SMES AND SUBCONTRACTING IN JAPANESE MANUFACTURING

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Introduction

- Small and Medium Enterprises (SMEs) have a **prominent presence** in the **manufacturing sector of Japan**.
- A distinguishing feature of Japanese SMEs is that **a significant proportion** of them in a **wide variety of industrial sectors** are **linked to large firms** through **industrial subcontracting** (McMillan, 1996).
- Subcontracting is considered to be an **important source** of **technical support**, **financial support**, **supply of input materials**, **managerial support**, etc. to SMEs **from large firms**.
- Subcontracting transactions play **an active role in improving the productivity** of SMEs (Hayashi, 2002).
- In the Japanese economy, subcontracting has been regarded as **an important source of efficiency and competitiveness** for industries such as textiles, general machinery, electric machinery and automobiles (Nishiguchi, 1994; Kimura, 2001).
- SMEs and subcontractors have been the major source of **economic vitality and creativity** and, more importantly, they have **contributed significantly** to the **rapid development of Japanese economy**.

Source: Directly quoted from Bala Subrahmanya (2006)

Introduction (cont'd)

- SMEs in Japan are defined under the **Small and Medium Enterprise Basic Law**.
- In general, **SMEs** refer to the enterprises with **a capital of not in excess of ¥300 million** or **300 or fewer employees**, and sole proprietorships with 300 or fewer employees.
- Small enterprises are defined as enterprises with **20 or fewer employee**s (SME Agency, 2004).
- For most studies, an **SME** is defined as an enterprise having **less than 300 employees**;
  - a **small enterprise** is one having **less than 20 employees**
  - a **medium enterprise** is one having **20–299 employees**.

Source: Directly quoted from Bala Subrahmanya (2006)

What is Subcontracting ?

- **Subcontracting (*shitauke*)** is not always specified in an explicit manner.
- Some researchers stress the asymmetric relationship **between a large downstream firm and a small upstream firm**.
- Kawasaki (1998, p. 38) defines a subcontracting relationship as:

  *"a contractual relationship in which a **large firm asks a small firm to conduct a commissioned work** (producing parts, components, or finished products) under a dominant position."*

- Statistically, the Ministry of International Trade and Industry (MITI), Government of Japan (GOJ), defines subcontracting as follows:

  *"A contractual arrangement between a firm and **a 'parent' firm with larger capital or larger number of employees**. The former firm **is commissioned to produce products, parts, attachments, materials, or components used as inputs in the parent firm's production**, or to produce or repair facilities, equipment, tools, and others which the parent firm uses in production. When a firm purchases noncustomized parts, components, and others through a usual marketing channel, it is not regarded as subcontracting. In subcontracting, a **parent firm orders the work directly to a subcontractor with assigning a plan, quality, spec, form, design, or others**."*

Source: Directly quoted from Kimura (2001)

Historical and Theoretical Foundation of Subcontracting

- Japan has a **longstanding history** of **inter-firm cooperation** and **cooperative learning**.
- The widespread presence of **subcontracting systems** is one of the **peculiarities** of **Japanese industrial organisation** (Yokokura, 1988).
- However, this system has undergone changes from time to time.
- The history of subcontracting traces its **origin to the munitions industry** in **the 1930s**.
- An important development thereafter was the introduction of **gradational subcontracting by Toyota** in the 1940s, which **laid the foundation for multilayered subcontracting system**.
- Appropriate **policy measures**, such as demarcation of production for subcontracting manufacturing, direction for contractors to use subcontractors as much as possible and designating subcontractors, also **helped subcontracting promotion** in Japan (Bala Subrahmanya, 2006).

Source: Directly quoted from Bala Subrahmanya (2006)

Historical and Theoretical Foundation of Subcontracting (cont'd)

- However, subcontracting got a **renewed life** due to **the Korean War in 1950,** after World War II. At this stage, **technical standards** of subcontractors were **very backward**.
- In the **1960s and 1970s** when manufacturing expanded rapidly due to mass production, and when large firms adopted flexible manufacturing practices to survive in the competition, relying on **subcontracting became inevitable** and so was the **transfer of vital resources** such as **technology, material** and **managerial support** from contractors to subcontractors.
- By the 1980s, subcontracting in Japan had emerged as **a multi-layered pyramidal structure** where large, medium and small firms had **collaborative** and **continuous relationship** between them.
- There was direct relationship between large and medium firms and between medium and small firms, but **no direct contact between the head of the pyramid and smaller firms located at the lower tiers** (Bala Subrahmanya, 2006).

Source: Directly quoted from Bala Subrahmanya (2006)

Historical and Theoretical Foundation of Subcontracting (cont'd)

- The **public view on subcontracting** in Japan has **drastically changed** over time.
- Traditionally, partially under the **influence of Marxian economics** that **dominated the academic literature in Japan**, researchers emphasized the **asymmetry between large and small firms** in the **subcontracting relationship**.
- It was thought that large firms had **monopsonic power** in determining prices, imposing conditions on product quality and delivery, and **using smaller firms** as a **buffer for business fluctuations**.
- The **dualistic structure** in **labor and capital markets** was also emphasized as a **background** of the **subcontracting system**.
- Researchers in managerial science and the **"neoclassical" school** of economics highlighted the **efficiency-enhancing nature** of subcontracting system.

Source: Directly quoted from Kimura (2001)

Historical and Theoretical Foundation of Subcontracting (cont'd)

Since then, subcontracting has been regarded as one of **the important components** of **the Japanese economic system**, with presumed benefits in:

(1) **saving costs to search** and **select new suppliers**

(2) having successful **quality enhancement** and **cost reduction** in cooperation with subcontractors

(3) successfully **providing incentive** for subcontractors' **investment on relation-specific assets**

(4) having **efficient risk-sharing** mechanism

(5) sometimes **maintaining a good relationship** by a **certain amount of share holding** (but not necessarily restricting suppliers' counterparts).

Source: Directly quoted from Kimura (2001)

Historical and Theoretical Foundation of Subcontracting (cont'd)

- In the latter half of the 1940s and 1950s, there existed **a distinctive dualistic structure between large and small enterprises**, but the gap **was not too large** in terms of, for instance, technology and entrepreneurship to prohibit them from **constructing efficient subcontracting arrangements**.
- Japan then had an international **comparative advantage** on **labor-intensive manufactured goods**, and **abundant supply of labor** was available for SMEs.
- At the same time, **SMEs** did **not have direct access** to **foreign technology** and an **export marketing** channel, which left room for large firms to utilize SMEs.
- The government conducted a series of SME promotion policies. For example, the policies had multiple channels helping financial arrangements, managerial practice and technology, cooperative organizations, modernization scheme through advice, and tax concessions.
- The **financial support** to **compensate liquidity constraints** was particularly important.
- In addition, some policies were implemented to **protect weak SMEs** from the **viewpoint of social policy** as well as **competition policy**.

Source: Directly quoted from Kimura (2001)

Historical and Theoretical Foundation of Subcontracting (cont'd)

- Subcontracting is a **long-term relationship** and thus has a **strong path-dependent nature**.
- With the comfort of long-term commitments, **large enterprises provided technological assistance to SMEs**.
- The long-term relationship **stabilized the financial condition of SMEs**. Such a system seemed to **work well in the high-growth period** of **1955–73.**
- The changes in the economic environment **after 1973**, however, forced firms to make **some modification** of the **subcontracting system**.
- From the latter half of the 1980s, the **globalization of Japanese firm**s accelerated.
- Many SMEs **faced difficulties** in **finding new customers** when a production **plant of the client moved out to foreign countries**.
- On the other hand, there are a number of SMEs that **successfully made foreign direct investment** and got out of old rigid subcontracting connection

Source: Directly quoted from Kimura (2001)

Historical and Theoretical Foundation of Subcontracting (cont'd)

Based on Maruyama (1996), there are **four theoretical foundations** of subcontracting.

(1) The transaction cost approach

- A firm decides **whether to internalize certain transactions or not.**
- Subcontracting arrangements can be interpreted as one of the devices **to save transaction costs**.
- Asanuma (1989) conducts a detailed case study and finds **the reshuffling of subcontractors** in the process of model changes in the **automobile industry**. He provides the detailed classification of supplier arrangements and proposes the concept of **relation-specific skill**.

(2) The game theory approach

- This approach emphasizes a **long-term cooperative relationship** between **upstream and downstream firms** based on **repeated game, reputation, and coordination**.
- The formulation of **coordinating relationship** is explained by using the game theoretic concepts.

Source: Directly quoted from Kimura (2001)

Historical and Theoretical Foundation of Subcontracting (cont'd)

(3) The economics of information approach

- This approach is based on **the contract theory**, particularly the principal-agent model in which long-term relationship works for fostering efficient **risk sharing arrangements under incomplete information**.

(4) The network approach

- This approach advocates that the Japanese interfirm relationship is interpreted as an **"intermediate" organization** (*chuukan soshiki*) in which the **market principle** and the **organizational principle coexist**.
- It emphasizes that under a certain economic environment, interfirm relationship with an **efficient synergy of competition and coordination** is constructed

Source: Directly quoted from Kimura (2001)

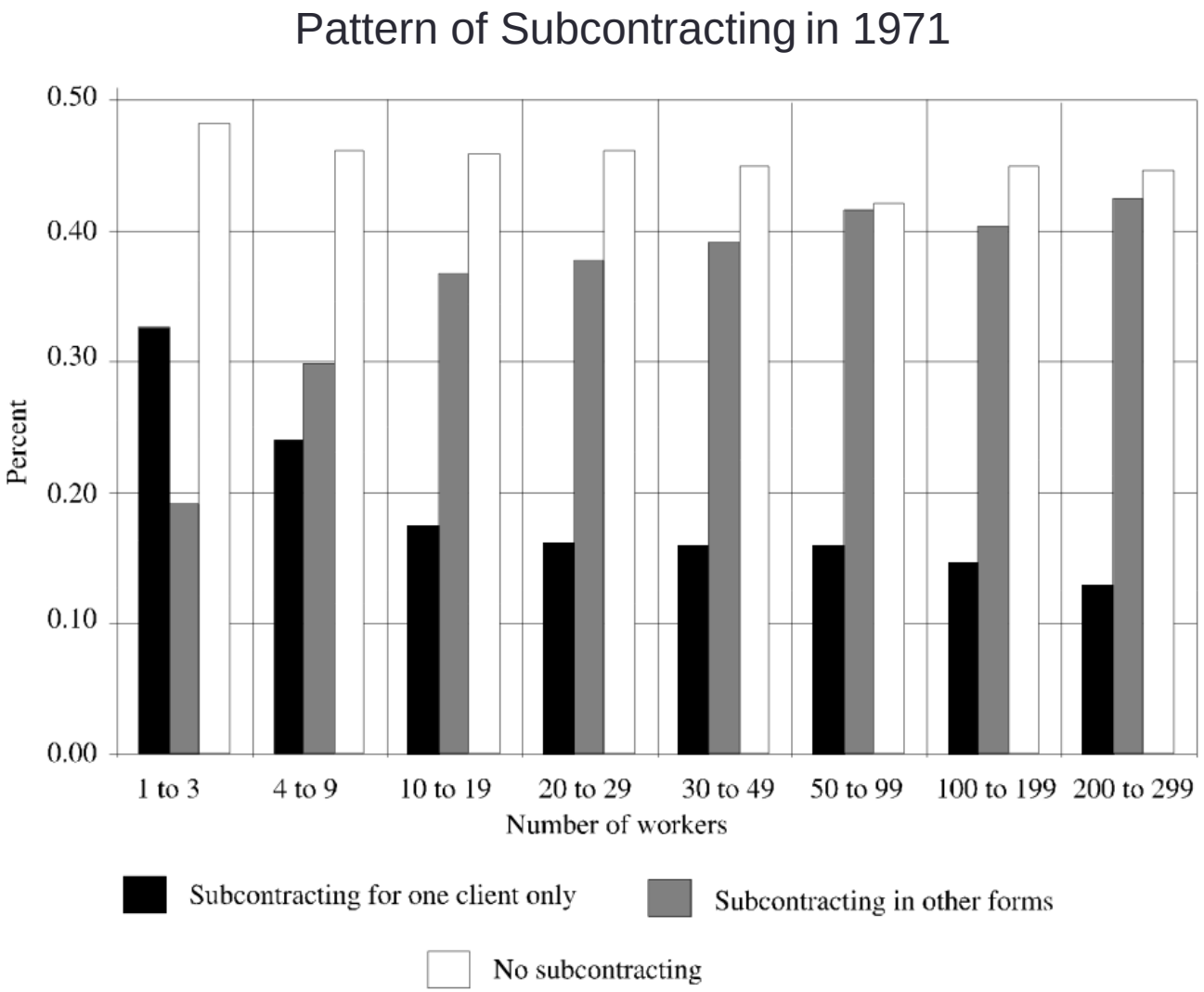
Sectoral Pattern of Subcontracting

The Percentage of Firms Working as Subcontractors

	1966	*1971*	*1976*	*1981*	*1987*
Manufacturing total	53.3	58.7	60.7	65.5	55.8
Food products	16.5	30.2	14.5	17.5	8.2
Textiles	79.8	75.9	84.5	84.9	79.6
Clothing	73.6	71.4	83.9	86.5	79.0
Wood and wood products	35.0	43.8	42.9	48.0	21.7
Furniture and fixtures	45.6	49.4	41.2	51.6	38.5
Pulp, paper, and paper products	51.1	43.9	44.8	51.6	41.1
Publishing and printing	46.3	51.0	50.8	59.0	21.7
Chemicals	40.2	38.7	37.1	38.5	–
Petroleum and coal products	30.0	30.7	27.0	38.9	18.1
Plastic products	–	–	–	–	68.5
Rubber products	62.3	54.3	61.1	71.8	65.3
Leather and skin products	60.0	64.5	62.5	68.8	64.6
Ceramics, soil and stone products	33.8	34.0	29.4	36.6	35.4
Iron and steel	66.0	66.0	70.4	72.0	52.3
Nonferrous metal	67.0	69.7	68.7	73.6	61.7
Metal products	66.3	71.7	74.8	48.6	70.9
General machinery	70.7	75.8	82.7	84.2	74.5
Electrical machinery	81.4	78.9	82.3	85.3	79.4
Transport equipment	67.1	77.9	86.2	87.7	79.6
Precision machinery	72.4	70.7	72.4	80.9	70.1
Other manufacturing	50.9	58.7	56.5	62.2	43.4

Source: Kimura (2001)

Sectoral Pattern of Subcontracting



Source: Kimura (2001)

Characteristics of Firms in Japanese Machinery Industry in 1994: By Firm Size

	(a) With 50–300 workers	(b) With 301–1000 workers	(c) With 1001 or more workers
Firm size:			
Number of regular workers (L)	137	534	4178
[number of persons]	(67)	(188)	(8706)
Total sales (SALES)	3304	16332	209231
[millions of yen]	(3295)	(12896)	(631186)
Economic performance:			
Ratio of tangible assets to	6.44	7.14	9.89
regular workers (KLRATIO)	(6.69)	(6.64)	(7.09)
[millions of yen per person]			
Ratio of operating surplus to	0.0549	0.0416	0.0383
total sales (PAIRATIO)	(0.1636)	(0.0442)	(0.0331)
Ratio of gross value added to	0.5527	0.4625	0.4233
total sales (VARATIO)	(0.2318)	(0.2089)	(0.1972)
Foreign sales (1) (PROBEXP):	0.2588	0.4259	0.6883
1 positive; 0 zero	(0.4381)	(0.4948)	(0.4639)
Foreign sales (2) (REXP):	0.0319	0.0529	0.1400
ratio to total sales	(0.095)	(0.1274)	(0.1847)
Product differentiation:			
R&D expenditure (1) (PROBRD):	0.4596	0.6926	0.8827
1 positive; 0 zero	(0.4985)	(0.4617)	(0.3223)
R&D expenditure (2) (RRD):	0.0090	0.0141	0.0299
ratio to total sales	(0.0236)	(0.0231)	(0.0302)
Ratio of advertisement	0.0024	0.0031	0.0034
expenditure to total sales (RADV)	(0.0059)	(0.0177)	(0.005)
Linkage:			
Commissioning production (PROBCOM):	0.8872	0.9086	0.9136
1 yes; 0 no	(0.3164)	(0.2883)	(0.2814)
Using subcontractor(s) (PROBUSUB):	0.7350	0.8012	0.8519
1 yes; 0 no	(0.4414)	(0.3993)	(0.3558)
Working as a subcontractor (PROBWSUB):	0.4550	0.3383	0.1636
1 yes; 0 no	(0.4981)	(0.4734)	(0.3705)
Ratio of foreign stock	0.0101	0.0210	0.0692
ownership (FRATIO)	(0.0877)	(0.1187)	(0.2031)
Number of establishments (ALLEST)	2.70	5.68	19.63
	(2.72)	(7.23)	(32.90)
Number of domestic affiliates (DAFFI)	0.40	1.23	11.36
	(1.14)	(2.29)	(24.53)
Number of foreign affiliates (FAFFI)	0.05	0.36	4.73
	(0.53)	(1.49)	(9.50)
Number of firms in the sample:	2589	810	324

Source: Kimura (2001)

Simple Correlations between variables

	L	*SALES*	*KLRATIO*	*PAIRATIO*	*VARATIO*	*REX*	*RRD*	*RADV*	*PROBCOM*	*PROBUSUB*	*PROBWSUB*	*FRATIO*
L	1.0000											
SALES	0.9123	1.0000										
KLRATIO	0.0925	0.0974	1.0000									
PAIRATIO	–0.0191	–0.0157	0.0654	1.0000								
VARATIO	–0.0783	–0.0759	–0.0349	0.1045	1.0000							
REX	0.1887	0.1622	0.1914	0.0271	–0.0646	1.0000						
RRD	0.1793	0.1357	0.0538	0.0450	–0.0055	0.2529	1.0000					
RADV	0.0414	0.0365	0.0543	0.0372	0.0245	0.0938	0.1449	1.0000				
PROBCOM	–0.0047	0.0018	–0.0248	–0.0160	–0.0337	0.0210	0.0157	0.0084	1.0000			
PROBUSUB	0.0303	0.0260	–0.0017	–0.0130	–0.0643	0.0284	0.0321	–0.0104	0.1743	1.0000		
PROBWSUB	–0.0887	–0.0690	–0.1249	–0.0174	0.0693	–0.2017	–0.1741	–0.1031	0.0823	0.2354	1.0000	
FRATIO	0.1841	0.1552	0.0642	0.0176	–0.0031	0.1568	0.0910	0.0427	–0.0443	0.0269	–0.1104	1.0000

Source: Kimura (2001)

The Result of Logit Estimation: Firms in Japanese Machinery Industry in 1994

	Dependent variables	
	PROBUSUB	*PROBWSUB*
	Using subcontractor(s) = 1 Otherwise = 0	*Working as a subcontractor = 1 Otherwise = 0*
Constant	0.0558169	–1.461543 **
	(0.360)	(–8.446)
L	0.0000338	–0.0004064 **
	(1.163)	(–4.693)
KLRATIO	0.0052952	–0.297447 **
	(0.885)	(–4.448)
PAIRATIO	–0.0849547	–0.0292907
	(–0.301)	(–0.118)
VARATIO	–0.8176049 **	0.6379953 **
	(–4.521)	(3.927)
REX	0.8841049 *	–3.853797 **
	(2.251)	(–7.127)
RRD	6.386876 **	–13.00605 **
	(3.167)	(–5.688)
RADV	0.2509413	–56.75889 **
	(0.054)	(–5.461)
PROBCOM	1.023187 **	0.37993 **
	(8.882)	(2.962)
PROBUSUB	–	1.450414 **
	–	(14.993)
PROBWSUB	1.41165 **	–
	(14.609)	–
FRATIO	0.0010676 *	–0.0026925 **
	(2.510)	(–3.652)
Log likelihood	–1868.9965	–2155.592

Source: Kimura (2001)

Subcontracting-intensive industry groups

More Subcontracting Intensive (MSI)		Less Subcontracting-Intensive (LSI)	
MSI industries (industry code)	*Subcontracting (%)*	*LSI industries (industry code)*	*Subcontracting (%)*
Textiles (11)	84.9	Food and Tobacco (9 and 10)	17.5
Apparel (12)	86.5	Wood Products (13)	48.0
Rubber (20)	71.8	Furniture and Fixtures (14)	51.6
Iron and steel (23)	72.0	Paper Products (15)	51.6
Nonferrous (24)	73.6	Printing (16)	59.0
Metal Products (25)	78.6	Chemicals (17)	38.5
Gen. Machinery (26)	84.2	Petro Products (18)	38.9
Elec. M (27+28+29)	85.3	Leather Products (21)	68.8
Transport (30)	87.7	Ceramics and Clay (22)	36.6
Pre. Machinery (31)	80.9	Or. Mfg. + Plastics (19) (32)	62.2

Source: Directly quoted from Bala Subrahmanya (2006)

Structure of manufacturing industry in Japan (1980 – 1998)

Year	*Small*	*Medium*	*Large*	*Total*
Establishments				
1980	641494 (87.32)	89618 (12.20)	3511 (0.48)	734623 (100.00)
1998	550306 (85.52)	89603 (13.93)	3559 (0.55)	643468 (100.00)
Employment				
1980	3288326 (29.81)	4741108 (42.97)	3003397 (27.22)	11032831 (100.00)
1998	2813299 (27.09)	4869660 (46.88)	2703595 (26.03)	10386554 (100.00)
Value-added (Yen million)				
1980	12149021 (17.05)	28233073 (39.62)	30871733 (43.33)	71253827 (100.00)
1998	16819256 (14.65)	49089361 (42.76)	48888264 (42.59)	114796881 (100.00)

Note: Figures in parentheses are percentages to the total.

Source: Bala Subrahmanya (2006)

Labour productivity and VA/VO: small, medium and large firm

	Labour productivity			*Value-added/value of output*		
Year	*Small*	*Medium*	*Large*	*Small*	*Medium*	*Large*
1980	3.69	5.95	10.28	0.45	0.33	0.30
1998	5.98	10.08	18.08	0.50	0.38	0.33

Source: Bala Subrahmanya (2006)

- To ascertain the influence of labour and capital to value-added and how did the change in the globalisation period, regression analysis is done.
- Regression analysis is done for the total medium sector and for MSI and LSI sectors separately.
- The regression equations for the analysis are as follows:

$$\text{Ln } Y_T = a_0 + a_1 \text{ Ln } L + a_2 \text{ Ln } K + a_3 D_P + a_4 D_P \text{ Ln } L + a_5 D_P \text{ Ln } K \quad (1)$$

$$\text{Ln } Y_{\text{MSI}} = b_0 + b_1 \text{ Ln } L + b_2 \text{ Ln } K + b_3 D_P + b_4 D_P \text{ Ln } L + b_5 D_P \text{ Ln } K \quad (2)$$

$$\text{Ln } Y_{\text{LSI}} = c_0 + c_1 \text{ Ln } L + c_2 \text{ Ln } K + c_3 D_P + c_4 D_P \text{ Ln } L + c_5 D_{\text{P}} \text{ Ln } K \quad (3)$$

where $\boldsymbol{Y}$ = value-added,
$\boldsymbol{L}$ = wages and salaries,
$\boldsymbol{K}$ = depreciation,
$\boldsymbol{Dp}$ = year dummy for 1998,
$\boldsymbol{D_P}\,\mathbf{Ln}\,\boldsymbol{L}$, and $\boldsymbol{D_P}\,\mathbf{Ln}\,\boldsymbol{K}$ are dummy variables for labour and capital, respectively, for 1998.

Source: Bala Subrahmanya (2006)

Influence of labour and capital on value-added

Variables	*Total*	*MSI*	*LSI*
Ln L	0.49	0.71	0.44
	(7.21)*	(8.14)*	(5.04)*
D_p Ln L	0.29	0.15	0.43
	(2.99)*	(1.23)*	(3.49)*
Ln K	0.47	0.30	0.51
	(7.23)*	(3.60)*	(6.37)*
D_p Ln K	–0.18	–0.09	–0.28
	(–2.93)*	(–0.82)	(–2.52)*
Intercept	1.02	0.59	1.14
	(5.01)*	(2.36)*	(4.63)*
Dummy intercept	–0.81	–0.48	–1.10
	(–2.93)*	(–1.40)	(–3.26)*
Adjusted R^2	0.98	0.99	0.99
F value	357.50	254.28	252.02
No. of observations	40	20	20

*Significant at 0.05 level.

F value is significant at 0.05 level.

Source: Bala Subrahmanya (2006)