Multinationals and Uncertainty: The Role of Internal Capital Markets

Jianlin Wang

UC Berkeley

October 25, 2022

MNEs & Internal Capital Markets are Important

- MNEs and their foreign subsidiaries are globally important (OECD 2019):
  - 1/3 of global output and value-added.
  - 50% of international trade.
  - 25% of employment in the global economy.
- ICMs are important for the capital allocation of non-financial business groups:
  - **Intra-group capital transfers** mostly follow the **ownership** linkage.
  - 30%-40% of the subsidiaries' borrowings are intra-group loan (likely a lower bound).
  - Operating subsidiaries primarily use bank loans and rarely issue bonds.
  - Santioni et al. (2020), Kim et al. (2020), Buchuk et al. (2020), Stein (1997), etc.
- ICMs can reallocate **equity capital** with a **tightening borrowing constraint**:
  - Domestic groups & **crises**: Santioni, Schiantarelli, and Strahan (2020), Buchuk et al. (2020, 2014), Almeida et al. (2015), Gopalan et al. (2007), etc.
  - MNEs & **crises**: Bena, Dinc, and Erel (2021), Biermann and Huber (2020), etc.

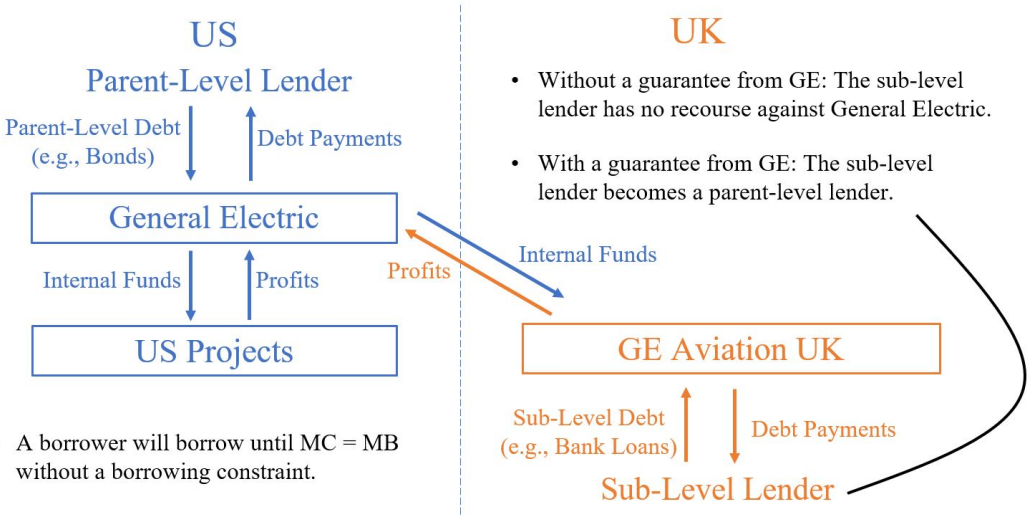
This Paper

- What we know: The reallocation of **equity capital** via ICMs during **crises**.
- My Focuses:
  1. How do the ICMs of MNEs interact with **external capital markets** across borders?
  2. How do the ICMs of MNEs react to uncertainty shocks in a **non-crisis** environment?
     - Optimally borrow/invest less vs. Inflows of foreign capital by raising foreign external debt?
- Why uncertainty shocks: Shocks in the second moment or risk shocks?
  - **Important** w/o. crises: Bloom et al. (2018), CMR (2014), Julio and Yook (2012), etc.
  - A more **general** shock to interact with the ICMs $\Rightarrow$ **Novel** to the literature of ICMs.
  - Increasingly **relevant** to policy makers: Geopolitical uncertainty, MP uncertainty, etc.
  - Other shocks are also interesting: MP shocks, FX shocks (Andreas and Wang 2022), etc.

Research Questions

- Do the ICMs of MNEs respond to a country-level uncertainty shock?
- Do they respond with **debt flows** across external capital markets?
- How can ICMs stabilize a country-level uncertainty shock?
- Is the stabilizing effect stronger for MNEs vs. domestic business groups?

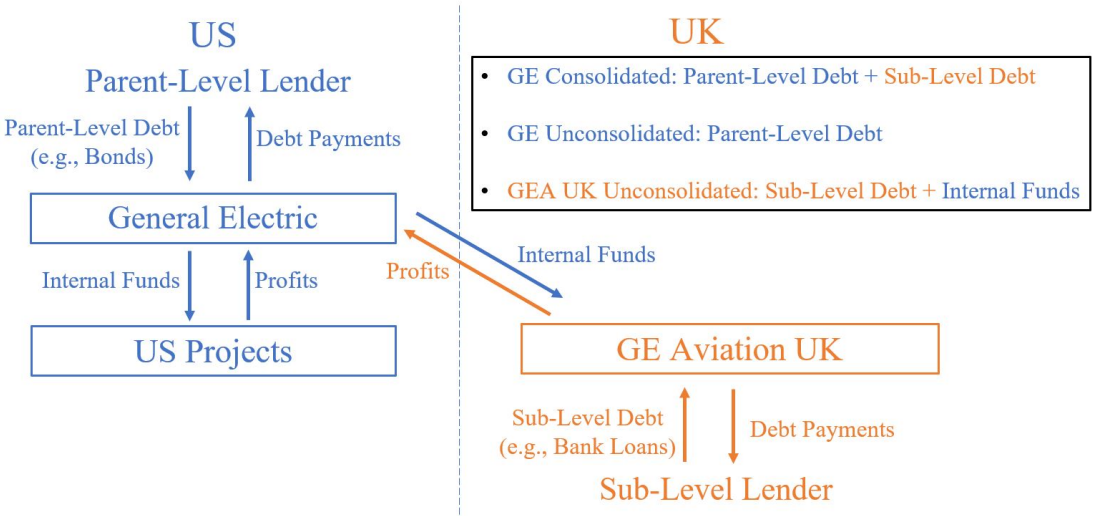
What Does an ICM Look Like?



- A borrower will borrow until MC = MB without a borrowing constraint.

- Without a guarantee from GE: The sub-level lender has no recourse against General Electric.
- With a guarantee from GE: The sub-level lender becomes a parent-level lender.

What Does an ICM Look Like?



Parent-Level Empirical Findings

- The unexpected Brexit vote ⇒ The Brexit interregnum (06/23/2016-2018).
  - The UK remained in the EU during the 2.5 years.
  - Large and persistent uncertainty with little other changes (Bloom et al. 2019).
  - DMP Survey (2017-2018): 56% chance for Brexit to have a non-negative impact.

- Parent-Level Findings (Consolidated): US parents w/o. an UK exposure.
  - US parents with an UK exposure increased the ratio of parent-level debt/TA.
  - No significant change in the ratio of total debt/TA.
  - The rise of parent-level debt/TA cannot be explained by total debt/TA and TA.

Subsidiary-Level Empirical Findings

- Parent-Level Findings (Consolidated): US parents w/o. an UK exposure.
  - US parents with an UK exposure increased the ratio of parent-level debt/TA.
  - No significant change in the ratio of total debt/TA.
  - The rise of parent-level debt/TA cannot be explained by total debt/TA and TA.
- Sub-Level Findings (Unconsolidated): UK subs of US MNEs vs. UK domestic groups.
  - UK subs of US MNEs raised internal debt/TA, while lowered external debt/TA.
  - No significant change in the ratio of total debt/TA.
  - The substitution cannot be explained by total debt/TA and TA.
- Both sets of findings cannot be explained by a credit stress in the UK.

Theory

- The interaction between internal and external capital markets:
  - A 2-period and 2-country model with a representative MNE.
  - Without a crisis or borrowing constraint: A firm will borrow with MC = MB.
  - Question: Why a parent borrows for a sub if a higher risk raises the MC for both?

- No sub-level debt as informed capital ⇒ The MNE **optimally borrow/invest less**.
  - Standard agency problems & costly defaults.
  - The ICM turns a local deleverage to a global deleverage ⇒ Negative spillovers.
  - Cannot explain a change in the debt structure without a deleverage.

- With sub-level debt as informed capital ⇒ A **substitution of external debt**.
  - Holmstrom and Tirole (1997).
  - The ICM can counteract the deleveraging pressure of a higher uncertainty.
  - Can explain a change in the debt structure without a significant change in leverage.

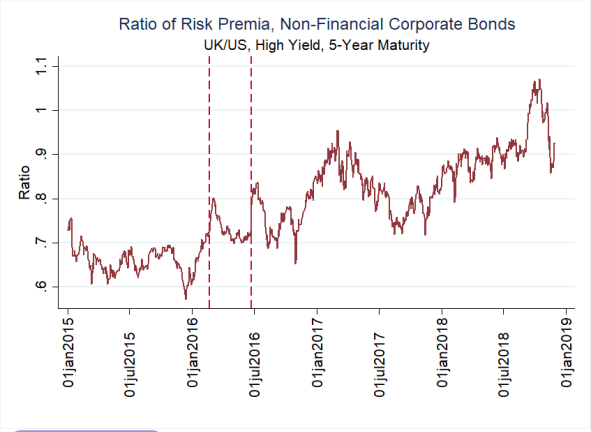
Overview

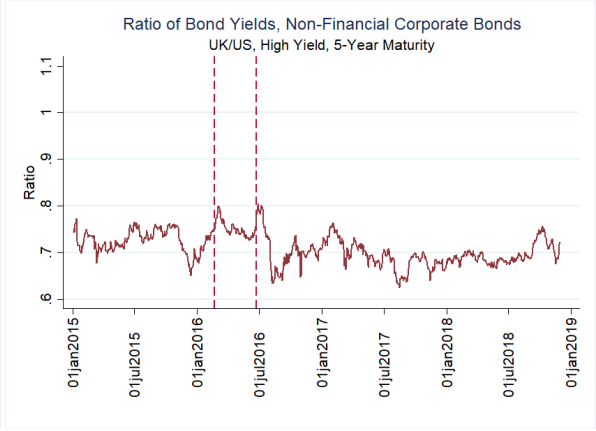
The Brexit Interregnum

- The UK **unexpectedly** voted to leave on Jun 23, 2016 (52% to 48%).
- Why focus on the (early) Brexit interregnum: 06/23/2016-2018?
- Reason 1: Large uncertainty with little other changes (Bloom et al. 2019).
  - The UK remained in the EU during the interregnum.
  - The demand condition remained stable (Broadbent 2017, BOE 2018, etc.).
  - A severe lack of clarity on the eventual Brexit outcome:
    - 2017-2018: 56% chance for Brexit to have a non-negative impact.
    - 2017-2018: 15% chance for "No Brexit." Below 30% chance for a "No Deal Brexit."
- Bottom line: The uncertainty shock was large and dominating.
  - First moment shocks cannot explain a substitution without a change in leverage.

The Brexit Interregnum

- Reason 2: The credit market & borrowing cost in the UK remained stable.
  - Don't need to reallocate due to a tightening credit constraint.
  - Definition: Bond yield = Risk-free rate + Risk premium.





Original Data

Data Structure

- Parent-Level Data: Consolidated financial statements, US public firms.
  - Quarterly, Compustat + Capital IQ + Orbis.
  - Exclude firms from the financial and utility sectors.
  - Majority-owned, US non-financial subs, ≤ 3 tiers below the HQ by 2018.
  - Use senior bonds in my sample.

- Subsidiary-Level Data: Unconsolidated balance sheets, UK subsidiaries.
  - Annual, regulatory data from the UK Companies House + Orbis.
  - All majority-owned subsidiaries in the UK tradable sectors:
    - UK subs with a US ultimate parent.
    - Subs of UK domestic business groups.
  - Advantage: External and internal debt can be observed separately.

The Empirical Battle Plan

- Parent-Level Analysis (Consolidated Financial Statements):
  1. Did US parents with an UK exposure increase the ratio of parent-level debt/TA? (Yes).
  2. Did US parents with an UK exposure decrease the ratio of total debt/TA? (No).
  3. Can the increase in parent-level debt/TA be explained by total debt/TA? (No).

- Subsidiary-Level Analysis (Unconsolidated Balance Sheets):
  1. Did the UK subs of US parents increase the ratio of internal debt/TA? (Yes).
  2. Did the UK subs of US parents lower the ratio of external debt/TA in exchange? (Yes).
  3. Did the UK subs of US parents decrease the ratio of total debt/TA? (No).
  4. Can changes in the internal and external debt be explained by total debt/TA? (No).

- The **combination** of two analyses: A substitution of parent- for sub-level debt.

Parent-Level Analysis: Consolidated Financial Statements

- US parents with an UK exposure vs. US parents without an UK exposure.
  - Exposure: Majority-owned, UK non-financial subs, ≤ 3 tiers below the HQ by 2018.
  - Non-Exposure: No subs in the UK by 2018.

- How to approximate parent-level debt?
  - Ideal: All debt instruments at the parent level or with a parent guarantee $\Rightarrow$ Difficult.
  - Solution: Use debt instruments specialized at the parent level $\Rightarrow$ Senior bond debt.

- Detect changes in parent-level debt: Changes in senior bond debt.
  - Nearly 90% of US non-financial corporate bonds are at the parent level.
    - SDC, FISD, and TRACE (Altieri et al. 2019, Kolasinski 2009, etc.).
  - Operating subsidiaries primarily use bank loans (Santioni et al. 2020, Kim et al. 2020).
  - Subsidiary-level analysis: Confirm debt flows from the US parents to their UK subs.

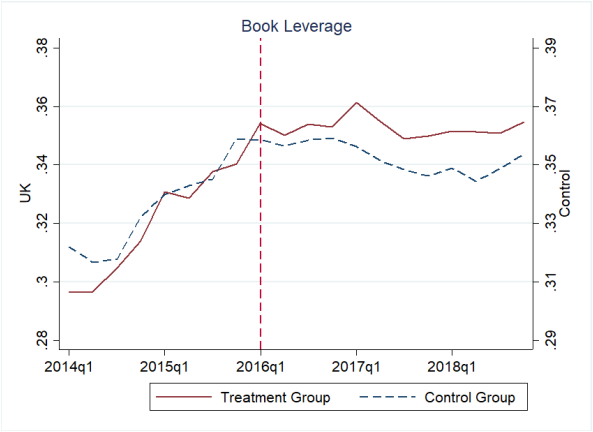
Parent-Level DID

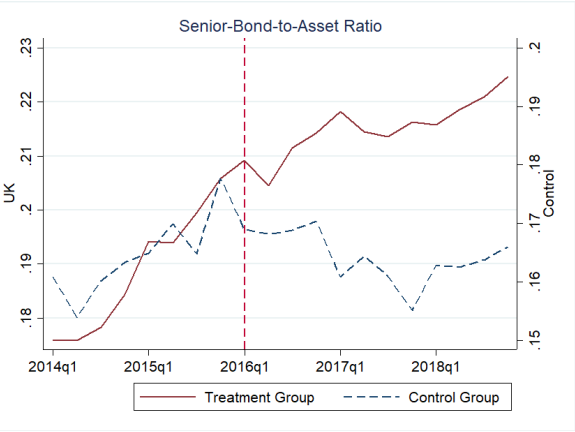
- Parent-Level DID:

$$Y_{i,t} = \alpha_i + \beta After_t + \gamma After_t \times UK_i + \sum_{k=1}^{K} \varphi_k X_{k,i,t} + \epsilon_{i,t}$$

- Treatment & Control (UK_i): US parent companies w./w.o. the UK exposure.
- Dependent Variables ($Y_{i,t}$): Total Debt/TA (Book Leverage) or Senior Bonds/TA.
- Identification: The UK uncertainty shock is the only time-varying factor that can...
  - Total Effect: Cause a relative difference in Senior Bonds/TA.
  - CDE: Cause a relative difference in Senior Bonds/TA, conditioning on Total Debt/TA.
  - The controlled direct effect (CDE) confirms a direct impact on the debt **structure**.
- Avg of 2014Q1-2016Q2 vs. Avg of 2016Q3-2018Q4.

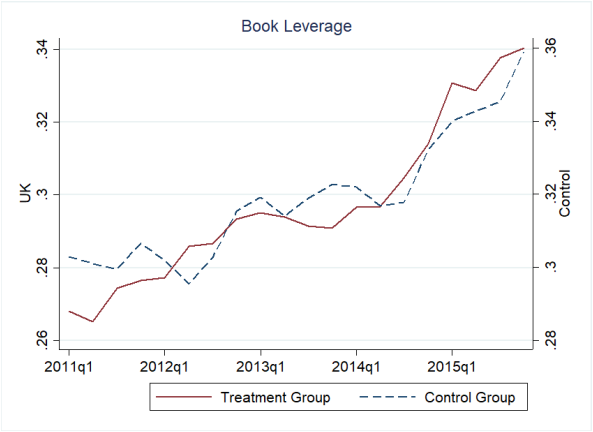
Is There a Rise in Parent-Level Debt?

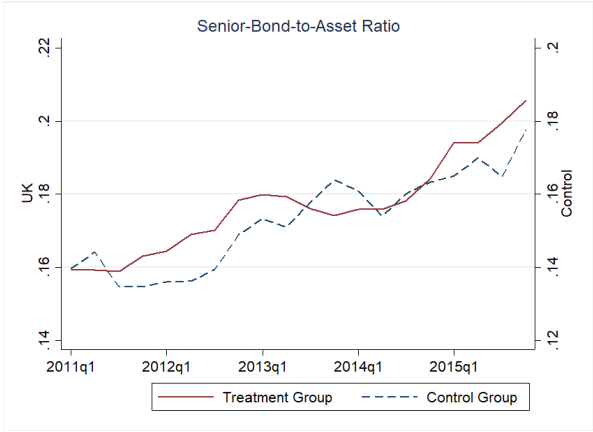




▸ Normalized ▸ Alternative

Is There a Pre-Trend?





▸ Normalized

Table 1: Parent-Level DID Analysis (2014Q1-2016Q2 vs. 2016Q3-2018Q4)

	(1) BookLev	(2) SnrBond/TA	(3) SnrBond/TA	(4) SnrBond/TA	(5) SnrBond/TA	(6) SnrBond/TA	(7) SnrBond/TA
After	0.017**	-0.003	-0.014***	-0.015***	-0.022*	-0.021	-0.022*
	(2.463)	(-0.411)	(-2.936)	(-2.998)	(-1.755)	(-1.554)	(-1.756)
After×UK	0.013	0.025***	0.016***	0.016***	0.018***	0.017**	0.018***
	(1.572)	(3.063)	(2.727)	(2.698)	(2.913)	(2.094)	(2.636)
After×MNE						-0.002	
						(-0.184)	
After×EU27							0.001
							(0.144)
BookLeverage			0.709***	0.710***	0.719***	0.719***	0.719***
			(14.902)	(14.920)	(15.040)	(15.019)	(15.046)
LnTA				0.003	0.003	0.003	0.003
				(0.307)	(0.240)	(0.236)	(0.243)
Tobin'sQ					0.003	0.003	0.003
					(0.473)	(0.473)	(0.471)
Quick					0.002	0.002	0.002
					(0.663)	(0.665)	(0.670)
Firm-Level FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
After×Industry	No	No	No	No	Yes	Yes	Yes
Observations	2016	2016	2016	2016	2016	2016	2016
R-squared	0.035	0.016	0.502	0.502	0.527	0.527	0.527

t-statistics reported in parentheses are based on robust standard errors clustered at the firm level.
* p<0.10, ** p<0.05, *** p<0.01.
All models include firm-level fixed effects, which subsume the effect of the stand-alone treatment and control group dummies.

▸ QEs ▸ Matching: Treatment vs. Control ▸ Matching: Alternative

Table 2: Parent-Level DID Analysis (2011Q1-2013Q2 vs. 2013Q3-2015Q4)

	(1) BookLev	(2) SnrBond/TA	(3) SnrBond/TA	(4) SnrBond/TA	(5) SnrBond/TA	(6) SnrBond/TA	(7) SnrBond/TA
After	0.031***	0.034***	0.014**	0.009*	-0.018	-0.020	-0.020
	(4.194)	(5.050)	(2.567)	(1.731)	(-0.670)	(-0.755)	(-0.792)
After×UK	0.002	-0.007	-0.009	-0.008	-0.004	-0.002	-0.002
	(0.246)	(-0.915)	(-1.507)	(-1.384)	(-0.534)	(-0.176)	(-0.244)
After×MNE						0.004	
						(0.381)	
After×EU27							0.008
							(0.729)
BookLeverage			0.656***	0.655***	0.646***	0.646***	0.646***
			(14.049)	(14.827)	(14.221)	(14.210)	(14.207)
LnTA				0.021**	0.021*	0.021*	0.021*
				(2.022)	(1.873)	(1.871)	(1.870)
Tobin'sQ					-0.006	-0.006	-0.006
					(-0.963)	(-0.977)	(-0.978)
Quick					0.001	0.001	0.001
					(1.047)	(1.036)	(1.047)
Firm-Level FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
After×Industry	No	No	No	No	Yes	Yes	Yes
Observations	1964	1964	1964	1964	1964	1964	1964
R-squared	0.060	0.060	0.509	0.515	0.544	0.544	0.544

t-statistics reported in parentheses are based on robust standard errors clustered at the firm level.
* p<0.10, ** p<0.05, *** p<0.01.
All models include firm-level fixed effects, which subsume the effect of the stand-alone treatment and control group dummies.

From the Battle Plan...

- Given the parent-level findings from the consolidated financial statements:
  1. The US parents with an UK exposure **increased** the ratio of parent-level debt/TA.
  2. The US parents with an UK exposure **did not decrease** the ratio of total debt/TA.
  3. The increase in parent-level debt/TA **cannot be explained** by total debt/TA.

- Subsidiary-Level Analysis (Unconsolidated Balance Sheets):
  1. Did the UK subs of US parents increase the ratio of internal debt/TA?
  2. Did the UK subs of US parents lower the ratio of external debt/TA in exchange?
  3. Did the UK subs of US parents decrease the ratio of total debt/TA?
  4. Can changes in the internal and external debt be explained by total debt/TA?

- The **combination** of two analyses: A substitution of parent- for sub-level debt.

Subsidiary-Level Analysis: Unconsolidated Balance Sheets

- The UK subs of US MNEs vs. The subs of UK domestic business groups.
  - Both groups had active ICMs and lived through the 2.5 years of the interregnum.
  - Main Difference: MNEs should have a stronger external debt substitution.
    - MNEs can use more non-UK assets to support parent-level debt.
    - Non-UK assets were less affected by the UK uncertainty shock.
    - Better parent-level support by raising parent-level debt.
  - Robust: The UK subs of all MNEs vs. The subs of UK domestic business groups.

- Regulatory Data & Subsidiary-Level Capital Structure:

$$\frac{\text{External Liabilities}}{\text{Total Assets}} + \frac{\text{Internal Liabilities}}{\text{Total Assets}} + \frac{\text{Equity}}{\text{Total Assets}} = 1$$

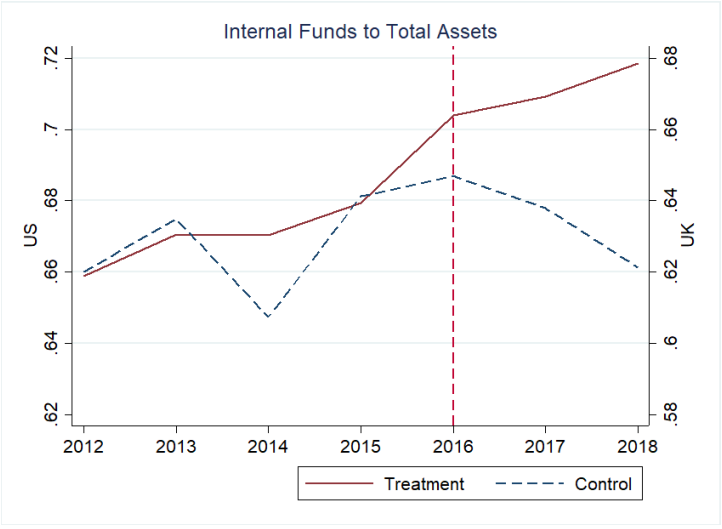
Subsidiary-Level DID

- Subsidiary-Level DID:

$$Y_{i,t} = \alpha_i + \beta After_t + \gamma After_t \times FA_i + \sum_{k=1}^{K} \varphi_k X_{k,i,t} + \epsilon_{i,t}$$

- Treatment & Control (FA_i): UK subs of US MNEs & UK domestic groups
- $Y_{i,t}$: External Liab/TA, Internal Liab/TA, or Total Liab/TA (Accounting Leverage).
- Identification: The Brexit uncertainty is the only time-varying factor that can...
  - Total Effect: Cause a relative difference in External Liab/TA and Internal Liab/TA.
  - CDE: Cause a relative difference in EL/TA and IL/TA, conditioning on TL/TA.
  - The controlled direct effect (CDE) confirms a direct impact on the debt **structure**.
- Avg of 2014-2015 vs. Avg of 2017-2018.

Is There an Increase in Internal Funds?



Normalized

Table 3: Subsidiary-Level DID Analysis (2014-2015 vs. 2017-2018) – UK Subs of US MNEs vs. Subs of UK Domestic Business Groups

	(1) IL/TA	(2) IL/TA	(3) IL/TA	(4) IL/TA	(5) EL/TA	(6) EL/TA	(7) EL/TA	(8) EL/TA	(9) Leverage	(10) Leverage	(11) Leverage
After	-0.101***	-0.090***	-0.098***	-0.104***	0.080***	0.078***	0.100***	0.096***	-0.010**	0.004	0.015
	(-23.744)	(-19.679)	(-7.294)	(-8.490)	(27.208)	(25.645)	(8.702)	(8.626)	(-2.179)	(0.755)	(1.434)
After×ForeignAff	0.066***	0.066***	0.063***	0.070***	-0.083***	-0.083***	-0.078***	-0.075***	-0.019	-0.019	-0.016
	(7.887)	(8.299)	(7.848)	(8.816)	(-11.049)	(-11.059)	(-10.154)	(-11.401)	(-1.517)	(-1.546)	(-1.313)
LnTA		-0.108***	-0.107***	-0.050***		0.014**	0.014**	0.044***		-0.133***	-0.133***
		(-6.696)	(-6.696)	(-5.382)		(2.159)	(2.119)	(5.875)		(-7.218)	(-7.194)
Leverage				0.428***				0.228***			
				(14.383)				(17.177)			
Firm-Level FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
After×Industry	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes
Observations	17526	17526	17526	17526	17526	17526	17526	17526	17526	17526	17526
R-squared	0.066	0.110	0.116	0.332	0.078	0.079	0.084	0.202	0.001	0.054	0.059

t-statistics reported in parentheses are based on robust standard errors clustered at the firm level.
* p<0.10 , ** p<0.05 , *** p<0.01.
All models include firm-level fixed effects, which subsume the effect of the stand-alone treatment and control group dummies.

▸ Provisions ▸ All Foreign Subsidiaries

Table 4: Subsidiary-Level DID Analysis (2012-2013 vs. 2014-2015) – UK Subs of US MNEs vs. Subs of UK Domestic Business Groups

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	IL/TA	IL/TA	IL/TA	IL/TA	EL/TA	EL/TA	EL/TA	EL/TA	Leverage	Leverage	Leverage
After	-0.000	0.009**	0.016	0.010	-0.021***	-0.023***	-0.018**	-0.020**	-0.020***	-0.006	0.013
	(-0.127)	(2.169)	(1.430)	(0.995)	(-10.075)	(-10.448)	(-2.043)	(-2.435)	(-4.494)	(-1.105)	(1.267)
After×ForeignAff	-0.003	-0.004	-0.002	-0.005	0.002	0.003	0.002	0.001	0.008	0.006	0.006
	(-0.449)	(-0.664)	(-0.359)	(-0.784)	(0.496)	(0.540)	(0.299)	(0.125)	(0.827)	(0.639)	(0.562)
LnTA		-0.094***	-0.093***	-0.027**		0.017***	0.017***	0.042***		-0.148***	-0.147***
		(-6.087)	(-6.015)	(-2.357)		(2.706)	(2.679)	(6.286)		(-6.365)	(-6.393)
Leverage				0.454***				0.175***			
				(12.669)				(13.957)			
Firm-Level FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
After×Industry	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes
Observations	14902	14902	14902	14902	14902	14902	14902	14902	14902	14902	14902
R-squared	0.000	0.032	0.038	0.351	0.016	0.018	0.024	0.145	0.003	0.051	0.062

t-statistics reported in parentheses are based on robust standard errors clustered at the firm level.
* p<0.10 , ** p<0.05 , *** p<0.01.
All models include firm-level fixed effects, which subsume the effect of the stand-alone treatment and control group dummies.

Overview

The Basic Setup

- A 2-period and 2-country model with a representative MNE:
  - Two periods: t and $t+1$ & Two countries: Home and Foreign.
  - A parent in Home owns a subsidiary in Foreign by majority.
- The parent and subsidiary manage their own projects: $E_t(\omega_{t+1})R_t$ and $E_t(\omega^*_{t+1})R^*_t$.
  - R_t and R^*_t: **Publicly** known at t (e.g. country-level fundamentals).
  - ω_{t+1} and ω^*_{t+1}: **Privately** observed at $t+1$ (e.g. local management).
  - $E_t(\omega_{t+1}) = e^{\mu_t + \frac{1}{2}\sigma_t^2} = 1$ & $E_t(\omega^*_{t+1}) = e^{\mu^*_t + \frac{1}{2}\sigma^{*2}_t} = 1$
  - A foreign uncertainty shock: $\uparrow \sigma^*_t$ with $E_t(\omega^*_{t+1}) = 1$.
- At t: Observe the distribution parameters, sign debt contracts, invest.
- At $t+1$: Observe the private draws and realize the returns.

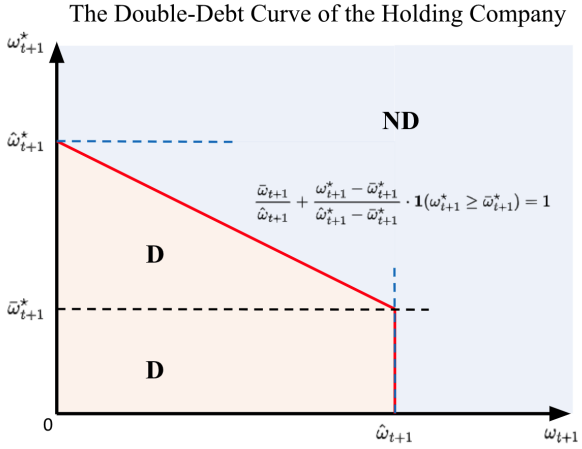
Agency Problems

- MNE vs. External Lenders: Costly defaults.
  - Non-truthful reporting ⇒ CSV (Townsend 1979, BGG 1999, CMR 2014, etc.).
  - Parent-level debt ⇒ Verify the total return of the parent.
  - Subsidiary-level debt ⇒ Verify the individual return of the subsidiary.
  - The parent has an incentive to borrow for the group due to a **diversification benefit**.

- Parent vs. Subsidiary: Shirking with a limited internal monitoring capacity.
  - The subsidiary may shrink $\omega^*_{t+1} \to (1-\psi^*)\omega^*_{t+1}$ for private benefits.
  - Local debt as informed capital to reduce ψ^* with enough "skin in the game" (HT 1997).
  - Limited internal monitoring capacity: Chernobai, Ozdagli, and Wang (2021).
    - Villalonga (2004), Schoar (2002), Whited (2001), Lamont (1997), etc.
  - A potential usage of sub-level debt as **local informed capital**.

Optimal Contracts and Debt Specialization

- Optimal contracts ⇒ A within-group debt specialization.
  - Parent-level uninformed capital (e.g., bonds): Diversification benefits.
  - Subsidiary-level informed capital (e.g., bank debt): Shrinkage prevention.

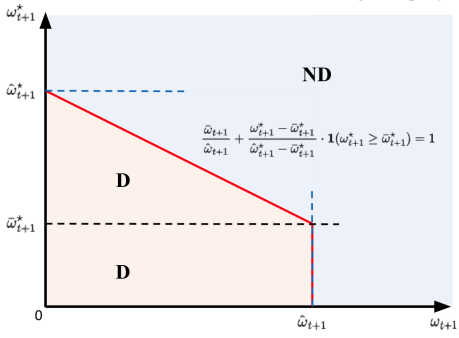


Foreign Default Threshold

- The IC for monitoring: $M(\bar{\omega}^*_{t+1})R^*_t = c^*$ with $\frac{\partial M(\bar{\omega}^*_{t+1})}{\partial \bar{\omega}^*_{t+1}} > 0$.
  - $\bar{\omega}^*_{t+1}$: The minimum share of $E_t(\omega^*_{t+1})R^*_t$ **per unit** of I^*_t.
  - $M(\bar{\omega}^*_{t+1})$: The expected benefit of monitoring **per unit** of I^*_t.
  - c^*: The cost of monitoring **per unit** of I^*_t.

- $\bar{\omega}^*_{t+1}$ decides D^*_t/I^*_t with $\frac{\partial(D^*_t/I^*_t)}{\partial \bar{\omega}^*_{t+1}} > 0$.

The Double-Debt Curve of the Holding Company



Model Predictions: No Local Informed Capital

- p chooses I_t, internal lending (T_t), and D_t^* to maximize expected profits:

$$\max_{\{I_t, T_t, D_t^*\}} \Upsilon^h(\hat{\omega}_{t+1}, \hat{\omega}_{t+1}^*, \bar{\omega}_{t+1}^*) I_t R_t + \Upsilon^f(\hat{\omega}_{t+1}, \hat{\omega}_{t+1}^*, \bar{\omega}_{t+1}^*) F_{t+1} I_t^* R_t^*$$

  - H and F lenders break even: Local risk-free rates + Monitoring costs.
  - The IC for monitoring: $M(\bar{\omega}_{t+1}^*) R_t^* = c^*$.

- Standard Costly Defaults, No Local Informed Capital:
  - A mean-preserving $\uparrow \sigma_t^* \Rightarrow$ Both the parent and sub: MC $>$ MB.
  - Foreign lender: $\downarrow \Omega^* \left(\bar{\omega}_{t+1}^*\right) I_t^* R_t^*$.
  - Home lender: $\downarrow \Omega^h(\hat{\omega}_{t+1}, \hat{\omega}_{t+1}^*, \bar{\omega}_{t+1}^*) I_t R_t$ and $\downarrow \Omega^f(\hat{\omega}_{t+1}, \hat{\omega}_{t+1}^*, \bar{\omega}_{t+1}^*) I_t^* R_t^*$.

- **Negative** spillovers: The ICM turns a local deleverage into a global deleverage.

Model Predictions: Local Debt as Informed Capital

- p chooses I_t, internal lending (T_t), and D_t^* to maximize expected profits:

$$\max_{\{I_t, T_t, D_t^*\}} \Upsilon^h(\hat{\omega}_{t+1}, \hat{\omega}_{t+1}^*, \bar{\omega}_{t+1}^*) I_t R_t + \Upsilon^f(\hat{\omega}_{t+1}, \hat{\omega}_{t+1}^*, \bar{\omega}_{t+1}^*) F_{t+1} I_t^* R_t^*$$

  - H and F lenders break even: Local risk-free rates + Monitoring costs.
  - The IC for monitoring: $M(\bar{\omega}_{t+1}^*) R_t^* = c^*$.

- Standard Costly Defaults with Local Informed Capital:
  - A mean-preserving $\uparrow \sigma_t^* \Rightarrow$ Relax the IC for monitoring by $\frac{\partial \bar{\omega}_{t+1}^*}{\partial \sigma_t^*} < 0$.
  - Local informed capital $\times$ ICM as a **stabilizer**: $\frac{\partial (D_t^*/I_t^*)}{\partial \bar{\omega}_{t+1}^*} > 0$.
  - Expensive local informed capital can be substituted with cheaper parent-level debt.

- **Positive** spillovers: The ICM helps with an external debt substitution.

Taking Stock...

- Empirical findings from the exogenous UK uncertainty shock:
  1. US parents with an UK exposure **increased** the ratio of parent-level debt/TA.
  2. US parents with an UK exposure did **not decrease** the ratio of total debt/TA.
  3. UK subs of US parents **increased** internal debt/TA & **decreased** external debt/TA.
  4. UK subs of US parents had an **insignificant** change in total debt/TA.

- Empirical findings do not support the class of model with only costly defaults.
  - Model Prediction: Deleverage and **negative** spillovers.

- Empirical support for the class of model: Local debt as informed capital.
  - Model Prediction: Local debt $\times$ ICM as a **stabilizer** & external debt substitutions.
  - US parents increased uninformed debt (bond debt) in the consolidated debt structure.

Conclusions

- I study how ICMs of MNEs connect external capital markets via uncertainty shocks.
  - Natural Experiment: Brexit uncertainty shock during the Brexit interregnum.
- The ICMs of MNEs respond to a country-level uncertainty shock.
- They respond with **external debt substitutions** across capital markets.
- Theoretical Explanations:
  - External debt substitutions do not support with models with only costly defaults.
  - External debt substitutions support models where local debt is used as informed capital.
- The stabilizing effect is stronger for MNEs relative to domestic business groups.

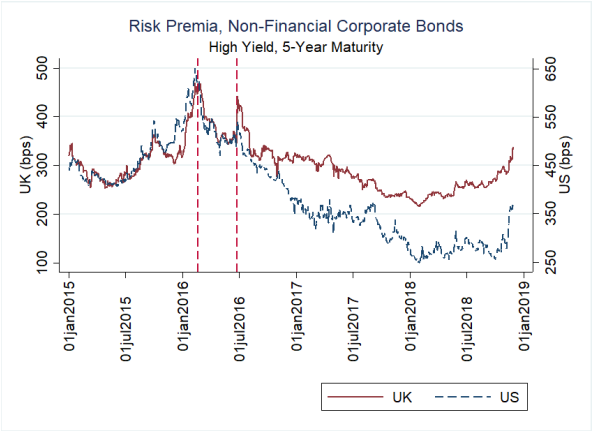
Research Agenda

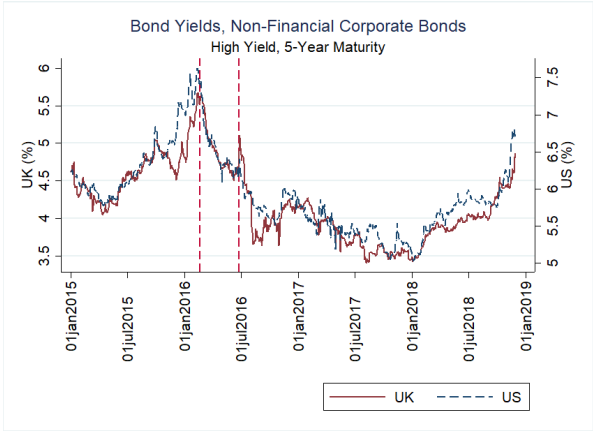
- The interaction between MNEs and the global financial market:
  - How do they interact?
  - Whether the interaction propagate or stabilize the transmission of shocks?
    - Uncertainty shocks, MP shocks, FX shocks (Andreas and Wang 2022), etc.
  - What are the potential macroeconomic implications?

- The interaction between banks and firms:
  - Is bank debt special for uncertainty shocks? (Ozdagli and Wang 2022).

- Agency problems faced by large and complex organizations:
  - Global banks, MNEs, etc.
  - Operational risk of financial MNEs (Chernobai, Ozdagli, and Wang 2021).

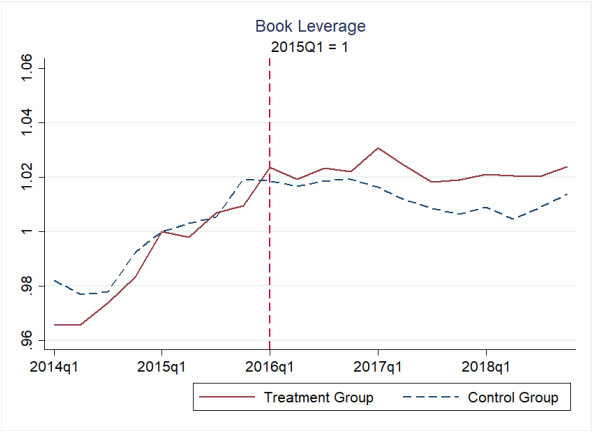
The Levels of Risk Premia and Bond Yields

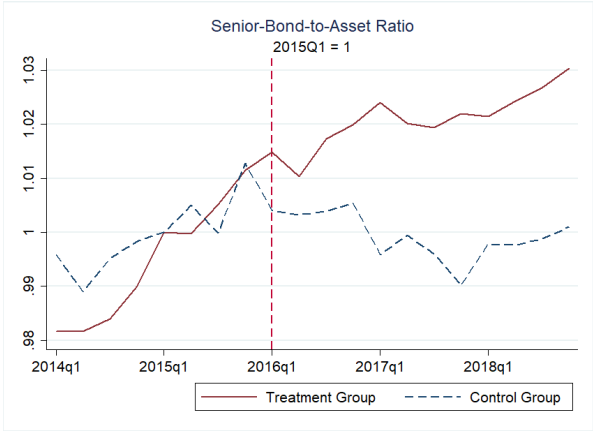




Return

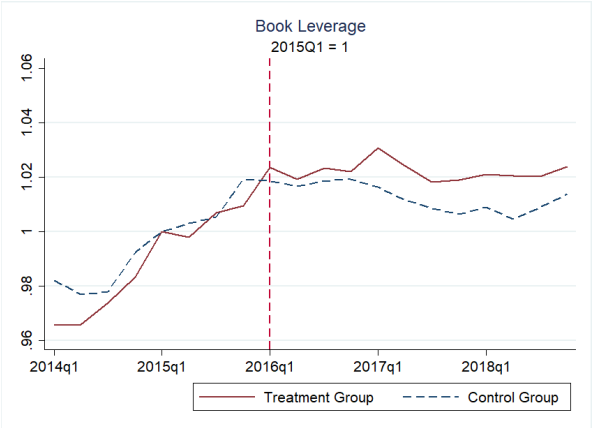
Parent-Level Capital and Debt Structures: Normalized

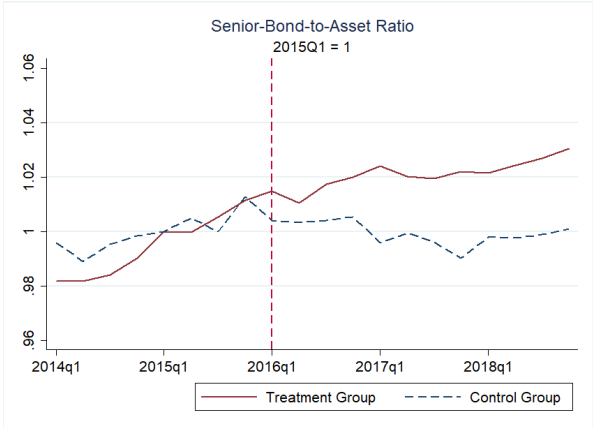




Return

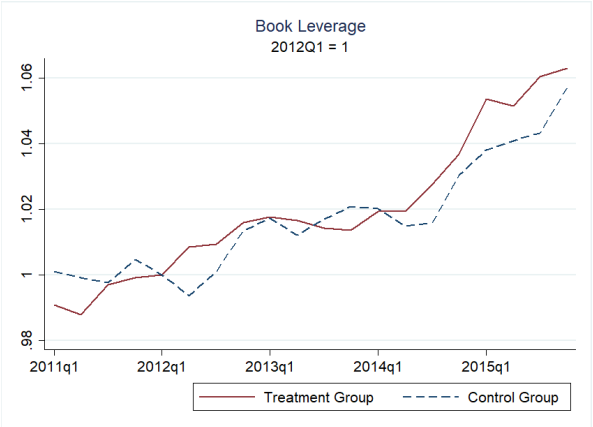
Parent-Level Capital and Debt Structures: Alternative

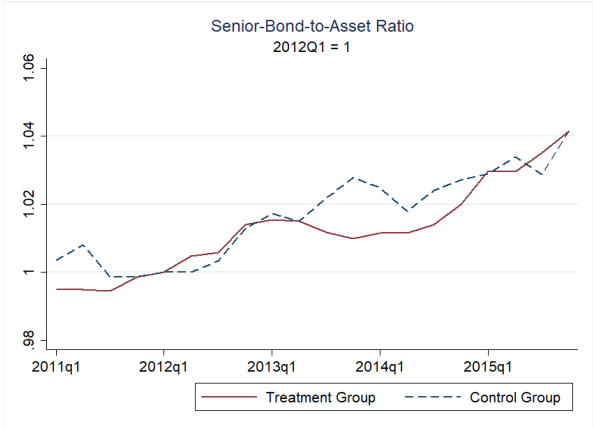




Return

Parent-Level Capital and Debt Structures: Normalized Pre-Trends





Return

Robustness Check on QEs

Robustness Check on QEs

	Original			No BoE and ECB QEs		
	(1)	(2)	(3)	(4)	(5)	(6)
	Main	MNE	EU27	Main	MNE	EU27
After	-0.022*	-0.021	-0.022*	-0.022*	-0.021	-0.022*
	(-1.755)	(-1.554)	(-1.754)	(-1.741)	(-1.565)	(-1.742)
After×UK	0.018***	0.017**	0.018***	0.019***	0.018**	0.019***
	(2.913)	(2.094)	(2.624)	(3.043)	(2.229)	(2.751)
After×MNE		-0.002			-0.001	
		(-0.184)			(-0.137)	
After×EU27			-0.001			0.002
			(-0.078)			(0.155)
BookLeverage	0.719***	0.719***	0.719***	0.724***	0.724***	0.723***
	(15.040)	(15.019)	(15.020)	(15.253)	(15.231)	(15.260)
LnTA	0.003	0.003	0.003	0.003	0.003	0.003
	(0.240)	(0.236)	(0.240)	(0.282)	(0.278)	(0.285)
Tobin'sQ	0.003	0.003	0.003	0.004	0.004	0.004
	(0.473)	(0.473)	(0.475)	(0.630)	(0.629)	(0.628)
Quick	0.002	0.002	0.002	0.002	0.002	0.002
	(0.663)	(0.665)	(0.655)	(0.615)	(0.617)	(0.623)
Firm-Level FE	Yes	Yes	Yes	Yes	Yes	Yes
After×Industry	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2016	2016	2016	1990	1990	1990
R-squared	0.527	0.527	0.527	0.533	0.533	0.533

t-statistics reported in parentheses are based on robust standard errors clustered at the firm level.
* p<0.10, ** p<0.05, *** p<0.01.
All models include firm-level fixed effects, which subsume the effect of the stand-alone treatment and control group dummies.

Return

Matching Analysis: Treatment vs. Control

Summary Statistics – Matching Analyses: US Parents with an UK Exposure vs. US Parents without an UK Exposure

Panel A: Original Sample (Averages of 2014Q1-2016Q2)

	US Parents with an UK Exposure (N = 539)					US Parents without an UK Exposure (N = 469)					T-Test
	Mean	SD	Median	P1	P99	Mean	SD	Median	P1	P99	P-Value
BookLeverage	.32	.18	.29	.01	.88	.33	.22	.31	.004	.91	0.244
LnTA	8.26	1.76	8.32	2.91	12.22	6.01	2.53	6.62	-.11	10.42	0.000
Tobin'sQ	1.81	1.10	1.49	.60	5.96	1.71	1.28	1.28	.51	5.96	0.337
Quick	.79	1.11	.47	.04	4.66	.83	1.64	.34	.005	7.28	0.584

Panel B: Mahalanobis Score Matching on Size, Top 3 Matches with Replacements (Averages of 2014Q1-2016Q2)

	US Parents with an UK Exposure (N = 539)					US Parents without an UK Exposure (N = 336)					T-Test
	Mean	SD	Median	P1	P99	Mean	SD	Median	P1	P99	P-Value
BookLeverage	.32	.18	.29	.01	.88	.35	.20	.34	.03	.88	0.013
LnTA	8.26	1.76	8.32	2.91	12.22	7.00	2.00	7.36	1.26	10.46	0.000
Tobin'sQ	1.81	1.10	1.49	.60	5.96	1.46	.90	1.25	.52	4.78	0.000
Quick	.79	1.11	.47	.04	4.66	.69	1.35	.35	.005	5.67	0.239

Panel C: Coarsened Exact Matching (Averages of 2014Q1-2016Q2)

	US Parents with an UK Exposure (N = 432)					US Parents without an UK Exposure (N = 352)					T-Test
	Mean	SD	Median	P1	P99	Mean	SD	Median	P1	P99	P-Value
BookLeverage	.32	.18	.29	.01	.88	.34	.21	.30	.03	.82	0.380
LnTA	7.87	1.54	7.98	2.49	10.96	7.82	1.62	7.94	2.12	10.86	0.704
Tobin'sQ	1.65	.86	1.43	.60	5.16	1.65	.90	1.46	.58	5.96	0.995
Quick	.78	1.04	.48	.04	4.53	.76	1.16	.48	.005	4.59	0.846

Matching Analysis: Treatment vs. Control

Matching Analyses – US Parents with an UK Exposure vs. US Parents without an UK Exposure

	(1) Original	(2) Original	(3) Mahalanobis	(4) Mahalanobis	(5) CEM	(6) CEM
After	-0.022*	-0.022*	-0.015	-0.019	-0.002	-0.007
	(-1.765)	(-1.755)	(-0.899)	(-1.125)	(-0.277)	(-0.777)
After×UK	0.019***	0.018***	0.020***	0.020***	0.022**	0.022**
	(2.983)	(2.913)	(2.792)	(2.750)	(2.187)	(2.331)
BookLeverage	0.716***	0.719***	0.714***	0.710***	0.623***	0.636***
	(15.055)	(15.040)	(12.213)	(12.091)	(10.254)	(11.761)
LnTA		0.003		0.026*		0.021*
		(0.240)		(1.871)		(1.715)
Tobin'sQ		0.003		0.002		0.005
		(0.473)		(0.188)		(0.562)
Quick		0.002		0.001		0.007
		(0.663)		(0.302)		(1.492)
Firm-Level FE	Yes	Yes	Yes	Yes	Yes	Yes
After×Industry	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2016	2016	1750	1750	1568	1568
R-squared	0.527	0.527	0.501	0.507	0.453	0.461

t-statistics reported in parentheses are based on robust standard errors clustered at the firm level.
* p<0.10, ** p<0.05, *** p<0.01.
All models include firm-level fixed effects, which subsume the effect of the stand-alone treatment and control group dummies.

Return

Matching Analysis: Treatment vs. Control Group MNEs

Summary Statistics – Matching Analyses: US Parents with an UK Exposure vs. US Parents with a Non-UK Foreign Exposure

Panel A: Original Sample (Averages of 2014Q1-2016Q2)

	US Parents with an UK Exposure (N = 539)					US Parents with a Non-UK Foreign Exposure (N = 231)					T-Test
	Mean	SD	Median	P1	P99	Mean	SD	Median	P1	P99	P-Value
BookLeverage	.32	.18	.29	.01	.88	.32	.19	.31	.001	.82	0.904
LnTA	8.26	1.76	8.32	2.91	12.22	6.68	2.31	7.09	-.04	10.46	0.000
Tobin'sQ	1.81	1.10	1.49	.60	5.96	1.61	1.12	1.28	.52	5.96	0.023
Quick	.79	1.11	.47	.04	4.66	.79	1.32	.35	.008	6.66	0.938

Panel B: Mahalanobis Score Matching on Size, Top 3 Matches with Replacements (Averages of 2014Q1-2016Q2)

	US Parents with an UK Exposure (N = 539)					US Parents with a Non-UK Foreign Exposure (N = 207)					T-Test
	Mean	SD	Median	P1	P99	Mean	SD	Median	P1	P99	P-Value
BookLeverage	.32	.18	.29	.01	.88	.33	.18	.32	.01	.77	0.601
LnTA	8.26	1.76	8.32	2.91	12.22	7.06	2.04	7.33	1.92	10.46	0.000
Tobin'sQ	1.81	1.10	1.49	.60	5.96	1.49	.90	1.27	.52	4.66	0.000
Quick	.79	1.11	.47	.04	4.66	.69	1.17	.34	.008	6.20	0.292

Panel C: Coarsened Exact Matching (Averages of 2014Q1-2016Q2)

	US Parents with an UK Exposure (N = 429)					US Parents with a Non-UK Foreign Exposure (N = 211)					T-Test
	Mean	SD	Median	P1	P99	Mean	SD	Median	P1	P99	P-Value
BookLeverage	.33	.18	.30	.02	.91	.34	.19	.34	.03	.81	0.324
LnTA	7.99	1.51	8.08	2.91	10.66	7.93	1.56	8.11	2.77	10.59	0.650
Tobin'sQ	1.60	.77	1.41	.60	4.98	1.60	.79	1.40	.60	4.56	0.993
Quick	.73	.98	.46	.03	4.11	.72	.97	.46	.01	5.19	0.895

Matching Analysis: Treatment vs. Control Group MNEs

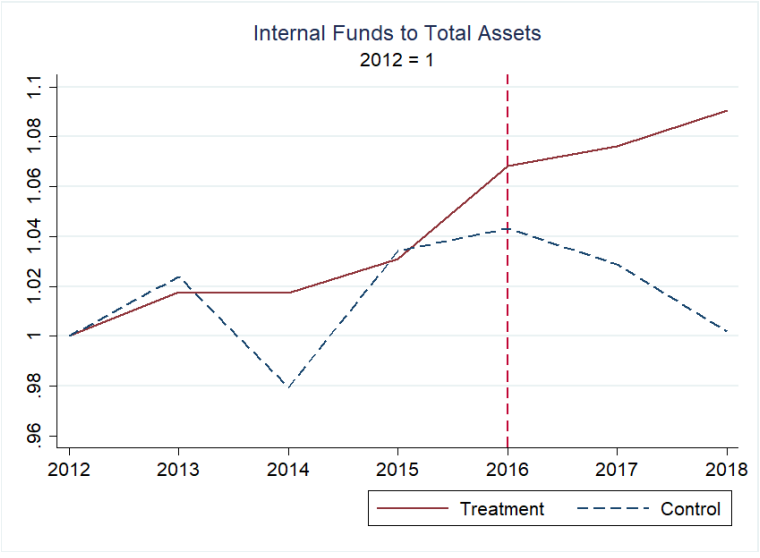
Matching Analyses – US Parents with an UK Exposure vs. US Parents with a Non-UK Foreign Exposure

	(1) Original	(2) Original.	(3) Mahalanobis	(4) Mahalanobis	(5) CEM	(6) CEM
After	-0.008	-0.007	-0.018	-0.020	-0.003	-0.007
	(-0.425)	(-0.336)	(-0.997)	(-1.080)	(-0.324)	(-0.676)
After×UK	0.020***	0.020***	0.020***	0.021***	0.016**	0.017**
	(2.617)	(2.650)	(2.674)	(2.699)	(2.004)	(2.134)
BookLeverage	0.746***	0.750***	0.727***	0.729***	0.707***	0.708***
	(12.350)	(12.214)	(10.895)	(10.713)	(9.111)	(9.690)
LnTA		-0.005		0.005		0.017
		(-0.418)		(0.364)		(1.290)
Tobin'sQ		-0.001		-0.004		0.002
		(-0.379)		(-0.567)		(0.234)
Quick		0.003		0.003		0.011*
		(0.839)		(0.688)		(1.958)
Firm-Level FE	Yes	Yes	Yes	Yes	Yes	Yes
After×Industry	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1540	1540	1492	1492	1280	1280
R-squared	0.542	0.543	0.521	0.522	0.538	0.545

t-statistics reported in parentheses are based on robust standard errors clustered at the firm level.
* p<0.10, ** p<0.05, *** p<0.01.
All models include firm-level fixed effects, which subsume the effect of the stand-alone treatment and control group dummies.

Return

Subsidiary-Level Capital Structure: Normalized



Return

With and Without Provisions

Subsidiary-Level DID Analysis (2014-2015 vs. 2017-2018) - The Internal Liability Ratio with/without Provisions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	IL/TA	IL/TA	IL/TA	IL/TA	No Provisions	No Provisions	No Provisions	No Provisions
After	-0.095***	-0.084***	-0.110***	-0.112***	-0.092***	-0.082***	-0.106***	-0.108***
	(-22.989)	(-18.759)	(-8.053)	(-8.972)	(-23.100)	(-19.404)	(-7.802)	(-8.539)
After×ForeignAff	0.062***	0.062***	0.059***	0.069***	0.062***	0.062***	0.057***	0.065***
	(7.909)	(8.357)	(7.628)	(8.979)	(8.185)	(8.587)	(7.653)	(8.932)
LnTA		-0.101***	-0.100***	-0.051***		-0.096***	-0.095***	-0.053***
		(-5.873)	(-5.880)	(-4.980)		(-6.208)	(-6.211)	(-5.431)
Leverage				0.377***				0.322***
				(11.807)				(10.863)
Firm-Level FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
After×Industry	No	No	Yes	Yes	No	No	Yes	Yes
Observations	15476	15476	15476	15476	15476	15476	15476	15476
R-squared	0.071	0.117	0.124	0.321	0.071	0.116	0.123	0.277

t-statistics reported in parentheses are based on robust standard errors clustered at the firm level.
* p<0.10 , ** p<0.05 , *** p<0.01.
All models include firm-level fixed effects, which subsume the effect of the stand-alone treatment and control group dummies.

Return

All Foreign Subsidiaries

Subsidiary-Level DID Analysis (2014-2015 vs. 2017-2018) – UK Subs of Foreign MNEs vs. Subs of UK Domestic Business Groups

	(1) IL/TA	(2) IL/TA	(3) IL/TA	(4) IL/TA	(5) EL/TA	(6) EL/TA	(7) EL/TA	(8) EL/TA	(9) Leverage	(10) Leverage	(11) Leverage
After	-0.101***	-0.090***	-0.097***	-0.107***	0.080***	0.078***	0.103***	0.098***	-0.010**	0.004	0.022**
	(-23.745)	(-20.227)	(-7.825)	(-9.383)	(27.209)	(25.916)	(9.723)	(9.499)	(-2.179)	(0.848)	(2.145)
After×ForeignAff	0.061***	0.062***	0.059***	0.056***	-0.061***	-0.061***	-0.057***	-0.058***	0.004	0.005	0.005
	(9.919)	(10.364)	(9.272)	(10.210)	(-13.037)	(-13.079)	(-11.692)	(-13.168)	(0.470)	(0.660)	(0.664)
LnTA		-0.107***	-0.106***	-0.050***		0.015***	0.014**	0.047***		-0.137***	-0.136***
		(-8.041)	(-7.959)	(-6.324)		(2.655)	(2.542)	(7.540)		(-8.799)	(-8.743)
Leverage				0.413***				0.242***			
				(17.098)				(20.959)			
Firm-Level FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
After×Industry	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes
Observations	24536	24536	24536	24536	24536	24536	24536	24536	24536	24536	24536
R-squared	0.054	0.099	0.103	0.320	0.059	0.061	0.066	0.205	0.000	0.054	0.058

t-statistics reported in parentheses are based on robust standard errors clustered at the firm level.
* p<0.10 , ** p<0.05 , *** p<0.01.
All models include firm-level fixed effects, which subsume the effect of the stand-alone treatment and control group dummies.

Return