

Table 1.1 Product Values of the Petrochemical Related Industries, Chemical Materials and Manufacturing Sector in Taiwan, 1986-2004

Unit: billion NT \$, %

Year	Product value of the petrochemical related industries (a)	Product value of the chemical materials (b)	Product value of the manufacturing sector		
			(c)	(a/c)%	(b/a)%
1986	1197	288	3551	33.71	24.08
1987	1270	291	3907	32.50	22.95
1988	1292	334	4143	31.19	25.83
1989	1315	322	4426	29.71	24.48
1990	1305	321	4432	29.45	24.59
1991	1465	359	4876	30.06	24.48
1992	1410	360	4949	28.50	25.55
1993	1403	371	5196	27.01	26.41
1994	1577	493	5692	27.71	31.27
1995	1840	683	6519	28.22	37.14
1996	1774	580	6644	26.70	32.68
1997	1868	600	7059	26.46	32.12
1998	1819	565	7269	25.03	31.04
1999	1857	590	7514	24.72	31.78
2000	2115	729	8468	24.98	34.47
2001	2032	739	7445	27.30	36.36
2002	2118	805	8066	26.26	38.03
2003	2402	986	8795	27.31	41.03
2004	2938	1317	10405	28.24	44.81

Notes: Petrochemical related industries include: textile, wearing apparels, chemical materials, chemical products, petroleum refining & coal products, rubber products and plastic products industries.

Source: Department of Statistics, Ministry of Economic Affairs, Industrial Production Statistics Monthly.

Table 1.2 Domestic Firms' *PCM*, Domestic Concentration, Import Share and Export Share for 21 Midstream Petrochemical Industries in Taiwan, 1986-2002

Year	<i>PCM</i> ^d	<i>H</i> ^d	<i>MR</i>	<i>ER</i>
1986	--	--	0.317	0.202
1987	--	--	0.371	0.172
1988	--	--	0.398	0.163
1989	0.432	0.79	0.383	0.159
1990	0.370	0.80	0.413	0.175
1991	0.449	0.80	0.451	0.164
1992	0.422	0.78	0.464	0.186
1993	0.407	0.75	0.437	0.198
1994	0.407	0.62	0.437	0.203
1995	0.429	0.66	0.420	0.238
1996	0.406	0.69	0.411	0.252
1997	0.351	0.69	0.413	0.245
1998	0.381	--	0.411	0.278
1999	0.349	--	0.407	0.290
2000	0.267	--	0.370	0.317
2001	0.289	--	0.318	0.378
2002	0.273	--	0.308	0.393

Notes: Although there are more than 30 midstream petrochemical products, data on some of these products are unavailable and incomplete. Therefore, only 21 products are chosen and used in this paper. They are SM, VCM, ML, EG, VAM, PA, DOP, PTA, CPL, AN, ME, CB, PVC, LDPE, HDPE, PS, PP, PVA, ABS, SBR, BR. As to their full names, please refer to Appendix 2C. *PCM*^d stands for the weighted average of the domestic firms' *PCMs* in two countries; *H*^d domestic concentration; *MR* import share; *ER* export share.

Table 1.3 Domestic Firms' *PCM*, Domestic Concentration and Openness for 21 Midstream Petrochemical Industries in Taiwan, 1986-2002

Year	<i>PCM</i> ^d	<i>H</i> ^d	<i>OP</i>
1986	--	--	0.656
1987	--	--	0.981
1988	--	--	1.161
1989	0.432	0.79	0.851
1990	0.370	0.80	0.892
1991	0.449	0.80	3.273
1992	0.422	0.78	0.922
1993	0.407	0.75	2.154
1994	0.407	0.62	0.642
1995	0.429	0.66	1.259
1996	0.406	0.69	1.381
1997	0.351	0.69	1.408
1998	0.381	--	1.983
1999	0.349	--	1.036
2000	0.267	--	0.802
2001	0.289	--	0.662
2002	0.273	--	0.682

Notes: *OP* stands for openness (trade share, exports plus imports/total production).

Table 2.1 Computation of Relevant Variables and Data Sources

Variables	Computation formula	Data sources
P^m	total value of import / total quantity imported	(A)
P^d	(domestic sales) / (X^h)	(C)
$ex \cdot P^w$	(value of export) / (X^e)	(A) and (F)
PCM^h	$(P^d - C^h) / P^d$	(C) and (D)
PCM^w	$(ex \cdot P^w - C^h) / (ex \cdot P^w)$	(A), (C) and (D)
PCM^d	$PCM^h \cdot X^h / X^T + PCM^w \cdot X^e / X^T$	(A), (C) and (D)
MR	$X^m / (X^h + X^m)$	(A)
ER	$X^e / (X^h + X^e)$	(A)
OP	$(X^e + X^m) / X^T$	(C)
H^d	$\sum_{i=1}^n (x_i^h / X^h)^2$	(B)
H^m	$\sum_{k=1}^{n^w} (x_k^m / X^m)^2$	(A)
MS	$X^T + X^m - X^e$	(C)
E	$X^T / capacity$	(C) and (D)
$cd(=CD/P^d)$	$(P^d - P^m) / P^d$	(A) and (C)
H^{ce}	$\sum_{k=1}^{n^w} (\text{the exports to the } k\text{th country} / \text{total exports})^2$	(A)
t^h	(general tariff rate * quantities imported from countries and areas subject to general tariff rate) / X^m + (reciprocal tariff rate * quantities imported from countries and areas subject to reciprocal tariff rate) / X^m	(A) and (E)
f^v	$\sum_{k=1}^{n^w} k\text{th country's distance from the home country} * (x_k^m / X^m)$	(A) and (F)
ex	$\sum_{k=1}^{n^w} k\text{th country's exchange rate to the home country} * (x_k^m / X^m)$	(A) and (F)

Notes: P^m : the import prices; P^d : the domestic prices; P^w : the foreign prices; C^h : the marginal cost of domestic firms. (A): Department of Statistics, Ministry of Finance, Monthly Statistics of Export and Imports, Taiwan Area, R.O.C. (Taipei, 1986-1997); (B): Department of Statistics, Ministry of Economic Affairs; (C): Department of Statistics, Ministry of Economic Affairs, Industrial Production Statistics Monthly; (D): Petrochemical Industry Association of Taiwan, Petrochemical Industries in Taiwan, Republic of China (Taipei, 1986-1997); (E): Directorate General of Customs, ROC, Customs Import Tariff and Classification of Import and Export Commodities of the Republic of China; (F): Financial Statistics, Taiwan District, The Republic of China (Compiled in Accordance with IFS Format).

Table 2.2 Regression Results

Independent variables	Dependent variables			
	Estimates			
	PCM^d Equation	H^d Equation	MR Equation	ER Equation
Intercept	0.76*** (6.02)	0.30*** (3.70)	0.63*** (9.58)	0.58*** (5.94)
PCM^d		0.23*** (3.31)	-0.38*** (-7.35)	-0.15** (-2.12)
H^d	0.16* (1.85)		0.38*** (7.62)	0.11 (1.49)
MR	-0.70*** (-6.97)	0.61*** (7.04)		-0.63*** (-7.05)
ER	-0.24** (-2.40)	0.01 (0.16)	-0.40*** (-7.47)	
H^m	-0.61*** (-5.65)	0.52*** (5.22)	-0.45*** (-5.75)	-0.23** (-2.17)
t^h	2.69 (1.06)			
f^w	4.78E-6 (0.30)			
ex	5.90E-4 (0.44)			
H^{ce}	-0.19* (-1.89)			-0.17 (-1.23)
MS		-2.00E-7*** (-4.89)		
E			-0.15** (-2.15)	
cd			0.17*** (2.89)	-0.06 (-0.70)
Effective sample size		181		

Notes: ***, ** and * represent that the coefficients are significantly different from zero at 1%, 5% and 10% levels, respectively. The numbers in parentheses are t-statistics.

Table 3.1 Regression Results

Independent variables	Dependent variables								
	Estimates								
	<i>PCM^d</i> Equation			<i>H^d</i> Equation			<i>OP</i> Equation		
	Model (1)	Model (2)	Model (3)	Model (1)	Model (2)	Model (3)	Model (1)	Model (2)	Model (3)
Intercept	0.53*** (5.45)	0.51*** (8.76)	0.51*** (9.00)	0.10 (0.94)	0.10 (1.00)	0.10 (0.99)	6.20*** (6.62)	6.31*** (6.66)	6.34*** (6.71)
<i>PCM^d</i>				0.17* (2.06)	0.16* (1.90)	0.16* (1.91)	-13.47*** (-16.2)	-13.71*** (-17.10)	-13.73*** (-17.14)
<i>H^d</i>	0.17** (2.52)	0.18*** (2.92)	0.19*** (3.11)				2.01** (2.15)	2.07** (2.25)	2.07** (2.25)
<i>OP</i>	-0.06*** (-15.70)	-0.06*** (-18.28)	-0.06*** (-18.37)	0.01*** (2.63)	0.01** (2.53)	0.01** (2.54)			
<i>MR</i>	0.01 (0.03)			0.36*** (4.31)	0.36*** (4.33)	0.36*** (4.33)	2.13* (1.72)	1.99* (1.97)	1.97* (1.95)
<i>H^m</i>	-0.57*** (-6.46)	-0.57*** (-6.77)	-0.57*** (-6.93)	0.48*** (4.94)	0.48*** (4.87)	0.48*** (4.87)	-7.50*** (-5.29)	-7.58*** (-5.45)	-7.61*** (-5.48)
<i>t^h</i>	0.29 (0.21)								
<i>f^v</i>	-7.93E-6 (-0.7)	-6.28E-6 (-0.62)	-6.67E-6 (-0.66)						
<i>ex</i>	4.79E-4 (0.50)	3.72E-4 (0.41)							
<i>H^{ce}</i>	-0.03 (-0.36)								
<i>MS</i>				-1.97E-7*** (-5.35)	-1.98E-7*** (-5.36)	-1.98E-7*** (-5.36)			
<i>E</i>				0.39*** (4.08)	0.39*** (4.09)	0.39*** (4.09)			
<i>cd</i>	0.03 (0.4)						-0.62 (-0.53)	-0.84 (-0.88)	-0.78 (-0.83)
Effective sample size	181								

Table 4.1 Values of Import and Export for 21 Midstream Petrochemical Industries, 1986-2004

Year	Exchange rate Unit: NT\$, %		Values of import and export Unit: NT\$ million, %				
	NT\$/US\$	Rate of change (%)	Export	Import	Trade balance	Rate of change (%)	Import ratio
1986	35.50	(-) 10.92	6,952	26,469	(-) 19,517	--	0.32
1987	28.55	(-) 19.58	8,689	37,597	(-) 28,908	48.12	0.37
1988	28.17	(-) 1.33	16,857	54,081	(-) 37,224	28.77	0.40
1989	26.16	(-) 7.16	15,225	47,759	(-) 32,534	(-) 12.60	0.38
1990	27.11	3.63	14,817	42,817	(-) 28,000	(-) 13.94	0.41
1991	25.75	(-) 5.02	18,239	56,627	(-) 38,388	37.10	0.45
1992	25.40	(-) 1.36	18,483	46,946	(-) 28,463	(-) 25.85	0.46
1993	26.63	4.84	23,842	51,630	(-) 27,788	-2.37	0.44
1994	26.24	(-) 1.46	33,503	66,664	(-) 33,161	19.34	0.44
1995	27.27	3.93	53,928	89,292	(-) 35,364	6.64	0.42
1996	27.49	0.81	49,258	73,272	(-) 24,014	(-) 32.09	0.41
1997	32.64	18.73	44,408	79,051	(-) 34,643	44.26	0.41
1998	32.22	(-) 1.29	47,072	74,378	(-) 27,306	(-) 21.18	0.41
1999	31.40	(-) 2.55	55,908	62,893	(-) 6,985	(-) 74.42	0.41
2000	33.01	5.13	83,073	71,019	12,054	(-) 272.57	0.37
2001	34.99	6.00	85,877	52,416	33,461	177.59	0.32
2002	34.76	(-) 0.66	105,191	52,426	52,765	57.69	0.31
2003	33.98	(-) 2.24	136,130	62,703	73,427	39.16	--
2004	33.42	(-) 1.65	194,172	81,679	112,493	53.20	--

Sources: 1.Exchange Rate: Financial Statistics Monthly, Taiwan District, The Republic of China.

2.Values of Import and Export: Monthly Statistics of Exports and Imports in Taiwan Area, The Republic of China, January, 1986 to December,2004.

Notes: The data start from 1986 because the regulations on the import of midstream petrochemical products were not completely lifted until February 1986.

Table 4.2 Exchange Rate and Values of Import and Export , 1986-2004

Year	NT\$/US\$	Values of import and export Unit: NT\$ million			Rate of change (%)	
		Export	Import	Trade balance	Export	Import
1986	35.50	1,507,044	917,033	590,011	23.22	14.37
1987	28.55	1,707,608	1,113,871	593,737	13.31	21.46
1988	28.17	1,731,804	1,423,101	308,703	1.42	27.76
1989	26.16	1,747,800	1,385,720	362,080	0.92	- 2.63
1990	27.11	1,802,783	1,471,803	330,980	3.15	6.21
1991	25.75	2,040,785	1,690,772	350,013	13.20	14.88
1992	25.40	2,047,963	1,817,061	230,902	0.35	7.47
1993	26.63	2,239,032	2,034,746	204,286	9.33	11.98
1994	26.24	2,456,011	2,261,651	194,360	9.69	11.15
1995	27.27	2,949,578	2,742,851	206,727	20.10	21.28
1996	27.49	3,176,625	2,815,120	361,505	7.70	2.63
1997	32.64	3,481,685	3,276,094	205,591	9.60	16.37
1998	32.22	3,693,269	3,503,569	189,700	6.08	6.94
1999	31.40	3,917,445	3,576,416	341,029	6.07	2.08
2000	33.01	4,616,301	4,368,696	247,605	17.84	22.15
2001	34.99	4,137,744	3,619,430	518,314	-10.37	-7.15
2002	34.76	4,507,506	3,893,682	613,824	8.94	7.58
2003	33.98	4,952,475	4,383,724	568,751	9.87	12.59
2004	33.42	5,817,800	5,627,587	190,213	17.47	28.37

Sources: same as Table 4.1

Table 4.3 Values of Import for 21 Midstream Petrochemical Industries from the US and Japan in Taiwan, 1986-2002

Year	US Unit: thousand NT\$, %		Japan Unit: thousand NT\$, %		(a)+(b) (%)
	Values of import NT\$	Values of import / total import (%) (a)	Values of import NT\$	Values of import / total import (%) (b)	
1986	10663753	40.29	5596214	21.14	61.43
1987	13965286	37.14	8927567	23.75	60.89
1988	22367819	41.36	10148417	18.77	60.12
1989	23424981	49.05	10047190	21.04	70.09
1990	19492787	45.53	9609884	22.44	67.97
1991	27084401	47.83	12600415	22.25	70.08
1992	19275610	41.06	10525191	22.42	63.48
1993	22130824	42.86	9615565	18.62	61.49
1994	28619315	42.93	11884184	17.83	60.76
1995	36225285	40.57	17899199	20.05	60.61
1996	24361292	33.25	16364243	22.33	55.58
1997	23363651	29.56	19373646	24.51	54.06
1998	17023980	22.89	17971081	24.16	47.05
1999	14891660	23.68	15048188	23.93	47.60
2000	16655307	23.45	15054445	21.20	44.65
2001	11063059	21.11	11605979	22.14	43.25
2002	10560718	20.14	11726142	22.37	42.51

Sources: same as Table 4.1

Table 4.4 OLS Estimates of the Pass-Through Equation

Explanatory variables	US	Japan
Constant	5.32*** (7.77)	8.60*** (22.44)
Log exchange rate (ex)	0.34* (1.87)	0.13* (1.92)
Log marginal cost (C)	0.52*** (13.32)	0.13*** (4.35)
Market share of imports (S)	0.58*** (3.27)	1.63*** (6.50)
Adjusted R ²	0.34	0.13
Sample size	345	355

Notes: Dependent variable is log price. ***, ** and * represent that the coefficients are significantly different from zero at 1%, 5% and 10% levels, respectively. The numbers in parentheses are t-statistics.

Table 4.5 OLS Estimates Including Nonlinear Terms of Taylor Series Expansion

Explanatory variables	US	Japan
Constant	4.04*** (6.03)	7.96*** (21.16)
Log exchange rate (ex)	0.51*** (2.96)	0.13* (1.89)
Log marginal cost (C)	0.58*** (15.34)	0.16*** (5.62)
Market share of imports (S)	10.82*** (6.38)	13.69*** (7.12)
Market share of imports ² (S ²)	-70.39*** (-4.72)	-101.94*** (-5.34)
Market share of imports ³ (S ³)	167.22*** (3.69)	281.86*** (4.56)
Market share of imports ⁴ (S ⁴)	-129.52*** (-2.96)	-246.09*** (-4.07)
Adjusted R ²	0.42	0.22
Sample size	345	355

Notes: same as Table 4.4