

# Online Appendix for “Fine Me If You Can: Fixed Asset Intensity and Enforcement of Environmental Regulations in China”

## Appendix A: Additional Data Analysis

**Table A-1: Correlation statistics.**

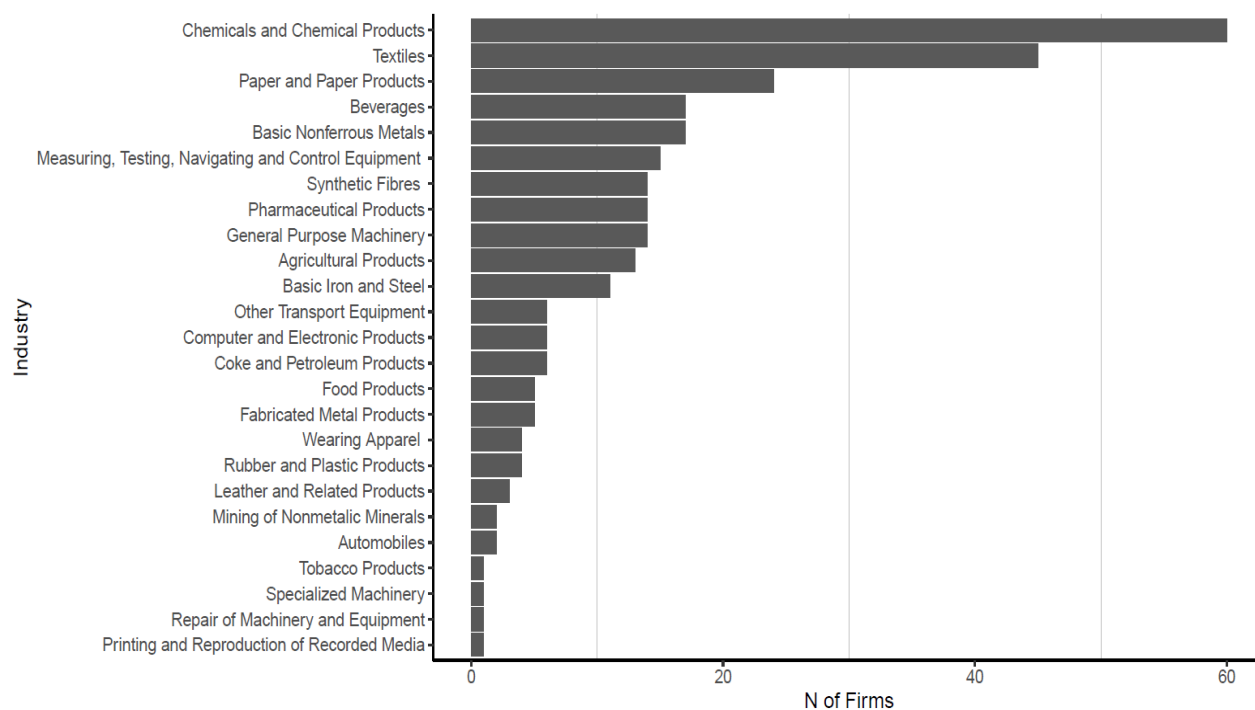
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1: punitive action	1.00	0.21	0.22	0.05	-0.11	-0.03	-0.05	0.14	0.02	0.13	-0.00	0.01	0.03	0.04	0.04	0.05	0.05
2: pollution levi (log)	0.21	1.00	0.28	0.13	-0.11	-0.03	-0.14	0.44	0.18	0.27	0.08	0.15	0.03	0.02	0.02	0.16	0.15
3: state-owned enterprise	0.22	0.28	1.00	-0.07	-0.45	-0.17	-0.21	0.26	0.07	0.34	0.06	0.11	0.09	0.10	0.10	0.11	0.09
4: collectively owned	0.05	0.13	-0.07	1.00	-0.15	-0.06	-0.07	0.07	0.06	0.01	0.02	-0.01	-0.04	-0.10	-0.10	-0.06	-0.06
5: privately owned	-0.11	-0.11	-0.45	-0.15	1.00	-0.38	-0.48	-0.25	-0.01	-0.14	-0.09	0.03	-0.03	0.07	0.07	-0.30	-0.28
6: HMT owned	-0.03	-0.03	-0.17	-0.06	-0.38	1.00	-0.18	0.04	-0.05	-0.07	0.08	-0.07	-0.03	-0.07	-0.07	0.12	0.12
7: foreign owned	-0.05	-0.14	-0.21	-0.07	-0.48	-0.18	1.00	0.02	-0.03	-0.09	-0.02	-0.08	-0.01	-0.08	-0.09	0.21	0.20
8: firm total output (logged)	0.14	0.44	0.26	0.07	-0.25	0.04	0.02	1.00	0.43	0.21	0.49	0.09	-0.05	-0.10	-0.09	0.08	0.08
9: firm income tax (logged)	0.02	0.18	0.07	0.06	-0.01	-0.05	-0.03	0.43	1.00	0.18	0.22	0.48	-0.02	-0.00	-0.00	-0.07	-0.07
10: firm age (logged)	0.13	0.27	0.34	0.01	-0.14	-0.07	-0.09	0.21	0.18	1.00	0.04	0.11	0.10	0.08	0.08	0.02	0.00
11: firm wage contribution (%)	-0.00	0.08	0.06	0.02	-0.09	0.08	-0.02	0.49	0.22	0.04	1.00	0.01	-0.03	-0.06	-0.05	-0.01	-0.01
12: firm profit rate	0.01	0.15	0.11	-0.01	0.03	-0.07	-0.08	0.09	0.48	0.11	0.01	1.00	0.04	0.09	0.09	-0.17	-0.17
13: environmental violation	0.03	0.03	0.09	-0.04	-0.03	-0.03	-0.01	-0.05	-0.02	0.10	-0.03	0.04	1.00	-0.00	-0.01	0.04	0.04
14: fixed asset per output <sup>industry</sup> median	0.04	0.02	0.10	-0.10	0.07	-0.07	-0.08	-0.10	-0.00	0.08	-0.06	0.09	-0.00	1.00	1.00	0.04	0.04
15: fixed asset per sale <sup>industry</sup> median	0.04	0.02	0.10	-0.10	0.07	-0.07	-0.09	-0.09	-0.00	0.08	-0.05	0.09	-0.01	1.00	1.00	0.03	0.03
16: fixed assets as % of output (log)	0.05	0.16	0.11	-0.06	-0.30	0.12	0.21	0.08	-0.07	0.02	-0.01	-0.17	0.04	0.04	0.03	1.00	0.99
17: fixed assets as % of sale (log)	0.05	0.15	0.09	-0.06	-0.28	0.12	0.20	0.08	-0.07	0.00	-0.01	-0.17	0.04	0.04	0.03	0.99	1.00

**Table A-2: Explaining pollution levies and punitive actions, Jiangsu, 2012-2014 – models with fewer control variables.**

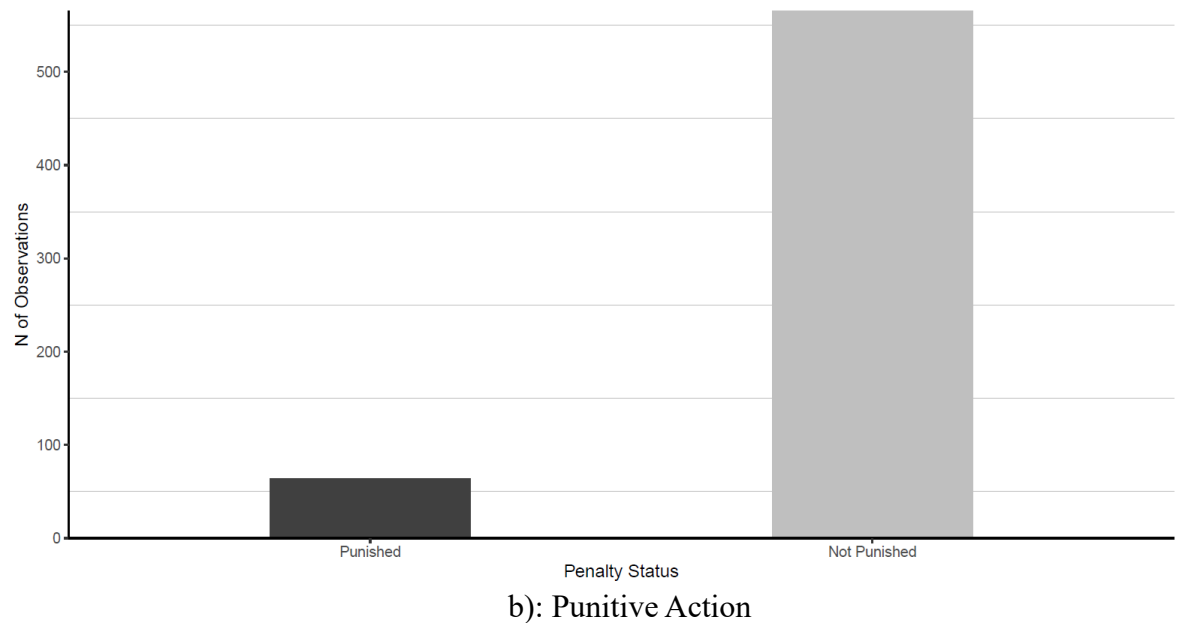
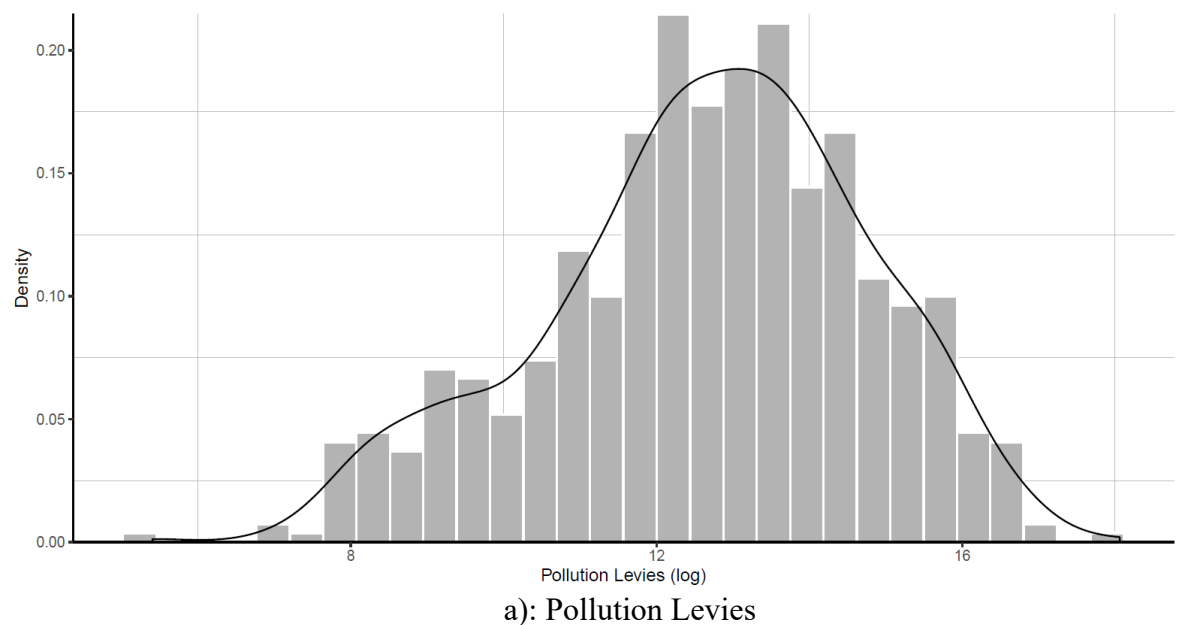
	<i>Dependent variable:</i>							
	Pollution Levies				Punitive Action			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fixed assets as % of output (log)	0.429*** (0.091)	0.399*** (0.079)	0.400*** (0.080)	0.405*** (0.080)	0.012 <sup>a</sup> (0.008)	0.013* (0.008)	0.013* (0.008)	0.013* (0.008)
Firm Ownership (baseline: private)								
State-owned enterprise (SOE)	0.955** (0.383)	0.607** (0.307)	0.605** (0.307)	0.446 (0.275)	0.128* (0.066)	0.120* (0.066)	0.119* (0.066)	0.118* (0.066)
Collectively owned	0.981*** (0.225)	0.584** (0.259)	0.586** (0.261)	0.630** (0.309)	0.118** (0.049)	0.117** (0.046)	0.117*** (0.045)	0.117** (0.045)
HMT Owned	0.583 (0.370)	0.344 (0.321)	0.341 (0.327)	0.341 (0.319)	0.024 (0.025)	0.021 (0.024)	0.021 (0.024)	0.021 (0.025)
Foreign Owned	0.364 (0.347)	0.093 (0.305)	0.091 (0.309)	0.105 (0.290)	-0.035* (0.019)	-0.039* (0.021)	-0.039* (0.021)	-0.039* (0.022)
Firm profit rate	1.601* (0.925)	-0.087 (0.657)	-0.049 (0.674)	0.021 (0.664)	0.011 (0.128)	0.077 (0.168)	0.073 (0.163)	0.072 (0.164)
Firm total output (logged)		0.376*** (0.058)	0.366*** (0.061)	0.368*** (0.056)		0.008 (0.007)	0.010 (0.007)	0.010 (0.007)
Firm income tax (logged)		0.050** (0.025)	0.049* (0.027)	0.038 (0.024)		-0.006 (0.007)	-0.006 (0.007)	-0.006 (0.007)
Firm wage contribution (%)			0.038 (0.140)	0.023 (0.130)			-0.004 (0.007)	-0.004 (0.007)
Firm age (logged)				0.323*** (0.116)				0.002 (0.017)
Year fixed effects	√	√	√	√	√	√	√	√
Prefecture fixed effects	√	√	√	√	√	√	√	√
Industry fixed effects	√	√	√	√	√	√	√	√
Clustered s.e. (prefecture)	√	√	√	√	√	√	√	√
Observations	619	611	611	611	727	719	719	719
R <sup>2</sup>	0.630	0.687	0.687	0.694	0.147	0.139	0.139	0.139
Adjusted R <sup>2</sup>	0.601	0.661	0.661	0.668	0.092	0.080	0.079	0.077

*Note:* model 1-4 (pollution levies in logged 1000RMB) and model 5-8 (punitive action measured as a binary variable) are estimated by OLS; all right-hand side variables are lagged by one year. \*p<0.1; \*\*p<0.05; \*\*\*p<0.01. a: p-value is 0.104.

**Figure A-1: Key monitored firms by industry, Jiangsu 2012-2014**



**Figure A-2: Density Distributions of Pollution Levies and Punitive Actions.**



## Appendix B: Online Survey of Managers.

We used a marketing research firm to recruit participant from the firm's subject pool of managers, defined as those holding managerial positions, such as general managers, vice presidents, directors, and CEOs. The firm used a variety of methods to recruit these people into the subject pool, mostly by inviting managers that had enlisted the firm to help with their own marketing research. Importantly, the marketing research company was only responsible for participant recruitment, not the design of the questionnaire, which was distributed as a link directing the respondent to Qualtrics, where the survey was hosted. When the survey was in the field, the firm sent out batches of invitations to a random sample of its manager pool to reach our target sample size of 500.<sup>1</sup> In total, 534 firm managers successfully completed the survey.

**Sample Comparison to All Chinese Above-scale Firms:** Table B1 presents the comparisons between our sample and over 300,000 of "above-scale" industrial firms (defined as all SOEs as well as non-SOEs with sales exceeding 20 million RMB) in the Chinese Firm-level Industrial Survey (CFIS), an annual survey conducted by the National Bureau of Statistics.<sup>2</sup> Though not drawn from a probability-based sample, our firms, especially those that reported over 20 million RMB in sales, are comparable to the population of such firms in China in terms of their geographical location, ownership, size (measured by sales), and, to some extent, industrial breakdown. Figure B1 shows the spatial distribution of our sampled firms.

**Variables and Variable Distributions from Our Survey:** We include a large number of questions in our survey. The following are used in our analysis. Table D2 provides the summary statistics of these variables.

Log Environmental Expense: "What were your firm's operation costs related to environment (monitoring, auditing, pollution fees, and fines, etc.) in 2017?"

Fixed Assets (% of Sales): "What is the percentage of your firm's fixed assets in sales?"

Sales: "What was your firm's sales last year?" – below 5 million; 5-10 million; 10.01-15 million; 15.01-20 million; 20.01-40 million; 40.01-80 million; 80.01-200million; over 200 million; Not sure.

CEO NPC: "Is the CEO/Director of your firm a member of the national/provincial/local People's Congress?" – yes; no; not sure.

Board NPC: "Are there members of the national/provincial/local People's Congress on the board of directors?" – yes; no; not sure; our firm does not have a board.

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<sup>1</sup> This "opt-in" method of subject recruitment—i.e., all of the potential respondents that met the eligibility criteria received invitations to take part in the survey, and the survey link expired once a pre-set number of responses was reached—made it difficult to calculate response rate as would be done with traditional surveys, since the invitations were rolled out in phases rather than according to a pre-determined pool size.

<sup>2</sup> The latest publicly available version of the data is from 2013, which covers 345,101 firms.

Ownership: “What is the registration type of your firm?” – SOE; private enterprise; Hong Kong, Macau, Taiwan (HMT) invested enterprise; foreign (non-HMT) invested enterprise; collective enterprise; joint venture (JV).

Employee: “How many employees does your firm have in all office and production units?”

Doing Better: “Is your firm doing better than last year” – yes; no; about the same.

Productivity: “How does your firm’s productivity compare to similar firms in the same industry?” – significantly lower; slightly lower; about the same; slightly higher; significantly higher; not sure.

Substitutability: “Can the products of your firm be easily substituted by other like products?” – very hard; somewhat hard; somewhat easy; very easy; not sure.

Age of Firm: “What year was your firm founded?”

ISO 14000: “Is your firm certified by ISO 14000?” – yes; no.

Environmentally Certified: “Have your firm obtained environmental certification for your products?” – yes; no.

Difficulty Meeting Standard: “Are there challenges for your firm to meet the environmental standards set by the state?” – yes; no.

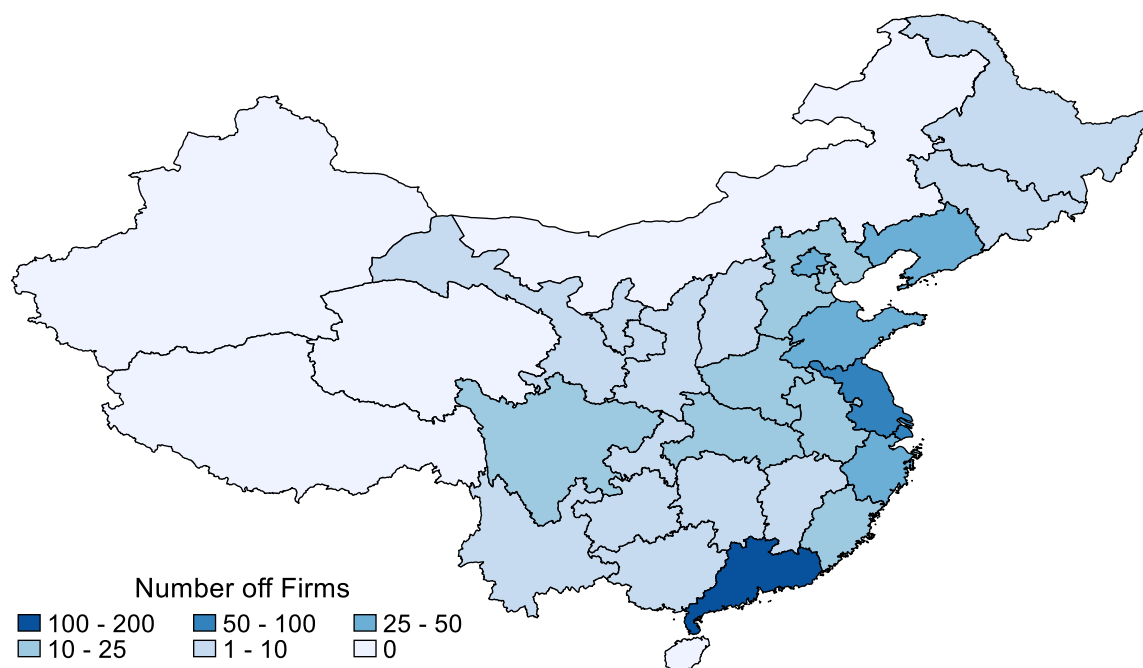
Hard to Relocate: “How difficult would it be for your firm to move the production to a different city within the province?” – not difficult at all (can relocate at any time); somewhat difficult; very difficult; almost impossible to move (relocation means closing business altogether).

**Table B-1: Sample Comparison.**

<i>Variable</i>	<i>Sample A (%)</i>	<i>Sample B (%)</i>	<i>Sample C (%)</i>
Region			
Eastern	75.9	79.4	80.7
Central	16.7	13.5	12.5
Western	7.4	7.1	6.8
Registration Type			
SOE	23.6	21.7	23.9
Private	59.7	60.1	55.7
Foreign	9.9	11.1	12.8
Collective	1	2.1	1.4
Joint Venture	5.8	5.1	6.3
Industry			
Textiles and Textile Products	10	8.1	7.4
Leather, Leather and Footwear	2.3	2.6	2.6
Wood and Products of Wood and Cork	2.5	4.7	1.4
Pulp, Paper, Printing, and Publishing	1.9	3.8	3.7
Coke, Refined Petroleum, and Nuclear Fuel	0.6	0.8	1.1
Chemicals and Chemical Products	6.9	5.6	6.8
Rubber and Plastics	4.8	9.4	11.1
Machinery	11.5	20.4	21.9
Electrical and Optical Equipment	10	6.9	8.5
Other	49.5	37.7	35.5
Sales (CNY)			
< 20 million	-	34.9	-
20–40 million	24.4	12.6	19.7
40–80 million	23.7	13.9	21.8
80–200 million	27	20.8	32.7
> 200 million	24.9	16.5	25.9
Sample Size	345,101	534	352

Note: The three samples are (A) 2013 CFIS, (B) our survey sample, and (C) our survey sample with firm sales greater than 20 million yuan.

**Figure B-1: Geographical Distribution of Sampled Firms**



**Table B-2: Variable Construction and Descriptive Statistics.**

Variable	Obs.	Mean	Std. Dev.	Min	Max
Log Environmental Expense	527	3.54	1.93	0.00	8.52
Fixed Assets (% of Sales)	525	35.01	23.81	0.00	250.00
Sales	522	5.24	2.20	1.00	8.00
CEO NPC	534	0.23	0.42	0.00	1.00
Board NPC	534	0.39	0.83	0.00	4.00
SOE (Baseline)	534	0.22	0.41	0.00	1.00
Private	534	0.60	0.49	0.00	1.00
HMT	534	0.05	0.22	0.00	1.00
Foreign	534	0.06	0.23	0.00	1.00
Collective	534	0.02	0.14	0.00	1.00
JV	534	0.05	0.22	0.00	1.00
Employee	534	3.67	1.02	1.00	5.00
Productivity	531	3.69	0.93	1.00	5.00
Difficulty Meeting Standard	534	2.26	0.55	1.00	3.00
Hard to Relocate	534	0.92	0.28	0.00	1.00

**Table B-3: Testing the effect of fixed asset using survey data.**

	(1)	(2)
	Immobility	Environmental Expense
Fixed Assets as a Percentage of Sales	0.008*	0.00742**
	(0.004)	(0.00348)
Immobility		0.0551
		(0.270)
Privately Owned	-0.794***	-0.497**
	(0.268)	(0.223)
HMT Owned <sup>a</sup>	0.0926	-0.615
	(0.579)	(0.392)
Foreign Owned	-0.553	-1.110***
	(0.433)	(0.358)
Collectively Owned	-0.747	-0.0512
	(0.640)	(0.445)
Joint Venture	-0.546	0.115
	(0.460)	(0.486)
CEO is NPC Member	0.496	0.265***
	(0.334)	(0.0450)
Board Contains NPC Member	-0.407	0.108
	(0.303)	(0.253)
Firm Sales	-0.017	0.383
	(0.053)	(0.241)
Number of Employees	-0.149	0.172*
	(0.105)	(0.0999)
Productivity	-0.061	0.235***
	(0.160)	(0.0903)
Difficulty in Meeting Env. Stand.	0.008*	-0.358**
	(0.004)	(0.152)
Coastal Provinces <sup>b</sup>	-0.017	-0.0738
	(0.053)	(0.286)
Central Provinces	0.496	-0.0867
	(0.334)	(0.379)
Constant	-0.407	0.165
	(0.303)	(0.859)
Industry fixed effects	√	√
Observations	493	508

Notes: a: HMT Owned refers to Hong Kong, Macao, and Taiwan ownership; b: western province is the baseline category. For ownership variables, the baseline category is state-owned enterprises (SOE). Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

### **Appendix C: Selection of Key-monitored Polluting Firms in China.**

In China, local bureaus of environmental protection implement environmental ratings. Provincial regulator verifies and publishes ratings. According to Administrative Measures of Environmental Statistics coming into force in December 2006, local environmental protection bureaus at or above county level are responsible for the collection of environmental statistics under the guidance of environmental protection bureaus at higher level and bureaus of statistics at the same level. In 2007, MEP, National Bureau of Statistics, and Ministry of Agriculture launched the first national census of pollution sources. This census provides a population of pollution sources from which key-monitored polluting points were selected during 2011-2015. In 2016, the State Council launched the second national census of pollution sources.

Regarding the selection of key-monitored polluting firm, first, in 2005, the State Environmental Protection Administration (SEPA) issued the Guideline for Promoting the Production and Improving the Quality of Environmental Statistics (No.100, 2005). The Guideline stipulates that key polluting firms to be identified through the collaborative efforts of SEPA and province-level environmental departments. In principle, key-monitored air polluting firms and key-monitored water polluting firms are selected following the same set of procedures. Take key-monitored air polluting firms in 2007 as an example. First, 80,000 firms surveyed nationwide in 2005 are ranked in order of SO<sub>2</sub>, soot, and dust respectively. For each pollutant, environmental agencies add emissions up, starting from the largest emitting firm, the second largest emitting firm, the third largest emitting firm, ..., and so forth, until the aggregate amount accounts for 65% of the total emissions of the pollutant in China: firms whose emissions are counted and contribute to the aforementioned 65% are considered national level key-monitored air polluting firms; firms below the threshold are not included. The final list of key-monitored air polluting firms includes those who appear at least once on the three pollutant lists (SO<sub>2</sub>, soot, and dust).

In addition to these firms, municipal water treatment plants whose capacity is equal to or larger than 10,000 tons per day are also considered key-monitored firms by the government. We choose not to include these water treatment plants, because they are not industrial firms that pursue maximization of profits: unlike other firms included in the analysis, water treatment plants are designed to deal with pollution.

**Appendix D: an example of firm level regulatory record from the IPE website, Chinese original text and English translation.**

**林州市环境保护局行政处罚决定书林环罚字（2017）47 号  
林州市环境保护局行政处罚决定书**

林环罚字（2017）47 号

林州市重机集团控股有限公司：

法定代表人（负责人）：郭现生

统一社会信用代码：91410581670068493T（1-1）

地址：林州经济开发区陵阳路北段

**一、环境违法事实和主要证据**

2017 年 8 月 11 日，林州市环保局执法人员现场检查时发现：你单位 12 号车间有喷漆、喷涂工件迹象，未在密闭空间或者设备中进行，且未采取减少废气排放措施。

从你单位违法行为的事实、性质、情节、社会危害程度和证据看，你单位的违法行为等次属于一般。

以上事实有“调查询问笔录”和“现场检查（勘察）笔录”等为证。

上述行为违反了违反了《中华人民共和国大气污染防治法》第四十五条“产生含挥发性有机物废气的生产和服务活动，应当在密闭空间或者设备中进行，并按照规定安装、使用污染防治设施；无法密闭的，应当采取措施减少废气排放”的规定。

我局于 2017 年 8 月 25 日向你单位送达了《林州市环境保护局行政处罚（听证）事先告知书》，告知你单位依法享有的陈述、申辩、听证权利。你单位逾期未进行陈述、申辩和要求听证。

**二、行政处罚的依据、种类及其履行方式和期限**

依据《中华人民共和国大气污染防治法》第一百零八条第一项“违反本法规定，有下列行为之一的，由县级以上人民政府环境保护主管部门责令改正，处二万元以上二十万元以下的罚款；拒不改正的，责令停产整治：（一）“产生含挥发性有机物废气的生产和服务活动，未在密闭空间或者设备中进行，未按照规定安装、使用污染防治设施，或者未采取减少废气排放措施的；”和河南省环保厅《大气污染防治法行政处罚裁量标准》关于适用《中华人民共和国大气污染防治法》第一百零八条第一项“当事人当年度初犯的责令改正，处 2 万元以上 5 万元以下罚款；拒不改正的，责令停产整治”的规定，

经我局法制领导小组会议研究，

我局决定对你单位环境违法行为作出以下处理：

- 1、责令你单位改正违法行为；
- 2、给予罚款 3 万元的行政处罚。

依据《行政处罚法》和《罚款决定与罚款收缴分离实施办法》的规定，你单位应于接到本决定书之日起 15 日内，将罚款缴至林州市财政局指定的代收机构。

收款银行：林州市农村信用联社营业部

户 名：林州市财政局非税收入归集户

账 号：00000111244531910012

你单位缴纳罚款后，应将缴款凭证报送我局法制科进行备案。

林州市环境监察大队负责对你单位履行处罚决定的情况实施环境行政执法后督察。请你单位于 2017 年 10 月 9 日前将履行处罚决定的情况书面报告林州市环境监察大队。

### 三、申请行政复议或者提起诉讼的途径和期限

如不服本处罚决定，可在接到决定书之日起六十日内向安阳市行政复议受理中心或者向林州市人民政府申请复议，也可在六个月内直接向安阳市文峰区人民法院提起行政诉讼。

如你单位逾期不申请复议，也不提起行政诉讼，又不履行本处罚决定的，我局将依法申请人民法院强制执行。

林州市环境保护局

2017 年 9 月 4 日

## **Linzhou City Environmental Protection Bureau administrative punishment decision [2017] No. 47**

Linzhou Environmental Protection Bureau Administrative Punishment Decision [2017] No. 47

### **Linzhou Heavy Machinery Group Holdings Co., Ltd.:**

Legal representative (person in charge): Guo Xiansheng

Unified Social Credit Code: 91410581670068493T (1-1)

Address: North Section of Lingyang Road, Linzhou Economic Development Zone

### **I. Environmental violations and main evidence**

On August 11, 2017, the law enforcement officers of the Linzhou Environmental Protection Bureau found during onsite inspection that the No. 12 workshop of your unit had signs of previous work of painting and spraying the workpiece that were not carried out in sealed space or equipment, and no measures to reduce exhaust emissions were taken.

Based on the facts, nature, degree of social harm and evidence, we determine that the level of offense is “general”.

The above facts are recorded as evidenced in the “investigation inquiry transcript” and “on-site inspection (survey) transcript”.

The above acts violated Article 45 of the Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution, which states that, “Production and service activities involving the emission of volatile organic compounds should be carried out in sealed spaces or equipment, with installation and use of pollution prevention and control measures in accordance with regulations. Measures should be taken to reduce exhaust emissions if the operation cannot be performed in sealed spaces or equipment.

On August 25, 2017, our bureau delivered to you the "Linzhou Environmental Protection Bureau Administrative Punishment (Hearing) Advance Notice" to inform you of the rights, opinions, and hearings that the unit enjoys in accordance with the law. Your unit has not submitted a statement, defense or request for a hearing by the deadline.

### **II. Basis, type of administrative punishment and its implementation methods and deadlines**

According to the first item of Article 108 of the Law of the People's Republic of China on Prevention and Control of Atmospheric Pollution, "in the event of one of the following acts in violation of the provisions of this Law, the department of environmental protection of the people's government at or above the county level shall order the violating unit to rectify its actions and pay a fine of less than 200,000 yuan; if the unit refuses to rectify its actions, it shall be ordered to suspend production: (1) Production and service activities involving the emission of volatile organic compounds not carried out in sealed spaces; failure to install and use pollution prevention devices or measures in accordance with regulations." Also according to Henan Provincial Environmental Protection Department "Air Pollution Prevention Law Administrative

Punishment Discretionary Standards" on the application of the "Air Pollution Control Law of the People's Republic of China" Article 108, item (1): first-time offender's shall be ordered to rectify its actions and pay a fine of between 20,000 yuan and 50,000 yuan; if the unit refuses to rectify its actions, it shall be ordered to suspend production.

After research by the Legislative Affairs Leading Group Meeting of the Bureau,

Our bureau has made the following decisions regarding your unit's environmental violations :

1. Rectify the violating actions;
2. An administrative penalty of a fine of 30,000 yuan.

According to "Administrative Punishment Law" provisions and "Decision to separate fines and their collection", the fine should be paid to the state forest collection agency of the Municipal Finance Bureau within 15 days of the receipt of this decision.

Beneficiary Bank: Linzhou Rural Credit Cooperatives Sales Department

User Name: Linzhou City Finance Bureau, non-tax revenue collective account

Account number: 00000111244531910012

After your unit pays the fine, you should submit the payment receipt to the Legal Affairs Section of the Bureau for filing.

The Linzhou Environmental Monitoring Brigade is responsible for the implementation of the environmental administrative law enforcement inspection of your unit's performance of this decision. Your unit will report the implementation of the penalty decision to the Linzhou Environmental Monitoring Brigade by October 9, 2017.

### **III. Procedures and deadlines for applying for administrative reconsideration or filing a lawsuit**

If you do not accept this penalty decision, you can apply to the Anyang City Administrative Reconsideration Acceptance Center or the Linzhou Municipal People's Government for reconsideration within 60 days from the date of receipt of the decision letter. You can also directly file an administrative lawsuit to the people's court of Wenfeng District of Anyang City within six months.

If your unit does not apply for reconsideration, or not file an administrative lawsuit, and does not perform the decision on this penalty, the bureau will apply to the people's court for mandatory enforcement.

Linzhou Environmental Protection Bureau

September 4, 2017

## **Appendix E: Regulatory changes, firm location choice, and checking potential bias for the effect of fixed asset intensity.**

For China, the mid-2000s is a point in time that the central government stepped up significantly the environmental campaign. One substantial shift that marks this major change is the fact that the environmental cadre evaluation was included for the first time in the 11<sup>th</sup> Five-Year Plan (2006-2007). In addition, to set up quantifiable targets, the central government carried out the first national environmental census in 2007; based on this census, national-level key monitored polluting firms were identified. These firms were the first ones to disclose pollution data to the public.

Would such a major policy shift affect firm location choice, therefore bias our result regarding the effect of fixed asset intensity on government environmental regulatory enforcement at the firm level? To answer this, we need to think about “why firms are located in the sample area?” We think there are two possibilities: 1). a firm located to the area before regulations became stringent in mid-2000s; 2). a firm decided to locate to an area despite stringent local regulations because of other factors such as local labor quality, infrastructure, better access to market, and supportive government policies, to name but a few.

In the first scenario, which is similar to an obsolescing bargaining model (OBM) situation, firm location decision was made before environmental regulations became stringent; when local governments tightened regulations, firms can choose to relocate or to threaten to do so; those that are more mobile present a more credible threat; local governments therefore are less likely to target them because they do not want to lose these mobile firms – this is in essence our theory. This first scenario is also good for making causal inference because firms’ location decisions came before the change in environmental regulations.

We went back to the data to check the starting years of the firms included in our main analysis: we want to see what percentage of firms started their business in Jiangsu before the tightening up of environmental regulations starting with the 11<sup>th</sup> Five-Year plan (2006-2010): it turns out about 83% of the firms started before 2006. This works in our favor to make a stronger causal claim, again, because firm located to Jiangsu before the major change in environmental regulations and their enforcement. In other words, the fact that 83% of the firms were in Jiangsu before 2006 helps to avoid a self-selection effect (as a function of regulatory stringency and other related firm characteristics) among firms.

The second scenario, i.e., a firm decided to locate to an area despite stringent local regulations, therefore, only includes 17% of the firms in our data. In this case, if a firm’s selection into Jiangsu is based on firm fixed asset intensity, only low fixed asset intensity firms would go to Jiangsu after 2006’s tightening up of environmental regulations. This is because, as our theory posits, after local government tightened regulations, mobile firms can choose to relocate or to threaten to do so; local governments are less likely to target them because they do not want to lose these mobile firms; local governments then target less mobile firms (i.e., the high fixed asset intensity type) with heavier enforcement to reduce local pollution.

However, this situation in which firms self-select into Jiangsu based on fixed asset intensity is not supported by our data. With the major regulatory change brought by the 11<sup>th</sup> Five-Year plan (2006-2010), if firms’ location decision started to include regulatory stringency and fixed asset intensity in 2006, firms located to Jiangsu in and after 2006 should be different from those that were already in Jiangsu before 2006. We plot the distributions of the firm-level fixed asset intensity variable for firms established before and after 2006 in Figure 1 of this memo. Their

distributions look almost identical. We have also conducted a T-test between values of the firm-level fixed asset intensity variable for firms that started before 2006 and those for firms that started in and after 2006. The p-value is 0.87, failing to reject the null hypothesis that there is no statistical difference. Therefore, there is unlikely major change in firms' location decisions between the pre-2006 and post-2006 periods.

**Figure E-1: distributions of firm-level fixed asset intensity for firms established before and after 2006.**

