



# Insuring Against International Hazards: Descriptive and Prescriptive Aspects

**Kunreuther, H.C. and Kleindorfer, P.**

**IIASA Collaborative Paper  
October 1981**



Kunreuther, H.C. and Kleindorfer, P. (1981) Insuring Against International Hazards: Descriptive and Prescriptive Aspects. IIASA Collaborative Paper. Copyright © October 1981 by the author(s). <http://pure.iiasa.ac.at/1772/> All rights reserved. Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage. All copies must bear this notice and the full citation on the first page. For other purposes, to republish, to post on servers or to redistribute to lists, permission must be sought by contacting [repository@iiasa.ac.at](mailto:repository@iiasa.ac.at)

**INSURING AGAINST INTERNATIONAL HAZARDS:  
DESCRIPTIVE AND PRESCRIPTIVE ASPECTS**

Howard Kunreuther  
Wharton School, Univ. of Penn. and IIASA

Paul Kleindorfer  
Wharton School, Univ. of Penn.

October 1981  
CP-81-31

Invited Paper prepared for the  
Conference on  
Managing International Risks  
Wharton School  
October 26-27, 1981

*Collaborative Papers* report work which has not been performed solely at the International Institute for Applied Systems Analysis and which has received only limited review. Views or opinions expressed herein do not necessarily represent those of the Institute, its National Member Organizations, or other organizations supporting the work.

INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS  
2361 Laxenburg, Austria



## ABSTRACT

Today multinational firms face grave uncertainties with respect to their investment strategies in other countries. This paper stresses the importance of integrating the descriptive aspects of this problem with prescriptive recommendations. It does so by raising two broad interrelated questions:

- (1) How do multinational firms and insurers deal with the problems of international risk in making their decisions on what investments to undertake?
- (2) What role can analytic approaches, including insurance mechanisms, play in better managing risk and uncertainty in international transactions?

These questions are addressed by developing a conceptual framework which emphasizes the importance of problem formulation, institutional arrangements and decision processes as a basis for prescriptive recommendations. The problem is characterized by lack of a detailed statistical data base to estimate probabilities and consequences of different types of political, economic, and social risks. Corporate planners and risk managers who have responsibility for these investment decisions are anxious to avoid uncertainty. Hence, their actions appear to be greatly influenced by past experience and personal contacts.

Our prescriptive recommendations are designed to widen the statistical data base by the use of experts and Bayesian analysis as well as to broaden the responsibility for investment decisions within the organization. We also propose a jointly operated private-federal insurance program which maintains features of current government operated systems

but has private firms marketing policies and settling claims.

The above theoretical concepts are illustrated with a case study of Indonesia's investment evaluation problem pursuant to their decision to provide the United States with liquefied natural gas in the early 1970's. This case study illustrates the political risks of firms investing even in highly developed economies such as the United States.

## TABLE OF CONTENTS

I.	INTRODUCTION	1
II.	A CONCEPTUAL FRAMEWORK	3
	Problem Formulation	4
	Political Risk	5
	Economic Risk	6
	Safety and Environmental Risk	7
	Institutional Arrangements	7
	Host Country	8
	Investor	8
	Insurer	9
	Decision Processes	10
	Estimation of Probabilities and Losses	10
	Allocation of Responsibility	12
	Avoidance of Uncertainty	13
	Prescriptive Recommendations	14
III.	HOW FIRMS AND INSURERS DEAL WITH INTERNATIONAL RISK	15
	Problem Formulation	16
	Institutional Arrangements	17
	Decision Processes of Investors	18
	Use of Decision Trees	18
	Systematic Biases	20
	Role of Regret	23
	Threshold Models	25
	Summary	27
	Decision Processes of Insurers	27
	Adverse Selection	28
	Moral Hazard	30

IV. THE LNG SITING DECISION IN THE UNITED STATES	31
Pertamina's Investment Strategy	35
V. PRESCRIPTIVE SOLUTIONS	37
Improving Political Risk Assessment	38
Process Improvements	38
Organizational Design Issues	41
A Joint Federal-Private Insurance Program	43
Pooling and Sharing of Information	44
Risk Sharing by Investing Firm	45
Government Reinsurance	45
A Prototype Program	46
REFERENCES	49



**INSURING AGAINST INTERNATIONAL HAZARDS:  
DESCRIPTIVE AND PRESCRIPTIVE ASPECTS**

Howard Kunreuther  
Paul Kleindorfer

**I. INTRODUCTION<sup>1,2</sup>**

Multinational firms face grave uncertainties today with respect to their investment strategies in other countries. In particular, there has been an increasing awareness by international managers of the difficulty of predicting the future political and economic climate which is likely to exist in a foreign country. One only has to look at the following headlines from *The Economist* during the first few months of 1981 to see graphically the types of uncertainties which exist in different parts of the world:

---

<sup>1</sup>The research reported in this paper is partially supported by the Bundesministerium fuer Forschung und Technologie, F.R.G., contract no. 321/7591/RGB 8001. While support for this work is gratefully acknowledged, the views expressed are the authors' own and are not necessarily shared by the sponsor.

<sup>2</sup>Our thanks to David Bell for helpful discussion during the preparation of this paper.

Iran and Iraq: A New Front in a Slow War? (January 3, 1981)

El Salvador: Final Offensive to the Next? (January 17, 1981)

Ecuador and Peru: The Oil War (February 7, 1981)

Poland: A Shaky Kind of Peace (March 21, 1981)

Arab-Israel Conflict: Steam from the Middle East's Back Burner (March 28, 1981)

American companies have received only limited protection from US government supported insurance programs so they have been forced to turn to a few relatively inexperienced private insurers for coverage to self-insure against potential hazards in foreign countries. Economists are predicting, however, that more insurers will enter the market in the near future and that multinational firms will become more knowledgeable about their needs. Hence, they expect insurance coverage to expand and premiums to drop dramatically (*Business Week* 1981).

The above illustrative examples on the unstable world situation coupled with the increasing interest by multinational firms in investing abroad have motivated two broad questions which this paper addresses:

- (1) How do multinational firms and insurers deal with the problems of international risk in making their decisions on what investments to undertake in foreign countries?
- (2) What role can analytic approaches, including insurance mechanisms, play in better managing risk and uncertainty in international transactions?

The first question is of a descriptive nature, while the second one has a prescriptive flavor. A basic theme of this paper is the importance of

undertaking descriptive analysis before making prescriptive recommendations. In the next section we develop a conceptual framework which highlights the importance of integrating these two components of the analysis. Sections III and IV probe into the actual decision processes utilized by firms and insurers in coping with international risk (Question 1). The concluding section addresses ways to improve the process (Question 2).

In order to make the analysis more concrete we will illustrate the theoretical concepts with an actual problem facing Indonesia: whether to provide the United States with liquefied natural gas. We hypothesize that countries planning to invest in the United States may face similar types of political and economic risks as do American-based firms who are contemplating projects in less-developed areas of the world. If this is true, then there may be lessons to be learned from the way other countries deal with these hazards.

## **II. A CONCEPTUAL FRAMEWORK**

The framework which guides our analysis is depicted in Figure 1. We will illustrate each of the elements in turn indicating how descriptive analysis is linked with prescriptive recommendations.

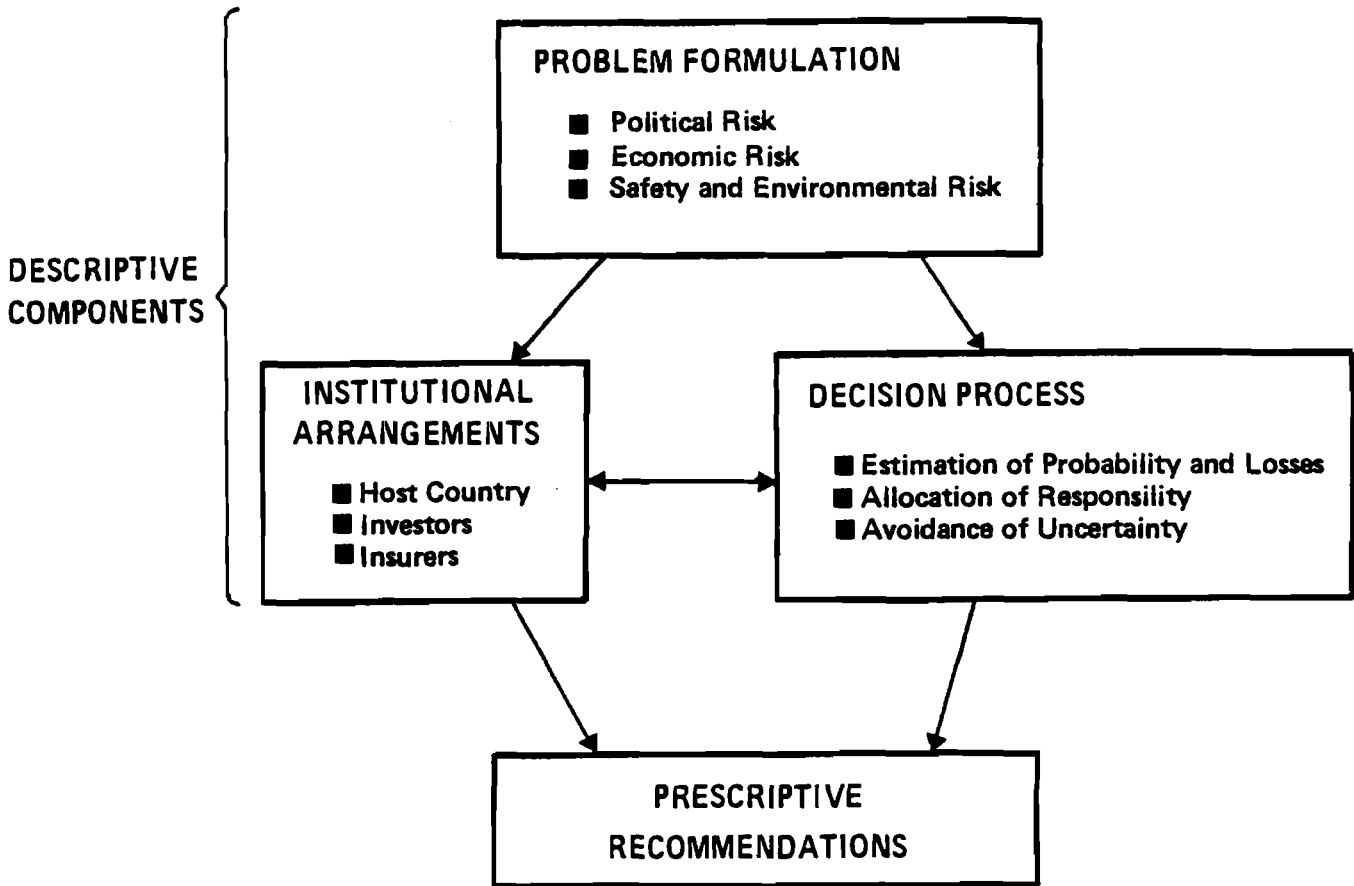


Figure 1. Elements of Conceptual Framework

### PROBLEM FORMULATION

Before undertaking a detailed analysis one needs to identify and define the problem. The problem of managing international risks revolves around the uncertainties associated with the future political and economic climate in the countries in which an investment is contemplated. There is a growing literature on this subject which elaborates on the types of uncertainties that multinational firms and insurers face in their investment decisions. We will classify them under four different

types of risk, none of which are mutually exclusive from the others.

*Political Risk*

This type of risk revolves around the instability associated with a particular country. Some of the possible consequences which come under this general heading are

- inconvertibility of currency
- expropriation of facilities
- war, revolution or insurrection (West 1980).

Not all investments are affected by these political risks in the same way since potential losses are partially determined by the level of technology, organizational structure of the firm as well as the formal linkages between the firm and the foreign government. Kobrin (1981) points out that the political environment is likely to be less risky for "a consumer products producer with minimal investment and production that is generally not integrated worldwide than for a petrochemical producer with considerable fixed investment and globally rationalized operations" (p.254).

Firms who are contemplating an investment subject to approval at the local, municipal and state governmental level must also be concerned with the social climate within the foreign country. One only has to witness the changing history of nuclear power to recognize that what appeared to be an investment which would be tacitly approved by the public in the 1950s and 1960s has been viewed very differently in recent

years (Hohenemser et al., 1977).

*Economic risk*

With respect to investments in physical facilities one must consider the likelihood and consequences of changing world market conditions and price fluctuations over time. For example, the success of investments in any type of energy source is critically dependent on the available supply of other products and future demand for this particular source.

If one is considering making a loan to a foreign country there are additional economic risks associated with such a financial commitment. Eaton and Gersovitz (1980) distinguish between three types of behavior which may create problems for the lender.

1. The borrower can *repudiate* the loan by refusing to pay interest and/or principal as originally agreed.
2. The borrower can *default* on the loan by failing to comply with the terms of the loan agreements (e.g., skipping payments).
3. There can be a *rescheduling* of the loan through an explicit agreement between the relevant parties as to how payments of interest and/or principal should be modified.

### *Safety and Environmental Risk*

Here we are referring to direct losses to the investment itself and the indirect consequences to others. Natural disasters, such as floods, earthquakes, or fire, can cause severe destruction to a facility or plant. There can also be man-made disasters such as explosions which can damage the facility and may also kill or severely injure employees or individuals residing nearby. There are also a set of qualitative risks such as pollution, noise, environmental degradation which may be created by a particular project. The firm investing their money in the project or the potential insurers will want to know the extent of their liability from any of these negative impacts.

The potential investment by a multinational firm will involve only some of the risks outlined above. It is important for the relevant interested parties to identify these elements of uncertainty as a prelude to analyzing their decision.

### INSTITUTIONAL ARRANGEMENTS

There is a need to identify the relevant interested parties who are involved in the decision process. Figure 1 indicates the three principal actors who deserve attention with respect to the problem of managing international risk.

*Host Country*

We will assume there is an expressed interest by this party in having funds invested. In many cases the host country may not be able to give complete assurance that the particular investment will be approved, as indicated by the above discussion of social risks. Once the project is completed there may be political, economic, and safety risks which influence its relative success.

*Investor*

Multinational firms often have the option of investing in a number of different projects, each of which will be viewed differently. Funds can be allocated for modernization or expansion of an existing enterprise in a host country, for a new facility, or for exploration of natural resources (e.g., gas, oil, minerals). The project can be jointly owned by the investor and a firm in the host country or it can be controlled entirely by the investing firm. With respect to the organizational structure, corporate investment planners have the responsibility for collecting data and judging the relative attractiveness of specific projects. They are frequently assisted by outside experts who have specialized knowledge of the host countries (Rummel and Heenan 1978).



*Insurer*

For reasons discussed below, few private companies have marketed insurance covering financial losses from foreign investments. In most countries there is some type of government insurance firm which has been established for this purpose. For example, in the United States the Overseas Private Investment Corporation (OPIC) can insure projects in less-developed countries or areas where there are bilateral agreements between the U.S. and the foreign host that recognize OPIC's rights. Before providing coverage OPIC must determine that suitable arrangements exist to protect its interest with respect to any insured project (West 1980, p.10).

In 1971, France set up two systems to protect the foreign investments of their companies, one managed by its foreign trade bank BFCE (Banque Francaise pour le Commerce Exterieur) and the other by the COFACE (Compagnie Francaise d'Assurance a l'Exportation) (Chavlier and Hirsch 1981). COFACE guarantees the total amount of the credit (BFCE plus private portion) for a rate premium of approximately 8.85 percent. The Central Banks of other developing countries frequently provide loan guarantees which enable investors to obtain funds from the eurocurrency market in currencies not native to their country.<sup>3</sup>

---

<sup>3</sup>Similar governmental agencies providing insurance against expropriation, inconvertibility, war, revolution, insurrection exist in Canada, Japan, Norway, Denmark, Australia, the Netherlands, West Germany, Sweden, and Great Britain. Many of these agencies also offer investment guarantee programs which coordinate at the federal level agreements between capital-importing and capital-exporting countries concerning compensation for expropriation, and which also provide prompt interim relief to firms which suffer expropriation and other disruptions.

## DECISION PROCESSES

By decision processes we mean the collection and evaluation of data as a basis for determining whether or not to invest in a particular project. In the discussion which follows we will concentrate on the decision processes of the investing firm and insurer. The uncertainties facing them will, of course, be related to the behavior of the host country. As shown in Figure 1 there are three elements which form the basis of our analysis of the international risk problem:

### *Estimation of Probabilities and Losses*

Before each interested party can evaluate the relative attractiveness of a particular investment there needs to be a clear understanding of the elements of uncertainty. We will utilize the language of decision analysis to structure the problem, although we recognize that in practice individuals and firms may not undertake such a formal approach.

Consider a particular project which has been proposed by a host country to a multinational firm. In Figure 2 we consider a specific investment, Project A, where there are  $n$  possible events which can occur, each one producing a specific outcome. The investor assigns probability  $\Phi_i$  to each event  $i$  and  $C_i$  to the consequence if this event occurs. Some events (e.g., political or economic stability) will yield positive profits while others (e.g., social conflict) may produce losses.

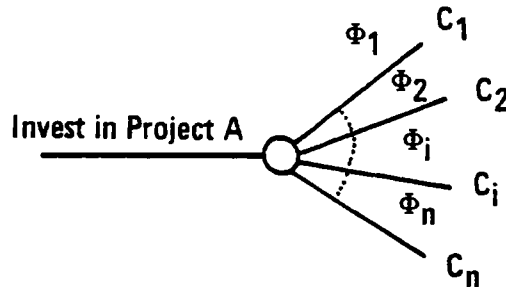


Figure 2. Events and Consequences of Firm's Investment Decision.

A similar tree could be constructed for the insurer in evaluating outcomes if he insures Project A, but his perception of the probability of an event may differ from that of the investor. It is also possible that the firm and insurer may experience different consequences if a particular event occurs. For example, suppose that an investor was fully insured against the possibility of expropriation by the host country. If this event occurred then the firm would file for a claim and the financial loss would be borne entirely by the insurer.

One of the principal problems facing investors and insurers is the lack of a detailed statistical data base for estimating probabilities and consequences of different events. There are thus likely to be systematic biases based on past experience which play an important role in this estimation process.

*Allocation of Responsibility*

In their classic study of the behavioral theory of the firm, Cyert and March (1963) noted that each part of the organization has a set of independent goals and constraints which guide their actions. We hypothesize that this feature of the organizational structure plays a key role in the foreign investment decision by many firms. Corporate investment planners are responsible for the outcomes of their decisions with respect to particular projects. Any specific action on their part requires some justification to others, so that if there is a negative outcome they can protect themselves from being penalized. There is thus a reliance on experts for advice as well as a tendency for investment planners to favor projects in foreign countries where they feel they understand the situation very well.

Risk managers in private insurance firms are likely to have similar concerns about offering coverage to multinational corporations particularly if the data base on which they must estimate premiums may not be representative of future probabilities and consequences associated with a specific set of events. Rather than assume the responsibility for such a risky decision, few private insurance firms have opted to provide protection against foreign investments.

*Avoidance of Uncertainty*

Organizations prefer to avoid uncertainty by developing decision rules which enable them to avoid collecting information on future events (Cyert and March 1963). For this reason investors are likely to utilize threshold models of choice, whereby projects are only approved if the corporate risk manager perceives the chances of a given event to be below an acceptable risk level. If the problem is structured in this way, firms avoid undertaking a detailed analysis of the consequences of different events. Let  $\Phi_i^*$  be the acceptable risk level for each event  $i$  which produces negative outcomes. Their decision rule under a threshold model is simply: accept if each  $\Phi_i \leq \Phi_i^*$ ; otherwise reject the project.

Insurance firms face additional problems of uncertainty if they decide to offer protection against certain investments. Two phenomena which constrain their behavior are problems of adverse selection and moral hazard.

*Adverse selection* is caused by the inability of insurance firms to discriminate between different types of risks. The insurer may thus attract a portfolio of investors whose expected performance is worse than the average. He thus opens himself up to unanticipated losses. By recognizing this possibility the insurer raises his premiums, thus restricting the market even further. Eventually, the rates may be so high that only the poorest risks, if any, are willing to insure and the market fails. This spiral effect has been discussed widely in the economics and insurance literature (see Arrow 1971). For adverse selection to occur, investors must have better information on the nature of their risks than private

insurance firms.

The *moral hazard* problem is a variation on the above theme. After investors protect their investment with insurance, they may be less concerned with its success than if they had to bear the entire risk themselves. If insurers do not anticipate these behavioral consequences then their premiums will be inadequate to cover expected losses. We will discuss the nature of adverse selection and moral hazard in more detail in Section II.

#### PRESCRIPTIVE RECOMMENDATIONS

Once a descriptive analysis of the problem has been completed, it may be possible for the analyst to recommend ways of improving the situation. One of the most difficult tasks here is to develop measures of performance with which to judge the outcomes of alternative policies. Here we are confronting the tradeoffs between efficiency and equity that have become so prominent in the recent literature on social choice and policy analysis. By efficiency we are referring to an allocation of scarce resources so that given the available alternatives it is impossible to increase one output without giving up some of at least one other. By equity we are referring to distributional considerations which may suggest that certain interested parties receive a different share of goods and services than that specified by an efficient allocation of resources (Stokey and Zeckhauser 1978). We are not concerned in this paper with resolving equity/efficiency tradeoffs. Rather the paper will focus on ways to improve the decision processes of investors and insurers.

In the case of international risk, the private market is likely to be imperfect because of difficulties in estimating probabilities and consequences, allocation of responsibility in the organization and uncertainty avoidance by firms. In addition there are political constraints which may come into play regarding investments in other countries which directly involve the government. Schelling (1981) has provided an interesting perspective on this latter issue by showing how the pricing system cannot be utilized if governmental bodies have partial responsibility for the outcomes of specific decisions. These issues generally raise the prescriptive question as to how best to institutionalize the provision of insurance coverage between government and private insurers. This is an issue we address in some detail below.

### **III. HOW FIRMS AND INSURERS DEAL WITH INTERNATIONAL RISK**

In this section we will utilize the conceptual framework to provide more detail on the decision processes that firms and insurers are likely to utilize in coping with the problems of international risk. We will motivate our discussion with a real world example: the problem faced by Indonesia as to whether they would invest financial resources into constructing facilities for shipping liquefied natural gas (LNG) abroad. In particular, we will focus on the question "Should Indonesia enter into a formal contract with United States firms to supply a specific quantity of LNG over the next 20 years?" We will construct simplified models of the decision process based on this particular problem to illustrate our points, even though we are aware that the actual decision making process is far

more complicated than our treatment may imply. This exercise should thus be viewed as a starting point for stimulating future research as to how analysis can be made more realistic.

#### PROBLEM FORMULATION

Liquefied natural gas (LNG) is a potential source of energy which requires a fairly complicated technological process that has the potential, albeit with very low probability, of creating severe losses. For purposes of transportation, natural gas can be converted to liquid form at about 1/600 its gaseous volume. It is shipped in specially constructed tankers and received at a terminal where it undergoes regasification and is then transported through pipelines to transmission systems where it is distributed to residences and business establishments.

Indonesia became a logical source of gas supply to other countries after Mobil Oil Indonesia announced in late 1971 that they had discovered large reserves of natural gas in northern Sumatra (i.e., the Arun field). Both the United States and Japan expressed interest in buying Indonesia LNG. The principal decision facing Pertamina, the Indonesia state-owned oil company, was whether they wanted to invest approximately \$900 million in the construction of a liquefaction storage and loading facility for shipping LNG abroad.

The primary risk facing Pertamina was the possibility of project failure after significant amounts of money had been spent on facilities. In the case of the United States there would be some chance that a receiving site would not be approved in California, (the state which would



receive the LNG) or that there would be long delays in the final approval process. Since the proposed contract was for 20 years there was some concern that LNG be marketable over this period due to the uncertainty about the future of world energy prices. Given the large investment costs in Indonesian LNG facilities all of which are borne by Pertamina, this question as to the stability of future markets had considerable importance.

#### INSTITUTIONAL ARRANGEMENTS

Each real world problem involving foreign investment has a special set of institutional arrangements which reflect the regulatory and political structure of the involved countries. In our specific example the investor, Pertamina, could only enter into any contract on shipping LNG abroad after it was approved by the Indonesian government. With respect to the host country, the United States, two gas utilities in California (Pacific Lighting Corporation and Pacific Gas and Electric) formed a partnership to import LNG from Indonesia through a subsidiary PacIndonesia. Any contract signed between PacIndonesia-Pertamina was subject to approval by the Federal Power Commission.

Other parties also had a stake in the final decision. For large scale investments such as LNG facilities a substantial portion of the required funds are provided by long-term loans at moderate rates of interest. The lenders, who include banks and insurance companies, utilize other people's money and thus are obliged to repay in full. Hence before undertaking the financing of any project such as an LNG regasification

facility, they require some form of insurance against possible losses from the risks listed above. In the case of Indonesia, lenders to Pertamina, which included the eurocurrency market, were guaranteed repayment of any financial loss by the Indonesia Central Bank (Office of Technology Assessment 1980).

## DECISION PROCESSES OF INVESTORS

### *Use of Decision Trees*

Let us first turn to the question of how the investor is likely to evaluate whether to commit funds to a particular project. In the case of Pertamina their decision was undoubtedly influenced by their estimate of the probability that California would approve the siting of an LNG terminal. Pertamina was entirely at risk with respect to the investment costs of their liquefaction and loading facilities.<sup>4</sup> For illustrative purposes suppose that their estimate of the probability of California not siting a facility was  $\Phi_1 = .05$ . Should this scenario develop we assume that they would lose their entire investment of \$900 million. If California did construct a receiving terminal then they anticipate that their total discounted profits profit on the investment would be \$270 million. Pertamina knows that if it doesn't invest in liquefaction facilities it could invest its resources in alternative earnings opportunities, which we assume are known to yield \$180 million with certainty.

---

<sup>4</sup>A force majeure clause in that contract absolved the United States from any obligation to pay for gas should a facility not be sited.

The relevant branches and outcomes for the decisions "Invest in LNG Facilities" and "Don't Invest in LNG Facilities" are depicted in Figure 3. If one was using the criterion of maximizing expected or average return on investment then the LNG facilities would be deemed attractive.<sup>5</sup> In reality, the actual situation is much more complicated than the simple tree of Figure 3. There are questions with respect to the final terms of the contract, the future prices of different forms of energy and the uncertain costs in constructing the liquefaction and leading facility. Each of these factors could be represented in a more complicated decision tree and Pertamina would then be faced with estimating the probabilities and consequences of a more detailed decision tree.

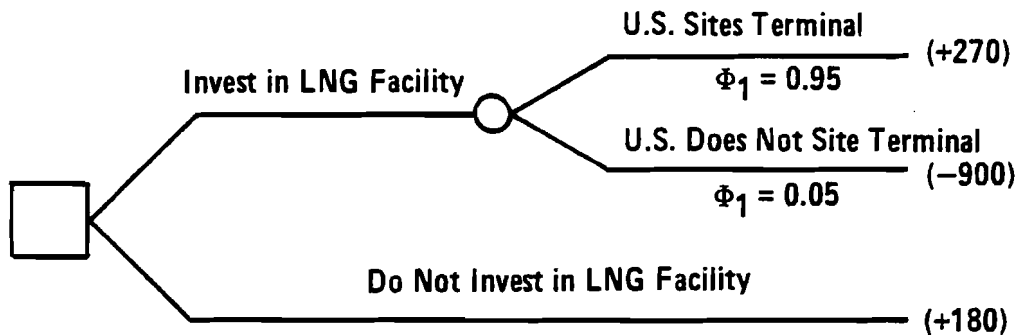


Figure 3. Decision Tree for Evaluating Pertamina's Options.

As we pointed out in the previous section, the lack of a good statistical data base makes it unlikely that Pertamina actually followed this for-

<sup>5</sup>The expected return for investing in the LNG facilities is simply the sum of probabilities times end consequences, i.e.,  $.95(\$270) + .05(-900) = \$211.5$ . Thus, on an expected return basis, Pertamina would prefer to invest rather than not (211.5 vs 180). If, however, Pertamina's management were strongly risk averse so there was a high disutility assigned to the large loss then the reverse preference might hold. See Raiffa (1968) for a discussion of how utilities can be introduced into this analysis.

mal analysis process. We do not know exactly how the company went about making its decision but we can suggest factors which may have influenced their data collection and processing activities. Our conjectures are derived from related research on political risk coupled with empirical data on how individuals and firms behave with respect to low probability events.

### *Systematic Biases*

Due to the lack of a good statistical data base, past experience with the host country is likely to be an important element in determining whether to invest in a particular project. Most firms feel they do not have a good understanding of the relationship between events and managerial contingencies from historical data to estimate the probabilities and consequences of future events on particular investments. Kobrin (1981) points out that impacts of political environments on firms are rarely documented with the exception of expropriation. As a result firms frequently focus on recent events to the exclusion of others in making their judgments. Undue importance may be placed on dramatic events such as a student riot or a palace coup which suggests that the country is unstable when, in fact, it is not (Rummel and Heenan 1978). Economists who have studied corporate risk management feel that too much time is devoted by multinationals to worrying about these salient events and not enough attention is given to studying erratic shifts in foreign laws and regulations which steadily erode corporate profits (*Business Week* 1981).

Kelley (1981) provides empirical evidence on the role of past experience in the foreign investment decision making process through a study of 105 multinational firms, all in the Fortune 500. She points out that if a firm has suffered recent losses from political risks, it tends to use a finer screen and undertakes a more detailed and sophisticated analysis of this factor before making future decisions.

This type of biased behavior on the part of firms has been well documented in field survey and controlled laboratory experiments. Tversky and Kahneman (1974) have labeled this phenomenon availability, whereby one judges the probability of future events by the ease with which one can remember past ones. An example of the availability bias from the field of financial investment is provided by Guttentag and Herring (1981). They indicate that several European banks (e.g., the Fugger Bank, the Bardi, and the Peruzzi) became insolvent during the Middle Ages because they lent to sovereigns. These rulers had a history of paying back small loans but defaulting on large ones. By focusing only on the number of times loans were repaid it appeared as if the sovereign had a favorable record while in fact he was a very risky customer.

Empirical data on consumer decision-making with respect to low probability reveals similar behavior. For example, few individuals voluntarily protect themselves against the financial consequences of natural hazards until after a disaster occurs. Kunreuther, et al. (1978) have documented the importance of past experience as a critical variable in the insurance purchase decision against flood and earthquakes by statistically analyzing data from face to face interviews with 3000 homeowners, half of them insured and the other half uninsured. A comment from a homeowner in a

flood prone area illustrates the importance of past experience in determining his attitude toward future coverage:

I've talked to the different ones that have been bombed out. This was their feelings: the \$60 in premiums they could use for something else. but now they don't care if the figure was \$600. They're going to take insurance because they have been through it twice and learned a lesson from it. (Kunreuther, et al. p.112)

Similar behavior was observed in earthquake areas of California. Following the Santa Barbara quake of 1978, insurance agents noted that there was a sharp increase in demand for coverage (MacDougall 1981).

The media can play a key role in highlighting certain events which then increases their salience as perceived by the public. As a result there is often a tendency to estimate the probability of a particular event to be much higher than it actually is. Combs and Slovic (1978) undertook a study of the frequency with which two newspaper reported various causes of death. They found that violent deaths such as homicides, accidents, and natural disasters were over-reported, while diseases were under-reported. These biases in coverage corresponded closely to biases found in a previous study (Lichtenstein, et al. 1978) in which people were asked to judge the frequency of these same causes of death. Their findings suggest that there may be similar biases with respect to political risk if firms focus on headlines as a basis for judging the magnitude of the risks facing a particular investment.

*Role of Regret*

The absence of both a detailed statistical data base and a causal model of political and economic risk places an enormous responsibility on the shoulders of the corporate investment planner. He is likely to be highly sensitive to the potential losses if he commits funds to an unsuccessful project. We hypothesize that one of the important factors influencing the decision on whether or not to invest in a particular project is how much the responsible individual will regret each choice on the basis of possible outcomes. Bell (1981) has defined the concept of regret as the level of assets that the decision maker would have had, if a different decision had been made.

The simplified choice problem depicted in Figure 3 can be expanded to illustrate how regret may enter into the investment planner's choice process. As shown in Figure 4, the choice between investing and not investing is characterized by two attributes, the second one indicating the amount of money foregone had the other action been taken.

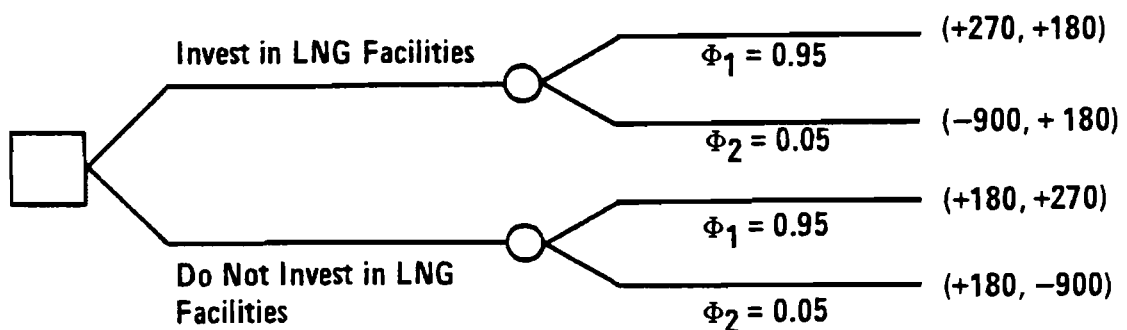


Figure 4. Regret as Part of Pertamina's Decision Tree.

Before recommending that Pertamina invest in LNG facilities the planner would compare the outcomes under both branches of the tree "Invest in LNG facility," with the return from a certain investment (i.e., +180). Bell discusses the case where regret is an additive function, that is, where regret is the difference between the returns on the two options under consideration. Hence with  $\Phi_1 = .05$  the planner would be subject to a regret of 1080 (i.e.,  $900 + 180$ ), which represents the difference between the result that did occur and the result that could have been obtained had another decision been made (viz, the decision "do not invest"). However, if  $\Phi_2$  were to be obtained, the decision maker would be pleased with a positive investment decision, and his regret would be -90 (i.e.,  $-270+180$ ). A similar analysis would be undertaken in evaluating the positive and negative elements of regret in the decision "Do not invest in LNG facilities."

If regret is an important factor in the decision making process then the investment planner will base his decision partly on potential returns and partly on foregone returns. If the foregone returns are sufficiently large and regret is weighed heavily in his process, then the manager may prefer not to take the responsibility for having made a "bad" decision even if the probability of this outcome is relatively small.

Regret can be avoided by diffusing the responsibility for taking actions to others. Hopple and Kuhlman (1981) point out that firms are increasingly relying on country and area specialists in making their decisions. Investment planners can also utilize personal contacts in the host country where an investment is planned. These sources of information provide firms with a more detailed rationale for justifying investment



actions.

The principal disadvantage of this strategy is that it frequently leads to a lack of diversification across countries because of large transaction costs associated with finding experts and personal contacts from many different nations. Guttentag and Herring (1981) note a tendency of banks to invest in only a few foreign nations thus opening themselves up to the possibility of large losses should a particular government refuse to honor foreign debts. Each investment taken by itself may be sound, but the portfolio of projects may be very risky.

#### *Threshold Models*

An additional way to reduce the possibility of regret is not to undertake any actions unless the probability of a failure is below a given threshold level. This avoidance of uncertainty is very common with respect to behavior in both organizational settings as well as individual decision-making by risk managers (Borkan and Kunreuther 1979). To illustrate, suppose Pertamina used a threshold model for screening out projects. It would then specify an acceptable risk level  $\Phi^*$  which would be used as a criterion for approving and disapproving a project. If the risk associated with failure  $\Phi_1$  was less than  $\Phi^*$  then the project would be approved, subject to the additional condition that the expected rate of return for success was above an acceptable level. If  $\Phi_1 > \Phi^*$ , then the project would be rejected no matter how high the rate of return would be. Looking at the data in Figure 3, the LNG liquefaction and loading facility would be approved if  $\Phi^* > .05$  and 30 percent was considered an acceptable rate of

return.

In a study of 38 companies considering foreign investments, Aharoni (1966) provides empirical evidence on the importance of thresholds models for initially screening out projects which have a sufficiently high risk. Kelley (1981) finds similar behavior on the part of the 105 firms she investigated. Investment planners made decisions on the basis of acceptable rates of return and acceptable risk levels rather than attempting to undertake any type of optimization behavior. Each situation was looked at on its own merits without any attempt to undertake any type of portfolio or covariance analysis across projects, as would be implied by an optimization model. This type of decision rule reduced the costs of collecting and processing large amounts of data and avoided uncertainty. It thus conforms very closely to the hypotheses advanced by Cyert and March (1963) in their behavioral theory of the firm.

The use of threshold models to avoid having to focus on the consequences of extremely low probability events is utilized by consumers and government agencies as well as business organizations. In making their insurance decisions, an individual frequently concludes that if the probability of a disaster is below some given level  $\Phi^*$  then it won't happen to me; hence it is not worth worrying about the potential consequences. In such a case insurance protection is not even considered (Slovic, et al. 1977; Kunreuther, et al. 1978). Government regulatory agencies such as the Nuclear Regulatory Commission, use threshold rules on which to evaluate the licensing decision of plants. If they deem the probability of a severe accident to be below  $\Phi^*$  then they don't worry about the consequences (Jackson and Kunreuther 1981).

*Summary*

Taken together, the empirical evidence supports the hypothesis that multinational firms behave in a manner consistent with concepts from the behavioral theory of the firm. The lack of a good statistical data base and causal model of risk creates special burdens on the investment planner. Actions are justified and regret is avoided through the use of experts and personal contacts. Threshold models and acceptable levels of performance are also used as a guide to selecting projects. Finally there is little effort made to deal with the portfolio of risks--rather each project is evaluated on its own merits without comparisons made between other potential investments.

DECISION PROCESSES OF INSURERS

If an investment planner could entice private insurance firms to protect his investments against political and economic risk then he effectively shifts responsibility for a loss to another party. As we pointed out earlier, few private insurance firms actually offer coverage against international risks. Their absence of a good statistical data base and lack of a causal model of political risk open them up to problems of adverse selection and moral hazard.

### *Adverse Selection*

To illustrate adverse selection consider the simplified case where there are an equal number of each of two types of projects, low and high risk, but the insurer cannot distinguish between them. Low risk projects have a probability  $\Phi_L$  of a loss of  $X$  dollars while high risk projects face a probability  $\Phi_H > \Phi_L$  of a loss of  $X$  dollars.<sup>6</sup> The insurer cannot distinguish between the projects and assumes that the probability of a loss is the average of the above two probabilities  $\Phi = (\Phi_L + \Phi_H)/2$ . He bases his premium  $P$  per dollar coverage on this estimate.

Figure 5 depicts the phenomenon of adverse selection due to this imperfect information by the insurer. Investment planners are assumed to be risk averse, estimate the probability of a loss correctly, and choose the optimal amount of insurance which maximizes their expected utility. The demand curves for high and low risk projects are then given by  $D_H$  and  $D_L$  respectively with full coverage purchased if  $P \leq \Phi_i, i = L, H$ . They will want to purchase  $Q_L$  units of coverage for low risk projects and  $Q_H$  units for high risk investments. The expected loss to the insurer on high risk projects (shown by the hatched area in Figure 5) exceeds the expected gain (the dotted region) for low risk ones.

One way for the insurer to counteract the adverse selection problem, when he does not have good information on the respective risks, is to market price-quantity policies. This type of insurance system has been proposed by Rothschild and Stiglitz (1976) but requires some monitoring on the part of insurance firms to ensure that no one attempts to protect

<sup>6</sup>We are assuming that there are only two states of nature: loss of  $X$  dollars or no loss.

itself against a large loss by purchasing multiple low premium-low coverage policies from several different insurers.<sup>7</sup>

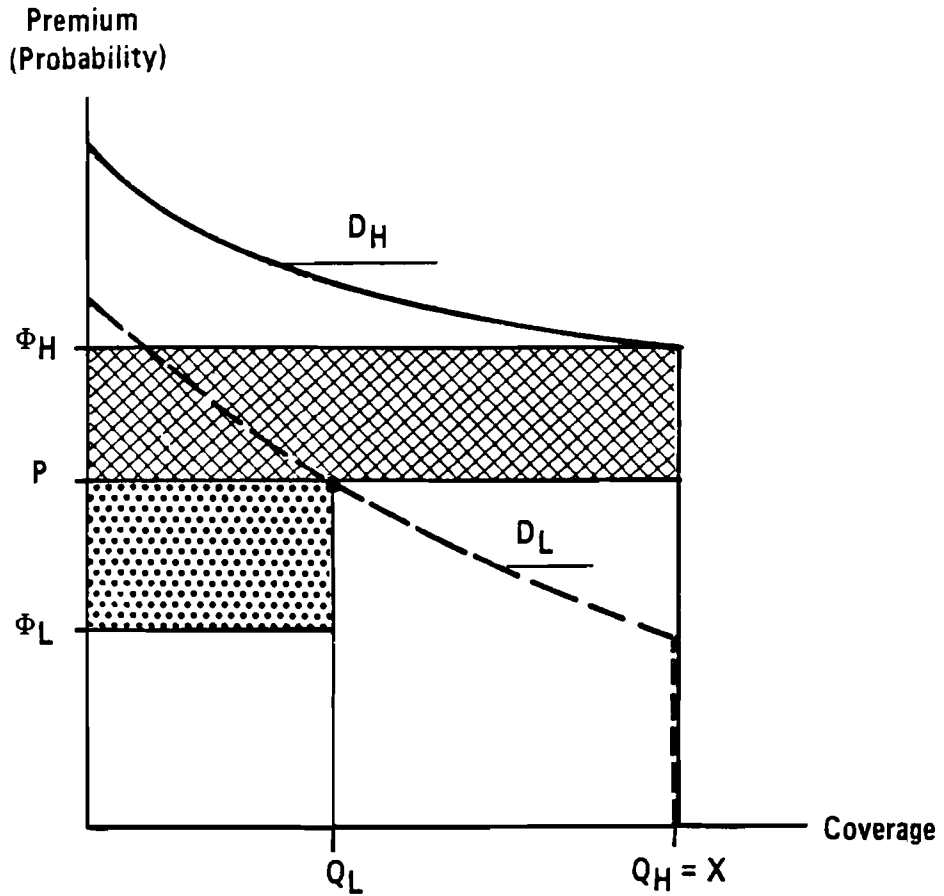


Figure 5. The Adverse Selection Process.

<sup>7</sup> Kleindorfer and Kunreuther (1981) have investigated the robustness of these types of price-quantity policies for the case where potential insured individuals misperceive the probabilities of a loss.

*Moral Hazard*

Moral hazard refers to an increase in the probability of a loss because the investment firm's or the country's have modified their behavior solely as a result of the insurance purchase decision. In addition, the insurer is assumed not to have anticipated or to have underestimated this increased probability. For example, if the host country feels less responsibility toward the investing firm because it knows that someone else will cover its potential losses, then this would create a moral hazard problem unless the insurer was also aware of this structural change. How prevalent this type of situation actually is in the real world is an empirical question worth pursuing.

The moral hazard problem is illustrated in Figure 6 for a set of low risk projects, each of which is assumed to have a probability of  $\phi_L$  that it will fail. The investment planners purchase  $\phi_L$  units of insurance at  $P$  dollars per unit. Once coverage is purchased the insurer is surprised to find that the actual probability of a project failure has increased to  $\phi_H$  so that he suffers an expected loss for each project shown by the cross hatched area in Figure 6.

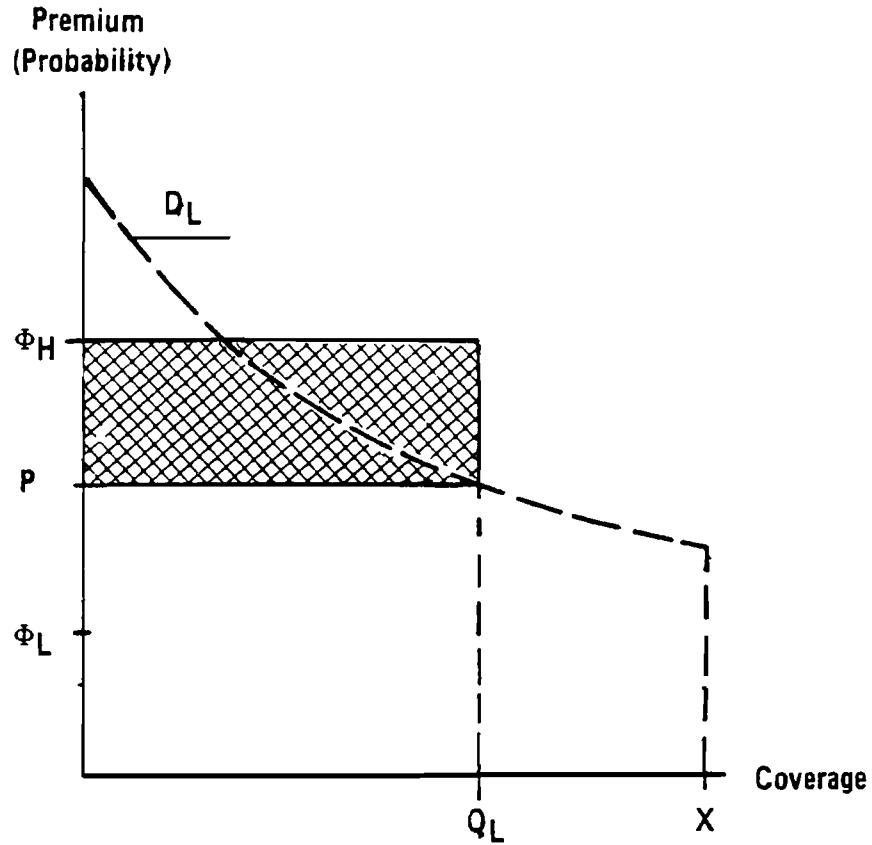


Figure 6. The Moral Hazard Problem.

#### IV. THE LNG SITING DECISION IN THE UNITED STATES

Let us now return to the specific uncertainty facing Pertamina: determining the probability that the United States will actually site an LNG receiving terminal in California. There are great difficulties in providing an estimate of this probability because of the complex nature of the decision making process in the U.S. with respect to the siting of large-scale technologies such as nuclear power plants or LNG terminals.

For one thing, the decision affects many different individuals and groups in society rather than being confined to the normal relationship of a private market transaction such as when a consumer purchases food or an appliance from a store or firm. In the siting decision, each of these groups has its own objectives, attributes, data base and constraints (Kee-ney 1980).

In the case of the LNG terminal in California there were several different parties who were concerned with the siting decision: First, the applicant for the terminal (Western LNG Terminal Associates)<sup>8</sup> Second, government agencies at the federal state and local level: the Federal Energy Regulatory Commission (FERC) determines whether a proposed LNG project is in the public interest and should be allowed, the California Coastal Commission has the responsibility of protecting the California coastline, the California Public Utilities Commission (CPUC) is the principal state body involved in power plant issues, and the state legislature sets up the rules of the siting process. Finally there are public interest groups, represented by the Sierra Club and local citizens groups.

Each of these different parties interacted with each other at different stages of the decision process with respect to the siting of a terminal. Their concerns centered around three different classes of attributes: economic aspects, environmental aspects and risk aspects. Table 1 depicts an interested party/concern matrix showing the main attributes considered by each of the relevant groups. It is clear from this table that each of the parties brought to the debate their own special interests.

<sup>8</sup> This was a special company set up to represent the LNG siting interests of the three gas distribution utilities: Southern California Gas Company, Pacific Gas and Electric and El Paso Natural Gas Company.



Table 1. Party-Concern Matrix.

CONCERNS	PARTIES	APPLICANT UTILITY	FEDERAL				STATE GOV'T		LOCAL GOV'T	INTEREST GROUPS	
			FERC	CCC	CPUC	LEG		SIERRA CLUB	LOCAL CITIZENS GROUP		
ECONOMIC											
NEED FOR GAS		●	●		●	●					
PROFIT CONSIDERATIONS		●			●	●					
PRICE OF GAS		●	●		●	●					
LOCAL ECONOMICS							●				
ENVIRONMENTAL											
AIR QUALITY			●		●	●			●		
LAND USE			●		●	●	●		●	●	
RISK											
POPULATION		●	●		●	●	●		●	●	
EARTHQUAKE			●		●	●					

The applicant's primary concerns are earning profits for shareholders and delivering gas reliably to consumers, although there is also a concern with safety to the population. The federal and state governmental agencies concerns were specified by legislation; local government bodies determined the economic advantage of a terminal to their community in the form of higher tax revenues and employment possibilities and compared these benefits with environmental costs and risk to their population. Finally the public interest groups focused their attention on the environmental and safety risks associated with the proposed project. There is thus a potential for conflict between these different parties.

Another feature of the siting problem is the absence of a statistical data base on which to base reliable estimates of the different economic, environmental and safety risks associated with a proposed project. Experts are likely to differ on their estimates of the consequences of an LNG terminal and each of the different parties will use those quantitative figures which best suit their purposes.

Lathrop and Linnerooth (1981) have explored the process of risk assessment and provide detailed comparisons of seven major risk assessments regarding the safety of an LNG terminal in the three sites proposed in California: Los Angeles, Oxnard and Point Conception. They point out that the content of each study is largely determined by the use that this assessment will be given in the political debate. They provide empirical data by comparing three risk assessments for Oxnard in some detail. For example, a consulting firm, Science Applications Inc. (SAI) commissioned to do a risk assessment for the Federal Power Commission estimated the probability of a ship accident in the Oxnard harbor to be  $5.6 \times 10^{-8}$ . Socio

Economic Systems, a consulting firm who undertook a study for the City of Oxnard, estimated this same probability to be much larger, i.e.  $3 \times 10^{-2}$ .

For the reasons given above, it is difficult to accurately estimate the probability that a site will be chosen. Today, eight years after initial applications were filed for three terminals in California, no final decision has been made as to whether one will actually be built. The Los Angeles facility was ruled out because of seismic risk and Oxnard was rejected because the risk to the population of a catastrophic accident was perceived to be too high. Only Point Conception still remains a possibility. In 1978 this site was approved, conditional on it being a seismically safe harbor. The final report on the safety of the facility has not yet been issued by the FERC and CPUC. <sup>9</sup>

#### PERTAMINA'S INVESTMENT STRATEGY

Despite these uncertainties with respect to the siting decision in the United States, Pertamina decided to invest in a liquefaction and loading facility. In taking this action Pertamina protected their investment in two ways. First, they signed a contract with Japan to ship LNG from its new facility. By diversifying their portfolio, Pertamina was not locked into one potential customer. They actually began shipping LNG to Japan in August 1977 from their new plant (Wood, 1979). Second, in October

---

<sup>9</sup> A detailed description of the California siting decision appears in Lathrop (1981) and Linnerooth (1980). A descriptive model of choice indicating the nature of the political and social risks and how they play a role in siting decisions can be found in Kunreuther, Lathrop and Linnerooth (1981).

1977, they renegotiated their contract on a month to month basis with PacIndonesia, the United States firm. Pertamina now has the right to cancel at any time without any attached penalty. Given the expansion of the Japanese market there is now no guarantee that the United States will receive LNG from Indonesia even if a terminal in California is approved.

The other uncertainty that Pertamina faced with respect to the profitability of their LNG facility is the future of world energy prices. They resolved this problem through contract negotiations. Soon after the initial contract between PacIndonesia and Pertamina was signed in 1973 the world price of oil rose sharply. Since this contract was not tied to an increase in energy prices the Indonesian government refused to approve it. A final version was eventually approved in 1978. It includes an escalation clause reflecting changes in the Indonesian crude oil export prices.<sup>10</sup> In the case of Japan, the initial contract was tied to the price of world oil and automatically reflected the increase so it did not have to be renegotiated (Western LNG Terminal Associates 1978).

At an empirical level, we see that Pertamina was able to protect its large financial investment by diversifying its portfolio by having Japan as another customer and negotiating its contract to reflect world energy prices. The Indonesian government played an important role in the process by refusing to approve a final contract between Pertamina and its customers unless the selling price of LNG was competitive with the market price. The government also encouraged lenders to provide Per-

---

<sup>10</sup>Further information on this is contained in Office of Technology Assessment (1980).

tamina with funds for the LNG facilities by providing insurance through its Central Bank.

## V. PRESCRIPTIVE SOLUTIONS

The above descriptive analysis and case study make clear that there are several impediments to an efficient sharing of political risks between insurers and corporations involved in direct foreign investments. Concerning firms, the complexities involved in assessing such risks give rise to organizational reactions characterized by single project-single country myopia, by organizational diffusion of responsibility and regret, and by uncertainty avoidance. Such organizational behavior can result in various inefficiencies, including improperly diversified investments, problems of organizational monitoring and control, and inappropriate protective reaction to unfolding events.

These reactions at the firm level only compound the normal problems of providing coverage against large risks by insurers. It is not surprising, therefore, that the role of insuring political risks has been assumed for the most part by government agencies such as the Overseas Private Investment Corporation in the U.S. and the Export Development Corporation in Canada. One may argue, of course, that some governmental involvement in insuring these risks is desirable given their strategic ramifications. Nonetheless, private industry has demonstrated significant efficiency advantages over governmental operations in other areas.<sup>11</sup> It may also be desirable to insulate insurance against

---

<sup>11</sup>See Blankart (1980) for a survey of comparative results on public versus private provision

international hazards and from the vicissitudes of domestic politics. This suggests that one explore ways that the private insurance industry can provide such coverage. As a prelude to our own proposals in this regard, we first examine how corporations might improve their risk assessment procedures, so that they have a better understanding of the hazards for which they seek insurance.

#### IMPROVING POLITICAL RISK ASSESSMENT

The descriptive analysis above suggests several areas where political risk assessment might be improved. We briefly review here recent research of interest under two headings: process improvements and organizational design.

##### *Process Improvements*

It should be recognized that the problem of political risk assessment is a special case of the general problem of risk assessment. In recent times, the increasing technical and social complexity of industrial society has given rise to a concerted research effort to develop publicly and scientifically defensible methods for assessing social and technological hazards. It would take us too far a field to review this literature here but some of its major conclusions deserve stress in the present context.<sup>12</sup>

---

of goods and services. These empirical results strongly support the view that private industry has cost advantages relative to governmental provision of goods.

<sup>12</sup>Recent research on the role of risk assessment in an institutional context can be found in Conrad (1980).

First, one may broadly describe the process of risk assessment as containing two interrelated tasks:

- (1) Determining the structure of the contingent events and decisions relating to the risk in question. Figure 3 is a very simple example of such a structure. This phase of risk assessment describes in so-called "decision-tree" fashion the possible events and consequences resulting from different scenarios.
- (2) Estimating the actual values of probabilities and consequences of each scenario.

Concerning the second task, recent research has provided a variety of subjective and analytical methods of assessment. However, the more fundamental problem in the political risk assessment area is the first task, determining the "right" decision tree (i.e., a decision tree whose causal links to the risks in question are not just specious). The above Indonesian case study indicates how difficult this task is, as it calls for an intricate knowledge of the events or scenarios in another country which may condition or cause significant political change. Although it would be foolish to expect a perfect understanding in advance of such scenarios, recent research on corporate planning and risk assessment has shown that the use of controlled group methods and new corporate planning methodologies can be of help here.<sup>13</sup> By a formal analysis of alternative assumptions and their consequences, these methods enlarge the set of scenarios considered and lend added plausibility and understanding to

---

<sup>13</sup>See Ackoff (1974) and Kleindorfer (1981) for a review of recent research on planning methods and risk assessment. Zeleny (1979) and Hogarth and Madriakis (1981) discuss recent field and experimental results on group processes and forecasting.

the chains of events which may produce negative outcomes. In the end, of course, nothing substitutes for wisdom and intuition of the participants in such planning processes. Nonetheless, this research suggests that although political risk assessment is intrinsically subjective, one can substantially improve even wise intuition by instituting explicit and formal procedures.

One of the most promising assessment procedures for evaluating the political risks is SPAIR, an acronym for Subjective Probabilities Assigned to Investment Risks. This approach, developed at Shell Oil Company (see Meisner 1976 and Gebelein, et al. 1978) requires experts to evaluate different global scenarios (some of which they may generate themselves). Each expert provides qualitative judgement on the likelihood that certain events such as civil disorder, war, expropriation, price controls, taxation changes and export or production restrictions will occur.

These assessments are then converted into probability estimates on the basis of how strongly a particular proposition is supported or refuted by the expert. The elicitation technique is similar to the Delphi procedure because it uses opinion solicited through a questionnaire. Unlike the Delphi method the SPAIR procedure does not force a panel consensus.

The approach also incorporates a Bayesian updating procedure if new information becomes available. For example, suppose that Pertamina brought in a group of experts to estimate the probability that California would site an LNG terminal. One individual might have estimated the probability that a terminal would *not* be sited to be  $\Phi_1 = .05$ . After learning that two of the three proposed sites were rejected, he might revise his estimate downwards using data on previous real world scenarios as a



basis for updating of the probability.<sup>14</sup>

### *Organizational Design Issues*

Many of the problems of country and project myopia observed in multinational corporations are due to the necessity of organizing corporate activities around specific (large) projects and geographic regions. Oftentimes such specialization represents the appropriate tradeoff between responsibility and control in disaggregating corporate world-wide activities into manageable chunks. Moreover, political risks form only one piece of the more complicated puzzle of business and foreign exchange risks for a given geographic region or group of investment projects.

These considerations can be evaluated operationally by considering the costs and benefits of alternative organizational designs, e.g., organizing by region, by project, or by functional area. Each of these organizational forms has certain corporation-specific benefits for the planning and control of corporate activities. The final choice of organizational structure is then dictated by those dimensions of corporate performance which are most critical for responsibility and control.

Kelley's (1981) analysis of the organizational structure of international operations reveals considerable diversity in the ways in which firms organize, including structuring corporate activities by geographic divisions (19%), by global product divisions (34%), having international opera-

---

<sup>14</sup>A more detailed discussion on how Bayesian techniques can be used to revise political risk estimates appears in Hopple and Kuhlman ed. (1981).

tions organized under an international division (22%), or by matrix organizations (23%). This variety reflects the absence of general truths regarding efficient organizational design. However, the increase in matrix organizations over the past decade may reflect attempts by corporations to fill in some of the cracks in their primary operational structure. For example, organizing by product groups may make sense from an operational viewpoint, whereas assessing and monitoring political and foreign exchange risks would be much simpler under a regional organization. Combining these two criteria can be accomplished, at some expense, through a matrix organization with primary operational control vested in the product group while simultaneously giving a regional coordinator the authority to collect and monitor information on all corporate activities in a given region.

Compromise solutions such as matrix organizations have begun to prove their worth in coping with a variety of informational and control tradeoffs in organizational design.<sup>15</sup> Indeed, one may view organizational design generally as the evaluation of how different organizational forms fare with respect to competing long- and short-run planning and control dimensions. Here, just as with decision process problems, the key to improvement is an explicit analysis of alternatives and their consequences.

In reviewing the above discussion on prescriptive measures for the firm, one may view the fundamental problem of dealing with the risks of international hazards to be the cost and/or unavailability of accurate

---

<sup>15</sup>See Galbraith (1973) for a detailed discussion of matrix organizations and their relationship to other organizational design issues.

information concerning probabilities and consequences of different events, and the organizational responses which such uncertainty evokes. In part, these problems are a generic feature of the complexity of doing business in the international arena. It is natural, however, to inquire whether properly motivated insurers might not promote a more statistically informed and efficiently diversified risk sharing in this area than individual firms. Some of the reasons this has not taken place to date have been noted above. We now take this theme up again and suggest a possible improvement to present institutional arrangements through a partnership between the federal government and the private insurance industry.

#### A JOINT FEDERAL-PRIVATE INSURANCE PROGRAM

In this section we will propose a program whereby coverage is offered to investing firms through the cooperation of a federal government agency such as OPIC and the private insurance industry. The principal difference between the existing system in the United States and the one which we suggest is a provision to allow private insurance firms access to government information on country risks, thus providing for more accurate assessment activities on their part. Let us discuss the elements of the system in more detail:

*Pooling and Sharing of Information*

One reason that private insurance companies do not provide coverage against international risks is that it is too difficult for them to estimate accurately the probabilities and losses resulting from different events.<sup>16</sup> OPIC, on the other hand, has access to political and economic intelligence data provided by U.S. government agencies and U.S. embassies and consulates worldwide. In fact, West (1980) feels that this agency is likely to have better knowledge regarding the probable incidence of a political event than its clients. This type of information helps guard against problems of adverse selection.

In our proposed system, these data would be made available to private companies who would then supplement them with their own private data base. The same information-sharing would take place with respect to the settling of claims. Each private company who settles a loss with a client firm would make these data available through a public information bank operated by a federal department or government insurance firm. All private insurance firms would have access to these data banks and hence could learn from the experience of others in making future investments.

---

<sup>16</sup> According to a recent article in *Business Week* (1981), multinationals worldwide paid \$600 to \$700 for political risk insurance in 1980, of which about \$500 million went to government insurance agencies. For US companies about 40% of the estimated total of \$100 million in premiums paid in 1980 went to private insurance companies. So far there are only four US carriers marketing political risk coverage in the US. The article further reports that the major complaint with such privately marketed insurance is its (perceived) exorbitant cost.

*Risk Sharing by Investing Firm*

One way to deal with problems of moral hazard is to have some type of risk sharing by investing firms through a deductible or coinsurance clause. A deductible requires the individual to incur a mixed amount of the loss no matter how large the claim may be. Automobile contracts written with a \$100 deductible requires the policy holder to pay the first \$100 worth of damage. Coinsurance clauses require the individual to pay a fixed percentage of the loss. OPIC requires investors (except institutional lenders) to pay 10 percent of the risk (West 1980). This type of insurance clause acts as an incentive for firms to protect foreign investments more carefully than if they were fully covered by insurance.

*Government Reinsurance*

One reason that private industry wants to insure their large foreign investments against political risk is their concern about the possibility of incurring severe losses which may threaten their solvency. Private reinsurance companies have also been reluctant to share this risk. Some type of government reinsurance may be desirable, whereby private insurers pay a relatively small premium to a federal agency for protection against losses in excess of a certain amount. By agreeing to share the risk in this way then the government also has an incentive and responsibility to protect their own investments and intervene in the foreign country if they feel this is necessary.

*A Prototype Program*

The National Flood Insurance Program provides an instructive example for designing a joint federal-private program for political risk. The program was enacted in 1968 as a means of offering federally subsidized flood insurance on a nation-wide basis through the cooperation of the federal government and the private insurance industry. The federal government, through the Federal Insurance Administration (FIA), identifies flood-prone communities, establishes insurance rates and policy terms, subsidizes premiums, provides reinsurance, sets standards of flood plain management, and enforces hazard mitigation requirements for participating communities. Up until the end of 1977 the writing of flood insurance was overseen by the National Flood Insurers Association (NFIA), an organization that represented a pool of 130 of America's major property and casualty insurance companies. The private insurance industry, under the auspices of the NFIA, committed a percentage of the risk capital, bore a portion of the expenses and insured losses, and, through licensed insurance agents and brokers, sold and processed flood insurance policies.

Our proposed system of political risk insurance in the United States would follow a similar structure. The role of the Federal Insurance Administration could be played by OPIC. Private insurers would market policies to individual firms but OPIC would provide these companies with the data on the country risk in much the same way that FIA provides all private insurance firms with hydrological data on the flood hazard for different river basins. If the estimated premiums were considered to be unusually high using the best available estimates of the probability and

consequences of certain events, then OPIC could subsidize insurance premiums to encourage foreign investment. This policy would be similar to the subsidization of flood insurance premiums by the Federal Insurance Administration. Reinsurance on unusually large losses would be offered by OPIC in much the same way that FIA handled reinsurance for catastrophic floods.

The great advantage of this type of system is that it enables the private and public sector to each exhibit their comparative advantages. OPIC would be the central source for information on country risk and losses over time; it would also help monitor projects and provide diplomatic and military liaison to the Federal Government to safeguard strategic interests. Government reinsurance provides financial protection to the private insurance firms.

The insurance industry could utilize its comparative advantage of marketing policies, settling loss claims and supplementing OPIC's information base on country risk by collecting data on the costs and benefits of each specific investment project. As more data became available on how different projects fared, then insurance premiums could be adjusted to reflect actuarial risk levels.

We should bear in mind however that the rate setting process is not likely to reach a stable equilibrium. When it comes to insuring against international hazards one has to be prepared for surprises. The great challenge with respect to firms and insurers improving their decision making process is to harness these surprises to allow efficient risk-sharing and investment in the international arena.





## REFERENCES

- Ackoff, R. 1974. *Redesigning the Future: A Systems Approach to Societal Problems*. New York: Wiley.
- Aharoni, Y. 1966. *The Foreign Investment Decision Process*. Cambridge: Graduate School of Business Administration, Harvard University.
- Arrow, K. 1971. *Essays in the Theory of Risk Bearing*. Chicago: Markham.
- Bell, D. 1981. "Regret in decision making under uncertainty." (Mimeo).
- Blankart, C.B. 1980. "Bureaucratic Problems in Public Choice: Why do Public Goods Still Remain Public?" in K.W. Roskamp (ed.), *Public Finance and Public Choice*. Paris: Cujas.
- Borkan, B., and H. Kunreuther. 1979. "Contingency Planning Against Low Probability Events," *Best's Review*, 80:106-112.

- Business Week*. 1981. "Insuring Against Risk Abroad", (September 14), pp.59-62.
- Chavlier, A., and G. Hirsch. 1981. "The Assessment of the Political Risk in the Investment Decision." *Journal of Operational Research*, 32:599-610.
- Combs, B., and P. Slovic. 1979. "Newspaper Coverage of Causes of Death," *Journalism Quarterly*, 56:837-43.
- Conrad, J. 1980. *Society, Technology and Risk Assessment*. New York: Academic Press.
- Cyert, R., and J. March. 1963. *A Behavioral Theory of the Firm*. Englewood Cliffs, N.J.: Prentice Hall.
- Eaton, J., and M. Gersovitz. 1980. "Poor country borrowing in private financial markets and the repudiation issue." (mimeo).
- Galbraith, J. 1973. *Designing Complex Organizations*. Addison-Wesley.
- Gebelein, et al. 1978. "Assessing political risk of oil investment ventures," *Journal of Petroleum Technology*. (May):725-30.
- Guttentag, J., and R. Herring. 1981. "Financial Disorder and International Banking." (Mimeo).
- Hogarth, R.M., and S. Madridakis. 1981. "Forecasting and planning: an evaluation," *Management Science*, Vol. 27, no.2, February, 115-138.
- Hohenemser, C., et al. 1977. "The distrust of nuclear power," *Science*, 196:25-34.
- Hopple, G., and J. Kuhlman. 1981. *Expert-generated data: applications in international affairs*. Boulder, Colorado: Westview.

- Jackson, J., and H. Kunreuther. 1981. "Low probability events and determining acceptable risk: the case of nuclear regulation." Professional paper, PP-81-87, May, Laxenburg, Austria: IIASA.
- Keeney, R. 1980. *Siting Energy Facilities*. New York: Academic Press.
- Kelley, M. 1981. "Foreign investment evaluation practices of U.S multinational corporations," UMI Reseach Press, Ann Arbor, Michigan.
- Kleindorfer, P. 1981. "Group Decision Making Methods for Evaluating Social and Technological Risk." Paper presented at IIASA Summer Study on Decision Processes and Institutional Aspects of Risk. Laxenburg, Austria: IIASA, June.
- Kleindorfer, P., and H. Kunreuther. 1981. "Misinformation and Equilibrium in Insurance Markets." Paper presented at a conference on Economics of Regulation, International Institute of Management, West Berlin, July.
- Kobrin, S. 1981. "Political assessment by international firms: models or methodologies." *Journal of Policy Modeling*, 3:251-70.
- Kunreuther, H., et al. 1978. *Disaster Insurance Protection*. New York: Wiley.
- Kunreuther, H., J. Lathrop and J. Linnerooth. 1981. "A Descriptive Model of Choice for Siting Facilities: The Case of the California LNG Terminal." IIASA Working Paper, WP-81-106. Laxenburg, Austria: IIASA.
- Lathrop, J. 1980. "The Role of Risk Assessment in Facility Siting: An Example from California." WP-80-150, Laxenburg, Austria: IIASA.
- Lathrop, J., and J. Linnerooth. 1981. "The Role of Risk Assessment in a Political Decision Process," (Mimeo).

- Lichtenstein, S., et al. 1978. "Judged frequency of lethal events," *Journal of Experimental Psychology: Human Learning and Memory*, 4:551-78.
- Linnerooth, J. 1980. "A short history of the California LNG terminal." WP-80-155, Laxenburg, Austria: IIASA.
- MacDougall, A. 1981. "Earthquake insurance: Is it worth it?" *Los Angeles Times*, March 8.
- Meisner, J. 1976. "Processing and Evaluating Expert Opinion." Paper presented at the Second European Congress on Operations Research, Stockholm.
- Office of Technology Assessment. 1980. "Alternative Energy Futures: Part I, the Future of Liquefied Natural Gas Imports," Washington, D.C.: Government Printing Office.
- Raiffa, H. 1968. *Decision Analysis*. Reading, Mass.: Addison-Wesley.
- Rothschild, M., and J. Stiglitz. 1976. "Equilibrium in competitive insurance markets: an essay in the economics of imperfect information." *Quarterly Journal of Economics*, 90:629-49.
- Rummel, R., and Heenan, D. 1978. "How multinationals analyze political risk." *Harvard Business Review* 56:67:76.
- Schelling, T. 1981. "Economic reasoning and the ethics of policy." *Public Interest* 63:37-61.
- Stokey, E., and R. Zeckhauser. 1978. *A Primer for Policy Analysis*. New York: Norton.
- Slovic, P., et al. 1977. "Preferences for insuring against probable small losses: insurance implications." *Journal of Risk and Insurance*,

44:237-58.

Tversky, A., and D. Kahneman. 1974. "Judgment under uncertainty: heuristics and biases." *Science* 185:1124-34.

West, G. 1980. "Underwriting and management policies of the overseas private investment corporation." Paper presented before International Risk Management Symposium on Managing Country Risk. New York City, January.

Western LNG Terminal Associates. 1978. "Indonesian LNG Project Case History." (Mimeo).

Wood, 1979. "Chronology and history of PacIndonesia project." R. Petsinger and R. Vance (eds.), *LNG Terminals and Safety Symposium*, Flushing, NY: Scholium.

Zeleny, M. 1979. "Intuition: Its failures and its merits." B. Persson (ed.), *Surviving Failures*, Atlantic Highlands: Humanities Press, 172-183.