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Article abstract

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Le Chili est dans la zone la plus menacée. Elle a eu périodiquement des séismes qui ont ébranlé certaines de ses villes et menacé sa population. Aussi n'est-ce pas étonnant que sa délégation ait jugé à propos de présenter une communication sur le sujet à la *IXth Hemispheric Insurance Conference* qui a eu lieu à Mexico en novembre 1963. Nous en reproduisons ici le texte en anglais, et non en espagnol comme l'était la version originale, afin que nos lecteurs puissent le lire plus facilement. – A.

L'assurance contre les tremblements de terre[1]

La catastrophe d'Anchorage, en Alaska, a mis à l'ordre du jour l'assurance contre les tremblements de terre et contre les raz de marée, tout le long de cette côte du Pacifique, des Aléoutiennes — chapelet d'îles et d'îlots d'une si grande importance stratégique pour les Nations d'Occident — jusqu'à l'extrême pointe d'Amérique du Sud où les vents du cap Horn ont, à tous les âges de la voile, jeté la crainte dans les esprits des marins les plus aguerris.

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In order to serve as a guide to the proper development of this study and to the scope of the insurance described, we consider it necessary to provide a brief description of the nature of the phenomenon giving rise to the risk covered by the said insurance.

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[1] C'est-à-dire à toutes fins pratiques l'assurance contre les tremblements de terre dans les parties du monde les plus exposées et, en particulier, au Chili.

I — Definition

This natural phenomenon has been defined as a violent tremor of the earth's surface, the movement of which extends in any direction.

There are two types of earthquakes. The first comprises the so-called "volcanic" tremors which are caused by violent explosions that take place inside volcanoes. It has been
220 proved that the destructive power of these phenomena have a relatively short radius of action, measured from the point of origin of the volcanic activity. The other type is composed of "tectonic" tremors, phenomena involving the formation of the earth and which occur at great depths, between 70 and 120 kilometers, caused by basal sinking of unstable areas bringing about collisions of the masses against each other. As a rule, tectonic tremors affect wide areas and appear most commonly in the zones along the great faults in the earth's crust which are mainly found in the Mediterranean circle and in another circle around the Pacific. Seismologists have observed that the majority of the principal foci of earthquakes are located in the ocean near coasts overlooked by high mountain ranges; when the epicenter of a seismic movement is situated below sea level, the quake takes the form of a tidal wave.

Accordingly, it appears that the biggest earthquakes are not caused by explosions of volcanic gases but by dislocations of the earth's crust as a result of tectonic conditions.

Just as there are seismic phenomena of great intensity, there are many others, of course, of little or no destructive power. This intensity is measured according to scales which consist of various accelerations, the most familiar of these being the Sieberg, Rossi-Forel, Omori, etc. The different accelerations of the horizontal movement of the earth are

represented on the scales by degrees and range from tremors perceptible only to the most delicate seismographs to the "great catastrophe tremor" which destroys all the buildings and brings about landslides and the formation of new fault in the earth's crust. Statistics show that the number of tremors per year vary between 10,000 and 30,000 of which 5,000 to 6,000 are imperceptible to man. About 150 have some destructive power and approximately 25 cause catastrophes. The number of victims of earthquakes is estimated at 30,000 a year.

II — Generalities on earthquake insurance

Problems in this type of coverage. As explained above, there are areas of the earth's crust that are more susceptible to seismic phenomena than others because of their tectonic conditions. The insurance companies of those countries in which seismic zones exist have had a difficult problem up to now in determining the granting of sufficient protection for property threatened by earthquakes.

It is for this reason that in spite of the great damage generally wrought by these earthquakes, insurance against this risk does not seem to be widespread anywhere, even in those countries where they are relatively frequent occurrences. Fundamentally, the explanation is probably because the cost of this coverage is very high. Observations have shown that as far as earthquakes are concerned the law of high figures cannot be applied; nor are basic insurance principles applicable regarding the make up of portfolios with a reasonable balance between premiums collected and maximum probable exposure. The law of averages operates over such long and varied time lapses, that it is not possible to determine the average of losses within a period of practical utility.

In other words, the risks are distributed very unequally, from a geographical point of view, and their catastrophic

aspects are concentrated in limited zones, where the calamity occurs only at long intervals.

All of this more or less explains the problems insurance companies face in engaging in the business of earthquake insurance on a larger scale.

Its aspects in relation to catastrophe and the Japanese experience — Tokyo-Yokohama. In support of the above
222 it is useful to review essentially catastrophic character of this risk which usually affects prosperous zones with dense populations where even quakes of moderate intensity may have disastrous effects. In Japan, for example, 95% of the damage produced by the Tokyo-Yokohama earthquake of 1923 was due to the fire that followed it, coming as it did at midday when dinner was being prepared in the houses. If we add to this the destruction of the water mains, the strong winds that struck, and the general panic, it is easy to understand why an earthquake of medium intensity should have brought about one of the worst catastrophes in the world. Approximately 580,000 houses were destroyed and 141,720 people killed, while total property loss amounted to U.S. $2,750,000,000. Only 5% of the damage produced in this great calamity was directly due to the quake itself; the remaining 95%, we repeat, was the indirect results of the seism.

Aside from this tragic experience in Japan, her hardly enviable record in number and destructiveness of earthquakes has resulted in making her one of the most advanced countries in the world in scientific research in the field of seismic disturbances. Studies were begun there in 1880 with the foundation of the University of Tokyo. The enormous strides made since that date both in the field of study and in instrument design are revealed in the publications of the Japanese Seismological Society. The 1923 disaster gave tremendous forward impetus to the government's seismological program and re-

sulted in the establishment of a new organization, the Institute of Earthquake Research at the Imperial University.

In our opinion, the most useful lesson that has been drawn from all the catastrophes of this type is that which concerns the condition of the buildings and the planned arrangement of urban centers affected by earthquakes. Earthquake-proof construction may be realized with any material, wood or reinforced concrete, if the proper precautions are taken in regard to the nature of the terrain (solid or fill), height of the buildings, and if the regulations regarding earthquake-proofing, in general, are observed; broad avenues avoid fires, starting point of catastrophes.

Direct and Indirect damages. In commenting on the Japanese disaster of 1923, we referred to the fact that the major part of the losses were the result of "indirect" damage. It is pertinent, then, to define this important element that plays such an important role in the coverage of the risk under discussion.

Earthquake insurance appears under two different forms: insurance against direct damage (sinking or destruction of the building as a direct consequence of the quake) and insurance against indirect damage (fire, explosion, flood, etc., resulting from the earthquake or tidal wave).

These two different aspects may be defined in the following manner: a direct causal relation exists when a single agent is enough to trigger a series of mechanical consequences, each of which is the immediate source of the one that follows. On the other hand, indirect causal relation exists when two sources are concurrent, neither of which produces the damage independently. One of these agents causes the other to produce a certain effect, also in direct form.

III — Earthquake insurance abroad

How it operates. We have already pointed out that there are many obstacles in the path of the application of earthquake insurance on a commercial basis and, in consequence, it is relatively little diffused. We will cite what has been done in this field, according to the available information, in Japan and the United States.

224 *Japan.* Faced with the theoretically insuperable problem of insuring against the risk of earthquake, this country has tried certain measures of a practical order that permit its operation on a limited basis:

a) Increase of the number of insured through including persons who normally would not have taken out earthquake insurance. This can be achieved through legal action or by including the risk of earthquake in a "package" coverage.

b) Reduction of premium rates to a level that makes the coverage interesting to the insured through government subsidies and guarantees to insurers and reinsurers.

c) Limited insurance of first class risks alone.

d) Application of big discounts in case of disaster.

Until recently, Japanese companies were legally prevented from extending earthquake insurance. At various times, because of competition from foreign companies, plans were previously promoted extending such coverage by national companies according to programs that received the joint support of insurance companies and legislators. A bill was introduced in 1933 that sought to insure property and fixtures against earthquake on the government's account, making up an integral part of fire insurance. However it never became law.

According to information at our disposal, there are at present restricted plans for insurance coverage on a purely

commercial basis of industrial and commercial risks whose buildings are earthquake-proof. There is very little market for insuring the great majority of buildings, which are dwellings.

As regards rates, Japan has established a regionally based system with coverage extended exclusively in conjunction with direct fire insurance.

United States of America. All damage caused by conflagration is covered as a whole under fire insurance by United States insurance companies, consequently, that resulting from earthquake is also included without any special clause.[1]

As far as earthquake is concerned, insurance is regulated by standards set by two groups of companies: the "Pacific Fire Rating Bureau" for the states of Arizona, California, Idaho, Montana, Nevada, Oregon, Utah and Washington and the "Inter Regional Insurance Conference" for the rest of the United States.

According to the standards issued by the first of the two groups mentioned, on the Pacific coast the scope of fire coverage is broadened to include the risk of earthquake through the inclusion of a special clause called "Earthquake Damage Assumption Endorsement." If the insured so requests, the policy may also be issued carrying another clause called the "Earthquake Policy Form" which transforms the fire policy into a true earthquake policy. This clause has great practical scope since it can be included only in a fire policy that covers the same risk, limiting the amount of additional coverage to the value of the policy.

[1] Dans la province de Québec, la situation est la même puisque l'exclusion prévue par la condition statutaire 10 (b) est corrigée par une clause spéciale de l'intercalaire. J.H.

According to the standards of the "Inter Regional Insurance Conference," the insurance company issues a special policy to cover the risk of earthquake.

No matter what the type of policy, the insured always shares in a coinsurance for a sum amounting to 5% of the value of the object insured (and not of the insured amount). This coinsurance may go up to 10 or 15% of the value of the subject, according to the classification of the risk.

Companies operating in this branch in the United States have obtained excellent results during the last twenty years.

Exclusion clauses. We will now study some exclusion clauses as they appear under the general conditions of fire in use in certain countries, as well as other exclusion clauses worthy of consideration.

Switzerland. "At the moment of acts of war (including violation of neutrality) or of internal disturbances and military and police measures that result therefrom; at the moment of earthquakes, volcanic eruptions or of change of atomic structure, the company will only be responsible in case that the insured proves that the damage is not related directly or indirectly to these occurrences."

France. Art. 45 of the Law of July 13, 1930 relative to the insurance contract, specifies:

"Except in case of agreement to the contrary, the insurance does not cover fires produced directly by volcanic eruptions, earthquakes or other cataclysms."

Art. 3 of the conditions adopted on March 12, 1940 by the Plenary Session provides the following: "The company does not cover fire caused directly by volcanic eruptions, earthquakes, and other cataclysms."

In 1946, this last clause was replaced, with proper authorization, by the following one: "The company does not cover fires directly or indirectly caused by volcanic eruptions, earthquakes, or other cataclysms."

Greece. General conditions, clause 7: "This policy does not cover: a) any damage or loss caused by typhoon, tornado volcanic eruptions, earthquake or other natural calamity or as a consequence of such causes or event of fire produced directly or indirectly by any such events."

There are also other clauses similar to the above indicated regulations that are based in the British Home Standard Policy. We know, however, that some companies occasionally cover the risk of earthquake with the guarantee of an ordinary fire insurance for at least an equal amount. There is correspondence of this market on the problem which says: "In special cases we consider coverage for earthquake together with an equal amount, at least, for ordinary fire, but prefer to limit the coverage to the fire caused by earthquake, eliminating the direct risk. In this case, we issue an additional clause to the particular conditions of the fire insurance policy. If, in addition, we should be required to cover the direct risk, we write a special additional one to that effect. In both cases, the text of the additional clauses is the same as the one adopted by the tariff of the Fire Underwriters which is mandatory for all insurance companies of the country. The Greek text is a translation of the British clause of the F.O.C. (Foreign).

England. The Standard Policy excludes the risk in the following terms: "If the insured property or any part of it should be destroyed or damaged by fire (from explosion or other) caused by or resulting from a) ..... b) earthquake, volcanic eruption ....."

The Comprehensive Policy, on the other hand, covers the risk of fire resulting from earthquake, as well as the direct risk.

Mexico. Exclusions from the general conditions. The risk is included through an additional or separate policy under the conditions determined by the tariff.

228 **IV — Earthquake insurance in Chile**

Brief comments on the earthquake record. In relation to earthquake zones, Chile is located in the so-called "Circumpacific Fire Ring," formed by the Andes range, the mountains located to the west of South and North America, Alaska, the Aleutian Islands, Japan, and the islands of Oceania. This "ring" is very unstable and for this reason volcanic eruptions and earthquakes frequently occur in it.

By way of illustration, we mention below the main earthquakes that have affected Chile during this century.

On August 16, 1906, towards evening, a violent earthquake took place whose epicenter was in the Province of Valparaiso and which was also felt in various other parts of the country and in Argentina. Its effects were disastrous, especially in the port of Valparaiso, the destruction of which was almost total as a result either of the effects of the earthquake itself or of a series of fires that broke out as a consequence. The property damage was not estimated at that time, but to give an idea of its extent, we might cite that fact that it is mentioned in the Yearbook of the Geopsysical and Seismographical Institute for 1959 as being among the fifteen biggest earthquakes between 1900 and 1952. This Yearbook shows it to have been of a magnitude of 8.6 on the International Scale. The number of deaths was subsequently estimated to have amounted to 3,000.

In the month of November, 1928, a strong quake shook the city of Talca, a large population center in the middle of the country. It struck at midnight and most of the city fell, causing great loss of life.

Another of the great earthquakes tragically remembered in our country occured during the night of January 24, 1939. Its epicenter was in the city of Chillan which was practically destroyed leaving about 30,000 dead. The damage caused by the quake itself was almost total since because of the hour in which it occurred fires did not follow. This one was rated as grade 7.75 on the International Scale.

To conclude this list of great disasters there only remains to mention the earthquakes that took place in our country on May 21st and 22nd, 1960. The magnitude of the first was similar to the Chillan quake of 1939, having been of grade 7.75 on the Richter scale, probably of grade IX according to the Cancani-Mercalli-Sieberg scale in the city of Conception and of grade IX and X on the same scale in the village of Lebu. The quake the next day was even more violent than the previous one with an estimated magnitude of 8.75 on the Richter scale and intensity of grade X in Valdivia, IX to X in Rio Negro and X to XI in the lower part of Puerto Montt. This one may be considered to have been of record proportions in the world since its magnitude (8.75) has not been equalled by any other previous quakes. The total number of victims is estimated at 3,000 which is fortunatly not a very large number since the most violent quake took place on a Sunday in broad daylight at 3.15 p.m.

Earthquake-proofing Laws. The Talca earthquake which caused so much property destruction and loss of life in 1928 proved the need for regulating buildings so as to eliminate the deficiencies causing the damage.

In December of that year, a bill was sent to Congress which was made into law the following February under the number 4563. This law empowers the president to decree a General Order to set standards for the construction of buildings in the various zones of the country; and it imposed the requirement upon municipalities of having an Official Plan for the transformation and extension of cities and included regulations on height and exterior appearance of buildings, etc. This was the first serious step taken in Chile in the field of town planning.

In order to give an idea of how important these regulations were from the insurance point of view, we transcribe Article 59 which says, textually: "The General Order will provide regulations regarding the esthetics of building groups, rational blocks, common sewage service and common earthquake-proofing in building blocks under construction.

"The construction of low-cost housing, on an emergency basis or by stages, will be regulated by the provisions of D.F.L.2 of 1959.

"The special regulations covering Low-Cost Housing will establish building systems, sanitary conditions, earthquake-proofing, common services, etc. . . . which shall required of dwellings constructed in accordance with the Dwelling Plan of Low-Cost Housing."

In addition, Art. 248 stipulates that: "The effect of earthquake will be taken into account in calculating stability in all constructions and the stresses and strains produced in their various parts will be established, etc." Arts. 249 and 250 also refer to the earthquake problem in relation to constructions.

Exclusion clauses. Chile is not exempt from the problems described as facing countries in other parts of the world

in relation to earthquake insurance. As a consequence, she handles her classical insurance plans with special care and we can see the following exclusion clauses in the form of the General Conditions of the fire insurance policy:

"Art. 3. Except in case of express stipulation of premiums and contractual conditions which shall be set forth in this policy or in another specially written document to that effect, the insurance company will not be responsible for:

a) Fires occurring during or immediately following earthquakes. In case of doubt as to whether a seismic movement may or may not be considered an earthquake, the decision of the Chilean Seismological Service shall be determinant;

b) Fires starting during an abnormal situation brought about by the movement of the earth as referred to in letter a) of this article which deprives the city or locality of the ordinary means of preventing and extinguishing fires;

c) . . . . .

"The evaluation, in each case, of the nature, extent, and effects of the abnormal situation referred to in letters b) and c) of this article are to be presented to the courts."

Types of coverage. The issuance of insurance against the risks of earthquake and of the fires caused by them, thus, operates through the inclusion of special clauses in the fire insurance policy. There are two types of clauses for this purpose, one of which is named "Fire caused by earthquake" and "Property damage caused by disturbances of the earth" being the other. We describe them below.

Fire starting during or immediately after an earthquake. The risk referred to here may be covered through a special clause attached to the ordinary fire insurance policy. In this

case, there is responsibility for the damage caused by fire starting during or immediately after the earthquake — as expressed in the title of the addition — and, also covered are the damages by fire produced during the days the abnormal situation caused by the earthquake lasts, during a consecutive period of up to fourteen days, when the city or locality is deprived of the ordinary means of preventing and extinguishing fires.

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The rates for covering this risk are calculated in additional form to the ordinary fire risk — it being deducted thereby that this risk is mandatory in character — and are the following:

Ordinary	Fire	Rates	up to 8%	4.50% add.
"	"	"	from 8% to 16%	6.45% "
"	"	"	from 16%	10.65% "

Property damage caused by disturbances of the earth. As in the previous case, the risk of damages arising from earthquake are covered by a special clause added to the ordinary risk policy. This clause establishes the special condition of a coinsurer at 2%, charged to the insured.

Rates for covering this risk fluctuate between 6.45% and 20.25% in accordance with the construction of the buildings and the conditions of the land upon which they are located, whether solid ground or fill. For the establishment of this difference, a certificate should be requested from the Municipal Works Office which should be registered with the Insurance Association of Chile and the companies informed thereof through a circular.

As the provisions of these two clauses indicate, the scope of the coverage they extend includes direct as well as indirect damages caused by earthquake.

Any insurance company authorized by the Superintendent's Office may write additional earthquake insurance. These have a contract with the Reinsurance Fund for amounts up to E° 5,000,000 and it, in turn, places this contract among reinsurers in the world market. This sum is related to a single risk, leaving it to the judgment of the Reinsurance Fund to determine what constitutes a risk.

Responsibilities and Premiums. The country has been divided into five zones for the effects of the earthquake insurance, as shown in the table below.

Zone I	The North of the Country
Zone II	Valparaiso and Viña del Mar
Zone III	The Province of Santiago
Zone IV	The Central Provinces
Zone V	The Southern Provinces

There is also a system for identifying risks that are located throughout the country called "Floating Insurance."

At the present time, the earthquake insurance that has been written in the above zones amounts to:

Zone I	E° 6,525,993.08
Zone II	21,315,636.66
Zone III	28,788,069.67
Zone IV	79,385,642.20
Zone V	8,460,664.07
Floating	14,331,664.07
	E° 158,807,896.08

Total premiums collected in the fiscal year 1962-63 amounted to E° 1,024,962.27.

Reinsurance. As has been shown, Chilean companies operate upon a purely commercial basis. Insofar as possible, they seek to limit their responsibility in the earthquake branch to an amount that they can reasonably absorb in case of a catastrophe. Thus, the calculation of average loss becomes

possible only through reinsurance; in our country, all the national insurance companies turn their surpluses over to the Reinsurance Fund of Chile which, in turn, withdraws part of these to foreign companies through contracts.

Conclusions

We have reported that in Chile, as in the rest of the world, in view of the special technical aspects and catastrophic nature of earthquake insurance, it meets many great stumbling blocks in its development from the viewpoint of the insurance company. We have likewise observed that this insurance is technically acceptable to some degree only through reinsurance. At the present time, most of the earthquake surpluses are reinsured through the Reinsurance Fund of Chile, preferably in the British market.

The question we ask ourselves, then, taking into account the efforts being made right now in this hemisphere to achieve the economic integration of Latin America, is whether it would not be possible to absorb part of the earthquake insurance surplus of Chile through a plan that would operate within the mechanisms regulating this integration.

We are of the opinion that if all the countries of Latin America having a problem similar to that of Chilean earthquake insurance could interchange part of their surpluses through a great reinsurance institution of a regional character, it would be possible, technically, to absorb a large part of the emerging responsibilities within the hemisphere itself on a basis of relative diffusion and equilibrium. In the final analysis, this would be in fulfillment of the spirit that guides the progress of the economic integration of the hemisphere.

It seems to us that it would be useful for that purpose to have the following information:

a) How many countries of the hemisphere require foreign contracts.

b) Description of the types of insurance and rates in the various countries.

c) Statistical minimum periods of 20 years on the results of their respective foreign contracts.

We put this problem before the distinguished members of the IX Hemispheric Insurance Congress so that they may lend their consideration to ways and means of providing for its future.[1]

[1] La question est extrêmement intéressante, puisqu'elle présente la notion de collaboration entre des pays dont les représentants nous ont paru assez divisés au Congrès, sous des dehors d'une très grande politesse. C'est le but ultime fixé par les fondateurs du Congrès des assureurs d'Amérique, nous semble-t-il, que cette coopération sur tous les plans, entre des Etats voisins qui se divisent un immense continent. Chacun a des besoins, plus ou moins semblables. Or c'est la base de la coopération inter-américaine qu'on est encore à chercher dans un milieu où s'opposent susceptibilités et privilèges individuels et collectifs, intérêts locaux et internationaux divergents. En écoutant les discussions auxquelles les débats donnaient lieu, on était souvent tenté de reprendre pour ces pays d'Amérique centrale et du Sud, ce mot de Bernard Shaw, croyons-nous, à propos de l'Angleterre et des Etats-Unis: deux pays divisés par une langue commune. J. H.

The Official Supervision of Insurance Companies, by H. G. Hurren, F.C.I.I. Dans the "Journal of the Chartered Insurance Institute". London, E.C. 2, 1964.

Quelles sont les tendances actuelles du contrôle des assurances ? Voilà la question à laquelle répond M. Hurren dans la conférence qu'il a donnée sur le sujet à l'Institut des assurances de Londres. Il note que ce n'est guère que depuis un demi-siècle que l'Etat exerce une surveillance sur les affaires d'assurances. Signalons ici que le Canada a eu une loi de contrôle dès 1858. J.H.