References

Antle, J. M. 1998. *No such thing as a free safe lunch : the cost of food safety regulation in the meat industry.* http://www.trc.montana.edu/publications/researchpapers/rdp9.htm

Boardman, A. E., Greenberg, D. H., Vining, A. R. and Weimer, D. L. 1996. *Cost-benefit analysis : concepts and practice.* New Jersey, USA: Prentice-Hall, Inc.

Butler, J. R. G., Furnival, C. M. and Hart, R. F. G. 1995. *Estimating treatment cost functions for progressive diseases:A multiproduct approach with an application to breast cancer.* J.of Health Economics,14,361-385.

Dor, A. 1994. *Non-minimum cost functions and the stochastic frontier:On applications to health care providers.* J.of Health Economics,13,329-334.

Dor, A. and Farley, D. E. . 1996. *Payment source and the cost of hospital care: Evidence from a multiproduct cost function with multiple payers.* J.of Health Economics,15,1-21.

Drummond, M. F., Stoddart, G. L. and Torrance, G. W. 1989. *Methods for the Economic Evaluation of Health care programmes.* Guildford and King's Lynn, Great Britain: Biddles Ltd.

Escarce, J. J. and Pauly, M. V. 1998. *Physician opportunity costs in physician practice cost functions.* J.of Health Economics,17,129-151.

FDA Thailand. Food and Drug Administration of Thailand, 2nd edition, 1995 and 1st edition, 1989.

Gaynor, M. and Anderson, G. F. 1995. *Uncertain demand,the structure of hospital costs,and the cost of empty hospital beds.* J.of Health Economics,14,291-317.

Given, R. S. 1996. *Economies of scale and scope as an explanation of merger and output diversification activities in the health maintenance organization industry*. J.of Health Economics,15,685-713.

Global health law. World Health Organization, regional office for south-east Asia, New Delhi, India, 1998.

Guasch, J. L. and Hahn, R.W. 1999. *The costs and benefits of regulation : implications for developing countries*. The World Bank Research Observer, 14(1), Feb., 137-158.

Hyman, D. N. 1987. *Public Finance, a contemporary application of theory to policy*, 2nd ed., New York, USA: CBS colledge publishing.

Karnjanaphanthu K. 1994. *The comparison of efficiency and cost of airlines in Asia-Pacific region and Thai international airline*. Master thesis, Thammasat University, Bangkok. (in Thai)

Klein, L. R. 1969. *An Introduction to Econometrics*. New Delhi, India: Prentice-Hall of India Private limited.

Laffont, J. J. and Tirole, J. 1994. *A Theory of Incentives in Procurement and Regulation*. Cambridge,Massachusetts,London,England: The MIT Press.

Luenberger, D. G. 1995. *Microeconomic theory*, international ed., USA: McGraw-Hill, Inc.

Ministry of Public Health and health development plan in Thailand. Sam Charoen Panich (Bangkok) co., ltd., 1998.

Needham, D. 1983. *The Economics and Politics of Regulation;A behavioral approach*. Western Kentucky University,USA.

Nichols, D. A. and Reynolds, C.W. 1971. *Principles of Economics*. USA: Holt, Rinehart and Winston, Inc.

Nyman, J. A. and Dowd, B. E. 1991. *Cost function analysis of medicare policy:Are reimbursement limits for rural home health agencies sufficient?.* J.of Health Economics,10,313-327.

Paudyal, N. K. 1996. *Technical efficiency of fish farmers in Nepal : a case study of Chakkar village development committee of Dhanusha district.* Master thesis, Thammasat University, Bangkok.

Pongsarananthakul A.1999. *Economy of scale in petroleum industry in Thailand.* Master thesis,Thammasat University,Bangkok.(in Thai)

Prompat P. 1998. *Economies of scale and economies of scope of commercial banks in Thailand.* Individual study, Chulalongkorn University, Bangkok.

Rogowski, J. A. and Newhouse, J. P. 1992. *Estimating the indirect costs of teaching.* J.of Health Economics,11,153-171.

Shiell, A., Pettipher, C., Raynes, N. and Wright, K. 1993. *A cost function analysis of residential services for adults with a learning disability.* J.of Health Economics,2,247-256.

Skinner, J. 1994. *What do stochastic frontier cost functions tell us about inefficiency?.* J.of Health Economics,13,323-328.

Sorber, B. 1993. *Performance Measurement in the Central Government Departments of the Netherlands.* Public Productivity and Management Review,17(1),59-69.

Suparatphoka C. 1997. *Productivity, economy of scale, regulation, and technical change in Electricity Generating Authority of Thailand (EGAT).* Master thesis, Thammasat University, Bangkok.

Taemthong K.1998. *The X-efficiency of Thai commercial bank.* Master thesis, Chulalongkorn University, Bangkok.(in Thai)

Termrattanakul W. 1998. *An estimation of domestic resource cost of hot-rolled sheet steel industry in Thailand.* Master thesis, Chulalongkorn University, Bangkok. (in Thai)

The eighth national economic and social development plan (1997-2001), The health consumer protection sector. Food and Drug Administration, Ministry of Public Health, Thailand, 1997.

Trisuthamas P. 1994. *Economy of scale on life insurance industries in Thailand.* Master thesis, Thammasat University, Bangkok. (in Thai)

Vasuprasat P. 1979. *Hospital cost functions in Bangkok.* Master thesis, Thammasat University, Bangkok.

Walker, G. 1998. *Economies of scale in Australia bank 1978-1990.* Australian economic paper,Blackwell Publishers Ltd/University of Adelaide and Flinders University of South Australia, March.

Zuckerman, S., Hadley, J. and Iezzoni, L. 1994. *Measuring hospital efficiency with frontier cost functions.* J.of Health Economics,13,255-280.

Appendices

Appendix A

Background and organization structure of the Thai FDA

Activities of Food and Drug control in Thailand began in 1909. The control was emphasized merely on adulteration of toxic substances in foods and drugs. The first legislation promulgated was the Narcotic Act, A.D. 1922 (B.E. 2465). The responsible agency was the Division of Narcotic, Ministry of Interior. The division was late transferred to Ministry of Public Health and was named as Food and Drug Division in 1942. The Division was divided into 3 sections; Food, Drug and Statistic and registration section. Later in 1965 the name was changed to Food and Drug Control Division under the Office of the Permanent Secretary for Public Health. The Division was also expanded to 5 sections namely; technical, registration, narcotic, advertisement control and inspection division. In 1972 the Division was transferred to be under Health Promotion Department and reorganized into 6 groups, namely; technical, provincial inspection, central inspection, narcotic and toxic substances, registration, and advertisement and information groups. On December 11,1974, the Food and Drug Control Division was promoted to the Office of Food and Drug Administration. Its status is equivalent to a Department of the Ministry of Public Health.

Important milestones

1922 Firstly, established as Division of Habit-Forming Drugs, Ministry of Interior and engaged in the works under the Harmful Habit-Forming Drug Act, 1922 (B.E. 2465).

1927 The Skimmed Milk Act was promulgated to prevent the public from being cheated with low nutritional values of milk products.

1934 Declaration of the Cannabis Act to protect the public from being addicted to the Cannabis.

1937 The division was reorganized and renamed to Food and Drug Section, Ministry of Interior.

1938 The Division of Consumer Welfare was included into the Food and Drug section and was named as the Division of Food and Drug, Ministry of Public Health. The division was divided into 3 sections; Food, Drug, and Registration and Statistics.

1939 The Kratom Act was promulgated to limit uses and propagation of Kratom trees.

1941 The Food Quality Control Act was promulgated.

1950 The Act on Sale of Drug was proclaimed.

1959 The Amendment of the Food Quality Control Act got to its start.

1964 The new revision of the Food Quality Control Act was promulgated.

1965 The division was remodified its internal organization to be five sections namely; Narcotics, Registration, Technical, Advertisement Control, and Inspection.

1967 The Toxic Substance Act and the Drug Act (B.E. 2510) were promulgated in the same year.

1972 The division was transferred from the Office of the Permanent-Secretary for Public Health to be under the Department of Health Promotion and was divided into 6 sections namely; Technical, Rural Inspection, Narcotics and

Toxic Substances, Food and Drug Registration, Central Inspection, and Advertising and Information Center.

1974 The office was promoted to be the Food and Drug Administration consisted of 8 divisions namely; Technical, Food, Drug, Cosmetic, Office of the secretary, Legal affairs group, Inspection, Advertisement and public relation.

1974 The Cosmetic Act, B.E. 2517 was originated.

1975 The Psychotropic Substance Act, B.E. 2518 and the Drug Act, B.E. 2518 (2^{nd} revision) were promulgated.

1979 The Narcotic Act, B.E. 2522, the Food Act, B.E. 2522 and the Drug Act, B.E. 2522 (3^{rd} revision) were promulgated.

1984 The Drug Act, B.E. 2527 (4^{th} revision) was declared.

1985 FDA was appointed by the Ministry of Public Health to be the National Focal Point for the International Programme on Chemical Safety (IPCS).

1987 The Drug Act, B.E. 2530 (5^{th} revision) was promulgated.

1988 The Medical Device Act, B.E. 2531 was declared.

1990 Volatile Substance Act, B.E. 2533 was promulgated.

1992 Hazardous Substance Act, B.E. 2535 (formerly, the Toxic Substance Act, B.E. 2510) was collaboratively proclaimed.

1992 Cosmetic Act, B.E. 2535 (2^{nd} revision) was promulgated.

present The office is consisted of 10 divisions, a legislation office and an information centre.

With regard to the organization of FDA, it comprises of 10 divisions and two smaller entities. Chart 1 showed the organization structure of Food and Drug Administration. The duties and responsibilities of each division are verified by their names. From the latest figures in 1999, there were totally 541 personnels (fully official capacity) in this office. Of this number, more than 60% hold degrees in either pharmacy or food technology, 4% have background in public health, nutrition, communication and public relations, 2% are lawyers and the rest 30% are supportive staffs. The administration is headed by a Secretary-General who is assisted by three Deputies.

		Number of positions
1.	High level administrators	14
2.	Pharmacists and food specialists	325
3.	Other health related personnels	52
4.	Lawyers	10
5.	Supportive staffs	140
	Total	541

The descriptions of each division are as the followings:

(1) Office of the Secretary

The office is headed by a senior administrative officer. Its responsibilities deal with general administration of finance, personnel, supplies and maintenance management. The office splits its duties into three sub-divisions, namely;

- Finance
- Personnel
- General Administration

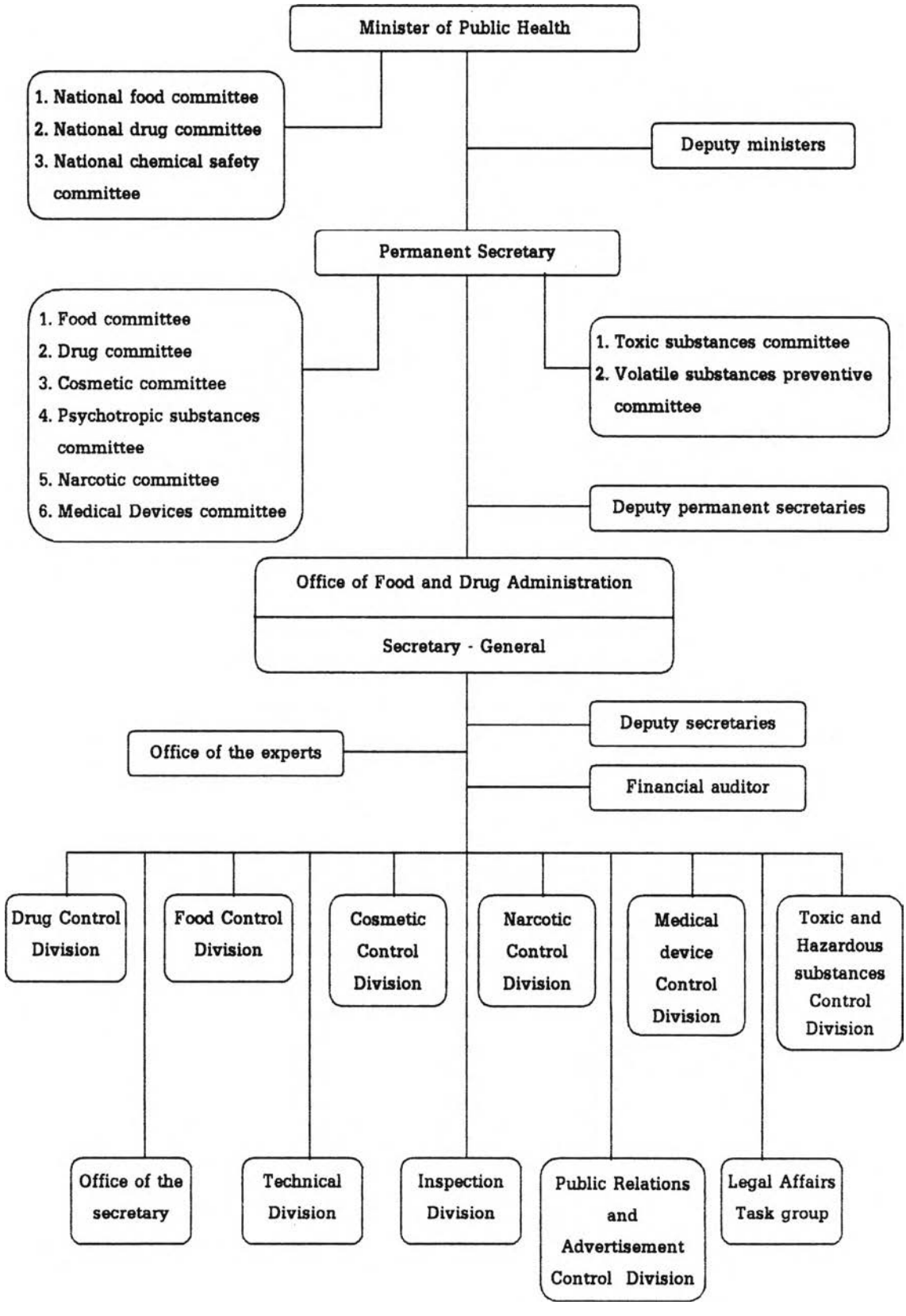

Chart 1 Organization of Food and Drug Administration

(2) Legal Affairs Group

The unit handles and administers all legal works concerned the earlier mentioned Acts. The jobs include general legal affairs, action consideration and recommendation of lawsuits, penalization, and legislative analysis.

(3) Technical Division

Coordination and formulating of the FDA policy, action plans, budgeting, monitoring the planned activities, evaluation of the FDA performance and all projects are undertaken by this division. Statistical compilation of FDA activities are carried out in various fields and generate data base filings. Numerous applied researches are done in collaboration with concerned agencies.

The division also acts as the National Adverse Drug Reaction Monitoring Center (NADRMC) by collection, compilation of adverse drug reactions which are spontaneously reported by medical and pharmaceutical professionals working in health service institutes throughout the country. Technical cooperation center, particularly the national focal point for the International Programme on Chemical Safety (IPCS), is also assigned.

(4) Drug Control Division

All kinds of control activities involved licensing of manufacturing, importation, exportation, and sale of drugs as well as granting registration certificates for drug products are the duties of this division. Those who wish to do such businesses must apply for a licence and register their products. Supervisory advises

are also given to manufacturers for upgrading their manufacturing quality to GMP standards.

(5) Food Control Division

The division is responsible for control of licensing for manufacturing, import, and export of food commodities and registration of specific-controlled food. Standard requirements of specific-controlled food and codes of hygienic practices as a guideline for manufacturers are elaborated, handled and periodically issued under the Ministerial Notification.

(6) Cosmetic Control Division

As indicated by its name, responsibilities of the division can not be any but licensing of manufacturing, import, and export premises and registration of specially-controlled cosmetics. It is also carrying out a surveillance programme in order to ensure safety, efficacy, and quality of cosmetics distributed in the market.

(7) Medical Device Control Division

The division manages and handles control activities related to manufacturing, importation and sale of medical devices in the country.

(8) Narcotic Control Division

Its function is to manage and handle activities on controlling manufacturing, importation, exportation, transfer and possession of narcotic and psychotropic substances. The division works in close cooperation and collaboration with the Office of Narcotic Control Board. Statistical reports concerning circulation and consumption

of narcotics in the kingdom must be regularly prepared and submitted to the International Narcotic Control Board (INCB).

(9) Toxic and Hazardous Substance Control Division

The division controls all household toxic and hazardous substances regarding to Toxic and Hazardous Substances Act, B.E. 2535.

(10) Inspection Division

The division carries out post-marketing surveillance, inspection with sampling, auditing, monitoring at customs and places or plants where manufacture, auditing import and sale of all products under the responsibilities of the FDA take place. Whenever non-compliance with the laws and regulations are found, the division may firstly notify and/or take legal action to the offenses and/or report the whole issues to the related subcommittees for further considerations. Surveillance programme has been monitored for products distributed in the market on safety, efficacy and quality assurance purposes.

(11) Public Relations and Advertisement Control Division

Tasks of this division include:

1) proper guidance and control over the advertisement of foods, drugs, and other controlled substances in accordance with the provisions in respective acts.

2) dissemination of information and relevant publications to various sectors.

3) periodically organizing and conducting educational programmes through various media.

(12) Information Center

This unit is mainly responsible for information technological development and maintenance of computer system. It also carries out information services and library activities to support various kinds of data and information.

In addition, the office of the provincial consumer protection was established as a collaborative center between FDA and provincial health offices, regarding to decentralization policy of the consumer protection programme in 1992 (B.E. 2535). The functions of the office are to promote and supervise provincial health officers on the consumer protection activities.

Inter-institutional, co-operation and collaboration

The Office of Food and Drug Administration is not equipped with all facilities and personnels that are capable of handling all kinds of jobs. Parts of the tasks need assistance from other competent institutes. Many institutes have continuously performed the tasks that the FDA cannot carry out completely by itself.

(1) Institutes under the Ministry of Public Health

Provincial health offices

Since 1992, all provincial health offices scattering in provinces throughout the country have been delegated by the FDA to take responsible for some extents according to delegated authorities, such as renewal of licences and registration certificates and approval of manufacturing, importation and selling licences.

Eventhough the Offices directly cooperate to the Office of the Permanent Secretary , they work in close collaboration with the FDA on safety monitoring and post-marketing surveillance of health products within their own boundaries.

Department of medical sciences

All laboratorial tasks are performed and carried out by the Department of medical sciences in Nonthaburi province and 12 regional centers scattering around the country. Divisions within the Department that work directly and co-operatively with the FDA are divisions of drug analysis, food analysis, food-for-export analysis, and toxicology. When FDA send product samples to the related divisions for various kinds of laboratorial analysis, then the Department will report the test results back to the FDA after the samples have been analyzed and evaluated.

Department of health

The work of the Department relates to monitoring and recommendation service operations on food hygienic services as well as alerting public awareness on uncleaned or nonhygienic food consumption. The main responsibilities are monitoring and upgrading sanitary conditions of food stores, markets, kitchens, restaurants, etc.

Department of medical services

Public hospitals under the Department of medical services, are also collaborated with the FDA, particularly NADRMC and IPCS. They cooperate and share their expertises on training courses in concerned subjects. Hospitals are good sources of information and data on adverse drug reaction and poisoning incident cases.

Government pharmaceutical organization (GPO)

GPO is a public enterprise under the Ministry of public health that work collaboratively with the FDA on training courses, seminars, drug campaigns, technical information and researches, especially for traditional medicine production, to serve the primary health care needs.

Health system research institute

The institute works with the FDA on various research projects related to health system such as drug utilization, rational use of drugs, drug consumption, national drug policy, adverse drug reaction, impacts and effects of authority decentralization, etc.

Chart 2 showed consumers' health protection network within the Ministry of Public Health

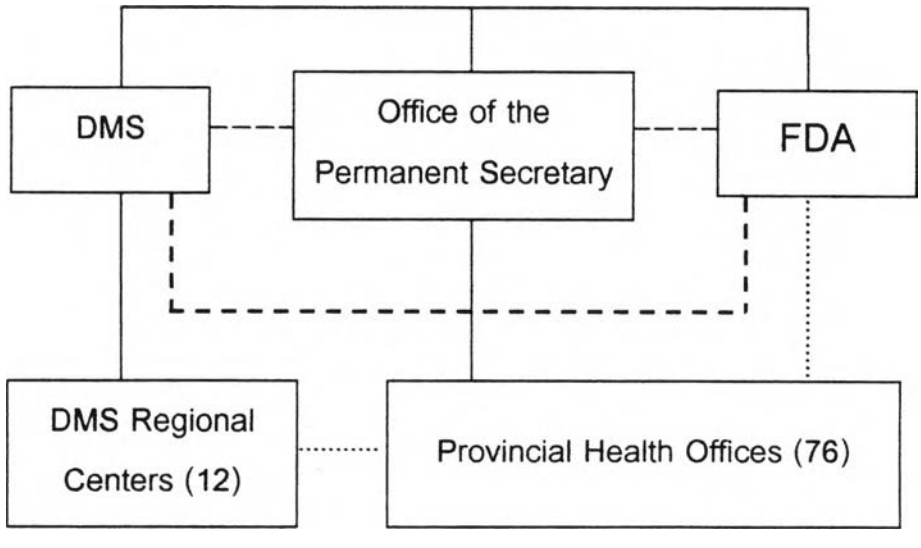

Chart 2 Consumers' Health Protection Network within the Ministry of Public Health

(2) Institutes outside the Ministry of Public Health

Many other ministries also deliver health services and contribute to good health of the people. Those institutes are:

- Ministry of University Affairs
- Ministry of Agriculture and Cooperatives:- Department of Agriculture, Department of Agriculture Extension, Department of Fisheries, Department of Livestock Development
- Ministry of Science, Technology and Environment:- Department of Science Service
- Ministry of Industry:- Thai Industrial Standard Institute
- Office of the Prime Minister:- Office of the Consumer Protection Board
- Bangkok Metropolitan Administration

Contributions of these institutes to the FDA tasks are, for example,

1) provision of their expertises by offering their delegates and experts to participate in the meetings of committees and subcommittees on various missions and occasions.

2) cooperation in research projects of mutual interest.

3) organizing and co-organizing seminars and training programs for officers, industrial personnels and business operators to conceptualize basic understanding and update their knowledge on technological advancement that they can apply to further develop in their works for the progress of the national industries and competition in the international businesses.

Appendix B

The data of costs and outputs of the Thai FDA,

by year 1980 - 1999

Table 3.1
Total costs (TC) of Thai FDA

	(1)		(2)	(3)	(4)	(5)	
year	total expenses	allocate budget to provincial health office	building	car	computer	cost of land	TC
1999	371,412,952	(66,535,190)	6,849,867	3,112,469 (-)	42,788,036 (24,409,430)	13,182,139	346,400,843
1998	467,466,078	(53,254,851)	6,849,867	3,182,230 (-)	36,834,516 (40,645,670)	25,544,146	445,976,316
1997	285,167,481	(43,331,596)	6,849,867	3,251,991 (3,264,000)	26,920,938 (48,371,845)	30,131,783	257,354,619
1996	237,520,304	(44,227,504)	6,849,867	2,787,299 (3,791,445)	15,122,927 (27,902,000)	33,222,983	219,582,431
1995	253,544,269	(43,439,377)	6,849,867*	2,247,515 (3,106,240)	8,317,561 (30,505,000)	35,464,845*	229,373,440
1994	195,349,449	(38,776,768)	3,424,934	1,839,167 (885,000)	877,317 (3,597,000)	59,249,454	217,481,553
1993	171,274,571	(30,290,028)	3,424,934	1,713,170 (3,902,500)		62,324,999	204,545,146
1992	107,027,848	-	3,424,934	1,157,575 (3,129,000)		64,880,727	173,362,084
1991	78,865,966	-	3,424,934	712,102 (2,379,800)		78,511,363	159,134,565
1990	68,938,700	-	3,424,934	373,292 (1,404,000)		62,697,272	134,030,198
1989	52,104,754	-	3,424,934	173,406 (490,000)		24,095,454	79,308,548
1988	41,947,000	-	3,424,934	103,645 (490,000)		9,996,000	54,981,579
1987	39,011,100	-	3,424,934	33,884 (-)		5,140,909	47,610,827
1986	38,270,100	-	3,424,934	33,884 (-)		4,279,364	46,008,282
1985	36,486,500	-	3,424,934 (1,500,000)	33,884 (238,000)		3,294,545	41,501,863
1984	30,145,600	-	3,304,054 (1,000,000)			3,534,545	35,984,199
1983	30,507,800	-	3,223,467 (4,000,000)			3,158,182	32,889,449
1982	42,398,700	-	2,901,120 (20,000,000)			3,499,091	28,798,911
1981	30,063,460	-	1,289,387 (12,000,000)			3,545,454	22,898,301
1980	17,804,400	-	322,347 (14,000,000)			3,545,454	17,672,201

TC = (1) + (2) + (3) + (4) + (5) - figure in ( )

( ) = real expenses

* moved from Tevaves, Bangkok to Nonthaburi province

Table 3.2
Cost of pre-marketing activities (C_1)
and Cost of post-marketing activities (C_2)

year	real expenses of pre-marketing activities	real expenses of post-marketing activities	C_1	C_2
1999	80,153,765	12,306,490	105,431,909	18,948,774
1998	79,485,909	14,073,451	98,382,990	19,795,745
1997	70,904,816	15,339,750	80,998,599	16,882,017
1996	68,245,812	20,385,190	85,886,354	22,210,837
1995	61,305,576	17,742,768	74,302,432	18,982,643
1994	55,509,288	17,057,544	94,575,263	23,911,764
1993	51,542,959	27,170,149	94,061,482	31,774,745
1992	65,233,383	25,776,542	109,434,921	30,832,826
1991	39,608,570	24,998,868	92,700,393	31,692,701
1990	31,062,066	24,221,193	73,938,429	29,905,776
1989	25,788,864	16,040,164	43,645,457	18,507,267
1988	20,150,887	12,533,453	28,835,858	13,527,826
1987	19.397,769	11,387,831	24,968,955	12,274,911
1986	18,382,500	10,791,800	23,393,682	11,592,725
1985	18,041,800	10,282,600	21,414,049	10,620,843
1984	13,533,700	9,356,400	17,328,789	9,940,259
1983	12,630,300	8,554,100	14,178,372	8,792,265
1982	9,861,500	7,146,900	1,021,637	5,786,921
1981	7,337,500	5,445,600	2,680.147	4,729,084
1980	6,043,500	4,369,300	5,957,571	4,356,080

C_1, C_2 are costs after adjustment by capital allocation.

Table 3.3
Unit price of labor (P_L)

year	E_L	number of staff	P_L
1999	113,828,340	529	215,176
1998	104,311,882	532	196,075
1997	96,115,041	532	180,667
1996	86,737,370	532	163,040
1995	81,441,972	503	161,912
1994	68,710,241	491	139,939
1993	66,729,989	498	133,996
1992	56,626,647	502	112,802
1991	46,879,055	481	97,462
1990	40,907,678	451	90,704
1989	34,502,326	441	78,237
1988	27,542,609	428	64,352
1987	25,809,656	414	62,342
1986	26,503,816	421	62,954
1985	25,003,600	409	61,134
1984	21,923,200	405	54,131
1983	18,739,100	344	54,474
1982	14,867,200	335	44,380
1981	12,758,160	327	39,016
1980	11,342,820	292	38,845

Table 3.4
Outputs of pre-marketing activities (Q1)

year	Qd	Qf	Qm	Qn	Qc	Qt	Q1	Q11	Q12	Q13
1999	7563	3003	514	1449	1739	922	15190	9315	15815	35573
1998	7535	2809	438	2429	1430	843	15484	14064	14486	26139
1997	6522	3052	418	3453	2547	748	16740	15806	13804	35172
1996	5708	3184	334	2826	3369	322	15743	13277	12774	40456
1995	6215	3632	340	3086	4469	942	18684	14408	15085	53771
1994	5314	3413	343	3286	3329	562	16247	14453	11934	44998
1993	5391	2730	284	3128	2425	479	14437	13903	10374	36876
1992	5366	3577	269	2055	1960	776	14003	13001	12223	26904
1991	4099	3158	-	2429	1665	208	11559	11769	6939	33852
1990	3768	2704	-	2271	1532	318	10593	11697	6215	28059
1989	3969	2571	-	3506	1522	117	11685	14696	5708	29510
1988	4591	2219	-	2350	1481	131	10772	11945	6714	26374
1987	5830	1841	-	2646	1146	89	11552	13023	8104	22890
1986	6052	1444	-	2460	1158	88	11202	11389	8858	12165
1985	6344	1049	-	2281	1154	91	10919	9929	9636	11273
1984	5365	985	-	1771	1152	115	9388	9964	6072	13676
1983	8788	1994	-	2327	1860	101	15070	12915	16417	16952
1982	6654	1020	-	2176	2425	172	12447	11083	13964	10326
1981	6029	1594	-	1504	1667	89	10883	9153	11744	13502
1980	6747	1490	-	667	1544	99	10547	7444	12702	12201

Qd = outputs of pre-marketing activities of drug product.
Qf = outputs of pre-marketing activities of food product.
Qm = outputs of pre-marketing activities of medical device product.
Qn = outputs of pre-marketing activities of narcotic and psychotropic substance.
Qc = outputs of pre-marketing activities of cosmetic product.
Qt = outputs of pre-marketing activities of toxic and hazardous substance.

Table 3.5
Outputs of post-marketing activities (Q2)

year	Q2	Q21	Q22	Q23
1999	14661	6524	6929	85872
1998	13627	4585	6580	85028
1997	11501	6307	6493	57320
1996	5936	4735	2163	29605
1995	9800	5052	4291	56329
1994	7701	1573	2954	55951
1993	8263	2628	4985	47202
1992	8730	4245	3294	53854
1991	19169	16550	14334	53816
1990	17347	17485	12798	39543
1989	17741	18097	12140	44317
1988	14359	13611	11236	32973
1987	12441	13926	7846	29477
1986	9434	13610	1804	30880
1985	17890	23899	10204	32279
1984	12692	18012	6839	20670
1983	13763	15963	8791	29825
1982	14779	15819	9432	37350
1981	12556	11496	8790	35626
1980	12096	12779	8035	29662

Appendix C

The estimated data of each cost function

obs	LNTC	LNQ3	LNPL	DUMMY
1980	16.68750	10.02761	10.56733	0.000000
1981	16.94657	10.06216	10.57173	0.000000
1982	17.17585	10.21193	10.70054	0.000000
1983	17.30866	10.26928	10.90548	0.000000
1984	17.39859	10.00243	10.89916	0.000000
1985	17.54125	10.26844	11.02082	0.000000
1986	17.64433	9.934792	11.05016	0.000000
1987	17.67857	10.08552	11.04039	0.000000
1988	17.82251	10.13186	11.07212	0.000000
1989	18.18886	10.28963	11.26750	0.000000
1990	18.71358	10.23781	11.41536	0.000000
1991	18.88526	10.33293	11.48722	0.000000
1992	18.97089	10.03157	11.63339	0.000000
1993	19.13630	10.03012	11.80557	0.000000
1994	19.19762	10.08364	11.84896	0.000000
1995	19.25086	10.25710	11.99481	0.000000
1996	19.20724	9.984099	12.00175	0.000000
1997	19.36597	10.24853	12.10441	0.000000
1998	19.91578	10.27887	12.18625	1.000000
1999	19.66311	10.30397	12.27921	0.000000

Dependent Variable: LNTC
Method: Least Squares
Date: 05/10/00 Time: 13:20
Sample: 1980 1999
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.298475	3.560389	-0.926437	0.3680
LNQ3	0.202217	0.358614	0.563885	0.5807
LNPL	1.717789	0.084714	20.27760	0.0000
DUMMY	0.202284	0.209023	0.967758	0.3476

R-squared	0.969541	Mean dependent var	18.33496
Adjusted R-squared	0.963830	S.D. dependent var	0.997357
S.E. of regression	0.189681	Akaike info criterion	-0.310085
Sum squared resid	0.575665	Schwarz criterion	-0.110938
Log likelihood	7.100845	F-statistic	169.7656
Durbin-Watson stat	0.742126	Prob(F-statistic)	0.000000

obs	LNTC	LNQ1	LNQ2	LNPL	DUMMY
1980	16.68750	9.263597	9.400630	10.56733	0.000000
1981	16.94657	9.294957	9.437954	10.57173	0.000000
1982	17.17585	9.429235	9.600963	10.70054	0.000000
1983	17.30866	9.620461	9.529739	10.90548	0.000000
1984	17.39859	9.147188	9.448727	10.89916	0.000000
1985	17.54125	9.298260	9.791997	11.02082	0.000000
1986	17.64433	9.323848	9.152075	11.05016	0.000000
1987	17.67857	9.354614	9.428753	11.04039	0.000000
1988	17.82251	9.284705	9.572132	11.07212	0.000000
1989	18.18886	9.366061	9.783634	11.26750	0.000000
1990	18.71358	9.267949	9.761175	11.41536	0.000000
1991	18.88526	9.355220	9.861050	11.48722	0.000000
1992	18.97089	9.547027	9.074521	11.63339	0.000000
1993	19.13630	9.577550	9.019543	11.80557	0.000000
1994	19.19762	9.695664	8.949105	11.84896	0.000000
1995	19.25086	9.835423	9.190138	11.99481	0.000000
1996	19.20724	9.664151	8.688791	12.00175	0.000000
1997	19.36597	9.725556	9.350189	12.10441	0.000000
1998	19.91578	9.647563	9.519808	12.18625	1.000000
1999	19.66311	9.628393	9.592946	12.27921	0.000000

Dependent Variable: LNTC
Method: Least Squares
Date: 05/10/00 Time: 13:23
Sample: 1980 1999
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.742336	3.607071	0.205800	0.8397
LNQ1	-0.500428	0.362524	-1.380400	0.1877
LNQ2	0.087129	0.156557	0.556529	0.5861
LNPL	1.887326	0.120986	15.59951	0.0000
DUMMY	0.172475	0.200120	0.861858	0.4023

R-squared	0.974588	Mean dependent var	18.33496
Adjusted R-squared	0.967811	S.D. dependent var	0.997357
S.E. of regression	0.178939	Akaike info criterion	-0.391231
Sum squared resid	0.480285	Schwarz criterion	-0.142298
Log likelihood	8.912307	F-statistic	143.8162
Durbin-Watson stat	0.711371	Prob(F-statistic)	0.000000

obs	LNTC	LNQ11	LNQ12	LNQ13	LNQ21	LNQ22
1980	16.68750	8.915164	9.449515	9.409273	9.455558	8.991562
1981	16.94657	9.121837	9.371098	9.510593	9.349754	9.081370
1982	17.17585	9.313168	9.544238	9.242420	9.668967	9.151863
1983	17.30866	9.466145	9.706073	9.738141	9.678029	9.081484
1984	17.39859	9.206734	8.711443	9.523398	9.798793	8.830397
1985	17.54125	9.203215	9.173261	9.330166	10.08159	9.230535
1986	17.64433	9.340403	9.089076	9.406318	9.518560	7.497762
1987	17.67857	9.474472	9.000113	10.03846	9.541513	8.967759
1988	17.82251	9.388068	8.811950	10.18013	9.518634	9.326878
1989	18.18886	9.595331	8.649624	10.29248	9.803501	9.404261
1990	18.71358	9.367088	8.734721	10.24206	9.769099	9.457044
1991	18.88526	9.373224	8.844913	10.42975	9.714141	9.570390
1992	18.97089	9.472782	9.411075	10.20003	8.353497	8.099858
1993	19.13630	9.539860	9.247058	10.51532	7.873978	8.514189
1994	19.19762	9.578657	9.387147	10.71437	7.360740	7.990915
1995	19.25086	9.575539	9.621456	10.89249	8.527539	8.364275
1996	19.20724	9.493788	9.455167	10.60797	8.462737	7.679251
1997	19.36597	9.668145	9.532714	10.46801	8.749415	8.778480
1998	19.91578	9.551374	9.580938	10.17118	8.430545	8.791790
1999	19.66311	9.139381	9.668714	10.47934	8.783243	8.843471

obs	LNQ23	LNPL	DUMMY
1980	10.29762	10.56733	0.000000
1981	10.48083	10.57173	0.000000
1982	10.52809	10.70054	0.000000
1983	10.30310	10.90548	0.000000
1984	9.936439	10.89916	0.000000
1985	10.38217	11.02082	0.000000
1986	10.33786	11.05016	0.000000
1987	10.29137	11.04039	0.000000
1988	10.40344	11.07212	0.000000
1989	10.69912	11.26750	0.000000
1990	10.58514	11.41536	0.000000
1991	10.89333	11.48722	0.000000
1992	10.89403	11.63339	0.000000
1993	10.76219	11.80557	0.000000
1994	10.93223	11.84896	0.000000
1995	10.93896	11.99481	0.000000
1996	10.29570	12.00175	0.000000
1997	10.95640	12.10441	0.000000
1998	11.35074	12.18625	1.000000
1999	11.36061	12.27921	0.000000

Dependent Variable: LNTC
Method: Least Squares
Date: 05/10/00 Time: 13:26
Sample: 1980 1999
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.215355	3.041099	-0.070815	0.9448
LNQ11	0.135289	0.247099	0.547509	0.5950
LNQ12	-0.372322	0.131257	-2.836593	0.0162
LNQ13	0.052546	0.195510	0.268761	0.7931
LNQ21	-0.075869	0.102736	-0.738485	0.4757
LNQ22	0.011438	0.105749	0.108163	0.9158
LNQ23	0.365683	0.187227	1.953154	0.0767
LNPL	1.482443	0.185478	7.992566	0.0000
DUMMY	0.194540	0.205697	0.945763	0.3646

R-squared	0.987559	Mean dependent var	18.33496
Adjusted R-squared	0.978511	S.D. dependent var	0.997357
S.E. of regression	0.146204	Akaike info criterion	-0 705469
Sum squared resid	0.235131	Schwarz criterion	-0 257389
Log likelihood	16.05469	F-statistic	109.1468
Durbin-Watson stat	1.437099	Prob(F-statistic)	0.000000

obs	LNC1	LNQ11	LNQ12	LNQ13	LNPL	DUMMY1
1980	15.60017	8.915164	9.449515	9.409273	10.56733	0.000000
1981	14.80138	9.121837	9.371098	9.510593	10.57173	0.000000
1982	13.83692	9.313168	9.544238	9.242420	10.70054	0.000000
1983	16.46723	9.466145	9.706073	9.738141	10.90548	0.000000
1984	16.66788	9.206734	8.711443	9.523398	10.89916	0.000000
1985	16.87956	9.203215	9.173261	9.330166	11.02082	0.000000
1986	16.96798	9.340403	9.089076	9.406318	11.05016	0.000000
1987	17.03314	9.474472	9.000113	10.03846	11.04039	0.000000
1988	17.17713	9.388068	8.811950	10.18013	11.07212	0.000000
1989	17.59161	9.595331	8.649624	10.29248	11.26750	0.000000
1990	18.11874	9.367088	8.734721	10.24206	11.41536	0.000000
1991	18.34488	9.373224	8.844913	10.42975	11.48722	0.000000
1992	18.51084	9.472782	9.411075	10.20003	11.63339	1.000000
1993	18.35946	9.539860	9.247058	10.51532	11.80557	1.000000
1994	18.36491	9.578657	9.387147	10.71437	11.84896	1.000000
1995	18.12365	9.575539	9.621456	10.89249	11.99481	1.000000
1996	18.26854	9.493788	9.455167	10.60797	12.00175	1.000000
1997	18.20994	9.668145	9.532714	10.46801	12.10441	1.000000
1998	18.40438	9.551374	9.580938	10.17118	12.18625	1.000000
1999	18.47358	9.139381	9.668714	10.47934	12.27921	1.000000

Dependent Variable: LNC1
Method: Least Squares
Date: 05/10/00 Time: 13:29
Sample: 1980 1999
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.272177	12.36377	0.426421	0.6763
LNQ11	-0.156323	0.923941	-0.169191	0.8681
LNQ12	-1.372846	0.576102	-2.382992	0.0319
LNQ13	0.413087	0.548916	0.752551	0.4642
LNPL	1.931677	0.675021	2.861657	0.0126
DUMMY1	0.093398	0.758351	0.123159	0.9037

R-squared	0.858409	Mean dependent var	17.31010
Adjusted R-squared	0.807841	S.D. dependent var	1.321900
S.E. of regression	0.579467	Akaike info criterion	1.989908
Sum squared resid	4.700945	Schwarz criterion	2.288628
Log likelihood	-13.89908	F-statistic	16.97533
Durbin-Watson stat	2.140506	Prob(F-statistic)	0.000017

obs	LNC2	LNQ21	LNQ22	LNQ23	LNPL	DUMMY1
1980	15.28708	9.455558	8.991562	10.29762	10.56733	0.000000
1981	15.36924	9.349754	9.081370	10.48083	10.57173	0.000000
1982	15.57111	9.668967	9.151863	10.52809	10.70054	0.000000
1983	15.98938	9.678029	9.081484	10.30310	10.90548	0.000000
1984	16.11210	9.798793	8.830397	9.936439	10.89916	0.000000
1985	16.17833	10.08159	9.230535	10.38217	11.02082	0.000000
1986	16.26589	9.518560	7.497762	10.33786	11.05016	0.000000
1987	16.32307	9.541513	8.967759	10.29137	11.04039	0.000000
1988	16.42026	9.518634	9.326878	10.40344	11.07212	0.000000
1989	16.73367	9.803501	9.404261	10.69912	11.26750	0.000000
1990	17.21356	9.769099	9.457044	10.58514	11.41536	0.000000
1991	17.27160	9.714141	9.570390	10.89333	11.48722	0.000000
1992	17.24409	8.353497	8.099858	10.89403	11.63339	1.000000
1993	17.27418	7.873978	8.514189	10.76219	11.80557	1.000000
1994	16.98988	7.360740	7.990915	10.93223	11.84896	1.000000
1995	16.75904	8.527539	8.364275	10.93896	11.99481	1.000000
1996	16.91609	8.462737	7.679251	10.29570	12.00175	1.000000
1997	16.64176	8.749415	8.778480	10.95640	12.10441	1.000000
1998	16.80098	8.430545	8.791790	11.35074	12.18625	1.000000
1999	16.75725	8.783243	8.843471	11.36061	12.27921	1.000000

Dependent Variable: LNC2
Method: Least Squares
Date: 05/10/00 Time: 13:32
Sample: 1980 1999
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.540270	4.181375	1.085832	0.2959
LNQ21	-0.560441	0.299176	-1.873278	0.0821
LNQ22	0.071832	0.224141	0.320474	0.7533
LNQ23	-0.357060	0.415712	-0.858910	0.4049
LNPL	1.834028	0.406878	4.507560	0.0005
DUMMY1	-1.627942	0.660911	-2.463179	0.0273

R-squared	0.741114	Mean dependent var	16.50593
Adjusted R-squared	0.648655	S.D. dependent var	0.615086
S.E. of regression	0.364589	Akaike info criterion	1.063231
Sum squared resid	1.860948	Schwarz criterion	1.361950
Log likelihood	-4.632308	F-statistic	8.015571
Durbin-Watson stat	0.731709	Prob(F-statistic)	0.000944

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Education :

	Degree	Name of Institutes	Year of Graduation
1.	MPA	Faculty of Political Science, Chulalongkorn University, Thailand.	1996
2.	B.Sc.in Pharm	Faculty of Pharmaceutical Science, Chulalongkorn University, Thailand.	1988

Position Held :

Year	Position
1988-1988	Quality control in laboratory, Yaowarash co.,Ltd.
1988-1990	Registration Pharmacist, East Asiatic (Thailand) co.,Ltd.
1990-1993	Inspector, Inspection Division, FDA.
1993-1997	Policy and plan analyst, Technical Division, FDA.
1997-present	Pharmacist, Technical Division, FDA.

Current job : The national adverse product reaction (APR) monitoring center, FDA.