The Secular Stagnation of Investment?

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NYU, NBER, CEPR

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Investment and Operating Profits

- Net investment rate
  \[ \chi_t \equiv \frac{I_t}{K_t} - \delta_t = \frac{K_{t+1} - K_t}{K_t} \]

- Net operating return
  \[ \frac{P_t Y_t - \delta_t P_t^k K_t - W_t N_t - T_t^\gamma}{P_t^k K_t} \]
Fact #1: Business is Profitable but does not Invest

Figure: $x_t$ and operating return

Notes: Annual data for Non financial Business sector (Corporate and Non corporate).
Fact #1: Business is Profitable but does not Invest

Figure: $x_t$ / Operating Surplus

Notes: Annual data for Non financial Business sector (Corporate and Non-corporate).
Q-Theory

- FOC

\[ x_t = \frac{1}{\gamma} (Q_t - 1) \]

- Tobin’s Q

\[ Q_t \equiv \frac{E_t [\Lambda_{t+1} V_{t+1}]}{P_t^k K_{t+1}} \]
Fact #2: I/K is low while Q is High

Note: Annual data. Q for Non Financial Corporate sector from Financial Accounts.
Theory

- Theories that predict low \( I/K \) because they predict low \( Q \)
  - E.g.: spreads & risk premia, low expected growth, low profits, regulatory uncertainty...
  - Solve the wrong puzzle: \( Q \) is high, but \( I/K \) is low.

- Theories that predict a gap between \( Q \) and \( I/K \)
  - gap between average \( Q \) and marginal \( Q \)
  - gap between \( Q \) and manager’s objective function
Gutiérrez & Philippon (2016)

- Use industry and firm level data
Fact #3: Gap Starts around 2000

Note: Time fixed effects from errors-in-variables panel regressions of de-meaned net investment on median/firm-level $Q$. Industry investment data from BEA; $Q$ and firm investment from Compustat.
Fact #4: What Does (Not) Explain Investment Gap in Micro Data

- Gutiérrez & Philippon (2016a): industry and firm level data
- Investment gap *NOT* explained by:
  - credit constraints, safety premium, globalization, regulation,...
  - Intangibles relevant, but not main explanation
- But gap well explained by:
  - Competition (lack of)
  - Governance
Two measures of concentration

- Traditional Herfindahl + Common ownership adjustment (Azar, et. al. (2016))

\[ Mod - HHI = \sum_j s_j^2 + \sum_j \sum_{k \neq j} s_j s_k \frac{\sum_i \beta_{ij} \beta_{ik}}{\sum_i \beta_{ij}^2} \]

\[ = HHI + HHI^{adj} \]

- Other measures including entry, share of sales by top #10 firms, etc. also significant
Fact Concentration has Increased

Mean Herfindahl across industries (Compustat)

Notes: Annual data from Compustat
Institutional Ownership has Increased

Average share of institutional ownership, by type

Notes: Annual data from Thomson Reuters 13F.
Share Buybacks have Increased

Note: Annual data from Compustat
Causality?

- Gutiérrez & Philippon (2016b)
  - Competition: Dynamic Oligopoly with Leaders/Followers/Entrants

- **Key predictions of increased competition by entrants**
  - More investment by leaders (escape competition effect)
  - Exit and/or lower investment by laggards (Schumpeterian effect)

- Positive aggregate impact in *closed* economy/industry.
Causality

- Identification & External validity
  - Natural experiment: China
  - Instrumental variable: excess entry in the 1990s

- Closed economy
  - Followers become more competitive → industry investment increases

- Open economy: foreign entrants
  - Domestic leaders increase investment
  - Impact on industry investment ambiguous
Note: Annual data. Import competition defined as $\Delta IP_{j\tau} = \frac{\Delta M_{j\tau}}{Y_{j,91} + M_{j,91} - E_{j,91}}$. 
Number of US Firms, by Exposure to China

Notes: Annual data. US incorporated firms in manufacturing industries only. Industries assigned to exposure based on median 91-11 exposure. (1995 = 1)
Notes: Annual data. US incorporated firms in manufacturing industries only. Industries assigned to exposure based on median 91-11 exposure. Similar patterns for Assets, Intangibles, etc.
Employment of Surviving Firms

Mean Employment per Firm (1995=1)

Notes: Annual data. US incorporated firms in manufacturing industries only. Industries assigned to exposure based on median 91-11 exposure.
## Regressions results

<table>
<thead>
<tr>
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<th>(1)</th>
<th>(2)</th>
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<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \log(\text{AT}_t) )</td>
<td>(-0.210^*)</td>
<td>(-0.228^*)</td>
<td>(-0.218)</td>
<td>(-0.414^{**})</td>
<td>(-0.468^{**})</td>
<td>(-0.445^+)</td>
</tr>
<tr>
<td>( \log(\text{PPE}_t) )</td>
<td>([-2.42])</td>
<td>([-2.29])</td>
<td>([-1.01])</td>
<td>([-3.92])</td>
<td>([-4.00])</td>
<td>([-1.79])</td>
</tr>
<tr>
<td>( \log(\text{Intan}_t) )</td>
<td>(-0.210^*)</td>
<td>(-0.228^*)</td>
<td>(-0.218)</td>
<td>(-0.414^{**})</td>
<td>(-0.468^{**})</td>
<td>(-0.445^+)</td>
</tr>
</tbody>
</table>

\( \text{Post95} \times \Delta I P_{j,99,11} \)

| \( \log(\text{Age}_{t-1}) \) | \(0.240^{**}\) | \(0.331^{**}\) | \(0.018\) | \(0.235^{**}\) | \(0.325^{**}\) | \(0.017\) |
|                           | \([7.70]\)    | \([9.22]\)   | \([0.24]\) | \([7.59]\)    | \([9.12]\)   | \([0.23]\)   |

\( \text{Post95} \times \Delta I P_{j,99,11} \times \text{Lead}^\S \)

<table>
<thead>
<tr>
<th>Observations</th>
<th>50376</th>
<th>50235</th>
<th>29925</th>
<th>50376</th>
<th>50235</th>
<th>29925</th>
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</thead>
<tbody>
<tr>
<td>Within ( R^2 )</td>
<td>0.45</td>
<td>0.22</td>
<td>0.35</td>
<td>0.46</td>
<td>0.22</td>
<td>0.35</td>
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<tr>
<td>Overall ( R^2 )</td>
<td>0.09</td>
<td>0.07</td>
<td>0.10</td>
<td>0.09</td>
<td>0.07</td>
<td>0.10</td>
</tr>
<tr>
<td>Industry controls(^\dagger)</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Year FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Firm FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Sample</td>
<td>All firms</td>
<td>All firms</td>
<td>All firms</td>
<td>All firms</td>
<td>All firms</td>
<td>All firms</td>
</tr>
</tbody>
</table>

Notes: T-stats in brackets. \(+ p<0.10, ^* p<0.05, ^{**} p<0.01\). Standard errors clustered at the firm-level. Results robust to clustering at industry-level or instrumenting for \( \Delta I P \) with \( \Delta I P_{oc} \).

\(^\S\) Leaders defined as firms with above-median \( Q \) as of 1995 within each NAICS Level 4 industry.

\(^\dagger\) Industry controls include measures of industry-level production structure (e.g., \( K/\text{Emp} \)) as of 1991.
Competition & Investment: Beyond Manufacturing

• Chinese import competition
  - clean identification
  - but limited scope (only manufacturing)

• Broader approach
  - excess entry in 1990s
  - identification issue: entry at $t$ depends on expected demand at $t + \tau$, so low concentration would predict future investment even under constant competition
  - Need instrument that predicts concentration but not future demand
  - We use excess entry in the 1990s
    • we can show it varies a lot across sectors, and it is orthogonal to future demand
    • we do not know exactly why (although we can tell stories: VCs, entry costs, etc.)
IV: Entry post-2000 vs. Excess entry in 1990s

![Graph showing the log-change in the number of firms from 2000 to 2009 against excess entry in 1990-1999. The graph includes points for various sectors such as Min_exOil, Health_hospitals, Retail_trade, Inf_data, Inf_telecom, and Acc_accomodation. The fitted values are indicated by a red line.](image)

- Log-change in # of firms 2000-2009
- Excess entry (1990–1999)

- Entry (2000–2009)
- Fitted values
### IV: Regression Results

<table>
<thead>
<tr>
<th></th>
<th>(1) 1st St. HHI_{i,t-1} ≥ 2000</th>
<th>(2) 2nd St. Net I/K ≥ 2000</th>
<th>(3) 1st St. HHI_{i,t-1} ≥ 2000</th>
<th>(4) 2nd St. Net I/K ≥ 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Stock Q (t-1)</td>
<td>0.016** [2.61]</td>
<td>0.029** [10.40]</td>
<td>0.022** [3.89]</td>
<td>0.033** [7.42]</td>
</tr>
<tr>
<td>Excess Inv_{90-99}</td>
<td>-0.569 [-1.08]</td>
<td>-0.589* [-2.41]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excess Entry_{90-99}(i)</td>
<td>-0.153** [-4.76]</td>
<td>1.295+ [1.66]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excess Entry_{90-99}(i) × Med HHI_{t}</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HHI_{i,t-1}</td>
<td>-0.246** [-6.96]</td>
<td>-0.249** [-5.06]</td>
<td>-0.539** [-5.41]</td>
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<tr>
<td>Comm. Own. adj. (t-1)</td>
<td>-0.063** [-3.80]</td>
<td>-0.120** [-3.34]</td>
<td>-0.080** [-2.71]</td>
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</tr>
<tr>
<td>Age and size controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year FE</td>
<td>No</td>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Industry FE</td>
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<tr>
<td>Observations</td>
<td>672</td>
<td>672</td>
<td>672</td>
<td>672</td>
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<tr>
<td>( R^2 )</td>
<td>0.078</td>
<td></td>
<td>0.045</td>
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</tbody>
</table>

Notes: T-stats in brackets. + p<0.10, * p<0.05, ** p<.01.
Competition and Investment: Summary

• Most domestic industries have become MORE concentrated
  - Lower competition/entry means less investment by leaders and less investment at the industry level

• Some manufacturing industries have seen increased competition from China
  - Domestic leaders have increased investment, R&D, and employment
  - But much less entry, so overall effect on domestic investment somewhat negative

• Next: Governance
Governance & Investment: Causality

• Problem:
  - Buybacks should depend on investment opportunities, ownership as well.
  - Need to isolate buybacks driven by ownership, but exogenous to financial performance

• Solution 1: natural experiment
  - Russel index rebalancing, Crane-Micheneau-Weston (2016)

• Solution 2: instrument variables
  - Excess QIX ownership pre-2000: QIX ownership is highly persistent: $t-5$Y ownership predicts 0.9x ownership at $t$
  - Activism increased after 2004 → unforeseen in 2000; but QIX predicts activism (Appel et. al. 2016)
  - Coefficients consistent with solution 1.
Activism

Source: JP Morgan (February 12, 2014)
Buyback rate by ownership type

Notes: Annual data for all US incorporated firms in Compustat. Firm financials from Compustat; ownership from Thomson Reuters and Brian Bushee’s website.
## Governance: Firm IV Estimates

<table>
<thead>
<tr>
<th></th>
<th>1st Stage (1)</th>
<th>2nd Stage (2)</th>
<th>3rd Stage (3)</th>
<th>1st Stage (7)</th>
<th>2nd Stage (8)</th>
<th>2nd Stage (9)</th>
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<tr>
<td>Stock Q ≥2000</td>
<td></td>
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<tr>
<td>Industry Median Q (t-1)</td>
<td>0.650**</td>
<td>-0.001</td>
<td></td>
<td>0.732**</td>
<td>0.000</td>
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<td></td>
<td>[21.46]</td>
<td>[-0.56]</td>
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<td>[25.47]</td>
<td>[-0.33]</td>
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<tr>
<td>% QIX owners (96-99)</td>
<td>0.279**</td>
<td>0.013**</td>
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<td></td>
<td>[3.03]</td>
<td>[4.32]</td>
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<tr>
<td>QIX_{96-99(i)} \times B\bar{B}A(t)</td>
<td></td>
<td></td>
<td>-20.949*</td>
<td>3.969**</td>
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<td>[-2.36]</td>
<td>[14.85]</td>
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<tr>
<td>Stock Q (t-1)</td>
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<td>0.048**</td>
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<td>0.046**</td>
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<td></td>
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<td>[2.99]</td>
<td></td>
<td>[2.86]</td>
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<tr>
<td>Buyback/Assets (t-1)</td>
<td>-4.740*</td>
<td></td>
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<td>-5.570**</td>
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<tr>
<td></td>
<td>[-1.98]</td>
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<td></td>
<td>[-6.08]</td>
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<tr>
<td>Pre-2000 firm-level controls</td>
<td>Yes</td>
<td></td>
<td></td>
<td>No†</td>
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<tr>
<td>Year FE</td>
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<td>Yes</td>
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<td>Yes</td>
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<td>Observations</td>
<td>20841</td>
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<td></td>
<td>29973</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between/Overall $R^2$</td>
<td>19.5% / 4.6%</td>
<td></td>
<td></td>
<td>8.1% / 4.0%</td>
<td></td>
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</tbody>
</table>

Notes: T-stats in brackets. † p<0.10, * p<0.05, ** p<.01. Firm-level controls include market capitalization, leverage, sales growth, dividends, profitability, size, etc. † Only log-age is included as control.
Aggregate Implications

- Preferences
  \[
  \mathbb{E}_0 \left[ \sum_{t=0}^{\infty} \beta^t \left( \frac{C_t^{1-\gamma}}{1-\gamma} - \frac{N_t^{1+\varphi}}{1+\varphi} \right) \right],
  \]

- \( C_t = \left( \int_0^1 \frac{C_{j,t}^{\varepsilon-1}}{\varepsilon} \, dj \right)^{\frac{\varepsilon}{\varepsilon-1}} \)

- Wages set à la Calvo

- Kernel
  \[
  \mathbb{E}_t \left[ \Lambda_{t+1} \frac{P_t}{P_{t+1}} \tilde{R}_{t+1} \right] = 1
  \]
Model: Capital Producers

- **Firm Value**
  \[ V_t = \sum_{j=0}^{\infty} \Lambda_{t,t+j} Div_{t+j} \]

- **Accumulation**
  \[ K_{t+1} = (1 - \delta_t) K_t + I_t \]

- **Payments**
  \[ Div_t = R_{k,t} K_t - P_{k,t} I_t - \frac{\varphi_k}{2} P_{k,t} K_t \left( \frac{I_t}{K_t} - \delta_t \right)^2. \]
Model: Final Producers

• Objective

\[
\begin{align*}
\min & \quad \frac{W}{PN} + R_k K \\
\text{s.t.} & \quad Y = AK^\alpha N^{1-\alpha}
\end{align*}
\]

• Price setting à la Calvo, desired markup

\[
\mu_t = \frac{\varepsilon_t}{\varepsilon_t - 1}
\]

• Market Value of Producers

\[
V^\varepsilon_t = P_t Y_t (1 - MC_t) - \Phi_t + E_t \left[ \Lambda_{t+1} V^\varepsilon_{t+1} \right]
\]
Micro Calibration

• Firm $i$ in industry $j$

$$C_{j,t} = \left( \int_0^j \frac{C_{i,j,t}}{C_{i,j,t}} di \right) \frac{\varepsilon_{j,t}}{\varepsilon_{j,t} - 1}$$

- Desired markup: $\frac{P_{j,t}}{P_t} = \mu_{j,t}MC_t$ where $\mu_{j,t} = \frac{\varepsilon_{j,t}}{\varepsilon_{j,t} - 1}$

• Capital demand in cross section

$$\log K_{j,t} = A_t - \varepsilon \log \mu_{j,t}$$

- Estimate in panel of industries $\log K_{j,t} = ... - 1.3\chi_{j,t}$ where $\chi_{j,t}$ is concentration ratio
- Set cross-industry elasticity to $\varepsilon = 1$

• then construct a measure of “average” markup based on the “average” concentration ratio

$$\log \bar{\mu}_t \approx 1.3\bar{\chi}_t$$
Expected durations of the ZLB, quarters
Shocks

Technology

Preference

Valuation of corporate assets

Steady-state markup
Counter-Factual

**Consumption**

- Data
- No change in $\epsilon_P$

**Output**

- Filtered
- No change in $\epsilon_P$

**Capital**

- Filtered
- No change in $\epsilon_P$
Counter-Factual

Nominal interest rate, % pa

- Data
- No change in $\epsilon_P$
EXTRA: Entry has Decreased

Establishment entry and exit rates (Census)

Notes: Annual data from Census BDS
IV: Concentration as of 2000/2010 vs. Excess entry in 1990s

The graphs illustrate the relationship between Herfindahl indices and excess entry rates in the 1990s. The x-axis represents excess entry (1990-1999), while the y-axis shows the Herfindahl values. The plots show a negative correlation, indicating that as excess entry increases, Herfindahl values decrease. The fitted values are indicated by the trend lines in the graphs.
EXTRA: Shocks

- **TFP**
  \[ a_t = \rho a_{t-1} + \varepsilon_{a,t} \]

- **Discount rate shock to the pricing kernel**
  \[ \lambda_{t+1} = \log \beta - \gamma (c_{t+1} - c_t) + \zeta^d_t \]
  \[ \zeta^d_t = \rho_d \zeta^d_{t-1} + \varepsilon^d_t \]

- **Risk premium on corporate assets**
  \[ q^k_t = \mathbb{E}_t \left[ \lambda_{t+1} + \log \left( r^k_{t+1} + q_{t+1} + 1 - \delta + \frac{1}{2\gamma} q^2_{t+1} \right) \right] + \zeta^q_t \]

- **Time-varying elasticity of substitution between goods**
  \[ \varepsilon_t = \varepsilon_{t-1} + \varepsilon^\varepsilon_t \]
### Regressions results: continuing firms only

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>log($AT_t$)</td>
<td>log($PPE_t$)</td>
<td>log($Intan_t$)</td>
</tr>
<tr>
<td><strong>Post95 \times \Delta IP_{j,99-11}</strong></td>
<td>-0.592**</td>
<td>-0.476**</td>
<td>-0.414</td>
</tr>
<tr>
<td></td>
<td>[-2.97]</td>
<td>[-2.69]</td>
<td>[-0.88]</td>
</tr>
<tr>
<td><strong>Post95 \times \Delta IP_{j,99-11} \times Lead§</strong></td>
<td><strong>0.808</strong>*</td>
<td><strong>0.729+</strong></td>
<td><strong>0.992</strong></td>
</tr>
<tr>
<td></td>
<td>[2.18]</td>
<td>[1.89]</td>
<td>[1.01]</td>
</tr>
<tr>
<td>log($Age_{t-1}$)</td>
<td>0.548**</td>
<td>0.457**</td>
<td>0.219</td>
</tr>
<tr>
<td></td>
<td>[8.37]</td>
<td>[7.81]</td>
<td>[1.60]</td>
</tr>
</tbody>
</table>

|                  | Observations      | 17633             | 17659             | 11847             |
|------------------|-------------------|-------------------|-------------------|
|                  | Within $R^2$      | 0.33              | 0.57              | 0.46              |
|                  | Overall $R^2$     | 0.14              | 0.15              | 0.12              |
| Industry controls† | YES              | YES              | YES              |
| Year FE          | YES              | YES              | YES              |
| Firm FE          | YES              | YES              | YES              |
| Sample           | Continuing firms  |                   |                   |

Notes: T-stats in brackets. + p<0.10, * p<0.05, ** p<.01. Standard errors clustered at the firm-level. Results robust to clustering at industry-level or instrumenting for $\Delta IP$ with $\Delta IP_{oc}$. § Leaders defined as firms with above-median $Q$ as of 1995 within each NAICS Level 4 industry. † Industry controls include measures of industry-level production structure (e.g., $K/Emp$) as of 1991.
China import exposure was predictable in 1999.

![Graph showing the relationship between China IE 91-99 and China IE 91-11, with fitted values and data points for Low IE and High IE categories.]
Firm entry and exit rate, by Chinese exposure

Notes: Annual data. US incorporated firms in manufacturing industries only. Industries assigned to exposure based on median 91-11 exposure.
### Regressions results: K, Emp and K/Emp

<table>
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<tr>
<th></th>
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<tbody>
<tr>
<td></td>
<td>log($PPE_t$) log($Emp_t$) log($\frac{PPE_t}{Emp_t}$)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Post95 × ΔIP_{j,99,11}</strong></td>
<td>-0.228*</td>
<td>-0.195*</td>
<td>-0.051</td>
<td>-0.468**</td>
<td>-0.363**</td>
<td>-0.128+</td>
</tr>
<tr>
<td></td>
<td>[-2.29]</td>
<td>[-2.28]</td>
<td>[-0.91]</td>
<td>[-4.00]</td>
<td>[-3.72]</td>
<td>[-1.87]</td>
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<tr>
<td><strong>Post95 × ΔIP_{j,99,11} × Lead§</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>0.765</strong>**</td>
<td><strong>0.548</strong>**</td>
<td><strong>0.249</strong>**</td>
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<tr>
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<td></td>
<td>[4.67]</td>
<td>[3.81]</td>
<td>[2.99]</td>
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<tr>
<td>log($Age_{t-1}$)</td>
<td>0.331**</td>
<td>0.409**</td>
<td>-0.084**</td>
<td>0.325**</td>
<td>0.405**</td>
<td>-0.086**</td>
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<tr>
<td></td>
<td>[9.22]</td>
<td>[13.45]</td>
<td>[-4.05]</td>
<td>[9.12]</td>
<td>[13.38]</td>
<td>[-4.16]</td>
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<tr>
<td>Observations</td>
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<td>49649</td>
<td>49543</td>
<td>50235</td>
<td>49649</td>
<td>49543</td>
</tr>
<tr>
<td>Within $R^2$</td>
<td>0.22</td>
<td>0.109</td>
<td>0.216</td>
<td>0.224</td>
<td>0.113</td>
<td>0.217</td>
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<tr>
<td>Overall $R^2$</td>
<td>0.07</td>
<td>0.19</td>
<td>0.10</td>
<td>0.07</td>
<td>0.18</td>
<td>0.10</td>
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<tr>
<td>Industry controls†</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
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<td>Year FE</td>
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<td>YES</td>
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<td>Firm FE</td>
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<td>Sample</td>
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<td>All firms</td>
<td>All firms</td>
<td>All firms</td>
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</tr>
</tbody>
</table>

Notes: T-stats in brackets. + $p<0.10$, * $p<0.05$, ** $p<0.01$. Standard errors clustered at the firm-level. Results robust to clustering at industry-level or instrumenting for $\Delta IP$ with $\Delta IP_{oc}$. § Leaders defined as firms with above-median $Q$ as of 1995 within each NAICS Level 4 industry † Industry controls include measures of industry-level production structure (e.g., $K/Emp$) as of 1991
## Interaction between Ownership and Competition

<table>
<thead>
<tr>
<th></th>
<th>1st Stage</th>
<th>2nd</th>
<th>1st Stage</th>
<th>2nd</th>
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<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
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<tr>
<td>Stock Q (t-1) ≥ 2000</td>
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<tr>
<td>Buyback/Assets ≥ 2000</td>
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<tr>
<td>Net I/K ≥ 2000</td>
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</tbody>
</table>

### Industry Median Q (t-1)

- 0.581**
- 0.001

### % QIX owners (96-99)

- 0.733**
- 0.003

### $QIX_{96-99}(i) \times MHHI$

- -1.305**
- 0.026**

### $QIX_{96-99}(i) \times BBA(t)$

- -24.316
- 5.085**

### $QIX_{96-99}(i) \times MHHI \times BBA(t)$

### Stock Q (t-1)

- 0.105**

### Buyback/Assets (t-1)

- -3.134+

### Pre-2000 firm-level controls

- Yes

### Year FE

- Yes

### Other FE

- Industry

### Observations

- 20841

### Between/Overall $R^2$

- 11.3% / 4.7%

### Notes:

- T-stats in brackets. + p<0.10, * p<0.05, ** p<.01. Firm-level controls as above.
- † Only log-age is included as control.