Survey-based approach to generate regional multipliers for the Indonesian tropical tuna fisheries

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ONLINE APPENDIX

APPENDIX A

1. Input-Output analysis

Input-output (I-O) analysis is based on a model of the economy such that $AX + Y = X$, where A is a matrix of technical coefficients describing input requirements for each sector; X is a vector of total outputs; and Y is a vector of final demand. This equation is rearranged to give:

$$X = (1 - A)^{-1}Y, \tag{A1}$$

and hence

$$\Delta X = (1 - A)^{-1}\Delta Y. \tag{A2}$$

The total regional impact on output is then able to be estimated by a change in final demand, where $Z = (1 - A)^{-1}$ is the Leontief inverse of A. In a closed I-O model, total household consumption expenditure and fishers' wages are included in addition to the A matrix. This forms a new matrix, B, and the Leontief inverse of the B matrix, $(1 - B)^{-1}$, termed the *closed inverse matrix*. In I-O analysis, the last column of the closed inverse is interpreted as the *consumption multiplier* (the effect on the output of each sector of an additional dollar of consumption) and the last row as the *household income multiplier* (income created by each dollar of sales of each sector). The remaining rows and columns of the closed inverse (denoted by B^*), which correspond to rows and columns of the open inverse, represent the productive sectors. The matrices B^*, A and $(1 - A)^{-1}$ are used to derive input-output multipliers.

To derive the output multiplier, we add up each column vector of the A matrix, which will form a new row vector denoted by V_1. Similarly, by adding up each column vector of $(1 - A)^{-1}$ and B^*, we obtain V_2 and V_3 respectively. Let V_1', V_2' and V_3' be the transposes of V_1, V_2 and V_3.

The vector V_1' gives the *first round effect*, which is the amount of output required from all industries of the economy to produce the initial output effect. The vector V_2' gives the *simple*

multiplier, which is combined effects of the initial effects (vector of 1) plus all the production-induced rounds of extra output. The vector $V3'$ gives the *total multiplier*.

The *industrial-support* effects – the effects of the second and subsequent rounds of induced production – is calculated as:

- industrial support effects = simple multiplier ($V2'$) – initial effects – first round effects ($V1'$).

  The production-induced effect is then calculated as:

- production-induced effects = first round effects + industrial support effects.

  The consumption-induced effected is calculated as:

- consumption-induced effect = total multiplier ($V3'$) − simple multiplier ($V2'$).

2. Characteristics of the survey respondents

A high proportion of respondents at the larger ports were employees who did not own a boat. The respondents were either hired captains who worked for a boat owner or company (51%), crew members (25%), or owner captains who own a boat (24%) (figure A1, panel (a)). There was a small percentage of "Others" – non-fishers who owned a boat or fishing company or were accountants for a fishing or boating company.

There were different size boats used by the respondents from the larger ports. The highest proportion of responses at larger ports were in the "10-29.9 GT" class (53%), followed by large industrial boats of "Over 30 GT" (19%). The remainder were small-scale boats less than 10 GT. The largest proportion of respondents at larger ports were handline fishers. Deep-set handlines (HLD) and surface handlines (HLS) together represented 58% of respondents (figure A1, panel (a)). More than half of these handline operators used 10-29.9 GT size boats. The respondents using longline (LL), pole & line (PL) and purse seine (PS) all had predominantly larger boats (10-29.9 GT & Over 30 GT). The respondents at small landing places in Maluku

were predominantly owner fishers (90%) using surface handline gears with small-scale boats less than 5 GT (94%) (figure A1, panel (b)).
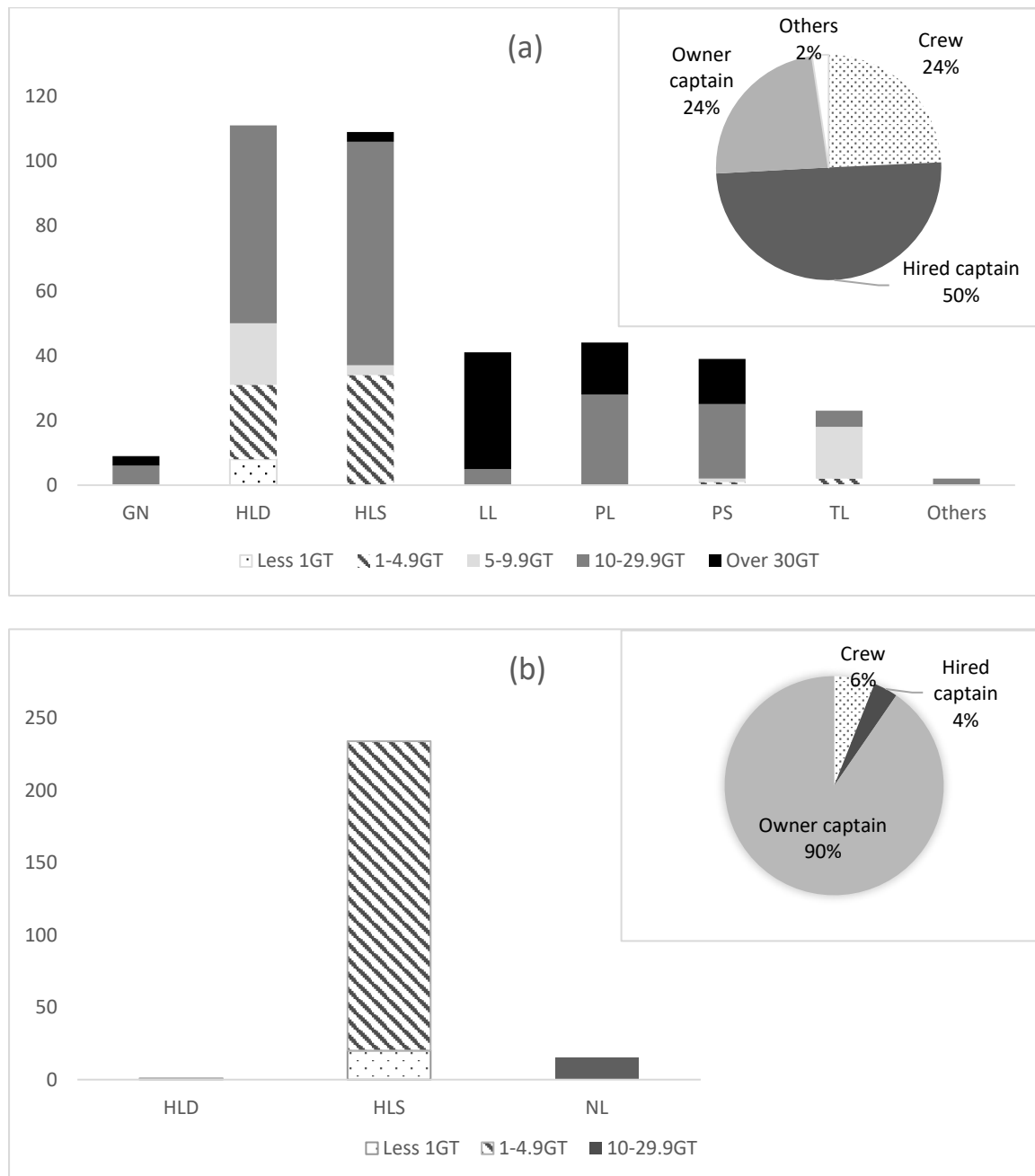

Figure A1. Characteristics of respondents by boat sizes (GT), gear type and types of fishers at larger fishing port (a) and small island places in Maluku (b).
GN= gillnet, HLD = deep handline, HLS = surface handline, LL = longline, PL = pole and line, PS = purse seine, TL = troll line, NL = netline.

Average catch composition by respondents' gear type is given in table A1. Note that there is a considerable variation in catch composition between individuals and among ports. Skipjack

tuna and yellowfin tuna are the dominant species landed in Indonesian archipelagic water (i.e., Bitung and Kendari fishing ports), with little quantities of bigeye tuna landing, while Indian Ocean ports (i.e., Palabuhanratu and Cilacap) have caught a higher proportion of bigeye tuna between 2016 and 2021 (Satria *et al.*, 2023).

Table A1. Average species composition (%) in annual catch by respondents' gear types

Larger ports	Albacore	Baitfish	Bigeye	Bluefin	Neritics	Skipjack	Yellowfin	Others
GN	0.0	0.0	3.3	0.0	62.2	10.0	12.8	11.7
HLD	19.5	2.0	6.1	0.0	6.0	26.2	38.0	2.1
HLS	2.4	0.5	15.6	0.0	2.0	30.9	42.2	6.4
LL	16.1	0.2	17.0	3.7	2.0	19.4	26.3	15.3
PL	0.0	0.0	0.0	0.0	0.8	78.6	19.5	1.0
PS	0.0	2.3	4.6	0.0	4.0	48.0	14.4	26.8
TL	7.4	0.0	13.7	0.0	2.7	41.3	24.3	10.7
Others	0.0	0.0	5.0	0.0	7.5	15.0	32.5	40.0
Small landing places								
HLS	0.5	3.5	3.2	0.0	11.2	22.1	53.9	5.6
NL	0.0	0.0	7.3	0.0	39.0	47.3	6.3	0.0

3. Business expenditure

Out of 379 responses collected at larger ports, only 12 respondents answered that they kept accounting books. Regardless of whether the respondents kept accounting books or not, the fuel costs and crew labour costs generally make up the highest component of the total cost among respondents at larger ports, representing more than half of the total cost on average. The only difference between bookkeepers and non-bookkeepers is that the former reported a negligible proportion of fixed costs (e.g., administration cost, port fees, license fees, etc) over total costs. This may be due to respondents not being familiar with fixed costs because they are employees (either hired crew or hired captains) or did not remember, as the survey interviews rely on recollections. While fuel generally makes up the largest share of the cost for non-

bookkeeping respondents at larger fishing ports, there are some variations among gear (figure A2, panel (a)). For instance, crew labour represents the largest share of the cost for purse seine operators, while bait represents the second highest share of the cost for pole and line operators. The proportion of business cost spent locally (within the same province) varies by gear, although the median values indicate that most of business costs for longline and troll line operators were spent outside of the local areas (median values – the middle bars in figure A2, panel (b) of around 20%).

Out of the 250 respondents at small landing places in Maluku, only two respondents kept accounting books. Net line fishers are all crew members who did not report business expenditure hence they are excluded in the business-level multiplier estimates. Based on non-bookkeeping respondents (all surface handline fishers), fuel was by far the largest cost component, representing approximately 70% of total cost on average, followed by other running costs (such as ice, freight, packing) (figure A2, panel (a)). Based on a related question on who financed the running costs, only six respondents (out of the 37 who used crew or deckhands) said they paid labour fees. The majority of crew members are therefore unpaid labour and are likely to be either family members or are paid in fish caught rather than wages. Almost all business costs were spent locally, as indicated by the median value around 1 (figure A2, panel (b)).
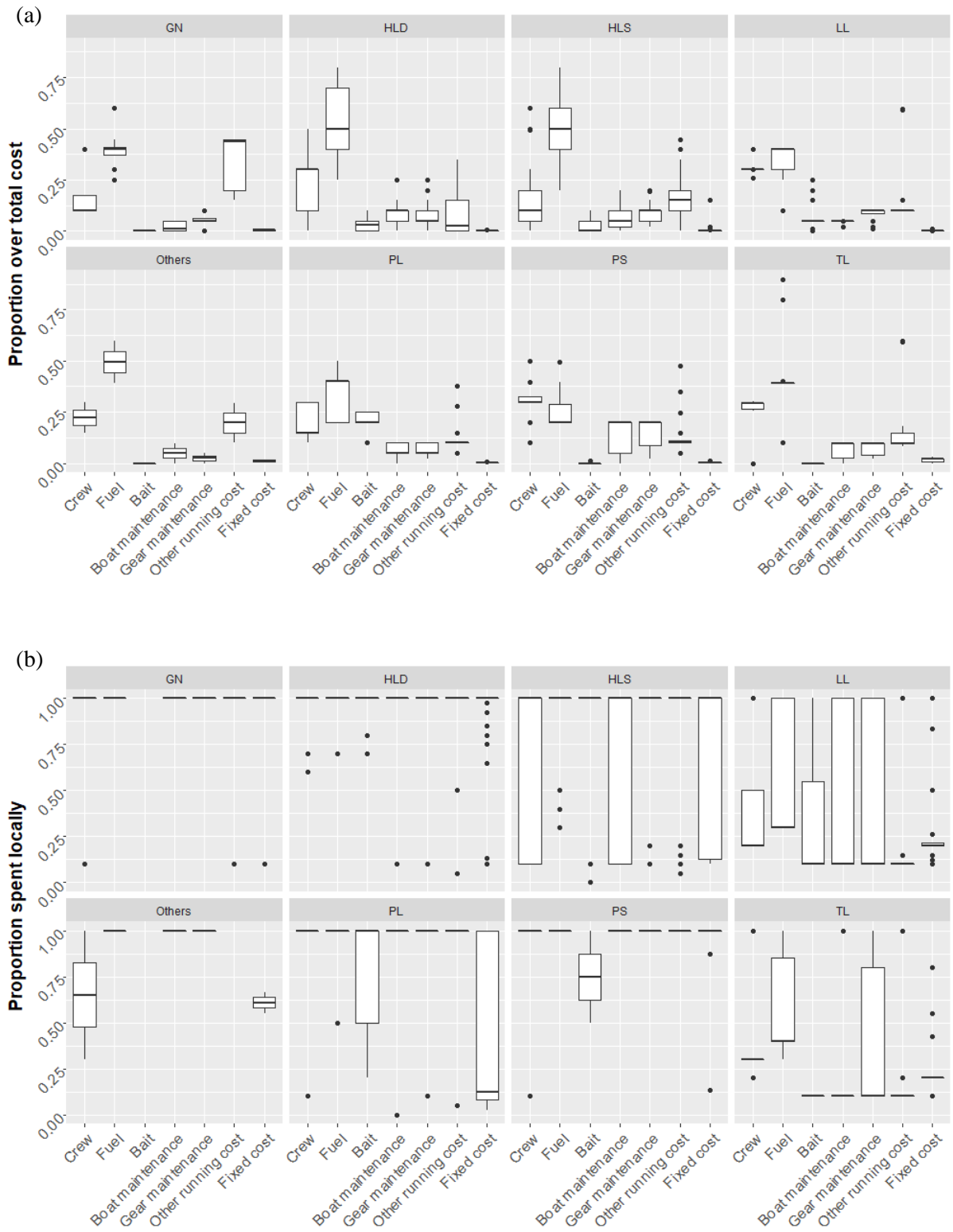
Figure A2. (a) Proportion of the cost items over total business cost, and (b) the proportion of the cost spent locally (1 means 100% spent locally)

Crew labour represents a small cost component for respondents at small landing places in Maluku islands (figure A3). Based on the question on who financed the running costs of the vessel, only six respondents out of the 37 who used crew (deckhands) said they paid labour fees. The majority of crew members are unpaid labour and are likely to be either family members or made non-cash payment (e.g., fish) rather than wages.
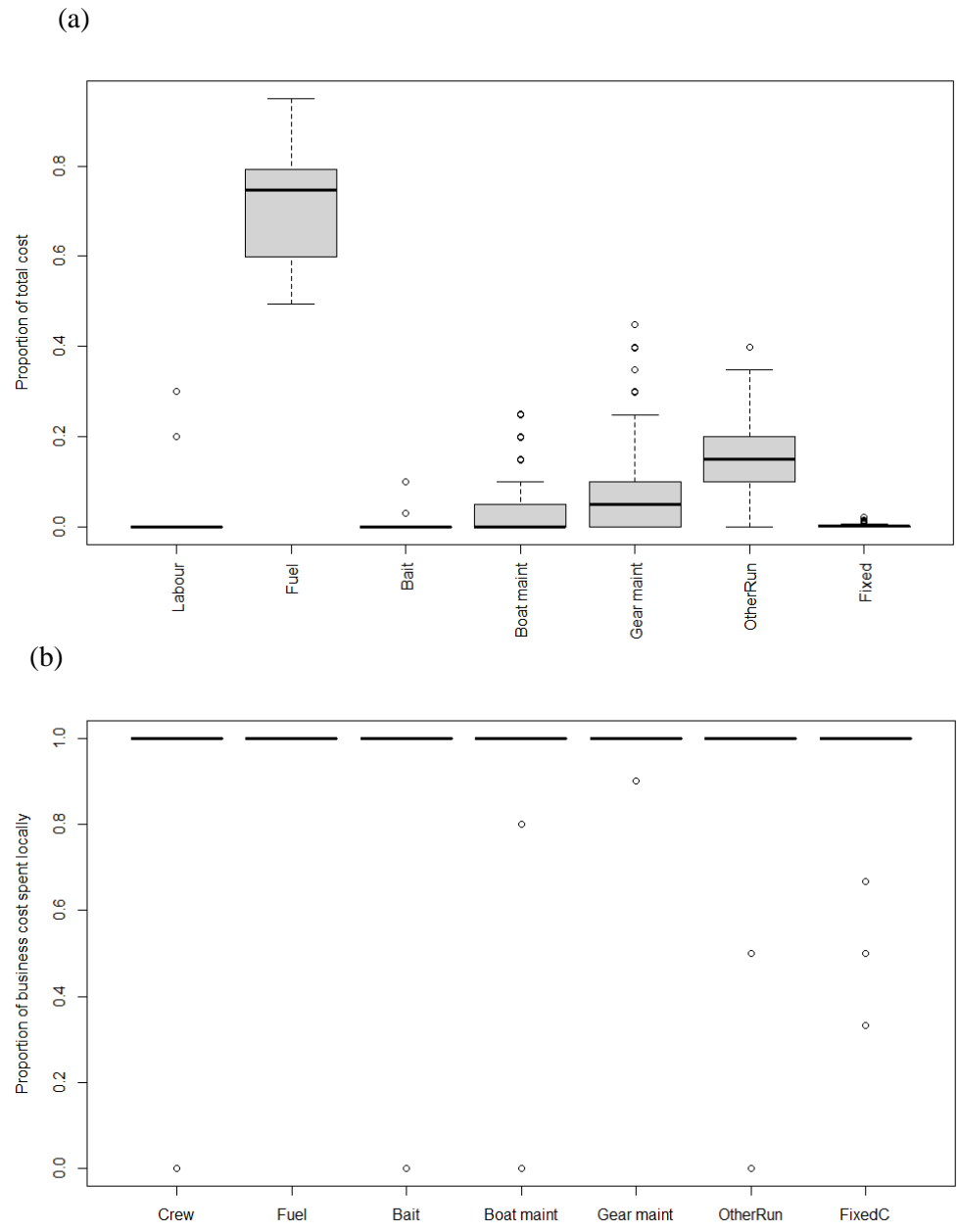
(a)

(b)

Figure A3. (a) Proportion of the cost items over total business cost, and (b) the proportion of the cost spent locally, for surface handline operators at the small island places in Maluku.

4. Household expenditure

Household expenditure and the proportion spent locally is given in figures A4 and A5, respectively. Household expenditure was divided into four major groups. Basic goods include education, utilities such as electricity and gas, health services, grocery, transportation, and other basic goods. Recreation includes accommodation, dining out, and other recreation. Construction & Trade includes construction of a building such as a house, manufacturing of furniture, etc., and other building. Government services include banking service, government tax (such as driver's license), mortgage, rent, and other banking services.

For both sampled locations, respondents spent the highest proportion on basic goods (figure A4), although the respondents at small landing places in Maluku spent far less proportion on recreation and construction & trade, likely due to its remoteness. While the proportion of expenditure spent locally varied among respondents at larger ports, such variation was less among respondents at small landing places in Maluku, with the majority of respondents spending their household expenditure locally (figure A5).
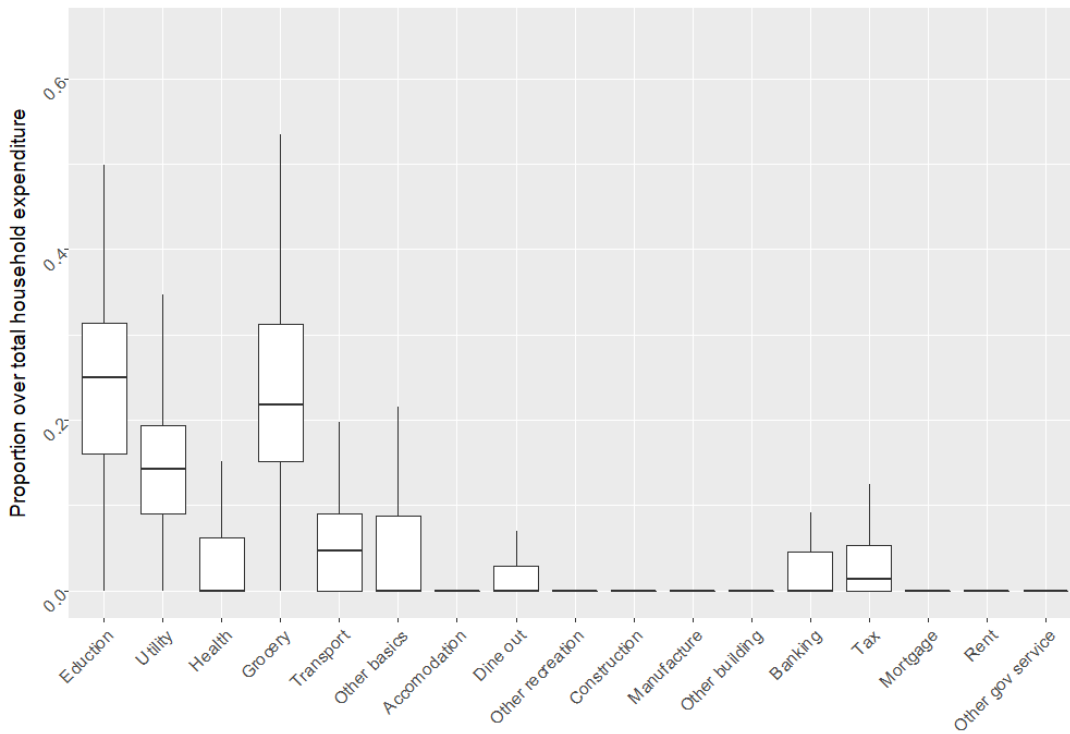
(a) Larger ports
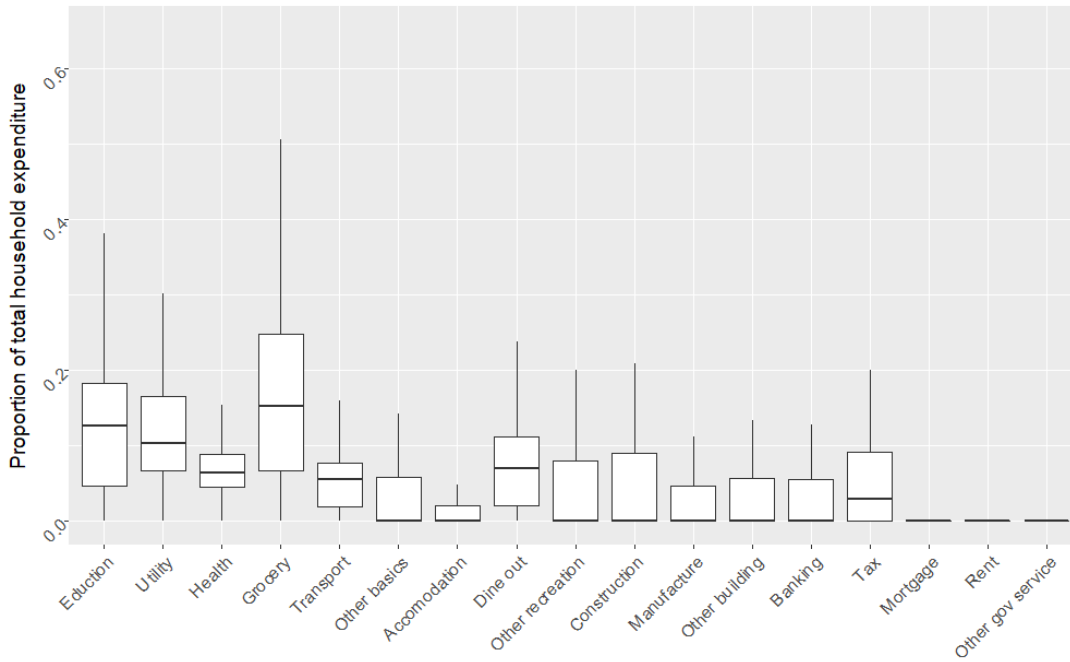
(b) Small landing places

Figure A4. (a) Household expenditure for different goods at larger ports, and (b) small landing places in Maluku.
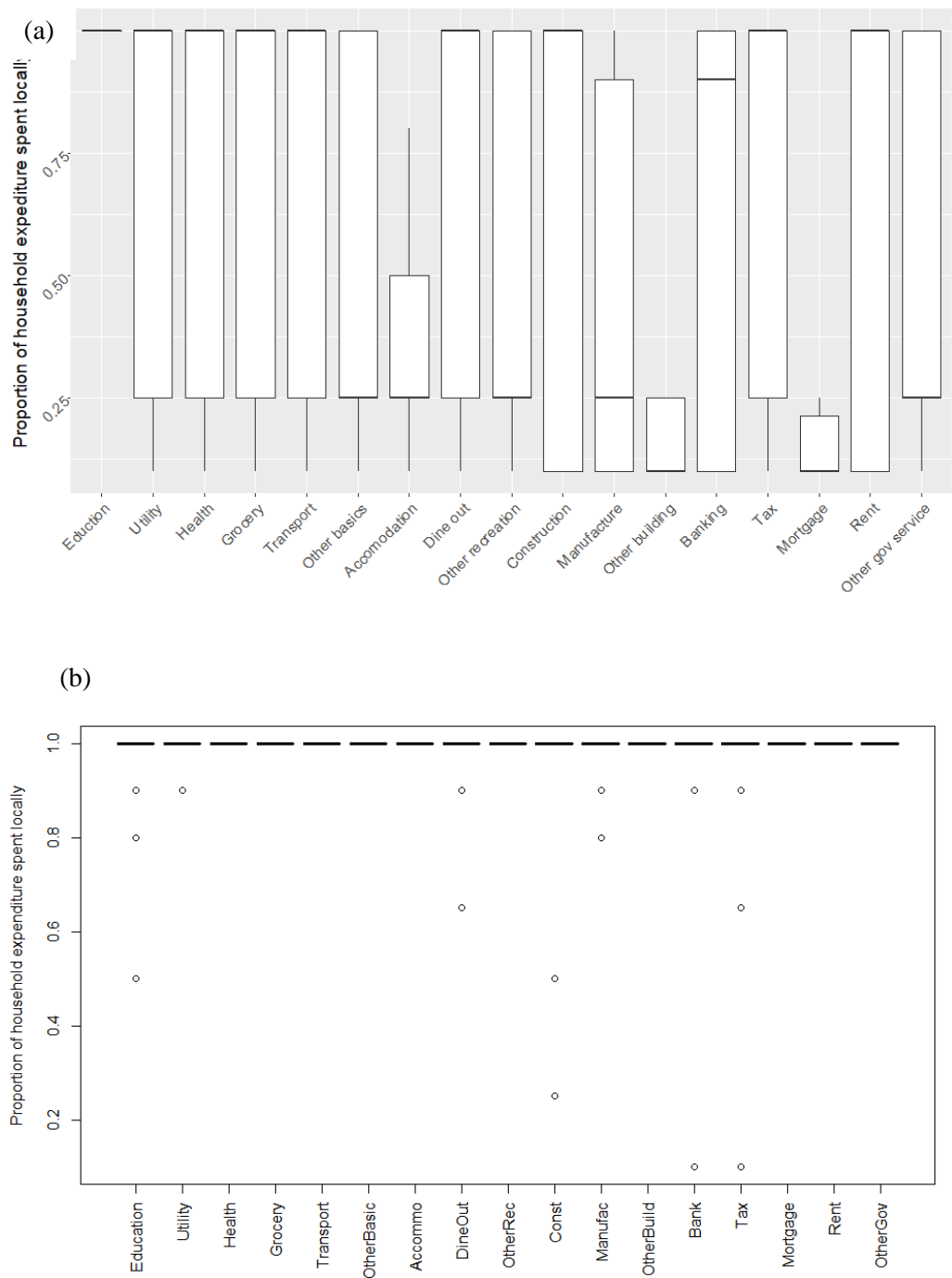
Figure A5. The share of household expenditure spent locally for respondents (a) at larger ports, and (b) at small landing places in Maluku islands.

5. Extrapolation of catch

In designing the survey, the trip level catch category was capped at 1,000 kg/trip, assuming that larger vessel owners would keep accounting books, hence would report annual revenue. However, this was not the case – almost all the respondents at larger ports were employees

(either hired captain or crew members) rather than owners. In cases when fishers reported "over 1000 kg/trip", an extrapolation was carried out. We used the information on self-reported species composition of the year, and average catch/trip for each species. Suppose a fisher reported annual catch comprising 10% neritic tuna, 20% yellowfin tuna, and 70% skipjack tuna (figure A6). Then the average catch for skipjack tuna was reported as "over 1000 kg/trip" and average catch of neritic tuna was reported as 200-300 kg/trip.
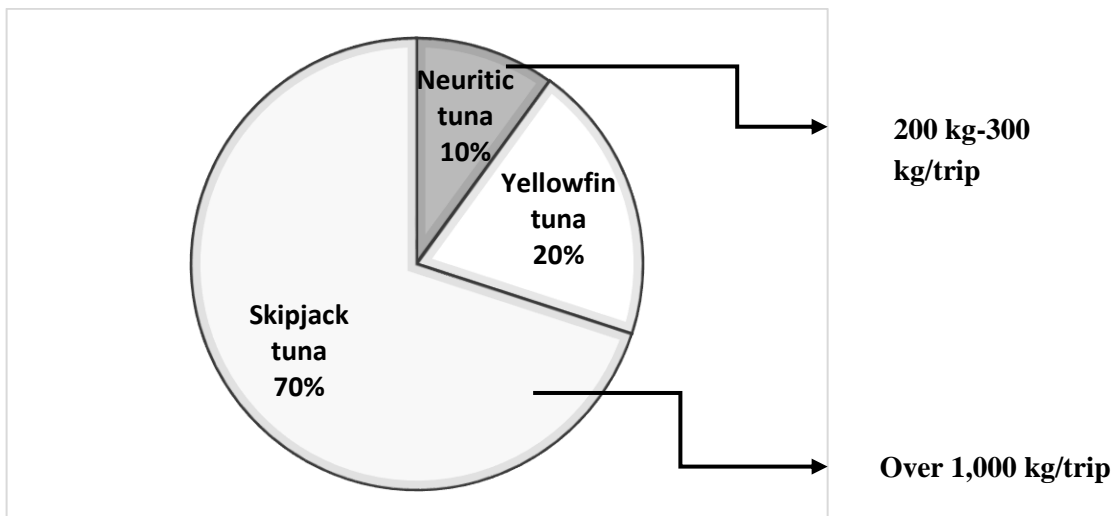

Figure A6. An example of exploration of skipjack tuna catch when a fishery reports "over 1,000 kg/trip", using reported annual catch composition by species and reported catch/trip for each species.

We calculate the upper bound of skipjack catch as follows:

Extrapolated upper bound of skipjack catch $= \frac{300 \text{ kg} \times 70}{10} = 2{,}100$ kg/trip

6. Regression analysis

6.1. Regression models considered

Model 1 is the simplest model considered which includes a smooth term for log profit, along with three categorical variables (gear, GT, and port classes) as explanatory variables. Model 2 includes an additional smooth term for log revenue. Comparing models 1 and 2, model 2 has higher deviance explained with lower Akaike Information Criterion (AIC) (table A2). An additional chi-square test confirmed a significant improvement when moving from the simplest

model 1 to model 2. Model 3 includes a bivariate smooth term[1] representing an interaction between log profit and log revenue, in addition to the three categorical variables. Models 4–6 include an interaction term between log profit and gear or log revenue and gear or both in addition to three categorical variables (table A2).[2]

Table A2. Model formulas considered in explaining business-level production multipliers

Models	Formula
1	mult ~ s(log(Profit)) + GT + Gear + PortClass
2	mult ~ s(log(Profit)) + s(log(Rev)) + GT + Gear + PortClass
3	mult ~ s(log(Profit), log(Rev)) + GT + Gear + PortClass
4	mult ~ s(log(Profit), by = Gear) + s(log(Rev)) + GT + Gear + PortClass
5	mult ~ s(log(Profit), by = Gear) + s(log(Rev)) + GT + Gear + PortClass + s(log(Profit), log(Rev))
6	mult ~ s(log(Profit), by = Gear) + s(log(Rev), by = Gear) + GT + Gear + PortClass

Notes: mult indicates business level production multiplier with log link function with gamma distribution. Rev= Revenue. s represents smooth terms. We considered three specifications of bivariate smoothers: thin plate spline, tensor, and tensor with cubic spline. However, there was little difference in coefficients among them, presumably because log (Profit) and log(Rev) are at similar scales. Based on the AIC, we choose thin plate spline as the default. "by=" indicates interaction between smoothed (i.e., log(Profit)) and a categorical variable (i.e., gear). The maximum value of $k = -1$ was used as the default in selecting the optimal smoothness.

Table A3. Summary of models considered relative to the selection criteria

Model	Smooth terms	Edf	REML	df/AIC	Deviance explained
Model 1	log(Profit)	6.513***	-142.82	22.16/-342.35	62.8%
Model 2	log(Profit)	7.437***	-206.87	29.97/-494.06	71.5%
	log(Rev)	6.999***			
Model 3	log(Profit), log(Rev)	13.39***	-237.83	28.91/-565.13	76.4%
Model 4	log(Profit):GearHLD	6.512***			
	log(Profit):GearHLS	1.000***			
	log(Profit):GearLL	3.947***			
	log(Profit):GearPL	1.000***	-226.29	39.47/-555.44	79.7%
	log(Profit):GearPS	3.813***			
	log(Profit):GearTL	1.000***			
	log(Rev)	5.626***			
Model 5	log(Profit):GearHLD	1.000			
	log(Profit):GearHLS	6.169***	-252.79	58.14/-677.31	86.3%
	log(Profit):GearLL	2.144			
	log(Profit):GearPL	0.000			

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[1] GAM is not restricted to models containing only smooths of one predictor, but smooths of any number of predictors (Woods, 2017).
[2] We also considered different combination of interaction terms between smoothed and other categorical variables (e.g., GT) but based on AIC and chi-square test results they were not considered further as no improvement was observed.

	log(Profit):GearPS	1.000***				
	log(Profit):GearTL	1.000***				
	log(Rev)	6.886***				
	log(Profit),log(Rev)	21.560***				
Model 6	log(Profit):GearHLD	5.322***			42	
	log(Profit):GearHLS	5.304***	-263.09	51.39/-635.61	23	84.3%
	log(Profit):GearLL	1.380			1.452	
	log(Profit):GearPL	1.000			1.000	
	log(Profit):GearPS	2.534***			2.721	
	log(Profit):GearTL	1.000			1.000	
	log(Rev):GearHLD	4.942***			6.544	
	log(Rev):GearHLS	5.024***			6.051	
	log(Rev):GearLL	1.843*			1.848	
	log(Rev):GearPL	1.000			1.000	
	log(Rev):GearPS	1.000			1.000	
	log(Rev):GearTL	1.827			2.164	

Notes: REML = restricted marginal likelihood, df = degrees of freedom, and AIC = Akaike Information Criterion. All models include GT, gear, and port class as categorical (factor) variables in addition to the smooth terms, but coefficients are only reported for the selected model in the manuscript since there was little difference among the models considered. log(rev) = log of revenue, Edf = effective degree of freedom of the smooth term(s). Asterisks next to the EDF values indicate the level of statistical significance of the smooth term(s), *** = 0, ** = 0.01, * = 0.05.

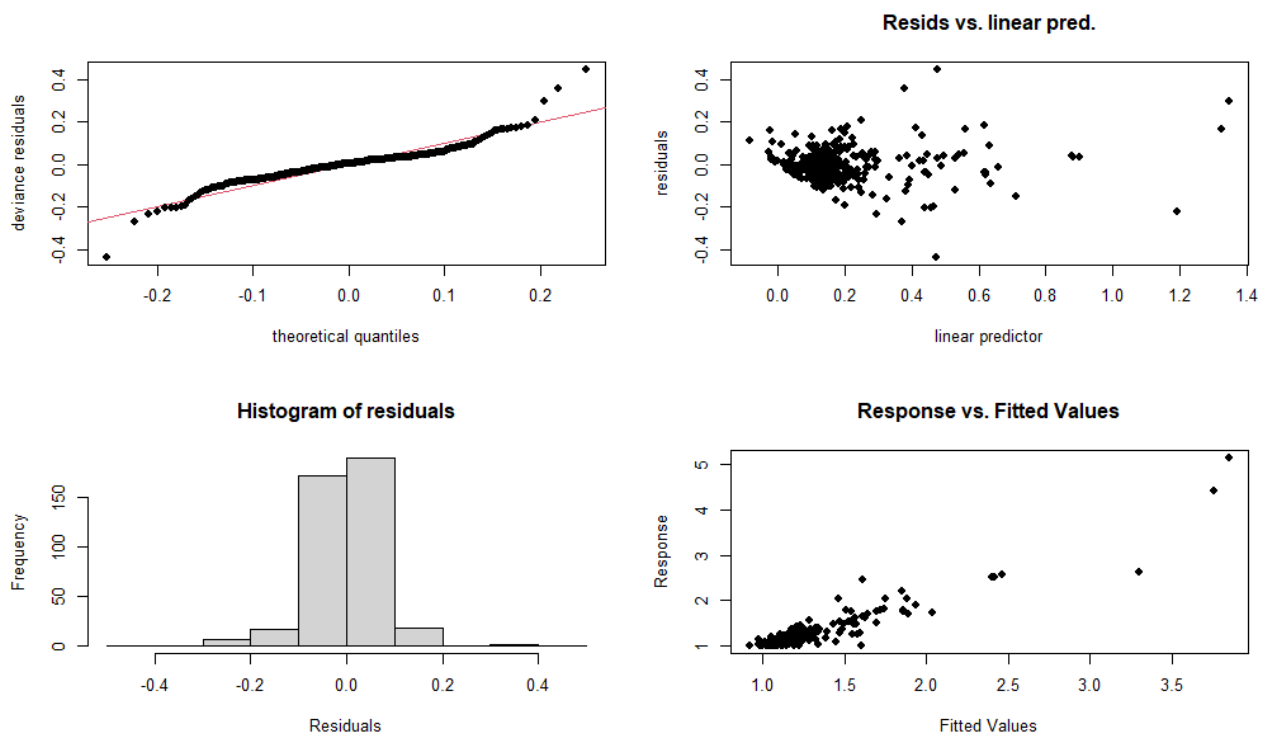## 6.2. Diagnostic plot for the selected model (model 5)

Figure A6. Diagnostic plots for the selected model (model 5)

6.3. Marginal plots for the selected model (model 5)
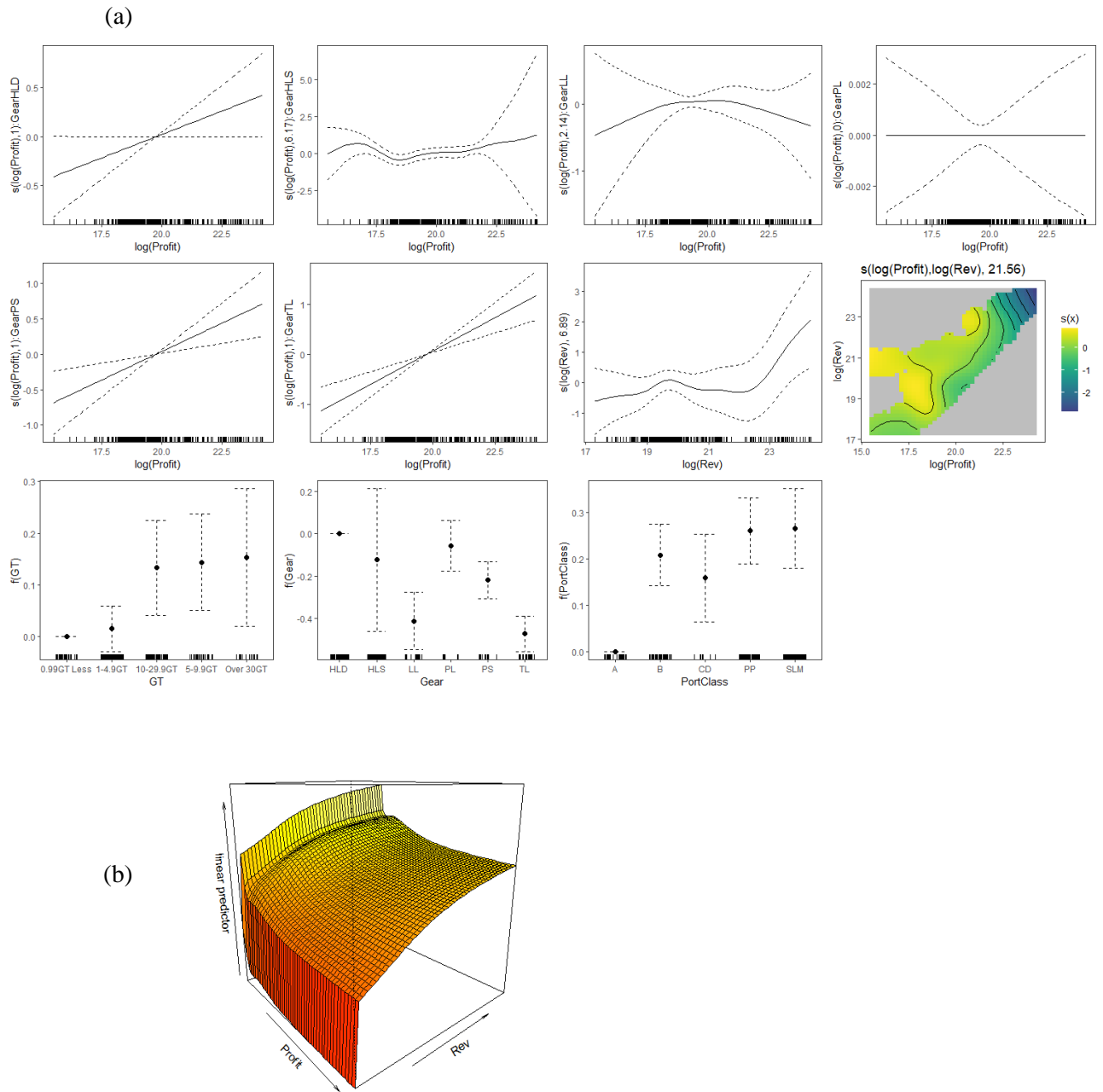
(a)

(b)

Figure A7. Summary of marginal plots for model 5 (a), and 2D plot (b), illustrating non-linear interaction between profit and revenue. For factor variables (GT, gear, and port class), solid lines indicate estimated coefficient values, and dotted lines are 95% confidence intervals.

APPENDIX B

QUESTIONNAIRE

A. Introduction

Thank you for agreeing to participate in this survey. This survey is part of a larger project aimed at characterizing the socio-economic contribution of the tropical tuna fisheries in Indonesia. The project is run jointly by the Centre for Marine Research Institute (Balai Riset Perikanan Laut) of the Ministry of Marine Affairs and Fisheries (Kementerian Kelautan dan Perikanan, KKP) and the Australian Commonwealth Science and Industry Research Organization (CSIRO), and is funded by the Walton Family Foundation and CSIRO.

The purpose in this survey is to estimate the flow-on effects of the tropical tuna fishery (i.e. skipjack tuna, yellowfin tuna, and bigeye tuna) to the local and regional economy. Your business contributes to this economic flow-on effect through business-based expenditure as well as your own private household expenditure. To properly estimate the tuna fishery contribution to the local and regional economy, your input to our project (and this survey) is very important.

Completing this survey is an opportunity for commercial fishers to demonstrate their value to the local and regional economy.

We will be asking about your business expenditure and household expenditure and what percentage of goods and services were purchased locally. Here "local" means your local government area in terms of province (or special district). Knowing this is important to determine regional flow on effects as business and personal expenditure patterns are likely to be different, but both contribute to the regional economy.

Your responses will be confidential, and *your personal information will not be identifiable*. Only aggregated information from the survey will be used to estimate flow-on effects of fishing business. The results of the analysis will be used to understand the potential economic implications of any future fishery regulatory changes (i.e. as a result of harvest strategy implementation, or any other management decisions relevant to the tropical tuna fisheries) to the local and regional economy, and to provide recommendations to the government of Indonesia for considerations to minimise the potential adverse economic impacts to the fishing industry and the members of fishing communities.

We expect this survey to take around 20 to 30 minutes to complete.

Please feel free to contact us if you have any concerns or queries about the questions. For English please contact Eriko (email: eriko.hoshino@csiro.au). For Bahasa Indonesia please contact Rani (email: rani.ekawaty@utas.edu.au).

* 1. In 2020, were you or was your business involved catching tropical tuna? "Tropical tuna" means Albacore tuna, Bigeye tuna, Skipjack tuna, and Yellowfin tuna.

○ Yes

○ No (move to the end)

B. Basic questions about you and your business

In the first part of the survey, we will ask some basic questions about you and your fishing business.

* 2. How would you describe yourself?

○ I am a captain of my own boat

○ I am a captain working for someone's boat (i.e. hired captain)

○ I am a crew member (deckhand) who works for a company or other fisher (s)

○ I don't fish myself but I own a fishing company

○ Accountant of a fishing company

Other (please specify)

[   ]

* 3. Which local government area do you fish?

[   ]

* 4. In which local government areas does your business (home port) located?

[   ]

* 5. Please specify the number of boat for each gear used to catch tuna in your business in 2020

Longline	[ ]
Pole-and line	[ ]
Purse seine	[ ]
Handline	[ ]
Lift net	[ ]
Troll line	[ ]
Gillnet	[ ]
Others	[ ]

* 6. Please select average gross tonnage (GT) of the boat, average number of crew per boat (excluding captain), and typical trip length.

	Gross Tonnage	Number of crew on board	Typical trip length
Longline			
Pole-and line			
Purse seine			
Handline			
Lift net			
Troll line			
Gillnet			
Others			

* 7. What species of tuna do you typically catch and approximately what proportion? Please enter a number between 0 and 100. If your catch typically consists of 30% yellowfin tuna and 70% skipjack tuna, please type "30" for yellowfin tuna and "70" for skipjack tuna. Please add positive, whole numbers only (no decimals or points) and the total needs to be 100.

Please note "Neritic tuna and mackerels" includes Bullet tuna, Frigate tuna, Longtail tuna (Tongkol), Kawakawa, Narrow-barred Spanish mackerel, and Indo-Pacific king mackerel. "Bait fish" includes anchovy, sardine, scad, and other small pelagics used for bait to catch tuna.

Albacore tuna

Bait fish

Bigeye tuna

Bluefin tuna

Neritic tuna and mackerels

Skipjack tuna

Yellowfin tuna

Other species

* 8. Do you keep accounting book to track records of fish sales and costs every year?

◯ Yes

◯ No (move to C-2)

C-1. Annual revenue and costs

This page is for those who have an accounting book, keeping records of annual revenue from fish sales and costs information for 2020.

In this section we will ask you about annual revenue in 2020, average costs (both running cost and annual cost) for your fishing business in 2020 and who financed the cost.

* 9. What is your approximate total **fishing revenue** (total fish sales before deducting the costs of fishing and administration) in year 2020 (January 2020 to December 2020)? The currency is Indonesian Rupia (IDR). Please enter a number only. For example, if your annual revenue is IDR 50 million (juta) please enter "50" in the box below.

10. If the revenue in 2020 is significantly different from typical years due to COVID-19, please specify how different (lower or higher) and how much the difference in 2020 was from the typical years (e.g. 2018, 2019) prior to the pandemic. Please select only one answer, either higher or lower (not both).

	Same	Less than 10%	10-20%	20-30%	30-40%	40-50%	More than 50%
Higher	○	○	○	○	○	○	○
Lower	○	○	○	○	○	○	○

* 11. **Running costs**: The running costs of a business are the amount of money that is regularly spent on items necessary to go on fishing trips. Examples include fuel, ice, bait, gear replacement etc. Please let us know the total amount of running costs in 2020 in Indonesian Rupia (IDR). Please enter a number only. For example, if your total annual running cost is IDR 10 million (juta) please enter "10" in the box below.

12. If the running costs in 2020 are significantly different from typical years due to Covid-19 related impacts, please specify how different the 2020 costs are from the typical years prior to Covid-19 (e.g. year 2019). Please select only one answer, either higher or lower (not both).

	Same	Less than 10%	10-15%	15-20%	20-30%	30-40%	40-50%	More than 50%
Higher	○	○	○	○	○	○	○	○
Lower	○	○	○	○	○	○	○	○

* 13. Please provide the proportion of each running cost item from 0 to 100%. Please enter a number only. The total must add up to 100.

Crew labour

Fuel

Bait

Ice

Food costs on board

Vessel repairs, maintenance

Gear repairs, replacement, maintenance

Packing and freights

Marketing

Other trip costs

* 14. Who financed each running cost item?

	Who financed the running cost?
Crew labour	
Fuel	
Bait	
Ice	
Vessel repairs, maintenance	
Gear repairs, replacement, maintenance	
Packing and freights	
Marketing	
Other trip costs	

Please specify other trip cost and who financed the cost

* 15. **Fixed costs:** The fix costs of a business are the money spent on monthly or annual basis and are not directly related to how much you fish or how much you catch. Examples include license fees, telephone, and administration costs. Please let us know the total amount of fixed costs in 2020 (in IDR). Please enter a number only. For example, if your annual cost is IDR 10 million (juta) please enter "10" in the box below.

[   ]

16. If the fixed costs in 2020 are significantly different from typical years due to Covid-19 related impacts, please specify how different the 2020 costs are from the typical years prior to Covid-19 (e.g. year 2019). Please select only one answer, either higher or lower (not both).

	Same	Less than 10%	10-15%	15-20%	20-30%	30-40%	40-50%	More than 50%
Higher	○	○	○	○	○	○	○	○
Lower	○	○	○	○	○	○	○	○

17. Please provide the proportion of each annual cost item from 0 to 100% . Please enter a number only. The total has to add up to 100.

Accountancy	[ ]
Telephone and postage	[ ]
Bank fees	[ ]
Bank interest	[ ]
Brokerage fees (e.g. middlemen fees)	[ ]
Wharf/port fees	[ ]
Electricity and gas	[ ]
Vehicle repair and maintenance	[ ]
Fishing license fees	[ ]
On-shore leasing	[ ]
Insurance	[ ]
Other administrative costs	[ ]

18. Who financed each fixed cost item?

Who financed the annual cost?

Accountancy	
Telephone and postage	
Bank fees	
Bank interest	
Brokerage fees (e.g. middlemen fees)	
Wharf/port fees	
Electricity and gas	
Vehicle repair and maintenance	
Fishing license fees	
On-shore leasing	
Insurance	
Other administrative costs	

Please specify other administration costs and who financed the costs

C-2. Trip level revenue and costs

This page is for those who don't keep accounting books and need to answer from your memory.

In this section we will ask you about how much fish you catch per trip, their sales prices and average cost of each fishing trip.

* 19. What is your average catch (kg) per trip in 2020?

	Albacore tuna	Bigeye tuna	Skipjack tuna	Yellowfin tuna	Neuritic tuna and mackerels	Other species
0 (I don't catch)	○	○	○	○	○	○
Less than 10kg	○	○	○	○	○	○
10-25kg	○	○	○	○	○	○
25-50kg	○	○	○	○	○	○
50-100kg	○	○	○	○	○	○
100-200kg	○	○	○	○	○	○
200-300kg	○	○	○	○	○	○
300-500kg	○	○	○	○	○	○
500-1000kg	○	○	○	○	○	○
Over 1000kg	○	○	○	○	○	○

Please specify the average catch amount if it is over 1000kg per trip

[   ]

20. How many times does the average fishing trip per month/per year in 2020? If you remember exactly how many trips you did in 2020, please let us know below.

Average number of fishing trips per month in 2020   [   ]

Total number of fishing trips in 2020   [   ]

* 21. What is the average price you received in 2020? Unit is Indonesian Rupia per kg (IDR/kg)

	Albacore tuna	Bigeye tuna	Skipjack tuna	Yellowfin tuna	Neuritic tuna and mackerels	Other species
0 (I don't catch)	○	○	○	○	○	○
5,000-10,000 (IDR/kg)	○	○	○	○	○	○
10,000-20,000	○	○	○	○	○	○
20,000-30,000	○	○	○	○	○	○
30,000-40,000	○	○	○	○	○	○
40,000-50,000	○	○	○	○	○	○
50,000-60,000	○	○	○	○	○	○
60,000-70,000	○	○	○	○	○	○
70,000-80,000	○	○	○	○	○	○
80,000-90,000	○	○	○	○	○	○
100,000-120,000	○	○	○	○	○	○
120,000-150,000	○	○	○	○	○	○

* 22. If the average fish price in 2020 is significantly different from typical years due to COVID-19, please specify how different (lower or higher) and how much the difference in 2020 was from the typical years (e.g. 2018, 2019) prior to the pandemic. Please select only one answer, either higher or lower (not both).

	Same	Less than 10%	10-20%	20-30%	30-40%	40-50%	More than 50%
Higher	○	○	○	○	○	○	○
Lower	○	○	○	○	○	○	○

* 23. **Running costs**: The running costs of a business are the amount of money that is regularly spent on items necessary to go on fishing trips. Examples include fuel, ice, bait, gear replacement etc. Please let us know the average amount of running costs per trip in Indonesian Rupia (IDR) in 2020. Please enter a number only (no comma or decimal). For example, if your total annual running cost is IDR 100,000 please enter "100000" in the box below.

[   ]

* 24. If the running costs in 2020 are significantly different from typical years due to Covid-19 related impacts, please specify how different the 2020 costs are from the typical years prior to Covid-19 (e.g. year 2019). Please select only one answer, either higher or lower (not both).

	Same	Less than 10%	10-15%	15-20%	20-30%	30-40%	40-50%	More than 50%
Higher	○	○	○	○	○	○	○	○
Lower	○	○	○	○	○	○	○	○

* 25. Please provide the proportion of each running cost item from 0 to 100% Please enter a number only. The total has to add up to 100.

Crew costs

Food costs for crew

Fuel costs

Vessel repairs and maintenance

Gear repairs, maintenance, replacement

Freight and marketing

Packing costs

Bait

Ice

Other trip costs

* 26. Who financed each running cost item?

Who financed the cost?

Crew costs	
Food costs for crew	
Fuel costs	
Vessel repairs and maintenance	
Gear repairs, maintenance, replacement	
Freight and marketing	
Packing costs	
Bait	
Ice	
Other trip costs	

Please specify other trip cost and who financed the cost

* 27. **Fixed costs:** The fixed costs of a business are the money spent on monthly or annual basis, and are not directly related to how much you fish or how much you catch. Examples include license fees, telephone, and administration costs. Please let us know the average amount of monthly fixed costs in 2020 (in IDR). Please enter a number only. For example, if your monthly fixed cost is IDR 100,000 please enter "100000" in the box below.

D. Sales location

This section asks approximately what percentage of your fish is sold to processors, traders, or retailers (markets, shops, restaurants) and their locations.

* 28. Who did you sell your fish to in 2020? Please indicate approximate percentage of your fish sold to the following from 0 to 100%. For example, if you sold all of your catch to a middleman in 2020 please enter "100" for Middleman. If you sell half of your fish to middleman and used other half for your own consumption please enter "50" for each. You can select multiple buttons.

Dried or salted processing	
Cannery processors for export	
Cannery processors for local use	
Fillet or loin processors for export	
Other processors	
Local market or shops (direct sale)	
Restaurants	
Middleman	
Traders	
Own consumption (including family and relatives)	

* 29. If you sold your fish to processors/retailers, where are they located?

◯ Local (within the same province or district)

◯ Outside of the local area

◯ Both local and outside of local area

◯ I didn't sell fish (move to Q31)

* 30. If you sold your fish to a trader/middleman, does she/he live locally?

◯ Yes (within the same province or district)

◯ No

◯ Both

E. Business expenditure location

In this section we will ask you about how much you spent locally on each cost item

* 31. Approximately what proportion of your **running costs** is spent within your local government area (province, district)? For example, if about half of your fuel was purchased locally, then you would click on the 50% button. If you did not use a particular input at all (e.g. bait), you would click on the "did not use" button (rather than the 0% button, which means that all bait were purchased from outside.

	Did not use	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Crew costs	○	○	○	○	○	○	○	○	○	○	○	○
Food costs for crew	○	○	○	○	○	○	○	○	○	○	○	○
Fuel costs	○	○	○	○	○	○	○	○	○	○	○	○
Vessel repairs and maintenance	○	○	○	○	○	○	○	○	○	○	○	○
Gear repairs, maintenance, replacement	○	○	○	○	○	○	○	○	○	○	○	○
Freight and marketing	○	○	○	○	○	○	○	○	○	○	○	○
Packing costs	○	○	○	○	○	○	○	○	○	○	○	○
Bait	○	○	○	○	○	○	○	○	○	○	○	○
Ice	○	○	○	○	○	○	○	○	○	○	○	○
Other	○	○	○	○	○	○	○	○	○	○	○	○

* 32. Approximately what proportion of the **fixed costs** is spent within your local government area (province, district)? 0% means you spent the item outside of local area.

	Did not use	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Accountancy	○	○	○	○	○	○	○	○	○	○	○	○
Telephone and postage	○	○	○	○	○	○	○	○	○	○	○	○
Bank fees	○	○	○	○	○	○	○	○	○	○	○	○
Bank interest	○	○	○	○	○	○	○	○	○	○	○	○
Brokage fees (e.g. middlemen)	○	○	○	○	○	○	○	○	○	○	○	○
Wharf/port fees	○	○	○	○	○	○	○	○	○	○	○	○
Electricity and gas	○	○	○	○	○	○	○	○	○	○	○	○
Vehicle repair and maintenance	○	○	○	○	○	○	○	○	○	○	○	○
Fishing license fees	○	○	○	○	○	○	○	○	○	○	○	○
Onshore leasing	○	○	○	○	○	○	○	○	○	○	○	○
Insurance	○	○	○	○	○	○	○	○	○	○	○	○
Other administrative costs	○	○	○	○	○	○	○	○	○	○	○	○

* 33. How many of your crew live locally?

☐ None of them

☐ About 1/3 of them

☐ About half of them

☐ Most of them

☐ All of them

☐ I don't use crew

F. Personal and household income and expenditure

The economic contribution of fishing to the region depends not only on the expenditure from your business, but also how your personal and household income is spent. On this page, we wish to find out roughly how much of your fishing income was used by yourself or by your household, and how much of this is spent or saved.

* 34. Do you have income sources other than fishing (e.g. farming, trading, public service etc.) in your household?

☐ Yes

☐ No (move to Q36)

35. If your answer above is "yes" please indicate the proportion (%) of "other" income. For example, your total household income is made up with 30% fishing and 70% farming please indicate "70%" below.

0	100

36. Roughly what proportion of your fishing income (fish sales or salary) did you keep as your own personal or household income in 2020? This is important as it provides an indication as to how much of your fishing income is available for personal or household expenditure. Please indicate an approximate proportion.

0	100

37. Roughly what percentage of your **total household income** (including both fishing and other sources of income) is available for spending? For example, you save 10% income and another 10% to pay for income tax, then please select "80%" of your income to be available for spending.

0	50	100

* 38. Please indicate approximately **what proportion of your own personal or household income is spent on each of group of goods and services** ?

Here we divide the types of goods and services in 4 groups:

1) Basic goods and services (such as food);
2) Recreation;
3) Building and trades
4) Government and financial services (including mortgage repayment and rent for house)

	None	Very little	Some	Around half	A bit more than half	Quite a lot	Almost all
Basic goods and services	○	○	○	○	○	○	○
Recreation	○	○	○	○	○	○	○
Building and trades	○	○	○	○	○	○	○
Government and financial services	○	○	○	○	○	○	○

* 39. Approximately what proportion of your own personal or household income is spent on each of the following **Basic goods and services**?

	None	Very little	Some	Around half	A bit more than half	Quite a lot	Almost all
Communication (e.g. mobile phone)	○	○	○	○	○	○	○
Education	○	○	○	○	○	○	○
Electricity, gas, and water supply	○	○	○	○	○	○	○
Health and community service (e.g. doctor visit, childcare, pharmacy)	○	○	○	○	○	○	○
Grocery (e.g. fruits and vegetable, fish and meat markets)	○	○	○	○	○	○	○
Retailers (e.g. cloth shops)	○	○	○	○	○	○	○
Transport (e.g. bus)	○	○	○	○	○	○	○
Others	○	○	○	○	○	○	○

Other (please specify)

* 40. Approximately what proportion of your own personal or household income was spent on each of the following **Recreational goods and services**?

	None	Very little	Some	About half	A but more than half	Quite a lot	Almost all
Accommodation	○	○	○	○	○	○	○
Dining out (e.g. café, warung, restaurants)	○	○	○	○	○	○	○
Other recreational services	○	○	○	○	○	○	○

Other (please specify)

[   ]

* 41. Approximately what proportion of your own personal or household income was spent on each of the following **Building and trade goods and services**?

	None	Very little	Some	About half	A bit more than half	Quite a lot	Almost all
Construction and trade services	○	○	○	○	○	○	○
Manufactures (e.g. furniture)	○	○	○	○	○	○	○
Others	○	○	○	○	○	○	○

Other (please specify)

[   ]

* 42. Approximately what proportion of your own personal or household income was spent on each of the following **Government and financial services**?

	None	Very little	Some	About half	A bit more than half	Quite a lot	Almost all
Banking services and insurance (e.g. bank charges, interests, insurance payment)	○	○	○	○	○	○	○
Government administration (e.g. car and motorbike registration, license)	○	○	○	○	○	○	○
Local government tax and levies (e.g. Banjar fees)	○	○	○	○	○	○	○
Mortgage repayments	○	○	○	○	○	○	○
Rent (house) payment and housing services (e.g. cleaning, maid services)	○	○	○	○	○	○	○
Others	○	○	○	○	○	○	○

Other (please specify)

[   ]

G. Personal and household expenditure location

The aim of the questions below is to estimate what part of your personal or household expenditure was spent locally (within your province or district) in 2020. For example if you purchased all food from local shops please select "All".

* 43. Approximately what proportion of your own personal or household expenditure on each of the following **Basic goods and services** was spent locally?

	Did not use	None (all non-local)	Very little	Some	Around half	A bit more than half	Quite a lot	Almost all	All
Communication (e.g. mobile phone)	○	○	○	○	○	○	○	○	○
Education	○	○	○	○	○	○	○	○	○
Electricity, gas, and water supply	○	○	○	○	○	○	○	○	○
Health and community service (e.g. doctor visit, childcare, pharmacy)	○	○	○	○	○	○	○	○	○
Grocery (e.g. fruits and vegetable, fish and meat markets)	○	○	○	○	○	○	○	○	○
Retailers (e.g. cloth shops)	○	○	○	○	○	○	○	○	○
Transport (e.g. bus)	○	○	○	○	○	○	○	○	○
Others	○	○	○	○	○	○	○	○	○

Other (please specify)

[   ]

* 44. Approximately what proportion of your own personal or household expenditure on each of the following **Recreational goods and services** was spent locally?

	Did not use	None (all non-local)	Very little	Some	About half	A bit more than half	Quite a lot	Almost all	All
Accommodation	○	○	○	○	○	○	○	○	○
Dining out (e.g. café, warung, restaurants)	○	○	○	○	○	○	○	○	○
Other recreational services	○	○	○	○	○	○	○	○	○

* 45. Approximately what proportion of your own personal or household expenditure on each of the following **Building and trade goods and services** was spent locally?

	Did not use	None (all non-local)	Very little	Some	Around half	A bit more than half	Quite a lot	Almost all	All
Construction and trade services	○	○	○	○	○	○	○	○	○
Manufactures (e.g. furniture)	○	○	○	○	○	○	○	○	○
Others	○	○	○	○	○	○	○	○	○

* 46. Approximately what proportion of your own personal or household expenditure on each of the following **Government and financial services** was spent locally?

	Did not use	None (all non-local)	Very little	Some	About half	A bit more than half	Quite a lot	Almost all	All
Banking services and insurance (e.g. bank charges, interests, insurance payment)	○	○	○	○	○	○	○	○	○
Government administration (e.g. car and motorbike registration, license)	○	○	○	○	○	○	○	○	○
Local government tax and levies (e.g. Banjar fees)	○	○	○	○	○	○	○	○	○
Mortgage repayments	○	○	○	○	○	○	○	○	○
Rent (house) payment and housing services (e.g. cleaning, maid services)	○	○	○	○	○	○	○	○	○
Others	○	○	○	○	○	○	○	○	○

H. Contact

Please fill in your information below so we can stay in touch.

All information provided by you will be treated confidentially. Your name, workplace, or any other personal information will not be included in any publications resulting from the study. All data collected in this study will be coded in a de-identified manner and subsequently analysed and reported in such a way that responses will not be able to be linked to any individuals.

Thank you!

47. Your contact

Name	
Company	
City/Town	
State/Province	
ZIP/Postal Code	
Email Address	
Phone Number	