

How does labor market size affect firm capital structure? Evidence from large plant openings **in** **counties**

JFE 2015.02

Hyunseob Kim

汇报人：任建辉

2021年6月2日





Hyunseob Kim

Academic Degrees

- PhD Duke University, 2012
- MA Harvard University, 2007
- BBA Seoul National University, 2002

Selected Publications

- **Kim, Hyunseob.** "How Does Labor Market Size Affect Firm Capital Structure? Evidence from Large Plant Openings"*Journal of Financial Economics*. 138.1 (2020): 277-294
- Graham, John; **Kim, Hyunseob**; Leary, Mark. "CEO-Board Dynamics"*Journal of Financial Economics*. 137.3 (2020): 612-636
- **Kim, Hyunseob**; Kung, Howard. "The Asset Redeployability Channel: How Uncertainty Affects Corporate Investment"*Review of Financial Studies*. 30.1 (2017): 245-280



Abstract

I examine how the labor market in which firms operate affects their capital structure decisions.

Based on US Census Bureau data and information on companies' decisions to locate their new operations, I use a large plant opening as an abrupt increase in the size of a local labor market.

I find that a new plant opening leads to an increase of 2.5-3.9% percentage points in the debt-to-capital ratio of existing firms in the “winner” county relative to the “runner-up” choice.

This result is consistent with the argument that larger labor markets make job loss less costly, which in turn reduces the indirect costs of financial distress.

Notably, this spillover effect is larger for firms that employ the same type workers as the new plant in the affected county.



1.Introduction

Main conclusion: firms that operate in larger labor markets have significantly higher leverage controlling for firm and year fixed effects as well as other covariates.

This paper examines whether and how the size of labor markets in which firms operate affects their capital structure decision.

The first step(Section 2): I build a simple model that illustrates the economic forces that link labor market size and firms' capital structure.

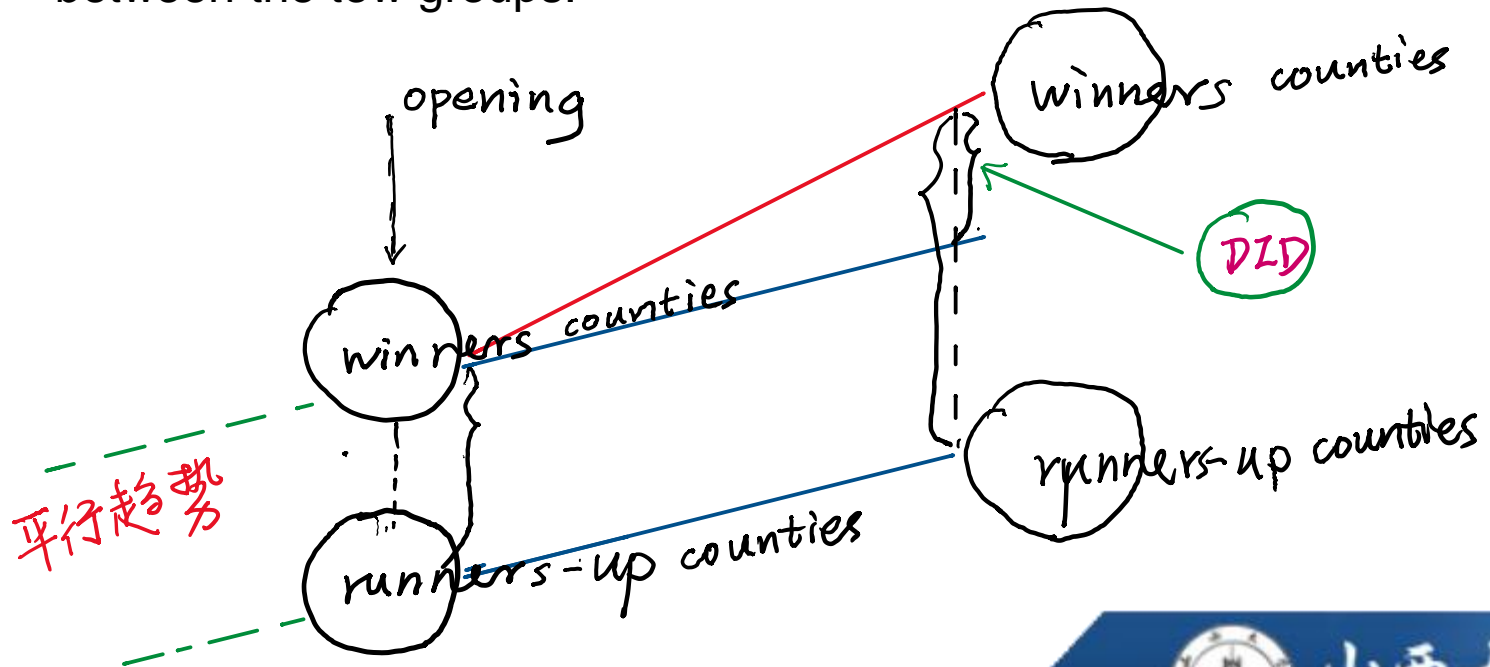
- The premise is that large labor markets facilitate workers in their job search , which makes losing their jobs less costly.
- In such markets, when firms use more debt, the maiginal compensating premium for increased risk of job loss is smaller.



The second step(Section 5): Answer the whether question

I test this(firms operating in large labor markets may use more debt in their capital structure) by exploiting an empirical setting in which the size of a local labor market increases abruptly due to a large plant opening.

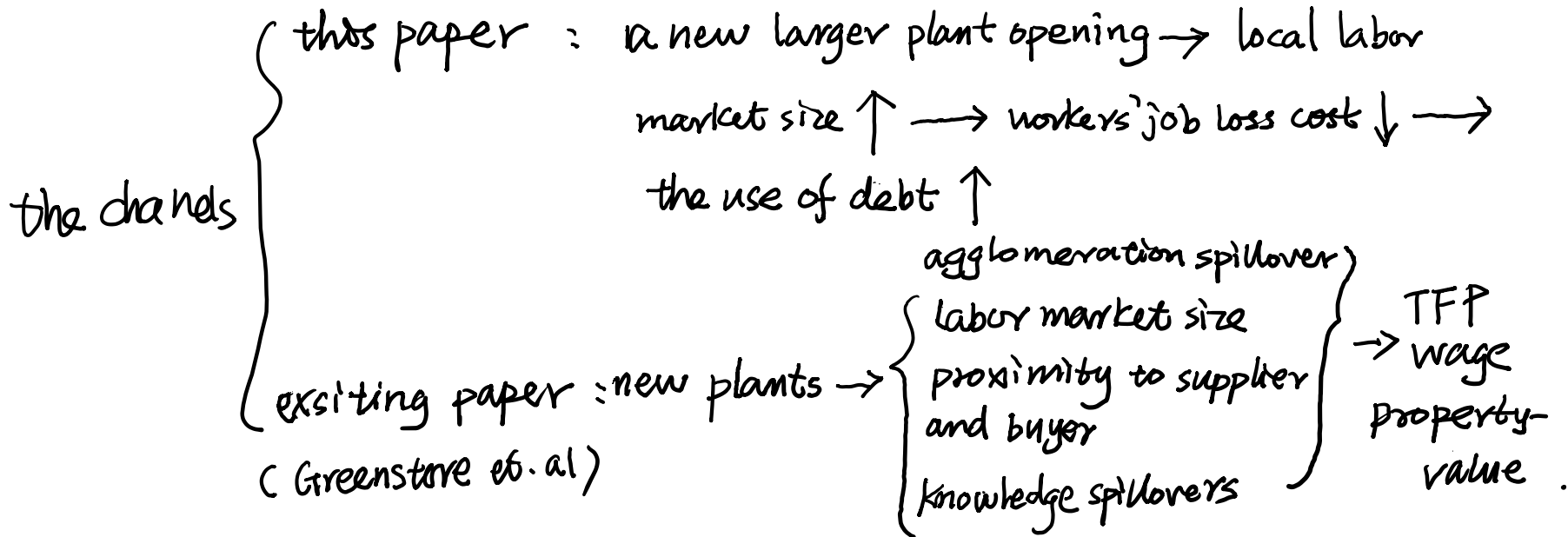
- Empirical approach : a quasi-natural experiment
- Treated Group : winners(win a larger manufacturing plant)
Control group: runners-up(lose the competition)
- I estimate the effect of an increase in labor market size on corporate capital structure by comparing changes in leverage between the two groups.



- ◆ I find that after the plant opening, manufacturing firms operating in the winner county increase their leverage ratios by 2.3 % after two year and 3.9 % after four years relative to those in the runners-up county.

The third step (Section 2): Answer the how question that is channel

I propose that an increase in the local labor market size, which reduces workers' job loss costs, leads firm to increase the use of debt in their capital structure.



- ◆ First, I measure **similarity of skills** using the frequency of worker moves from the industries of the existing plants to those of the new plants. I find that the effect of a plant opening is more pronounced for existing manufacturing firms
- ◆ Second, I employ measures of how the industries of the new and existing plants are related along other mechanisms of agglomeration economies, especially **proximity to suppliers and buyers and knowledge spillovers**.
- ◆ Third, I find that existing firms increase their leverage whether or not they operate in industries that use assets highly similar to the assets in the industry of the new plant in the winner county.
- ◆ Finally, I test the key presumption of the paper's empirical approach that large labor markets reduce the costs of job loss.



Main contribution



- ◆ This paper to show evidence that **search frictions** in the labor market **shape corporate capital structure decisions**.
Previous research about that **employee' unemployment risk** affect firms' capital structure choice.
- ◆ This paper also adds to the large literature on agglomeration spillovers by showing that **firms' increased debt usage** is another significant benefit of firm clustering in local areas due to **improved incentives for managers and interest tax deductions**.
- ◆ This paper provides novel evidence that labor market size is an important determinant of worker earnings after a job loss.



2. Simple model of labor market size and capital structure

This section illustrates conceptual links between the size of labor markets and corporate leverage policy using a simple static trade-off model of capital structure with labor as a production input.

Let L be a firm's **leverage ratio**, suppose that $L \in [0,1]$ generate a **tax benefit** $T(L)$, which is an increasing, concave function of L . L also increases the **probability** of financial distress, $p(L)$, and **the loss** given financial distress, $C_F(L)$, where $p(L)$ and $C_F(L)$ are increasing, convex functions of L .

The firm hires labor (in size 1) to produce output by paying **the wage** W , and the labor invests in required skills for which **the cost** to the worker is K . For simplicity, I assume that investments in skills have a positive **present value** to the worker, S . Due to the search frictions, if the worker is laid off from the current firm, he or she is not able to find another job using current skills with probability u ($u < 1$). **The maximization problem:**

$$\max_L T(L) - P(L) \cdot C_F(L) - W \quad (1)$$

$$s. t. W + [1 - P(L) \cdot u] \cdot S \geq K + e(o) \quad (2)$$

I capture this effect on the worker's outside option and wage with $e(o)$, which takes the value of a constant $e > 0$ if a large plant opens ($o = 1$), and



2. Simple model of labor market size and capital structure

Zero otherwise ($o = 0$). Eq.(2) represents the worker's participation constraint (PC) condition: the W must exceed the cost of the effort K plus a potential increase in the worker's outside option due to an entry $e(o)$, net of the future expected benefits from investing in skills. Therefore, the firm offers the following take-it-or-leave-it wage offer to the worker, who would accept it:

$$W = K - [1 - P(L) \cdot u] \cdot S + e(o) \quad (3)$$

To derive the firm's optimal leverage choice, substituting W in Eq.(3) into Eq.(1) and taking the derivative of the equation with respect to L gives the following first-order condition:

$$T'(L) = p'(L) \cdot (u \cdot S + C_F(L)) + p(L) \cdot C'_F(L)$$

Given that $p(\cdot)$ and $C_F(\cdot)$ are increasing and convex and $T(\cdot)$ is concave, the optimal leverage ratio is decreasing in u .



3. Empirical approach: a quasi-natural experiment

- ◆ I use the [opening of a large manufacturing plant](#) in a given county as an abrupt expansion of the local labor market in the sector.
- ◆ One difficulty with the empirical approach I employ is that plant opening decisions are driven by economic forces and thus could be endogenous.
 - I follow Greenstone and Moretti(2004) and GHM(2010) and hand collect rankings of potential large manufacturing plant sites from the [corporate real estate journal Site Selection](#).
 - The winner and runner-up counties, as well as plants therein, are comparable.
- ◆ Using information on winner and runner-up counties of new plants to identify a valid counterfactual has several advantages.
 - First, both winner and runner-up counties have survived a nationwide site selection process that usually involves dozens of initial candidates and can take several years.
 - Before the plant opening, the difference in observable characteristics of firms and plants in the winner and runner-up counties, is statistically insignificant.



3. Empirical approach: a quasi-natural experiment

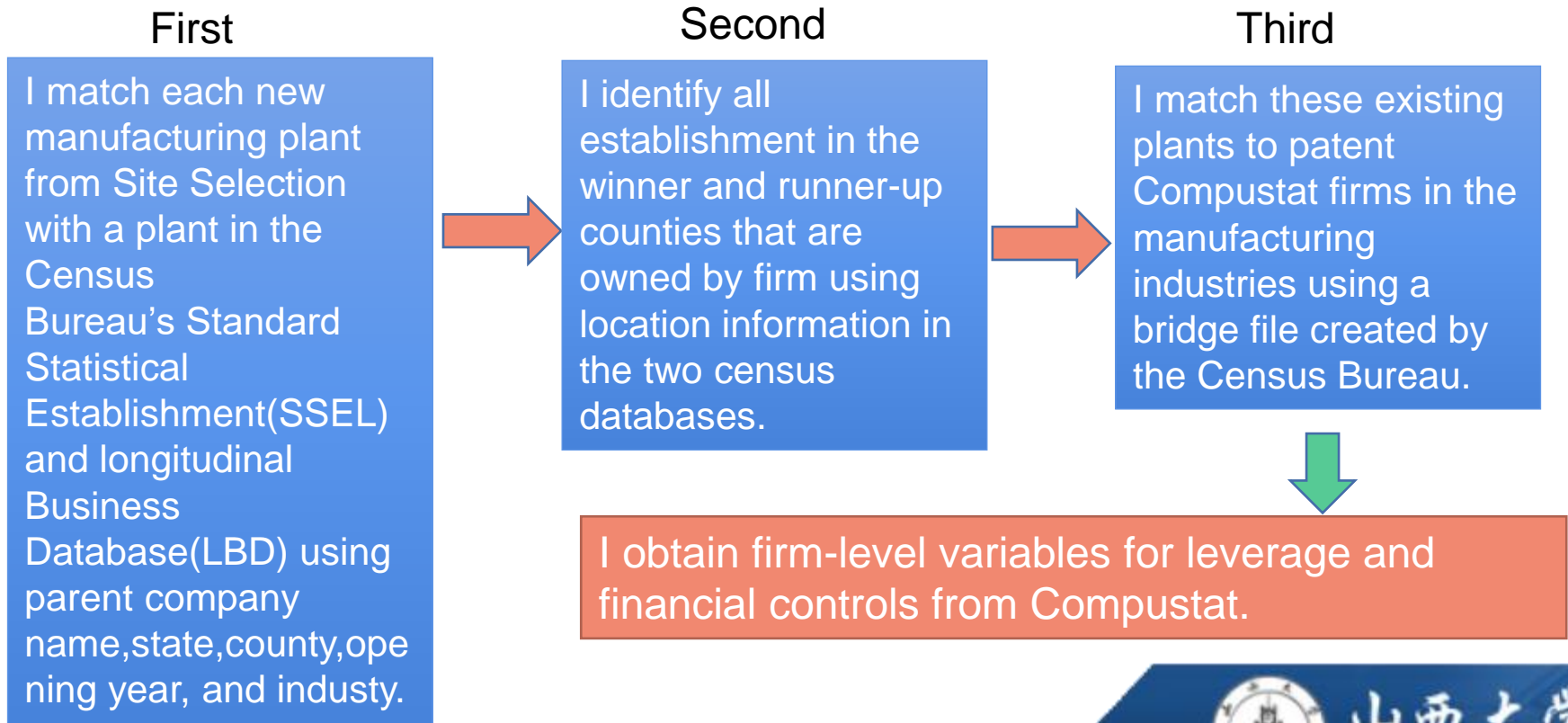
- Last, focusing the analysis on the manufacturing sector has two important advantages.
 - First, prior research shows that industry – or sector-specific human capital is more important for manufacturing worker.
 - Second, given that manufacturing industries generally produce nationally tradable goods, I can avoid alternative explanations related to local product market competition.



4. Data and descriptive statistics

4.1. data sources and sample construction

I hand-collect data on the opening of large manufacturing plants from “Million dollar plants”(MDP) articles from 1980 to 1995



4. Data and descriptive statistics

4.1. data sources and sample construction

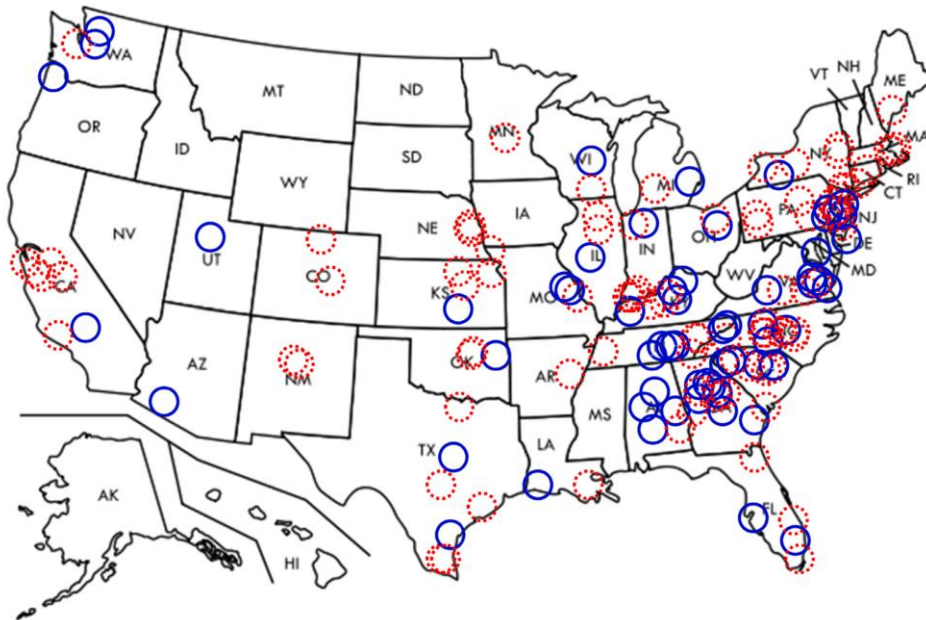


Fig. 1. Location of manufacturing plant opening events

This figure shows the approximate location of the counties in which new manufacturing plants opened (“winners”; blue solid circles) and the plants’ runner-up choices (“runners-up”; red dotted circles). There are 60 events represented in the figure, drawn from issues of Site Selection from 1980 to 1995, among which 40 are matched with the US Census Bureau’s establishment-level data sets. A detailed list of the 60 events is available on request. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

This sample selection procedure yields 40 manufacturing plant opening case from 1980 to 1995.



4.Data and Methodology

4.2 Descriptive statistic-similarity of winner versus runner-up

Table1 Summary statistics on manufacturing plant opening events

	(1)
Total number of events	40
Total number of winner counties	43
Total number of runner-up counties	59
Distribution of events by year:	
1980-1987	20
1988-1995	20
Distribution of winner counties by region:	
Northeast and Midwest	10
South and West	33
Distribution of runner-up counties by region:	
Northeast and Midwest	25
South and West	34
New plants relative to winner counties:	
Total employees	0.41
	(1.01)

Employment of the new plant is measured four to eight years after the opening, and that of the winner county is measured one year before the opening.



4. Data and Methodology

4.2 Descriptive statistic-similarity of winner versus runner-up

$$36\% - 33\% = 3\%$$

Table2 Summary statistics on firm observations

Sample: Statistic:	(1) Winner Mean	(2) Runner-up Mean	(3) All other firms Mean	(4) SD	(5) (1)-(2) t-statistic	(6) (1)-(3) t-statistic
% employees in winner/runner-up counties	0.25	0.25	-	-	0.20	-
Leverage	0.33	0.36	0.33	0.27	-1.99	0.14
Cash holdings	0.11	0.10	0.15	0.19	1.14	-3.32
✓Log assets	5.48	5.30	4.56	2.16	0.94	6.66
✓Tangibility	0.32	0.30	0.28	0.17	1.75	4.41
✓Market-to-book	1.83	1.66	2.14	2.25	1.41	-2.46
✓Return on assets	0.14	0.14	0.10	0.23	-0.30	4.52
Labor intensity	8.72	8.91	8.22	6.82	-0.37	1.20
Capex	0.27	0.25	0.35	0.42	0.56	-3.45
R&D	0.04	0.03	0.06	0.11	1.05	-4.79
Sales growth	0.07	0.08	0.10	0.32	-0.50	-1.85
Observations	276	413	44,599	-	-	-

The difference in key plant-level characteristics is also statistically insignificant between the winner and runner-up counties before the plant opening, further supporting the identifying assumption that the two counties are similar.



5. Empirical analysis

5.1 Baseline result

I estimate the effects of the **new manufacturing plant opening**, which increases the size of the manufacturing labor market in a county, on the **capital structure of incumbent manufacturing firms** using the following difference-in-difference approach.

$$\begin{aligned}Leverage_{ijet} = & \alpha_i + \alpha_{jt} + \alpha_e + \beta_1 After_{et} \times Winner_{ie} \\ & + \beta_2 After_{et} + \beta_3 Winner_{ie} + \gamma' X_{it-1} + \varepsilon_{ijet},\end{aligned}\tag{5}$$

Where \bar{i} indexes firm, \bar{j} industry, e plant opening event, and t year;

} 处理组虚拟变量
| 处理期虚拟变量.



5. Empirical analysis

5.1 Baseline result

Table3 Effect of new manufacturing plants on leverage of existing manufacturing firms

Panel A: Baseline results			
Dependent variable:	(1)	(2)	(3)
		Leverage (%)	
After × Winner	3.089 (1.034)	2.852 (1.039)	3.267 (0.997)
After	NR	NR	NR
Winner	-2.489 (1.011)	-2.404 (1.045)	-2.658 (0.944)
log(assets)	-	1.411 (1.167)	0.856 (0.991)
Tangibility	-	22.770 (5.593)	21.780 (5.694)
Market-to-book	-	0.815 (0.591)	0.666 (0.677)
ROA	-	-29.290 (3.309)	-25.370 (3.353)
Firm fixed effects	Y	Y	Y
Year fixed effects	Y	Y	Y
Event fixed effects		Y	Y
Industry × year fixed effects			Y
Observations	5900	5900	5900
R ²	0.7314	0.7436	0.7791

The result of the column 1 show that the leverage ratios of firms in the winner county increase by 3.09% after a plant opening relative to the leverage ratios of incumbent firms in the runner-up county.



5. Empirical analysis

5.2 Treatment intensity: effects of plant opening conditional on fraction of affected firm employees

Next, I examine whether the magnitude of the effect varies by the fraction of the incumbent firm's employees located in the winner or runner-up counties(i.e., treatment intensity).

$$\begin{aligned}Leverage_{iet} = & \alpha_i + \alpha_t + \alpha_e + (\beta_1 After_{et} \times Winner_{ie} \\ & + \beta_2 After_{et} + \beta_3 Winner_{ie}) \times Large_{ie} \\ & + (\beta_4 After_{et} \times Winner_{ie} + \beta_5 After_{et} \\ & + \beta_6 Winner_{ie}) \times Small_{ie} + \gamma' X_{it-1} + \varepsilon_{iet}. \quad (6)\end{aligned}$$



5. Empirical analysis

5.2 Treatment intensity: effects of plant opening conditional on fraction of affected firm employees

The result of the first row shows that the effect of a plant opening is indeed statistically and economically significant for firms with a large fraction of their employees in the affected counties.

Fraction of employees:	(1)	(2)
Dependent variable:	Large	Small
	Leverage (%)	
After × Winner	4.592 (1.673)	0.304 (1.379)
After	-2.000 (1.061)	0.542 (1.129)
Winner	-1.860 (1.519)	-2.687 (1.213)
Firm-level controls		Y
Firm fixed effect		Y
Year fixed effects		Y
Event fixed effects		Y
Observations		5900
R ²		0.7444
After × Winner × (Large – Small)	4.288	
t-statistic	1.83	



5. Empirical analysis

5.3 Dynamic effects of plant opening on firm leverage

I estimate the dynamic effects of a manufacturing plant opening on the capital structure of existing manufacturing firms using the following specification.

$$\begin{aligned}Leverage_{iet} = & \alpha_i + \alpha_t + \alpha_e + \sum_{k=-4}^{-2} \beta_k^W Winner_{ie} \times d[t+k]_{et} \\ & + \sum_{k=0}^4 \beta_k^W Winner_{ie} \times d[t+k]_{et} \\ & + \sum_{k=-4}^{-2} \beta_k^R Runner - up_{ie} \times d[t+k]_{et} \\ & + \sum_{k=0}^4 \beta_k^R Runner - up_{ie} \times d[t+k]_{et} \\ & + \beta^W Winner_{ie} + \gamma' X_{it-1} + \varepsilon_{iet}\end{aligned}\quad (7)$$



5. Empirical analysis

5.3 Dynamic effects of plant opening on firm leverage

Dependent variable:	(1)	(2)	(3)
Coefficient:	Winner	Leverage (%) Runner-up	[Winner - Runner-up]
d[t-4]	-0.778 (0.997)	-0.604 (0.804)	-0.174 (1.148)
d[t-3]	-0.651 (1.011)	-0.638 (0.664)	-0.013 (1.087)
d[t-2]	-0.620 (0.765)	-0.109 (0.672)	-0.512 (1.015)
d[t-1]	0.000	0.000	0.000
d[t]	0.436 (0.448)	-0.163 (0.536)	0.599 (0.669)
d[t + 1]	2.401 (0.756)	-1.340 (0.656)	3.740 (1.006)
d[t + 2]	2.258 (0.939)	-0.763 (0.649)	3.021 (1.159)
d[t + 3]	1.385 (0.919)	-1.100 (0.877)	2.485 (1.276)
d[t + 4]	2.551 (1.332)	-1.382 (0.896)	3.933 (1.631)
Firm-level controls		Y	
Firm fixed effect		Y	
Year fixed effects		Y	
Event fixed effects		Y	
Observations		5900	
R ²		0.7441	

These estimates suggest that the trends in leverage ratios of the winner and runner-up firms were statistically not different from each other before the plant decided to open

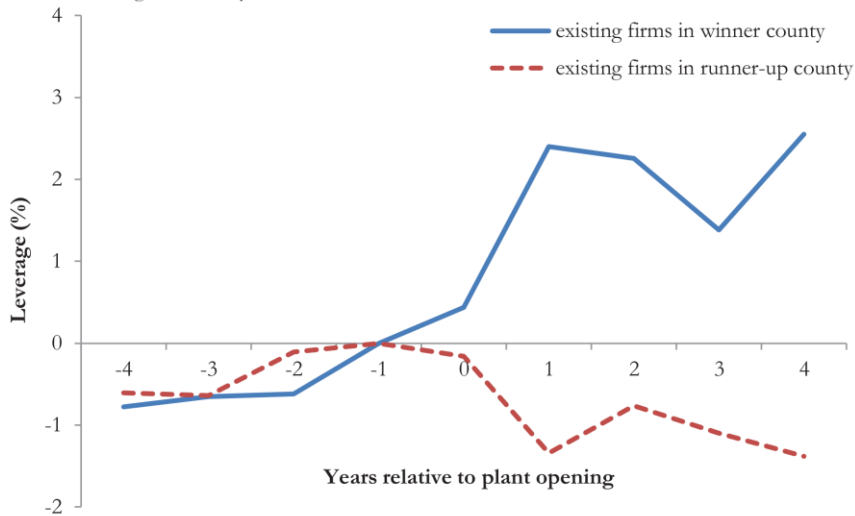
In contrast, the coefficients on $winner \times d(t + k) (0 \leq k \leq 4)$ show that the leverage ratios of firms begin to increase from the year of the plant opening.



5. Empirical analysis

5.3 Dynamic effects of plant opening on firm leverage

Panel A: With indexing to zero in year $t-1$



Panel B: Without indexing to zero in year $t-1$



Fig. 2. Dynamic effects of manufacturing plant opening on leverage of existing manufacturing firms.



5. Empirical analysis

5.4 Alternative explanations: selection and reversion to mean

One concern with the baseline results is that they could be due to a pre-event difference in leverage between firms in the winner and runner-up counties.

the first approach

uses a subset of MDP events for which the average difference in leverage between the winner and runner-up groups is less than 10% in absolute value one year before a plant opening.

the second approach

for a given firm in the winner county, I find a matched firm in the runner-up county with a leverage ratio that is closest to that of the winner firm one year before the plant opening.



5. Empirical analysis

5.4 Alternative explanations: selection and reversion to mean

Table 6 Robustness of baseline results to preexisting difference in leverage

Panel A: Excluding MDP events with large pre-event difference in leverage					Panel B: One-to-one matched sample on pre-event leverage				
Dependent variable:	(1)	(2)	(3)	(4)	Dependent variable:	(1)	(2)	(3)	(4)
	Leverage (%)					Leverage (%)			
After × Winner	2.832 (1.225)	2.377 (1.216)	2.293 (1.108)	2.125 (1.758)	After × Winner	4.229 (2.313)	3.662 (2.138)	4.006 (2.110)	3.776 (2.121)
After	-1.882 (0.685)	-1.533 (0.718)	-1.236 (0.616)	-	After	NR	NR	NR	-
Winner	-0.289 (1.287)	0.370 (1.142)	0.034 (1.063)	0.444 (1.284)	Winner	-1.774 (1.755)	-1.012 (1.404)	-0.933 (1.612)	-1.066 (1.440)
Firm-level controls		Y	Y	Y	Firm-level controls		Y	Y	Y
Firm fixed effects	Y	Y	Y	Y	Firm fixed effects	Y	Y	Y	Y
Year fixed effects	Y	Y			Year fixed effects	Y	Y		
Event fixed effects		Y			Event fixed effects		Y		
Industry × year fixed effects			Y		Industry × year fixed effects			Y	
Event × year fixed effects				Y	Event × year fixed effects				Y
Observations	4000	4000	4000	4000	Observations	4500	4500	4500	4500
R ²	0.7393	0.7541	0.7950	0.7621	R ²	0.7245	0.7457	0.8037	0.7757



5. Empirical analysis

5.5 Mechanisms for the effects

5.5.1 Labor market size versus other mechanisms of Agglomeration

Table 7 Labor market size versus other mechanisms of agglomeration spillovers.

Group:	(1) High labor flow	(2) Low labor flow	(3) High input- output	(4) Low input- output	(5) High citation	(6) Low citation	(7) High asset similarity	(8) Low asset similarity
Dependent variable:	Leverage (%)							
After × Winner	5.843 (2.061)	0.825 (1.241)	3.146 (1.519)	2.644 (1.196)	3.385 (1.869)	2.544 (1.179)	3.477 (1.588)	2.355 (1.333)
Firm-level controls	Y		Y		Y		Y	
Firm fixed effect	Y		Y		Y		Y	
Year fixed effects	Y		Y		Y		Y	
Event fixed effects	Y		Y		Y		Y	
Observations	5900		5900		5900		5900	
R ²	0.7445		0.7448		0.7439		0.7439	
After × Winner × (High – Low)	5.019		0.502		0.841		1.122	
t-statistic	1.97		0.28		0.39		0.56	



5. Empirical analysis

5.5 Mechanisms for the effects

5.5.2 How does labor market size affect costs of financial distress?

$$Outcome_{ijet} = \alpha_i + \alpha_{jt} + \alpha_e + \beta_1 After_{et} \times Winner_{ie} + \beta_2 After_{et} + \gamma' X_{it} + \varepsilon_{ijet}, \quad (8)$$

Table 8 Labor market size, wages, and labor productivity

Sample: Dependent variable:	(1) Average annual pay	(2) Plants Wage per hour	(3) Labor productivity
After × Winner	-0.001 (0.009)	0.003 (0.011)	0.032 (0.016)
After	-0.007 (0.006)	0.006 (0.005)	-0.023 (0.01)
log(plant per firm)	0.007 (0.004)	0.015 (0.005)	0.014 (0.009)
log(plant per segment)	0.002 (0.003)	0.006 (0.005)	0.007 (0.014)
Plant fixed effects	Y	Y	Y
Industry × Year fixed effects	Y	Y	Y
Event fixed effect	Y	Y	Y
Observations	19,000	19,000	19,000
R ²	0.8211	0.7996	0.9169



5. Empirical analysis

5.6 Labor market size and earnings loss of displaced workers

$$\begin{aligned} \log(\text{earn})_{ijt} = & \alpha_i + \alpha_{jt} + \sum_{k=-3}^5 d[t+k]_{it} \delta_k + \sum_{k=-3}^5 d[t+k]_{it} \\ & \times DS_i \theta_k + \sum_{k=-3}^5 d[t+k]_{it} \times DS_i \\ & \times \text{Market size}_i \beta_k + \gamma' X_{it} + \varepsilon_{ijt}, \end{aligned} \quad (9)$$



5. Empirical analysis

5.6 Labor market size and earnings loss of displaced workers

Table 9
Labor market size
and displaced
workers' earnings
loss

Dependent variable:	(1) log(earnings)
$d[t-3] \times DS$	NR NR
$d[t-2] \times DS$	-0.523 (0.302)
$d[t-1] \times DS$	-0.146 (0.351)
$d[t] \times DS$	-1.296 (0.814)
$d[t + 1] \times DS$	-2.065 (0.837)
$d[t + 2] \times DS$	-1.837 (0.710)
$d[t + 3] \times DS$	-0.527 (0.570)
$d[t + 4] \times DS$	-0.885 (0.546)
$d[t + 5] \times DS$	-1.655 (1.031)
$d[t-3] \times DS \times \text{Market size}$	NR NR
$d[t-2] \times DS \times \text{Market size}$	0.056 (0.030)
$d[t-1] \times DS \times \text{Market size}$	0.019 (0.035)
$d[t] \times DS \times \text{Market size}$	0.071 (0.081)
$d[t + 1] \times DS \times \text{Market size}$	0.190 (0.081)
$d[t + 2] \times DS \times \text{Market size}$	0.181 (0.070)
$d[t + 3] \times DS \times \text{Market size}$	0.057 (0.056)
$d[t + 4] \times DS \times \text{Market size}$	0.092 (0.054)
$d[t + 5] \times DS \times \text{Market size}$	0.167 (0.100)
Controls for $d[t-3]$ to $d[t + 5]$	Y
Individual fixed effects	Y
Industry \times year fixed effects	Y
Time-varying control	Y
Observations	75,000
R^2	0.6816



6. Alternative explanations and robustness

6.1 Bargaining with employees

6.2 Alternative measure of corporate leverage

6.3 Geographical distribution of winner and runner-up Counties

6.4 Increased labor cost

6.5 County-wide shocks



7. Conclusion

- This paper investigates how the size of labor markets affects the capital structure choices of firms through changes in the costs of financial distress arising from workers' limited ability to move across jobs.
- To examine this relation, I use the opening of a large manufacturing plant in a given county, combined with plant-level data from the Census Bureau, as an abrupt increase in local market size for manufacturing labor.
- My estimates indicate that after a plant opening, existing manufacturing firms in the county increase their leverage ratios by 2.5 to 3.9 percentage points relative to firms in an otherwise comparable county.
- Additional analysis shows that plant openings have a larger impact on firms that are more likely to use the same type of labor as the new plant.
- Tracking displaced workers in the LEHD data reveals that the costs of job loss are significantly mitigated in larger local labor markets.
- Overall, the evidence suggests that the size of labor markets in which firms operate is an important determinant of the costs of using financial leverage and hence the capital structure decisions of firms.



It's all, thanks !

