Discussion of

Investment, Taxes, and Capital Structure: A Study of U.S. Firms in the Early 1900s

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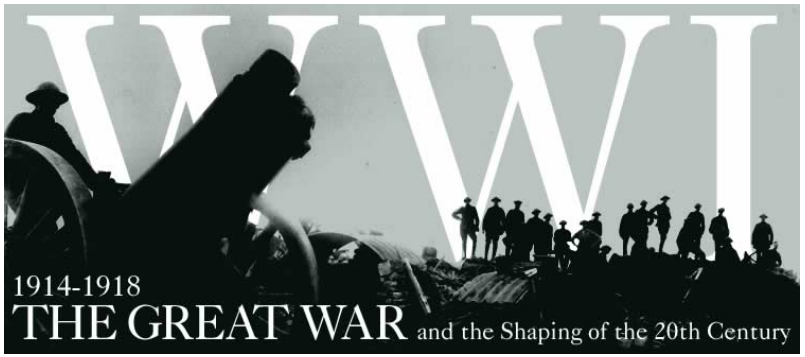
What is This Paper About?



- Onset of World War I caused:
  - Large, transitory, plausibly exogenous increase in investment outlays
    - Related to war effort
  - Changes in corporate and personal tax rates
    - Imposition of "war profits tax" and "excess profits tax" during 1917-1920 created a tax bias towards equity financing
- How important are taxes and investment outlays in explaining leverage of firms?

Yearly Tax Rates

Year	Top Corporate Rate	Normal Individual Rate	Top Individual Surtax Rate	Top Total Individual Rate	Top Capital Gains Rate	Top Excess Profits Tax Rate
1909	1%					
1910	1%					
1911	1%					
1912	1%					
1913	1%	1%	6%	7%	7%	
1914	1%	1%	6%	7%	7%	
1915	1%	1%	6%	7%	7%	
1916	2%	2%	13%	15%	15%	
1917	6%	4%	63%	67%	67%	60%
1918	12%	12%	65%	77%	77%	65%, 80%
1919	10%	8%	65%	73%	73%	40%
1920	10%	8%	65%	73%	73%	40%
1921	10%	8%	65%	73%	73%	40%
1922	12.5%	8%	50%	58%	12.5%	
1923	12.5%	8%	50%	58%	12.5%	
1924	12.5%	6%	40%	46%	12.5%	

Source: Table 3

Relative Advantage of Debt

Year	Return is 100% Dividend	Return is 50% Dividend	Return is 100% Capital Gain
1909	1.01	1.01	1.01
1910	1.01	1.01	1.01
1911	1.01	1.01	1.01
1912	1.01	1.01	1.01
1913	1.00	1.00	1.01
1914	1.00	1.00	1.01
1915	1.00	1.00	1.01
1916	1.00	1.01	1.02
1917	0.95	1.00	1.06
1918	0.75	0.90	1.14
1919	0.86	0.97	1.11
1920	0.86	0.97	1.11
1921	0.86	0.97	1.11
1922	0.96	0.70	0.55
1923	0.96	0.70	0.55
1924	1.03	0.84	0.71

Source: Table D1

Summary Statistics by Period

	1905 - 1908		1909 - 1912		1913 - 1916		1917 - 1920		1921 - 1924	
Variable	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Leverage - BVA	0.1482	0.1135	0.1460	0.1463	0.1459	0.1108	0.1376	0.1156	0.1349	0.0937
p-value	*0.729*	*0.763*	*0.836*	*0.793*	*0.843*	*0.978*	*0.752*	*0.832*	*0.644*	*0.687*
Leverage - MVA	0.2379	0.2115	0.2363	0.2253	0.2587	0.2642	0.2093	0.1835	0.2271	0.1822
p-value	*0.874*	*0.783*	*0.923*	*0.962*	*0.381*	*0.535*	*0.361*	*0.511*	*0.809*	*0.757*
Market-to-book	0.7094	0.6560	0.7281	0.6925	0.7064	0.6587	0.6860	0.6752	0.7319	0.6841
p-value	*0.936*	*0.822*	*0.645*	*0.970*	*0.859*	*0.707*	*0.468*	*0.902*	*0.596*	*0.476*
EBIT	4,293,131	2,098,906	4,785,580	2,143,760	5,445,753	2,162,284	13,712,432	4,817,271	7,854,860	2,772,414
p-value	*0.313*	*0.066**	*0.418*	*0.057**	*0.516*	*0.282*	*0.022***	*0.000****	*0.805*	*0.466*
EBIT (1905 dollars)	4,146,023	2,013,574	4,353,340	1,852,687	4,528,348	1,823,018	6,790,991	2,498,445	3,883,688	1,370,409
p-value	*0.728*	*0.928*	*0.824*	*0.588*	*0.846*	*0.767*	*0.212*	*0.048***	*0.634*	*0.215*
EBIT / Assets	0.0562	0.0514	0.0510	0.0455	0.0529	0.0478	0.0898	0.0832	0.0552	0.0510
p-value	*0.345*	*0.366*	*0.038***	*0.045**	*0.084**	*0.066**	*0.000****	*0.000****	*0.276*	*0.415*
Tangible	0.6452	0.7133	0.6504	0.6997	0.6473	0.6855	0.5427	0.5699	0.5557	0.5719
p-value	*0.186*	*0.052**	*0.126*	*0.064**	*0.175*	*0.147*	*0.014***	*0.003****	*0.057**	*0.018***
Assets	83,252,137	41,541,118	87,736,609	48,995,768	96,419,484	49,846,640	134,204,719	62,396,172	139,992,952	68,205,680
p-value	*0.472*	*0.042***	*0.556*	*0.173*	*0.693*	*0.539*	*0.417*	*0.060**	*0.343*	*0.023***
Assets (1905 dollars)	80,186,059	40,071,192	78,768,746	43,658,016	79,924,695	42,226,364	66,609,585	31,641,812	69,258,905	33,652,800
p-value	*0.811*	*0.438*	*0.858*	*0.509*	*0.893*	*0.479*	*0.730*	*0.203*	*0.823*	*0.350*
Investment	1,685,602	568,405	1,821,600	494,436	2,352,944	695,598	7,392,984	2,666,293	835,982	129,051
p-value	*0.392*	*0.792*	*0.444*	*0.482*	*0.627*	*0.668*	*0.000****	*0.000****	*0.150*	*0.006****
Investment (1905 dollars)	1,643,316	546,736	1,620,475	424,135	1,939,237	585,610	3,783,799	1,553,044	399,592	68,625
p-value	*0.774*	*0.597*	*0.746*	*0.817*	*0.935*	*0.925*	*0.012***	*0.001****	*0.067**	*0.004****
Investment / Assets	0.0226	0.0157	0.0210	0.0139	0.0243	0.0125	0.0540	0.0423	0.0005	0.0040
p-value	*0.732*	*0.708*	*0.522*	*0.506*	*0.851*	*0.617*	*0.000****	*0.000****	*0.000****	*0.000****

Source: Table 4

Introduction of Corporate Income Tax

Despite the improved fortunes of the trade-off theory, it cannot be the full story. The U.S. corporate income tax did not begin until 1909 when it was introduced at a 1% rate. The use of debt contracts by businesses has a much longer history than does the corporate income tax. Thus, while taxes probably play an important role, there must be more to it.

Frank and Goyal, 2008, Handbook of Empirical Corporate Finance

What explains the use of debt prior to introduction of taxes?

Figure 1: Median Investment to Asset Ratio

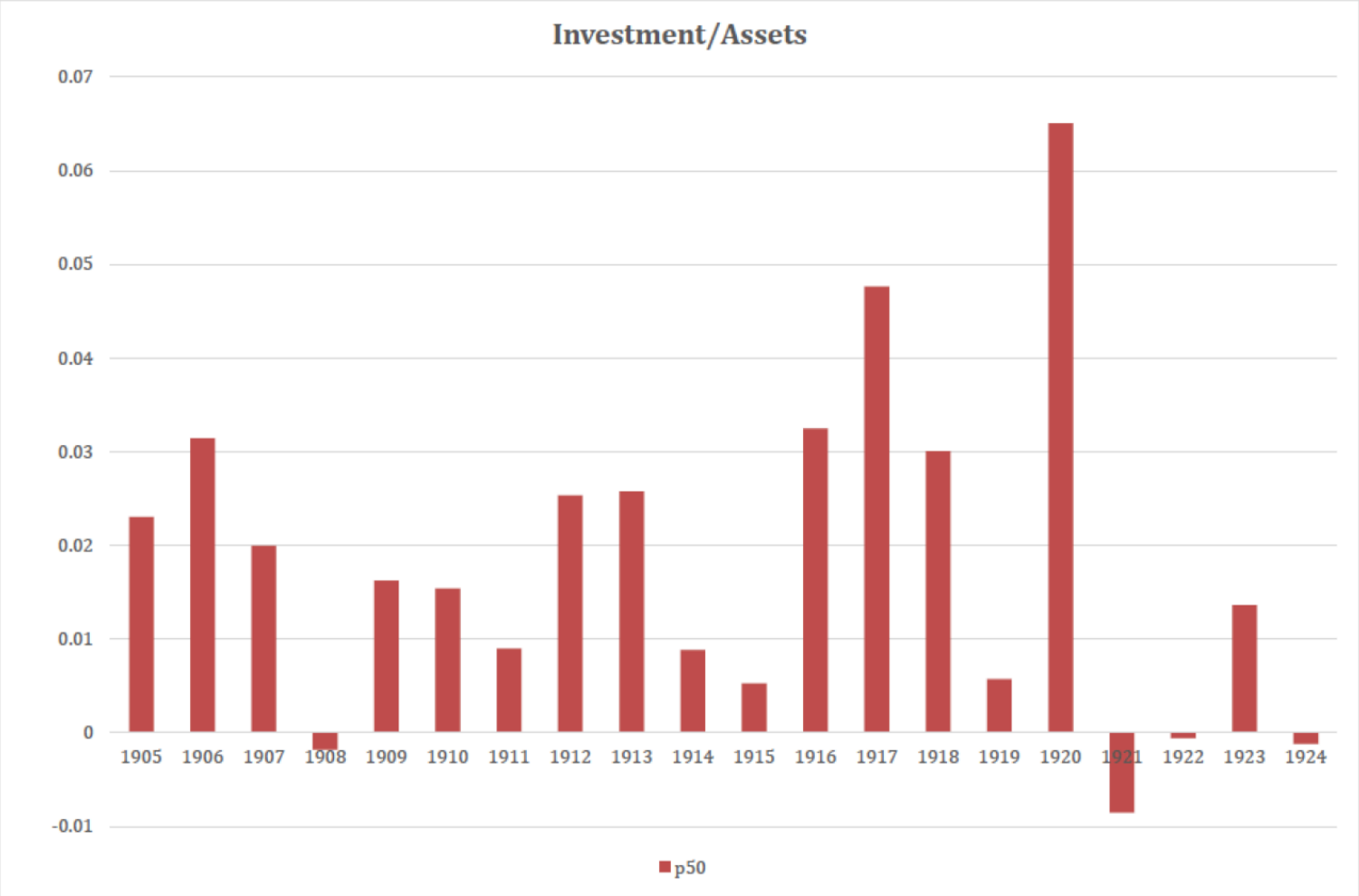


Fig. 1: For each year, the median value of the investment to assets ratio across firms is plotted.

What Does It Find?

- Shocks to corporate and individual taxes do not affect leverage ratios
  - Leverage actually increased during 1917-1920 despite the bias towards equity in the tax code.
- Transitory investments by firms during World War I resulted in transitory increases in debt (especially by firms with low earnings).
- Changes in leverage are related to investment outlays and negatively related to operating cash flows.

Cross-Sectional Regression Results

	(1) Leverage (BVA)	(2) Leverage (BVA)	(3) Leverage (MVA)	(4) Leverage (MVA)
1909-1912 period		-0.0033		-0.0093
		[0.635]		[0.351]
1913-1916 period		0.0065		0.0204
		[0.519]		[0.239]
1917-1920 period		0.0349**		0.0367
		[0.027]		[0.142]
1921-1924 period		0.0043		0.0230
		[0.827]		[0.456]
M/B	0.0562**	0.0500*	-0.0925*	-0.1047**
	[0.034]	[0.054]	[0.051]	[0.027]
LnAssets (1905 dollars)	0.0690**	0.0685**	0.0866**	0.0889**
	[0.035]	[0.026]	[0.027]	[0.017]
EBIT / Assets	-0.6387***	-0.5941***	-0.9296***	-0.8313***
	[0.000]	[0.000]	[0.000]	[0.000]
Tangible / Assets	-0.0011	-0.0008	0.0367	0.0365
	[0.989]	[0.993]	[0.760]	[0.759]
Constant	-0.6902	-0.6802	-0.6146	-0.6486
	[0.188]	[0.166]	[0.316]	[0.263]
Observations	1,003	1,003	1,003	1,003
Firm Indicators	Yes	Yes	Yes	Yes
Cluster errors	Firm	Firm	Firm	Firm
Adjusted R-squared	0.783	0.784	0.783	0.783

Source: Table 6

Investment and Leverage

- Changes in leverage are positively associated with changes in investment and negatively associated with changes in profitabilty
- Observed increase in leverage during World War I is driven by the need to finance war-related investment expenditures.

Investment Spikes, Financing Gaps and Change in Leverage

Panel A: Using Investment - EBIT to define financing gap:

For 114 investment spikes	# firm years	Investment / Assets	EBIT / Assets	Investment - EBIT	Change Leverage BVA	2year Change Leverage BVA	Common stock issues	Preferred stock issues
Investment > EBIT	53	0.1697	0.0886	0.0811	0.0386	0.0403	5	1
Investment ≤ EBIT	61	0.0625	0.1047	-0.0422	-0.0049	-0.0092	0	0
For 41 investment spikes with links to WWI								
Investment > EBIT	24	0.2166	0.1012	0.1154	0.0667	0.0632	2	0
Investment ≤ EBIT	17	0.0766	0.1260	-0.0494	0.0048	-0.0075	0	0

Why not estimate Pecking Order regressions?

Leverage and Investment

- Correlation between the change in leverage during the World War I (1917-1920) and the post-war period (1921-1924) is -0.34.
- Debt issued to finance investment spikes during World War I was transitory.
- Increase in leverage are a transitory response to funding needs during the war years.

Multivariate Analysis of Change in Leverage

	(1) CHG_Leverage	(2) CHG_Leverage	(3) CHG_Leverage
Investment / Assets	0.1936***	0.1977***	0.1817***
	[0.000]	[0.000]	[0.000]
Investment * 1917-1920 period			0.0387
			[0.485]
EBIT / Assets	-0.3024***	-0.3306***	-0.3143***
	[0.000]	[0.000]	[0.000]
EBIT / Assets * 1917-1920 period			-0.0321
			[0.678]
Lag Leverage (BVA)	-0.0634***	-0.0615***	-0.0618***
	[0.000]	[0.000]	[0.000]
Lag M/B	0.0158***	0.0136**	0.0130**
	[0.008]	[0.025]	[0.050]
Lag LnAssets (1905 dollars)	0.0006	0.0031	0.0032*
	[0.606]	[0.102]	[0.099]
Lag Cash / Assets	-0.0691**	-0.0807***	-0.0838***
	[0.017]	[0.007]	[0.005]
Predicted Leverage (BVA)		-0.0842	-0.0842
		[0.129]	[0.136]
1909-1912 period	-0.0017	-0.0040	-0.0039
	[0.588]	[0.266]	[0.278]
1913-1916 period	-0.0007	-0.0026	-0.0026
	[0.838]	[0.484]	[0.480]
1917-1920 period	0.0070	0.0032	0.0040
	[0.105]	[0.479]	[0.589]
1921-1924 period	0.0048	0.0022	0.0020
	[0.236]	[0.606]	[0.656]
Constant	0.0033	-0.0227	-0.0237
	[0.865]	[0.380]	[0.363]
Observations	999	939	939
Adjusted R-squared	0.211	0.220	0.220

Source: Table 10

Comments: World War I and Corporate Leverage

- War-time could affect both the demand and supply of debt.
- What else was changing during the sample period?
  - Bank funding/credit market conditions
  - Ownership structures
  - Equity valuations (market timing)
  - Valuation disagreements between managers and investors
  - Managerial attitudes and social norms about debt
- We lack a proper control group.

Comments: Interpreting Results

- How importance of adjustment costs?
  - Transitory increase in debt fund transitory investment outlays.
  - Rebalancing seems quick: As the wartime expansion dried up, firms reduced leverage
- How does the adjustment happen? Focus on issuances.

Comment: Data and Accounting Standards

- Why exclude railroads and mining companies?
- Tax deductibility of interest was also a function of the capital stock (accounting standards?). How binding was this constraint for firms?
- Unclear if this is captured in the "direct measures of tax incentives".

Comments: Leverage Models

- What models can be ruled out? What models make sense?
- Targeting behavior?
  - Aspects of investment policies are important. Increase in asset growth affects leverage.
  - Firms raise debt to fund expansion. They don't borrow to fund equity payouts.
  - What is happening to payout policies?
- Leverage variation could be a byproduct of decisions about other time-varying corporate policies.
- Do firms have time-varying targets?

Conclusions

- Excellent description of changes to investments, taxes, and leverage in the early 1900s.
- World War I and imposition of "excess profits tax" is a great setting for examining the effect of transitory shocks on corporate policy decisions.
- Questions about interpretation of these findings.

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