Explaining the Diversification Discount

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Overview

Diversification at a glance

Methodologies

Discussion

Diversification at a glance

Gains and losses of Diversification

Benefits

- Managerial economic of scale
- Internal capital market
- Internalize market failure / reduction of adverse selection
- Firm-specific asset exploitation in other industry

Costs

- Inefficiency in resource allocation
- Manager rent seeking internally / value-destroying investment
- Internal incentives

Endogeneity

Measurement of Diversification

Imputed value
$Imputedvalue = \sum_{i=1}^{N} Sales_i \times Sales/AssetMultiplier$

excess value
Excess Value $= log(\frac{MarketValue}{ImputedValue})$

Industry definition
Narrowest SIC with at least 5 firms. (4-digit and 3-digits)

Fun fact: this study used "Tape" version of Compustat

Measurement of Diversification

	Sales Multiplier			Asset Multiplier		
	BO 1978–1996	BO 1986–1991	Extended BO 1978–1996	BO 1978–1996	BO 1986–1991	Extended BO 1978–1996
Constant	−0.29	−0.32	−0.77	−0.07	−0.09	−0.45
	(39)	(24)	(36)	(10)	(7.76)	(24)
D	−0.13	−0.12	−0.11	−0.12	−0.13	−0.11
	(26)	(12)	(20)	(27)	(14)	(21)
Log of Total Assets	0.03	0.04	0.52	0.00	0.01	0.36
	(22)	(17)	(43)	(0.35)	(3.67)	(33)
CAPX/SALES	0.33	0.29	0.17	0.05	0.03	−0.05
	(25)	(12)	(10)	(5)	(1.70)	(3.77)
EBIT/SALES	1.05	0.95	0.86	0.82	0.73	0.76
	(57)	(31)	(42)	(56)	(30)	(45)
Log of Total Assets (1 lag)			−0.16			−0.09
			(11)			(−7.17)
CAPX/SALES (1 lag)			0.05			0.01
			(4.15)			(1.20)
EBIT/SALES (1 lag)			0.00			0.00
			(0.47)			(1.40)
Log of Total Assets (2 lag)			−0.19			−0.15
			(22)			(20)
CAPX/SALES (2 lag)			0.00			0.00
			(0.86)			(1.35)
EBIT/SALES (2 lag)			0.00			0.00
			(0.71)			(0.64)
LEV			0.10			0.01
			(8.26)			(0.78)
ASS2			−0.01			−0.01
			(17)			(15)
Number of observations	54,451	16,429	45,291	52,126	15,524	43,194
Adjusted R^2	0.11	0.11	0.17	0.08	0.08	0.12

Figure 1: Diversification Discount

Firm distribution

	Firm-years	Number of Firms
Firms that were always in single segments	30,284	5,387
Firms that diversified	4,326	606
Firms that diversified once from one segment to multiple segments	2,519	379
Firms that diversified once from multiple segments to multiple segments	791	105
Firms that diversified multiple times	1,016	122
Firms that refocused	7,987	873
Firms that refocused once from multiple segments to single segments	3,633	422
Firms that refocused once from multiple segments to multiple segments	1,588	183
Firms that refocused multiple times	2,766	268
Firms that both focused and diversified	13,133	1,371
Multisegment firms that did not change the number of segments	3,235	578
Total	58,965	8,815

Figure 2: Diversification profiles

Are conglomerates different?

	Total Assets		*CAPX/SALES*		*EBIT/SALES*		*DEBT/TA*		*INDGROW*		*R&D/SALES*	
	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean
Were always single segment firms	4.50	4.71	0.05	0.10	0.08	0.09	0.14	0.19	8.80	10.93	0.02	0.06
All firms that diversify	5.28	5.54	0.05	0.12	0.10	0.12	0.19	0.22	7.97	9.75	0.02	0.03
Single-segment years	5.01[a]	5.27[a]	0.05[a]	0.12[a]	0.10[a]	0.13[a]	0.17[a]	0.21[a]	8.80	10.67	0.02	0.04[a]
Multiple-segment years	5.57	5.72	0.06	0.11	0.10	0.10	0.21	0.23	7.86	9.18	0.02	0.03
All firms that refocus	5.05	5.23	0.04	0.08	0.08	0.08	0.19	0.21	7.68	9.39	0.02	0.03
Single-segment years	4.82[a]	5.02[a]	0.04[a]	0.09	0.07[a]	0.08[a]	0.18[a]	0.21[a]	8.05[a]	9.62[a]	0.02[a]	0.04[a]
Multiple-segment years	5.19[c]	5.36[c]	0.04[c]	0.07[c]	0.08[c]	0.09[c]	0.19[c]	0.21[c]	7.51[d]	9.21	0.02[d]	0.03[c]
Multisegment firms with no change in diversification status	5.14[c]	5.31[c]	0.05[c]	0.08[c]	0.10	0.11[d]	0.19[d]	0.20[c]	7.68	9.12	0.01[c]	0.02[c]
Firms that both focused and diversified	5.53	5.67	0.04	0.08	0.08	0.08	0.21	0.24	8.02	9.58	0.01	0.03
Single-segment years	4.86[a]	5.12[a]	0.04[a]	0.09[b]	0.08[a]	0.09	0.22[a]	0.25[a]	8.06[b]	9.84[a]	0.01[a]	0.03[a]
Multiple-segment years	5.84[c]	5.90[c]	0.05[c]	0.08[c]	0.08[c]	0.08[c]	0.21	0.24	7.95	9.47	0.01[c]	0.02[c]

Figure 3: Firm characteristics vs Diversification profile

Industry composition vs excess value

Year	Mean	Median (for Last Year in Sample)	Number of Firms with Last Year	Median (for First Year in Sample)	Number of Firms with First Year
1978	0.0	0.019	78		
1979	−0.008	−0.026	73	0	106
1980	−0.005	0	66	0.098	107
1981	−0.015	−0.061	84	0	203
1982	−0.012	−0.063	81	0.112	116
1983	−0.000	−0.165	134	0.135	234
1984	0.011	−0.037	128	0.089	227
1985	0.011	−0.024	147	0.134	201
1986	−0.004	−0.041	152	0.105	274
1987	0.006	−0.14	211	0.072	269
1988	−0.006	−0.126	179	0.139	206
1989	0.011	−0.011	117	0.129	175
1990	−0.009	−0.197	119	0.078	158
1991	−0.011	−0.286	90	0.207	225
1992	−0.019	−0.15	117	0.259	280
1993	−0.009	−0.112	175	0.159	394
1994	−0.009	−0.063	253	0.109	397
1995	−0.013	−0.125	271	0.144	433
1996	−0.013			0.158	500

Figure 4: Industry composition vs excess value

Distribution of exiting firms

	Percent Share of Exiting Firms in Industry Sales				Percentage of Exiting Firms in Industry			
	Median	Mean	Std. Dev.	Number	Median	Mean	Std. Dev.	Number
Single-segment firms	6.44	11.22	13.2	21,794	14.28	19.87	18.7	21,794
Single-segment years of conglomerates	9.74	14.00	13.9	6,615	21.94	24.94	18.8	6,615
Multiple-segment years of conglomerates	13.09	15.75	13.2	13,831	27.28	28.63	19.0	13,831
Diversifying firms	9.65	13.31	12.7	3,287	21.71	24.07	17.9	3,287
Single-segment years of diversifying firm	15.14	17.60	13.4	1,424	28.47	31.24	16.5	1,424
Multiple-segment years of diversifying firm	6.13	10.04	11.1	1,863	14.53	18.59	16.9	1,863
Focusing firms	11.56	14.91	13.2	4,934	26.35	27.74	19.2	4,934
Single-segment years of focusing firms	5.82	9.89	11.2	2,024	14.52	19.12	17.1	2,024
Multiple-segment years of focusing firms	17.02	18.40	13.3	291	37.00	33.7	18.2	291
Firms that both diversify and focus	13.19	16.12	13.8	10,444	27.84	28.79	19.1	10,444
Single-segment years	10.80	15.00	15.0	3,167	22.78	25.84	19.6	3,167
Multiple-segment years	14.13	16.60	13.2	7,277	30.36	30.08	18.8	7,277
Conglomerates that did not change diversification status	9.87	13.95	12.9	1,781	21.82	24.88	18.9	1,781

Figure 5: Distribution of exiting firms

Existing firms and excess value

	Sales Multipliers				Asset Multipliers			
	Median	Mean	Std. Dev.	Number	Median	Mean	Std. Dev.	Number
Single-segment firms that do not exit[a]	0.02	0.04	0.57	11,771	0.012	0.05	0.5	12,279
Single-segment years of diversifying firms	0.0	−0.004	0.53	1,327	0	0.02	0.45	1,390
Single-segment firms that exit[b]	−0.04	−0.08	0.56	5,511	−0.03	−0.05	0.48	5,736
Single-segment firms that do not exit[c]	0.02	0.04	0.57	12,442	0.01	0.05	0.5	12,946
Single-segment years of focusing firms	0.0	−0.01	0.54	1,919	0.0	0.0001	0.47	1,992
Single-segment firms that exit[d]	−0.07	−0.10	0.54	5,610	−0.05	−0.07	0.47	5,825

Figure 6: Diversification firms vs exiting firms

What we have so far

up to this point:

- Conglomerates are different
- Diversification decision is not random
- Need something to control for endogeneity

Methodologies

Firm value selection model

relative firm value:

$$V_{i,t} = \delta_0 + \delta_1 X_{i,t} + \delta_2 D_{i,t} + \epsilon_{i,t} \tag{1}$$

Diversification dummy D

$$D^*_{i,t} = \beta Z_{i,t} + \mu_{i,t} \tag{2}$$

Latent variable $D^*_{i,t}$.

$$D_{i,t} = 1 \text{ if } D^*_{i,t} > 0 \tag{3}$$

$$D_{i,t} = 0 \text{ if } D^*_{i,t} \leq 0 \tag{4}$$

Problem arises when:

- $mu_{i,t}$ is correlated with $\epsilon_{i,t}$
- Unobserved heterogeneity

Methodologies

Firm fixed effect
assumption: unobserved heterogeneity is time-invariant

IV
Value measure relative to industry thus industry neutral.

Heckman Self-selection model

IV

Industry characters

- Industry attractiveness: PNDIV / PSDIV

Time characters

- M&A: MNUM (M&A count year)
- MVOL: $ value of M&A
- GDP
- CONTRAC: business cycle

Firm characters

- MAJOREX: dummy variable for listed firm
- SNP
- FOREIGN: MNC firms

Heckman model

$$E(V_{i,t}|D_{i,t}=1) = \delta_0 + \delta_1 X_{i,t} + \delta_2 + E(\epsilon_{i,t}|D_{i,t}=1)$$
$$E(\epsilon_{i,t}|D_{i,t}=1) = \rho\sigma_\epsilon \lambda_1(\beta Z_{i,t}) \tag{5}$$

$$\lambda_1(\beta Z_{i,t}) = \frac{\phi(\beta Z_{i,t})}{\Phi(\beta Z_{i,t})} \tag{6}$$

$$E(V_{i,t}|D_{i,t}=0) = \delta_0 + \delta_1 X_{i,t} + E(\epsilon_{i,t}|D_{i,t}=0) \tag{7}$$

$$E(\epsilon_{i,t}|D_{i,t}=0) = \rho\sigma_\epsilon \lambda_2(\beta Z_{i,t}) \tag{8}$$

$$\lambda_2(\beta Z_{i,t}) = \frac{\phi(\beta Z_{i,t})}{\Phi(\beta Z_{i,t})} \tag{9}$$

Self-selection model

Biased estimator of δ_2

$$\begin{aligned} E(V_{i,t}|D_{i,t}=1) - E(V_{i,t}|D_{i,t}=0) &= \delta_2 + \rho\sigma_\epsilon\lambda_1(\beta Z_{i,t}) - \rho\sigma_\epsilon\lambda_2(\beta Z_{i,t}) \\ &= \delta_2 + \rho\sigma_\epsilon \frac{\phi(\beta Z_{i,t})}{\Phi(\beta Z_{i,t})(1-\Phi(\beta Z_{i,t}))} \end{aligned} \tag{10}$$

2-step

$$\begin{aligned} V_{i,t} &= \delta_0 + \delta_1 X_{i,t} + \delta_\lambda[\lambda_1(\hat{\beta} Z_{i,t})D_{i,t} + \lambda_2(\hat{\beta} Z_{i,t})(1-D_{i,t})] + \eta_{i,t} \\ &= \delta_0 + \delta_1 X_{i,t}\delta_2 D_{i,t} + \eta_{i,t} \end{aligned} \tag{11}$$

where $\delta_\lambda = \rho\sigma_\epsilon$.

For diversifying firms

	Sales Multipliers					Asset Multipliers				
	OLS (BO)	OLS	Fixed Effects	IV	Self-selection	OLS (BO)	OLS	Fixed Effects	IV	Self-selection
Constant	−0.36	−0.75	−0.09	−0.72	−0.68	−0.14	−0.43	0.68	−0.34	−0.32
	(33)	(26)	(1.67)	(30)	(30)	(14)	(17)	(14)	(15)	(15)
D	−0.13	−0.11	−0.06	0.30	0.18	−0.11	−0.09	−0.04	0.19	0.01
	(10)	(9.13)	(2.88)	(5.03)	(4.03)	(9.09)	(7.94)	(2.08)	(3.29)	(0.24)
Log of total assets	0.04	0.61	0.33	0.55	0.54	0.01	0.42	0.00	0.24	0.24
	(19)	(36)	(16)	(40)	(39)	(4.75)	(28)	(0.24)	(19)	(18)
EBIT/SALES	1.15	0.69	0.39	0.44	0.44	0.98	0.77	0.71	0.63	0.62
	(42)	(19)	(13)	(13)	(13)	(44)	(26)	(27)	(16)	(15)
CAPX/SALES	0.33	0.06	0.19	0.16	0.16	0.04	−0.06	−0.03	−0.02	−0.02
	(15)	(1.96)	(7.25)	(5.65)	(5.68)	(2.22)	(2.38)	(1.44)	(0.98)	(0.90)
Log of TA (1 lag)		−0.25	−0.28	−0.25	−0.25		−0.15	−0.12	−0.04	−0.04
		(12)	(19)	(13)	(13)		(8.10)	(8.75)	(2.32)	(2.50)
EBIT/SALES (1 lag)		0.20	0.16	0.20	0.20		0.07	0.14	0.10	0.10
		(5.57)	(5.99)	(5.49)	(5.42)		(2.18)	(6.11)	(2.31)	(2.28)
CAPX/SALES (1 lag)		0.08	0.05	0.09	0.09		−0.05	−0.04	−0.01	−0.02
		(2.45)	(2.04)	(3.51)	(3.40)		(1.91)	(1.89)	(0.67)	(0.86)
Log of TA (2 lag)		−0.20	−0.14	−0.14	−0.14		−0.17	−0.11	−0.12	−0.12
		(16)	(14)	(13)	(13)		(16)	(13)	(12)	(12)
EBIT/SALES (2 lag)		0.09	0.09	0.08	0.08		−0.02	0.05	−0.003	−0.002
		(3.58)	(4.84)	(3.14)	(3.19)		(1.06)	(3.02)	(0.11)	(0.09)
CAPX/SALES (2 lag)		0.08	0.06	0.07	0.07		0.05	0.02	0.04	0.04
		(3.65)	(3.08)	(3.94)	(3.80)		(2.78)	(1.08)	(2.79)	(2.65)
SNP				0.25	0.25				0.29	0.28
				(27)	(28)				(33)	(33)
LEV		−0.03	0.22	0.09	0.11		−0.06	0.12	0.03	0.04
		(1.48)	(10)	(6.81)	(8.11)		(3.94)	(5.72)	(2.21)	(3.61)
ASS2		−0.01	0.01	−0.01	−0.01		−0.01	0.01	−0.01	−0.01
		(11)	(6.12)	(19)	(19)		(10)	(6.38)	(16)	(16)
Lambda					−0.14					−0.04
					(6.07)					(1.83)
Hausman test (*P*-value)				43					20	
				(0.0)					(0.0)	
T-statistics: first stage				22.0					21.0	
Partial R^2: first stage				0.018					0.018	
No. of observations	24,964	24,964	24,964	24,964	24,964	25,480	25,480	25,480	25,480	25,480
Adjusted R^2	0.13	0.20	0.65	0.14	0.14	0.09	0.14	0.59	0.08	0.08
F-statistic	932	518	13.05	138	135	607	350	10.20	73	72

Probit estimates for diversitying firms

	Coefficient	*T*-statistic	Marginal Effect
Constant	−3.47	−31.03	−0.21
Log of total assets	0.22	3.98	0.03
EBIT/SALES	−0.07	−0.50	−0.01
CAPX/SALES	0.03	0.29	0.00
Log of TA (1 lag)	−0.10	−1.19	−0.01
EBIT/SALES (1 lag)	−0.07	−0.48	−0.01
CAPX/SALES (1 lag)	−0.11	−0.80	−0.02
Log of TA (2 lag)	0.23	4.18	0.02
EBIT/SALES (2 lag)	−0.10	−1.02	−0.01
CAPX/SALES (2 lag)	−0.09	−0.87	−0.02
SNP	−0.19	−4.08	−0.03
PNDIV	0.02	15.85	0.003
PSDIV	0.001	1.45	0.0002
MVOL	−0.0001	−0.36	0.00
MNUM	0.11	3.69	0.01
GDP	−0.01	−1.26	−0.002
GDP1	0.004	0.36	0.001
CONTRACTION	−0.08	−0.80	−0.02
CONTRACTION1	−0.02	−0.24	−0.01
A_TA	−0.20	−6.15	−0.02
A_EBIT	0.10	1.35	0.01
A_CAPX	0.04	0.39	0.01
MAJOREX	0.16	6.02	0.02
FOREIGN	0.06	1.22	0.02
No. of observations			24,964
Maximized likelihood			−6,478
Likelihood index			0.08
% multisegment observations			8.13

For refocusing firms

	Sales Multipliers					Asset Multipliers				
	OLS (BO)	OLS	Fixed Effects	IV	Self-selection	OLS (BO)	OLS	Fixed Effects	IV	Self-selection
Constant	−0.38	−0.76	−0.14	−0.68	−0.68	−0.17	−0.43	0.62	−0.31	−0.31
	(36)	(28)	(2.82)	(32)	(32)	(18)	(17)	(13)	(15)	(15)
D	−0.17	−0.13	−0.14	−0.21	−0.21	−0.13	−0.11	−0.11	−0.11	−0.10
	(17)	(14)	(9.20)	(9.60)	(10)	(14)	(12)	(7.05)	(4.51)	(4.48)
Log of total assets	0.05	0.59	0.35	0.53	0.53	0.01	0.39	0.01	0.22	0.22
	(22)	(36)	(17)	(41)	(41)	(7.23)	(28)	(0.69)	(18)	(18)
EBIT/SALES	1.14	0.66	0.37	0.40	0.40	1.00	0.76	0.67	0.59	0.59
	(43)	(19)	(13)	(12)	(12)	(46)	(27)	(28)	(15)	(16)
CAPX/SALES	0.32	0.10	0.18	0.17	0.17	0.04	−0.03	−0.03	−0.004	−0.004
	(15)	(3.43)	(7.46)	(6.64)	(6.64)	(2.44)	(1.30)	(1.24)	(0.21)	(0.20)
Log of TA (1 lag)		−0.24	−0.27	−0.24	−0.24		−0.14	−0.12	−0.04	−0.04
		(12)	(19)	(14)	(14)		(8.09)	(9.43)	(2.79)	(2.78)
EBIT/SALES (1 lag)		0.26	0.21	0.23	0.23		0.13	0.20	0.16	0.16
		(7.15)	(7.60)	(6.25)	(6.25)		(4.38)	(8.74)	(3.81)	(3.84)
CAPX/SALES (1 lag)		0.03	0.04	0.05	0.05		−0.07	−0.04	−0.03	−0.03
		(0.83)	(1.91)	(2.03)	(2.04)		(2.79)	(2.19)	(1.59)	(1.60)
Log of TA (2 lag)		−0.18	−0.12	−0.11	−0.12		−0.15	−0.10	−0.10	−0.10
		(15)	(13)	(11)	(11)		(15)	(12)	(11)	(11)
EBIT/SALES (2 lag)		0.12	0.12	0.09	0.10		−0.02	0.05	−0.01	−0.01
		(4.60)	(5.86)	(3.48)	(3.56)		(1.10)	(2.76)	(0.28)	(0.24)
CAPX/SALES (2 lag)		0.09	0.06	0.06	0.06		0.06	0.02	0.04	0.04
		(3.72)	(3.16)	(3.23)	(3.22)		(2.93)	(1.49)	(2.46)	(2.46)
SNP				0.25	0.25				0.28	0.29
				(29)	(29)				(35)	(35)
LEV		0.02	0.25	0.17	0.17		−0.04	0.15	0.09	0.08
		(1.43)	(12)	(13)	(12)		(2.58)	(7.59)	(7.23)	(7.05)
ASS2		−0.01	0.01	−0.01	−0.01		−0.01	0.01	−0.01	−0.01
		(12)	(3.48)	(21)	(21)		(−9.85)	(5.76)	(15)	(15)
Lambda					0.03					−0.01
					(2.44)					(0.48)
Hausman test (*P*-value)				3.20					0.08	
				(0.07)					(0.45)	
T-statistics: first stage				52					47	
Partial R^2: first stage				0.079					0.066	
No. of observations	27,995	27,995	27,995	27,995	27,995	28,161	28,161	28,161	28,161	28,161
Adjusted R^2	0.13	0.19	0.64	0.13	0.14	0.09	0.14	0.58	0.08	0.08
F-statistic	1064	557	13.00	142	142	732	383	10.30	77	77

Probit estimates for refocusing firms

	Coefficient	*T*-statistics	Marginal Effect
Constant	−3.40	−35.21	−0.24
Log of Total Assets	−0.09	−1.53	0.00
EBIT/SALES	−0.28	−1.94	−0.07
CAPX/SALES	0.24	1.58	−0.02
Log of TA (1 lag)	−0.20	−2.29	−0.02
EBIT/SALES (1 lag)	0.05	0.29	−0.03
CAPX/SALES (1 lag)	0.85	4.77	0.01
Log of TA (2 lag)	0.11	1.88	−0.01
EBIT/SALES (2 lag)	−0.14	−1.07	−0.01
CAPX/SALES (2 lag)	0.88	5.20	−0.02
SNP	−0.06	−1.54	0.01
PNDIV	0.02	14.97	0.003
PSDIV	0.01	12.87	0.001
MVOL	0.0003	1.02	0.0002
MNUM	−0.21	−8.10	−0.04
GDP	0.04	4.62	0.01
GDP1	0.01	0.93	−0.001
CONTRACTION	0.32	3.90	0.10
CONTRACTION1	0.25	3.15	0.05
A_TA	0.43	11.56	0.07
A_EBIT	−0.52	−4.40	−0.07
A_CAPX	−3.68	−13.97	−0.11
MAJOREX	0.20	7.94	0.03
FOREIGN	−0.33	−5.64	−0.05
No. of observations			27,995
Maximized likelihood			−8381
Likelihood index			0.21
% of positive observations			12.60

Discussion

From a investor's perspective

Do investors like single segment firm better or conglomerates?
Investment portfolio vs business portfolio

The End