1D-1

Tax Avoidance, Investment Efficiency, and Peer Competition: Evidence from Taiwan's Semiconductor Industry

Jr-Tsung Huang & Po-Sheng Kuo

Contents

01

Introduction

Background and Objectives

Background

- **The real entity theory**
  - Corporations have the obligations to pay taxes
- **Wealth maximization**
  - The shareholders have the incentives to encourage the managers to engage in tax avoidance
- **Agency problem**
  - The information held and the goal pursued by managers and shareholders often differ

Background

- **Desai and Dharmapala (2006)**
  - Tax avoidance induces managers to utilize the cash saved on self-benefiting plans
- **Tax avoidance might influence the investment decision of a company.**
- **Semiconductor industry in Taiwan**
  - Total market value: 16.88% (2012) → 40.29% (2020) of TAIEX
  - The future growth of Taiwan's economy

Objectives

In Taiwan's semiconductor industry:

The effect of tax avoidance on investment inefficiency

The peer effect of investment inefficiency

The dynamic effect of investment inefficiency

02

Literature Review

Literature Review

- **Desai and Dharmapala (2006)**
  - The complementary relationship between tax avoidance and the self-benefiting behavior of managers
  - Tax avoidance induces managers to conduct self-benefiting behavior
- **Blaylock (2016)**
  - Measuring the tax avoidance by the book-tax difference (BTD)
  - BTD = pre-tax income - taxable income
  - The correlation between investment inefficiency and tax avoidance is insignificant

Literature Review

- **Khurana, Moser, and Raman (2018)**
  - Measuring the tax avoidance by the BTD
  - Overinvestment is positively correlated with tax avoidance
  - The correlation between underinvestment and tax avoidance is insignificant
- **Asiri et al. (2020)**
  - Measuring the tax avoidance by GAAP effective tax rates (GAAP ETR)
  - GAAP ETR = tax expense / pre-tax income * 100%
  - Both overinvestment and underinvestment are positively correlated with tax avoidance

Literature Review

- **Free cash flow**
  - Jensen (1986), Lang, Stulz, and Walkling (1991), Richardson (2006)
- **Leverage**
  - Aivazian, Ge, and Qiu (2005), Lang, Ofek, and Stulz (1996)
- **Financial reporting quality**
  - Biddle, Hilary, and Verdi (2009), Chen et al. (2011)
- **Peer competition and investment**
  - Chen and Ma (2017), Lieberman and Asaba (2006), and Park, Yang, and Yang (2017)

03

Trend of Investment in Semiconductor Industry

Trend of Investment

- **The Standard Industrial Classification System of the Republic of China**
- **Manufacturing**
  - Manufacture of Electronic Parts and Components
    - Semiconductor Industry
  - Manufacture of Chemical Material
  - Manufacture of Computers, Electronic and Optical Products

Trend of Investment

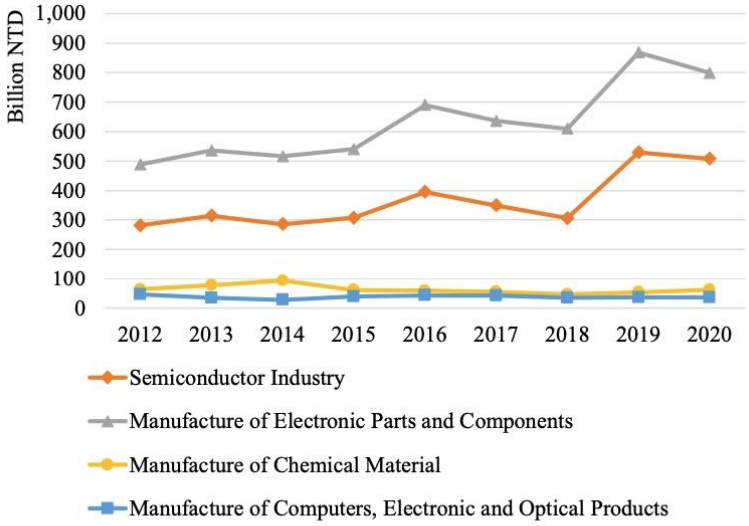


Figure 3.2 Investment Amount in M&E of Semiconductor Industry and Other Main Divisions in Manufacturing, 2012-2020

Source: SEMI and MOEA

Trend of Investment

- **Semiconductor Industry**
  - Wafer fabrication
  - IC packaging and testing
  - Other IC fabrication
  - IC lead frame
  - IC design
  - Others
- 44 listed companies over the period from 2012 to 2020
- Net increase in fixed assets / total assets of the previous year * 100%

Trend of Investment

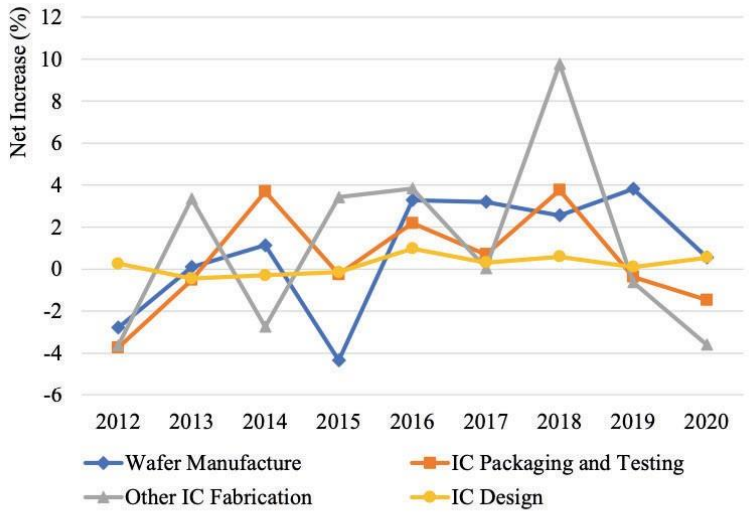


Figure 3.4 Average Net Increase in Fixed Assets Deflated by the Total Assets of the Previous Year, 2012-2020

Source: Taiwan Economic Journal (TEJ) Database

04

Methodology

Empirical Model, Definitions and Expected Signs of the Variables, and Data

Empirical Model

- **Dynamic spatial autoregressive model**

$$y_{it} = \gamma y_{it-1} + \rho \sum_{j=1}^{N} w_{ij} y_{jt} + x_{it}\beta + \mu_i + \varepsilon_{it} \qquad (1)$$

- **Peer dependence matrix**

$$W = \begin{bmatrix} w_{11} & w_{12} & w_{13} \dots & w_{1N} \\ w_{21} & w_{22} & w_{13} \dots & w_{1N} \\ w_{31} & w_{32} & w_{33} \dots & w_{3N} \\ . & . & . \dots & . \\ . & . & . \dots & . \\ w_{N1} & w_{N2} & w_{N3} \dots & w_{NN} \end{bmatrix} \qquad (2)$$

  - w_{ij} = 1 if company *i* and company *j* belong to the same subindustry, and w_{ij} = 0 otherwise. → standardize

Empirical Model

- **Baltagi, Fingleton, and Pirotte (2014)**
  - y_{it-1} is correlated with μ_i → Endogeneity
  - Difference generalized method of moments (GMM)

$$\Delta y_{it} = \gamma \Delta y_{it-1} + \rho \sum_{j=1}^{N} w_{ij} \Delta y_{jt} + \Delta x_{it}\beta + \Delta \varepsilon_{it} \qquad (3)$$

- **Arellano and Bond (1991)**
  - $y_{it-1} = y_{it-1} - y_{it-2}$, $_{it} = _{it} - _{it-1}$
  - Using two or further lags of *y* as the instrument of y_{it-1}

Empirical Model

- **Model specification**

$$INEFF_{it} = \gamma LINEFF_{it} + \rho \sum_{j=1}^{N} IND_{ij} INEFF_{jt} + \beta_1 TAXAVD_{it} + \beta_2 TAXAVD_{it} \times OVRINV_{it} + \beta_3 FCF_{it} + \beta_4 FCF_{it} \times OVRINV_{it} + \beta_5 LEV_{it-1} + \beta_6 LEV_{it-1} \times OVRINV_{it} + \beta_7 FRQ_{it-1} + \sum_{k=1}^{M} \beta_k Controls_{it-1}^{k} + \mu_i + \varepsilon_{it} \quad (4)$$

Empirical Model

- **Model specification**
  - *INEFF*: investment inefficiency
  - *LINEFF*: lagged investment inefficiency
  - *TAXAVD*: tax avoidance
  - *OVRINV*: indicator variable, = 1 if overinvesting, = 0 otherwise
  - *FCF*: free cash flow
  - *LEV*: leverage ratio
  - *FRQ*: financial reporting quality
  - *Controls*: control variables related to the investment levels

Definitions of the Variables

- **Investment inefficiency (*INEFF*)**

$$INV_{it} = \beta_0 + \beta_1 LINV_{it} + \beta_2 PB_{it-1} + \beta_3 LEV_{it-1} + \beta_4 SIZE_{it-1} + \beta_5 AGE_{it-1} + \beta_6 CASH_{it-1} + \lambda_i + u_{it} \quad (5)$$

  - *INV*: net increase in fixed assets / the lagged total assets * 100%
  - *LINV*: lagged investment
  - *PB*: market value of equity / book value of equity at the end of year
  - *LEV*: total liabilities / total assets * 100%
  - *SIZE*: ln(total assets)
  - *AGE*: ln(difference between the current and the establishment years)
  - *CASH*: cash and cash equivalents / total assets * 100%

Definitions of the Variables

- **Investment inefficiency (*INEFF*)**

$$INV_{it} = \beta_0 + \beta_1 LINV_{it} + \beta_2 PB_{it-1} + \beta_3 LEV_{it-1} + \beta_4 SIZE_{it-1} + \beta_5 AGE_{it-1} + \beta_6 CASH_{it-1} + \lambda_i + u_{it} \quad (5)$$

  - Investment inefficiency is measured by the residual (*u*)
  - *u* > 0: actual investment > predicted investment → overinvestment
  - *u* < 0: actual investment < predicted investment → underinvestment
  - |*u*|: the level of investment inefficiency

Definitions of the Variables

- **Tax avoidance (*TAXAVD*)**

$$\frac{statuary\ tax\ rate \times pretax\ income - cash\ taxes\ paid}{market\ value\ of\ assets} * 100\% \qquad (7)$$

  - *TAXAVD* > 0: actual tax paid < expected to pay → tax-favored
  - *TAXAVD* < 0: actual tax paid > expected to pay → tax-unfavored
  - Companies engaging in tax avoidance are expected to have high *TAXAVD* values

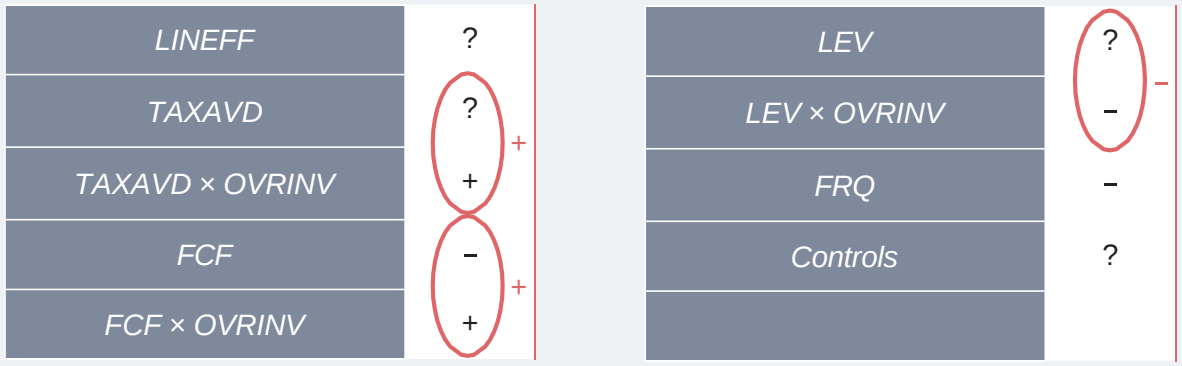
Definitions of the Variables

- **Free cash flow (*FCF*)**
  - Operating cash flow / lagged total assets * 100% - predicted investment
- **Leverage ratio (*LEV*)**
  - Total liabilities / total assets * 100%
- **Financial reporting quality (*FRQ*)**
  - Measured by discretionary revenue (Stubben, 2010)

$$\Delta AR_{it} = \alpha_0 + \alpha_1 \Delta REV_{it} + \theta_{it} \qquad (8)$$

  - *AR*: annual change in accounts receivable / lagged total assets * 100%
  - *REV*: annual change in net revenue / lagged total assets * 100%
  - |01: discretionary revenue → -|0|: financial reporting quality

Expected Signs



Data

- **Individuals**
  - 44 listed companies in Taiwan's semiconductor industry
- **Sample Period**
  - 2013-2020
- **Data Source**
  - Taiwan Economic Journal (TEJ) database

Data

Table 4.2 Descriptive Statistics

Variable	Mean	St. Dev.	Min.	Q1	Med.	Q3	Max.
Dependent Variable							
INEFF	7.37	5.91	0.01	3.25	5.90	9.93	35.50
Explanatory Variables							
LINEFF	7.20	6.00	0.01	3.14	5.69	9.64	35.50
TAXAVD	0.13	0.95	-5.77	-0.16	0.26	0.60	3.28
TAXAVD × OVRINV	0.15	0.60	-5.71	0	0	0.24	3.28
FCF	10.82	14.47	-38.54	1.12	12.14	20.32	56.69
FCF × OVRINV	8.52	12.70	-18.79	0	0	17.83	56.69
LEV	28.37	16.10	0.85	15.33	25.65	38.44	98.24
LEV × OVRINV	13.97	19.81	0	0	0	29.03	98.24
FRQ	-1.76	2.15	-20.86	-2.11	-1.06	-0.50	-0.01
Control Variables							
PB	1.92	1.43	0.49	1.08	1.59	2.25	16.71
SIZE	16.27	1.51	13.67	15.33	15.95	16.96	21.55
AGE	3.10	0.37	1.39	2.89	3.09	3.33	3.95
CASH	20.01	14.57	0.33	9.66	16.05	27.40	70.92

Source: TEJ Database

05

Empirical Analysis

Unit Root Test, Multi-Collinearity Test,
Empirical Results, and Robustness Test

Unit Root Test

Table 5.1 Results of LLC Unit Root Tests

Variable	*t*-statistic	*p*-value
Dependent Variable		
INEFF	-12.83	< 0.01***
Explanatory Variables		
LINEFF	-23.34	< 0.01***
TAXAVD	-12.99	< 0.01***
TAXAVD × OVRINV	-97.69	< 0.01***
FCF	-15.31	< 0.01***
FCF × OVRINV	-16.32	< 0.01***
LEV	-8.70	< 0.01***
LEV × OVRINV	-19.95	< 0.01***
FRQ	-16.80	< 0.01***
Control Variables		
PB	-19.43	< 0.01***
SIZE	-5.24	< 0.01***
AGE	-25.07	< 0.01***
CASH	-12.78	< 0.01***

Note: ***, **, and * indicate that the null hypothesis can be rejected at 1%, 5%, and 10% significance level respectively.

Multi-Collinearity Test

Table 5.2 Pearson Correlation Coefficient Matrix and VIF Values[21]

	LINEFF	*TAXAVD*	*FCF*	*LEV*	*FRQ*	*PB*	*SIZE*	*AGE*	*CASH*
LINEFF	1								
TAXAVD	0.11	1							
FCF	0.27	0.37	1						
LEV	-0.02	0.08	0.18	1					
FRQ	0.00	0.01	0.09	-0.07	1				
PB	0.16	0.24	0.20	0.25	-0.15	1			
SIZE	0.35	0.23	0.77	0.22	0.17	0.13	1		
AGE	0.01	0.02	0.08	0.14	0.24	-0.14	0.29	1	
CASH	0.06	-0.03	-0.21	-0.30	-0.15	0.09	-0.29	-0.35	1
VIF	1.66	1.65	1.25	1.66	1.70	1.67	1.22	1.61	1.65

Empirical Results

Table 5.4 Difference GMM Estimation Results

Variable	Coefficient
LINEFF	-0.12 **
	(0.06)
TAXAVD	-0.15
	(0.34)
TAXAVD × OVRINV	1.04 **
	(0.50)
FCF	-0.08 **
	(0.04)
FCF × OVRINV	0.14 ***
	(0.05)
LEV	0.02
	(0.04)
LEV × OVRINV	0.00
	(0.03)
FRQ	-0.19 *
	(0.11)
PB	-0.52 **
	(0.22)
SIZE	-1.73
	(1.20)
AGE	2.75
	(1.88)
CASH	0.02
	(0.03)
ρ	-0.63 ***
Observations	352
AR (1) (p)	0.00
AR (2) (p)	0.33
Sargan test (p)	0.10

Empirical Results

- **AR(1) 0.00***, AR(2) 0.33**
  - The regression model properly specified
- **Sargan test 0.10**
  - The instruments are valid
- ***p* -0.63*****
  - The investment inefficiency of a company is relatively low (high) when its peer exhibits relatively high (low) investment inefficiency
  - Learning a lesson from the investment behavior of its peer
  - Following its competitor's investment behavior to offset the negative impact despite not having equally good growth opportunities

Empirical Results

- ***LINEFF*** **-0.12****
  - The past investment inefficiency has a negative impact on the present investment inefficiency
  - A company's investment inefficiency tends to fluctuate rather than continue increasing — pressure from shareholders
- ***TAXAVD*** **-0.15,** ***TAXAVD × OVRINV*** **1.04****
  - Tax avoidance has a positive effect on overinvestment but does not have any effect on underinvestment
  - Consistent with Asiri et al. (2020) and Khurana, Moser, and Raman (2018)

Empirical Results

- ***FCF*** **-0.08****, ***FCF × OVRINV*** **0.14*****
  - Free cash flow has a positive effect on overinvestment but a negative effect on underinvestment
  - Consistent with Richardson (2006) and Blaylock (2016)
  - Supporting the hypothesis proposed by Jensen (1986)
- ***FRQ*** **-0.19***
  - The better the financial reporting quality, the lower the investment inefficiency
  - Consistent with Biddle, Hilary, and Verdi (2009) and Chen et al. (2011)

Empirical Results

- ***PB*** **-0.52****
  - *PB* measures the growth opportunity of a company
  - Companies with higher growth opportunities exhibit lower investment inefficiency
- In general, the empirical results match the expectations.

Robustness Test

Table 5.5 QMLE Estimation Results

Variable	Coefficient	Short-Run Total Effect	Long-Run Total Effect
LINEFF	0.06		
	(0.05)		
TAXAVD	-0.21	-0.16	-0.16
	(0.31)	(0.20)	(0.21)
TAXAVD × OVRINV	1.02 **	0.73 **	0.76 **
	(0.44)	(0.29)	(0.30)
FCF	-0.08 **	-0.06 **	-0.06 **
	(0.03)	(0.02)	(0.02)
FCF × OVRINV	0.16 ***	0.11 ***	0.11 ***
	(0.04)	(0.03)	(0.03)
LEV	0.02	0.01	0.01
	(0.03)	(0.02)	(0.02)
LEV × OVRINV	0.01	0.00	0.00
	(0.02)	(0.01)	(0.02)
FRQ	-0.24 **	-0.16 **	-0.17 **
	(0.10)	(0.07)	(0.07)
PB	-0.38 **	-0.25 *	-0.26 *
	(0.19)	(0.13)	(0.14)
SIZE	-1.19	-0.80	-0.83
	(0.98)	(0.68)	(0.71)
AGE	1.54	0.98	1.02
	(1.66)	(1.11)	(1.16)
CASH	0.02	0.01	0.01
	(0.02)	(0.02)	(0.02)
ρ		-0.50 ***	
		(0.13)	

06

Conclusions

Concluding Remarks and Policy Implications

Concluding Remarks

- **The peer effect of investment inefficiency is negative.**
- **The dynamic effect of investment inefficiency is negative.**
- **The companies tend to overinvest while engaging in tax avoidance.**
- **Excess free cash flow exacerbates the overinvestment but restrains the underinvestment.**
- **Enhancing financial reporting quality can improve the investment efficiency.**
- **Companies with higher growth opportunities exhibit lower investment inefficiency.**

Policy Implications

- **Government can implement anti-tax avoidance policies to increase the investment efficiency of companies.**
  - Controlled Foreign Companies (CFC) rules
- **Government or shareholders can take measures that enhance the financial reporting quality to improve the investment efficiency of companies.**
  - Clawback provisions

Thank you!