents lost plots in the same pattern, while land prices around later zones did not rise. Read as admission by coarse signal cells, the parent zones admitted a high cell, about the top 27 percent by productivity, and rationed the rest at random, sparing industries in the zones' supply chains. The applicants turned away held 18.6 to 36.8 percent of the four-year value of all applicants, 2.8 to 7.1 billion yuan of operating profit a year. This is of the same order as the taxes the government collected near the zones, yet it appears in no budget. The admitted kept the rent that a price would have collected, and workers gained only if the new jobs drew migrants across a wage gap.

For place-based policy the lesson concerns the instrument as much as the place. When a government allocates the land a policy needs by rule, the scarcity that the policy creates is not collected in land prices, and its costs fall on firms that never appear in data on the policy's results. Most of the cost lies in the rule rather than in the land: an auction on what is known at application would have recovered about two fifths of it without returning any land, while pooling land quotas across the province could recover only the part due to scarcity. These conclusions rest on parallel trends in entry and retention near the zones, on how the pool of applicants changed, which the data bound but do not pin down, and on the assumption that the applicants turned away did not rebuild elsewhere at no loss. The gains to migrant workers, which our data do not measure, could change the sign of the net effect on the places around the zones.

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Appendix

Guide to the appendix

	Contents	Used in
A	Exhibits referred to in the main text: the export series, every outcome within 40 km, pooled timing within 10 km, binary design and number of zones, supplier base, all related-product results, the hinterland path 100–150 km away	Sections 2–4.5
B	Symbols used in the main text	All
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D	Data construction: the firm survey, customs records, the zone directory, input–output links, relocation records, and the data problems we correct	Section 3
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F	How firms are located (the baseline comparison of places is Table 2 in the main text)	Section 3
G	Estimation details: exposure, comparison, estimator, reported quantities, inference with few treated prefectures, entry near the fence under each comparison, opening dates, the second wave without any one prefecture, firm-level measures, the supplier-base checks	Sections 3–5
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Q	Inference with few treated places: placebo zones and sensitivity to pre-trends	Sections 4.1, 4.5

A Exhibits referred to in the main text

This appendix collects exhibits that support statements made in the main text: the program's export series, every outcome at every distance within 40 km, the pooled timing within 10 km, the comparison with a binary design and with the number of zones nearby, the supplier-base split, the full set of results on related products, and the hinterland path 100–150 km away.

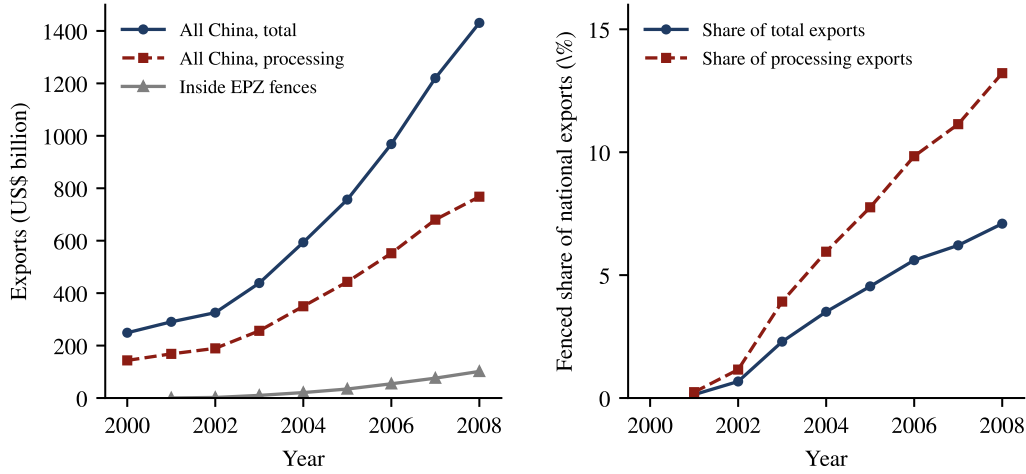


Figure A1: China's exports and exports of fenced firms (customs identifiers that mark an EPZ), 2000–2008. The figure stops in 2008, the end of the period this paper studies. From 2010 most zones were converted into comprehensive bonded zones and their firms re-registered under that zone type's identifier, so a series built on the EPZ identifier falls mechanically. Between 2010 and 2011, exports under the EPZ identifier fell from 130 to 102 billion US dollars, while exports under the comprehensive-bonded-zone identifier rose from 4.6 to 53 billion. The series to 2014 is in Appendix Figure C3.



Figure A2: Output, employment and new domestic establishments of manufacturing outside the fence within 10 km and 10–20 km of the zone, by years since the first opening, all zones. Equation (1) with one term per year from four years before to three years after the opening; reference: the year before the opening; standard errors clustered by prefecture; 95 percent confidence intervals. Joint p-values of the leads in Appendix Table I3.

Table A1: Manufacturing outside the fence after the first EPZ opening, by distance within 40 km

	0–10 km	10–20 km	20–40 km
<i>A. Production</i>			
Output	+0.15 (0.03)	+0.05 (0.05)	−0.02 (0.05)
Value added	+0.21 (0.05)	+0.10 (0.05)	+0.03 (0.06)
Fixed capital	+0.11 (0.04)	+0.05 (0.05)	−0.08 (0.08)
Profits	+0.18 (0.08)	+0.04 (0.07)	+0.05 (0.08)
Taxes	+0.16 (0.05)	+0.04 (0.06)	+0.04 (0.07)
<i>B. Labor</i>			
Employment	+0.18 (0.05)	+0.02 (0.05)	+0.03 (0.05)
Wage bill	+0.19 (0.04)	+0.02 (0.05)	−0.00 (0.06)
<i>C. Firms and exports</i>			
Number of firms	+0.06 (0.05)	+0.05 (0.05)	−0.00 (0.05)
New domestic establishments	−0.08 (0.11)	−0.05 (0.11)	−0.09 (0.12)
Domestic exits	+0.13 (0.11)	−0.09 (0.09)	−0.19 (0.09)
Export deliveries	+0.15 (0.08)	+0.06 (0.07)	+0.00 (0.07)
Exporting firms	+0.11 (0.05)	+0.06 (0.06)	+0.01 (0.07)
Cells	89	188	610

Equation (1): mean of the coefficients for the first four years after the opening, in changes in logs; standard errors clustered by prefecture (329 clusters) in parentheses. All manufacturing firms outside the fence; new establishments and exits are domestic. 19,149 cells, 1998–2007. The first column is the first column of Table 3.

Table A2: Binary and distance-group designs, with the number of zones nearby

	Binary design		Distance groups (this paper)	
	(1)	(2)	(3)	(4)
<i>New domestic establishments</i>				
Opening within 40 km (binary) or 10 km	-0.08 (0.08)	-0.04 (0.08)	-0.08 (0.11)	-0.03 (0.12)
40–100 km, zone's province	–	–	+0.10 (0.09)	+0.08 (0.08)
Each additional zone within 40 km		-0.40 (0.06)		-0.36 (0.06)
<i>Output</i>				
Opening within 40 km (binary) or 10 km	-0.00 (0.04)	-0.00 (0.04)	+0.15 (0.03)	+0.15 (0.03)
40–100 km, zone's province	–	–	+0.11 (0.03)	+0.11 (0.03)
Each additional zone within 40 km		-0.03 (0.04)		-0.02 (0.04)
<i>Employment</i>				
Opening within 40 km (binary) or 10 km	+0.03 (0.04)	+0.03 (0.04)	+0.18 (0.05)	+0.18 (0.05)
40–100 km, zone's province	–	–	+0.08 (0.04)	+0.08 (0.04)
Each additional zone within 40 km		-0.04 (0.04)		-0.02 (0.05)
<i>New domestic establishments around the opening of an additional zone within 40 km</i>				
Years relative to the opening	-4: +0.09 (0.16), -3: +0.12 (0.13), -2: +0.01 (0.10) 0: -0.07 (0.09), 1: -0.15 (0.15), 2: -0.24 (0.15), 3: -0.29 (0.23)			
Joint test of the leads (p); mean after	0.80; -0.19 (0.13)			

Columns (1)–(2): a binary design, one set of exposure terms for cells within 40 km of the first zone to open and every other cell in the comparison, no other exposure terms. Columns (3)–(4): equation (1), every distance group with its own exposure terms. Columns (2) and (4) add the number of export processing zones open within 40 km beyond the first. Mean of the first four years after the opening; Poisson regression with cell effects, year effects by matched stratum and baseline characteristics $\times$ year; standard errors clustered by prefecture. Bottom panel: cells that receive an additional zone within 40 km, one term per year relative to its opening (reference: the year before), within the design of column (3).

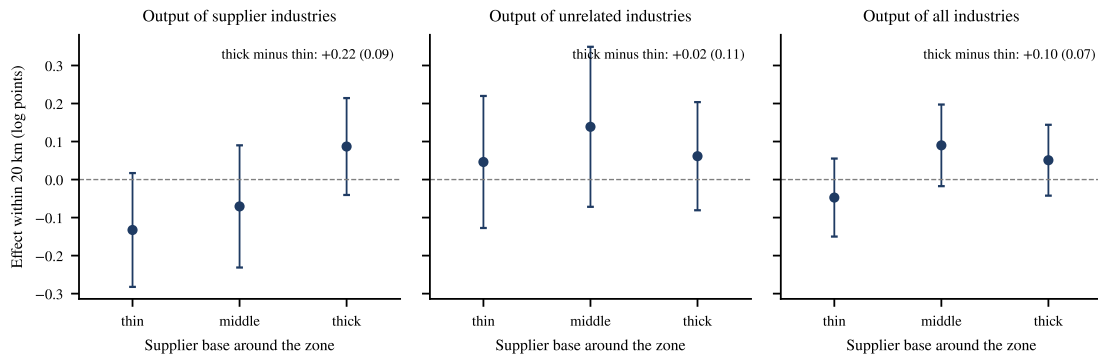


Figure A3: Effect within 20 km of the first opening by the zone's supplier base (terciles of the 1998–2000 output of the industries that supply fenced firms' inputs, in the cells around the zone): output of supplier industries, of unrelated industries and of all industries. Equation (1); standard errors clustered by prefecture; 95 percent confidence intervals.

Table A3: Entry of non-fenced exporters into fenced firms' markets and into related products: all results

<i>Panel A. Markets: entry into a product–destination pair a fenced firm within 20 km exported (percentage points; baseline 6.0)</i>				
	Without next year	Previous year	Next year	
Fenced exports of the pair	+2.9 (0.8)	+0.9 (1.1)	+3.5 (0.9)	
<i>Panel B. Related products: entry into a new product, by its proximity to the fence's portfolio within 100 km (percent of baseline)</i>				
	0.05–0.10	0.10–0.20	≥0.20	Same product
Fence portfolio, previous year	+17 (7)	+51 (20)	+95 (45)	+134 (39)
Fence portfolio, next year	−3 (3)	−4 (6)	+19 (15)	+36 (14)
Difference (percent of baseline)			+76 (36)	+98 (38)
Wild cluster bootstrap p-value			0.077	0.011
Fences' new products of the next year ^b	−1 (5)	+29 (12)	+62 (25)	+7 (26)
<i>Panel C. Where: same product, by the fence's province (percent of baseline)</i>				
	Previous year	Next year	Difference	p-value
Fences in own province	+141 (48)	+54 (16)	+87 (41)	0.04
Fences in other provinces	+27 (32)	+24 (32)	+3 (30)	0.91
Own minus other province			+84 (50)	0.10
<i>Panel D. Entry, scale and persistence: same product, entry years 2003–05</i>				
	Estimate			
Entries still exported the next year (percent of baseline)	+197 (43)			
Entries not exported the next year (percent of baseline)	+143 (47)			
Among entries: exported the next year (percentage points)	+3.7 (2.3)			
Among entries: log export value in the first year (log points)	+0.23 (0.10)			
<i>Panel E. Checks under a different specification (see notes; percent of baseline)</i>				
	0.05–0.10	0.10–0.20	≥0.20	Same product
Zones without EPZ status	−6 (2)	−14 (3)	−28 (4)	+1 (4)
Fences within 30 km, exporters with a zone within 30 km	+4 (4)	+2 (8)	−19 (14)	+26 (16)

Panel A: entry into a six-digit product–destination pair, non-fenced exporters, 2002–06; fenced firm within 20 km exported the pair in the previous (next) year; firm $\times$ product $\times$ year and product $\times$ destination $\times$ year effects; standard errors clustered by firm. Panels B–D: equation (2), entry into a new four-digit product, entry years 2003–05, percent of each sample's baseline entry rate (0.146 percent in the full sample); standard errors clustered by nearest zone (36 clusters); p-values from $t(35)$. Province from the firm's registration code. Wild cluster bootstrap: null imposed, Rademacher weights, 9,999 draws. Panel E: no next-year term, entry years 2003–06, standard errors clustered by firm, which are about a quarter of those clustered by nearest zone; the 30 km row keeps only exporters with a zone within 30 km, so its reference group differs from that of panel B and it is not evidence about distance (distance rings: Appendix Table N2, panel D). ^b Products that fenced firms within 100 km first export in $t + 1$ (not exported in $t - 1$ or t), in a regression that also includes both full portfolios.

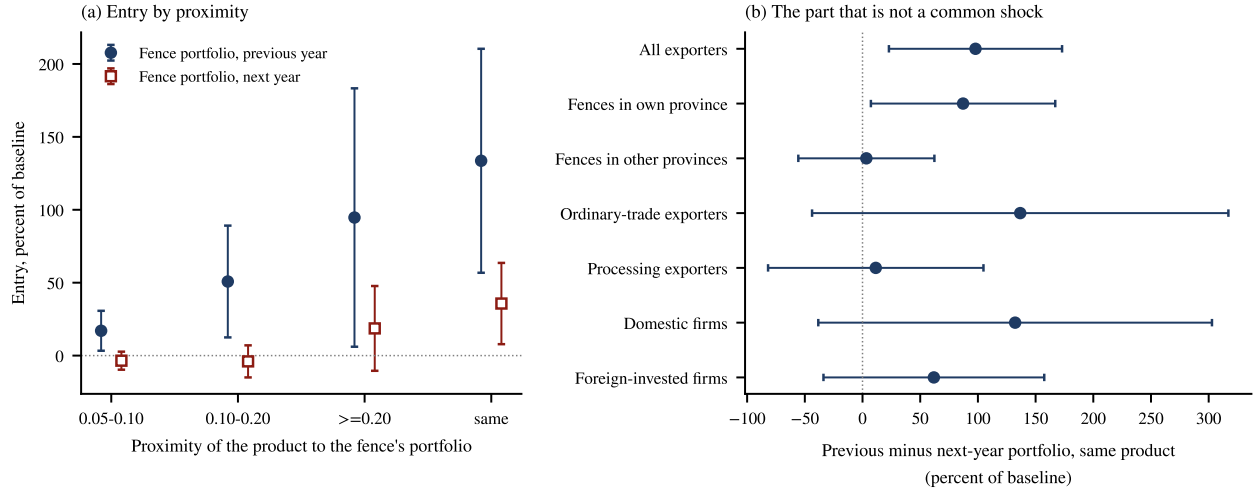


Figure A4: Entry of non-fenced exporters into new products, all splits. (a) By the product's proximity to what fenced firms within 100 km exported in the previous year and in the next year: percent of the baseline entry rate. (b) Previous-year minus next-year portfolio for the same product, by location of the fenced firms and type of exporter. Equation (2); 95 percent confidence intervals, clustered by nearest zone.

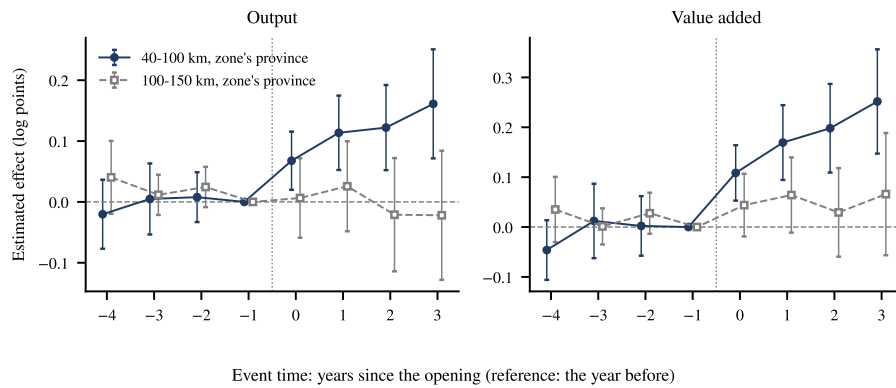


Figure A5: Paths in the hinterland and 100–150 km away inside the zone's province: equation (1) with one term per year; reference: the year before the opening; 95 percent confidence intervals.

B Notation

Table B1: Symbols used in the main text

Symbol	Meaning	Section
<i>Panel A. Design</i>		
c, t	Cell; year	3
y_{ct}	Outcome of manufacturing outside the fence in cell c and year t	3
$g_c, r(c), e$	Year of the first opening within 150 km of cell c ; the cell's distance group; years since the opening	3
$\beta_{re}, \bar{\beta}_r$	Effect in distance group r and year e after the opening; mean of the four post-opening coefficients	3
$\alpha_c, \lambda_{q(c),t}$	Cell effects; year effects of the cell's matched stratum $q(c)$	3
$\mathbf{x}_c, \boldsymbol{\mu}_t$	Baseline characteristics of the cell; their year-specific coefficients	3
χ_{ct}, η_{ct}	Exposure terms for later years and second zones; error with mean one	3
<i>Panel B. Related products</i>		
E_{ipt}	Entry of exporter i into four-digit product p in year t	5.3
$\kappa_{ip,t-1}, \kappa_{ip,t+1}$	Largest proximity of p to the products of fenced firms within 100 km in the previous and the next year	5.3
$b_\ell^{\text{prev}}, b_\ell^{\text{next}}$	Effects of the previous-year and next-year portfolios in proximity bin ℓ	5.3
$\text{Own}_{ipt}, \alpha_{it}, \alpha_{pt}, u_{ipt}$	Effects of proximity to the firm's own exports; firm-year and product-year effects; error	5.3

Table B2: Symbols used in the main text: the model

Symbol	Meaning	Section
<i>Panel C. Model</i>		
$s_j, \tau, \bar{s}, h_b$	Applicant j 's signal; its correlation with productivity; the boundary of the high cell; share of productivity fifth b in the high cell	6
$\iota, \gamma_\iota, \delta, \omega$	Signal cell (high H or low L); the parent zone's score of a cell; share of the low cell admitted; share of plots reviewed	6
r, ν, Λ	Share of applicants admitted; change in the log number of applicants; shadow price of land	6
$\pi_{j\ell}, F, J$	Operating profit of potential entrant j in area ℓ ; fixed cost; pool of potential entrants	6
ζ, θ, σ	Pareto tail of firm sales; Pareto shape of productivity; elasticity of substitution	6
ρ, T_ℓ	Correlation of profits across areas; attractiveness of area ℓ	6
$V_j, S_t, \beta, \mathcal{V}$	Value of entrant j ; survival to age t ; discount factor; value of all potential entrants within 10 km	6
R_i, F_R	Whether incumbent i 's plot is reviewed; cost of relocating	6
$\bar{a}, \bar{K}, p^L$	Land an establishment uses; land the parent zone allocates within 10 km; administered land price	6
$\varepsilon, B_\ell, w_\ell, L_\ell$	Fréchet shape of workers' tastes; amenity; wage; employment	6
$f_p, \kappa, N_p, \Delta \ln f$	Fixed cost of exporting product p ; its elasticity to the number of exporters; number of exporters; change in the fixed cost	6
$\lambda, \mathcal{C}, \mathcal{D}$	Charge on operating profit; transfer and loss under the charge	6
$\mathcal{L}_R, \mathcal{L}^{\text{eff}}, \mathcal{R}_R$	Efficiency cost of rule R ; cost of the ex post efficient allocation; transfer collected by R	7
$W_R, W^*(\bar{K}, V), W^*(\bar{K}, I)$	Value admitted by the estimated rule; by realized value per hectare; by value predicted at application	7

C Policy and institutions

This appendix documents the policy behind Section 2: which zones were approved and when, how a zone’s opening is dated, who is admitted to a fence, where a fence is placed, which customs rules govern it and how they changed, how the EPZ compares with other zone types, what the 2005 extension of carry-over did, and which level of government decides.

C.1 Origins and approvals

Export processing zones (EPZs) are a customs special supervision zone created by the State Council to concentrate processing-trade activity under unified customs supervision and to curb smuggling that scattered processing arrangements had made hard to police.⁹ They are the oldest and most common form of special economic zone: most of the roughly 5,400 zones operating in more than 140 economies in 2019 offer duty-free processing for export behind a customs fence (UNCTAD 2019; Farole 2011). By 2000 processing trade, imported inputs assembled for re-export, made up more than half of China’s exports but was scattered across thousands of bonded factories, each separately inspected and bonded.

The State Council approved the first wave of 15 zones on April 27, 2000: Beijing Tianzhu, Tianjin, Dalian, Hunchun, Yantai, Weihai, Kunshan, Suzhou Industrial Park, Songjiang, Hangzhou, Xiamen, Shenzhen, Guangzhou, Wuhan, and Chengdu. Further approvals followed in 2001–2003 (24 zones) and 2005–2006 (19 zones), and one zone each was approved in 2010 (Hefei) and 2011 (Jinggangshan), for 60 directory entries in all. A zone’s planned area was capped at 3 km²; zones that grew beyond it received a separately approved second area, which is why several zone names carry “and Area B.” One entry, Jinqiao, duplicates another zone under the name of an older development zone: its directory entry dates to a 1990 development-zone designation rather than to a customs-registered EPZ, and the zone itself appears separately as the Jinqiao South Area. The analysis therefore uses 59 zones, of which 52 had opened by 2007 (Appendix Table E1 lists them).

C.2 From approval to customs operation

Approval by the State Council and the start of customs supervision are distinct dates. A prefecture applied through its province and the State Council approved. The host prefecture then built the fence, a customs office dedicated to the zone with round-the-clock supervision, and the infrastructure inside; customs and other central agencies inspected the zone jointly

⁹General Office of the State Council (2002); see Kee and Tang (2016) and Koopman et al. (2012) for the broader processing-trade regime that EPZs sit inside.

before it began operating. Shenzhen, for example, was approved in the first wave but its zone was accepted into customs operation only on March 31, 2001, and Tianjin's on June 29, 2001. Each zone received its own customs district code, so a firm legally inside a fence is identified by its customs registration code rather than by its address (Appendix D.3).

The paper dates every opening by customs operation. A zone's opening year is the year of its official customs acceptance, counted from the following year when acceptance falls in the second half of a year; an official acceptance date is recorded for 36 of the 59 zones. For the remaining 23 zones the opening year is the approval year plus two, the median lag between approval and acceptance among zones with a recorded date. The median zone began operating 2 years after approval (Figure C1), and approval itself set off construction and investment promotion, so approval and operation are not interchangeable timing conventions. Appendix Table E1 reports for each zone which kind of date it has.

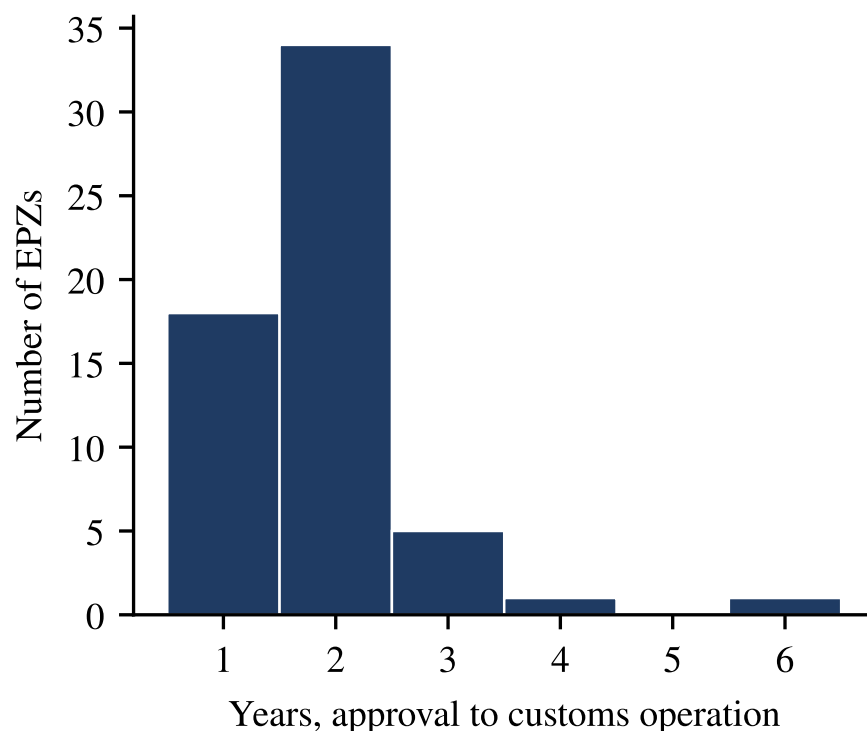


Figure C1: Years from State Council approval to customs operation

Notes: 59 EPZs; operation is the official customs acceptance year where available (36 zones), otherwise approval plus two years, so the lag is two years by construction for the zones without a recorded acceptance date. Median 2 years.

C.3 Investment promotion, firm admission, and who is inside the fence

Once customs accepted the zone, the host prefecture’s zone administration recruited firms into the fence; investment promotion, like land and infrastructure, is the host prefecture’s own responsibility (Appendix C.10). The founding customs order allowed three kinds of firms inside: export processors, warehousing firms serving them, and transport firms licensed to move goods in and out of the zone. The resulting activity is concentrated and foreign: among firms with customs records inside an EPZ, foreign-invested firms account for 99 percent of fenced exports in 2000–2006, and processing with imports, in which the zone firm itself owns the imported inputs and the exported output, as opposed to pure assembly on a foreign principal’s account, accounts for 100 percent of fenced processing exports.

Admission rules broadened over time. The founding customs order restricted zone firms to export processing only, unchanged through a 2011 revision. Successive entry guidelines in 2012, 2018, and 2021 progressively widened the menu of admissible activity to include bonded logistics, research, testing and repair, entrepôt trade, domestic sales, and processing on commission for firms outside the fence, classifying admissible investments by the combination of input sources and output destinations that fits the tax regime; the 2018 guideline, for instance, lists investments using only domestic inputs as admissible. None of the guidelines conditions entry on local sourcing or on linkages with local firms.

If the EPZ merely relocated the processing firms a development zone would host anyway, the firms inside should look like processing exporters outside it. Table C1 compares fenced exporters with processing-trade and ordinary-trade exporters in the same customs districts. By firm count, 75 percent of fenced exporters are foreign-invested, close to the 81 percent among processing exporters outside and far above the 28 percent among ordinary-trade exporters; weighted by exports, fenced firms are almost entirely foreign-invested. What sets the fence apart is organization, not ownership: processing with imports is 100 percent of fenced processing exports against 76 percent outside. Fenced firms are not selected on productivity: their mean within-industry TFP percentile in their first four operating years is 0.481, against 0.503 for processing exporters outside. And they leave little locally. The wage bill of the fenced firms the firm survey records is 1.1 percent of the median zone’s fenced exports, a lower bound because the survey records only some of the fenced exporters; relative to those firms’ own exports, wages are 6 percent in the median zone. The domestic value added ratio (DVAR) of fenced exports is in Table 1. The industry mix of the fence depends on the weighting: electronics is 87 percent of fenced exports, 21 percent in the median zone, and 55 percent of fenced firms on a broad definition (Appendix C.8).

Table C1: Who is inside the fence

	Fenced exporters	Outside the fence, processing trade	Outside the fence, ordinary trade
Foreign-invested (% of firms)	75	81	28
Main export in HS chapter 84, 85, or 90 (% of firms)	55	31	26
Processing-with-imports share of processing exports, 2000–2006 (%)	100	76	–
Median export value (US\$10,000)	41.6	38.6	14.9
Within-industry-year TFP percentile, own first four years (mean)	0.481	0.503	0.533
Wage bill / exports, first four years (%)	1.1	7.2	18.8

Notes: Customs data, 2000–2011. Fenced exporters: firms whose registration code places them inside an EPZ. The two comparison groups are exporters in the same customs districts that are in no special customs zone, split by whether processing is at least half of their exports. Each firm enters once, in its first year in the data. The first two rows count firms; the processing-with-imports row is export-weighted and uses firms first observed in 2000–2006, the years in which customs separate the two processing regimes. TFP percentile: mean within-industry-year percentile of fenced firms matched to the firm survey, production function estimated by the control-function method. Wage bill over exports: for fenced firms, the wage bill of the firms matched to the firm survey over all of the zone’s fenced exports, median across zones, which is a lower bound on the fence’s wage share because unmatched firms’ exports enter the denominator but not their wages; for the comparison groups, over the firms’ own exports. “–”: not available for the comparison group.

C.4 Siting inside existing development zones

The founding customs regulation allowed an EPZ only inside an existing development zone approved by the State Council, one EPZ per development zone, with a planned area of at most 3 km². In practice EPZs were placed inside national economic and technological development zones or high-technology zones, with Qingdao and Beihai among the few sited outside one. Of the 60 directory entries, 44 sit inside a parent development zone, 13 adjoin one, and 2 stand alone; the sixtieth is the duplicate entry of Appendix C.1.

Land, investment promotion, and infrastructure for the EPZ are the host prefecture’s responsibility, so an EPZ occupies development-zone land and admission capacity that the host prefecture could otherwise have allocated to other firms: plots, entry approvals, and administrative attention come out of the same allocation. This is the institutional basis for treating land next to a fence as an allocation made by the host prefecture (Section 6). Because the customs fence is built inside a pre-existing development zone rather than on a bare site, distinguishing a newly established EPZ from the mere conversion, renaming, or later revocation of an existing special-zone designation matters for dating an opening (Appendix D.4).

C.5 Customs rules and later reforms

Rules at the founding. Inside the fence, firms imported materials and equipment free of duty and exported without tax, but the founding regulation confined them to export processing: ordinary trade, entrepôt trade, and retail were prohibited, and output could not be sold on

the domestic market; the prohibition survived the 2011 revision. Deep-processing carry-over, the sale of fenced components to processing firms outside the fence, was piloted only in the Kunshan and Songjiang zones in 2002 and extended to all zones by General Administration of Customs Order No. 126, effective May 1, 2005, the only reform inside the firm-survey window that identifiably opened a channel between zone and non-zone firms. A firm subcontracting a stage of production to a supplier outside the fence had to post a bond equal to the tariffs and import value-added tax that would otherwise have been due on the subcontracted materials. Domestic materials bought by zone firms qualified for export rebates only under a 2008 rule, and only for listed products. The 2007 deposit requirement on processing trade in restricted products, which applied to processing firms elsewhere, did not apply inside customs special supervision zones. The test of the 2005 extension is in Appendix C.9.

Later reforms. The customs regime was not static. Between 2002 and 2019 the central government issued a sequence of rules that progressively lowered the cost of transactions between firms inside a zone and firms outside it (Table C2). Two features of the sequence matter for empirical work. First, the reforms that most directly open the fence—integration into comprehensive bonded zones, value-added-tax general-taxpayer status for zone firms, and selective tariffs on domestic sales—date from 2015 or later. Second, only two reforms change the rules within the period covered by firm-level customs records with registration codes (2000–2016): the 2005 national extension of carry-over, and the conversion of individual zones into comprehensive bonded zones, which occurred zone by zone rather than all at once. The comprehensive bonded zones that absorbed the EPZs numbered 168 in 2024 and handled about a fifth of China’s foreign trade (General Administration of Customs of China 2025).

No central document diagnoses weak local linkages of export processing zones as such: the recurring official diagnosis of zones through 2011–2012 concerns land use, operating returns, and the proliferation of zone types, and local linkage enters policy documents as an objective only from 2011–2012. Official statements in the same period also assert that processing trade had already “driven the development of supporting industries,” citing a rise in domestic purchases and value added from 32 to 44 percent of processing exports between 2002 and 2012; that ratio is measured by place of production and includes foreign-owned suppliers operating in China, so it is the domestic value added concept of Kee and Tang (2016) and Koopman et al. (2012), not a measure of local firms’ capabilities.

The official *Catalog of China’s Development Zones* lists every zone with its approval date and tracks the conversion into comprehensive bonded zones: the 2006 edition lists 58 export processing zones; the 2018 edition lists 135 special customs zones, in which zones that had been converted appear under their comprehensive-bonded-zone name and approval date, and 27 export processing zones appear unchanged. Matching the two editions by city

Table C2: Rules governing transactions across the fence of export processing zones, 2000–2020

Year	Document	Content
2000	Customs General Administration Order 81 (revised 2003, 2011)	Zone firms may only conduct export processing; ordinary trade, entrepôt trade, and retail are prohibited. The prohibition is unchanged in the 2011 revision.
2002	State Council General Office letter [2002] 64	Pilot of deep-processing carry-over (bonded sales of intermediate goods from zone firms to processing firms outside the fence) in the Kunshan and Songjiang zones.
2005	Customs General Administration Order 126	Carry-over extended to all export processing zones from May 1, 2005.
2008	Ministry of Finance, Customs, and Tax Administration notice [2008] 10	Listed domestic inputs purchased by zone firms regain export rebates when they enter the zone.
2011	Ministry of Commerce and five ministries, [2011] 448	Processing trade described as of “low growth quality and returns”; zones instructed to attract “large firms with strong capacity to drive local supporting industries.”
2012	State Council [2012] 58	First stand-alone task to “cultivate supporting capacity outside the zones” and to “bring qualified firms into processing-trade production and supply chains”; zones with low land use and poor performance to be rectified.
2015	State Council General Office [2015] 66	Integration of special customs zones into comprehensive bonded zones; zone firms allowed to take processing orders from firms outside the fence.
2016	Tax Administration, Finance, Customs announcement 2016 no. 65 (extended 2018, 2019)	Value-added-tax general-taxpayer status for zone firms, starting with seven zones: purchases from domestic suppliers outside the fence become creditable.
2016	Finance and Customs [2016] 40; announcement 2020 no. 20	Selective tariffs on domestic sales of zone output, extended to all comprehensive bonded zones in 2020.
2019	State Council [2019] 3	Twenty-one measures, including processing on commission for firms outside the fence.
2020	Customs and five ministries, performance evaluation rules	The only quantitative linkage indicator (“radiation and service”: second-line trade with the rest of China) receives 10 percent of the score.

Notes: Document titles are translated; the 2009 functional expansion of export processing zones (bonded logistics, research and development, testing, and repair) is documented indirectly in the 2011 and 2012 texts and its originating document number is omitted.

and name gives the conversion date of each zone; zones whose successor cannot be identified unambiguously are treated as unmatched. By 2024 no zone of the export-processing type remained in official counts.

C.6 Five zone types compared

Table C3 sets the EPZ beside the four other zone types a Chinese prefecture could host, and Table C4 adds each type's approval authority and main preferences. Three points qualify them. First, national economic and technological development zones and high-technology zones are labels for bundles of preferences whose content varied across places and years; the rules we can document from primary legal sources are income-tax rates, 15 percent for productive foreign-invested firms inside a national economic and technological development zone (1991–2007) and for certified high-technology enterprises inside a national high-technology zone (1991–2006), and each applies to a firm inside the zone's legal boundary that meets the stated conditions. These zones are not customs special supervision zones, so no customs rule separates their firms from the rest of the economy; their firms sell at home and buy from and subcontract to local firms without customs restriction. Second, the customs special supervision zones form a sequence: bonded zones from 1987, EPZs from 2000, bonded logistics parks and bonded ports in the mid-2000s, and comprehensive bonded zones from the Suzhou Industrial Park pilot of December 2006. A 2012 State Council guideline made the comprehensive bonded zone the only type for new special customs zones, and the 2015 integration plan converted the existing EPZs zone by zone (Figure C2). Third, the comprehensive bonded zone reversed the EPZ's defining restrictions in stages (Table C2) and added a performance evaluation in 2020 under which a zone graded lowest for two consecutive years and ranked among the bottom five nationally starts an exit procedure; the only quantitative linkage indicator in that evaluation measures goods moving between the zone and the rest of China and carries a tenth of the score.

Among the types whose rules we can document, the EPZ is the one that both confined its firms to export processing and restricted their dealings with firms outside. The comprehensive bonded zones that absorbed the EPZs reopened those dealings step by step: processing orders from firms outside, creditable purchases from domestic suppliers, and domestic sales at selective tariffs. Neither the EPZ rules nor the later admission guidelines condition entry on local sourcing.

Table C3: Five zone types a Chinese prefecture could host

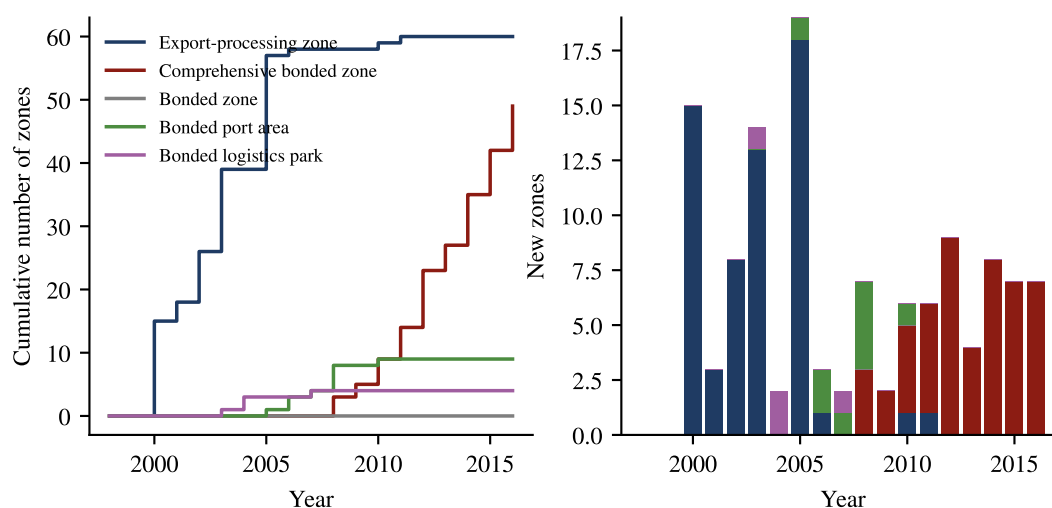
Zone type (first year)	Customs line	Sales to the domestic market	Transactions with firms outside	Siting and admission
Economic and technological development zone (1984)	None: not a customs special supervision zone	Unrestricted (no customs line)	Unrestricted (no customs line)	—
High-technology development zone (1988)	None: not a customs special supervision zone	Unrestricted (no customs line)	Unrestricted (no customs line)	—
Bonded zone (1987)	Yes: bonded warehousing, processing, and trade	—	—	—
Export processing zone (2000)	Yes: dedicated customs office, round-the-clock supervision; export processing only	No: general trade and retail prohibited; selective-tariff pilots in a few zones from 2016	Restricted: carry-over sales to outside processors from 2005 (two pilots in 2002); outward processing only against a bond; rebates on listed domestic inputs from 2008	Inside a State-Council-approved development zone, one per zone, up to 3 km ² ; export processors and the warehousing and transport firms serving them
Comprehensive bonded zone (2006)	Yes: bonded processing, logistics, research, testing, and repair	Yes, paying duties on entry; selective tariffs in all zones from 2020	Processing orders from outside firms (2015, 2019); creditable purchases from domestic suppliers (2016 pilot)	The only type for new zones since 2012; EPZs converted from 2015; projects screened on input sources and output destinations

Notes: National-level zones, all approved by the State Council (development and high-technology zones also exist at the provincial level). First year: earliest approval year of a zone of that type in the official Catalog of China's Development Zones; for comprehensive bonded zones, the Suzhou Industrial Park pilot (December 2006). "Unrestricted (no customs line)": development and high-technology zones are not customs special supervision zones, so no customs rule limits these transactions. "—": no rule we could document from primary sources. No documented admission rule conditions entry on local sourcing. Approval and main preferences: Table C4; later rules: Table C2.

Table C4: Approval and main preferences of the five zone types

Zone type (first year)	Approval	Main preferences for firms inside
Economic and technological development zone (1984)	State Council	Tax, land, and approval preferences varying by place and year; e.g., 15% income tax for productive foreign-invested firms (1991–2007)
High-technology development zone (1988)	State Council	Same kind of bundle; e.g., 15% income tax for certified high-technology firms (1991–2006)
Bonded zone (1987)	State Council	Bonded warehousing, processing, and trade behind a customs fence
Export processing zone (2000)	State Council, on application through the province	Duty-free imports of materials and equipment; tax-free exports; export processing only
Comprehensive bonded zone (2006)	State Council, zone by zone	Bonded processing, logistics, research, testing, and repair; general-taxpayer VAT status piloted from 2016

Notes: National-level zones; development and high-technology zones also exist at the provincial level, approved by provinces. First year: earliest approval year of a zone of that type in the official Catalog of China's Development Zones; for comprehensive bonded zones, the Suzhou Industrial Park pilot (December 2006). Bonded zones and EPZs were exempt from the 2007 deposit on processing trade in restricted products.

**Figure C2:** Special customs supervision zones by type and year

Notes: Zone directory. EPZs are identified by name. Left: cumulative number of zones; right: new zones per year. Comprehensive bonded zones absorbed most EPZs after 2015.

C.7 Where China’s exports were registered

The fifth digit of a customs registration code records the kind of zone in which a firm is registered. Pooling all exports over 2000–2011, firms registered in no designated zone shipped 69.8 percent of China’s exports. Firms in national economic and technological development zones shipped 9.4 percent, special economic zones 6.1 percent, EPZs 5.8 percent, national high-technology zones 4.1 percent, bonded zones 3.4 percent, comprehensive bonded zones and bonded ports 0.5 percent, and bonded logistics parks 0.2 percent; the remaining 0.7 percent carry no zone code. All customs special supervision zones together account for 10.0 percent. The EPZs were thus one instrument for concentrating processing trade, not the place where most of it happened: the fences shipped a small minority of national exports throughout (Figure A1 and Figure C3).

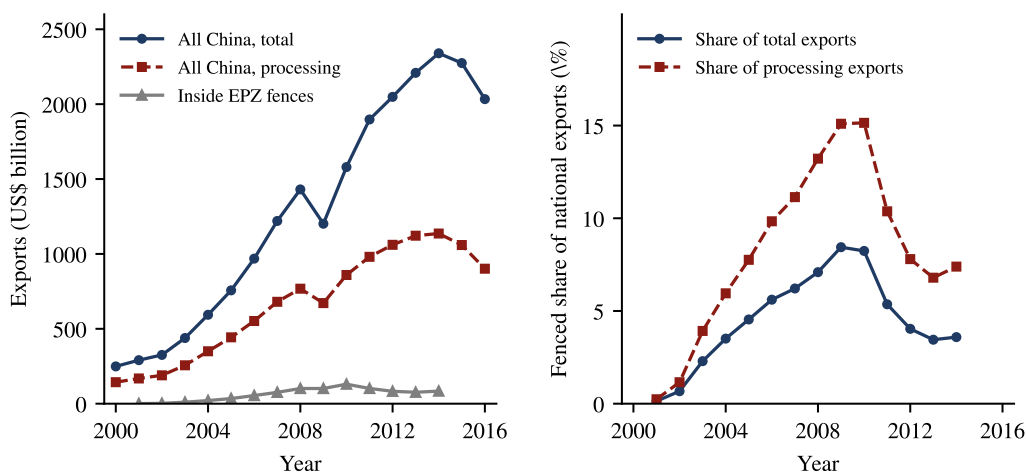


Figure C3: China’s exports and exports from inside EPZ fences, 2000–2016

Notes: Fenced exports are those of firms whose customs identifier marks an EPZ in the year of the record (2001–2014). The fall after 2010 is mostly recoding: as zones were converted into comprehensive bonded zones, their firms re-registered under that zone type’s identifier (between 2010 and 2011, 130 to 102 billion US dollars under the EPZ identifier against 4.6 to 53 billion under the comprehensive-bonded-zone identifier). Processing exports are total exports minus ordinary trade in every year.

C.8 The fence’s industry mix: three measures

The industry composition of fenced firms is used twice in the paper: to describe which industries they are in, and to define their suppliers in the input–output analysis (Appendix D.5). Products are mapped from six-digit HS codes to Chinese industries and then to the 42 sectors of the 2002 input–output table; a manual rule at the four-digit HS level covers the few codes the concordance misses. Electronics is the sector “communication equipment, computers, and other electronic equipment,” which contains computers and their parts (HS 8471 and 8473)

and the telecommunications, audio-visual, electronic-component, and semiconductor headings of chapter 85 (HS 8517–8529, 8534, 8540–8542); general and special-purpose machinery, office machinery, and electrical machinery are separate sectors.

Three measures answer different questions. (i) By export value: weighted by exports and pooled over all fenced firms in 2000–2006, electronics is 87 percent of fenced exports. (ii) Zone by zone: over each zone’s first three operating years, among the 37 zones whose fenced exports can be assigned to a named zone, the median zone’s electronics share is 21 percent, 14 zones have more than half their fenced exports in electronics, and 9 export none. (iii) By number of firms: the share of fenced firms whose main export is in HS chapters 84, 85, or 90, a broad definition that includes general machinery and instruments, is 55 percent (Table C1). The export-weighted share is high because most of the largest fences, the hubs, are electronics fences; the median zone is not an electronics enclave, and a statement about the fence as a whole describes the hubs. None of these product-based measures is affected by the 2003 revision of the Chinese industry classification (Appendix D.7).

C.9 The 2005 extension of carry-over

Were the zones enclaves because of the rules, or because of what local firms could do with the fence’s products? The rules changed once inside the firm-survey window. Deep-processing carry-over, the transfer of fenced output to processing firms outside the fence for further processing and re-export, not general domestic-market access for the fence’s products, was permitted from 2002 in two pilot zones, Kunshan and Songjiang, and extended to all EPZs in May 2005. The reform opened the forward linkage from the fence to downstream users. It did not change the terms on which local suppliers sold into the fence: domestic inputs bought by zone firms regained export rebates only under a 2008 rule, and only for listed products. Downstream user industries—general and special equipment, transport equipment, electrical machinery, and instruments, which each use at least 0.02 units of the fence’s products per unit of output (Appendix D.5)—should have gained relative to other industries within 20 km of zones already in operation if local processors could use the fence’s components; upstream industries, on which the reform did not act, serve as a within-location comparison. Table 1 shows the other side of the reform: the domestic-sales share of the fenced firms did not move after 2005.

Table C5 shows that relaxing the carry-over restriction generated no detectable short-run expansion of eligible downstream industries over the 2005–2007 post-reform window available in the firm survey: for employment the estimates rule out increases above 10 percent (output: upper bound 23 percent). Relative to other industries, output of downstream users within 20

Table C5: The 2005 extension of carry-over transfers

	(1)	(2)	(3)	(4)
	Extension, 2005	Extension, excl. 2005	Placebo: bonded zones	Pilot zones, 2003
<i>Panel A. Downstream user industries</i>				
Output	−0.067 (0.140)	−0.083 (0.150)	0.095 (0.138)	0.029 (0.155)
Employment	−0.026 (0.061)	−0.048 (0.076)	0.127 (0.106)	0.227 (0.172)
Export delivery value	−0.220 (0.116)	−0.257 (0.122)	−0.220 (0.082)	−0.245 (0.195)
<i>Panel B. Upstream supplier industries</i>				
Output	−0.073 (0.108)	−0.096 (0.120)	−0.007 (0.145)	−0.046 (0.106)
Employment	−0.076 (0.085)	−0.065 (0.093)	0.056 (0.086)	−0.018 (0.135)
Export delivery value	0.088 (0.130)	0.053 (0.147)	−0.103 (0.136)	0.133 (0.157)
<i>Panel C. Electronics</i>				
Output	−0.105 (0.161)	−0.138 (0.172)	0.098 (0.136)	1.123 (0.155)
Employment	0.171 (0.151)	0.155 (0.166)	0.283 (0.148)	0.527 (0.250)
Export delivery value	−0.076 (0.147)	−0.133 (0.154)	0.062 (0.111)	1.048 (0.159)
Treated grid cells	267	267	21	24

Notes: Coefficients on $T_c \text{Post}_t \mathbb{1}[k]$ for each industry group k in a Poisson triple difference with cell $\times$ group, cell $\times$ year, and group $\times$ year fixed effects, 1999–2007. Treated cells lie within 20 km of an EPZ operating by 2004, excluding the two pilot zones; comparison cells are those around special customs zones that open later, with no special customs zone within 40 km before 2008 and one by 2013. Column (2) drops the transition year 2005. Column (3) treats cells near 1990s bonded zones, to which the 2005 rule did not apply. Column (4) treats cells near the two pilot zones with 2003 as the first post year. Downstream users: industries with direct requirements of the fence’s products of at least 0.02 per unit of output. Export delivery value is reported in the firm survey. Standard errors clustered by prefecture in parentheses.

km of operating zones changes by -0.067 (0.140) and employment by -0.026 (0.061). Their export delivery value falls (-0.220 , s.e. 0.116), but by the same amount near bonded zones, where the reform did not apply (-0.220 , s.e. 0.082); the decline reflects a common trend in how processing exporters report, not the reform. The event study in Figure C4 shows no break in 2005.

The pilot zones show larger point estimates for downstream employment (0.227, s.e. 0.172) and a large relative expansion of electronics after 2003. Two zones in one of the densest electronics clusters in China cannot separate the pilot rule from the scale of foreign investment that arrived there at the same time, and we do not read these estimates as the effect of

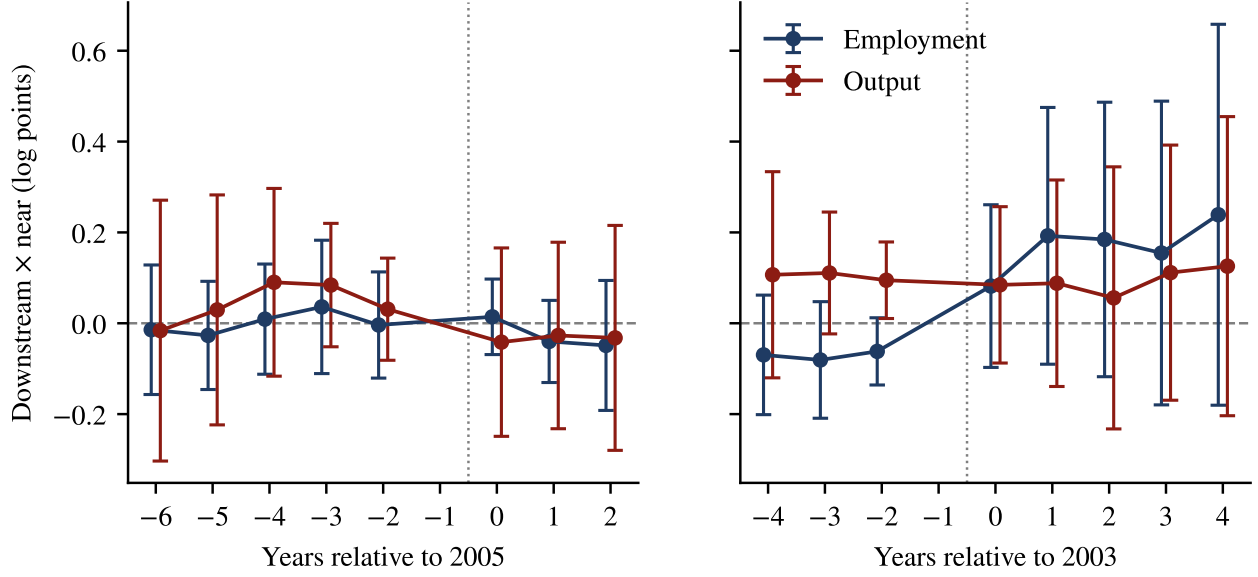


Figure C4: Downstream industries around the carry-over reform

Notes: Coefficients on treated cell $\times$ year $\times$ downstream industry from the triple difference in Table C5. Left: all operating zones except the pilots, reference year 2004. Right: Kunshan and Songjiang, reference year 2002. Bars are 95 percent confidence intervals clustered by prefecture.

carry-over.

Before 2005, fenced firms outside the two pilot zones could not transfer components to processing firms elsewhere under bond; once they could, the users did not expand. Regulatory permission was therefore not sufficient to generate forward linkages in 2005–2007: local processing firms that could use the fence’s components did not expand once they were allowed to buy them. This does not mean that regulation never matters for these linkages; it shows that removing this particular restriction was not, on its own, enough. Later reforms that equalized tax treatment inside and outside the fence, and the conversion of EPZs into comprehensive bonded zones after 2015, fall outside the firm-survey window (Appendix C.5).

C.10 The prefecture as the decision unit

In China’s administrative hierarchy, the prefecture-level city is the effective decision-making unit for the policy instruments relevant to a zone: land allocation, investment promotion, most industrial policy, and the fiscal revenue that a zone generates, and the unit along which local officials are evaluated. An export processing zone is proposed and operated by the local government, ordinarily the prefecture, and approved by the State Council; once approved, the zone’s land, infrastructure, and investment promotion are the host prefecture’s responsibility, and the zone’s tax revenue accrues to the host prefecture. Municipalities directly under the central government (Beijing, Tianjin, Shanghai, Chongqing) are a special case: their districts

and counties do not hold the same administrative powers as an ordinary prefecture-level city, so the relocation records treat each municipality as a single prefecture and a single province (Appendix D.6).

A firm’s legal identity is a registration in a specific county-level jurisdiction, and it pays tax where it is registered. Moving a firm’s registration across a prefecture boundary requires changing or re-filing its tax registration; moving it across a provincial boundary ordinarily requires deregistering the firm and registering it anew, which can break the cross-year identifier that links a firm’s records over time (Appendix D.6). By contrast, the channels through which a place-based policy transmits an economic shock across a jurisdictional boundary, commuting, input purchases, and output sales, do not require any change in registration. Migrant labor inflows are a further source of asymmetry: they make local labor supply highly elastic at the scale of an EPZ’s labor demand, so a zone’s effect on nearby wages need not resemble its effect on nearby firm entry or on the allocation of development-zone land.

D Data construction

This appendix describes how the data of Section 3 are constructed and lists the data traps that the paper handles.

D.1 The annual survey of industrial firms

Coverage. The firm-level data are China’s Annual Survey of Industrial Firms, 1998–2007. The survey covers all state-owned firms and all non-state firms with sales above 5 million RMB (Brandt et al. 2012); the paper applies no cut on employment or on any other measure of size. Firms are followed across years using the data provider’s cross-year firm identifier, which links a firm’s records across survey waves under a stable number.

The 2004 census year. The 2004 wave of the survey was assembled from the economic census and contains two kinds of new records: census passers-by, firms that appear in 2004 only, and established firms registered for the first time that remain in the survey afterwards, the census additions. The paper keeps every 2004 record. Firms first recorded in 2004 but founded earlier, the passers-by among them, are not counted as new establishments, because they were founded before the year in which they first appear (below). Appendix Table J2, panel B, removes all firms first recorded in 2004 and founded before 2003 in every year, and Section 4.5 reports that the hinterland’s response does not change.

Entry and exit. A firm is a new establishment in year t if it appears in the survey for the first time in t and its self-reported founding year is no earlier than $t - 1$; the second condition

excludes firms that are new to the survey only because they passed the size threshold or were brought in by the census, rather than because they were newly established. A firm exits in year t if it is present in $t - 1$ and absent in t , and it is assigned to its location in $t - 1$. Exit means leaving the survey, which is not the same as closing: a non-state firm leaves when its sales fall below the threshold, and a firm also disappears from the records when it ceases operating or when its identifier changes. Exits and early entries are not reliable on a file that keeps only firms with exact coordinates before 2004 (Appendix D.7).

Value added and output. The 2004 wave does not report value added. To keep one definition in every year, value added is measured as gross output minus intermediate inputs, both reported in every year including 2004, and set to zero where it would be negative; it is 23 to 24 percent of output in every year from 1998 to 2007. All money values are nominal and are aggregated over the firms of a cell before estimation. In the 2010 wave gross output is stored as zero for every firm rather than as missing; the firm panel used here ends in 2007 and no analysis uses output from 2010.

Industry codes. Analyses that compare industries across years use a single two-digit industry code for each firm that does not change over time, in the 2003 revision of the national industry classification (GB/T 4754-2002). The classification changed in 2003: several manufacturing codes in the tail of the schedule shifted by one digit, so that a firm coded 40 under the pre-2003 classification (“electrical machinery”) corresponds to code 39 under the 2002 classification, while code 40 under the 2002 classification is instead “electronics and telecommunications equipment.” The full correspondence used is $\{40 \rightarrow 39, 41 \rightarrow 40, 42 \rightarrow 41, 43 \rightarrow 42\}$. Firms with any post-2003 record are assigned the mode of their post-2003 codes; firms observed only before 2003 are assigned the mode of their pre-2003 codes after applying this correspondence. Grouping firms by their *current-year* reported code instead, without this harmonization, misclassifies pre-2003 electrical-machinery firms as electronics, because 94.5 percent of firms reporting the old code 40 in a pre-2003 year report code 39 from 2003 onward. The electronics share used as a baseline covariate and the input–output industry groups use the harmonized code. Measures defined within an industry and year, such as productivity relative to the industry-year mean and size fifths within industry and year, use the code the firm reports in that year, which the revision does not affect because each year is coded under a single classification; the product classes of the hinterland analysis are assigned from four-digit industry names.

D.2 Locating firms and zones

Firms. A firm is located by its exact coordinates where its address can be geocoded and otherwise by the centroid of its town or county; the share of firm-years located by exact coordinates rises from 33 percent in 1998 to 90 percent in 2007 (Appendix Table F1). The file of the survey that keeps only firms with exact coordinates is a survivor sample before 2004, and the paper therefore uses all surveyed firms, with centroid locations for the rest (Appendix D.7).

Zones. A zone’s location is constructed, in order of preference, as: (i) the median coordinates of its legally registered member firms under the customs fifth-digit code, provided at least 5 member firms are matched to coordinates and their median distance to that median point does not exceed 15 km; (ii) failing that, an empirical centroid computed from the locations of firms independently attributed to the zone, provided it is based on at least 10 firms with a median spread of at most 5 km; (iii) failing that, a zone-directory “recommended” coordinate; and (iv) failing all of the above, the zone directory’s raw coordinate. This fallback hierarchy privileges coordinates revealed by firms that are legally, rather than merely nominally, inside the fence.

Administrative units. Prefecture-level boundaries are taken from GADM version 4.1, level 2, simplified with a tolerance of approximately 200 meters. Each polygon is assigned to a prefecture by taking the modal administrative code among the firms whose coordinates fall inside it, rather than trusting the polygon dataset’s own labels; the firm-level administrative code agrees with the polygon it falls inside for 99.6 percent of firms.

D.3 Customs data

Coverage. The customs data record transactions at the firm $\times$ product $\times$ destination $\times$ year level for 2000–2016. Not every field covers every year. The trade-regime field, which separates processing with imports from pure assembly, is reported only through 2006, so analyses that use the regime are restricted to 2000–2006, and after 2006 processing exports are measured as exports other than ordinary trade (trap 9 below). From 2012 the records no longer carry the postcode that locates newly registered firms. The analyses of exporters’ product entry (Section 5.3) and of intermediaries use 2000–2007, the years that overlap the firm survey.

Identifying firms inside a fence. Each customs registration code carries a fifth digit that identifies the customs special-supervision status of the firm’s registered location: 1, special economic zone; 2, economic and technological development zone; 3, high-technology zone; 4,

bonded zone; 5, export processing zone; 6, comprehensive bonded zone; 7, bonded logistics park. This fifth digit is a legal fact about where a firm is registered, not an inference from its address or postal code, and is the basis on which a firm is classified as legally located inside an EPZ.

Processing with imports and pure assembly. Customs records distinguish two organizational forms of processing trade. Under *processing with imports*, the exporting firm itself purchases the imported inputs and owns both the inputs and the resulting output. Under *pure assembly*, a foreign principal owns the imported inputs and the output throughout, and the domestic firm performs only the processing step under contract. This distinction is a legal and contractual fact recorded in the trade regime field, not a measure of production technology: two firms performing identical physical transformations can be recorded under either regime depending on who holds title to the goods.

Domestic value added ratio. For a set of fenced firms, the domestic value-added ratio (DVAR) of their exports, as in [Kee and Tang \(2016\)](#), is one minus the ratio of processing imports to processing exports,

$$\text{DVAR} = 1 - \frac{\text{processing imports}}{\text{processing exports}}.$$

Because processing exports also embed domestic wages and profits that are not themselves evidence of local intermediate-input sourcing, DVAR is an upper bound on the share of a fence’s exports actually sourced from local suppliers, and customs records do not identify carry-over transfers to outside firms, so it bounds local intermediate sourcing from above rather than measuring it directly. It can be computed for an individual fence or aggregated across fences. Aggregated over the firms assigned to a named EPZ, using their processing imports and exports in each calendar year, it rose from 0.27 in 2003 to 0.48 in 2006, consistent with the economy-wide rise in the DVAR of Chinese processing exports documented by [Kee and Tang \(2016\)](#). This yearly series is not the measure of Section 2.1 and Table 1, which is computed from all fenced firms over each zone’s first four operating years and reported as the median zone (0.30), the export-weighted average (0.34), and the most generous variant (0.57). The two differ in aggregation, calendar years pooled across zones against each zone’s own first four years, and in definition, the firms assigned to a named zone against all fenced firms, so their levels cannot be compared directly.

D.4 The zone directory

The zone directory records, for each customs special supervision zone, an approval year, an operating (customs-acceptance) date, and a geographic location, together with the zone’s

type: export processing zone, comprehensive bonded zone, bonded port, bonded logistics park, or (plain) bonded zone. EPZs are identified by name and checked against the approval documents, not by the directory’s type field (Appendix D.7). How an EPZ’s opening year is set is described in Appendix C.2; the approval years of other zones are the directory’s own recorded start years. The non-EPZ zones are not the object of study; the later special customs zones enter the land test of Figure O1.

A change in a location’s customs special-supervision status is not always a newly established zone. A site can instead be *converted* from one special-zone type to another, *retained* under a new administrative category, or *renamed*, without a first customs-supervision event actually taking place there; a site’s special-zone status can also later be *revoked*. Because these status changes do not represent a first opening, the land test uses only zones opened on new sites, and conversions, retentions, renamings, and revocations of existing designations are not counted as openings.

D.5 Input–output linkage measures

The fence’s industry mix. Let w_k be the share of sector k of the 2002 42-sector national input–output table in the exports of firms legally registered inside an EPZ, pooled across all zones over each zone’s first three operating years. Fenced firms are identified by the fifth digit of the customs registration code (Appendix D.3), and their HS exports are mapped to input–output sectors. The national mix is used, rather than each zone’s own mix, so that industry groups are fixed before any zone opens and do not depend on what a particular zone later attracted. Electronics is the fence’s own industry and its share depends on the weighting: 87 percent of fenced exports in 2000–2006, 21 percent in the median zone, and 55 percent of fenced firms on a broad product definition (Appendix C.8).

Upstream and downstream intensity. With A the 42×42 matrix of direct requirements from the 2002 table,

$$U_j = (A w)_j, \quad D_j = (w' A)_j. \quad (D1)$$

U_j is the direct input from sector j required per unit of fence output: how much fenced firms need what j sells (backward linkage). D_j is the input of fence products required per unit of j ’s output: how much j needs what fenced firms sell (forward linkage). Both are mapped from input–output sectors to two-digit industries of the 2003 national classification, and industries are assigned to firms by the time-invariant harmonized code of Appendix D.1.

Industry groups. Electronics and telecommunications equipment (two-digit code 40) is the fence’s own industry. It is treated as a separate group and excluded before any quantile of U_j

or D_j is taken. The groups are:

- *Suppliers*: industries in the top quartile of U_j (excluding electronics). These are the supplier industries of Section 5 (Appendix G). Where the 2005 reform is analyzed, industries classified as downstream users are removed from this group.
- *Downstream users*: industries with $D_j \geq 0.02$ (general equipment 35, special equipment 36, transport equipment 37, electrical machinery 39, and instruments 41). This group is used only in the analysis of the 2005 reform (Appendix C.9), which acted on forward linkages.
- *Electronics*: code 40.
- *Other*: all remaining manufacturing industries, the comparison group in that analysis.

D.6 Firm relocation records

The firm relocation records cover county-to-county moves of above-scale manufacturing firms for 1999–2007, with 9,102 candidate moves and 3,982 confirmed moves. A *candidate* relocation is a change in a firm’s recorded county-level administrative code between consecutive appearances in the firm-level data, that is, an origin county-year record and a destination county-year record linked by the same firm identifier with a different county code. A *confirmed* relocation is a candidate that has been independently verified as an actual physical move of the firm’s operations, as opposed to a change in recorded location arising from administrative boundary reclassification or a data-entry correction. Municipalities directly under the central government are treated as a single prefecture and a single province for the purpose of classifying a relocation’s origin and destination (Appendix C.10).

The records have a known limitation. Because a cross-province move ordinarily requires a firm to deregister in its origin province and register anew in its destination province, a firm’s cross-year identifier can fail to survive a cross-province relocation. The records therefore capture within-province moves more completely than cross-province moves: a firm that relocates across a provincial boundary and re-registers under a new identifier will generally not appear in them as a relocation at all, but as an exit at the origin and an unrelated entry at the destination. Appendix L uses the records.

D.7 Data traps and how they are handled

Chinese firm and customs microdata contain structural breaks and coding conventions that can manufacture results. This section lists those that matter for the paper. For each we

state the trap, how it could mislead, how it is handled, and what it would do to a cell-level outcome if left unhandled.

1. *The 2003 revision of industry codes.* *Trap.* The national industry classification was revised in 2003, and several two-digit manufacturing codes shifted by one: code 40 means electrical machinery before 2003 and electronics and telecommunications equipment from 2003 on. *Risk.* Grouping firms by the code they report in each year relabels pre-2003 electrical-machinery firms as electronics, producing a jump in “electronics” near the zones exactly when the fence, itself mostly electronics, arrives. *Handling.* Every firm gets one harmonized two-digit code that does not change over time (Appendix D.1), used wherever industries are compared across years, including the electronics share used as a baseline covariate and the input–output groups. *What it would do.* Left uncorrected, cell-level electronics output would jump in 2003 in the cells that hold the earliest zones, and the supplier groups defined by industry would change composition at the same time.

2. *The 2004 economic census.* *Trap.* The 2004 survey wave was assembled from the economic census and contains two kinds of new records: census passers-by that appear in 2004 only, and established firms registered for the first time that stay in the survey afterwards. *Risk.* Counting both as entrants inflates entry in 2004; dropping the whole year removes legitimate firms and shortens every event window that crosses it. *Handling.* Every 2004 record is kept, but firms founded before the year they first appear are not counted as new establishments, and a robustness check removes all firms first recorded in 2004 and founded before 2003 (Appendix D.1). Because the 2004 wave does not report value added, value added is measured as output minus intermediate inputs in every year. *What it would do.* Counting census additions as entrants would add spurious new establishments in 2004 to every cell that holds firms the census brought in; using reported value added would leave a hole in 2004 that the year effects would absorb only if it were common to all cells.

3. *Output recorded as zero in 2010.* *Trap.* In the 2010 wave of the firm survey, gross output is stored as zero for every firm rather than as missing, while employment is recorded normally. *Risk.* A Poisson regression treats these zeros as real, so any design that reaches 2010 would record a collapse of output in that year. *Handling.* The firm panel ends in 2007 and no analysis uses output from 2010. *What it would do.* Nothing on the reported estimates; it limits how far the firm panel can be extended.

4. *A survivor sample in the geocoded file.* *Trap.* The file of the survey that keeps only firms with exact coordinates is a survivor sample before 2004: most firms in the file in 1998–2002 reappear in 2004 or 2007, far more than in the full survey. *Risk.* Exits before 2004 are almost invisible in the file and appear mainly in the later years, and early entry is affected by the

same selection, so exits and early entry measured on it are unreliable. *Handling.* The paper uses all surveyed firms and locates those without exact coordinates at the centroid of their town or county (Appendix Table F1); exit is reported as a record leaving the survey, not as a closure. *What it would do.* On the survivor file, cell-level counts of exiting firms would be too low before 2004 and would rise afterward for mechanical reasons, whatever happens near a zone.

5. *Where firms and zones are.* *Trap.* Firm locations come from geocoded addresses where these are available and from town or county centroids otherwise, and the official coordinates of several national zones, including the largest EPZ by exports, lie far from where their member firms actually are. In customs records a minority of firms, mostly small and short-lived, report an address and a name that point to different provinces. *Risk.* A misplaced zone puts cells in the wrong distance group, and a firm placed at a centroid is assigned to the cell that contains the centroid, which can differ from the cell of its plant. *Handling.* A zone is located from the median coordinates of its legally registered member firms where enough of them are geocoded, and from the directory only as a last resort (Appendix D.2). Whether a firm is inside the fence is read from its registration code, not from its location. Customs firms whose address and name conflict are flagged, not dropped; they carry a small share of exports. *What it would do.* Cells near the boundary of a distance group can be assigned to the wrong group; the innermost group, 10 km wide, is the most exposed.

6. *Zone types and dates in the zone directory.* *Trap.* The official directory lists 26 of the 60 EPZs, including 8 of the 15 in the first wave, under bonded zones, and for one zone, Caohejing, it records 1992, the year of its parent high-technology park; the EPZ was approved in March 2003 and began operating in March 2004. *Risk.* Splitting EPZs by the directory’s type field compares two arbitrary groups of genuine EPZs and invites a spurious “true versus mislabeled” interpretation; a parent-zone year would date an opening more than a decade too early. *Handling.* EPZs are identified by name and checked against the approval documents; openings are dated as in Appendix C.2, and Caohejing’s approval year is corrected in every table. *What it would do.* Dating Caohejing by the directory year would place its opening a decade before it began operating, and a split by the type field would sort genuine EPZs into arbitrary groups.

7. *Three measures of the fence’s electronics share.* *Trap.* “Share of the fence in electronics” can be computed by export value or by firm count, nationally or zone by zone, and with a narrow or broad product definition. *Risk.* The export-weighted national share, 87 percent, describes the hubs, not a typical zone; read as a typical zone, it would suggest that the fence is an electronics enclave everywhere, and that nearby electronics firms are the natural suppliers

or rivals of every fence. *Handling.* We report three measures: 87 percent by export value, 21 percent as the median zone’s share (with 14 of 37 measurable zones mainly electronics), and 55 percent by number of firms on a broad definition (Appendix C.8, Table C1). The product classification is by HS code and is therefore unaffected by trap 1. *What it would do.* A statement about the electronics fence would be read as a statement about every zone; the input–output groups use the national mix, fixed before any zone opens, and aggregate facts are best reported zone by zone and without the hubs.

8. *Two scopes for the domestic value-added ratio.* *Trap.* The ratio $1 - M/X$ for fenced firms depends on which flows and which firms enter it. The yearly series of Appendix D.3 uses processing imports and processing exports of firms assigned to a named EPZ: 0.27 in 2003, rising to 0.48 in 2006. Counting all imports and exports of every firm registered inside an EPZ, including duty-free equipment and other imports outside the processing regimes, gives 0.20 in 2003; the two firm sets export almost the same amount, so the gap comes from the imports counted. Adding firms of the comprehensive bonded zones and bonded ports that succeeded the EPZs changes nothing before 2007, when they barely traded, but lowers the ratio afterwards: in 2011 it is 0.41 with them and 0.46 without. *Risk.* Comparing ratios across studies, or across the yearly series and the zone-by-zone measure of Table 1, without noting the scope attributes a difference of definition to a difference in the fence. *Handling.* Every ratio is reported with its scope; the paper’s measure uses processing imports and exports only and is treated as an upper bound on local sourcing, since it also includes wages and profits paid inside the fence and customs records do not show carry-over sales. *What it would do.* The processing-only ratio is the higher of the two scopes, so any other scope would leave even less locally.

9. *Identifying fenced exports year by year.* *Trap.* After 2006 customs no longer separate the two processing regimes, and as zones were converted into comprehensive bonded zones, fenced firms re-registered under new codes. *Risk.* A series built from the regime columns stops in 2006, and a series built from a fixed list of fenced firms shows a spurious decline after 2010; either suggests that the zones faded. *Handling.* Fenced firms are identified each year from that year’s registration code, and processing exports are exports other than ordinary trade in every year. The resulting series reproduces the official EPZ export total for 2012 closely; it stops in 2014, before the conversion wave recodes most fenced firms (Figure A1). *What it would do.* Descriptive only; the series plays no part in the cell-level estimates.

E Which zones enter which analysis

Appendix Table E1 lists the 59 EPZs in order of approval with their approval and opening years. The opening year is the year of the zone’s official customs acceptance, counted from the following year when acceptance falls in the second half of a year, for the 36 zones with a recorded acceptance date, and the approval year plus two for the other 23 (Appendix C.2). The approval years follow the State Council documents; the zone directory’s year for Caohejing (1992) belongs to its parent zone and is corrected to 2003. The five hubs are the zones with the largest fenced exports. The last column marks the zones whose fenced exports can be assigned to a named zone in the customs records.

The analyses of the main text use different sets of zones. By 2007, 52 of the 59 zones had opened (Section 2), and the seven that opened later (2008, 2012, and 2013) have no post-opening year in the firm survey. The domestic value added ratio (DVAR) of fenced exports is computed for 32 zones, from the customs records of the fenced firms over each zone’s first four operating years (Table 1). The analysis of new products among non-fenced exporters uses exporters with known locations near 36 zones, with standard errors clustered by the nearest of the 36 (Section 5.3). The land test uses the 49 special customs zones that opened in 2008–2016 on new sites, with no earlier export processing zone, comprehensive bonded zone, bonded port or bonded logistics park within 10 km (Figure O1): 39 comprehensive bonded zones, 4 bonded ports and 6 of the 7 EPZs of Table E1 that opened after 2007.

Table E1: The 59 EPZs: approval, opening, and customs matching

Zone	City	Approval year	Opening year	Opening date	Hub	Fenced exports matched
<i>Approved on April 27, 2000 (first wave, 15 zones)</i>						
Beijing Tianzhu EPZ	Beijing	2000	2001	Official		Y
Sichuan Chengdu EPZ (incl. West Area)	Chengdu	2000	2002	Imputed		Y
Liaoning Dalian EPZ	Dalian	2000	2001	Official		Y
Guangzhou EPZ	Guangzhou	2000	2002	Imputed		Y
Zhejiang Hangzhou EPZ	Hangzhou	2000	2001	Official	Y	Y
Shanghai Songjiang EPZ (incl. Area B)	Shanghai	2000	2001	Official	Y	Y
Guangdong Shenzhen EPZ	Shenzhen	2000	2001	Official		Y
Jiangsu Kunshan EPZ	Suzhou	2000	2001	Official	Y	Y
Jiangsu Suzhou Industrial Park EPZ (incl. Area B)	Suzhou	2000	2001	Official	Y	Y

Continued on the next page

Zone	City	Approval year	Opening year	Opening date	Hub	Fenced exports matched
Tianjin EPZ	Tianjin	2000	2001	Official		N
Shandong Weihai EPZ	Weihai	2000	2001	Official		Y
Hubei Wuhan EPZ	Wuhan	2000	2001	Official		Y
Fujian Xiamen EPZ	Xiamen	2000	2002	Official		Y
Jilin Hunchun EPZ	Yanbian	2000	2002	Imputed		Y
Shandong Yantai EPZ (incl. Area B)	Yantai	2000	2002	Imputed		Y
<i>Approved in 2001–2003 (23 zones)</i>						
Chongqing EPZ	Chongqing	2001	2003	Official		N
Shanghai Jinqiao EPZ (South Area)	Shanghai	2001	2003	Imputed		N
Inner Mongolia Hohhot EPZ	Hohhot	2002	2008	Official		N
Jiangsu Nantong EPZ	Nantong	2002	2004	Imputed		Y
Zhejiang Ningbo EPZ	Ningbo	2002	2004	Official		Y
Hebei Qinhuangdao EPZ	Qinhuangdao	2002	2004	Imputed		Y
Anhui Wuhu EPZ	Wuhu	2002	2003	Official		Y
Jiangsu Wuxi EPZ	Wuxi	2002	2003	Official	Y	Y
Shaanxi Xi'an EPZ	Xi'an	2002	2004	Official		Y
Henan Zhengzhou EPZ	Zhengzhou	2002	2004	Official		Y
Guangxi Beihai EPZ	Beihai	2003	2005	Official		Y
Zhejiang Jiaxing EPZ	Jiaxing	2003	2005	Imputed		N
Jinan EPZ	Jinan	2003	2006	Official		Y
Jiangsu Lianyungang EPZ	Lianyungang	2003	2004	Official		Y
Jiangsu Nanjing EPZ (incl. South Area)	Nanjing	2003	2005	Imputed		Y
Shandong Qingdao EPZ	Qingdao	2003	2004	Official		Y
Shanghai Caohejing EPZ	Shanghai	2003	2004	Official		Y
Shanghai Qingpu EPZ	Shanghai	2003	2004	Official		Y
Shenyang EPZ	Shenyang	2003	2007	Official		N
Jiangsu Suzhou New & Hi-Tech Zone EPZ	Suzhou	2003	2005	Imputed		Y
Xinjiang Urumqi EPZ	Urumqi	2003	2005	Imputed		Y
Weifang EPZ	Weifang	2003	2006	Official		N
Jiangsu Zhenjiang EPZ	Zhenjiang	2003	2004	Official		Y
<i>Approved in 2005–2006 (19 zones)</i>						
Jiangsu Changzhou EPZ	Changzhou	2005	2007	Imputed		N
Hunan Chenzhou EPZ	Chenzhou	2005	2008	Official		N

Continued on the next page

Zone	City	Approval year	Opening year	Opening date	Hub	Fenced exports matched
Fujian Fuqing EPZ	Fuzhou	2005	2007	Official		N
Fujian Fuzhou EPZ	Fuzhou	2005	2007	Official		N
Guangdong Nansha EPZ	Guangzhou	2005	2007	Imputed		N
Guangdong Huizhou EPZ	Huizhou	2005	2007	Imputed		N
Jiangxi Jiujiang EPZ	Jiujiang	2005	2006	Official		Y
Yunnan Kunming EPZ	Kunming	2005	2008	Official		N
Hebei Langfang EPZ	Langfang	2005	2007	Imputed		N
Sichuan Mianyang EPZ	Mianyang	2005	2007	Imputed		N
Zhejiang Cixi EPZ	Ningbo	2005	2007	Imputed		N
Fujian Quanzhou EPZ	Quanzhou	2005	2007	Official		N
Shanghai Jiading EPZ	Shanghai	2005	2007	Imputed		N
Liaoning Shenyang (Zhangshi) EPZ	Shenyang	2005	2007	Imputed		N
Jiangsu Changshu EPZ	Suzhou	2005	2007	Imputed		N
Jiangsu Wujiang EPZ	Suzhou	2005	2007	Official		N
Jiangsu Wuzhong EPZ	Suzhou	2005	2008	Official		N
Jiangsu Yangzhou EPZ	Yangzhou	2005	2007	Imputed		N
Shandong Qingdao West Coast EPZ	Qingdao	2006	2008	Official		N
<i>Approved in 2010–2011 (2 zones)</i>						
Anhui Hefei EPZ	Hefei	2010	2012	Imputed		N
Jiangxi Jinggangshan EPZ	Ji'an	2011	2013	Imputed		N

Notes: Opening year: official customs acceptance (acceptance in the second half of a year counts from the next year), otherwise approval year plus two. Opening date: “Official” marks the former and “Imputed” the latter. Y: yes; N: no. Hub: the five zones with the largest fenced exports. Fenced exports matched: the zone’s fenced exports can be assigned to a named zone in the customs records. The directory’s sixtieth entry, Jinqiao, duplicates another zone under the name of an older development zone and is not listed; its South Area is a separate zone.

F Sample and balance

Table 2 in Section 3 compares cells near future zones with all comparison cells and with matched comparison cells before the openings.

Table F1: How firms are located: share of manufacturing firm-years by location source

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Exact coordinates	0.33	0.38	0.44	0.57	0.63	0.73	0.79	0.89	0.89	0.90
Town centroid	0.36	0.34	0.32	0.24	0.20	0.12	0.08	0.03	0.03	0.02
County centroid	0.31	0.29	0.25	0.19	0.17	0.16	0.13	0.08	0.08	0.07

Firms outside the fence. Fixing every firm at its most precise location in all years leaves the paths within 10 km unchanged (Section 4.1).

G Estimation details

This appendix states how the paper’s estimates are produced: the cells and the exposure variables, the comparison, the estimator, the quantities reported and their standard errors, and the checks of inference, timing and dating that the text refers to. The derivations and estimation details of the admission model are in Appendix P, and the checks with placebo zones and sensitivity to pre-trends in Appendix Q.

G.1 Cells and exposure

The unit is a cell of 0.1 by 0.1 degrees, about 11 by 10 km at China’s latitudes. The 19,149 cells are those in which at least one surveyed manufacturing firm is located in some year between 1998 and 2007. A cell’s outcome in a year is the total over the surveyed manufacturing firms located in it (two-digit industries 13–43), excluding firms identified as inside a fence. A cell without firms in a year has outcome zero and stays in the panel, so every cell enters in every year.

Distances are great-circle distances between a cell’s centroid and a zone’s coordinates. Among the EPZs open by 2007, let g_c be the earliest opening year of a zone within 150 km of cell c and $z(c)$ the nearest zone among those opening in g_c ; cells with no zone within 150 km have $g_c = \infty$. Of the 19,149 cells, 7,976 are exposed and 11,173 never are. The distance d_c to $z(c)$ places the cell in one of seven distance rings: 0–10 km (89 cells), 10–20 (188), 20–30 and 30–40 (610 together), 40–60 and 60–100 (3,132), and 100–150 km (3,957). A zone’s province is the province of the cell nearest to its coordinates. The six distance groups $r(c)$ of equation (1) pool these rings as 0–10, 10–20 and 20–40 km regardless of province; 40–100 and 100–150 km inside the zone’s province; and 40–150 km in another province. A cell keeps the group of its first zone in every year.

Two further sets of terms, collected in χ_{ct} in equation (1), keep every exposed cell-year out of the comparison. Years four and later after the first opening receive one indicator per distance group. When a second EPZ opens later, by 2007, closer to the cell than the lower

edge of its distance ring, three indicators mark the year of that opening, the year after, and all later years; 1,429 cells have such a second exposure. Both sets are estimated jointly with the main terms; no cell-year is dropped.

G.2 The comparison

Each cell belongs to a matched stratum $q(c)$ defined by seven macro-regions (North, Northeast, East, Central, South, Southwest, Northwest), terciles of the log distance to the nearest of 23 major seaports, five bins of the number of surveyed firms in the cell in 1998 (at most one, 2–4, 5–19, 20–99, 100 or more) and four bins of its 1998 output (none, and terciles of positive output); 165 strata are populated, and $\lambda_{q(c),t}$ gives each its own year effects. The bins follow the distribution of manufacturing rather than its quantiles: 79 percent of cells had at most one surveyed firm in 1998, so terciles of firm density or output would split cells with identical values arbitrarily and separate little more than cells with two or more firms from the rest. Within the bins, cells near future zones and their matched comparison cells are close in baseline size (Table 2). The covariates $\mathbf{x}_c$ are the same three baseline measures and the electronics share of the cell’s 1998 output, each standardized and interacted with year indicators for 1999–2007. The 1998 measures are computed from the surveyed firms that can be located by exact coordinates in that year; they rank cells before any opening and are not outcomes. Within a stratum, an exposed cell is compared with never-exposed cells and with exposed cells before their own openings, and the covariate terms absorb differences in trends associated with baseline size, port access and electronics within strata.

G.3 Estimator

Equation (1) is estimated by Poisson pseudo-maximum likelihood. The estimator solves

$$\sum_{c,t} \mathbf{z}_{ct} (y_{ct} - \hat{y}_{ct}) = \mathbf{0}, \quad \hat{y}_{ct} = \exp(\hat{\alpha}_c + \hat{\lambda}_{q(c),t} + \mathbf{x}'_c \hat{\boldsymbol{\mu}}_t + \mathbf{d}'_{ct} \hat{\boldsymbol{\beta}} + \hat{\chi}_{ct}), \quad (\text{G1})$$

where $\mathbf{z}_{ct}$ collects all regressors and fixed-effect indicators and $\mathbf{d}_{ct}$ the exposure indicators. It is consistent whenever the conditional mean is correctly specified, whatever the distribution of y_{ct} (Gourieroux, Monfort and Trognon 1984; Santos Silva and Tenreiro 2006). Three features make it the natural choice here. It handles zeros: half of the hinterland’s cells had no manufacturing above the survey threshold in 1998. It does not require homoskedastic errors, which in log-linear regressions on totals would bias the coefficients. And its coefficients aggregate: $\exp(\beta_{re})$ is the ratio of a group’s expected total at event time e to the total it would have had without the opening, so the level effects reported below add up across cells

and groups. With cell effects, the Poisson model has no incidental-parameter bias in the slope coefficients (Hausman, Hall and Griliches 1984; Wooldridge 1999). The fixed effects are concentrated out by iteratively reweighted least squares with alternating projections. A cell, or a stratum-year, whose outcome is zero in every year carries no information about the coefficients once its own effect is included; the estimator sets such observations aside, which leaves the estimates unchanged.

G.4 Reported quantities and standard errors

The text reports four quantities, all functions of $\hat{\beta}$ and its estimated covariance $\hat{V}$.

1. The *mean effect* of group r , $\bar{\beta}_r = \mathbf{v}_r' \hat{\beta}$, where $\mathbf{v}_r$ puts 1/4 on the four coefficients $\beta_{r0}, \dots, \beta_{r3}$; its standard error is $(\mathbf{v}_r' \hat{V} \mathbf{v}_r)^{1/2}$. In percent, the effect is $100(e^{\bar{\beta}_r} - 1)$.
2. The *level change* of group r over the first four years,

$$\Delta_r = \sum_{e=0}^3 \sum_{(c,t): r(c)=r, t-g_c=e} y_{ct} (1 - e^{-\hat{\beta}_{re}}), \quad (\text{G2})$$

the observed total minus the total predicted without the opening. Its standard error follows from the delta method with gradient $\partial \Delta_r / \partial \beta_{re} = \sum y_{ct} e^{-\hat{\beta}_{re}}$ over the same cell-years.

3. *Sums* of level changes across groups, used to add up the province's distance groups, and *differences* of mean effects between groups, with standard errors from the joint covariance of all the coefficients involved.
4. *Ratios to fenced exports*: a level change of value added divided by the exports of the fenced firms of the same zones in the same years.

Standard errors are cluster-robust by prefecture (329 clusters), with the usual small-sample correction. Prefectures are the governments that hold zones, approve land and collect most local taxes; clustering by prefecture allows arbitrary correlation across the cells of a prefecture and across years.

G.5 Inference with few treated prefectures

Some estimates rest on few treated prefectures: the second wave has 29 cells within 10 km, in nine prefectures. When few clusters are treated, cluster-robust standard errors can understate the sampling variability (MacKinnon and Webb 2017), so for the headline estimates we also compute p-values from the score wild cluster bootstrap with the null hypothesis imposed

(Kline and Santos 2012), which is valid for nonlinear models such as ours. For a hypothesis $H_0 : \mathbf{v}'\boldsymbol{\beta} = 0$ (a mean effect or a difference of two), we write the model so that $\theta = \mathbf{v}'\boldsymbol{\beta}$ is the coefficient of a single regressor a_{ct} , estimate the model with $\theta = 0$ imposed, and form the efficient score of each prefecture p ,

$$S_p = \sum_{(c,t) \in p} \tilde{a}_{ct}(y_{ct} - \tilde{\mu}_{ct}), \quad (\text{G3})$$

where $\tilde{\mu}_{ct}$ are the restricted fitted values and $\tilde{a}_{ct}$ is a_{ct} net of its projection on all other regressors and fixed effects, weighted by $\tilde{\mu}_{ct}$. The statistic is $T = \sum_p S_p / (\sum_p S_p^2)^{1/2}$. Each bootstrap draw multiplies every prefecture's score by an independent weight ω_p from the six-point distribution of Webb (2023), $T^* = \sum_p \omega_p S_p / (\sum_p \omega_p^2 S_p^2)^{1/2}$, and the p-value is the share of 9,999 draws with $|T^*| \geq |T|$. Because the scores are evaluated at the restricted estimate, no model is re-estimated in the bootstrap. Table G1 compares the analytic and bootstrap p-values. The bootstrap widens the uncertainty of the estimates that rest on few prefectures

Table G1: Analytic and wild-bootstrap p-values for the headline estimates

Group	Outcome	Estimate (s.e.)	Treated prefectures	p-value		
				Analytic	Bootstrap (Webb)	Bootstrap (Rademacher)
0–10 km, second wave	New establishments	−0.41 (0.11)	9	<0.001	0.023	0.021
0–10 km, second wave	Output	+0.08 (0.06)	9	0.201	0.275	0.276
0–10 km, second wave	Value added	+0.16 (0.12)	9	0.184	0.266	0.262
0–10 km, second wave	Employment	+0.04 (0.05)	9	0.451	0.479	0.475
0–10 km, all zones	Output	+0.15 (0.03)	25	<0.001	<0.001	0.001
0–10 km, all zones	Value added	+0.21 (0.05)	25	<0.001	0.001	0.002
0–10 km, all zones	Employment	+0.18 (0.05)	25	<0.001	0.005	0.005
0–10 km, all zones	New establishments	−0.08 (0.11)	25	0.459	0.476	0.465
40–100 km, same province	Output	+0.11 (0.03)	119	<0.001	0.002	0.002
40–100 km, same province	Value added	+0.18 (0.04)	119	<0.001	<0.001	<0.001
0–20 km, thick – thin base	Supplier industries' output	+0.22 (0.09)	24	0.015	0.030	0.029

Equation (1). Analytic: cluster-robust standard error by prefecture and normal p-value. Bootstrap: score wild cluster bootstrap with the null imposed (Kline and Santos 2012), Webb six-point weights (Rademacher weights in the last column), 9,999 draws. Treated prefectures: prefectures with at least one cell in the group (for a difference, in either group).

without changing a conclusion of the paper. The fall in new domestic establishments around the second wave, with nine treated prefectures, has an analytic p-value of <0.001 and a bootstrap p-value of 0.023 (0.021 with Rademacher weights), and its production outcomes stay far from significance. The pooled output gain within 10 km keeps a p-value of <0.001 under both, and the supplier-base contrast moves from 0.015 to 0.030. The hinterland's output and value added, which rest on many prefectures, keep bootstrap p-values of 0.002 and <0.001.

G.6 Event paths and tests before the opening

The paths replace the post-opening terms of equation (1) with one indicator for each event time $k = -4, \dots, 3$ except $k = -1$, plus one indicator for $k \geq 4$; the year before the opening and the years more than four years before it form the reference. The pre-opening test is the Wald test that the three coefficients at $k = -4, -3, -2$ are jointly zero, with the cluster-robust covariance (χ^2 with three degrees of freedom; Appendix Table I3).

G.7 Alternative comparisons

Four alternatives to the matched comparison are reported. The plain comparison has cell and year effects only (Appendix H). The bridge adds the matched-stratum year effects and the baseline covariates one at a time (Appendix Table I1). The not-yet-treated comparison replaces the never-exposed cells with cells within 150 km of special customs zones that open after 2007 (later EPZs, comprehensive bonded zones, bonded ports and bonded logistics parks), with distance-group $\times$ year effects; a stricter version uses only the 241 cells within 20 km of such zones and more than 150 km from any zone open by 2007. Binary designs give exposure terms to one distance group only and leave every other cell in the comparison (Appendix Table I2).

G.8 Entry near the fence under each comparison

The pooled effect on new domestic establishments near the fence depends on the comparison more than any other estimate in the paper, and Table G2 traces it step by step. With cell and year effects alone, entry within 20 km falls by -0.21 (0.10). The fall survives macro-region $\times$ year effects and matched strata built on terciles of baseline size (-0.20 (0.10)). It disappears once the comparison also holds baseline size fixed, either through baseline covariates $\times$ year (-0.08 (0.10)) or through strata built on bins of baseline firm counts and output. The pooled fall is therefore a difference between places of different baseline size, which in the 2000s had different entry paths, and not an effect of the zones. The fall around the second wave, whose surroundings had flat paths before the opening, is not of this kind: it holds in the design of the paper and net of its own path before the opening (Section 4.1). Firms with exact coordinates give the same pattern.

G.9 Opening dates

For 23 of the 59 zones, and 21 of the 52 zones open by 2007, no customs acceptance year is recorded and the opening year is the approval year plus two (Appendix C). To check that

Table G2: New domestic establishments near the fence under each comparison

Comparison	All located firms		Firms with exact coordinates	
	0–10 km	0–20 km	0–10 km	0–20 km
Cell and year effects	−0.31 (0.13)	−0.21 (0.10)	−0.33 (0.10)	−0.30 (0.10)
+ macro-region × year	−0.23 (0.13)	−0.23 (0.10)	−0.26 (0.10)	−0.29 (0.10)
+ port-distance × density class × year	−0.21 (0.14)	−0.16 (0.11)	−0.24 (0.10)	−0.24 (0.10)
and baseline covariates × year	−0.03 (0.14)	+0.01 (0.12)	−0.06 (0.11)	−0.07 (0.11)
Matched strata (terciles) × year	−0.20 (0.13)	−0.20 (0.10)	−0.19 (0.11)	−0.23 (0.11)
and baseline covariates × year	−0.08 (0.12)	−0.08 (0.10)	−0.05 (0.10)	−0.09 (0.11)
Matched strata (bins) × year	−0.08 (0.12)	−0.08 (0.09)	−0.03 (0.12)	−0.11 (0.10)
and baseline covariates × year (this paper)	−0.08 (0.11)	−0.07 (0.09)	−0.04 (0.12)	−0.10 (0.10)

Equation (1) with new domestic establishments as the outcome; mean of the first four years after the first opening for cells within 10 and within 20 km of the fence. Rows starting with “+” or “and” add the named controls to the row above; the matched-strata rows replace the region and port-distance effects with stratum × year effects. Terciles: matched strata built on terciles of baseline size (macro-region × port-distance tercile × terciles of 1998 firm count and output). Bins: the strata of this paper (Section 3). Exact coordinates: firms located by their own coordinates rather than by the centroid of their town or county. Standard errors clustered by prefecture.

the estimates do not rest on these imputed dates, we keep every cell and give the cells whose first zone has an imputed date their own exposure terms, so that the reported coefficients come only from zones with an official date (Table G3). Zones with an official date carry most of every distance group, and their estimates are those of the pooled sample. For each headline the official-date estimate has the sign of the pooled one and lies within one standard error of it: new domestic establishments around the second wave −0.31 (0.13), output in the hinterland +0.12 (0.04) and value added +0.18 (0.04). The few cells around zones with imputed dates give noisy estimates of their own, with no common direction.

G.10 The second wave without any one prefecture

The second wave consists of 29 cells within 10 km, in nine prefectures, so a single city could drive its estimates. Removing the second-wave cells of one prefecture at a time, the effect on new domestic establishments stays between −0.49 and −0.37 and the effect on output between 0.04 and 0.11 (Table G4). No prefecture carries the fall in entry or hides a change in production.

G.11 Firm-level measures

A *new establishment* is a firm whose first year in the survey is after 1998 and whose founding year is no earlier than one year before it. *Revenue productivity* (TFPR) is estimated separately

Table G3: Zones with an official opening date

	Output	Value added	Employment	New domestic establishments	Cells
<i>A. Zones with an official opening date</i>					
0–10 km, zones of 2001–02	+0.17 (0.04)	+0.22 (0.05)	+0.34 (0.06)	−0.23 (0.15)	35
0–10 km, zones of 2003–05 (second wave)	+0.08 (0.07)	+0.24 (0.11)	+0.03 (0.06)	−0.31 (0.13)	21
0–10 km, zones of 2006–07	+0.16 (0.03)	+0.14 (0.06)	+0.02 (0.07)	−0.15 (0.23)	18
10–20 km	+0.01 (0.04)	+0.07 (0.05)	+0.03 (0.05)	−0.03 (0.11)	159
20–40 km	−0.03 (0.05)	+0.01 (0.06)	+0.03 (0.05)	−0.15 (0.12)	535
40–100 km, zone’s province	+0.12 (0.04)	+0.18 (0.04)	+0.08 (0.04)	+0.09 (0.09)	2297
100–150 km, zone’s province	+0.00 (0.04)	+0.05 (0.04)	−0.00 (0.04)	+0.04 (0.08)	2334
40–150 km, other provinces	+0.01 (0.06)	+0.01 (0.07)	−0.10 (0.08)	+0.07 (0.24)	1237
<i>B. All zones (opening year imputed for 21 of 52)</i>					
0–10 km, zones of 2001–02	+0.16 (0.04)	+0.23 (0.05)	+0.29 (0.06)	+0.08 (0.21)	40
0–10 km, zones of 2003–05 (second wave)	+0.08 (0.06)	+0.16 (0.12)	+0.04 (0.05)	−0.41 (0.11)	29
0–10 km, zones of 2006–07	+0.16 (0.03)	+0.13 (0.06)	−0.01 (0.07)	−0.01 (0.18)	20
10–20 km	+0.05 (0.05)	+0.10 (0.05)	+0.02 (0.05)	−0.05 (0.11)	188
20–40 km	−0.02 (0.05)	+0.03 (0.06)	+0.03 (0.05)	−0.09 (0.12)	610
40–100 km, zone’s province	+0.12 (0.03)	+0.18 (0.04)	+0.09 (0.04)	+0.10 (0.09)	2709
100–150 km, zone’s province	−0.01 (0.04)	+0.04 (0.04)	−0.00 (0.04)	+0.04 (0.07)	3010
40–150 km, other provinces	+0.00 (0.06)	−0.01 (0.06)	−0.10 (0.07)	+0.07 (0.23)	1370

Equation (1) with separate exposure terms for cells whose first zone has an official customs acceptance year and for cells whose first zone’s opening year is imputed (approval year plus two); only the former are shown, next to the estimate that pools both. Mean of the first four years after the opening; standard errors clustered by prefecture.

Table G4: The second wave within 10 km, leaving out one prefecture at a time

Sample	New domestic establishments	Output	Second-wave cells
All nine prefectures	−0.41 (0.11)	+0.08 (0.06)	29
Without Qinhuangdao	−0.43 (0.11)	+0.07 (0.06)	25
Without Lianyungang	−0.38 (0.11)	+0.07 (0.06)	26
Without Wuhu	−0.42 (0.15)	+0.09 (0.06)	25
Without Qingdao	−0.41 (0.11)	+0.08 (0.06)	27
Without Zhengzhou	−0.37 (0.12)	+0.11 (0.05)	27
Without Beihai	−0.43 (0.11)	+0.08 (0.06)	27
Without Chongqing	−0.39 (0.13)	+0.04 (0.06)	26
Without Xi’an	−0.49 (0.11)	+0.04 (0.07)	24
Without Urumqi	−0.37 (0.11)	+0.09 (0.07)	25

Equation (1) with separate exposure terms by wave for cells within 10 km; each row removes from the sample the second-wave cells within 10 km of the zone in one prefecture. Mean of the first four years after the opening; standard errors clustered by prefecture.

for each two-digit industry: log sales are regressed on log employment, log fixed capital (original value) and log intermediate inputs after removing industry-year means, and TFPR is the residual, so it measures a firm relative to the average of its industry and year. As a revenue measure it combines physical efficiency and price (Foster, Haltiwanger and Syverson 2008). Entrants are ranked among all new domestic establishments of 1999–2007 by this measure, and their counts by fifth form the cell-level outcomes of Section 4.1; size fifths rank entrants by output at entry within industry and year. The average wage is estimated by stacking the wage bill and employment of each cell-year in one Poisson regression with cell $\times$ outcome and year $\times$ outcome effects and every exposure term interacted with an indicator for the wage bill; the interaction is the proportional change in the wage bill relative to employment, with the joint covariance.

G.12 Supplier industries and the supplier-base contrast

Industries are grouped by their links to the fence through the 2002 input–output table (Appendix D): the fence’s own industry (electronics); supplier industries, whose direct input requirement per unit of the fence’s output, weighted by the fence’s national export composition, is in the top quartile, electronics excluded; user industries, in the top quartile of purchases from the fence’s industries; and unrelated industries, the rest. A zone’s supplier base is the 1998–2000 output of supplier industries in the cells within 40 km of it, and zones with a cell within 20 km are divided into terciles of it. The supplier-industry and unrelated-industry outcomes are built from the survey firms with at least 8 employees, located at village level, the firm file used for the input–output analysis; the other cell outcomes use all surveyed firms. Table G5 reports two checks of the contrast in Section 5: whether thick- and thin-base zones’ supplier industries already diverged before the openings, and whether a split by the baseline output of *unrelated* industries produces the same contrast. Before the openings, supplier industries around thick- and thin-base zones moved together: the difference of their mean lead coefficients is -0.02 (0.08) ($p = 0.76$), and the contrast appears only after the opening ($+0.24$ (0.09) in the same regression). The second check is less favorable to a reading that singles out suppliers. Zones with a thick supplier base are also zones with a thick industrial base: the two rankings place 20 of the 29 zones in the same tercile (rank correlation 0.85). Splitting zones by the baseline output of unrelated industries gives a similar contrast in supplier industries ($+0.30$ (0.15)), while unrelated industries fall where their own base was thick (-0.25 (0.10)), the mean reversion expected when zones are split by an outcome’s own baseline. What the data show is that the fence’s supplier industries held up around zones in thick industrial places and declined around zones in thin ones, the opposite of what mean

Table G5: The supplier-base contrast: before the openings, and a split by unrelated industries

Split	Group	Supplier-industry output		Unrelated-industry output	
		Before	After	Before	After
Supplier split	thin	−0.02 (0.04)	−0.15 (0.08)	−0.05 (0.08)	+0.02 (0.10)
	middle	+0.03 (0.07)	−0.05 (0.10)	−0.04 (0.05)	+0.12 (0.11)
	thick	−0.05 (0.07)	+0.08 (0.06)	−0.00 (0.06)	+0.09 (0.06)
	thick minus thin	−0.02 (0.08)	+0.24 (0.09)	+0.05 (0.09)	+0.07 (0.11)
Unrelated split	thin	−0.13 (0.11)	−0.28 (0.15)	+0.13 (0.07)	+0.25 (0.09)
	middle	+0.06 (0.06)	+0.11 (0.06)	−0.11 (0.02)	+0.09 (0.12)
	thick	−0.02 (0.06)	+0.02 (0.05)	−0.01 (0.04)	−0.00 (0.07)
	thick minus thin	+0.11 (0.13)	+0.30 (0.15)	−0.14 (0.07)	−0.25 (0.10)

Equation (1); cells within 20 km of the zone, by tercile of the zone’s baseline supplier base (rows “supplier split”) or of the baseline output of unrelated industries around it (rows “unrelated split”). Before: mean of the coefficients at -4 , -3 , -2 years (reference: the year before the opening) in the event-path version of the equation; after: mean of the first four years after the opening in the same regression. Standard errors clustered by prefecture.

reversion would produce in a split by their own baseline, and that unrelated industries show no such contrast under the supplier split (+0.07 (0.11) in the same regression). They cannot separate a thick supplier base from a thick industrial base.

H The plain comparison

With cell and year effects alone, cells within 10 km show no production gain (output +0.04, 0.05) and a fall in new domestic establishments of 0.31 (0.13), and the second wave contracts (domestic output -0.16 , firms -0.36); the hinterland grows as under the like-with-like comparison (output +0.19). Three facts hold under both comparisons: no gain within 10 km attributable to the openings, the shift of entry away from the least productive and smallest entrants, and an unchanged average wage.

I Comparisons, design and pre-opening tests

A binary design that treats only the cells within 20 km of a zone puts the growing hinterland into its comparison group and lowers the estimate within 10 km by 0.03 to 0.06; a binary design that treats every cell within 150 km averages the response within 10 km and in the hinterland and cannot show where the response is. The second-exposure terms change the estimates by at most 0.04.

Table H1: Manufacturing outside the fence by distance: cell and year effects only

	0–10 km	10–20 km	20–40 km
<i>A. Production</i>			
Output	+0.04 (0.05)	+0.05 (0.05)	−0.01 (0.05)
Value added	+0.05 (0.05)	+0.07 (0.06)	+0.02 (0.05)
Fixed capital	+0.02 (0.06)	+0.10 (0.07)	−0.04 (0.07)
Profits	−0.05 (0.10)	−0.08 (0.08)	−0.03 (0.07)
Taxes	−0.03 (0.07)	−0.02 (0.06)	+0.02 (0.07)
<i>B. Labor</i>			
Employment	+0.09 (0.10)	+0.10 (0.07)	+0.14 (0.06)
Wage bill	+0.08 (0.07)	+0.08 (0.06)	+0.05 (0.07)
<i>C. Firms and exports</i>			
Number of firms	+0.05 (0.09)	+0.12 (0.07)	+0.08 (0.06)
New domestic establishments	−0.31 (0.13)	−0.15 (0.12)	−0.16 (0.14)
Domestic exits	+0.31 (0.12)	−0.05 (0.08)	−0.18 (0.09)
Export deliveries	+0.10 (0.05)	+0.08 (0.10)	+0.03 (0.07)
Exporting firms	+0.01 (0.07)	+0.02 (0.07)	−0.02 (0.08)
Cells	89	188	610

As Appendix Table A1, with year effects common to all cells and no baseline covariates.

Table H2: Cells within 10 km under the two comparisons

0–10 km from the zone	Cell and year effects	Like with like
Output	+0.04 (0.05)	+0.15 (0.03)
Value added	+0.05 (0.05)	+0.21 (0.05)
Employment	+0.09 (0.10)	+0.18 (0.05)
New domestic establishments, all	−0.31 (0.13)	−0.08 (0.11)
smallest fifth at entry	−0.49 (0.21)	−0.53 (0.24)
four smaller fifths	−0.42 (0.14)	−0.23 (0.13)
largest fifth	−0.08 (0.16)	+0.26 (0.16)
Second wave: domestic output	−0.16 (0.03)	+0.05 (0.06)
Second wave: domestic firms	−0.36 (0.10)	−0.19 (0.07)
Pay per worker	−0.00 (0.04)	—
40–100 km, zone’s province: output	+0.19 (0.04)	+0.11 (0.03)

Cells within 10 km (last row: 40–100 km, zone’s province). Size fifths: quintiles of output at entry within industry and year. Second wave: zones opened in 2003–05; domestic firms excluding census additions. Average wage under the like-with-like comparison: 0.00 (0.04).

Table I1: From the plain to the like-with-like comparison, one control at a time

	0–10 km	40–100 km, same province		100–150 km, same province	
	Output	Output	Employment	Output	Employment
Year effects (baseline)	+0.04 (0.05)	+0.19 (0.04)	+0.24 (0.06)	+0.05 (0.04)	+0.15 (0.05)
Macro-region $\times$ year	+0.01 (0.04)	+0.14 (0.04)	+0.09 (0.04)	+0.00 (0.04)	+0.00 (0.04)
Port-distance tercile $\times$ year	+0.04 (0.05)	+0.19 (0.04)	+0.24 (0.06)	+0.05 (0.04)	+0.15 (0.05)
Baseline density tercile $\times$ year	+0.10 (0.05)	+0.18 (0.04)	+0.24 (0.06)	+0.03 (0.04)	+0.15 (0.05)
Baseline output tercile $\times$ year	+0.09 (0.05)	+0.20 (0.04)	+0.24 (0.06)	+0.04 (0.04)	+0.15 (0.05)
Matched stratum $\times$ year	+0.14 (0.03)	+0.11 (0.03)	+0.10 (0.04)	−0.02 (0.04)	−0.01 (0.04)
Matched stratum and baseline covariates $\times$ year	+0.15 (0.03)	+0.11 (0.03)	+0.08 (0.04)	−0.02 (0.04)	−0.01 (0.04)
plus geography $\times$ year	+0.14 (0.04)	+0.09 (0.04)	+0.12 (0.03)	−0.03 (0.04)	+0.02 (0.04)
<i>Comparison = 241 cells near zones opened after 2007 and geography $\times$ year, provinces pooled; columns 3–6 refer to 60–100 and 100–150 km</i>					
Year effects	+0.04 (0.05)	+0.16 (0.04)	+0.20 (0.06)	+0.06 (0.04)	+0.17 (0.05)
Baseline and geography covariates $\times$ year	+0.06 (0.04)	+0.06 (0.04)	+0.03 (0.04)	−0.08 (0.04)	−0.05 (0.04)

Equation (1); rows change only the year effects and the covariates. The last two rows restrict the comparison group to the 241 cells within 20 km of zones that open after 2007 and more than 150 km from any zone open by 2007, with distance groups pooled over provinces. With all cells near later zones (and their not-yet-treated years) as comparison and ring $\times$ year effects, domestic output 40–100 km away in the zone’s province rises by 0.13 (0.04) and value added by 0.18 (0.07).

Table I2: Multi-ring versus binary designs (like-with-like comparison)

	Output	Value added	Employment	New dom. establishments
Distance groups, each with own terms (the paper)	+0.09 (0.03)	+0.14 (0.04)	+0.08 (0.04)	−0.07 (0.09)
Binary: 0–20 km treated, all other cells comparison	+0.06 (0.03)	+0.08 (0.04)	+0.04 (0.04)	−0.07 (0.08)
without second-exposure terms	+0.06 (0.03)	+0.08 (0.04)	+0.05 (0.04)	−0.03 (0.08)
Binary: within 150 km treated, never-exposed comparison	+0.04 (0.03)	+0.10 (0.03)	+0.03 (0.03)	+0.05 (0.06)
Memo: 40–100 km, zone’s province (the paper)	+0.12 (0.03)	+0.19 (0.04)	+0.08 (0.04)	+0.10 (0.09)

First row: the paper’s design with 0–10 and 10–20 km pooled. Binary rows: only the named group carries exposure terms; all other cells, including those 20–150 km from a zone after its opening, enter the comparison.

Table I3: Joint test that the three leads are zero (p-values), like-with-like comparison

	Output	Value added	Employment	Firms	New dom. establishments
0–10 km	0.20	0.17	0.00	0.37	0.86
10–20 km	0.70	0.16	0.74	0.13	0.40
40–100 km, zone’s province	0.89	0.47	0.69	0.91	0.22
100–150 km, zone’s province	0.10	0.19	0.08	0.33	0.08

Equation (1) with one term per year from four years before to three years after the opening, reference: the year before; Wald test of the leads at -4 , -3 , -2 with the clustered covariance.

J The hinterland and robustness

K The hinterland: composition, firms, buyers and robustness

This appendix gives the estimates behind the statements of Sections 5.3 and 4.5 that have no table of their own. Unless a note says otherwise, results are for the ring, the cells 40 to 100 km from the first-opening zone inside its province, from equation (1): “after” is the mean of the coefficients for the first four years after the opening, “before” the mean of the coefficients for the three years before it, and “after minus before” their difference.

K.1 Robustness, balance and composition of the ring

Table K1 reports the response of the ring net of the leads as the comparison is tightened (Panel A), how the ring differs from the cells it is compared with before the openings (Panel B) and what the ring consists of (Panel C). Adding the baseline industry mix leaves the output response at 0.10 to 0.11. Adding the size, rank and urban core of the city keeps 74 to 85 percent of it, and province $\times$ year effects keep 87 percent; with the finer distance controls added, the output response falls to 57 percent of the baseline and the value-added response to 69 percent.

K.2 Who grows

Table K2 classifies the firms of the ring by who controls their paid-in capital (Panel A) and by founding cohort (Panel B). Foreign, private and other legal-person firms hold 48 percent of the ring’s output before the openings and account for 67 percent of the summed contributions; foreign firms founded before 1995 account for 19 percent. Table K3 shows when each type responds (Panel A), splits foreign-invested and domestic firms into electronics

Table J1: Every outcome and distance group

	0–10	10–20	20–40	40–100 SP	100–150 SP	40–150 O
Output	+0.15 (0.03)	+0.05 (0.05)	−0.02 (0.05)	+0.11 (0.03)	−0.02 (0.04)	−0.00 (0.06)
Value added	+0.21 (0.05)	+0.10 (0.05)	+0.03 (0.06)	+0.18 (0.04)	+0.04 (0.04)	−0.01 (0.06)
Fixed capital	+0.11 (0.04)	+0.05 (0.05)	−0.08 (0.08)	+0.15 (0.06)	+0.02 (0.03)	−0.06 (0.05)
Employment	+0.18 (0.05)	+0.02 (0.05)	+0.03 (0.05)	+0.08 (0.04)	−0.01 (0.04)	−0.10 (0.07)
Wage bill	+0.19 (0.04)	+0.02 (0.05)	−0.00 (0.06)	+0.05 (0.04)	−0.14 (0.06)	−0.10 (0.08)
Number of firms	+0.06 (0.05)	+0.05 (0.05)	−0.00 (0.05)	+0.05 (0.03)	+0.03 (0.04)	−0.04 (0.10)
Profits	+0.18 (0.08)	+0.04 (0.07)	+0.05 (0.08)	+0.16 (0.06)	+0.04 (0.05)	+0.04 (0.06)
Taxes	+0.16 (0.05)	+0.04 (0.06)	+0.04 (0.07)	+0.19 (0.06)	+0.01 (0.04)	−0.02 (0.07)
Export deliveries	+0.15 (0.08)	+0.06 (0.07)	+0.00 (0.07)	+0.07 (0.05)	−0.02 (0.06)	+0.14 (0.08)
Exporting firms	+0.11 (0.05)	+0.06 (0.06)	+0.01 (0.07)	+0.03 (0.05)	+0.03 (0.06)	+0.03 (0.09)
New domestic establishments	−0.08 (0.11)	−0.05 (0.11)	−0.09 (0.12)	+0.10 (0.09)	+0.04 (0.07)	+0.07 (0.23)
Domestic exits	+0.13 (0.11)	−0.09 (0.09)	−0.19 (0.09)	−0.09 (0.07)	−0.02 (0.07)	+0.06 (0.12)
Output, domestic firms	+0.10 (0.05)	+0.01 (0.07)	−0.05 (0.07)	+0.11 (0.04)	+0.00 (0.05)	−0.03 (0.05)
Output, foreign-invested firms	+0.12 (0.06)	+0.08 (0.07)	−0.01 (0.06)	+0.10 (0.06)	−0.05 (0.07)	+0.12 (0.13)

Equation (1). SP: zone's province; O: other provinces. Mean of the first four years after the opening; standard errors clustered by prefecture in parentheses.

Table J2: Adding up, census additions, the zone’s own cells, contrasts and the average wage

<i>A. Value added added up over the zone’s province, per RMB of fenced exports (joint standard errors)</i>			
	Near field 0–40 km	Hinterland 40–150 km	Whole province
	+0.81 (0.65)	+1.83 (0.69)	+2.56 (1.29)
<i>B. Firms added by the 2004 census excluded</i>			
	Output	Value added	Employment
0–10 km	+0.14 (0.03)	+0.20 (0.05)	+0.17 (0.05)
40–100 km, zone’s province	+0.10 (0.03)	+0.17 (0.04)	+0.08 (0.04)
<i>C. Within 10 km: cells within 5 km of the zone and cells 5–10 km away</i>			
	Output, all firms	Output, foreign-invested	Output, domestic
0–5 km	+0.12 (0.07)	+0.04 (0.10)	+0.04 (0.06)
5–10 km	+0.16 (0.05)	+0.18 (0.11)	+0.11 (0.05)
<i>D. Differences between distance groups and pay per worker</i>			
	Output	Value added	
40–100 km minus 0–10 km	−0.03 (0.04)	−0.03 (0.05)	
40–100 km minus 10–20 km	+0.07 (0.05)	+0.09 (0.06)	
40–100 km: zone’s province minus other province	+0.12 (0.07)	+0.19 (0.07)	
Pay per worker, 0–10 km	+0.00 (0.04)		

Panel A: sums of the level effects of all distance groups of the zone’s province (0–10, 10–20, 20–40, 40–100, 100–150 km and the rest of the province beyond 150 km, timed by the province’s first opening; comparison: provinces without an EPZ by 2007), divided by fenced exports; standard errors from the joint clustered covariance. Panel B: firms first recorded in 2004 but founded before 2003 removed in every year. Panel C: cells within 5 km of the zone, where fenced firms missed by the customs match would sit, and cells 5–10 km away. Panel D: differences of mean post-opening coefficients with the joint covariance; average wage from a stacked Poisson regression of the wage bill and employment.

and other industries (Panel B) and places the firms relative to development zones (Panel C). Firms inside development zones listed in the catalog hold 6 percent of the ring’s output before the openings and do not grow; the firms around them carry 71 percent of the summed contributions.

K.3 Product classes

Table K4 splits the output response by product class. Ten of the twelve classes respond by 0.06 to 0.23, general and special-purpose machinery is flat, and energy, mining and other industries, which hold 2 percent of output, fall with a large standard error. No class accounts for more than 22 percent of the gain.

K.4 Inside the incumbent firms

Table K5 follows the firms that were in the 2000 survey. Among all of them, sales, fixed capital, employment and intermediate inputs rise together and profit rises about as fast as

Table K1: The response 40–100 km away under finer comparisons, balance of the ring, and its composition

<i>A. Response of the ring, after minus before the opening (log points)</i>				
	Output		Value added	
	Estimate	Relative to baseline	Estimate	Relative to baseline
<i>Baseline</i>				
Matched stratum and baseline covariates $\times$ year	+0.14 (0.04)	100%	+0.20 (0.05)	100%
<i>Finer baseline controls and geography</i>				
+ decile of baseline output $\times$ year	+0.14 (0.04)	101%	+0.20 (0.05)	100%
+ deciles of distance to capital and megacity $\times$ year	+0.15 (0.04)	108%	+0.23 (0.05)	113%
+ decile of distance to city core, pre-opening growth $\times$ year	+0.15 (0.04)	106%	+0.22 (0.05)	109%
<i>Baseline industry mix</i>				
+ dominant product class $\times$ year	+0.13 (0.04)	90%	–	–
+ twelve class shares $\times$ year (instead of the dominant class)	+0.14 (0.04)	100%	–	–
<i>Size, rank and urban core of the cell's city</i>				
+ decile of prefecture size $\times$ year	+0.12 (0.04)	85%	–	–
+ provincial-level rank $\times$ year	+0.12 (0.04)	86%	–	–
+ urban-core indicator $\times$ year	+0.12 (0.04)	83%	–	–
<i>Province $\times$ year effects in place of matched stratum $\times$ year effects</i>				
with prefecture size, rank and urban core $\times$ year	+0.10 (0.04)	67%	–	–
with the output and distance deciles and pre-opening growth $\times$ year	+0.06 (0.04)	44%	+0.12 (0.05)	59%
<i>B. Ring cells and never-exposed cells of the same strata, before the openings</i>				
	Ring	Comparison	Standardized difference	Output-weighted
Output in 1998 (log)	2.29	1.12	+0.51	+0.61
Number of firms in 1998 (log)	0.60	0.19	+0.49	+1.58
Distance to the nearest port (log km)	5.31	6.22	–0.94	–1.73
Distance to the provincial capital (log km)	4.60	5.27	–1.03	–0.58
Distance to the nearest megacity (log km)	6.01	6.55	–0.75	–2.03
Distance to the prefecture's core (log km)	3.75	3.93	–0.21	+0.58
Employment growth, 1999–2000 (log points)	0.22	0.15	+0.07	+0.08
Prefecture size: log of its 1998–2000 output	11.27	9.81	+1.18	+1.44
Capital, provincial-level or sub-provincial city (share)	0.26	0.09	+0.47	+0.37
Largest-output cell of its prefecture (share)	0.01	0.02	–0.06	–1.27
<i>C. What the ring consists of</i>				
	Cells	Share of cells		
All cells of the ring	2,709	100%		
Outer counties of the host prefecture	877	32%		
Neighboring prefectures of the same province	1,832	68%		
No manufacturing above the survey threshold in 1998	1,375	51%		
A development zone started by 2000 within 8 km	236	9%		

Panel A: Equation (1) for output and value added of manufacturing firms outside the fence (annual survey of industrial firms, 1998–2007); the group is the cells 40–100 km from the first-opening zone inside its province, and every other distance group keeps its own exposure terms. Entries are the mean of the coefficients for the first four years after the opening minus the mean of the coefficients for the three years before it, with the standard error of the difference clustered by prefecture; “relative to baseline” divides by the first row. The baseline has year effects by matched stratum (macro-region and terciles of port distance, baseline firm density and baseline output) and baseline firm density, output, electronics share and port distance interacted with year, as in the main equation. Each later row adds the terms named to the baseline; within a group they accumulate, except that the class shares replace the dominant class. Deciles are taken over all cells of the design; pre-opening employment growth (1999–2000) enters linearly. The last group replaces the matched-stratum $\times$ year effects by province $\times$ year effects. Industry-mix, size, rank and core rows were estimated for output only. Panel B: means over the cells of the ring and over the never-exposed cells of the same matched strata, before the openings; the standardized difference is the difference of means divided by the pooled standard deviation, and the output-weighted difference weights cells by their 1998–2000 output with the same standard deviation. Panel C: numbers of 0.1-degree cells; a development zone is a national or provincial zone other than an export processing or bonded zone, within 8 km of the cell center.

Table K2: Who grows in the hinterland: control of paid-in capital and founding cohort

<i>A. Output by control of paid-in capital (log points)</i>					
	Before	After	After minus before	Output share	Share of gain
Foreign	+0.01 (0.10)	+0.19 (0.14)	+0.18	26%	42%
Private	+0.13 (0.09)	+0.33 (0.13)	+0.20	12%	21%
Other legal persons	+0.18 (0.10)	+0.36 (0.12)	+0.18	10%	16%
State	−0.04 (0.08)	+0.02 (0.10)	+0.06	28%	15%
Collective	+0.26 (0.07)	+0.29 (0.10)	+0.03	24%	6%
All firms	+0.06 (0.04)	+0.21 (0.06)	+0.14	100%	—
<i>B. The same, by founding cohort and control</i>					
	Before	After	After minus before	Output share	Share of gain
<i>Founded before 1995</i>					
Foreign	−0.02 (0.10)	+0.18 (0.12)	+0.20	16%	29%
Private	−0.06 (0.08)	+0.08 (0.11)	+0.13	5%	6%
Other legal persons	+0.17 (0.15)	+0.27 (0.20)	+0.10	3%	3%
State	−0.05 (0.11)	+0.05 (0.12)	+0.10	25%	22%
Collective	+0.24 (0.08)	+0.25 (0.11)	+0.01	19%	1%
<i>Founded in 1995 or later</i>					
Foreign	−0.01 (0.18)	+0.08 (0.20)	+0.08	10%	7%
Private	+0.20 (0.13)	+0.45 (0.17)	+0.25	7%	15%
Other legal persons	−0.02 (0.09)	+0.15 (0.14)	+0.18	6%	10%
State	+0.46 (0.23)	+0.49 (0.26)	+0.03	3%	1%
Collective	+0.20 (0.13)	+0.33 (0.14)	+0.13	5%	6%

Equation (1) for cell-year output of the firms of each type, annual survey of industrial firms, 1998–2007; cells 40–100 km from the first-opening zone inside its province; standard errors of the two means clustered by prefecture (the difference is shown without a standard error). Control is assigned from the first survey year with capital data by the largest component of paid-in capital: foreign (registered with Hong Kong, Macau, Taiwan or foreign capital, or foreign capital of at least 25 percent), state, collective, private (individual capital the largest, or registered as private with no larger component) and other legal persons (legal-person capital the largest; the owner is not observed). Firms without capital records, under 0.01 percent of output, are not shown. Founded before 1995 includes firms with a missing founding year. Output share: share of the ring’s output in the cell-years before each cell’s opening. Share of gain: output share times the difference, as a fraction of the sum over the types shown; the products add up only approximately to the total, because the coefficients are not additive.

sales (Panel A). In Panel B the change in each ratio is smaller than the standard error of its numerator, except the share of new products among all firms, which falls.

K.5 Buyers and local demand

Table K6 asks who buys the extra output (Panels A and B) and whether the demand of the ring’s own cities rises (Panel C). Household goods rise by 0.17 and goods bought by firms by 0.09; within household goods, food rises as much as the income-elastic categories, which are imprecise. None of the indicators in Panel C rises by more than 1.64 standard errors; registered population is the only one that moves by more than that, and it falls.

Table K3: Timing of the response, electronics, and location relative to development zones

<i>A. Timing: coefficient by year relative to the opening</i>					
	Output of firms controlled by			Births of private establishments	
	Foreign	Private	Other legal persons	All	In or near zones
Four years before	+0.10 (0.07)	−0.08 (0.08)	+0.03 (0.07)	−0.28 (0.13)	−0.40 (0.14)
Three years before	+0.04 (0.08)	−0.04 (0.04)	−0.00 (0.06)	−0.19 (0.11)	−0.30 (0.09)
Two years before	+0.01 (0.03)	−0.01 (0.02)	−0.01 (0.03)	−0.13 (0.09)	−0.12 (0.10)
One year before (reference)	0	0	0	0	0
Year of the opening	+0.10 (0.04)	+0.11 (0.05)	+0.18 (0.05)	+0.02 (0.10)	−0.00 (0.11)
One year after	+0.16 (0.05)	+0.18 (0.06)	+0.12 (0.08)	−0.19 (0.11)	−0.21 (0.11)
Two years after	+0.27 (0.07)	+0.15 (0.07)	+0.17 (0.08)	−0.16 (0.17)	−0.24 (0.13)
Three years after	+0.37 (0.09)	+0.22 (0.08)	+0.25 (0.10)	+0.08 (0.15)	−0.01 (0.14)
Four years after	+0.38 (0.10)	+0.20 (0.10)	+0.16 (0.11)	−0.25 (0.14)	−0.16 (0.14)
Joint test that the three earlier years are zero (p-value)	0.482	0.723	0.943	0.123	0.002
<i>B. Foreign-invested and domestic firms, electronics and other (log points)</i>					
	Before	After	After minus before		
<i>Output</i>					
Foreign-invested, electronics	−0.76 (0.39)	−0.75 (0.50)	+0.01		
Foreign-invested, other industries	+0.04 (0.09)	+0.21 (0.12)	+0.17		
Domestic, electronics	−0.22 (0.26)	+0.49 (0.27)	+0.70		
Domestic, other industries	+0.11 (0.05)	+0.22 (0.06)	+0.10		
<i>Export value</i>					
Foreign-invested, electronics	−0.55 (0.49)	−0.66 (0.60)	−0.11		
Foreign-invested, other industries	+0.00 (0.09)	+0.12 (0.13)	+0.12		
Domestic, electronics	+0.55 (0.59)	+1.10 (0.60)	+0.55		
Domestic, other industries	+0.22 (0.13)	+0.23 (0.15)	+0.01		
<i>C. Output by location relative to development zones (log points)</i>					
	Before	After	After minus before	Output share	Share of gain
Inside a catalogued development zone	−0.10 (0.09)	−0.15 (0.21)	−0.05	6%	−3%
Around a catalogued zone, outside its core	+0.10 (0.05)	+0.23 (0.08)	+0.12	44%	51%
Names a zone, not placed in a catalogued zone	+0.07 (0.24)	+0.43 (0.36)	+0.36	6%	20%
Not located, names no zone	+0.05 (0.08)	+0.13 (0.11)	+0.08	43%	32%
Located outside all zones, names no zone	n.e.	n.e.	n.e.	2%	n.e.

Equation (1); cells 40–100 km from the first-opening zone inside its province; annual survey of industrial firms, 1998–2007; standard errors clustered by prefecture. Panel A: one coefficient for each year relative to the opening instead of the four-year mean, reference the year before the opening, same design; output of the firms of each type of control (defined in Table K2) and counts of new establishments, 1999–2007: domestic firms first appearing within a year of their founding that are registered as private, of which “in or near zones” are those inside a development zone listed in the catalog, within three zone radii plus 3 km of one, or reporting a zone name or address (zones as defined in Panel C); the last row is the p-value of the joint test that the coefficients for four, three and two years before the opening are zero. Panel B: before, after and their difference as in Table K2, without a standard error for the difference; foreign-invested firms are registered with Hong Kong, Macau, Taiwan or foreign capital; electronics is communication equipment, computers and other electronic equipment (two-digit industry 40); export value is the export delivery value reported to the survey. Panel C: output of firms by their place relative to development zones, with output share and share of gain as in Table K2; zones are the national and provincial development zones of the 2006 catalog with their approved areas, a firm is inside a zone if its village-level coordinates lie within the radius of a disc of that area plus 2 km of the zone’s center and around it if within three radii plus 3 km, and firms that lack such coordinates or lie outside these discs but name a zone in their name or address are placed in the third row; n.e.: the Poisson estimate for this group (2 percent of output) is unstable, with coefficients above 10, and is not reported.

Table K4: Output response by product class

<i>A. Output by product class (log points)</i>					
	Before	After	After minus before	Output share	Share of gain
Chemicals, plastics, rubber and pharmaceuticals	+0.07 (0.05)	+0.24 (0.08)	+0.17	17%	21%
Textiles, clothing and leather	+0.08 (0.06)	+0.19 (0.11)	+0.12	16%	13%
Metal smelting and rolling	−0.12 (0.12)	+0.07 (0.11)	+0.19	10%	14%
Electronics and communication equipment	−0.61 (0.20)	−0.39 (0.25)	+0.21	10%	15%
Food and beverages	+0.20 (0.06)	+0.36 (0.08)	+0.16	9%	11%
Electrical machinery, appliances and instruments	+0.06 (0.08)	+0.18 (0.10)	+0.12	7%	6%
General and special-purpose machinery	+0.04 (0.07)	+0.02 (0.09)	−0.01	7%	−1%
Light manufacturing (wood, paper, furniture, toys)	+0.24 (0.10)	+0.35 (0.12)	+0.11	6%	5%
Motor vehicles and other transport equipment	+0.02 (0.11)	+0.24 (0.14)	+0.22	6%	9%
Building materials, other non-metallic minerals	+0.23 (0.07)	+0.36 (0.10)	+0.13	5%	5%
Metal products	+0.15 (0.11)	+0.26 (0.13)	+0.12	5%	4%
Energy, mining and other	+1.06 (0.36)	+0.86 (0.54)	−0.20	2%	−3%
<i>B. Output by relation to the fence, construction and land use (log points)</i>					
	Before	After	After minus before	Output share	Share of gain
<i>Relation to the fence</i>					
Same industry as the fence (electronics assembly)	−0.82 (0.29)	−0.46 (0.36)	+0.35	7%	17%
Inputs to assembly (parts, packaging, molds)	+0.17 (0.11)	+0.23 (0.14)	+0.07	9%	4%
Neither	+0.08 (0.04)	+0.21 (0.06)	+0.13	84%	79%
<i>Construction and public works</i>					
Tied to construction	+0.18 (0.08)	+0.27 (0.09)	+0.09	7%	4%
Not tied to construction	+0.06 (0.04)	+0.20 (0.06)	+0.15	93%	96%
<i>Land use</i>					
Land-intensive bulk industry	+0.02 (0.06)	+0.18 (0.08)	+0.17	22%	22%
Not land-intensive	+0.11 (0.04)	+0.27 (0.06)	+0.16	78%	78%

Equation (1) for cell-year output of the firms of each class, annual survey of industrial firms, 1998–2007; cells 40–100 km from the first-opening zone inside its province; standard errors of the two means clustered by prefecture (the difference is shown without a standard error). Each firm is assigned a class from its own four-digit industry name in the latest survey year with a report, by an automated classifier that saw the name, its three- and two-digit parent names and the most frequent self-reported products of firms with that name, but not the firm’s location or treatment; firms whose name is not in the map take the most common class of mapped firms in their two-digit industry. Output share: share of the ring’s 1998–2000 output. Share of gain: output share times the difference, as a fraction of the sum over the rows of the same group. Panel B: the classifier also marked each name as the fence’s own industry, an input to assembly, tied to construction or public works, or a land-intensive bulk industry.

Table K5: Cell totals and ratios of the firms present in 2000

<i>A. Cell totals of the firms present in 2000 (log points)</i>						
	All firms			Non-state firms		
	Before	After	After minus before	Before	After	After minus before
Sales	+0.06 (0.05)	+0.19 (0.07)	+0.12	+0.04 (0.07)	+0.16 (0.10)	+0.12
Output	+0.06 (0.05)	+0.16 (0.07)	+0.11	+0.03 (0.07)	+0.14 (0.10)	+0.11
Employment	+0.01 (0.04)	+0.09 (0.07)	+0.08	−0.07 (0.05)	−0.05 (0.08)	+0.02
Fixed capital	−0.04 (0.08)	+0.15 (0.08)	+0.18	+0.01 (0.05)	+0.11 (0.08)	+0.10
Intermediate inputs	+0.04 (0.05)	+0.13 (0.07)	+0.09	+0.04 (0.07)	+0.12 (0.10)	+0.08
Wage bill	−0.01 (0.06)	+0.05 (0.08)	+0.06	−0.06 (0.07)	−0.03 (0.09)	+0.03
Profit (positive part)	+0.30 (0.17)	+0.44 (0.18)	+0.14	+0.14 (0.09)	+0.37 (0.13)	+0.24
Loss	−0.48 (0.22)	−0.41 (0.24)	+0.06	−0.63 (0.21)	−0.60 (0.24)	+0.02
Subsidy income	+0.15 (0.13)	+0.37 (0.18)	+0.22	+0.56 (0.32)	+0.84 (0.37)	+0.28
Taxes	+0.14 (0.09)	+0.32 (0.11)	+0.18	+0.07 (0.07)	+0.24 (0.10)	+0.17
Interest paid	−0.00 (0.07)	+0.09 (0.10)	+0.09	+0.04 (0.09)	+0.12 (0.13)	+0.08
Liabilities	−0.05 (0.05)	+0.11 (0.08)	+0.16	−0.03 (0.08)	+0.03 (0.13)	+0.06
New-product output	+0.13 (0.20)	−0.04 (0.24)	−0.17	−0.21 (0.23)	−0.42 (0.33)	−0.21
Export value	+0.17 (0.11)	+0.19 (0.13)	+0.03	−0.04 (0.06)	−0.04 (0.12)	−0.01
<i>B. Change in ratios (log points), with the numerator's standard error as benchmark</i>						
	All firms			Non-state firms		
	Change	Standard error	Change over standard error	Change	Standard error	Change over standard error
Profit to sales	+0.02	0.18	+0.10	+0.11	0.13	+0.89
Subsidy income to sales	+0.09	0.18	+0.54	+0.16	0.37	+0.42
Taxes to sales	+0.06	0.11	+0.53	+0.05	0.10	+0.49
Interest paid to liabilities	−0.06	0.10	−0.63	+0.02	0.13	+0.15
Liabilities to fixed capital	−0.03	0.08	−0.34	−0.04	0.13	−0.31
New-product output to output	−0.28	0.24	−1.17	−0.32	0.33	−0.98
Export value to output	−0.08	0.13	−0.60	−0.11	0.12	−0.94
Output to sales (inventory build-up)	−0.02	0.07	−0.24	−0.02	0.10	−0.15
Wage bill to employment (pay per worker)	−0.02	0.08	−0.27	+0.01	0.09	+0.12

Equation (1) for cell-year sums of each account item over the firms in the 2000 annual survey of industrial firms that can be located, held fixed and assigned to their 2000 cell, in every year they report (1998–2007); the same firms are followed in exposed and comparison cells. Non-state firms are those not controlled by the state or a collective by paid-in capital (control as defined in Table K2). Values are truncated at zero; profit is the positive part and loss is reported separately. Panel A: standard errors of the two means clustered by prefecture (the difference is shown without a standard error). Panel B: a ratio's change is the difference between the changes (after minus before) of the numerator and the denominator; no standard error is computed for that difference, so the standard error of the numerator's after-opening coefficient is shown as a benchmark, and the last column divides the change by it. Ratios in the order shown: profit, subsidy income and taxes over sales; interest paid over liabilities; liabilities over fixed capital; new-product output and export value over output; output over sales; wage bill over employment.

K.6 Intermediaries, product-market event study and the hinterland scenario

Table K7 gives further evidence for Sections 5.3 and 4.5. New trading intermediaries fall within 10 km of a zone and rise 10 to 20 km away, while exports outside the fence do not change (Panel A). Other Chinese exporters' sales of the product-markets of fenced firms rise when fenced firms first export them, but they were already rising before (Panel B). Panel C converts the response of the hinterland into value added per RMB of fenced exports (Section 4.5).

Table K6: Buyers and demand in the ring’s cities

<i>A. Output by buyer (log points)</i>					
	Before	After	After minus before	Output share	Share of gain
Household goods	+0.12 (0.06)	+0.32 (0.08)	+0.20	22%	30%
Goods bought by firms (intermediates, equipment)	+0.01 (0.05)	+0.12 (0.06)	+0.11	59%	48%
Construction and public works	+0.15 (0.08)	+0.31 (0.09)	+0.16	7%	9%
Mixed or unclassified	+0.12 (0.09)	+0.27 (0.12)	+0.15	13%	14%
All output	+0.06 (0.04)	+0.21 (0.06)	+0.14	100%	–
Export value, all firms	+0.12 (0.12)	+0.23 (0.13)	+0.11		
<i>B. Household goods by category (log points)</i>					
	Before	After	After minus before	Output share	Share of gain
Food, beverages and tobacco	+0.22 (0.07)	+0.38 (0.09)	+0.16	8%	9%
Clothing and footwear	+0.04 (0.08)	+0.19 (0.16)	+0.15	6%	6%
Furnishings and household appliances	+0.23 (0.13)	+0.35 (0.18)	+0.12	2%	2%
Vehicles	–0.20 (0.32)	+0.26 (0.33)	+0.46	2%	6%
Recreation and consumer electronics	–0.06 (0.17)	+0.07 (0.21)	+0.13	3%	3%
Personal care	–0.29 (0.22)	+0.59 (0.29)	+0.88	0%	3%
Other household goods	+0.40 (0.25)	+0.52 (0.30)	+0.12	1%	0%
<i>C. Urban districts of the ring’s cities (log points)</i>					
	Before	After	After minus before	Prefectures	
Retail sales	–0.00 (0.03)	–0.00 (0.05)	–0.00 (0.02)	281	
Retail sales per head	+0.02 (0.03)	+0.03 (0.05)	+0.01 (0.02)	278	
Average wage, non-private sector	+0.02 (0.02)	+0.04 (0.03)	+0.01 (0.01)	278	
Household savings per head	–0.03 (0.04)	–0.03 (0.04)	–0.00 (0.03)	278	
Wage bill, non-private sector	–0.06 (0.02)	–0.08 (0.04)	–0.03 (0.02)	278	
Urban employment, non-private sector	–0.04 (0.04)	–0.05 (0.05)	–0.01 (0.02)	278	
Registered population	–0.02 (0.01)	–0.03 (0.02)	–0.01 (0.01)	278	
GDP	+0.04 (0.03)	+0.06 (0.05)	+0.02 (0.02)	278	
Wholesale sales, large firms	+0.18 (0.15)	+0.21 (0.20)	+0.03 (0.10)	278	
Number of large wholesale firms	+0.15 (0.07)	+0.31 (0.12)	+0.16 (0.10)	278	
Employment in wholesale and retail trade	–0.19 (0.19)	–0.16 (0.20)	+0.03 (0.05)	241	
Road freight	+0.06 (0.10)	+0.19 (0.12)	+0.14 (0.10)	278	
Total freight	+0.04 (0.07)	+0.10 (0.10)	+0.06 (0.05)	278	
Road passengers	+0.02 (0.06)	+0.03 (0.09)	+0.01 (0.04)	278	

Panels A and B: equation (1) for cell-year output (export value in the last row of Panel A) of the firms of each type, annual survey of industrial firms, 1998–2007; cells 40–100 km from the first-opening zone inside its province; standard errors of the two means clustered by prefecture (the difference is shown without a standard error); output share is of the ring’s output in the cell-years before each cell’s opening and share of gain is as in Table K2 (in Panel A, the shares of household goods are sums over the categories of Panel B).

Buyers are assigned from each firm’s industry name by the automated classifier described under the product-class table; household goods are mapped to consumption categories by a fixed table written before the estimation. Panel C: city statistical yearbooks, urban districts of prefectures, 2000–2010, raw values; ordinary least squares on logs with prefecture effects, region (east, central, west) $\times$ year effects and log 2000 GDP $\times$ year; each prefecture takes the distance group, jurisdiction and opening year of its largest cell (by 1998–2000 output); the ring group is prefectures whose largest cell lies 40–100 km from the first-opening zone inside its province, the comparison is prefectures never within 150 km; event-time terms as in equation (1); the difference has its own standard error; standard errors clustered by prefecture.

Table K7: Intermediaries, other exporters' sales of the product-markets of fenced firms, and the hinterland scenario

<i>A. Intermediaries and exports outside the fence, after minus before (log points)</i>						
	Any province			Zone's province		Other provinces
	0–10 km	10–20 km	20–40 km	40–100 km	100–150 km	40–150 km
New intermediaries (first export year)	−0.51 (0.26)	+0.78 (0.36)	+0.00 (0.25)	−0.23 (0.23)	−0.04 (0.21)	−0.30 (0.23)
Active intermediaries	−0.05 (0.12)	+0.34 (0.13)	+0.02 (0.10)	+0.03 (0.10)	−0.08 (0.08)	+0.02 (0.11)
Exports of intermediaries	+0.06 (0.13)	+0.21 (0.12)	+0.03 (0.12)	+0.20 (0.12)	+0.04 (0.09)	+0.07 (0.12)
Exports of producing firms	−0.01 (0.11)	−0.14 (0.12)	−0.14 (0.10)	−0.07 (0.07)	−0.05 (0.06)	−0.07 (0.08)
All exports outside the fence	−0.06 (0.09)	−0.06 (0.09)	−0.12 (0.08)	+0.03 (0.07)	−0.08 (0.06)	−0.08 (0.08)
<i>B. Other exporters' sales of the fences' product-markets, by year relative to entry (log points)</i>						
	Sales by other Chinese exporters			Sales by all		
	All	Processing	Ordinary trade	exporters		
Four or more years before	−0.19 (0.11)	−0.37 (0.16)	+0.01 (0.04)	−0.17 (0.11)		
Three years before	−0.09 (0.05)	−0.17 (0.08)	−0.01 (0.02)	−0.07 (0.05)		
Two years before	−0.06 (0.03)	−0.12 (0.04)	−0.01 (0.01)	−0.05 (0.02)		
One year before (reference)	0	0	0	0		
Year of first export	+0.54 (0.16)	+0.72 (0.21)	+0.23 (0.09)	+0.57 (0.17)		
One year after	+0.24 (0.08)	+0.37 (0.11)	+0.08 (0.04)	+0.28 (0.08)		
Two years after	+0.24 (0.08)	+0.38 (0.12)	+0.08 (0.05)	+0.26 (0.08)		
Three years after	+0.21 (0.09)	+0.35 (0.14)	+0.06 (0.04)	+0.23 (0.09)		
Four or more years after	−0.03 (0.16)	+0.07 (0.22)	−0.01 (0.07)	+0.01 (0.15)		
Joint test that the three earlier years are zero (p-value)	0.049	0.015	0.810	0.145		
Product-markets entered by a fence	11,939					
<i>C. Hinterland scenario for the national account (billion RMB per year)</i>						
	Share of baseline value added		Value added gained			
No effect of the zones	0.00		0.0			
Strictest comparison (province × year effects and finer controls)	0.12		39.8			
Baseline comparison	0.20		66.4			
Baseline value added of the ring, mean 1998–2000	332					

Panel A: equation (1) for cell-year exports recorded in customs transactions, 2000–2007, of firms outside the fence, with the baseline comparison; each column is a distance group of cells with its own exposure terms; entries are after minus before with the standard error of the difference clustered by prefecture. An intermediary is a firm whose name contains a word for import-export, trade or foreign economic relations; new intermediaries are firms whose first export year, from 2001, is the year in question. Panel B: unit is a six-digit product × destination × year, 2000–2007; a pair is treated in the first year of 2001–2007 in which a fenced firm exports it, for pairs with no fenced exports in 2000, and the comparison is pairs of the same products that China exported outside the fences in 2000 and no fenced firm has entered; Poisson regression of the pair's sales by all other Chinese firms (columns 1–3: all, processing, ordinary trade) or by all firms (column 4) on event-time indicators, with pair, four-digit product × year and destination × year effects; the ends are binned and the year before entry is the reference; standard errors clustered by four-digit product; the last rows give the p-value of the joint test that the three earlier coefficients are zero and the number of product-markets entered. Panel C: share of baseline value added times the baseline value added of the cells of the ring (survey value added outside the fence, mean of 1998–2000); the shares are the after-minus-before response of value added of Panel A of Table K1 under the strictest comparison (0.12) and under the baseline comparison (0.20), and zero.

L Relocation records and where movers go

Growth in the provincial hinterland (Section 4.5) could be activity that moved there from the zone’s neighborhood or from elsewhere in the province, which is the question of Table 6. Two facts about registered firms bear on it from the data side: how much of the fence’s output is traceable to firms that were already active in the host prefecture, and where the firms that relocate go. Neither measures how much activity moved; both show what the firm records can and cannot reveal. The relocation records are described in Appendix D.6.

Firms already in the host prefecture. For each zone with customs records of fenced firms, we take the exports of every firm registered inside the fence in operating years 0–3 and ask whether the firm was already active in the host prefecture in the two years before the opening. A fenced exporter counts as already active if its name, after legal-entity suffixes, country qualifiers, brackets, and spaces are removed, matches the name of a firm that exported through customs or appeared in the manufacturing survey in the host prefecture in those two years; or if the link between customs and survey records ties it to a survey firm present in the host prefecture before the opening, or to another customs registration of the same firm that exported before the opening. A firm that moves into the fence appears under a different customs code, because the code records the special-supervision status of the registered location (Appendix D.3), so the name and survey links, not the customs code, identify it. Weighted by fenced exports across the 24 zones with customs records of fenced firms, 5.6 percent of fenced exports in the first four operating years come from firms that were already active in the host prefecture. The match misses local firms that were neither exporters nor above the survey’s reporting threshold before they moved, and firms that changed their names when they moved; for such firms 5.6 percent is a lower bound. The records thus trace a small part of the fence’s exports to firms already in the host prefecture; they do not set an upper limit on it.

Where relocating firms go. Table L1 estimates where relocating firms go. A destination in another prefecture of the same province is chosen with a relative probability of about 0.024 compared with a destination at the same distance and of the same size in the firm’s own prefecture (choice sets of 150 km, municipalities excluded), and cross-province moves are rarer still. The estimate changes little with 100 or 200 km choice sets, with confirmed moves only, and with the municipalities included. Legal entities rarely cross prefecture borders. The growth of the hinterland is as large in neighboring prefectures as in the outer counties of the host prefecture (Table 4), and registered firms that move across a prefecture border are rare, which makes it unlikely that moves of registered firms are the main source of the growth in neighboring prefectures.

Two limits apply. The model conditions on moving, so it says where movers go, not how many firms move; and a move across a provincial border that breaks the firm identifier is recorded as an exit and an entry, not as a move, so the records capture within-province moves more completely than cross-province moves. The records therefore support the statement that registered firms rarely relocate across prefecture borders, not the statement that no activity relocated.

Table L1: Where relocating firms go: destination choice across prefecture borders

Choice set		Other prefecture,		Other province,		Log	
radius (km)	Sample	same province γ_P	e^{γ_P}	γ_C	e^{γ_C}	distance	Moves
150	All candidate moves	-3.84 (0.29)	0.021	-7.68 (0.65)	0.0005	-1.35 (0.11)	6,233
150	Confirmed moves	-3.77 (0.32)	0.023	-7.88 (0.66)	0.0004	-1.07 (0.11)	3,250
150	Excluding municipalities	-3.75 (0.29)	0.024	not identified	—	-1.41 (0.12)	4,879
100	All candidate moves	-3.90 (0.33)	0.020	-7.11 (0.68)	0.0008	-1.35 (0.12)	6,195
100	Confirmed moves	-3.88 (0.36)	0.021	-7.28 (0.69)	0.0007	-1.05 (0.11)	3,221
100	Excluding municipalities	-3.82 (0.33)	0.022	not identified	—	-1.41 (0.12)	4,841
200	All candidate moves	-3.88 (0.28)	0.021	-7.91 (0.65)	0.0004	-1.36 (0.11)	6,246
200	Confirmed moves	-3.86 (0.30)	0.021	-8.18 (0.66)	0.0003	-1.07 (0.11)	3,259
200	Excluding municipalities	-3.78 (0.28)	0.023	not identified	—	-1.42 (0.11)	4,891

Notes: Conditional-logit destination choice of relocating firms, estimated as Poisson regressions with mover fixed effects (Guimarães et al. 2003). Choice sets are all counties with above-scale firms within the stated radius of the origin. e^γ is the probability of choosing a destination in another prefecture of the same province (another province), relative to a destination at the same distance and of the same size in the origin prefecture. Regressions also include log destination firm count. When no relocation in the sample crosses a province border, γ_C is not identified. Standard errors clustered by origin prefecture in parentheses.

M Entry by size, ownership and exports

Table M1: New domestic establishments by size at entry under four definitions (cell and year effects)

	Q1	Q2	Q3	Q4	Q5
New establishments, output within industry-year (text), 0–10 km	-0.49 (0.21)	-0.48 (0.19)	-0.38 (0.20)	-0.44 (0.15)	-0.08 (0.16)
New establishments, employment, all industries pooled, 0–10 km	-0.28 (0.21)	-0.43 (0.19)	-0.00 (0.21)	-0.56 (0.22)	-0.32 (0.12)
All first appearances in the survey, output within industry-year, 0–10 km	-0.37 (0.29)	-0.04 (0.16)	-0.01 (0.16)	+0.08 (0.15)	+0.16 (0.13)
New establishments, exact-coordinate file only, output within industry-year, 0–20 km	-0.45 (0.18)	-0.23 (0.17)	-0.10 (0.15)	-0.36 (0.14)	-0.34 (0.08)

Equation (1) with cell and year effects. The last row uses only firms with exact coordinates and pools 0–20 km.

Ranking entrants by employment across all industries places labor-intensive industries in the upper fifths and changes the largest fifth (-0.32, 0.12); ranking by output within industry and year compares each entrant with its industry peers. Firms that first appear in the survey long after their founding show no decline under any measure.

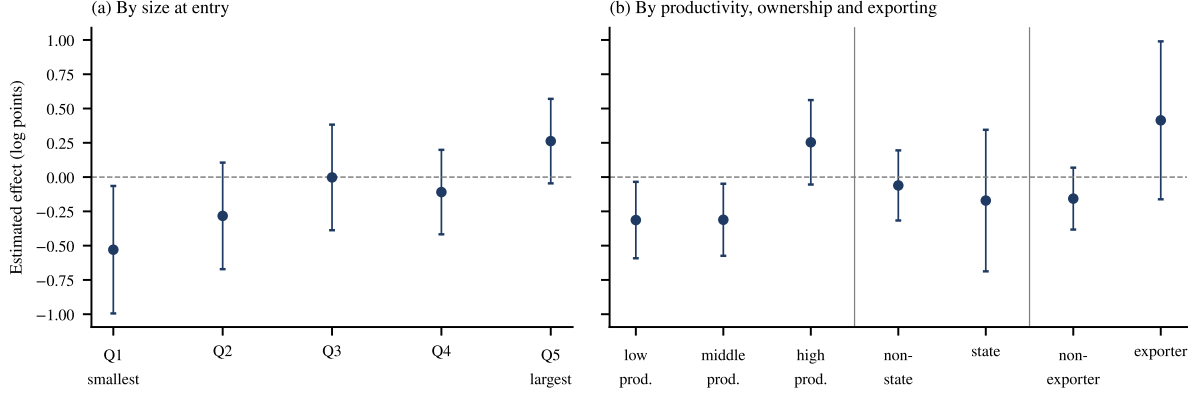


Figure M1: New domestic establishments within 10 km after the first opening: (a) by size at entry (quintiles of output within industry and year); (b) by productivity at entry, ownership and export status. Equation (1); 95 percent confidence intervals. Differences by ownership and export status are not significant.

N Ideas: samples, definitions and inference

Imitation. Non-fenced exporters with known locations, a 10 percent sample of firms; every six-digit product–destination pair the firm did not serve in $t - 1$ among its candidate set; entry years 2002–06 (with the next-year term, 2002–05: 1.62 million observations). Exposure rings by distance to the nearest fenced firm that exported the pair (0–20, 20–50, 50–100, 100–200 km). Without the next-year term, the 20–50 and 50–100 km rings are +1.2 and +1.4 percentage points; with it they fall to +0.8 and +0.8, and the next-year terms are +1.3 and +0.5.

Capability. Candidate products are four-digit products the firm has not exported since 2000 (the first year of the customs records), so a product exported before 2000 can count as an entry. Proximity is $\phi_{pq} = N_{pq} / \max(N_p, N_q)$, where N_{pq} counts non-fenced exporters of both products in 2000–02. Without the next-year term (entry years 2003–06, 3.32 million observations, baseline 0.141 percent), the gradient is 12, 39, 97 and 144 percent of the baseline (firm-clustered standard errors 2, 5, 11, 11; nearest-zone-clustered 7, 20, 47, 40). With fenced portfolios and portfolios of development zones without EPZ status entered together, the fence’s gradient is 10, 35, 91 and 138 percent, and the other zones’ –6, –14, –28 and +1.

Inference. Exposure varies by zone, product and year, so the main tables cluster by the nearest of the 36 zones. Clusters are unequal: the largest (Guangzhou) holds 17 percent of entries and the three largest 38 percent; p-values use $t(35)$, and for the key differences the text also reports p-values from the wild cluster bootstrap with the null imposed (Rademacher weights, 9,999 draws), which does not rely on equal cluster sizes (MacKinnon and Webb 2017). Two-way clustering by firm and zone equals clustering by zone, because each firm

Table N1: Related-product entry by exporter type: same product

	Previous year	Next year	Difference	p-value
Ordinary-trade exporters	+156 (93)	+19 (16)	+137 (92)	0.15
Processing exporters	+105 (43)	+93 (15)	+11 (48)	0.81
Domestic firms	+168 (91)	+36 (19)	+132 (87)	0.14
Foreign-invested firms	+150 (43)	+89 (23)	+62 (49)	0.21

Equation (2) estimated separately for each group; percent of each group's baseline entry rate; standard errors clustered by nearest zone (36 clusters); p-values from $t(35)$. Trade regime from the firm's exports in $t - 1$: ordinary-trade exporters have no processing exports. Ownership from the firm's customs code. Differences between groups are not tested.

belongs to one zone. Province is the registration province in the firm's customs code; for each zone, the province of all its fenced firms agrees.

O Factor prices: wages and industrial land

This appendix describes how the wage and land-price outcomes are measured, how land prices are adjusted for quality, and where the coverage of each source ends.

O.1 Wages

The city-level average wage is the prefecture's total manufacturing wage bill divided by its total employment in the firm survey (payable wages over the number of employees), computed from all surveyed firms; it is an employment-weighted average rather than an average of firm-level wages. Municipalities are treated as single cities. The series is nominal and covers 1998–2007. A second series, the average wage of staff and workers from the city statistical yearbooks (whole-prefecture scope, 2003–2019), is used as a check.

Two gaps limit what can be measured. The wage bill variable is missing for every firm in 2008 and 2009, so the firm survey cannot measure wages after 2007; and the postcode field used for sub-city geography is missing in 2000 and 2008–2010. Wage effects for zones that opened after 2007 are therefore measurable only in yearbook data at the city level.

O.2 Industrial land prices

Source. Land prices come from parcel-level transaction records of the China Land Market Network, 2000–2021, with price, area, use, transfer channel, coordinates, floor-area ratio, land grade, and lease term. A parcel is industrial if its stated use is industrial. The price outcome is the log price per hectare of industrial parcels transferred through market channels;

Table N2: Related-product entry: comparison group, inference, timing and distance

<i>Panel A. Comparison group: same product and proximity of 0.20 or more (percent of each sample's baseline)</i>				
	Previous year	Next year	Difference	p-value
All exporters (Table 5): same product	+134 (39)	+36 (14)	+98 (38)	0.015
proximity 0.20 or more	+95 (45)	+19 (15)	+76 (36)	0.043
Exporters with a zone within 100 km in $t - 1$: same product	+86 (29)	+36 (21)	+51 (28)	0.080
proximity 0.20 or more	+57 (34)	+31 (18)	+26 (28)	0.37
<i>Panel B. Inference: difference, all exporters (percent of baseline)</i>				
	Same product	p-value	0.20 or more	p-value
Nearest zone (36 clusters)	+98 (38)	0.015	+76 (36)	0.043
Groups of zones linked within 100 km (23 clusters)	+98 (37)	0.015	+76 (42)	0.085
Groups of zones linked within 200 km (12 clusters)	+98 (36)	0.020	+76 (45)	0.12
Registration province (31 clusters)	+98 (38)	0.015	+76 (42)	0.079
Nearest zone and product (two-way)	+98 (39)	0.017	+76 (36)	0.044
Province and product (two-way)	+98 (38)	0.015	+76 (42)	0.079
<i>Panel C. Timing: same product (percent of baseline)</i>				
	All exporters	p-value	Zone within 100 km	p-value
Previous year, still exported by fenced firms in t	+142 (39)	<0.001	+92 (29)	0.003
Previous year, dropped by fenced firms in t	+96 (47)	0.049	+63 (35)	0.080
Next year	+32 (14)	0.031	+33 (21)	0.13
Still exported minus next year	+110 (38)	0.006	+59 (27)	0.040
Dropped minus next year	+64 (45)	0.17	+30 (34)	0.39
Still exported minus dropped	+46 (23)	0.056	+29 (20)	0.16
	Previous year	Year t	Next year	
Previous, current and next-year portfolios together	+119 (37)	+31 (12)	+21 (14)	
<i>Panel D. Distance from the zone: same product, exporters with a zone within 150 km (percent of baseline)</i>				
	Previous year	Next year	Difference	p-value
0–30 km	+23 (36)	+48 (40)	–24 (55)	0.66
30–60 km	+43 (50)	–16 (41)	+60 (40)	0.15
60–100 km	+141 (66)	+35 (25)	+106 (55)	0.062
100–150 km	–2 (24)	–9 (25)	+7 (28)	0.81

Equation (2), entry into a new four-digit product, entry years 2003–05, percent of each sample's weighted baseline entry rate (0.146 percent for all exporters, 0.171 percent for exporter-years with a zone within 100 km in $t - 1$, 0.152 percent for exporters with a zone within 150 km); standard errors in parentheses, clustered by nearest zone unless panel B says otherwise; p-values from $t(G - 1)$, where G is the number of clusters.

Panel B: zones are grouped by single linkage of zone centers within 100 or 200 km. Panel C: the previous-year same-product indicator is split by whether fenced firms of zones within 100 km export the product in year t ; the last row adds the year- t portfolio's bins to equation (2). Panel D: exposure to the zones in each ring around the exporter, each ring with its own previous- and next-year bins, in one regression. The sample of panels C and D is rebuilt with the construction and random draws of the main sample and has the same observations.

commercial and residential parcels are measured separately. Parcels priced more than fifty times the median of their city, year, and use are dropped.

Quality adjustment. Because parcels enter the data only when they are sold, the average transaction price mixes changes in the price of comparable land with changes in which land the government chooses to sell. We residualize log prices on parcel characteristics,

$$\ln p_j = \gamma_1 \ln \text{area}_j + \gamma_2 \text{FAR}_j + \gamma_3 \text{grade}_j + \gamma_4 \text{lease}_j + \gamma_5 \text{newquota}_j + \delta_{\text{year}(j)} + u_j, \quad (\text{O1})$$

with year fixed effects only, so that spatial price differences, which carry the treatment effect, are not absorbed. The residual $\hat{u}_j$ is the constant-quality log price, aggregated to cell $\times$ year. Standard errors in the second stage are not corrected for estimation of γ . The land test of Section 4.1 (Figure O1) does not use these residuals: its price regressions control directly for the form of sale and the log of parcel area.

Coverage. Disclosure of land transactions became mandatory with the tender, auction, and listing rules of 2007: the number of cities with priced industrial transactions rises from 227 in 2006 to 340 in 2007. Around zones approved before 2007, coverage jumps from under a fifth before approval to more than two-thirds after, which would bias any comparison that spans the break. Land-price comparisons therefore use transactions from 2007 onward. All five parcel characteristics in equation (O1) are observed for 29 percent of paid industrial parcels (167,863 of 574,400), so the quality-adjusted sample is narrower than the raw price sample. Coordinates for most parcels are address-level, which supports comparisons at kilometer scale but not finer.

O.3 Land around later zones

P The Admission Model

P.1 Proofs

Throughout, the signal and profit of an applicant are jointly distributed in the same way whichever area it chooses, profits are in the Pareto region of (4) at the fixed cost F , and the area within 10 km is small in the prefecture.

Proposition 1. (a) For any set $\mathcal{A}$ of areas, let

$$T_{\mathcal{A}} = \left[\sum_{k \in \mathcal{A}} T_k^{1/(1-\rho)} \right]^{1-\rho}, \quad \psi_{\ell}^{\mathcal{A}} = \frac{T_{\ell}^{1/(1-\rho)}}{\sum_{k \in \mathcal{A}} T_k^{1/(1-\rho)}}.$$

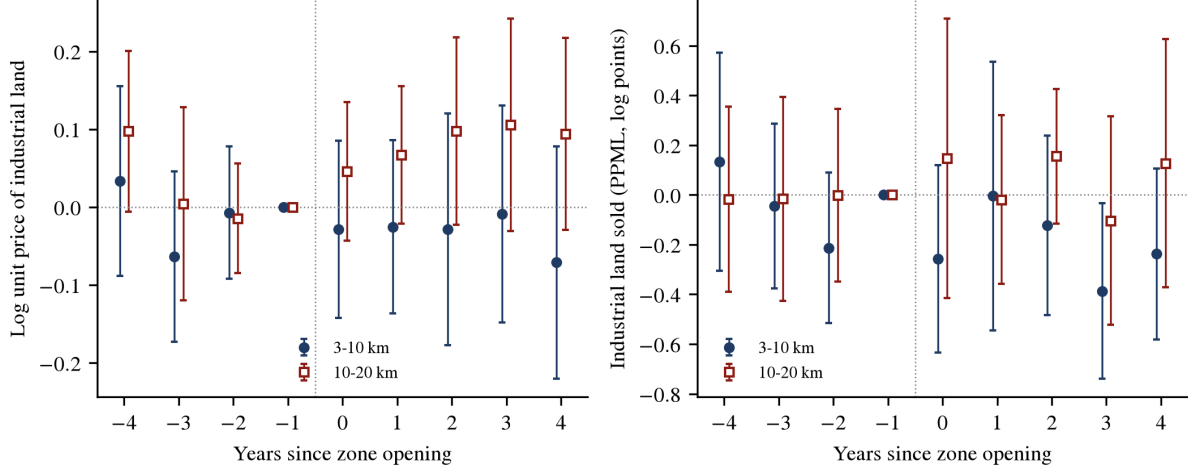


Figure O1: Industrial land around special customs zones opened on new sites in 2008–2016 (49 zones): log price per hectare of parcels sold at auction (left) and area of industrial land sold per 0.1-degree cell and year (right, Poisson), 3–10 and 10–20 km from the zone relative to 40–100 km in the same prefecture and year. Prefecture $\times$ year effects; price regressions control for the form of sale and log parcel area; reference: the year before the opening; 95 percent confidence intervals, clustered by zone. Mean effect over years 0–3, 3–10 km: price -0.02 (0.06), area -0.19 (0.16).

Applied to equation (4) of [Arkolakis et al. \(2018\)](#), their Lemma 1 gives

$$\Pr \left(\max_{k \in \mathcal{A}} \pi_{jk} \leq x, \ell = \arg \max_{k \in \mathcal{A}} \pi_{jk} \right) = \psi_\ell^{\mathcal{A}} (1 - T_{\mathcal{A}} x^{-\zeta}),$$

so the chosen area is independent of the maximal profit, which is Pareto with shape ζ and scale $T_{\mathcal{A}}$. Entry into area ℓ is $J\psi_\ell T_{\mathcal{A}} F^{-\zeta}$, proportional to ψ_ℓ . (b) Since the chosen area is independent of profit and the signal is distributed alike across areas, the applicants within 10 km are a representative sample of the pool's distribution of productivity and signal, scaled by $\exp(\nu)$. Let $z = \Phi^{-1}(q)$ for an applicant at productivity rank q . By (5), $s | z \sim N(\tau z, 1 - \tau^2)$, so the applicant is in the high cell with probability $\Phi((\tau z - \bar{s})/\sqrt{1 - \tau^2})$; averaging over the ranks of fifth b gives h_b in (6). The high cell is admitted and the low cell with probability δ , so the admitted share of fifth b is $h_b + (1 - h_b)\delta$ and entry of that fifth changes by $\nu + \ln[h_b + (1 - h_b)\delta]$. A fifth with $h_b = 0$ falls by $\nu + \ln \delta$ whatever its rank. As $\tau \rightarrow 1$, h_b is one above $\Phi(\bar{s})$ and zero below it; with $\delta = 0$ this is a hard cutoff on productivity. As $\bar{s} \rightarrow \infty$ only one cell remains and the admitted share is δ in every fifth. (c) With $\rho = 0$, (4) becomes $1 - \sum_\ell T_\ell x_\ell^{-\zeta}$, and for any two areas E and k , $\Pr(\pi_{jE} > x_E, \pi_{jk} > x_k) = 0$ in the Pareto region. An applicant with $\pi_{jE} \geq F$ therefore has $\pi_{jk} < F$ in every other area and stays out when turned away. With $\rho > 0$ the joint survival is positive, and some applicants turned away enter elsewhere.

Proposition 2. (a) Problem (9) is linear in (δ_H, δ_L) with one resource constraint. The Lagrangian $\sum_i \delta_i n_i (\gamma_i - \Lambda \bar{a}) + \Lambda \bar{K}$ with $\delta_i \in [0, 1]$ gives the first-order conditions of Fu (2014, equations 13–14): $\delta_i = 1$ when $\gamma_i > \Lambda \bar{a}$, $\delta_i = 0$ when it is below, and $\delta_i \in [0, 1]$ when equal, with $\Lambda \geq 0$ and complementary slackness. When the land binds and $\gamma_H > \gamma_L$, the high cell is admitted and $\Lambda = \gamma_L / \bar{a}$ at the low cell. The ranking $\gamma_H > \gamma_L$ is an assumption on the parent zone's score, not on social value; it holds, for instance, when the score is the expected value given the signal, since $z \mid s$ rises in s in the likelihood-ratio order and v rises in z . A fall in $\bar{K}$ lowers δ and, once $\delta = 0$, rationing reaches the high cell and Λ rises to its expected value per hectare; plots freed by exits raise δ in the following year. With a continuum of applicants and a continuous signal this is the supply-and-demand lemma of Azevedo and Leshno (2016). (b) With the signal ranking applicants by profit, the cutoff admits $\pi_{jE} \geq \bar{\pi}$ with $\Pr(\pi \geq \bar{\pi} \mid \pi \geq F) = (\bar{\pi}/F)^{-\zeta} = r$. A charge λ admits $(1 - \lambda)\pi_{jE} \geq F$, the same set when $(1 - \lambda)^\zeta = r$; a minimum size admits sales $\sigma\pi_{jE} \geq \sigma\bar{\pi}$, again the same set. With $\rho = 0$, no applicant turned away enters elsewhere under any of the three, so entry, composition and output coincide. (c) The charge collects λ times the operating profit of the admitted. In units of the operating profit of all potential entrants without the claim, $\int_F^\infty \pi dG$, the admitted earn $(\bar{\pi}/F)^{1-\zeta} = r^{1-1/\zeta} = r/(1 - \lambda)$, so $\mathcal{C} = r\lambda/(1 - \lambda)$. The cutoff and the minimum size collect nothing. (d) Only a charge levied per hectare on the transaction moves the transaction price.

Proposition 3. (a) and (b): Compare each group with entry without the claim. Each applicant turned away forgoes its value net of fixed costs and gains its value elsewhere. Each admitted establishment pays the transfer the rule collects above the administered price, and the parent zone receives it. By the envelope theorem applied to U in (10), workers' welfare changes by the wage bill times the change in the log wage. Summing, transfers cancel. (c) The efficient allocation chooses a set of applicants to maximize their total value subject to the land. With plots small relative to $\bar{K}$, admitting applicants in order of value per hectare solves this problem. No rule that uses the same land therefore turns away less value. (d) With Pareto profits above F , equal land per establishment and a signal that ranks by profit, the applicants turned away have profits in $[F, \bar{\pi})$ with $\bar{\pi} = Fr^{-1/\zeta}$. Their profit net of the fixed cost, as a share of all operating profit, $\zeta F/(\zeta - 1)$ per entrant, is

$$\mathcal{D} = \frac{\zeta - 1}{\zeta} \int_1^{r^{-1/\zeta}} (x - 1) \zeta x^{-\zeta-1} dx = \frac{1 - r}{\zeta} + r - r^{1-1/\zeta}.$$

Expanding $r^{1-1/\zeta}$ to second order in $1 - r$ gives $\mathcal{D} \approx (\zeta - 1)(1 - r)^2/(2\zeta^2)$; the derivative at $r = 1$ is zero. A signal unrelated to profit, or random rationing of a whole cell, turns away a random share $1 - r$, whose profit net of fixed costs is the share $1 - (\zeta - 1)/\zeta = 1/\zeta$ of their

operating profit, so the cost is $(1 - r)/\zeta$. Under a charge, the burden on potential entrants is $\mathcal{C} + \mathcal{D} = r^{1-1/\zeta} - r + \mathcal{D} = (1 - r)/\zeta$.

Proposition 4. (a) An incumbent of fifth b is reviewed with probability ω . If reviewed, it keeps its plot for sure in the high cell and with probability δ in the low cell, so it loses the plot with probability $(1 - \delta)(1 - h_b)$. The share of fifth b that keeps its plots is $1 - \omega(1 - \delta)(1 - h_b)$. When the review uses current rather than past productivity and ranks are correlated ϕ over time, $s \mid z_0 \sim N(\tau\phi z_0, 1 - \tau^2\phi^2)$ for an incumbent classified by its earlier rank z_0 , and h_b is evaluated at $\tau\phi$; the simulation checks of the replication files confirm both forms. (b) By (8), an incumbent that loses its plot relocates if $\pi_{jo} \geq F + F_R$. If an incumbent's profit elsewhere rises with its current profit, the displaced that relocate are the largest of the displaced. Review displaces incumbents of every size within the low cell, so relocating incumbents come from the upper part of the size distribution of the low cell.

Proposition 5. With export profits Pareto with tail ζ above the fixed cost, the number of exporters is proportional to $f^{-\zeta}$, so $\Delta \ln N = -\zeta \Delta \ln f$. Net export profits are $V^X = N(\mathbb{E}[\pi^X \mid \pi^X \geq f] - f) = Nf/(\zeta - 1) \propto f^{1-\zeta}$, and base exports are $X_0 = \sigma N_0 f_0 \zeta / (\zeta - 1)$, so $V_0^X / X_0 = 1/(\sigma \zeta)$ and $\Delta V^X / X_0 = (e^{-(\zeta-1)\Delta \ln f} - 1)/(\sigma \zeta)$. The incumbent exporters keep their gross profits and save $f_0(1 - e^{\Delta \ln f})$ each, which in units of X_0 is $(\zeta - 1)(1 - e^{\Delta \ln f})/(\sigma \zeta)$ since $N_0 f_0 / X_0 = (\zeta - 1)/(\sigma \zeta)$; the remainder is the surplus of new exporters. The gain is a welfare gain of the province's exporters if the province is small, fixed costs use real resources, profits accrue in the province, and the fixed cost is the only channel.

P.2 The Charge Reading

Proposition 2(b) holds when $\rho = 0$. With $\rho > 0$, a charge that keeps the share $u = 1 - \lambda$ of operating profit within 10 km also lowers entry of the more productive half, because a charge selects on the match between a firm and an area rather than on scale alone. Entry within 10 km becomes $r = u^\eta S^{-\rho}$, with $\eta = \zeta/(1 - \rho)$ and $S = 1 - \varpi_0(1 - u^\eta)$, where $\varpi_0 = 0.173$ is the share of the host prefecture's new domestic establishments that located within 10 km before the opening. The two halves then identify u and ρ jointly.

Estimated by minimum distance on the two half moments together with the other entry moments of the reduced form, with diagonal weights, the charge keeps $u = 0.916$ (0.041) of operating profit, a charge of 8.4 percent. The correlation sits at its lower bound of zero. The overidentification statistic is 1.80 ($p = 0.41$), and the profile of the statistic rejects ρ above 0.66 at the 5 percent level with the boundary-corrected critical value; resampling gives upper limits of 0.59 (parametric) and 0.45 (wild). At $\rho = 0$ the charge reproduces the entry of a cutoff on scale, with a transfer of 8.4 percent of operating profit and a loss of 0.03 percent,

the values of $\mathcal{C}$ and $\mathcal{D}$ in Proposition 2. The unchanged transaction price of land rules out a charge levied in the price but not one levied in commitments of investment and output. A charge on profit ranks applicants by value and therefore predicts a ramp across the five fifths, which the fifth moments reject (Section 6.10); we use it as a counterfactual rather than as a reading of the data. A charge that clears the same land as the estimated rule takes 15 to 25 percent of the admitted establishments' operating profit, depending on the reading of the pool and on what applicants know of their own value.

P.3 Profile and Robustness of the Rule

The ten fifth moments are estimated in ten regressions on the same cells and years. Stacking the prefecture influence functions of the ten regressions gives their joint covariance, which weights (16). The correlation τ governs only the sharpness of the step, and the objective is nearly flat in it near one. We therefore evaluate the objective on the grid $\tau \in \{0.5, 0.7, 0.8, 0.9, 0.95, 0.99, 0.999\}$, re-estimate the other four parameters at each point, and report the estimates at the minimum; the correlations within 3.84 of the minimum are 0.95, 0.99, 0.999. Each estimation starts from 24 initial values.

Four variations leave the step and the low-cell admission similar. In the four-year window, $\delta = 0.34$ with $J = 4.99$ ($p = 0.42$). If the review used current productivity, so that the incumbents' high cell is blurred by the rank correlation $\phi = 0.37$ over three years, $\delta = 0.45$ with $J = 14.34$ ($p = 0.01$). If the pool grew only in the high cell, $\delta = 0.62$ with $J = 8.99$ ($p = 0.11$). A smooth signal without cells, with or without a pool that tilts toward the more productive, is rejected ($J = 34.1$ on 5 degrees of freedom, $p < 0.001$).

P.4 What the Signal Records

We rank applicants by revenue productivity because the entry response is steeper across productivity than across capital. Among the 107,097 new domestic establishments of 1999–2007 with recorded revenue productivity and capital, the rank correlation of revenue productivity with sales is 0.37 and with capital -0.14 . A signal built on capital or employment would therefore keep productive entrants at a lower rate than unproductive ones, the opposite of the data. A signal built on output, taxes or revenue per unit of input ranks applicants close to revenue productivity, and the correlation τ absorbs the difference.

P.5 Values and Allocations of the Same Land

Table 11 uses the new domestic establishments of the 1999–2004 cohorts with positive first-year sales, capital and employment. Each establishment’s value is $\sum_{a=0}^3 0.95^a y_a$, where y_a is its sales at age a , zero once it leaves the survey; survival to ages one, two and three is 84, 76 and 68 percent. Sales at entry may cover part of a year, which raises measured growth to age one; four-year values are less sensitive to this than first-year shares. Discounted four-year sales are 5.7 times first-year sales among all entrants, which converts first-year sales within 10 km, 7.9 billion yuan a year for about 144 new domestic establishments, into $\mathcal{V}$.

Land per establishment is first-year employment to the power 0.24 (Appendix P.8). Within each industry and year, the estimated rule admits an applicant of productivity fifth b with probability $h_b + (1 - h_b)\delta$, and the expected land of the admitted is the capacity. The feasible rule admits applicants in descending order of value predicted from employment, capital, assets, leverage, industry and year, by gradient boosting with five-fold cross-fitting. The price rule admits applicants in descending order of first-year sales per hectare, and the efficient rule in descending order of four-year value per hectare, each until the capacity is used. The efficient rule uses realized values, so it assumes perfect foresight; its cost is a lower bound on the cost of scarcity. The rent under a price is the highest losing bid per hectare in each industry and year, the lowest price that clears the land, times the land admitted. At the efficient allocation it is 21.3 percent of $\mathcal{V}$, and 14.8 percent when the pool grows only in the high cell.

Values are gross of fixed costs. In the Pareto benchmark the fixed cost is the share $(\zeta - 1)/\zeta$ of the mean entrant’s operating profit. Netting the fixed costs of the applicants turned away therefore lowers each cost by at most the share of establishments turned away times $(\zeta - 1)/\zeta$. This is 3.3 points for the estimated rule, and less for the rules that turn away fewer establishments.

P.6 The Implementable Auction, Annual Flows and Outside Options

The implementable auction ranks applicants by the first-year sales predicted from the characteristics the parent zone sees at application, divided by the plot each would use. The prediction uses the same characteristics and five-fold cross-fitting as the feasible frontier. We use three information sets. The first, industry and year, cannot rank applicants within an industry and year, so no rule based on it improves on random allocation. The second, used in the main text, adds first-year employment and capital, which stand in for the employment and investment an applicant commits to in the land contract. The third adds first-year assets

and leverage, which the parent zone does not see at application; with it the auction would turn away 19.6 percent of $\mathcal{V}$ (9.3 percent under the other reading) instead of 23.0 (11.2). The ranking by realized first-year sales uses information that no rule at application has and is reported only as a benchmark. Under any rule that uses only information available at application, the value admitted cannot exceed the feasible frontier's; the auction comes within 0.5 points of it.

The annual flow of the entrants' loss assumes a steady state of identical cohorts: in any year, one cohort of each age from zero to three is alive, so the annual flow is the undiscounted sum of a cohort's operating profit over ages zero to three. Among new domestic establishments of 1999–2004, this sum is 1.09 times the discounted value. Among the applicants each rule turns away, the ratio is 1.10 for the estimated rule, 1.07 to 1.05 for the ex post frontier, whose excluded applicants are smaller and exit sooner, and 1.09 for the auction; Table 13 uses each rule's own ratio.

The incumbents' loss uses the 1999/2000 incumbents within 10 km in the year before the opening, 237.7 billion yuan of sales, by productivity fifth. Each fifth loses plots with the probability $\omega(1 - \delta)(1 - h_b)$ of Proposition 4, which is the same under both readings of the pool. A lost plot costs four years of the fifth's sales, as nationwide incumbents of that fifth realized them from 2000, times $1/\sigma$. This is an upper bound: it assumes no displaced incumbent rebuilt elsewhere.

Outside options follow from the multivariate Pareto model. When the area within 10 km is small in the prefecture, the share of applicants turned away whose next-best area also covers the fixed cost approaches the correlation ρ . If those applicants lost nothing by building there, every cost in Table 11 would fall by the factor $1 - \rho$; the ranking of rules is unchanged. Section 7.7 reports the cost at $\rho = 0.33$ and at the largest correlation the data allow, 0.66.

P.7 Further Checks of the Rule

The five checks of Section 6.10 use the event-path design and window of the ten fifth moments, with differences across outcomes from stacked prefecture influence functions. The threshold check re-ranks entrants within those with first-year sales of at least 10 or 20 million yuan, nationally within industry and year, and compares the mean of the three lowest fifths with the top fifth. The ownership check splits entrants by the survey's registration code: private firms against all other domestic firms. The linkage check splits industries by input-output links to the industries of the fenced firms: upstream, downstream or the same industry, against the rest. The survival check restricts entrants to the cohorts of 1999–2004, for which age three is observed, and sets the outcomes to zero in later years, so that those years drop out through

the stratum-by-year effects. The change in the log number of survivors to age three minus the change in the log number of entrants is the change in the survival rate; the change in log sales at age three minus that at age zero, both among survivors, is the change in growth. The comparison between the linked and unlinked industries and between the low and high cells were added after the first run of these checks.

Table P1 reports the event path of entry within 10 km by productivity fifth. Before the openings, entry of the three lowest fifths rose relative to the top fifth toward the year before the opening, the omitted year. In the three years after the opening, the difference lies below every pre-opening value. The incumbent check splits the 1999/2000 incumbents by whether they were already in the survey in 1998 and estimates the five retention moments for each group.

Table P1: Event path of entry within 10 km by productivity fifth

Years since the opening	−4	−3	−2	−1	0	1	2	3
Fifth 1	−0.39 (0.26)	−0.04 (0.25)	−0.04 (0.20)	0	−0.24 (0.24)	−0.69 (0.29)	−0.48 (0.28)	−0.06 (0.27)
Fifth 2	−0.59 (0.67)	−0.32 (0.40)	−0.39 (0.49)	0	−0.60 (0.40)	−0.75 (0.34)	−0.44 (0.30)	−0.14 (0.35)
Fifth 3	−0.62 (0.54)	−0.46 (0.32)	−0.33 (0.39)	0	−0.54 (0.22)	−1.00 (0.24)	−0.54 (0.32)	−0.38 (0.33)
Fifth 4	0.39 (0.43)	0.11 (0.18)	−0.05 (0.30)	0	0.19 (0.19)	−0.08 (0.24)	0.04 (0.39)	0.27 (0.32)
Fifth 5	0.31 (0.45)	0.31 (0.21)	0.18 (0.29)	0	0.49 (0.20)	0.43 (0.23)	0.47 (0.23)	0.57 (0.25)
Fifths 1–3 minus fifth 5	−0.85 (0.33)	−0.58 (0.32)	−0.44 (0.40)	0	−0.95 (0.27)	−1.24 (0.34)	−0.96 (0.27)	−0.77 (0.30)
All entrants	−0.20 (0.38)	−0.13 (0.19)	−0.17 (0.25)	0	−0.07 (0.17)	−0.38 (0.17)	−0.18 (0.22)	0.08 (0.23)

Notes: Coefficients of the event-path Poisson regression of the count of new domestic establishments in each productivity fifth within 10 km, relative to the year before the opening; cell effects, matched-stratum-by-year effects, standard errors clustered by prefecture in parentheses. Fifths are national, within two-digit industry and year. The row for fifths 1–3 minus fifth 5 combines the regressions through stacked prefecture influence functions. The step is −0.83 (0.22) in the net window of the main text, −0.58 (0.22) against the mean of the four years before the opening, and −0.54 (0.26) against the mean of years −3 and −2.

P.8 Plot Size and Bids

The elasticity of plot area to firm size comes from industrial parcels sold in 2007–2013 whose buyers are matched by name to the survey, with the buyer’s employment from the survey

year before the purchase. We regress log area on log employment after removing city-by-year means and cluster standard errors by city; the elasticity is 0.24 (0.012). If a bid for a plot equals the operating profit the plot enables and profit rises in proportion to scale, the bid per hectare rises with scale with an elasticity of 0.76, one minus the plot-size elasticity, so a price admits applicants largely in order of scale.

P.9 Design Choices

Table P2 lists the main choices in the model, the alternative each replaces and where the choice matters.

Q Inference with Few Treated Places

The cells within 10 km of the zones number 89, 29 of them around the zones opened in 2003–05, so we check the main estimates in two further ways (Table Q1).

Placebo zones. We assign the opening years of the real cells to never-exposed cells that resemble them in 1998 and re-estimate the main specification with these placebo zones added. The placebo estimates are widely dispersed. For the four estimates within 10 km that we check under both matches, the randomization p -values range from 0.24 to 0.66 under the pre-specified match and from 0.15 to 0.71 under the stricter one; across all estimates in the table they range more widely. The dispersion has a clear source: even under the stricter match, placebo cells are sparser than the cells within 10 km of the zones, with a quarter or less of their median output in 1998, and their estimates are correspondingly noisier, with a spread close to their own standard errors. Comparing t -statistics rather than coefficients corrects for this. Of the four estimates checked against the stricter placebo zones, the two that are significant in the main specification, the fall in new domestic establishments around the 2003–05 zones and the rise in output within 10 km of all zones, are more extreme than every placebo zone under that comparison. The studentized comparison was added after the first placebo run; we report both.

Pre-trends. Following Rambachan and Roth (2023), we ask how large a departure from parallel trends after the opening would overturn each estimate, measured relative to the largest departure before it. Allowing half that departure, the robust interval for output within 10 km still excludes zero, while the intervals for entry and for the hinterland include it; their pre-opening paths are noisier. These checks qualify the strength of the estimates within 10 km and in the hinterland without changing their sign.

Table P2: Design choices

Choice	Alternative	Reason	Where it matters
Fixed pool of potential entrants (Chaney 2008)	free entry (Melitz 2003)	entrepreneurs start firms where they live; a free-entry pool would refill the area	whether exclusion is a loss
Correlated profits across areas (Arkolakis et al. 2018)	nested logit location choice (Fajgelbaum et al. 2019)	closed form in which location is independent of profit; ρ nests both extremes	where the excluded go
Coarse signal cells, marginal cell at random (Fu 2014)	a cutoff on a score; a smooth signal	entry and retention fall in a step across productivity fifths	who is turned away; the rule's cost
Signal correlated with productivity (Khandelwal et al. 2013)	investment standards	the capital gradient rejects capital and employment signals	who is in the high cell
Administered price, rationing by the multiplier	a price; a charge in commitments	no change in transaction prices	transfers, not entry
Values measured over four years	a model of firm growth	comparable entrants' survival and growth are observed	size of the rule's cost
Wages held fixed	a local labor market	no detectable wage change within 10 km	workers' incidence
Review of held plots with the same rule (Khandelwal et al. 2013)	a separate renewal cutoff; exit at a profit cutoff only	incumbents below the top fifth lose plots alike; survivors' sales do not move	incumbents' margin
Two cells	more cells; priorities by ownership or investment type	ten moments pin down two cells; type priorities are not identified separately	composition by type
Pool changes in proportion across fifths	pool changes in the high cell only	admission can only remove applicants, so the top fifth's rise needs more applicants	the low cell's admission

Table Q1: Inference with placebo zones and sensitivity to pre-trends

	Estimate (s.e.)	Randomization p			Robust interval, $\bar{M} = 0.5$
		Pre-specified	Stricter match	Studentized	
<i>2003–05 wave, 0–10 km</i>					
Output	0.08 (0.06)	0.66	0.54	0.350	[-0.12, 0.27]
Value added	0.17 (0.13)	0.41	–	–	[-0.11, 0.54]
Employment	0.04 (0.06)	0.80	–	–	[-0.15, 0.20]
Establishments	-0.17 (0.08)	0.33	–	–	[-0.36, 0.07]
New domestic establishments	-0.36 (0.12)	0.24	0.15	0.000	[-2.13, 1.69]
<i>All waves, 0–10 km</i>					
Output	0.15 (0.03)	0.30	0.25	0.000	[0.00, 0.35]
Value added	0.21 (0.05)	0.20	–	–	[-0.01, 0.50]
Employment	0.18 (0.05)	0.08	–	–	[-0.04, 0.33]
Establishments	0.06 (0.05)	0.54	–	–	[-0.11, 0.29]
New domestic establishments	-0.08 (0.11)	0.66	0.71	0.562	[-1.08, 0.65]
<i>Same province, 40–100 km</i>					
Output	0.11 (0.03)	–	–	–	[-0.01, 0.24]
Value added	0.18 (0.04)	–	–	–	[-0.00, 0.38]
Employment	0.08 (0.04)	–	–	–	[-0.03, 0.20]
Establishments	0.05 (0.03)	–	–	–	[-0.05, 0.14]
New domestic establishments	0.10 (0.09)	–	–	–	[-0.35, 0.49]

Notes: Estimates are the paper’s main specification (post-opening years 0–3 against all pre-opening years), re-estimated on the survey cell aggregates used for the placebo runs, with each statistic’s own exposure terms; they differ slightly from the main text (for example, -0.36 against -0.41 for new domestic establishments around the 2003–05 zones). Randomization p : share of placebo estimates at least as large in absolute value, from never-exposed cells assigned the opening years of the real cells; the pre-specified match uses 1998 output within region, the stricter match also requires the same matching stratum. Placebo cells remain sparser than near-field cells, so their estimates are noisier; the studentized version, added after the first placebo run, compares t -statistics. Robust intervals follow Rambachan and Roth (2023), allowing post-opening departures from parallel trends up to half the largest pre-opening departure.