The sector for which some information on production losses has been available is agriculture. Even though the earthquake in Guatemala did not directly damage the agricultural sector to a large extent (the degree of destruction of physical capital in agriculture was relatively low), the damage may have been considerable for individual peasants and stricken communities. It has been estimated that due to the earthquake 5 per cent of the nation's maize crop and 10 per cent of the bean, rice, sorghum and wheat crops were lost (UNDP, 1976, p. 13). These losses were mainly due to disrupted markets for labor, transport and other services etc.*)

b) Indirect effects on prices. An illustrative example of the effects on prices of damage to housing is given by some reports from CARITAS (Stricker, 1977) on the Barrio Martinico in Guatemala C., where about 80 per cent of houses were made uninhabitable. For most house owners in this area, temporary shelter was arranged without much delay. However, no such assistance was made available for tenants. To a large extent they occupied unused land areas ("asentamientos") everywhere around Guatemala City. In this way, shortly after the earthquake more than 40 squatter areas had been added to the already large number of slums in the city. According to the National Reconstruction Committee (CRN), by the end of 1976, as a consequence of the earthquake, 12,500 families or 54,300 persons lived in such squatter areas. In total, the number of families living in temporary shelter (squatters and owners of destroyed houses) had by 1977 amounted to 150,000. This worsening of conditions in the housing sector accelerated the rate of increase in rents for the poor. At that time,

*) Other natural disasters for which information on production losses is available are the 1979 hurricanes in Dominican Republic. In the Dominican Republic, it has been estimated that a 27.6 per cent shortfall in the country's GNP for 1979 was likely as a result of the damage caused to the country's sugar, coffee and cocoa plantations (UNDRO, 1980, Newsletter No. 11).

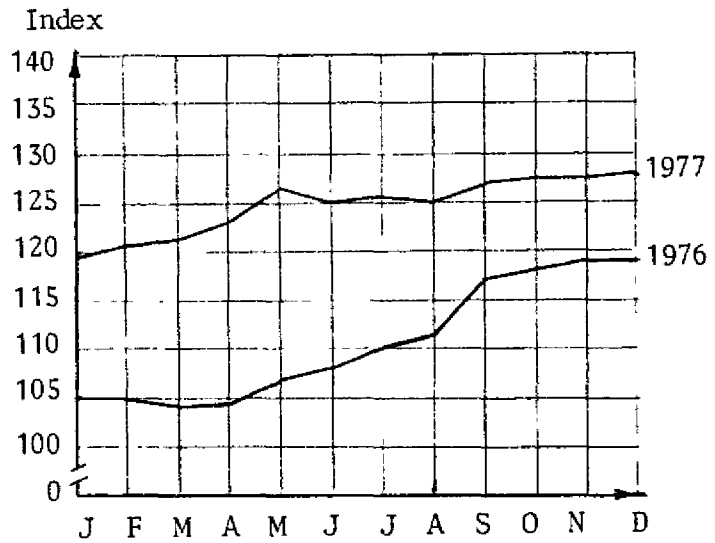
the average monthly rent for a two-room flat in the poorest areas had gone up from US $15 before the earthquake to US $50. This may be compared with the average monthly family income of US $60 to US $90 (Stricker, P., ibid).

Relative prices also showed tendencies to changes in the case of consumer goods. For instance, food prices increased at the rate of 11 per cent in 1976 and the price of cloth increased by 18 per cent (Bank of Guatemala, ibid). In the first case, the increase is lower than the increase of the general price index and in the second case, it is somewhat higher.

The tendencies of prices to fluctuate during the year of the catastrophe are also shown by the variations of the trend for the price index. The month-to-month variations, figure 2 below (Bank of Guatemala 1978, p. 19), of consumer prices after the earthquake, reveal some specific phases in the price trend. A first phase, between the months of February and April 1976, is characterized by falling prices. This tendency for prices to fall may reflect an overall reduction in incomes caused by the impact of the disaster and the neutralizing effects of the foreign disaster relief provided during the emergency phase. A second phase apparently begins in the month of April and continues to August when it tends to accelerate. The strong tendency for the price level to rise during the months following the earthquake could have been the result of demand increases (when the reconstruction started), sectoral and regional priorities given in reconstruction plans, re-establishment of economic activities, an overall improvement of the economy's liquidity, increased public spending and improvements of the balance of payments (owing to, e.g., the foreign loans and foreign disaster relief for reconstruction, and a more than doubled export of coffee; Bank of Guatemala, 1977).

As is made clear by this change in the price level and by our account of its possible causes, it becomes increasingly difficult over time to separate indirect effects of the disaster from indirect effects of other factors, including the effects of disaster relief. This is true not only for consumer prices, of course, but in principle for all endogenous variables of the economy. This will have to be born in mind as we now continue our discussion of the indirect effects of the disaster.

Figure 2: Month to Month Variations in Consumer Prices (1976-1977). 1975 = 100.0



Source: Bank of Guatemala, 1978a, p. 19.

c) Income distributional changes. As we have seen, Guatemala experienced significant variations in consumer prices after the earthquake. Here, in order to examine the way in which individuals became affected, we shall look at the post-disaster development of markets more closely. We shall see that various effects may work together to reinforce the adverse effects on the purchasing capacity of low-income groups of the population.

What we would like to present here most of all is the development of the "income terms of trade" for low in-

come groups during the period of reference. (For different definitions of "terms of trade" see, e.g., Meier, 1968, chapter 3.) That is, an examination of how wages and revenues from production of "small poor estates" developed in relation to prices of required inputs in, e.g., agricultural production and handicrafts. However, the information available is not of such a character that it permits an estimate of the changes in this "terms of trade" concept. Therefore, we shall present only fragmentary information about changes in the factors underlying the development of real income in the areas afflicted and accept a significant degree of uncertainty as to how income distribution did in fact change.

In Guatemala, there was a tendency for market reactions to change relative prices to the disadvantage of the very people afflicted by the physical destruction. This is illuminated by the following data on the post-disaster development of prices for different goods. By November 1976, input prices in the construction industries had on the average at least doubled since the earthquake. For some construction materials, for example bricks, prices had already tripled by that time as compared to prices before 4 February, 1976 (UNDP, 1976, p. 15 Castillo, P., 1978; COPEVI, ibid). During 1976, the rate of increase in the prices of these materials was 32 per cent of their level in 1975 (Bank of Guatemala, 1980, table 58). This occurred while the general price index during the same period increased at the rate of 17.6 per cent on the average (see figure 2, and Bank of Guatemala, 1978a, p. 20). Although detailed information on prices for other inputs, including unskilled labor, has not been available, some reports indicate that prices for skilled labor increased markedly in relation to prices for unskilled labor. For example, R.M. Carmack, in his study of the developmental and social effects of the Guatemalan earthquake, concludes "...Engineers, law-

yers, architects, and other 'professionals' similarly benefitted from the increased need for their services. Many of them raised their prices, and added burden partly shouldered by the already broken poor"... (Carmack, 1978).

Using the data presented by Orellana (1976, pp. 19-47) we find that 27.6 per cent of the GNP comes from the production of primary products in rural areas (mainly those stricken by the earthquake). This sector absorbs 57 per cent of the total labor force of the nation (ibid). Furthermore, in some stricken areas, such as Chimaltenango, Sacatepequez and Quiche almost the entire population depends on activities of this type (Orellana, ibid; CRN-archives). In table 2 below, we may see that during the post-disaster months up to July 1976, the market prices for the main products in these areas (beans, eggs, cereals, fresh fruits) fell markedly relative to other products. Although this tendency seems to have started already in the months prior to the earthquake, the disaster in February appears to have helped to encourage it. This seems to have been the result of a reduced food demand (due to falling real incomes and perhaps to the fact that there were fewer people to feed on average in the stricken areas) and increases in food supply (due to "the best harvest for years that coincided with the time of the earthquake", the need for cash inducing people to sell food reserves and the foreign food assistance arriving to the areas (Bunch and Ruddell 1977, pp. 4-11; Oxfam archives, Oxford)).*) According to Orellana (ibid) the purchasing capacity of an aver-

*)A further analysis of price variations would require comparing prices in table 2 with their corresponding prices during the same months in previous years. However, existing information on the development of food prices is on aggregated terms for non-rural areas in the whole nation, i.e., for disaster-stricken and non-disaster-stricken areas taken together. In other words, for statistical reasons a strict analysis of the development of food prices in the areas of our interest is impossible.

age household (of 5 family members in those areas) living on the incomes generated by the production of primary goods fell dramatically. By July 1976, for such a household to cover the market price of a daily diet, a 70 per cent increase in real income would have been necessary. This occurred at the same time that the costs of construction materials had already by July increased by about 25 per cent (ibid., see also Knightley, 1978; CARITAS, 1977-1980). In other words, the falling purchasing capacity of low-income groups, owing

Table 2: Price Index for Food in Non-Rural Areas of Guatemala, 1975-76. Average 1975 prices = 100

	Average 1975	1976						
		Jan	Feb	March	April	May	June	July
Total for all groups	100.0	97.4	102.9	101.7	102.4	103.6	106.1	107.9
Meat and meat elaborates	100.0	103.7	106.4	106.7	104.9	105.4	107.9	109.7
Cereals	100.0	85.4	94.0	93.0	94.4	94.4	93.3	87.6
Eggs	100.0	104.6	107.1	102.9	100.1	95.6	92.1	94.6
Milk and milk products	100.0	104.0	103.2	105.4	100.2	109.6	107.3	109.9
Tuberous	100.0	98.0	94.7	91.3	94.7	92.8	94.8	91.7
Vegetables	100.0	98.5	110.0	106.1	97.5	92.1	124.0	182.8
Fresh Fruits	100.0	92.6	98.6	104.9	107.1	95.1	92.3	91.4
Salt, sugar and condiments	100.0	118.0	118.0	115.8	119.9	120.8	118.6	113.8
Coffee, tea	100.0	107.4	116.1	122.0	126.9	154.9	173.1	189.7
Various	100.0	105.0	110.7	111.4	115.2	110.8	113.0	110.8

Source: General Bureau of Statistics.

to a falling price tendency for the product they sold, was reinforced by the increase in prices for the goods they had to buy in order to survive. It should be noted that the disaster may have significantly improved the real

income conditions for certain groups. For example, price increases may have been to the advantage of unaffected producers in the stricken areas (e.g., the "ladinos" for whom damages were very low; Orellana, idem) or of producers in sectors and regions benefiting from priorities given in reconstruction plans (e.g., the construction sector and the area of Guatemala City; we return to this in the next subsection).

Considering that "ladinos" (high income farmers) own most of the tea and coffee production while "small peasant estates" produce mainly cereals, eggs, tubers and other fresh food in Guatemala (Bunch and Ruddell, ibid) the development of the prices for these products (see table 2) gives an indication of the direction of the real income changes arising. The tendency of the prices for tea and coffee to increase means real income improvements for the wealthy groups of the population while the falling tendency for the prices of the other products means real income deterioration for the low-income groups.

Lack of data often prohibits a full understanding of the total effects on particular income groups. For example, a more complete picture of the deteriorating conditions of people in the stricken areas would require data on the employment of the labor force as well. During the period after the emergency phase, the reduced level of production of the country owing to the general deterioration of economic conditions would lead to lower rates of employment than otherwise. However, due to the special characteristics of labor markets in LDCs and due to the variety of activities engaging people in stricken areas in the aftermath of disasters, statistics over changes in the rate of employment of the labor force may be poor indicators of deteriorations or improvements in income bringing work opportunities. This is specially important if many individual activities are of the type not registered, e.g., self-employed, or people working for the day only.

In Guatemala, the complexity of the problem is illuminated by the following quotation from an UNDRO report (UNDRO, 1976, p. 14). "...In addition to the problems arising there is a threat to agricultural production through the disruption of traditional labor patterns. The lowlands of Guatemala are in normal times cultivated by the highland people who go down for seasonal work. It is possible that much of this labour will not be available this year as the people will be busy rebuilding their own houses. Some farmers may also not put the same effort into sowing as they usually do, because of the need to rebuild their homes."

d) Regional disparities. The extensive damage to housing forced a reallocation of resources from other sectors to the construction sector. At the governmental level an idea of this reallocating process is given by the amount of financial means granted to the main institution for house financing and planning, BANVI (Banco Nacional de la Vivienda). An average annual budget of US $2 million prior to the earthquake was increased to about US $62 million for 1977. Although this increase was made possible by a massive influx of foreign disaster relief, it illustrates the size of the reallocation of resources that took place (BANVI, 1978 report).*) Furthermore, owing to political, institutional and administrative factors, most of the reconstruction efforts were concentrated to areas in the big cities, specially in Guatemala City (BANVI, ibid. p. 52; Comité de Reconstrucción Nacional, 1977, tables No 3 and 4; Carmack, ibid). In addition, in order to improve the structure of buildings reconstruction was based on methods different from those previously used in Guatemala. This meant shifting from adobe-based techniques to those based on cement and iron, which, in most cases, led to a lower utili-

*) A similar case of an extensive reallocation of resources to the construction sector is to be find in Cyprus after the 1974 "crisis". From nothing (prior to the war) to 42 % of the Public sector expenditures in 1977-78. By 1981, 110.000 people had been rehoused under the Government auspices (Zetter, 1981).

zation of resources in the adobe and related industries traditionally located in the rural areas. On the other hand, most of the construction materials used by the new building techniques were products that - to the extent they are produced in the country - are fabricated by firms working under monopolistic conditions. Some examples are the firms in the cement, pre-fabricated construction and metallic industries. Their production is concentrated to the urban areas, especially Guatemala City (BANVI,1978,p. 67). Consequently, the reduction of work opportunities in rural areas lead to a great movement of laborers to the cities aggravating the housing problems referred to earlier (BANVI, ibid).*) (See also our discussion in subsection f) below.)

Evaluations by region of the economic repercussions of the problems just described have been difficult to find. However, a study of the economic consequences of the 1976 earthquake on one of the most affected areas in Guatemala, the Department of Chimaltenango (Cerezo, 1978), shows that the economic losses may be equivalent to six and a half years of the productive efforts of the whole population of the Department.

e) Changes in the government budget deficit and the balance of payments.**) Reports from UNDRO (UNDRO,1979a, p. 13) indicate that the public deficit in 1976 increased six times in relation to its level in 1975 and

*) The problems of migration from rural areas into the big cities (owing to lack of income generating opportunities during post-disaster periods) have also been observed in connection with other disasters; see e.g., Andra Pradesh 1977 (see Winchester, 1981).

**) It should be pointed out once again that indirect effects of this type are influenced by foreign disaster relief as well.

that it continued to increase during 1977.*) Other reports on the Guatemalan case (UNDP, 1976, p. 15) tell that 56 per cent of the public deficit had to be covered by increasing foreign indebtness. Foreign loans for reconstruction purposes alone, amounted to US $140 million in 1979 (see Table 11, Chapter 6). In 1976 (UNDP, ibid) the rate of amortization of the public debt had doubled (in real terms) from its 1975 level. The understandably heavy deficit shown by the government budget seems to have arisen through temporary imbalances created by considerable reductions in tax receipts combined with the large increases in the government expenditures required (UNDRO, ibid).

According to the UNDP (ibid, pp. 12-15), the volume of foreign trade in Guatemala decreased temporarily due to the damage to transport facilities, mostly affecting the so-called Atlantic Highway, which connects the capital to the main port on the Carribean, Puerto Barrios, and the major bridge "Agua Caliente" which collapsed, forcing traffic to be rerouted through El Salvador. Another part of the decrease was due to a disruption of tourist activities. The disruption of tourism was partly caused by the breakdown of the service infrastructure as, e.g., in the Departamento de Chimaltenango, a major

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*) By 1978 government expenditures has returned to levels which, relative to GDP, were only marginally greater than during the period 1972-74 (World Bank, 1980, p. 25). This was due to the Government's attempts to control the public deficit by cutting down reconstruction expenditures. "Once the most obvious and urgent post-earthquake reconstruction needs were met attention turned to longer term and often more difficult types of investment..." (World Bank, loc.cit.). Considering that the main source the Government had to finance reconstruction efforts with was "foreign loans" and that these loans were utilized only to a very little extent (see table 11, chapter 6) the information above indicates that the major source for the reconstruction of Guatemala was foreign disaster relief.

tourist area, where 13 of 16 municipalities were said to be completely destroyed (ibid). The deficit in the current account was increased by the cost of direct commercial imports for reconstruction, estimated at US $530 million for the whole period 1976-79 (ibid). Taking into account capital inflows and new export possibilities, the net decline in foreign reserves in 1979 as compared with 1975 has been estimated at US $40 million (ibid).*)

Most often the balance of payments appears to deteriorate in the aftermath of a natural disaster. This is a consequence of the decline in exports (due to production losses and/or to damage to the infrastructure vital to foreign trade) and extensive increase in commercial imports (for the satisfaction of immediate needs and for the inputs necessary for reconstruction). To some extent, however, the balance of payments in Guatemala improved by the disaster relief given from abroad and the increase in foreign loans.**)

f) Changes in the preconditions for economic development. As mentioned in chapter 1, the crisis situation generated by a disaster may be a blessing in disguise: the destruction caused by natural disasters creates opportunities for technical innovations, the application of new ideas, changes in individual and social attitudes, etc., that have development inducing properties.***) (See also Dacy-Kunreuther, 1969, p. xii.)

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*) Note that the Guatemalan currency, Quetzales, has been kept unchanged in relation to US dollar for the period as a whole (1 Q = US $1).

**) Another country for which information is available is Honduras. In this country, during the two years following the occurrence of hurricane Fifi, the public deficit amounted to US $ 200 million. (This is greater than the country's total gross annual investment.) The total deficit on the current account was estimated at US $115 million in 1974 and US $200 million in 1975. (It corresponds to an almost 100 per cent increase compared with what would have been expected in a normal "disaster free 1974".) See (UNDRO,1979a).

***) About the factors that according to different schools of economic thought are decisive in inducing economic development, see Adelman, 1961; Lindbeck, 1976, chapter 1.

Some of these changes are made possible by the new situations of supply and demand for goods and services that will generate a great deal of growth inducing economic incentives (cf the "unbalanced growth" approach; Hirschman, 1966, chapter 4). Others come from the elimination of certain social and legal institutions that would have persisted for political or other reasons under normal conditions but that are possible to change or even forced to change in the state of urgency that disasters create. In general, effects of these types are not easily measured and, therefore, difficult to express in quantitative terms. Hence, our presentation here will, very briefly, refer only to tendencies observed in this respect.

In Guatemala, it has been noted (Carmack, 1978) that after the catastrophe the western regions around Chimaltenango, Patzúm and San Pedro Ayampuc (the most affected by the earthquake) have been increasingly integrated into the market system. According to Carmack's report, the process of reconstruction and the resulting increased production and marketing possibilities in related sectors seems to have been giving incentives for factor mobility across stricken areas in different regions. Simultaneously, the higher level of economic activities seems to have been giving possibilities of perpetuating the new income bringing opportunities created through, e.g., the new brick and metallic factories, small-scale crafts and agricultural production etc. (CARITAS, 1980, Grupo Suizo, 1979-80, CRN, 1981).

Increased factor mobility may under some circumstances improve the conditions for economic activities. However, in LDCs, there are problems connected with labor migration that need to be considered. Most often, migration into the cities only aggravates unsolved urban problems, such as lack of "sufficient" infrastructure

and high growth rates of population living in slums (cf. our discussion in section 5b, above). In fact, migration from rural areas into Guatemala City (and other big cities of the nation) has accelerated after the earthquake and is still one of the most serious problems to be solved (CARITAS, 1980; Norwegian Church, 1978-1980; CRN, Reports of the Presidency, archives, Guatemala C; Chavarría-Smeaton, 1978).

On the other hand, it has been stated that the reconstruction process also gave an opportunity for the planning and establishment of technologies directed toward improvement of housing and infrastructures at the same time as resource utilization improved. A conclusion reached at the "International Symposium on the February 4th, 1976 Guatemalan Earthquake and the Reconstruction Process"*) (Chavarría-Smeaton, ibid; Cáceres-Asturias, 1978) is that the main beneficial effect of the earthquake and the disaster relief given is its impact on the attitudes of individuals and on increasing the concern of the Public Administration officials for the economic problems of the stricken communities. It was stated that there did not exist any deeper systematic insight into the crucial problems which were illuminated by the earthquake, such as an appropriate technology for use of adobe in building houses in high-risk areas, the relatively low advance in research on the appropriate materials to be used in construction in rural and suburban areas, and the inadequate knowledge of the needs in rural village communities possessed by professionals with an academic background. As a result, the educational system was also reexamined and re-organized and the assistance for reconstruction was partly integrated into educational programs. For example, universities such as the "San

*)At this symposium 72 reports we presented on investigations carried out by institutions and organizations representing 12 different countries (Symposium, ibid, p. 4).

Carlos University" (see Chavarría-Smeaton, ibid), included some training on assisting low-income groups affected by an earthquake in the education of students in different fields. In this way, new techniques better adapted to local needs and conditions were successfully implemented.

The attitudes of individuals and of the Public Administration seem to have changed in the sense that special attention was given to the problems of people in traditionally isolated areas such as those affected by the earthquake (Cáceres-Asturias, 1978). This has been done through the National Reconstruction Committee (CRN) created after the occurrence of the earthquake with the specific purpose of allocating assistance for reconstruction. This institution operates even now as an instrument for directing development assistance to areas not included in national development programs. From the point of view of disaster prevention, it is worthwhile to point out the provision (by initiative of the CRN) of "insurance policies" to people in the disaster-prone areas reconstructed (CRN, 1981, p. 8). However, most of these changes ("historical" from the point of view of LDCs) seem to have been a result of the disaster relief given by foreign organizations (NGOs as well as FGOs; see, e.g., Gonzales-Serrano, 1978; CARITAS, 1980; Hawkings and Skjörshammar, 1979; Grupo Suizo, 1979-80). Therefore, further presentation of these development inducing effects is postponed until the analyses of the foreign disaster relief made in chapter 7 of this study.

6. Concluding Remarks

We have examined the impact effects of the 1976 earthquake in Guatemala, with some reference to other natural disasters in LDCs, and seen that there is a tendency for disasters to affect mainly poor groups of individuals. This is primarily the result of an automatic segregation of the poor to cheap, highly disaster-prone land areas and the lack of institutional prerequisites or preventive measures, such as insurance and the like.

In addition, market reactions seem to reinforce the deterioration of income conditions for low-income individuals in poor sectors and regions caused by the impact of the disaster. At least in Guatemala, market adjustments to the new conditions changed relative prices to the economic disadvantage of the poor. For example, wages deteriorated for people working in temporary jobs or in activities for which the markets were disrupted while costs increased for the services of doctors, lawyers, engineers, etc. Similarly, prices of food, medicines, construction materials etc. not produced in the stricken areas tended to rise, while prices of goods and services produced there, such as food and handicrafts, were subject to a falling tendency due to transportation difficulties, etc.

Priorities in the reconstruction plans during the phases following the impact and emergency could reinforce these tendencies. For instance, reconstruction of housing using new techniques that require inputs not locally produced (e.g. from the cement industry) may increase outside dependence tending to shift income generating opportunities away from the stricken areas. Originally, this appears to have been the case in the adobe industry and related local industries in the stricken areas of Guatemala. Situations like these seem to have retarded the process of economic rehabilitation and reconstruction plans

in these areas and aggravated the long-standing problems of migration to the big cities in Guatemala.

Throughout this discussion it has been possible to identify a number of factors of importance for a proper analysis of the problems of disasters and the effects of disaster relief. These factors may be grouped as follows: institutional, such as the market forms for relevant inputs and consumption goods, as well as the characteristics of insurance and financial markets; technological, such as the kind of production processes utilized in productive activities, the possibilities for factor substitution and levels of resource utilization in the economy; and organizational, e.g., the degree of development of public institutions, the infrastructure for social services and public goods, and the country's disaster preparedness in general.