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How earthquake disaster changes with hazard, exposure and vulnerability?

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Unpredictable earthquake disasters had caused severe direct economic losses in the past periods, a major challenge in attributing and estimating disaster risk is that damage is sensitive not only on seismic natural characteristics, but also on socioeconomic factors. The scatter plot of direct economic losses with hazard, exposure and vulnerability shows that hazard is a necessary but not sufficient condition for loss prediction. In this study, the relationship between direct economic losses, hazard, exposure and vulnerability is quantified using the economic concept of "elasticity". Historical earthquake disaster records during 1990-2016 in mainland China were used to establish multiple regression model. The coefficient indicates that a doubling of asset value under the seismic area leads to a 69.00% increase in the direct economic losses rate, while a doubling of per capita gross domestic product (GDP) leads to a 10.50% decrease in the direct economic losses rate. Hazard elasticity indicates that on average direct economic losses will increased 126% for each additional level of intensity. The standardized coefficient of model shows that changes in asset value have been relatively more important in explaining earthquake direct economic losses than changes in intensity and per capita GDP. The earthquake direct economic losses may be more sensitive as exposure expansion. The comprehensive analysis of hazard, exposure and vulnerability can be used to explore policy implications when we know the social development trend in the future.