

Geopolitical Risk and Decoupling: Evidence from U.S. Export Controls

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Use of economic linkages in geopolitical confrontations

Export controls in the current race for technological leadership

- US uses export controls to deny rivals access to domestic cutting-edge technologies
- Lack a clear framework to assess the desirability and effectiveness of these tools
- These policies trade-off a collateral damage to domestic exporting firms vs. denying access to strategic technologies, inducing their reshoring and friendshoring

Long history of use of economic dependencies in geopolitical conflicts

- Britain and France imposing blockades on Germany during WWI and Germany retaliating with the use of U-boats ([Mulder, 2022](#))
- US embargo on Cuba by Eisenhower in 1960 after Fidel Castro's nationalization of hundreds of businesses including subsidiaries of US firms
- More recently, Ukraine and Central Africa

Export controls to deny access to cutting-edge technologies

Effort to stop the transfer of cutting-edge technologies to adversaries

- The Bureau of Industry and Security forbids exports to a list of foreign entities deemed to be a risk to US national security and foreign policy interests
- Most of the targets included in the export control lists are involved in strategic sectors, such as semiconductors, telecommunication, aviation, AI

Supply chain reconfiguration and potential effect on affected firms

- Due to data availability, we focus on export controls imposed on selected Chinese firms
- What is the extent of the supply chain reconfiguration?
- What is the effect on US firms that supply goods and services to the foreign targets?

Immediate decoupling, slow reconfiguration

Immediate decoupling without reshoring or friendshoring

- Affected suppliers more likely to terminate relations with Chinese customers, both those that are directly targeted by export controls and those that are not
- Affected suppliers less likely to form new relations with other Chinese customers
- No new relations with alternative customers outside of China, nor with domestic ones

Sizable collateral damage to the affected US suppliers

- Immediate -2.5% abnormal in stock prices $\rightarrow$ $-\$857$ million market for average affected US supplier $\rightarrow$ $\$130$ billion total losses across all affected suppliers
- Effects driven by reduction in operating income and increase in interest expenses
- Decline in employment among affected suppliers but no effect on capital expenditures

Export controls

The increasing reach of BIS export controls

The “Entity List” contains names subject to license requirements

- Names include foreign persons, businesses, institutes, and universities
- US firms must obtain a license from the Commerce Department (presumption of denial)
- Requirements needed for export, re-export, and in-country transfer of certain items
- BIS export controls also apply to foreign firms that use US-origin inputs
- The first “Entity List” was published in 1997 and targeted to WMDs
- Items now also include include purely civilian items

In Dec 2022, the BIS introduced the “**Military End User List**” to prevent military technology to be used by China, Russia, or Venezuela

BIS also publishes the “**Unverified List**” for entities with unclear legitimacy of the end-use of items subject to export controls

Huawei

- Largest telecom manufacturer in 2012, largest smartphones manufacturer in 2020
- Concerns about potential espionage by the Chinese military and intelligence services
- In Jan 2019, DOJ indictment alleging that Huawei circumvented Iran sanctions and was involved in the theft of trade secrets from telecom companies
- In May 2019, Huawei and subsidiaries added to the Entity List

Semiconductor Manufacturing International Corporation

- Largest semiconductor manufacturer in China
- Added to the Entity List as a result of its activities with the Chinese military

Fujian Jinhua Integrated Circuit

- In Oct 2018, Jinhua was included in the Entity List for economic espionage and IP theft

Data

Three sources of data

1) **Hand-collected data from the BIS (federalregister.gov, ecfr.gov)**

- Hand-collect additions and removals of Chinese companies from Entity, MEU, UV lists
- Focus only on Chinese firms (majority of targets we can match with supply chain data)
 - 691 Chinese entities: 422 corporations and 269 universities and institutions

2) **Information on supply chain relationships from FactSet Revere**

- Each observation identifies a customer/supplier and shows relationship start/end date
- 91 targeted Chinese entities linked to 175 suppliers around the export controls
- Target firms mostly in telecom, transportation, and electronic equipment sectors
- Affected suppliers mostly in electronics and industrial machinery equipment sectors

3) **Stock prices from CRSP & firm-level balance sheets from Compustat**

- Daily stock prices for 250 events hitting 156 suppliers in 2010-22
- Firm-level annual data for 2008-21, covering 3,272 firms (124 are affected suppliers)

Supply chain reconfiguration

Staggered and repeated treatment

Staggered treatment → “bad comparison” problem in TWFE ([Baker et al, 2022](#))

- BIS list includes Entity List, UVL, MEU list → 250 events, 156 affected suppliers
- The BIS has been adding Chinese entities in export control lists since early 2000s

Stack observations from multiple “cohorts” ([Gormley and Matsa, 2011](#))

- Treatment refers to the first time that a firm’s customer is included in the BIS lists
- A cohort includes treated and control firms in a $[-3, 3]$ year window around the first time that a Chinese firm is included in a BIS list
- Control firms have exported to China in the pre-treatment period
- Restrict the control group to firms that are either never treated or not yet treated

Analysis of the supply chain reconfiguration

$$y_{ict} = \beta \mathbb{1}_{ict} + \mu_{ic} + \mu_{ckt} + \varepsilon_{ict}$$

- i a firm, c is a cohort, and t a year
- y_{ict} is the number of total/terminated/new relationships
- $\mathbb{1}_{ict} = 1$ after the inclusion of customer i in the BIS list
- μ_{ic} are firm-cohort fixed effects
- μ_{ckt} are cohort-industry-year-size quartile fixed effects
- Standard errors are double-clustered at the firm and year levels
- Poisson regressions (Cohn, Liu and Wardlaw, 2022; Chen and Roth, 2023)

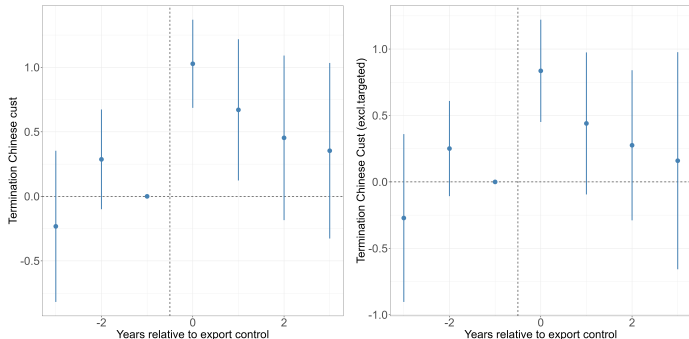
Decoupling from China

- Export controls lead 55% more terminated relations with Chinese customers
- Affected suppliers more likely to terminate even non-targeted Chinese customers
- After one of their customers is targeted by export controls, affected suppliers form 64% fewer relations with new Chinese customers (wake-up call)

	Termination		Term. (excl.target)		New Relations	
Affected $\times$ Post	0.631***	0.622***	0.420**	0.444**	-0.424***	-0.500**
	0.288	0.313	0.286	0.311	0.391	0.416
Cohort-Firm FE	✓	✓	✓	✓	✓	✓
Cohort-SIC-Year FE	✓		✓		✓	
Cohort-SIC-Size-Year FE		✓		✓		✓
Observations	20,762	18,396	20,575	18,248	28,261	25,896
Pseudo R ²	0.277	0.300	0.274	0.295	0.370	0.397

Poisson Pseudo Maximum Likelihood (PPML) regression results of the effect of export controls on supply chain configurations. Termination Chinese Cust is one after the inclusion of such customer in the BIS lists. For each cohort, the control group includes never treated and not yet treated firms. Size to the industry-specific size quartile of each firm. We require all control firms to be exporting to China in the pre-treatment period. Standard errors double clustered at the firm and year level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Decoupling from China



Dynamic effects of export controls on the number of terminated Chinese customers in affected suppliers. The estimations use the Poisson Maximum Likelihood Regression on the stacked regression. The dependent variable is the total number of terminations with Chinese customers in the left panel and the total number of terminations with Chinese customers excluding the targeted ones in the right panel. Regressions include firm and industry-size quartile-export to China-year fixed effects. In the stacked regressions, the fixed effects are further interacted with the cohort indicator variable. The blue bars indicate 95% confidence intervals around the estimated dynamic coefficient (blue dot).

Slow reconfiguration, no evidence of reshoring

- Affected suppliers not able to offset the drop in customers by finding new ones
- Affected suppliers do not find new domestic customers following export controls

	Total Cust		Domestic Cust	
Affected $\times$ Post	-0.129** (0.063)	-0.129* (0.068)	-0.101 (0.074)	-0.089 (0.081)
Cohort-Firm FE	✓	✓	✓	✓
Cohort-SIC-Year FE	✓		✓	
Cohort-SIC-Size-Year FE		✓		✓
Observations	36,212	36,082	35,693	35,547
Pseudo R ²	0.842	0.856	0.763	0.780

Pseudo Maximum Likelihood regression. Total Cust is the total number of customers. Domestic Cust is the number of domestic customers. Affect equals one for firms that within the previous year had a customer included in the BIS lists (Entity List, UVL, and MEU list). Post equals one after the inclusion of such customer in the BIS lists. For each cohort, the control group includes never treated and not yet treated firms. Size to the industry-specific size quartile of each firm. We require all firms to be exporting to China, U.S. and other countries in the pre-treatment period. Standard errors double clustered at the firm and year level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

More reliance on domestic customers, less geographic diversification

- The dependent variable is the share of customers in each region
- Affected suppliers more reliant on domestic customers

	Dom Share	China Share	Asia Share	Europe Share
Affected $\times$ Post	0.072*** (0.028)	-0.258*** (0.086)	-0.063 (0.047)	-0.106** (0.049)
Cohort-Firm FE	✓	✓	✓	✓
Cohort-SIC-Size-Year FE	✓	✓	✓	✓
Observations	32,813	28,998	30,232	30,620
Pseudo R ²	0.059	0.201	0.113	0.068

Poisson Pseudo Maximum Likelihood regression. Domestic Share is the ratio of the total number of domestic US customers to the contemporaneous number of total customers. China share is the ratio of the total number of Chinese customers to the contemporaneous number of total customers. Asia share is the ratio of the total number of customers from Asian countries other than China to the contemporaneous number of total customers. Europe share is the ratio of the total number of customers from European countries to the contemporaneous number of total customers. Affect equals one for firms that within the previous year had a customer included in the BIS lists (Entity List, UVL, and MEU list). Post equals one after the inclusion of such customer in the BIS lists. For each cohort, the control group includes never treated and not yet treated firms. Size is the industry-specific size quartile of each firm. All control firms to be exporting to China in the pre-treatment period. Standard errors double clustered at the firm and year level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

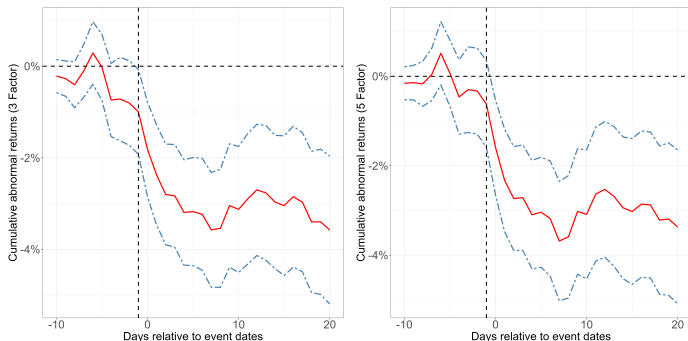
Takeaway: Broader decoupling, slow reconfiguration

- Export controls induce a broader degree of decoupling than strictly required
 - Wake-up call effect (awareness of geopolitical risk and potential future controls)
 - Fear that intermediate firms may purchase the sensitive goods and sell them back to the targeted firms—a violation of export control laws
- Affected suppliers cannot fully offset the effect of export controls in the short run
 - Consistent with near-zero short-run elasticity of substitution between different inputs (Boehm, Flaaen and Pandalai-Nayar, 2019)

Immediate and persistent hit for U.S. suppliers

Lower stock returns of US suppliers after customer added to BIS list

- Cumulative abnormal returns in $[-10, 20]$ day window using FF 3-/5-factor model
 -2.5% cumulative abnormal return $\rightarrow$ $-\$857\text{M}$ market cap $\rightarrow$, $-\$130\text{B}$ total loss

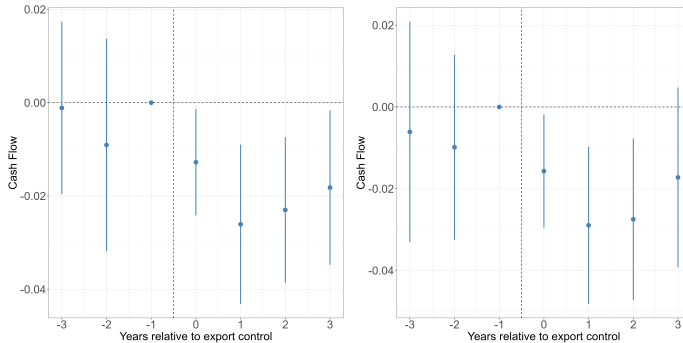


Cumulative abnormal returns (CAR) of affected suppliers in a $[-10, 20]$ day window around the announcement date of the inclusion of a target entity in the BIS lists. Panel A: CARs using Fama-French 3-factor model. Panel B: Fama-French 5-factor model. On the vertical axis are the cumulative abnormal returns in percentages and on the horizontal axis the days relative to the announcement dates. The dashed vertical line represents the announcement date. The solid red line represents the average CARs and the dot-dash blue line the 95% confidence intervals.

- ▶ Entity and MEU lists only

Significant and persistent drop in cash flow for affected suppliers

No pre-trends, immediate effect particularly pronounced in $t + 1$



Dynamic effects of export controls on the cash flow of affected suppliers. Cash flow is defined as operating income before depreciation (oibd) minus interest (xint) and taxes (txt), divided by lagged assets (source: Compustat). The left panel shows coefficient plots using the stacked regression approach. The right panel uses the TWFE regression approach. Regressions include firm and industry-size quartile-year fixed effects. In the stacked regressions, the fixed effects are further interacted with the cohort indicator variable. The blue bars indicate 95% confidence intervals around the estimated dynamic coefficient (blue dot).

Significant and persistent drop in cash flow for affected suppliers

- Decline in cash flow equal to 25% of its average value for treated firms
- Larger effect in the sample of more restrictive export controls ► Entity and MEU lists only

	Cash Flow				
Affected $\times$ Post	-0.015** (0.007)	-0.016** (0.006)	-0.021** (0.008)	-0.025*** (0.007)	-0.019** (0.007)
<u>Fixed effects</u>					
Cohort-firm	✓	✓	✓	✓	✓
Cohort-SIC-year	✓				
Cohort-SIC-year-size	✓			✓	
Cohort-SIC-China-year			✓	✓	
Cohort-SIC-year-size-China					✓
Observations	169,626	169,626	169,626	169,626	169,626
Adjusted R ²	0.656	0.722	0.653	0.719	0.722

Stacked regression of the effect of export controls on cash flow. Cash flow is defined as operating income before depreciation (oibd) minus interest (xint) and taxes (txt), divided by lagged assets (source: Compustat). Affected equals one for firms that within the previous year had a customer included in the BIS lists (Entity List, UVL, and MEU list). Post equals one after the inclusion of such customer in the BIS lists. For each cohort, the control group includes never treated and not yet treated firms. SIC is the 2-digit SIC code, Size to the industry-specific size quartile of each firm, and China equals one if a firm exports to China. The fixed effects are interacted with Cohort. We double cluster the standard errors at the firm and year level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Drop in income and employment, increase in interest expenses

- Lower cash flow due to drop in income and increase in interest expenses
- Reduction in employment but not in investment
 - 8% decline in the total number of employees
 - Effects consistent unchanged long-term investment opportunities

	Income	Interest	CAPEX	Employees
Affected $\times$ Post	-0.018** (0.008)	0.002** (0.001)	0.002 (0.002)	-0.059* (0.031)
Firm FE	✓	✓	✓	✓
SIC-Size-China-Year FE	✓	✓	✓	✓
Observations	169,626	169,626	169,626	169,626
Adjusted R ²	0.743	0.579	0.601	0.982

Stacked regression of the effect of export controls on operating income, interest expenses, capital expenditure, and employment. Income equals operating income before depreciation divided by lagged assets; Interest is interest expenses divided by lagged assets; CAPEX is capital expenditures divided by lagged assets; and Employees is the log of one plus the number of employees. Affect equals one for firms that within the previous year had a customer included in the BIS lists (Entity List, UVL, and MEU list). Post equals one after the inclusion of such customer in the BIS lists. For each cohort, the control group includes never treated and not yet treated firms. SIC is the 2-digit SIC code, Size to the industry-specific size quartile of each firm, and China equals one if a firm exports to China. The fixed effects are interacted with Cohort. We double cluster the standard errors at the firm and year level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Results are statistically robust

Reverse causality and omitted variable bias

- Chinese firm added to Entity List because charged with stealing IP from a US supplier
 - Victims of IP theft excluded from affected suppliers (Micron, Avago, Skyworks)
- Results unlikely to be driven by the 2018-19 retaliatory tariffs between U.S. and China
 - These tariffs did not apply to a single company but to various products and sectors
- Similarly, results unlikely to be driven by the August 2022 CHIPS Act

Conclusion

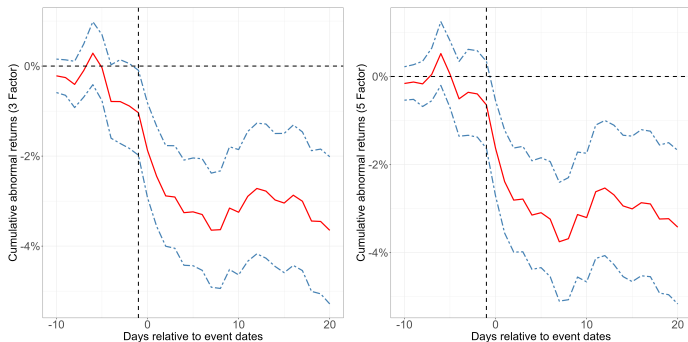
Conclusion

- Export controls → broad-based decoupling but slow supply-chain reconfiguration
- Persistent drop in income and employment for affected US suppliers
- We lack a comprehensive framework to assess the *optimality* of geopolitical tools
 - If national security is a public good, are export controls correcting an externality?
 - Should we penalize the same domestic firms that produce cutting-edge technologies?
 - Should we *boost* domestic demand for the restricted goods?
 - New exciting area of both theoretical and empirical research

Appendix

Lower stock returns of US suppliers after customer added to BIS list

- As a robustness, the BIS list here includes only the Entity and MEU lists

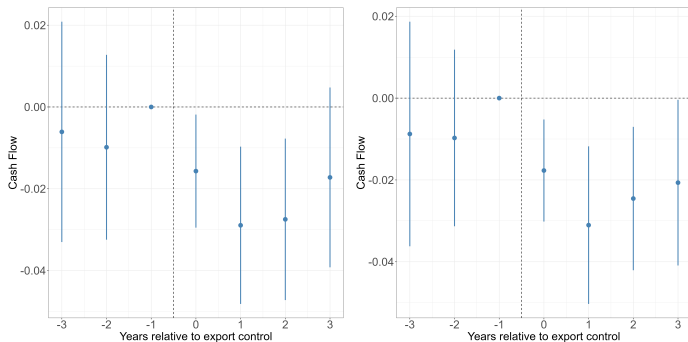


Cumulative abnormal returns (CAR) of affected suppliers in a $[-10, 20]$ day window around the announcement date of the inclusion of a target entity in the most stringent BIS lists, the Entity and MEU lists. Panel A: CARs using Fama-French 3-factor model. Panel B: Fama-French 5-factor model. On the vertical axis are the cumulative abnormal returns in percentages and on the horizontal axis the days relative to the announcement dates. The dashed vertical line represents the announcement date. The solid red line represents the average CARs and the dot-dash blue line the 95% confidence intervals.

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Persistent cash flow hit for affected US suppliers

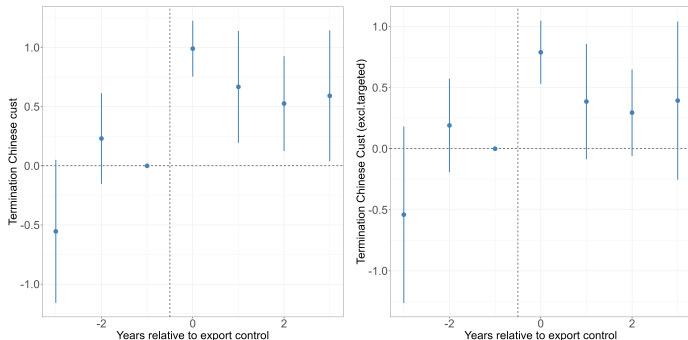
- Robust results using TWFE estimation



Dynamic effects of export controls on the cash flow of affected suppliers. These two panels show the coefficient plots for cash flow using the two-way fixed effects regression approach. The left panel A uses the full sample of export control events. The right panel excludes events related to the Unverified List (UVL), thus focusing on the most restrictive export controls. The blue bars indicate 95% confidence intervals around the estimated dynamic coefficient (blue dot).

Decoupling from China

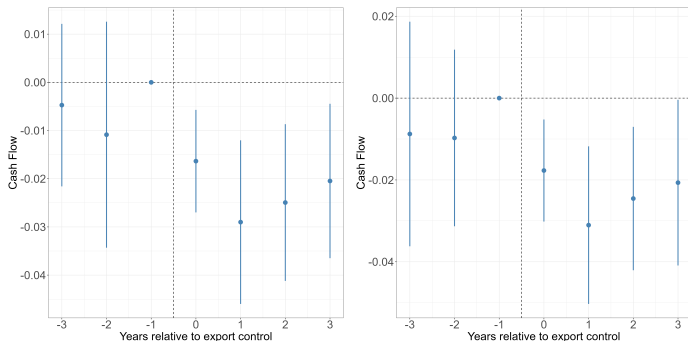
- No pre-trends, large immediate increase in terminations



Dynamic effects of export controls on the number of terminated Chinese customers in affected suppliers. The estimations use two-way fixed effects. The dependent variable is the total number of terminations with Chinese customers in the left panel and the total number of terminations with Chinese customers excluding the targeted ones in the right panel. Regressions include firm and industry-size quartile-export to China-year fixed effects. The blue bars indicate 95% confidence intervals around the estimated dynamic coefficient (blue dot).

Significant drop in cash flow for affected suppliers

Effects slightly larger in magnitude in the most restrictive sample



Dynamic effects of export controls on the cash flow of affected suppliers. Cash flows is defined as operating income before depreciation (oibd) minus interest (xint) and taxes (txt), divided by lagged assets (source: Compustat). The left panel shows coefficient plots using the stacked regression approach. The right panel uses the TWFE regression approach. Regressions include firm and industry-size quartile-year fixed effects. In the stacked regressions, the fixed effects are further interacted with the cohort indicator variable. The sample excludes events related to the Unverified List (UVL), thus focusing on the most restrictive export controls. The blue bars indicate 95% confidence intervals around the estimated dynamic coefficient (blue dot).

Significant and persistent drop in cash flow for affected suppliers

- Larger effect in the sample of more restrictive export controls

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	Cash Flow				
Affected $\times$ Post	-0.017** (0.007)	-0.018** (0.006)	-0.022** (0.008)	-0.025*** (0.008)	-0.021** (0.007)
<u>Fixed effects</u>					
Cohort-firm	✓	✓	✓	✓	✓
Cohort-SIC-year	✓				
Cohort-SIC-year-size	✓			✓	
Cohort-SIC-China-year			✓	✓	
Cohort-SIC-year-size-China					✓
Observations	147,002	147,002	147,002	147,002	147,002
Adjusted R ²	0.651	0.716	0.649	0.713	0.717

Stacked regression of the effect of export controls on cash flow. Cash flow is defined as operating income before depreciation (oibd) minus interest (xint) and taxes (txt), divided by lagged assets (source: Compustat). Affected equals one for firms that within the previous year had a customer included in the Entity List or MEU list. Post equals one after the inclusion of such customer in the BIS lists. For each cohort, the control group includes never treated and not yet treated firms. SIC is the 2-digit SIC code, Size to the industry-specific size quartile of each firm, and China equals one if a firm exports to China. The fixed effects are interacted with Cohort. We double cluster the standard errors at the firm and year level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.