Section 1: Pre-processing of the survey data

Monetary variables were reported in both surveys in Vietnamese Dong [VND]. The monetary variables are converted to Euros and, where appropriate, inflation-adjusted to 2020 via a Gross Domestic Product (GDP) price deflator (Oanda 2024; Trading Economics 2024). The variables from the HCMC survey that potentially explain flood losses to microbusinesses were further pre-processed to obtain a well-defined set of candidate predictors and response variables (see, Table 1). The response variables include flood loss to business contents (e.g. to furniture, electrical devices, stored products and vehicles) and business interruption losses (e.g. reduced sales and production). The latter was queried in the HCMC survey as economic losses relative to the average revenues of the microbusinesses [%], while the former was reported in terms of monetary values [VND] and thus needed to be transformed to a relative scale, i.e. as a ratio between monetary loss and the value of the business content. The business content values were calculated by assuming that the monetary loss to an entirely commercial-used building equals the value of its damaged business content (FEMA 2013; Huizinga et al. 2017). Since the approach is rather general and made for larger companies, we improved this approach with a correction factor (0.25) resulting in a weighted relationship between building and content values. In order to derive the value of the commercially used part of the building (i.e. ground floor), we used field survey data on the number of floors in the microbusinesses or assumed the most common building type (a two-storey building) in the case of missing data (Moon et al. 2009).

Binary responses (0 or 1) from the survey corresponding to a specific category were combined to form indicators. For instance, the presence of several types of flood water contamination and implementation of several emergency measures were translated into indicators. Among the ordinal-scaled responses on the implementation of structural and non-structural precautionary measures and flood resilience were also converted to indicators (Sieg et al. 2017; Paprotny et al. 2020; Schoppa et al. 2020).

The indicators for emergency measures and precautionary measures are ratios between implemented measures prior to the flood event (n_I) and the number of possibly implemented measures (n_P). These ratios are on the interval [0, 1], where 0 assigns to businesses with no implemented measures and 1 to well-prepared businesses who implemented all possible measures prior to the flood event (Schoppa et al. 2020).

The flood resilience indicator is also a ratio but based on ranked variables of five categories. The indicator expresses the perception of the respondent on how well the government, city or the neighbourhood helps the citizens in coping with floods. For each category, the respondent could provide a response on the interval between 0 (strongly disagree) and 5 (strongly agree).
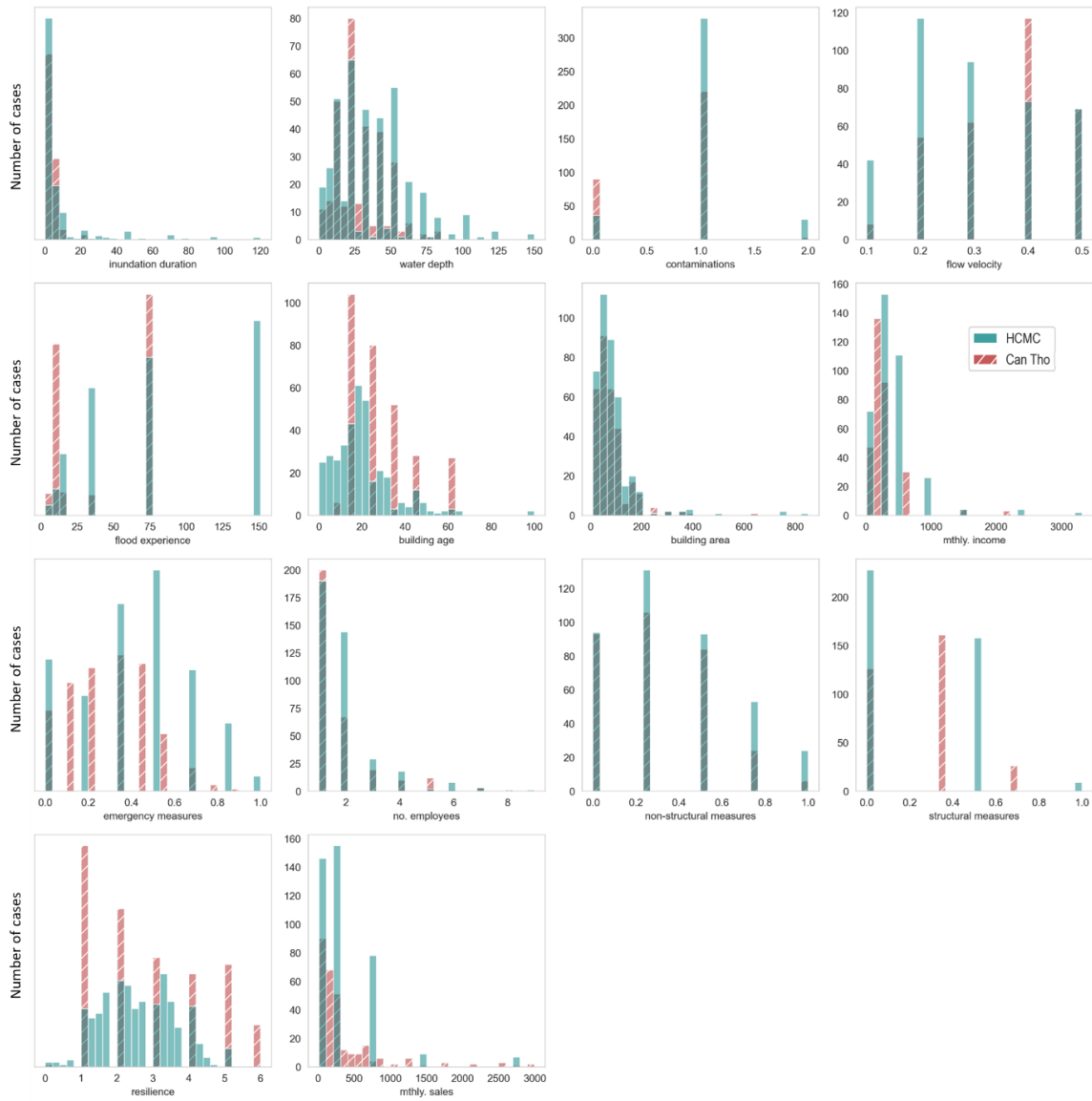
Figure S1: Distribution of potential predictors for HCMC and Can Tho. For a better visualization three to five extreme cases are removed for the variables: inundation duration, building area and monthly sales.
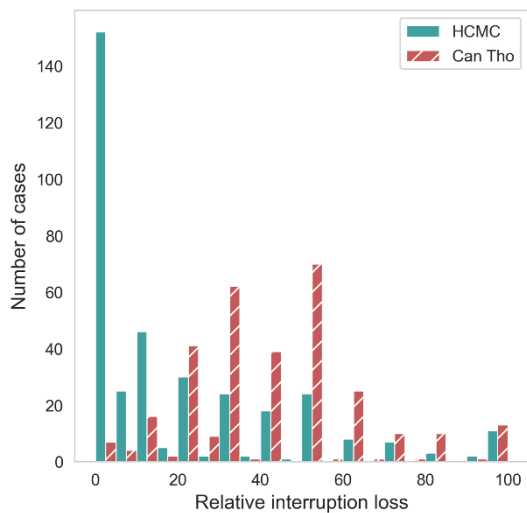
Figure S2: Distribution of reported relative losses due to business interruptions during the flood (HCMC) and during the flood month (Can Tho).
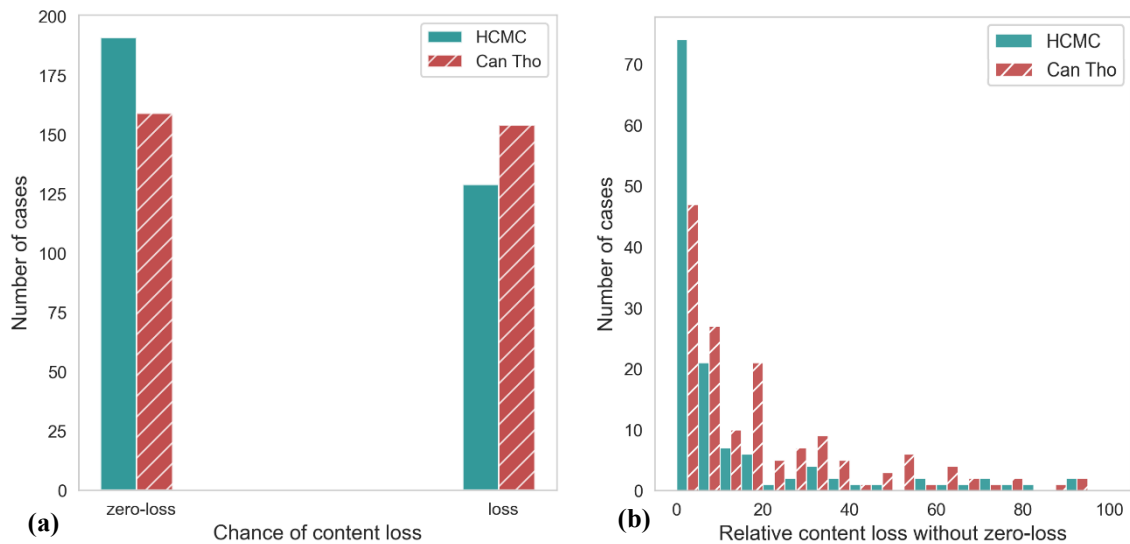
Figure S3: Distribution of reported relative losses to business content. (a) Distribution of zero-loss and loss cases. (b) Distribution of degree of content losses (only loss cases).

References

FEMA: Multi-hazard loss estimation methodology HAZUS-MH - Flood Model Technical Manual, Federal Emergency Management Agency (FEMA), Washington D.C., available at: https://www.fema.gov/sites/default/files/2020-09/fema_hazus_flood-model_technical-manual_2.1.pdf, 2013.

Huizinga, J., De Moel, H., and Szewczyk, W.: Global flood depth-damage functions: Methodology and the database with guidelines, Joint Research Centre (JRC) Technical Report, Publications Office of the European Union, Luxembourg, https://data.europa.eu/doi/10.2760/16510, 2017.

Moon, K., Downes, N. K., Rujner, H., and Storch, H.: Adaptation of the Urban Structure Type Approach for Vulnerability Assessment of Climate Change Risks in Ho Chi Minh City, 45th ISOCARP Congress 2009, available at: https://api.semanticscholar.org/CorpusID:54973884, 2009.

Oanda: Oanda currency converter, https://www.oanda.com/currency-converter/en/?from=VND&to=EUR&amount=1#, last access: 12 July 2024.

Paprotny, D., Kreibich, H., Morales-Nápoles, O., Castellarin, A., Carisi, F., and Schröter, K.: Exposure and vulnerability estimation for modelling flood losses to commercial assets in Europe, Science of The Total Environment, 737, https://doi.org/10.1016/j.scitotenv.2020.140011, 2020.

Schoppa, L., Sieg, T., Vogel, K., Zöller, G., and Kreibich, H.: Probabilistic Flood Loss Models for Companies, Water Resources Research, 56, 9, https://doi.org/10.1029/2020wr027649, 2020.

Sieg, T., Vogel, K., Merz, B., and Kreibich, H.: Tree-based flood damage modeling of companies: Damage processes and model performance, Water Resources Research, 53, 6050–6068, https://doi.org/10.1002/2017wr020784, 2017.

Trading Economics: Vietnam GDP Deflator 2019-2025 Data, https://jp.tradingeconomics.com/vietnam/gdp-deflator, last access: 12 July 2024.