Tax Incentives, Small Businesses & Physical Capital Reallocation

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Overview

What?   Do tax incentives foster physical capital reallocation towards small businesses?

Why?   The tax subsidy on new equipment increases the supply of old equipment in the secondary market and lowers the price of the old equipment

How?   **Two episodes of federal investment stimulus** (2002-2004 and 2008-2011)
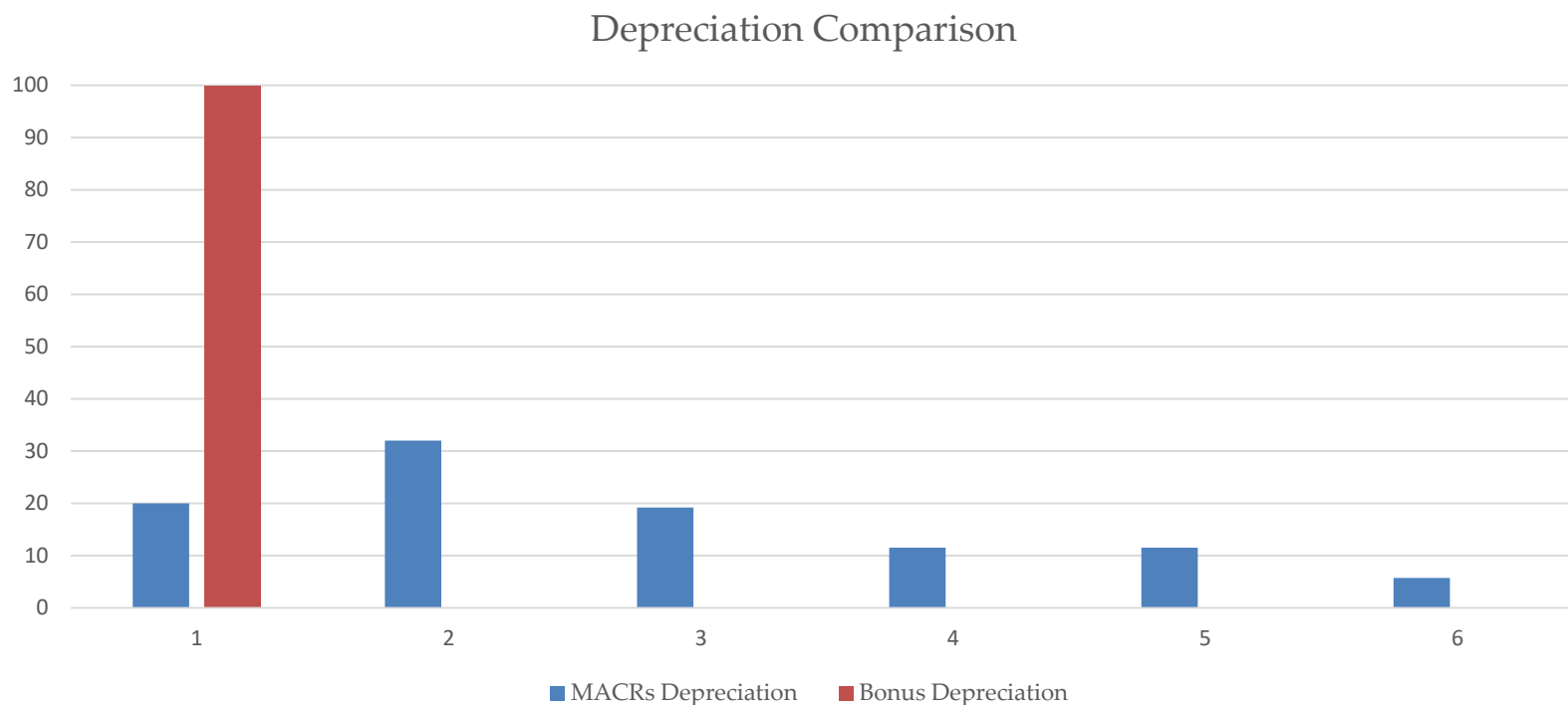
Bonus depreciation -- under Section 168(k) of IRC

Treatment and control groups:

Long versus short duration industries

Bonus Depreciation

- Temporary investment incentives, accelerated depreciation, as a counter-cyclical fiscal policy:

Depreciation Comparison

- Paper will compare firms that benefit more from this acceleration versus firms that benefit less

Literature

- Temporary investment incentives, accelerated depreciation, as a counter-cyclical fiscal policy:

  - ➤ Investment

    - ▪ **Insignificant effect** using Compustat data

      – Desai and Goolsbee, *Brookings Papers* 2004; House and Shapiro, *AER* 2008

    - ▪ **Positive effect** using IRS data covering small businesses using Section 168(k)

      – Zwick and Mahon, *AER* 2017; Ohrn, *AEJ: EP* 2018

  - ➤ Labor

    - ▪ Positive effect using aggregate county-industry data

      – Garrett, Ohrn, and Suarez Serrato, *AER: Insights* 2020

    - ▪ Reduction in routine task employees using BLS data and survey data on computer software installation (state variation with Section 179 limits)

      – Tuzel and Zhang, *JF* 2020

Motivation

- Why Capital Reallocation?
  - **New capital goods** are important for economic growth (Solow, 1960)
  - Trade of **used capital goods** by US firms accounts for almost **one-fourth of capital expenditure** (Eisfeldt and Rampini, *JME* 2007; Lanteri, *AER* 2018)
    - Constrained firms: Net buyer of old capital goods (Eisfeldt and Rampini, 2007)
    - Local availability of old capital goods helps business formations and capital reallocation (Ma, Murfin, and Pratt, JFE, 2021)

- **Direct Effect:** Firms may directly benefit from tax incentives by investing in new capital goods
  - **Capital Replacement:** With tax subsidy on new capital goods, firms with less binding constraints may replace old capital goods with new capital (Lanteri and Rampini, 2022)
- **Indirect Effect:** Old capital is reallocated to financially constrained small businesses

New Physical Capital
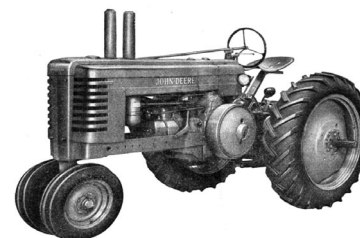
Old Physical Capital

Preview of Findings

- Use data on 1.7 million equipment transactions by 424,768 small businesses during 1998-2011 (UCC Filings data sourced from EDA)

- *Major Findings* (for one standard deviation change in treatment intensity):

  - **New equipment investment:** Increases by 22%

  - **Old equipment investment:** 44% of the new equipment investment elasticity

  - **Price of old capital: Decreases by** 3.2%

  - **Decline** in **machine age** and **model age** for used equipment

  - **Increase in sales (7%) and employment (3.4%)** for buyers of old capital with upgraded technology

  - **Business Entry:** Increases by 2%

Example

- Total investment a company makes in the tax year 2004 is the acquisition of 10 new machine tools at a total cost of $150,000. For federal taxes:

  - Step 1: Take Section 179 Expensing Allowance (Max $100,000):
    - Lowers basis for federal tax return: $150,000 - $100,000 = $50,000
    - Eligible capital: New and used equipment
    - **Cannot** carry forward as NOLs
    - Spending cap $400,000

  - Step 2: Take 168(k) Bonus Depreciation (50% of acquisition cost):
    - Bonus depreciation allowance of $25,000 (= $50,000 x 0.5)
    - Eligible capital: Only new equipment
    - **Can** carry forward as NOLs
    - No spending cap

  - Step 3: Follow MARCS rule: 20% first year
    - 0.2 x ($150,000 - $100,000 - $25,000) = 0.2 x 25,000 = $5,000
    - Total deduction first year: $130,000, which is 86.67% (= 100 x 130,000 / 150,000) of investment cost
    - Next five years at rates of 32%, 19.2%, 11.52%, 11.52%, and 5.76%, respectively

Section 168(k) Over Time

Bonus II (2008–2011)

Bonus I (2002–2004)

Bonus Depreciation - Industry Variation

- Present value of $1 tax shield benefit with tax rate (τ):

  ➤ $z^0 = \tau * (D_0 + \sum_{t=1}^{T} \frac{1}{(1+r)^t} D_t)$, where $\sum D_i = 1$

- Present value of $1 with bonus depreciation (θ is immediately expensed and (1- θ) based on MARCS schedule):

  ➤ $z_{j,t}^{\theta}: \theta_t + (1 - \theta_t)z_j^0$, where $\theta_t \in [0,1]$

Short Duration Industries (Control Group, z_j^0)			Long Duration Industries (Treatment Group, z_j^0)		
5111	Newspaper and Book Publishers	0.8889	2211	Electric Power Generation	0.7575
5182	Data Processing and Hosting	0.8979	2212	Natural Gas Distribution	0.7609
4853	Taxi and Limousine Service	0.9007	4821	Rail Transportation	0.8438

- Zwick and Mahon (2017)

  ➤ Use IRS data to calculate the weighted average present value of deductions at the four-digit NAICS level (z_j^0)

EDA Database

- Downloads UCC-1 filings from all the states in the U.S.

- 1.7 million equipment purchase transactions from 1998 to 2011

- 424,768 small U.S. businesses

- Median annual sales of $320,000

- Median employment 3 workers

- Information on machine characteristics

- Provide estimated value of equipment

Sample UCC-1 Filing

UCC FINANCING STATEMENT
FOLLOW INSTRUCTIONS

A. NAME & PHONE OF CONTACT AT FILER (optional)
 LIEN SOLUTIONS 800-331-3282

B. E-MAIL CONTACT AT FILER (optional)
  UCCFILINGRETURN@WOLTERSKLUWER.COM

C. SEND ACKNOWLEDGMENT TO: (Name and Address)

  P.O. BOX 29071

  GLENDALE, CA 91209-9071

  US

Delaware Department of State
U.C.C. Filing Section
Filed: 04:37 PM 02/13/2019
U.C.C. Initial Filing No: 2019 1042535

Service Request No: 20190981665

THE ABOVE SPACE IS FOR FILING OFFICE USE ONLY

1. **DEBTOR'S NAME:** Provide only one Debtor name (1a or 1b) (use exact, full name; do not omit, modify, or abbreviate any part of the Debtor's name); if any part of the Individual Debtor's name will not fit in line 1b, leave all of item 1 blank, check here ☐ and provide the Individual Debtor information in item 10 of the Financing Statement Addendum (Form UCC1Ad)

1a. ORGANIZATION'S NAME			
3M COMPANY			
1b. INDIVIDUAL'S SURNAME	FIRST PERSONAL NAME	ADDITIONAL NAME(S)/INITIAL(S)	SUFFIX

1c. MAILING ADDRESS	CITY	STATE	POSTAL CODE	COUNTRY
2115 S BROADWAY ST	ALEXANDRIA	MN	56308	US

2. **DEBTOR'S NAME**: Provide only one Debtor name (2a or 2b) (use exact, full name; do not omit, modify, or abbreviate any part of the Debtor's name); if any part of the Individual Debtor's name will not fit in line 2b, leave all of item 2 blank, check here ☐ and provide the Individual Debtor information in item 10 of the Financing Statement Addendum (Form UCC1Ad)

2a. ORGANIZATION'S NAME			
2b. INDIVIDUAL'S SURNAME	FIRST PERSONAL NAME	ADDITIONAL NAME(S)/INITIAL(S)	SUFFIX

2c. MAILING ADDRESS	CITY	STATE	POSTAL CODE	COUNTRY

3. **SECURED PARTY'S NAME** (or NAME of ASSIGNEE of ASSIGNOR SECURED PARTY): Provide only one Secured Party name (3a or 3b)

3a. ORGANIZATION'S NAME			
CATERPILLAR FINANCIAL SERVICES CORPORATION			
3b. INDIVIDUAL'S SURNAME	FIRST PERSONAL NAME	ADDITIONAL NAME(S)/INITIAL(S)	SUFFIX

3c. MAILING ADDRESS	CITY	STATE	POSTAL CODE	COUNTRY
2120 WEST END AVENUE	NASHVILLE	TN	37203	US

4. **COLLATERAL:** This financing statement covers the following collateral:
ONE (1) CATERPILLAR 777G OFF HIGHWAY TRUCK S/N: RDR00556 And substitutions, replacements, additions and accessions thereto, now owned or hereafter acquired and proceeds thereof. The above collateral is within the scope of Article 9 of the Uniform Commercial Code (if this statement is filed in New Jersey, specifically Chapter 9 of Title 12A, pursuant to 12A:9-102 and 12A:9-109).

Sample UCC-1 Filing

Identification Strategy

- We exploit **time-series** variation in the *bonus depreciation schedule* and **cross-sectional** variation in industry *investment duration:*

$$y_{i,t} = \alpha + \beta z_{j,t}^{\theta} + \gamma X_{i,t} + \delta_j + \omega_t + \epsilon_{i,t}$$

                    Firm Controls   Industry FEs   Year FEs

- $y_{i,t}$: log(New/Old Equipment Investment)

- $z_{j,t}^{\theta}$: $\theta_t + (1 - \theta_t)z_j^0$

  - Weighted present value of tax benefits for industry *j* at time *t* at the four-digit NAICS level (Zwick and Mahon, 2017)

  - Allows for difference-in-difference setup with continuous treatment ($z_{j,t}^{\theta}$)

- Firm controls: log(Sales), log(Number of Employees)

- State-year fixed effects, buyer fixed effects, industry-specific quadratic trends

New and Old Equipment Investment
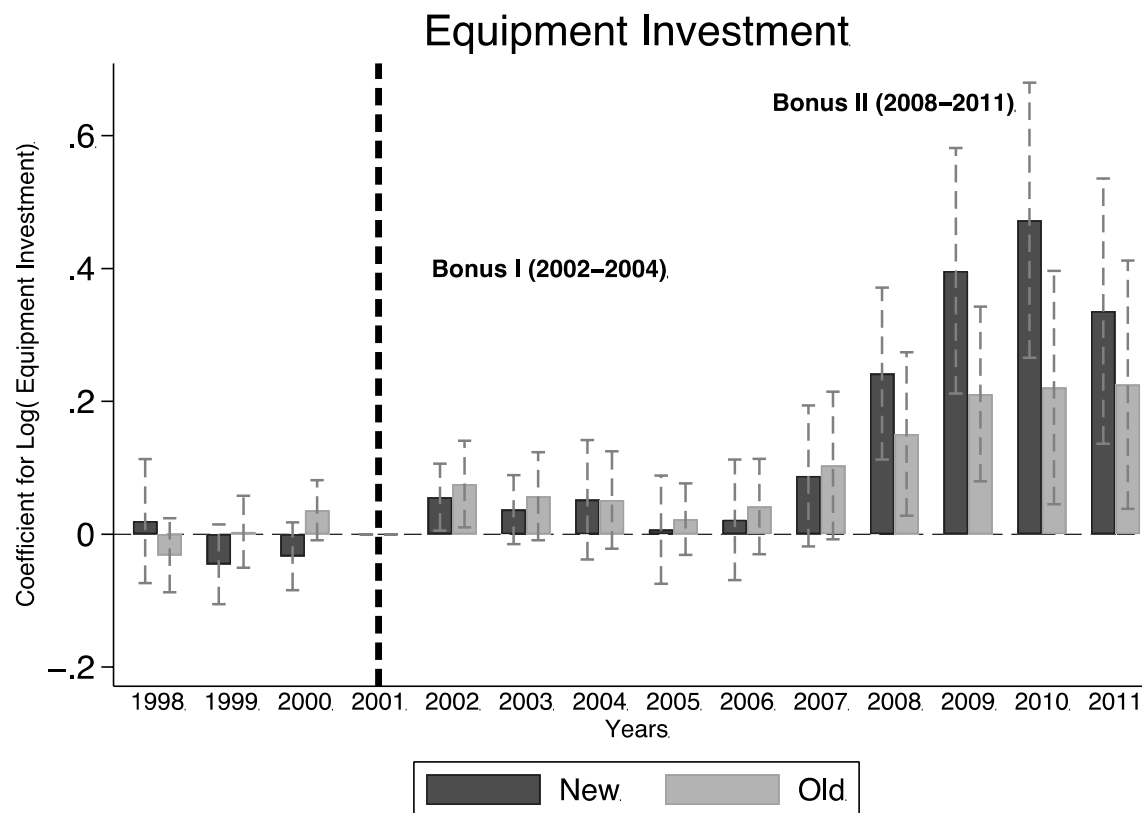
- Aggregate to the four-digit NAICS, county, and year
- Treatment (control) group defined as the bottom (top) three deciles of z_j^0

Direct Effect

PANEL A: **Direct Effect: New Equipment Investment**

Dependent Variable:	Log($ New Equipment Investment)			
Level: Buyer-Year	(1)	(2)	(3)	(4)
$z_{j,t}^{\theta}$	8.881***	5.260***	5.443***	4.666***
	(5.570)	(4.174)	(4.046)	(3.765)
Observations	543,670	543,670	376,494	376,494
Clusters (Industry)	240	240	237	237
R²	0.24	0.24	0.69	0.69
Year Fixed Effects	Y	Y	Y	
Industry Fixed Effects	Y	Y		
Sector Trends		Y	Y	Y
Buyer Fixed Effects			Y	Y
Buyer Size × Year Fixed Effects				Y

- One standard deviation increase in $z_{j,t}^{\theta} \rightarrow$ 20.9 log point increase

Main Result – Indirect Effect

PANEL B: **Indirect Effect: Old Equipment Investment**

Dependent Variable:	*Log(\$ Old Equipment Investment)*			
Level: Buyer-Year	(1)	(2)	(3)	(4)
$z_{j,t}^{\theta}$	3.431***	1.995***	2.330***	2.066***
	(3.111)	(3.202)	(3.624)	(3.508)
Observations	545,869	545,869	396,142	396,142
Clusters (Industry)	238	238	237	237
R^2	0.17	0.17	0.62	0.62
Year Fixed Effects	Y	Y	Y	
Industry Fixed Effects	Y	Y		
Sector Trends		Y	Y	Y
Buyer Fixed Effects			Y	Y
Buyer Size × Year Fixed Effects				Y

- One standard deviation increase in $z_{j,t}^{\theta} \rightarrow$ 9.02 log point increase
- 44% (=2.066/4.666) of the direct effect

Mechanism – Price of Old Equipment

Tax incentive on new capital $\rightarrow$ Supply of old capital $\uparrow \rightarrow$ Price of old capital $\downarrow$

- W-53 John Deere Windrower
  - New: $61,079 (2019)
  - Old: $34,935

Price of old equipment reduces by 3.2%

PANEL B: **Impact on Price of Old Equipment**

Dependent Variable:	Old Price Residual			
Level: Equipment Code-County-Industry-Year	(1)	(2)	(3)	(4)
$z_{j,t}^{\theta}$	-0.838***	-0.940***	-0.931***	-0.640***
	(-5.590)	(-5.401)	(-5.435)	(-4.067)
Observations	553,601	553,580	553,573	553,573
Clusters (Industry)	238	238	238	238
R^2	0.02	0.05	0.06	0.06
Year Fixed Effects	Y	Y	Y	Y
Industry Fixed Effects	Y	Y	Y	Y
Equipment Fixed Effects		Y	Y	Y
County Fixed Effects			Y	Y
Sector Trends				Y

- **No effect** on the price of new equipment

Equipment Type

PANEL A: **Machine Age of Old Equipment Purchased**

Dependent Variable:	Log(Machine Age of Old Equipment)			
Level: Buyer-Year	(1)	(2)	(3)	(4)
$z_{j,t}^{\theta}$	-3.554***	-4.153***	-6.401***	-4.416***
	(-4.433)	(-4.667)	(-4.677)	(-3.670)
Observations	538,493	538,493	389,719	389,719
Clusters (Industry)	238	238	237	237
R^2	0.10	0.10	0.61	0.61
Year Fixed Effects	Y	Y	Y	
Industry Fixed Effects	Y	Y		
Sector Trends		Y	Y	Y
Buyer Fixed Effects			Y	Y
Buyer Size × Year Fixed Effects				Y

PANEL B: **Model Age of Old Equipment Purchased**

Dependent Variable:	Log(Model Age of Old Equipment)			
Level: Buyer-Year	(1)	(2)	(3)	(4)
$z_{j,t}^{\theta}$	-1.261**	-3.535***	-5.368***	-3.574***
	(-2.525)	(-4.037)	(-4.362)	(-3.676)
Observations	544,366	544,366	394,927	394,927
Clusters (Industry)	238	238	237	237
R^2	0.10	0.11	0.55	0.55
Year Fixed Effects	Y	Y	Y	
Industry Fixed Effects	Y	Y		
Sector Trends		Y	Y	Y
Buyer Fixed Effects			Y	Y
Buyer Size × Year Fixed Effects				Y

➢ Average machine age declines by 7.5 to 13.2 months

- Average machine age: 4.6 years

➢ Average model age decreases by 3 to 11.5 months

- Average model age: 6.2 years

Who Benefits?

Dependent Variable:	Sales Growth $_{it+1}$	Employment Growth $_{it+1}$	Sales Growth $_{it+1}$	Employment Growth $_{it+1}$
Level: Buyer-Year	(1)	(2)	(3)	(4)
Newer Vintage$_{it}$ × $z_{j,t}^{\theta}$	1.630***	0.712***		
	(3.723)	(3.053)		
Newer Model$_{it}$ × $z_{j,t}^{\theta}$			1.656***	0.710***
			(3.562)	(3.376)
$z_{j,t}^{\theta}$	3.904***	0.604	3.999***	0.657
	(6.254)	(1.169)	(6.138)	(1.229)
Observations	357,923	359,643	357,923	359,643
Clusters (Industry)	235	235	235	235
R^2	0.30	0.31	0.30	0.31
Buyer Controls	Y	Y	Y	Y
Buyer Fixed Effects	Y	Y	Y	Y
Year × Vintage Indicator Fixed Effects	Y	Y	Y	Y
Sector Trends	Y	Y	Y	Y

- Future sales increases by 7% and employment increases by 3.4% for buyers of used equipment of upgraded technology

More Results

- Entry of small businesses increase by 2%, especially in industries and locations with relatively higher ex-ante price of old equipment

- Section 179 vs. Section 168(k)
  - Small businesses in states that conform to Section 168(k) are more likely to investment in old equipment at lower prices
  - There is no effect for those in states that conform changes in limits of Section 179

- Heterogeneity
  - Greater reallocation for businesses with access to finance (supply of small bank loans and SBA loans)
  - Less price depreciation for equipment manufacturers with greater market power

Robustness Checks

Robustness

- ➢ Re-define tax policy measure at machine-level
- ➢ With Industry-year FEs
- ➢ Controlling for productivity difference in new/used machines
- ➢ Using BEA/ACES weights
- ➢ Keeping only bonus firms
- ➢ Using CEM matching within same state

Conclusion and Policy

- Overall, our results document the evidence on **how tax incentives** foster the allocation of physical capital across firms

- We find that **tax subsidy** on new equipment **increases** the **old equipment investment elasticity** (44% of direct effect)

- Increase in supply of old capital lowers old equipment's relative price by 3.2%

- This **reallocation towards financially constrained firms** help in business entry

THANK YOU!