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DISCUSSION PAPER SERIES

Number 58

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Social Security in Thailand: Growth, Trend and Problems

by Medhi Krongkaew
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Introduction

As of 1977, Thailand still lags far behind most countries in the world in standard social security measures. No social insurance scheme is under operation today despite the fact that the legislation enabling the establishment of such a system (the Social Insurance Act, B.E. 2497) has been in the statute book for more than 20 years. The system of workmen's compensation which can be construed as a social insurance scheme, has been in operation for only three years. The existence of present public welfare and health programmes is limited in scope, operation and permanency. Considering the underdeveloped nature of the economy where the majority of the population are poor, the relatively unresponsive role of the public sector as regards the significance of public welfare and social security is rather perplexing and largely undesirable.

What contributes to this lack of development in social security efforts in Thailand? What have been the attempts of the government in instituting various measures to help those who are economically or socially in need? What are the directions to which Thailand should turn regarding social security policies at present?

To be able to answer these questions, one should possess the knowledge
of the past and present social situations and the vicissitudes of
social policies which have been proclaimed, implemented, or failed.

The purpose of this paper is, therefore, to give a histori-
cal account of the development of social security activities in Thailand
in the last four decades or so. It does not pretend to be an exhaus-
tive or definitive treatise on social security in Thailand; it only
gives an overview of the attempts made by the Thai government to de-
velop measures of social security protection to its working force and
the general population, the problems encountered in such attempts, the
present stage of social security planning and development in the coun-
try, and the prospects for the future. The main emphasis will be
placed on the social insurance aspect of social security to conform
with general usage. Other aspects of broadly defined social security
which include social assistance and public services will also be dis-
cussed although in much less detail in the last part of the paper.

Early Attempts at Social Security Measures

The earliest attempt at establishing a full-fledged social
security programme in Thailand can be traced back to 1932 when the
country changed from absolute monarchy to constitutional monarchy.
One important part of the National Economic Policy (NEP) of Nai Pridi
Phanomyong, one of the coup leaders who was assigned the duty of
drawing up a future economic plan for the country, aimed at setting up

a social insurance scheme in which every Thai citizen resident in Thailand would be entitled to receive regular income from the government or from one of the cooperative societies in an amount to be determined by law.[1] In other words, every citizen was to be made a government employee under one of 30 different official ranks based on academic or professional qualifications.[2] Certainly, this appeared to be too radical a move for a country just changed from an absolute monarchy: the proposal was finally rejected by the Prime Minister (Phrya Mano), and its author (Pridi) banished from the country on a charge of being a communist. But even when Pridi returned to the country, and later became the Prime Minister himself, he never succeeded in launching this NEP programme. The political upheavals in the country in the ensuing years forced Pridi to leave the country many times, and for practical purposes the NEP lost all of its identity and significance.

The actual legislative and administrative role of the government in the realm of public welfare in the prewar period was then quite minimal. The most outstanding public welfare activity was, perhaps, public health and hygene, but even this was confined to Bangkok and few other provincial centers. The public servants were the exception of course; they were protected by relative job security, allowance for paid sick leave, child support and school fees, and most of all, pensions at retirement.

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[1] See Kenneth P. Landon, 'Siam in Transition' New York: Greenwood Press, 1968, pp. 264-7 and 294-7.

[2] See Ibid. pp. 294-5.

As the industrial and commercial workers in the capital
city and other urban centers were still few and consisted mainly of
Chinese, the government was reluctant to initiate any social security
measures that would protect these workers.[3] The relevant labour le-
gislation before the Second World War included, for example, Part 3,
Section 6 of the Civil and Commercial Code of 1929, which dealt with
legitimate hiring practices, the Employment Bureau and the Local Em-
ployment Opportunity Acts both of 1932, and the Factory Control Act
of 1939.

In 1938, a comprehensive labour bill designed to cover the
whole field of wages, hours of work, conditions of women and child
labour, old-age pensions and workmen's insurance was turned down by
the national assembly for the reason that the law would help Chinese
labourers more than Thai. In 1944, a labour bill was again introduced
to the Parliament by a member of parliment. He was later asked by
the government to withdraw the bill (he agreed to do so) on the ground
that such a law should not he applied to the present Thai industry
which was still in its infancy stage, and that most employees were
treated fairly and contentedly just like members of the employer's
family.[4]

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[3] See Virginia Thompson, Virginia Thompson, Labour Problems in
Southeast Asia New Haven; Yale University Press, 1947, p. 230.

[4] See Phaisit Phipatkul, Lectures on Labour Laws, Bangkok:
Ramkamhaeng University, no date, p. 8.

Development After the Second World War.

The periods after the War saw many changes in the government labour and social welfare policies. In addition to the first internationally recognized labour union in Thailand, the Central Union of Labour (CUL), which had been in existence since 1944, another labour union, the Thai Union of Labour (TUL) was allowed to be established in 1948. From this beginning, the labour movement has gone into periods of ups and downs, but culminated in 1956 with the promulgation of the first comprehensive labor legislation in Thailand, the Labour Act, B.E. 2499.

This Act provided for the protection of industrial labour in terms of conditions of work and employment, wages, injury compensation, regulations on the setting up of labour unions, and on labour-management relations in general. Although this Act was abrogated shortly after it was put to use as a result of a coup d'état in 1957, it was replaced by the "Notification of the Revolutionary Party number 19" which empowered the Ministry of Interior to issue several labour protection rules and regulations similar to the repealed law, the major difference being only the outlawing of labour unions. The adoption of the Labour Relations Act of 1975, where unionization is now legalized, signifies the end of a modern movement for labour legislation and administration in Thailand.

On the side of social insurance proper, the government's endeavor was not as successful. After the debacle of Pridi's **assurance sociale** programme in the early thirties, nothing was done which would

gear the country to the acceptance of social insurance system, until 1952 when Field Marshall Pibulsongkram, after his return from a world tour, set up a Social Welfare Committee to consider an appropriate social welfare plan for the public in general with himself as the chairman of the Committee. After the committee had convened and re-solved that a social insurance scheme was needed to provide the general public with security in life and employment, a 3-member subcommittee was appointed to prepare such a scheme. This subcommittee took only 6 weeks to study the ways and means of a social insurance system, and finally submitted the draft of the Social Insurance Bill to the Committee and the Government in November, 1952. Over a year later, the Bill passed the Parliament to become law on February 10, 1954.

The Social Insurance Act, B.E. 2497: Its Rise and Decline.

Indeed this law has created a milestone in the development of social security in Thailand. Never before had the government made a stronger move toward this internationally accepted approach to so-cial security. Roughly, the Act provides for benefits covering six types of contingencies: maternity, sickness, invalidity, child care, old age, and death (funeral expenses). Every citizen aged 16 to 60 in the designated location, except public servants, could voluntarily insure himself with the scheme. For employees having income over a certain level (baht 500 per month), however, the insurance is compul-sory. The contributions are varied according to the level of earned income, and the benefits could be made both in cash and in kind. The

administration of social insurance scheme was to be carried out by

the newly created Department of Social Insurance in the Ministry of

Finance under the policy supervision of the Social Insurance Committee.

Certain operational details such as the geographical areas to be

covered, persons to be exempted, the procedure of collecting or chang-

ing the rates of contribution, the types and rates of benefits to

be paid, were to be decided later through Royal Decrees or Ministerial

Regulations.

The success seen in the enactment of this legislation belied

the basic problems that the government had yet to solve. The popula-

tion at large was still ignorant of the concept of social insurance,

and many believed that the insurance contributions were government

taxes in different guise. The administrative body was hurriedly set

up, drawing officials who had little or no experience in social se-

curity from other government departments. The Act itself lacked suf-

ficient operational details especially on the crucial matter of scope

of benefits, and in general was too ambitious for the first practical

attempt.

So, the programme came under heavy public criticism. More

than 2 years after the law came into effect, and the bureaucratic

machinery was set up and waiting, the programme was still grounded.

Another coup in 1958 killed the chance for the implementation of the

Act. The new Cabinet's decision in April, 1958 shelved the plan to

launch a social insurance programme according to the 1954 Act, and a

new law was to be prepared. The Department of Social Insurance was disbanded, but the staff of its research division were transferred to the Department of Public Welfare to form a new Social Security Division with the main responsibility of preparing an improved social insurance bill.

In 1959, a new Committee to Improve the Social Insurance Act was appointed by the Council of Ministers to draw up a new bill. The completed social insurance bill was submitted to the Government in 1961. This bill was then sent to be examined by the Juridical Council where many objections were raised. A resubmission of the bill after its recall for changes by the Ministry of Interior passed the Juridical Council's screening, but the Government was still not satisfied. In 1964, five years after the new bill was received, the Government decided to let the National Research Council make a further study of the feasibility or appropriateness of the new social insurance bill.

The National Research Council took over one year to study the bill. After the study of the population composition of Thailand, medical services provided by the government, and the survey of industrial workers in Bangkok and Thonburi, the practices of seeking medical help of these workers, and their attitudes toward social insurance in general, the National Research Council recommended the following two policy options:[5]

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[5] National Research Council, Research Report: Social Insurance
     Bill, Bangkok: National Research Council, 1965.

Either (1) The government should not proceed to enact this social insurance bill until a more appropriate time in the future. At the same time existing business establishments must be coerced to strictly adhere to the present (labour) laws, and study must be made as to what types of social insurance were most needed by the general population.

Or (2) The government could pursue the enactment of this new bill. As a trial measure certain employees could be allowed to have voluntary insurance, but employers could force the employees to insure. It would be sufficient for the present staff of the Social Security Division to operate the programme without setting up a new Office of Social Insurance, and to make medical arrangements with existing public and private hospitals without building new hospitals.

In November, 1965, the Council of Ministers selected to withdraw the bill until a more appropriate time.

Contributions of the ILO

Throughout the development of social insurance efforts in over three decades from the fifties to the seventies Thailand has been receiving assistance on the planning of social insurance system by the International Labour Organization. The assistance consisted of official expert missions, numerous seminars and conferences in which Thai officials involved were invited to attend, various publications that indirectly stimulate the interest in the field, and many official and non-official contacts with the Thai authorities. Of this

assistance, the recommendations of ILO experts on social insurance planning and implementation have been particularly useful; the present idea has incorporated many of these recommendations. Therefore, it is important to review the character of the assistance further.

The first social insurance mission was carried out by Mrs. Ida C. Merriam, an official of the US Social Security Administration, upon a request for technical assistance by the Thai Government.[6] Mrs. Merriam spent about three months in Thailand from October 1955 to January 1956 learning about the country and analyzing the Social Insurance Act of 1954 with the aim of making an overall assessment of the suitability of the Social Insurance Act and to suggest any changes in the law before it was put into effect. She concluded that a social insurance programme was important for Thailand in the period of growing industrialization. The major recommendations were that the scheme should be applied to only one or two districts at first; the coverage should include employees earning less than the limit set in the Act (Baht 500); the benefit provisions of the Act should be extended to include employment injuries as well; the programme should be limited to employees on compulsory contributions only; contribution rates for different wage classes should be changed; and the investments of the insurance fund be more carefully planned. Even when these recommendations were implemented, Mrs. Merriam still

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[6] ILO, Report to the Government of Thailand on the Application of the Social Insurance Act (ILO/TAP/Thailand/R.6), Geneva, 1956.

insisted that a final decision on the effective date of the scheme, should be postponed until planning was further advanced; considerable time was still required to take the various steps that were necessary before the programme could be instituted on a sound basis.

The second expert mission on social insurance in Thailand was headed by Mr. W. H. Wandel, an expert on general administration of social insurance schemes from the U.S., and Dr. C. C. Cuccodoro, a medical expert from Italy.[7] Both experts were in Thailand from the latter part of 1957 to the middle of 1958. The period of the mission coincided with the internal confusion created by another coup d'état. So, instead of finding the most desirable coordination of the administration of the social insurance scheme with the programme of protection for industrial injury, maternity and sickness embodied in the labour Act of 1956 which was abolished (a victim of the coup), the purpose of the mission was changed to drafting a new social insurance legislation and a plan for its administrative organization.

Major recommendations were similar to those made by Mrs. Merriam; only minor details differed. According to Wandel and Cuccodoro, the new scheme should cover only employment injury, maternity and sickness. Up to 60% of wage should be paid for sick-leave. Greater use of cash benefits should be allowed, and an extension of protection against contingencies of old-age, invalidity and survivorship after

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[7] ILO, Report to the Government of Thailand on Social Security Measures (ILO/TAP/Thailand/R.9), Geneva, 1959.

some years of successful experience should be made.

In 1961, the ILO sent its third expert mission on social insurance to Thailand. Head of the mission was Mr. F.E. Amato - Gauci of Malta who spent almost one year in Thailand.[8/] The purpose of this mission was similar to that of the second mission: to advise on the preparation of a new, comprehensive social insurance legislation, a plan for its implementation, and its administrative organization. The last expert mission of social insurance took place in 1968.[9/] It was led by Mr. E.D. Tsoucatos whose final recommendations were essentially those of Amato - Gauci and Wandel and Cuccodoro. The recommendations of these ILO experts were by then quite complete, and they had helped the formulation of the social insurance bill in its present form.

The Workmen's Compensation Scheme

Whereas the social insurance efforts were struggling to survive, the labour welfare had managed to succeed in various legislative or administrative overtures. Despite the short life of the 1956 Labour Act, the spirit of the attempt to protect industrial labour was kept alive, albeit faintly, in the "Announcement of the Revolutionary Party Number 19" dated 31 October, 1958 and various

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[8/] ILO, Report to the Government of Thailand on Proposed Social Security Legislation (ILO/TAP/Thailand/R.19), Geneva, 1962.

[9/] E.D. Tsoucatos, "Report on a Social Security Scheme in Thailand", August, 1968 (Mimeographed).

notifications of the Ministry of Interior. In 1971, there was another
coup d'état, but this time the coup leaders were convinced by the
arguments of labour officials that protection of labour and good re-
lations between employers and employees were important for the econo-
mic and social developments of the country.[10] The "Announcement of
the National Executive Council Number 10³" was issued in 1972 replac-
ing the previous "Announcement number 19' and empowered the Ministry
of Interior to impose regulations on the general employment practices,
hours of work and holidays, use of woman and child labour, minimum
wage and overtime payments, compensation for termination of employ-
ment, health and employment safety facilities, and the responsibility
of employers in compensating the employees who became ill or were in-
jured as a result of work.

For many, employment injury benefits always rank highest in
their labour protection schemes, and, as such, are often incorporated
in a broader social insurance scheme. There were two major develop-
ment regarding benefits or compensation for employment injuries: the
first was the general acceptance of the (employer's) liability-without-
fault doctrine over (employee's) own-risk doctrine applicable to in-
juries related to, or caused by, employment; and the second was the
growing public assumption of the administration of the compensation
fund. These developments have now been widely adopted. And as can
be seen in the opinions of all four ILO missions, the establishment

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[10] See Nikorn Chandrawitun, "Labour Laws of Thailand" in A Collec-
tion of Labour Laws, 1975, Bangkok: Department of Labour, 1975.

of the workmen's compensation system was highly recommended.

It is fortunate that while the future of the broader social insurance plan was still in doubt, the workmen's compensation system was taking shape in 1972. Through Section 3 of the Announcement number 103", the Office of Workmen's Compensation Fund was set up in the Department of Labour, taking over the payment of work injuries from private employers. The Workmen's Compensation Committee (WCC) was also set up to advise the Ministry of Interior on the type of business activity in which the employer must make a compulsory contribution, the rates of such contributions, and general operating policies of the office.

The Department of Labour started the operation of a workmen's compensation scheme in the middle of 1972. One of the first tasks that the WCC did was to design the rates of contribution in different businesses or industrial activities. These ranged from the highest rate of 4.5 percent of the wage payments in underground mining to the lowest rate of 0.2 percent of wage payments in such activities as watch repairing, tailoring, working in financial institutions and so on.[11] The registation of employers in Bangkok Metropolitan Areas having 20 or more employees started in the middle of 1973, and the collection of contributions started January 1st, 1974. In 1976 the scope of operation of the Workmen's Compensation scheme was extended

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[11] See Notification of Ministry of Interior Re: Rates and Method of Collection of Compensation Fund, Benefit Payments of the Office of Workmen's Compensation Fund, and the Appeal.

to cover five more provinces adjacent to Bangkok, namely Samutprakarn, Nontburi, Pratumthani, Samutsakcrn, and Nakorn Pathom. Eventually, all provinces will be covered by the plan.

The record of the operation in the last 3 years (for Bangkok areas only) showing the amount of contributions received, compensation paid, member of cases of injuries, and compensation to contribution or loss ratio is shown in Table 1 below:

Table 1: Cases of Injuries, Compensation Fund, Benefit Payment, Loss Ratio and Compensation per Injury Case, Bangkok Metropolitan Area, 1974-1976

Year (1)	Injury Cases (2)	Compensation Made (Million baht) (3)	Contribu-tion Received (Million ฿) (4)	Loss Ratio (5)=(3)÷(4)	Compensation per injury case (baht) (6)
1974	3,200	16.4	24.2	.678	5,125
1975	4,605	23.5	34.8	.676	5,103
1976	6,062	31.1	47.4	.658	5,135

Source: Report of the Operation of the Office of the Workmen's Compensation Fund, 1976, Department of Labour Ministry of Interior, 1977.

It can be seen from this table that the amount of contributions kept growing every year, but so did the amount of compensation paid and the number of cases of employment injuries. An extraordinary thing was that the loss ratio and the compensation per injury in each of the three years remains virtually the same from year to year (see column 5 and 6). The less-than-unity loss ratio means either that the compensation rates were too low or that the contribution rates were too high, and efforts should be made to make the ratio as close to one as possible with allowances for adequate administrative costs.[12] Overall, the workmen's compensation system is on its way to become a permanent feature in labour protection in Thailand which, one day, could be merged with a broader social insurance system.

Status of Social Insurance Movement in 1977

The government's decision in 1965 to postpone the enactment of the social insurance bill indefinitely was a blow to advocates of such a system. The old sentiment, however, still lingered: the government still allowed the Social Security Division to function in the capacity of planner of a new social insurance programme, and the old Social Insurance Preparatory Committee was not dissolved. Although no substantive work was done in the late 1960's and early 1970's the existence of the committee was referred to periodically by the Government.

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[12] As of late 1977, the WCC is in the process of changing the entire contribution rate structure useing the statistics and experience gained in the past three years, as a guideline for new rates.

In 1974, another committee was set up to consider a social insurance project, workmen's compensation project, and provident fund project all at the same time. The result of the consideration of this new committee was that (i) it argued in principle that there should be a social insurance law; (ii) the Ministry of Interior would be responsible for drafting a social insurance bill to be submitted the Prime Minister and the Council of Ministers, and (iii) the Ministry of Interior would be assigned the job of preparing for the eventual appearance of a social insurance programme. In May, 1975, the Council of Ministers appointed the National Insurance Committee, replacing the Committee to Consider Social Insurance Project, workmen's compensation Fund and Provident Fund. This is the latest committee to consider social insurance problems and prospects in Thailand.

In 1977, the Social Security Division has finished the drafting of another social insurance bill to be sent to the Minister of Interior for consideration. The main features of this bill are as follows:

(a) on coverage, three contingencies, namely, sickness, maternity and funeral expenses will be covered;

(b) on contribution, the employee/employer/government share of the contribution is, respectively, 1:2:1 with the insured person contributing no more than 2% of his wage;

(c) on benefits, the insured persons must be insured for at least 90 days before being eligible to receive benefits, and the detail of each benefit is clearly spelled out; and

(d) on administration, the Office of National Insurance
(ONI) is to be set up in the jurisdiction of the Ministry of Interior
to implement the social insurance plan under the policy supervision of
the National Insurance Committee (NIC).

As for the practical operational plan of this social insurance
scheme, the Social Security Division has set the following objectives:[13]

A. In the first five-years, the National Insurance Office
will:

(1) carry out the social insurance programme in Bangkok
areas covering sickness, maternity, employment injures, invalidity,
old-age death. But insurance on sickness, maternity and funeral ex-
penses will be applicable at first only to private establishments hav-
ing 20 or more employees. Later, establishment with 10 or more employees
will be included, and the operation of the workmen's compensation fund
will be taken over from the Department of Labour;

(2) extend the three insurance services to the pro-
vinces at a rate of 8 to 10 provinces annually for employers having
more than 10 employees;

(3) establish a special training school for prospective
social insurance officials.

13/ Social Security Division, Department of Public Welfare, "Social
Insurance Programme of Public Welfare Department, Ministry of
Interior" (mimeographed).

B. In the second five-years, the following achievements
are expected:

(1) The social insurance plan will be expanded to cover
all businesses or industrial firms having one or more employees.
Furthermore, sickness benefits will be extended to members of the family
of the insured as well.

(2) For those provinces where sickness, maternity and
funeral expenses insurance are already in operation, two more types
of insurance will be added: invalidity and old-age.

(3) At the end of the period, all provinces will have
had insurance facilities covering at least sickness, maternity and
funeral expenses.

C. In the third-five-years, the following aims should be
accomplished:

(1) All types of insurance (except unemployment insurance)
will be adopted nationwide.

(2) Preparation will be made to include farmers and
fishermen in the scheme.

(3) Preparation for a voluntary contribution system and
unemployment insurance will be made.

A Statistical Support of the Social Insurance Programme

In order to substantiate the claim that the need for a social

insurance scheme, especially in the capital city of Bangkok, is quite

acute, the Social Security Division joined the Statistics Division of

the Faculty of Commerce and Accountancy, Chulalongkorn University in

conducting a survey of welfare of employees in Bangkok Metropolitan

areas in 1975. Over 4000 establishments in all economic activities

with the total number of employees over 280,000 were surveyed of which

the pertinent results on welfare conditions of employees are shown in

Table 2 below:-

Table 2: Percentage Distribution of Establishments Providing Medical
and Other Welfare Services to Their Employees, Bangkok
Metropolitan Areas, 1975

Type of Establishment	Medical Services		Other Services	
	Yes	No	Yes	No
Single Proprietorship	63.6	36.4	89.4	10.6
Partnership	68.0	32.0	91.1	8.9
Limited Company	69.7	30.3	89.0	11.0
Public Enterprise	98.3	1.7	100.0	-
Cooperative	83.3	16.7	100.0	-
Other	73.4	26.6	89.4	10.6
Total	68.0	32.0	90.0	10.0

Source: Report on Survey of Wages and Welfare of Employees in Bangkok
Metropolitan Areas, 1975, Bangkok: Department of Public
Welfare, 1976.

Note: Total number of establishment surveyed: 4165.

It can be seen that of all 4165 establishments in 1975, only 2832 or 68 percent provided medical welfare to their employees, leaving 1333 or 32 percent without any provisions for medical care in time of sickness.[14] For other welfare categories including such aids as provident fund, retirement bonuses, school fees and so on, a much higher number of establishments (90.0 percent) had a regular assistance programme. But this was so perhaps because non-medical aids were much less expensive. With these and other results, the study group surmised that the social insurance system offers one of the most widely adopted method of protecting the welfare of workers.[15]

It is interesting to point out that one similar result was also obtained in a survey by the National Research Cou :il in 1965, but different interpretation was made out of it. In 1965, when asked, "Does the management of the factory or firm in which you work pay for your medical costs when you are sick?" 1115 employees out of 3680 under survey replied in the negative.[16] In other words, about 30.3 percent of the relevant workers were without proper sickness benefits.

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[14] This statistics could be misleading because it measures the pro visions for medical care in terms of how many firms, regardless of size, have or have not these provisions. A better indication would be the number of employees in the survey areas who are protected or assisted in time of sickness as a percentage of the entire workers. If this method is adopted, it is estimated that about 26 percent of the eligible workers in Bangkok are without any social security protection against sickness at all.

[15] "Report on Survey of Wages", op.cit., p. 43.

[16] National Research Council, op.cit., p. 38.

Unlike the Social Security Division Study Group, the National Research Council Study Group was not at all alarmed by this revelation; they (the latter group) were satisfied that with the outcome that the majority of workers (69.7 percent) had received medical benefits from employers.

But to remain complacent when one out of three employees does not receive any sickness benefits from his employer is certainly not justified. Neither is it justified to infer a bias against social insurance programme (as the National Research Council Study Groups did) when most workers, many of whom lacked the proper knowledge and understanding of such programmes, were found to have disliked the idea of contributing to the programme. The response under this situation was highly suspect and should not be used as a basis for any judgment.

In June, 1977, after the Social Security Division completed its drafting of the social insurance bill, the first tripartite seminar was held in Bangkok between employees, employers and the government to discuss the above bill before it was sent to the Interior Minister. The result of this two-day seminar could not be called either a success or failure mainly because the majority of participants did not study the bill beforehand, or failed to understand all the points at issue. Whereas the employers were unduly cautious about the responsibilities, the employees were unreasonably critical about the narrow scope of its initial operation. It is hoped that with a greater government information offensive, and with more thorough understanding of the issue on the part of employers and employees, the social insurance scheme will soon become a reality.

Social Assistance and Public Services

So far the concept of social security has been linked with social insurance only. This is of course a narrow view of social security; a wider view extends social security to include social assistance, public services and provident fund system as well. Provident fund is actually compulsory saving system which is supplementary to social insurance scheme. As such, a successful social insurance scheme which covers old-age often obviates the need for another provident fund system. Social assistance refers to a system whereby the government provides assistance either in the form of cash, goods, services or the combination of all three to those who are in need of social help. Public services are given to anyone who wants them without previous contribution or means test.

In Thailand at present, a provident fund system is available only in some large private firms. The social assistance public services are major responsibilities of the Department of Public Welfare and the Ministry of Public Health. The Government may (and in fact, did) assign government organizations other than these two organizations to carry out social assistance or public service programmes, but the assignment is often on a piecemeal or ad hoc basis. The section which follows will describe briefly the activities of the Department of Public Welfare, the Ministry of Public Health and a few other government bodies which have been involved in social welfare measures.

Department of Public Welfare

Realizing that various segments of the population were in
need of social help one time or another, the government decided to
establish the Department of Public Welfare in the Office of the Prime
Minister in 1940 to administer social assistance and public services
programmes for the whole country.[17] At first, the areas of assistance
included housing, nutrition, household welfare, employment and consu-
mer's purchase. Later, the assistance was centered on larger groups
of "needy" people: children, women and the aged, and on such areas
as low income housing, agricultural self-help settlement, labour pro-
tection and disaster relief.

Since 1953, the Department of Public Welfare has been attached
to the Ministry of Interior. At present, its main social welfare
activities are as follows:[18]

(1) Promote the welfare of children and youth who are
without parents or guardians by housing them and giving them basic
vocational training;

(2) Provide family assistance to poor families through
small cash grant, household goods or medical expenses;

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[17] For an early history of this department see Pakorn Angsusingh,
Public Welfare System, Bangkok, Thammasat University, 1955.

[18] Information was received from Annual Report of the Department
of Public Welfare, 1975.

(3) Establish and administer self-help land settlements throughout the country;

(4) Promote hill-tribe welfare and development, especially land settlements, development and welfare centers, agricultural of one development, and tribal refugee centers;

(5) Give occupational training in hair cutting;

(6) Provide relief in various public disasters;

(7) Provide welfare for the destitute, the aged, the disabled and the socially handicapped women;

(8) Provide mental rehabilitation centers to mental patients who have just been discharged from psychiatric hospitals;

(9) Caters for such community services as recreational centers for youth, control on student hostels, public sight-seeing tour, and so on;

(10) Help prepare social insurance scheme;

(11) Operate public pown shops;

(12) Carry out social surveys and research;

(13) Control and promote funeral assistance associations.

Ministry of Public Health

Responsibilities for public health are shared among 6 major departments of the ministry: Office of the Undersecretary, Departments of Health, Communicable Disease Control, Medical Science, Medicine, and Office of Food and Drug Committee. Major areas of concern are as follows:[19]

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[19] Information available in Ministry of Public Health, Public Health Development Project, Bangkok, 1976.

Office of the Undersecretary: Central administration work, operation of provincial hospitals and health centers, training institutes for nurses, public health planning.

Department of Health: family health, nutrition research, control on public sanitation, school hygene, environmental health protection, dental health, occupational health, and provincial potable water scheme.

Department of Communicable Disease Control: control of general communicable diseases, venereal disease, malaria, elephantiasis, leprosy, and tuberculosis.

Department of Medical Science: pathological and preventive research and analysis of various diseases.

Department of Medicine: operation of public hospitals in Bangkok Metropolitan areas.

Office of Food and Drug Committee: control of medicine, narcotics and fool; general food and drug research.

Occasionably the Ministry is assigned a special project on a temporary basis. For example, during 1975-77, it was responsible for administering the **project which** gives or fully subsidized free medical services to low-income earners.

Other Government Organizations

Most local governments (municipalities and sanitary district

offices) maintain some medical or health facilities where local citizens can benefit. Of all local governments, the Bangkok Metropolitan Administration is, of course, tne largest; and it also has the most extensive health and welfare services which include 2 general hospitals, 32 health clinics and 7 recreational centers for youth.

In the past few years several other government organizations has been involved in some ad hoc health and welfare programmes. For example in 1975 the Ministry of Communication was requested to provide a free bus service in Bangkok for persons having income less than baht 1,000 a month. These people could also receive entirely free medical services in a special programme run by the Ministry of Public Health. Food stamps for the poor were seriously contemplated by the Ministry of Finance in the same period but never materialized. These well-known health and welfare programmes were very commendable in principle but badly managed in practice. They were all abolished with the changes in the political situation in 1976.

Social Security in Thailand: Problems and Prospects'

As the purpose of this paper is not a thorough analysis of social security system in Thailand, but a descriptive account of how such a system has developed from the 1930's to the present time, only a small part in the remainder of this paper will be devoted to the discussion of its problems and prospects of social security in Thailand. First, the discussion will be centered on social insurance, after which it will be shifted to social welfare.

On Social Insurance

The development of ideas and the contribution of the ILO have been
mentioned in the preceeding text. The relevant points to be discussed
now are some agreements on a feasible social security plan, the posi-
bility of public acceptance of the system, the problems of costs and
burdens of individual contributions, and the extension of the programme
to cover the rural workers or the self-employed in the future.

1. A Feasible Social Insurance Scheme

        In Thailand, the general agreement seems to be that a social
insurance system is useful and, to a great extent, necessary to the
industrializing economy of the country where an increasing member of
workers earn their living from fixed-income employment, and are exposed
to various expected and unexpected contingencies. The main question
is not whether to have or not to have a social insurance system, but
when and how such a system is to be instituted. Whereas the details
of operation vary from one planner to the other, most appear to have
a consensus on certain minimum requirements for a practicable or
fessible social insurance system. These requirements may be summed
up as follows:

        (a) Only a small area should be covered first, and Bangkok
Metropolitan Areas have been singled out as the most appropriate lo-
cation in the beginning.

(b) Contingencies covered should not be too many at the start. After initial success of these few benefits schemes, they can be extended to cover more contingencies. Employment injury seems to have received top priority in most plans followed by sickness, maternity, funeral expenses, old-age, invalidity, survivor ship, and unemployment roughly in that order.

(c) Only wage earners would be required to insure; the self-employed would be excluded from the scheme for abvious administrative reasons. At first, only workers in establishments having a certain number of employees, say 10 or 20, will be insured. Later, all employees will be insured.

(d) Contributions will be shared by employees, employers, and the government at a rate to be determined later. Employees having income lower than a given amount (floor or minimum income) will have their share of the contribution made by either the employers or the government.

(e) Benefits should be paid out both in cash and in kind. Waiting periods before payment of benefits are necessary, but must not be too long. A system of wage compensation while under temporary incapacitation should be adopted.

(f) Either the Department of Labour which is already handling the workmen's compensation scheme, or the Department of Public Welfare can be entrusted with the responsibility of carrying out the social insurance programme. Better still, a separate national bureau or office

merging parts of the two departments having greater autonomy than a
present government department should be established.

2. Acceptance of the Programme

A Social insurance programme which is well-planned, not overly
ambitious, administered by competent and honest staff, and supported
by all parties concerned will have a greater chance of success. The
failure of the social insurance efforts in the past has been attribut-
able to plans which was not well thought out, were too ambitious, and
beyond the administrative capacity of the government.

In the beginning, while the government was enthusiatic about
the programme and genuine in its intention to protect employees, the
general public was still skeptical about its desirability or necessity.
Lack of credibility of the government exacerbated the early public
acceptance of the programme. Later governments kept a token interest
in the idea but did not elicit sufficient initiative in putting the
programme into practice. Meanwhile, the employee groups were not
fully organized to exert effective demand for protection through social
insurance, and the employers, although most likely to be appreciative
of the social insurance system, kept postponing their support. In the
end, apart from the workmen's compensation system, Thailand is still
without an acceptable social insurance programme.

What is the chance of success of the present social insurance
bill? Judging from the experience learned from the past failure and

the extent of improvement that was made to the bill, this bill, which
meets most of the requirements mentioned above, has a reasonable chance
of success. Of the three contingencies to be covered: sickness, mater-
nity and funeral expenses, the first is of course the most important.
The scheme is made more flexible by the allowance of the insured person
to seek medical help from private to well as public clinics or hospitals.
The significance of maternity coverage can be, and indeed should be,
de-emphasized by providing maternity assistance only up to a certain
number of children, say two, for insured families having no children
before, or just one more child for insured families already having two
or more children. Coverage on funeral expenses can similarly be de-
emphasized by providing crematory and other religious facilities. The
reluctance of employers is likely to disappear once the scheme is in
operation under strong and competent administration.

3. Contribution Issues

One important practical problem concerns the rate and
incidence of social insurance contributions. Who should contribute
and how much depends very much on the underlying philosophy of the
government on social policies. If public welfare is in greater need
of public attention, then the government should be willing to bear a
higher burden of the share of contributions. For instance the govern-
ment will pay the contributions of those insured persons who have
income below a certain minimum level, or will assume the same burden
as that of the employers. Otherwise, the government may let the em-
ployers share greater burden.

Another point that needs discussion is the incidence of social insurance contributions. For an employee, his contribution to a social insurance scheme is nothing but a tax taken from his wages or payroll (hence an equally well-known term: payroll tax). If a contribution requirement is made at a very low earning level, this tax can be very regressive. Indeed it is often the case that an income earner who is exempted from paying income tax because his taxable income is below some subsistence level is required to make a social insurance contribution. Furthermore, it has been established empirically that the employer's share of the contributions is likely to be shifted forward to employees in real wage or employment cut,[20/] so the burden of social insurance contributions on the part of employees could be doubly severe. In specifying the rate and share of contributions, the government should take these points into account, and try not to offset one positive measure of income redistribution (regressive social insurance benefits) with another negative measure of income redistribution (regressive contributions).

Once the insurance scheme is under operation, a study of the effective payroll tax rate across income classes should be made so that more equitable contribution rates could be designed. In certain cases, the financing of social insurance through general revenue can even be recommended.

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[20/] For a good summary of empirical studies on the incidence of payroll tax see John A. Brittain, The Payroll Tax for Social Security, Washington, D.C.: The Brookings Institution, 1972.

in Table 3 below, will give a rough indication of how the Thai Government perceives the significance of social welfare spending.

Table 3 : Percentage share of social welfare expenditures in the national budget, 1960 - 1977

Year	Dept. of Public Welfare	Min. of Public Health	Total	Year	Dept. of Public Welfare	Min. of Public Health	Total
1960	0.5	2.7	3.2	1969	0.7	2.7	3.4
1961	0.5	2.7	3.2	1970	0.6	2.8	3.4
1962	0.5	2.9	3.4	1971	0.6	3.3	3.9
1963	0.7	2.9	3.6	1972	0.6	3.2	3.8
1964	1.2	3.5	4.7	1973	0.8	3.1	3.9
1965	0.9	3.3	4.2	1974	0.5	3.1	3.6
1966	1.1	3.1	4.2	1975	0.5	3.1	3.6
1967	1.0	2.8	3.8	1976	0.5	4.4	4.9[a]
1968	0.8	2.8	3.6	1977	0.6	5.0	5.6[a]

Source: Computed from Thailand Statistical Yearbooks, and Annual Budget Document.

[a] Budgeted, not actual, share of total expenditures.

It is evident from Table 3 that the share of social welfare expenditures in the total budget has been quite small; the highest share is no higher than 5.6 percent of the budgeted (not actual) expenditures. What contributed to this jump in the share was the special budgetary allocations in 1977, and also in 1976, to the Minister of Public Health to administer the Free Medical Services for the Poor Project. Without these special allocations the actual share normally hovered around 3 to 4 percent of the annual expenditures. Although the share of social welfare expenditures in total expenditures was also quite small in other Asian countries, it was still at least 2 or 3 percentage points higher than that of Thailand.[21]

In his evaluation of the role of social insurance in an overall programme of social welfare in the U.S., Richard A. Musgrave a well-known public finance economist concluded that:[22]

> "....social insurance needs to be strengthened, but...it is not the aspect of welfare policy which, in the decade to come, is most in need of attention. Emphasis should be above all on the poverty issue, and this not primarily a matter of social insurance."

[21] For detailed comparison see U.N. Statistical Yearbook.

[22] Richard A. Musgrave, "The Role of Social Insurance in an Overall Program of Social Welfare," in The American System of Social Insurance, edited by William G. Bowen and others, New York: McGraw-Hill, 1968, p. 34.

It this same sentiment is to be fostered in Thailand, the scope of the present social welfare policies will have to be expanded greatly. And that may mean a several-fold increase in the activities of the Department of Public Welfare and the Ministry of Public Health.

In dealing with the poverty problems, one of the first tasks facing a policy planner is the identification of the poor, normally by using family income as a demarcation device. Other socio-economic characteristics associated with the poor, or the "poverty profile", are studied so as to understand the poverty conditions better. The poverty policies which follow may take the forms of a short-run poverty relief programme through existing health and welfare services or a long-run income-maintenance programme through increased employment, negative tax policies or structural changes of the economy.

It is not the intention of this paper to discuss the poverty problems in detail. Suffice it to say that the extent of poverty in Thailand is quite worrisome.[23/] But it is believed that the present public welfare and health programmes, fragmented and piecemeal as they are, could do much to alleviate the poverty problems if they are big enough.

[23/] The present author has estimated that almost 50 percent of the total households in Thailand in 1969 are classified as poor. For detail as the poverty concept and estimating procedure, see Medhi Krongkaew and Chintana Chernsiri, "Measurement of Poverty Level in Thailand."

Thammasat University Journal, 5 (June - September, 1975), pp. 48-62.

Conclusion

In conclusion, it may be just a matter of time before Thailand
will eventually have a social insurance system. But the longer the
delay, the greater loss it will be for the welfare of those workers who
suffer from sudden contingencies. Moreover, as the country is becoming
more industrialized with growing number of waged employees, the problems
of organizing such a system will increase in their difficulties and
complexities; and the "learning" period will also last longer. There
is much to gain even from a trial, limited-scope, social insurance plan
because experience gained could lead to a greater development of the
social insurance system in Thailand.

Where the choice has to be made between social insurance and
social assistance, the outcome will depend much upon the philosophical
underpinning of the decision maker. An efficiency-minded planner would
opt for the former, and an equity-minded planner for the latter. But
there is no reason why both policies should not be adopted together.
A social insurances programme could be designed to serve both humanitarian
as well as egalitarian purposes through selective benefit coverage and
contribution rates. And a social welfare programme could be designed
so as not to be detrimental to work incentives. Therefore, both social
insurance and social welfare do supplement each other to form a more
complete social security system.

Thailand has been slow as compared with other developing countries in adopting various labour protection and social security measures. It is hoped that policy makers would henceforward pay more interest to social security as this could indeed contribute to national security in the long run.

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The Supply Response of Rubber in Thailand.

by

J.M. Dowling

Introduction

Dynamic adjustment models based on the work of Nerlove /12/
have been widely adopted in the analysis of supply for agricultural
products. The Nerlovian framework has been extended and modified
in recent years to incorporate more complex elements of the supply
process and to reflect recent developments in dynamical analysis.
Particular emphasis has been put on the analysis of perennial crops
where gestation lags introduce problems not ordinarily encountered
in the study of annual crops /5,7,13/. Originally the dynamics of
supply were not developed with reference to optimum adjustment over
some time horizon but rather were added to a static model in the form
of lagged responses (i.e. "adaptive expectations" or 'partial adjustment")
to external market movements. Furthermore, the nature of the original
Nerlove model ordinarily restricts the adjustment pattern to a geome-
trically declining lag response. While this may not be inappropriate
when yearly data for annual crops are being analyzed, more general
classes of lag distributions may be appropriate for quarterly and
monthly data or when the supply response involves long lags. In this
paper a model for the supply response of rubber in Thailand will be
constructed and tested. The model incorporates recent developments
in dynamical analysis and incorporates a flexible distributed lag
specification which can be easily adopted for the supply analysis of
other perennial crops.

Supply Response Model

The Nerlovian supply response model takes one of three forms, depending on the formulation of the output price relationship.

$$Q_t^* = \alpha + \beta P_t \tag{1}$$

$$Q_t = \alpha + \beta P_t^e \tag{2}$$

$$Q_t^* = \alpha + \beta P_t^e \tag{3}$$

where Q^* denotes desired supply, P^e denotes expected price, Q denotes actual supply and P denotes actual price. If

$$Q_t - Q_{t-1} = \lambda(Q_t^* - Q_{t-1}) \quad 0 < \lambda < 1 \tag{4}$$

$$P_t^e - P_{t-1}^e = \delta(P_t - P_{t-1}^e) \quad 0 < \delta < 1 \tag{5}$$

then reduced forms can be obtained by combining (1) and (4), (2) and (5), (3)(4) and (5) to obtain

$$Q_t = \alpha\lambda + \beta\lambda P_t + (1-\lambda)Q_{t-1} \tag{6}$$

$$Q_t = \alpha(1-\delta) + \beta(1-\delta)P_t + \delta Q_{t-1} \tag{7}$$

$$Q_t = \alpha\lambda\delta + \beta\lambda\delta P_t + \underline{/}(1-\lambda) + (1-\delta)\underline{/}Q_{t-1} \tag{8}$$

$$- (1-\lambda)(1-\delta)Q_{t-2}$$

In (6) and (7) the lag distribution is geometrically declining. (8) admits a wider class of lag distributions but if we restrict ourselves to nonnegative lag coefficients[1] then the only sensible lag

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[1] In some instances negative coefficients may be justified. See below, page 10.

distribution which looks distinctly different from the geometric

has a single peak. $\underline{/}$8$\underline{/}$ Furthermore this shape is obtained by

restricting the adjustment coefficients to the region $\delta + \lambda < 1.\underline{\frac{2}{}}$

A more generalized distributed lag function can be obtained

by several alternative approaches, including rational distributed lags

$\underline{/}$10$\underline{/}$, inverted V lags $\underline{/}$4$\underline{/}$ and generalized polynomial lags (Almon)

$\underline{/}$7$\underline{/}$. While it is possible to adopt ad hoc procedures for estimating

the lag response by one of these methods, estimation based on a

theoretical foundation is preferable. Griliches $\underline{/}$8$\underline{/}$ has shown that

small changes in estimated coefficients may often result in gross

differences in the lag distribution. Without a theoretical model

it may be impossible to make a choice between alternative lag structures.

The model recently suggested by Wickens and Greenfield $\underline{/}$15$\underline{/}$

serves as a useful focus for the estimation of the rubber supply

response function. They suggest that the potential output of a tree

crop (Q_t^P) depends upon the number of surviving trees and their yields

$$Q_t^P = \sum_{i=0}^{n} \delta(i,t) I_{t-i} \qquad\qquad (9)$$

where I_{t-i} is the number of trees planted i years ago and which have

survived until t, $\delta(i,t)$ is the average yield of these trees. Technical

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$\underline{\frac{2}{}}$ For a nonnegative lag distribution Griliches $\underline{/}$8$\underline{/}$ shows that in
the model $Y_t = aX_t + bY_{t-1} + cY_{t-2}$ only the area bounded by

  $1 < b < 2$, $b + c = 1$, $b^2 = -4c$ yields lag distributions of the
  desired shape. Substitution into (8) leads to the restriction on
  $\delta + \lambda$.

progress occurs if $\delta(i,t)$ is a positive function of time. (9) is a vintage production function which depends upon the assumption that labor plays no role in the production process. In reality labor will be an important factor in determining rubber output. The skill of the tapper and tapping frequency as well as the preparation and maintenance of the plantation are important determinants of yield. However because of data collection difficulties and to simplify the structure of the model they are ignored in the subsequent analysis.

To determine the optimum number of new trees planted in any year we maximize the stream of discounted future earnings subject to the production function constraint. Assuming that planting costs associated with investment in trees are seperable from tapping costs, we can construct the following objective function.

$$L = \sum_{t=0}^{\infty} \left\{ (1+r)^{-t} \left[\pi^e Q_t^P - f(I_t) \right] + \mu \left(Q_t^P - \sum_{i=0}^{\infty} \delta(i,t) I_{t-i} \right) \right\} \qquad (10)$$

where $f(I_t)$ is the planting cost function, π^e is expected unit profit excluding planting cost, r is the discount rate and μ is the Lagrange multiplier.

The necessary conditions for maximizing (10) lead to the dynamic version of MC = MR

$$\frac{\partial f}{\partial I_t} = \sum_{i=0}^{\infty} (1+r)^{-i} \pi_{t+i}^e \delta(i,t) \qquad (11)$$

If planting costs are a linear function then investment will be zero or infinity, depending upon the r.h.s. of (11). For a realistic investment function we require that $\frac{\partial^2 f}{\partial I^2} > 0$, in addition to $\frac{\partial f}{\partial I} > 0$.

Since $f(I_t)$ must be a nonlinear function, $I = g(\frac{\partial f}{\partial I_t})$. . If g is a second degree polynomial then

$$I_t = a + b \frac{\partial f}{\partial I_t} \tag{12}$$

and new planting depends on the discounted expected future profit stream.

Note that in (10) we assume that potential output is completely harvested. It is possible to modify (10) without changing (11). Suppose, for example, that the difference between actual and potential output is a function of price. Then if we replace Q_t^P by Q_t, $\pi^e Q_t^P$ in (10) becomes $\pi^e Q_t$ but $Q_t = Q_t^P - (Q_t^P - Q_t) = Q_t^P - f(\sum_{i=o}^{n} P_{t-i})$ and $\pi^e Q_t = \pi_t^e (Q_t^P - f(\sum_{i=o}^{n} P_{t-i}))$. Since $\pi_t^e f(\sum_{i=o}^{n} P_{t-i})$ does not involve the variables Q_t^P, I_t or μ, the maximizing condition is unaffected.

If we ignore abandonments, uprootings and disease losses, then the change in total area planted, ΔA_t, is proportional to I_t. $\frac{\partial f}{\partial I_t}$ can be proxied by a weighted sum of current and past prices and costs. Since cost data are generally unavailable on a time series basis, we have the empirical counterpart of (12)

$$\Delta A_t = \beta_o + \sum_{i=o}^{n} W_i P_{t-i} \qquad (13)$$

If $W_i = \beta\phi^i$, $0 < \phi < 1$, then

$$\Delta A_t = \beta_o^* + \beta P_t + \phi\Delta A_{t-1} \qquad (13a)$$

If reliable total area data were available, alternative assumptions about W_i could be explored. Unfortunately area data for Thailand are woefully deficient. Only two accurate point estimates are available, the 1963 Census of Agriculture and the Rubber Survey of 1966 [13]. The later is based on aerial photographs taken between September of 1966 and the end of Spring, 1967 and is considered by experts to be very reliable. The 1963 rubber area figures were obtained as part of the first nation-wide agricultural census and are based on a tree count which was later converted to area. Comparisons with the 1966 survey suggest that the 1963 census was under estimated. Estimates for other years are based on a limited sample and are plagued by under reporting errors.[3]

(13) bears a close resemblance to the Nerlove model. Replacing Q with A, in the Nerlove model[3a] (8) can be rewritten

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[3] It is possible to generate total area estimates by using production data. Using an assumed yield pattern and an average short run supply elasticity Stifel [14] generates estimates from 1913 to 1962 which appear to be quite good. Unfortunately the Stifel methodology is not applicable in the present context, since we are concerned with adjustments in area as a function of price changes. It would be unacceptable to use area data which were algebraically derived from production.

[3a] This is often done in the literature. See Nerlove [12].

$$\Delta A_t = d_0 + d_1 P_t + d_2 \Delta A_{t-1} + d_3 A_{t-2} \qquad (14)$$

where $d_0 = \alpha\lambda\delta$, $d_1 = \beta\delta\lambda$, $d_2 = (1-\delta-\lambda)$, $d_3 = \delta\lambda$. Aside from the final term this is identical to (13). If (13) is the correct specification, then $d_3 = 0$ and either of the adjustment coefficients δ or λ is zero. If (14) is correct (13) contains a misspecification error which may lead to residual autocorrelation in the reduced form derived below.

The final structural relationship explores the pattern of short run production. If excess capacity exists, potential and actual production diverge. When prices are low tappers abandon low yielding and/or inaccessible trees and excess capacity persists, while high prices may sometimes lead to overtapping.[4] This suggests a short run tapping relationship of the following form

$$Q_t - Q_t^P = A + \sum_{i=0}^{m} b_i P_{t-i} \qquad (15)$$

or, more generally

$$Q_t = A_0 + A_1 Q_t^P + \sum_{i=0}^{m} b_i P_{t-i} \qquad (16)$$

where m is probably only one or two years. In many instances a price relative rather than the raw rubber price may be relevant. This is particularly true in south Thailand where rice is an alternative crop and also the staple food source.

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[4] Tapping on alternate days is recommended by the Thailand Rubber Research Center. However it is possible to tap more frequently in most districts. This increases short run yields but is potentially damaging in the long run.

The reduced form of the model is obtained by combining (9), (13a) and (16) and letting $A_t = I_t$. (13a) can be rewritten using the lag operator L ($LX_t = X_{t-1}$).

$$\Delta A_{t-i} = I_{t-i} = \beta_0^*(1-\phi L)^{-1} + \beta P_{t-i}(1-\phi L)^{-1} \qquad (16a)$$

Substitution of (16a) and (9) into (16) yields

$$Q_t = A_0 + A_1 \{(1-\phi L)^{-1} \sum_{i=0}^{n} \delta(i,t) \underline{/}\bar{\beta}_0^* + \beta P_{t-i}\underline{/}\} + \sum_{i=0}^{m} b_i P_{t-i} \qquad (17)$$

$$Q_t = \sum_{i=1}^{n} \delta(i,t) A_1 \beta P_{t-i} + \sum_{i=1}^{m} (b_i - \phi b_{i-1}) P_{t-i} + (\delta(i,t) A_1 \beta + b_0) P_t$$

$$- b_m \phi P_{t-(m+1)} + \phi Q_{t-1} + \text{constant}$$

or

$$Q_t = \sum_{i=0}^{n} \tau_i P_{t-i} + \phi Q_{t-1} + \text{constant} \qquad (18)$$

where
$$\tau_i = \delta(i,t) A_1 \beta + b_0 \quad i = 0$$

$$\tau_i = \delta(i,t) A_1 \beta + b_i - \phi b_{i-1} \quad i = 1 \ldots m$$

$$\tau_i = \delta(i,t) A_1 \beta - b_m \phi \quad i = m+1$$

$$\tau_i = \delta(i,t) A_1 \beta \quad i = m+2 \ldots n$$

The coefficients on lagged price will depend primarily upon the short run adjustment coefficients b_i when the lag is short ($i \leq m$) and will be directly proportional to the yield pattern when

the lag is long (i $\geqslant$ m+2)$\underline{5/}$. The lag distribution in Table 2 assumes
the yield pattern from Table 1. Negative short term coefficients
may occur if ϕ is large and b_i declines geometrically.

Table 1 :   Yearly yield per rai in kilograms

Age in years (i)	Yield $(\delta(i,t))$	Age	Yield
1-7	0	22	65
8	33	23	60
9	46	24	55
10	57	25	50
11	66	26	40
12	70	27	30
13-19	74	28	20
20	70	29	10
21	68	30	0

Source :   Stifel /14/. More recent estimates of yields for
existing seedling rubber made in the South Thailand
Regional Planning Study / 9 / are somewhat lower but
exhibit a similar overall pattern.

$\underline{5/}$ $\delta(i,t)$ will be zero for i < 7 in most instances because of
gestation lags in rubber production. It is at least 6 years
after planting before a rubber tree can be tapped.

Table 2 : Hypothetical lag distribution coefficients assuming
$b_i = (.6)^{i+1}$ $i = 0,1,2$, $n = 30$, $m = 2$, $\phi = .8$,
$A_1 = \beta = 1$, and δ (i,t) is taken from Table 1.

i	Price Coefficient	i	Price Coefficient
0	$b_o = .6$	20	70
1	$b_1 - \phi b_o = -.12$	21	68
2	$b_2 - \phi b_1 = -.07$	22	65
3	$- b_2 \phi = -.17$	23	60
4-7	0	24	55
8	33	25	50
9	46	26	40
10	57	27	30
11	66	28	20
12	70	29	10
13-19	74	30	0

Table 3 : First Difference of Table 2, ignoring lags > 19

i	Price Coefficient
0	.60
1	-.72
2	.05
3	-.10
4	-.17
5-7	0
8	33
9	13
10	12
11	7
12	4
13	4
14-19	0

Figure 1 - Generalized Schema for Distributed

Lag Coefficients in Equations (18)

and (19)

τ_i τ_i^*

8   30   8   11-14
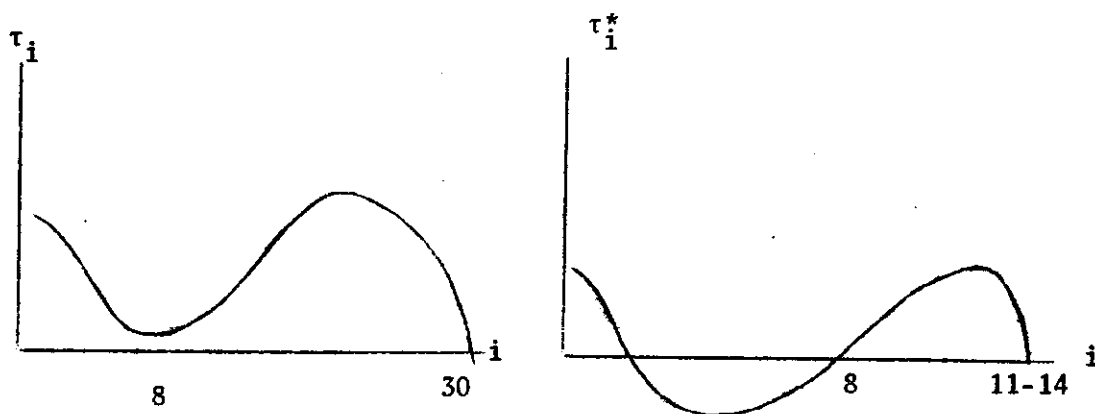
The foregoing example has been derived for yields which are time independent $\left(\delta(i,t) = \delta(i)\right)$. A more general approach would admit the possibility of technical progress in rubber production. Then the lag distribution will vary with the passage of time as well as with the time difference as measured by i. We would have to construct a model where the lag response only changes for the later lags, since $\delta(i,t)$ only enters into the lag distribution after lag 8.

Unfortunately it is very difficult to construct such a distribution. Furthermore, it is questionable whether rubber yields have changed appreciably over the sample period.[6] An average yield

6/ Though admittedly suspect because of downward bias in estimates of planted area Thai government sources still reflect no significant change in yield over the postwar period.

of only 38.2 kilograms per rai of mature rubber is implied by the 1966

area planted figures. This is considerably lower than the average

yield estimates used in Table 1 and is probably not more than prewar

yields. In fact it is reasonable to expect that in the absence of an

active extension service and a well funded Rubber Research Center,

most small holders would continue to use primitive technology both

in planting and cultivation and that technical advance would be adopted

rather slowly due to high replanting cost.[7]

We must use a distributed lag model to find estimates for

τ_i in (18). The distributed lag polynomial suggested by Almon $/\!\!\;\bar{}\;1\;\bar{}\;7$

was used. However because of the length of the lag (up to 30 years)

and because of the flatness of the yield curve after 13 years, a

first difference form of the model was used. Then (18) became

$$Q_t = \sum_{i=o}^{n} \tau_i^* \; P_{t-i} + (1+\phi)Q_{t-1} - \phi Q_{t-2} \qquad (19)$$

where
$$\tau_i^* = \tau_i \qquad\qquad i = o$$

$$\tau_i^* = \tau_i - \tau_{i-1} \qquad i = 1....n$$

$$\tau_i^* = -\tau_{i-1} \qquad\quad i = n+1$$

and n will only need to be about 12 or 13. The general expected

shapes of (18) and (19) are shown in Figure 1.

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[7] This has changed in the past few years, since the establishment
of the Rubber Replanting Aid Fund Board in 1960 and with the
recent acceleration of replanting which the World Bank has helped
finance. These new trees are top quality high yielding varieties.
Plans are to completely replace all of the older low yield trees
by 1990 or so. $/\bar{1}\bar{3}7$ However this rapid shift in technology
does not affect our sample, as less than 5% of tappable area
was planted with high yielding varieties in 1975.

Estimation of the Supply Response Model

Equation (19) is fitted using Almon lags both with and
without an endpoint constraint. Several regressions were run for
different degree polynomial and lag length. The results are displayed
in Table 4. In every instance the empirical results confirm the
theoretical shape of the lag distribution. The individual coefficients
are almost all highly significant as is the sum of coefficients. R^2
is also quite high in most instances. There is some evidence of
residual autocorrelation. This may arise from the possible misspeci-
fication of the area planted structural equation (13a). Reestimation
of several of the equations by the iterative Cochrane-Orcutt method
reduced the level of residual autocorrelation without appreciably
affecting the shape or significance of the lag distribution, the size
of the coefficients on Q_{t-1} and Q_{t-2} or R^2.

The coefficients of the lag distribution become positive
somewhat later than predicted by the yield curve (8-10 years as
opposed to 7-8). This may reflect local tapping practices, especially
in periods of slack demand when the onset of tapping might be delayed
for a year or so. Also nontrivial yields may not appear until several
years after tapping first begins. Another difficulty is the perverse
sign of the Q_{t-2} coefficient in every case. While not highly signifi-
cant the sign is always positive. According to (19) this coefficient
should be minus ϕ, where ϕ is the lag parameter in the area adjustment
equation (13a). This is probably due to the inability of the model to

Table 4

Almon Lag Model of Production Response - First Difference Form[1] - Equation (19)

			Lagged Output Coefficients		Coefficient τ^*_i in $\sum_{i=0}^{n} \tau^*_i P_{t-i}$								
Equation Number	Time	End Point Constraint	Q_{t-1}	Q_{t-2}	i=0	i=1	i=2	i=3	i=4	i=5	i=6	i=7	i=8
1	1915-1939 1950-1971	yes	.630 (.193)	.400 (.204)	1.041 (.253)	.523 (.154)	.145 (.105)	-.109 (.098)	-.258 (.104)	-.319 (.104)	-.310 (.005)	-.249 (.000)	-.153 (.654)
2	1915-1939 1950-1971	yes	.571 (.186)	.453 (.196)	1.437 (.311)	.573 (.148)	.027 (.115)	-.272 (.124)	-.339 (.118)	-.379 (.103)	-.291 (.091)	-.165 (.087)	-.340 (.086)
3	1915-1939 1950-1971	no	.622 (.192)	.400 (.201)	1.133 (.260)	.544 (.153)	.126 (.105)	-.144 (.101)	-.290 (.106)	-.335 (.104)	-.302 (.094)	-.213 (.084)	-.093 (.081)
4	1915-1939 1950-1971	no	.466 (.139)	.575 (.201)	1.977 (.440)	.606 (.144)	-.172 (.159)	-.513 (.182)	-.566 (.153)	-.456 (.109)	-.278 (.831)	-.106 (.090)	.015 (.087)
5	1950-1975	yes	-1.024 (1.215)	.616 (1.308)	2.925 (2.219)	3.140 (1.050)	1.338 (1.467)	-1.061 (1.243)	-3.014 (.817)	-3.848 (.822)	-3.262 (1.047)	-1.328 (1.046)	1.510 (.879)
6	1950-1975	no	-.795 (.168)	.766 (.183)	2.171 (.320)	1.936 (.122)	1.020 (.207)	-.163 (.235)	-1.283 (.200)	-2.095 (.140)	-2.438 (.107)	-2.237 (.134)	-1.50 (.179)
7	1950-1975	yes	-1.271 (1.102)	.914 (1.185)	2.942 (1.766)	2.477 (.826)	.657 (1.148)	-1.417 (.983)	-2.952 (.688)	-3.452 (.713)	-2.726 (.868)	-.885 (.843)	1.657 (.671)

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Table 4 (continued)

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i=9	i=10	i=11	i=12	i=13	i=14	Degree[3] of Polynomial	Q Σ Lag Coefficients	P Σ Lag Coefficients	P Mean Lag	R^2	Residual[2] Autocorrelation
-.040 (.059)	.072 (.065)	.166 (.075)	.223 (.080)	.226 (.073)	.158 (.048)	3	1.03	1.117 (.287)	2.736 (3.198)	.976	*
.787 (.082)	.156 (.075)	.190 (.073)	.180 (.080)	.133 (.083)	.065 (.065)	4	1.02	1.310 (.295)	1.801 (2.62)	.979	*
.355 (.084)	.150 (.090)	.227 (.089)	.244 (.081)	.177 (.082)	.004 (.132)	3	1.02	1.26 (.308)	2.44 (2.81)	.980	*
.068 (.786)	.057 (.091)	.016 (.121)	.004 (.126)	.105 (.079)	.430 (.217)	4	1.04	1.207 (.263)	.575 (2.64)	.982	
4.437 (.804)	6.263 (1.102)	5.428 (1.067)				4	-.408	12.527 (.780)	9.32 (1.97)	.790	*
-.324 (.209)	1.114 (.210)	2.550 (.179)	3.635 (.122)	3.937 (.162)	2.937 (.408)	4	-.03	9.258 (.199)	12.72 (.41)	.998	*
4.186 (.696)	5.683 (.952)	4.829 (.906)				4	-.357	11.0 (.978)	9.891 (1.93)	.830	

[1] For equations 1-4 Price series are taken from Stifel /14/, and cover the period 1915-1939, 1950-1971. Prewar production data are rubber exports, Department of Customs, Bangkok, Thailand and Postwar production estimates are from various issues of Agricultural Statistics of Thailand, the price series is the ratio of rubber to rice price. Both series have been adjusted to approximate the village price. For details see Stifel. For equations 5-7 the production data are unchanged but the price series are no longer in relative form. For 5 and 7 price is the London price in U.S. cents per pound (International Financial Statistics, various issues) while for 6 the price is Malaysian, again in U.S. cents per pound. Estimated standard errors are in parentheses.

[2] * denotes rejection of the null hypothesis that the residuals are independent at the 95% level. The test used is recommended by Durbin /5 / when lagged endogenous variables are regressors.

[3] The priori shape of the lag distribution in Figure 1 suggest a third or fourth degree polynomial. Regressions using higher order polynomials did not change the general shape of the lag response and are not reported here.

generate reliable reduced form estimates of the structural para-
meters, especially in cases where misspecification may be possible.
If, for example, equation (14) is used the coefficient on Q_{t-2} would
be $(1-\delta-\lambda)$ which could easily be positive. It should be noted,
however, that for equations 1-4, the coefficients on Q_{t-1} and Q_{t-2}
do sum to one as we would expect from (19) and the sign of Q_{t-1}'s
coefficient is a priori correct. Neither of these conclusions hold
for equations 5-7, which use postwar data and a raw rubber price
instead of a price relative, and while Q_{t-1}'s coefficient is not
statistically significant in either 5 or 7 we are inclined to think
that because of these difficulties the price relative form of the
price variable is preferable. One potential failing of the use of
Almon lags is that it imposes unnecessary constraints on the parameters
of the lag distribution. A likelihood ratio test $/\overline{11}/$ was performed
to see whether the Almon model was more restrictive than ordinary
least squares without restrictions. The results of this test, suggest
that the Almon technique is not overly restrictive.

The elasticity of output supply can be estimated by analysis
of the price coefficients in (18). These can be obtained from Table 4
using the relationship between τ_i^* and τ_i. These coefficients are
shown in Table 5. Defining the price elasticity of supply as

$$E_i = \frac{\partial Q}{\partial P_i} \cdot \frac{\bar{P}}{\bar{Q}} \qquad i = 0, 1, 2, \ldots.n$$

and the cumulative price elasticity as

$$E_n = \sum_{i=0}^{n} \frac{\partial Q}{\partial P_{t-i}} \frac{\bar{P}}{\bar{Q}}$$

where $\bar{P}$ and $\bar{Q}$ are mean values for the sample[8/], we obtain the short medium and long run elasticities reported in the final three columns of Table 5. In the long run, output response is fairly elastic and is somewhat higher in the past war period. The short run response is rather inelastic, especially if we consider only the first year.

A review of the findings for previous studies of rubber supply response in Thailand yield some interesting comparisons. Stifel /14/ found a short run price elasticity of supply of .77 and .15 respectively for (1926-1937) and (1950-1968) using a double log model with raw rubber price, rice price, time and seasonal dummies as explanatory variables. Behrman /3/ found a short run elasticity (evaluated at the mean) of .409 for the 1947-1965 period using a rubber price which was deflated by the cost of living.

Adjusting for the use of quarterly data by Stifel we can conclude that both estimates imply a considerably higher short run elasticity than is suggested in Table 5. Since Stifel and Behrman do not include any lagged price variables, their models are misspecified.

8/ This definition of elasticity is arbitrary. We could have used the mean of P for each lagged period. Such a modification causes the elasticity estimates to change slightly.

In general the size of the specification bias depends upon the correlation between the excluded and included variables times the regression coefficient of the excluded variable. The correlation between lagged and current prices is positive and most of the τ_i are positive. Thus it is likely that the estimates of Stifel and Behrman are biased upwards.

Table 5

Almon Lag Model of Production Response: Price Coefficients for Original Variable Form (τ_i) in equation (18).

Equation Number	i=1	i=1	i=2	i=3	i=4	i=5	i=6	i=7	i=8	i=9	i=10
1	1.041	1.564	1.709	1.600	1.342	1.022	.712	.463	.311	.271	.343
2	1.437	2.010	2.037	1.764	1.376	.996	.705	.540	.506	.584	.741
3	1.133	1.677	1.804	1.659	1.369	1.034	.732	.518	.425	.460	.610
4	1.997	2.603	2.431	1.918	1.352	.896	.618	.512	.527	.595	.652
5	2.925	6.065	7.403	6.342	3.323	-.520	-3.782	-5.110	-3.600	.337	7.100
6	2.171	4.107	5.127	4.964	3.681	1.585	-.852	-3.989	-4.590	-4.915	-3.301
7	2.942	5.419	6.077	4.660	1.707	-1.744	-4.479	-5.356	-3.700	.487	6.170

Table 5 (continued)

Equation Number	i=11	i=12	i=13	i=14	Short[1] Run Elasticity E_o	Medium[2] Run Elasticity E_4	Long[3] Run Elasticity E_n
1	.509	.732	.959	1.117	.092	.639	1.205
2	.931	1.111	1.245	1.310	.126	.759	1.522
3	.838	1.082	1.259	1.262	.098	.670	1.394
4	.668	.672	.777	1.207	.176	.906	1.533
5	12.529				.165	1.556	2.641
6	-1.251	2.384	6.321	9.258	.180	1.664	1.751
7	11.000				.265	1.917	2.132

[1] Mean elasticity for i=o

[2] Sum of mean elasticities for i=o, ... i=4

[3] Sum of mean elasticities for i=o, ... i=14 or i=o, ... i=11

Conclusions

Despite the lack of reliable data for area planted a
theoretical model based on dynamic maximization behavior has been
successfully applied to the determination of rubber output response
in Thailand. Use of the relative price of rubber to rice resulted in
more satisfactory statistical results than rubber price alone. In
consistencies between the theoretical model and the empirical results
may be partially due to the lack of reliable estimates for the area
planted function. Where data on rubber area planted do exist, as
in Malaysia, empirical estimates may be even more satisfactory.

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