

Leasing as a Mitigation Channel of Capital Misallocation

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Abstract

Leased capital accounts for about 20% of the total productive physical assets used by US publicly listed firms, and this proportion is even higher among small and financially constrained firms - over 40%. In this paper, we argue that leasing is an important alternative way of capital reallocation, complementary to directly purchasing capital from the reallocation market, and it significantly mitigates credit-constraint-induced capital misallocation. However, in the existing literature, leased capital is “unmeasured” capital in quantifying capital misallocation. Empirically, we show that neglecting leased capital and overlooking its mitigation effect leads to significant overestimations of capital misallocation (Hsieh and Klenow, 2009) and the cyclicity of capital reallocation (Eisfeldt and Rampini, 2006). Theoretically, we develop a general equilibrium model with an explicit buy versus lease decision to demonstrate leasing’s novel role in mitigating capital misallocation.

Motivation

- Macro models with financial frictions assume firms have to buy capital.
- However, constrained firms have the option to rent (lease) capital – an **alternative capital reallocation channel**.
- Leased capital is important: about 20% of the total productive physical assets used by US public firms, over 40% among small and financially constrained firms

Table: Summary statistics

Variables	Aggregate	Size			WW index		
	Mean	S	M	L	C	MC	UC
Lease Ratio (multiplier)	0.24	0.48	0.40	0.22	0.49	0.40	0.22
Lease Ratio (commitment)	0.13	0.32	0.25	0.12	0.33	0.26	0.12
Rental Share	0.18	0.31	0.28	0.17	0.32	0.27	0.17
Debt Leverage	0.20	0.10	0.17	0.20	0.13	0.18	0.20
Lease adj. Lev.	0.30	0.29	0.33	0.29	0.33	0.34	0.29

- Before recent leasing accounting change (ASC 842, or, IFRS 16), operating lease was off-balance sheet. Therefore, leasing was largely overlooked by macro and asset pricing.
- Operating lease is a **highly collateralizable** but an **expensive** way of borrowing.
 - Eisfeldt and Rampini (2009), Rampini and Vishwanathan (2013).
- Leasing is in the intersection of **finance, macro and accounting**.

Summary of the Paper

- **Empirical measurement:**
 - Hsieh and Klenow (2009): misallocation \Leftrightarrow dispersion in marginal product of capital (MPK).
 - However, leased capital is an off-balance-sheet “unmeasured” capital.
 - Consistent with Rauh and Sufi (2012), Rampini and Vishwanathan (2013).
 - Adjusting MPK by lease leads to about **40% - 50% reduction in measured MPK dispersion**.
 - Adjusting capital reallocation by lease leads to less procyclical patterns.
- **Theory:**
 - A GE model with heterogeneous firms and financial constraints and an explicit buy versus lease decision.
 - Formalize the intuition on the mitigation effect.
 - Provide guidance on testable implications.

Empirical Measurement

- Production function: $Y_i = A z_i (K_i^o + K_i^l)^\alpha L_i^{1-\alpha}$
- MPK adjusted for lease:

$$MPK_i^{adj.} = \frac{\alpha Y_i}{K_i^o + K_i^l}$$

- In prior studies, MPK is not adjusted for lease:

$$MPK_i^{unadj.} = \frac{\alpha Y_i}{K_i^o}$$

- Without lease adjustment, an **over-estimate** of MPK, in particular, for small and constrained firms
- Our paper: Mis-measurement of MPK without adjusting for lease leads to a **significant overestimation** of capital misallocation \Leftrightarrow dispersion in MPK.
- 40%-50% reduction in measured MPK dispersion

Table: MPK dispersion unadjusted v.s. adjusted

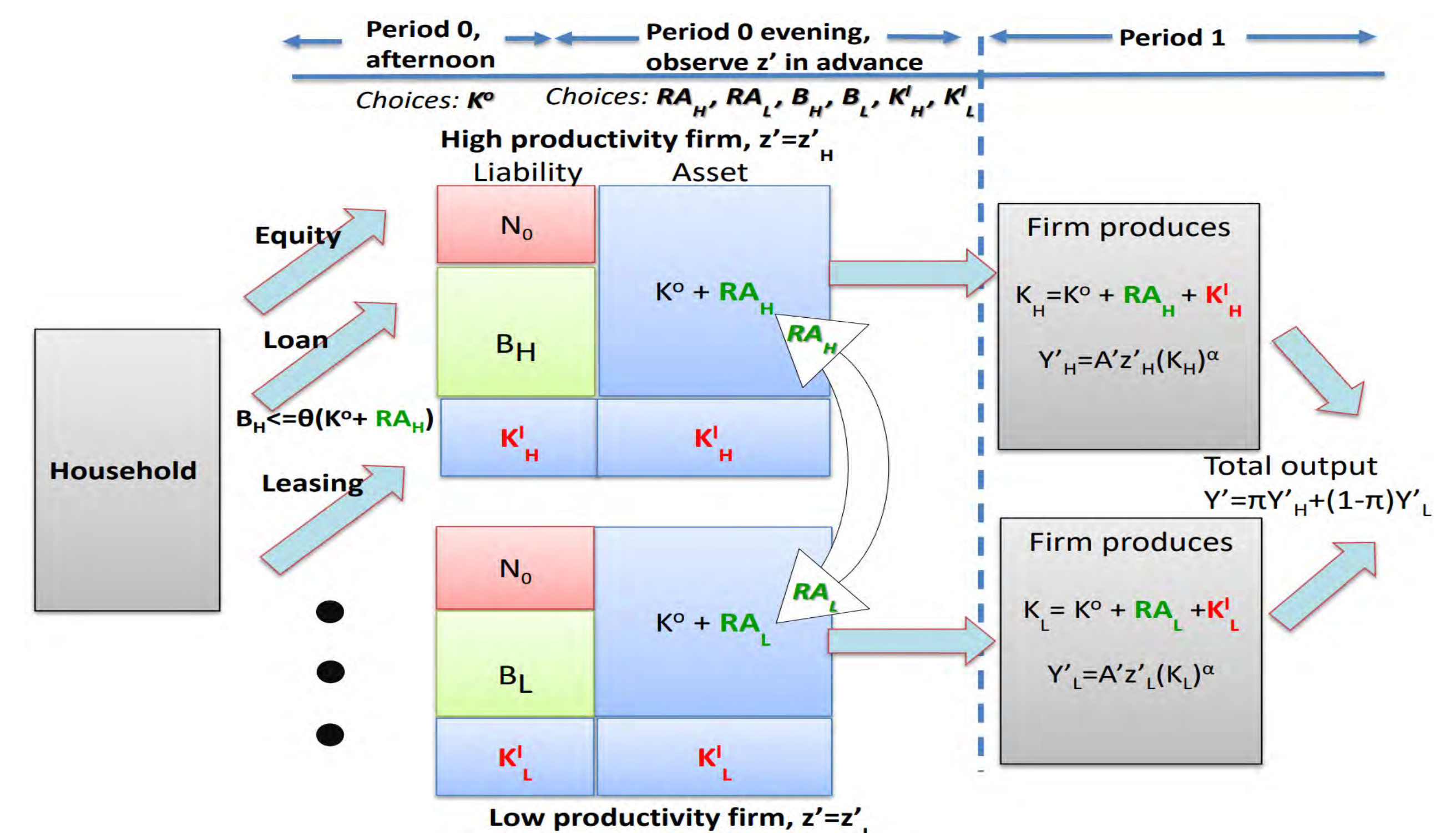
Variables	Aggregate	Size			WW index		
	Mean	S	M	L	C	MC	UC
mpk dispersion- unadjusted	0.48	0.68	0.45	0.31	0.68	0.43	0.29
mpk dispersion- adjusted	0.26	0.34	0.25	0.18	0.33	0.24	0.17
Level Diff.	-0.22	-0.34	-0.20	-0.13	-0.35	-0.19	-0.12
Percentage Diff.	-46%	-50%	-44%	-42%	-51%	-44%	-41%

Contacts

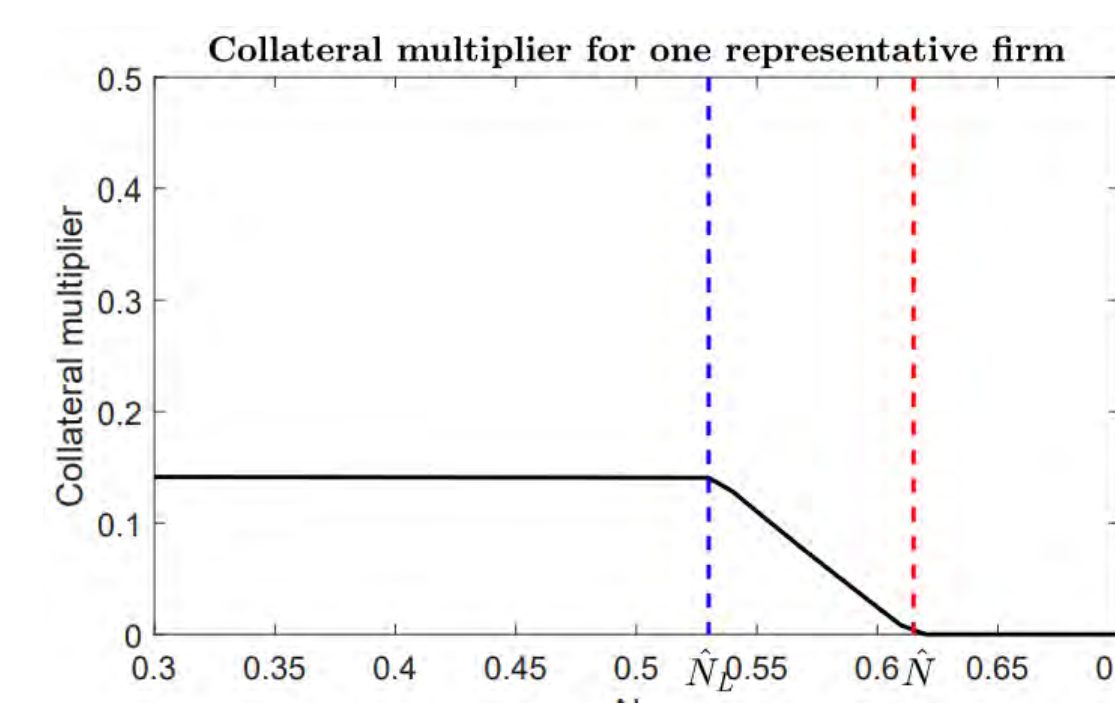
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Model

- A GE model with heterogeneous firms and financial frictions
 - Collateral constraints as in Kiyotaki and Moore (1997), and Kiyotaki and Gertler (2012)
- New ingredients to allow for capital misallocation and reallocation:
 - Idiosyncratic productivity shocks
 - Choice between buy versus lease capital, as Eisfeldt and Rampini (2009)
 - A capital reallocation market, as Ai, Li and Yang (2020)

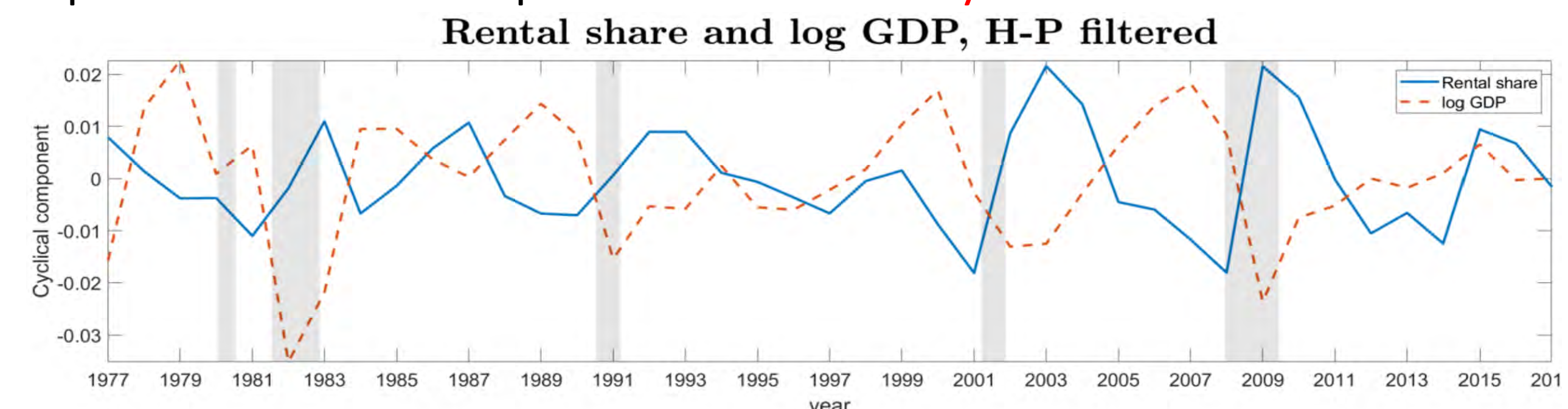


- **Buy versus Lease Decision:** Only when a firm becomes sufficiently constrained will it start to lease, as lease’s marginal benefit of relaxing constraints dominates the agency cost.



Model Implications

- Implication 1: Leased capital ratio is **countercyclical**.



- Implication 2: Leasing significantly changes the **cyclical pattern** of capital reallocation (Eisfeldt and Rampini, 2006).
 - Adjusted by lease, capital reallocation becomes **less procyclical**.

Table: Correlation of output with reallocation

Variables	Aggregate	Size			WW index		
		S	M	L	C	MC	UC
$RA^{unadj.}$	0.77	0.59	0.56	0.76	0.59	0.56	0.73
$RA^{adj.}$	0.54	-0.05	0.16	0.53	0.11	0.06	0.56
$\frac{RA^{unadj.}}{AT_{-1}}$	0.69	0.46	0.38	0.67	0.49	0.39	0.65
$\frac{RA^{adj.}}{AT_{-1}}$	0.45	-0.01	0.12	0.45	0.01	0.02	0.45

- Adjusted by lease, the benefit of capital reallocation becomes **less countercyclical**.

Table: Correlation of output with MPK dispersion unadjusted v.s. adjusted

Variables	Aggregate	Size			WW index		
		S	M	L	C	MC	UC
mpk dispersion- unadjusted	-0.55	-0.40	-0.42	-0.52	-0.41	-0.39	-0.46
$[t]$	-3.35	-2.03	-2.02	-3.53	-2.16	-1.97	-2.84
mpk dispersion- adjusted	-0.31	-0.15	-0.31	-0.29	-0.22	-0.22	-0.31
$[t]$	-1.36	-0.63	-1.28	-1.59	-0.96	-0.89	-1.55

Conclusion

- **Key message:** Leasing as a mitigation of capital misallocation.
 - Empirically: Explicitly accounting for lease significantly changes measurements of capital misallocation and reallocation.
 - Leasing as an important source of “unmeasured” capital \Rightarrow overestimation of capital misallocation
 - Leasing as an alternative channel of capital reallocation \Rightarrow changes cyclical pattern of capital reallocation and capital misallocation.
- **Theory:**
 - A general equilibrium model with heterogeneous firms to formalize the intuition.

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