

Cruising Through School: General Equilibrium Effects of Cruise Ship Arrivals on Employment and Education

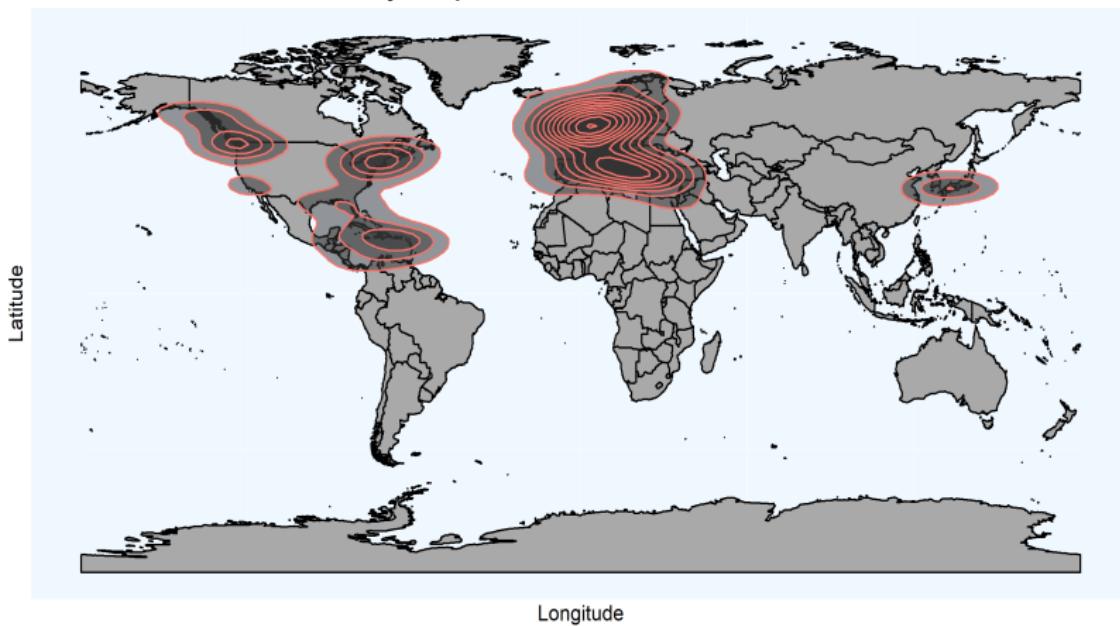
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GLOBAL PORT TRAFFIC HEAT MAP: 2009 AND 2019

Global Port Traffic Density Map 2009 - 2019



RESEARCH QUESTIONS

- ▶ Does Cruise Tourism drive differential human capital outcomes?
 1. Labor Participation
 2. Educational Attainment
- ▶ Use ship locational information and match to Women's Demographic and Health Survey (DHS) individual-level characteristics in the developing context
 - ▶ 23 countries from 2009 to 2016
- ▶ Utilize a variety of panel fixed effects models to determine general equilibrium effects
- ▶ Explore variation to understand various equilibria:
 1. Within Tourism Cities
 2. Between Tourism Cities and Port Cities
 3. Between Tourism Cities and All Cities

LITERATURE REVIEW

1. Tourism and Cruise Tourism

- ▶ Tourism : \$8.8 Trillion USD, 10.4% Global GDP, 1 in 10 Jobs
- ▶ Cruise Tourism: \$128 Billion USD, 4.5% Growth Rate
 - ▶ Ship Types
 - ▶ Tourism Vs Cruise
- ▶ Tourism acts as a multiplier effect ([Frechtling and Horvath, 1999](#); [Sharpley, 2000](#))
- ▶ Tourism Led Growth Hypothesis (TLGH) ([UNWTO, 2019](#); [Brida and Pulina, 2010](#); [Nunkoo et al., 2020](#); [Sharpley and Telfer, 2002](#))
- ▶ Tourism certainly impacts Service Employment and Wages ([Faber and Gaubert, 2019](#))

LITERATURE REVIEW

2. Ports and Trade

- ▶ Agglomerated market activity around specific locations by cruise liner oligopolies ([Krugman, 1991](#); [Song et al., 2012](#); [Sinclair, 1998](#))
- ▶ Theory of the Port: Maximize revenues from a variety port traffic ([Talley, 2006](#); [Tang et al., 2011](#))
- ▶ Developing Countries rely heavily on ports for trade ([Wood, 1982](#)) and New Trade Theory places multinational firms at the heart of trade networks ([Markusen and Venables, 1998](#))

3. Differential Labor Market Effects

- ▶ [Romer \(1989\)](#) shows human capital is the engine for growth
- ▶ A key component of allocative efficiency in market is increased female labor participation ([Hsieh et al., 2019](#))
- ▶ Consistent with Labor Market Segmentation Theory ([Reich et al., 1973](#)), an expansion of the service sector should deferentially benefit women ([Tingum, 2016](#); [Nelson and Lorence, 1988](#); [Lorence, 1991, 1992](#))

DATA

1. Ship Level Data

- ▶ Automatic Identification System (AIS) Location Data From SailWX [Transmissions = 10,666,103]
- ▶ Wikipedia and Cruise Mapper Ship Characteristics [Vessels = 517] ▶ AIS

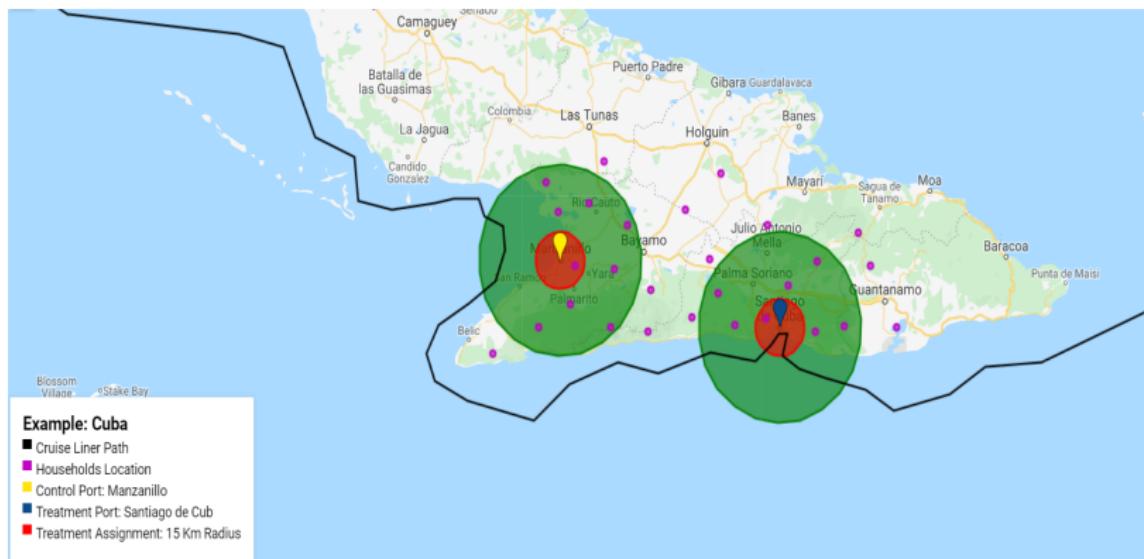
2. Port Level Data

- ▶ Combined List of Identifiable Ports Geocoded Port Latitude and Longitude via Google Map API [Ports = 5,374] from:
 - ▶ Wikipedia
 - ▶ Natural Earth
 - ▶ Central Intelligence Agency

3. Household Level Data

- ▶ Women's Survey from Demographic and Health Surveys (DHS) [Observations = 341,299] ▶ DHS Questions
- ▶ 23 Countries from 2009 to 2016 ▶ Country List ▶ Country By Year

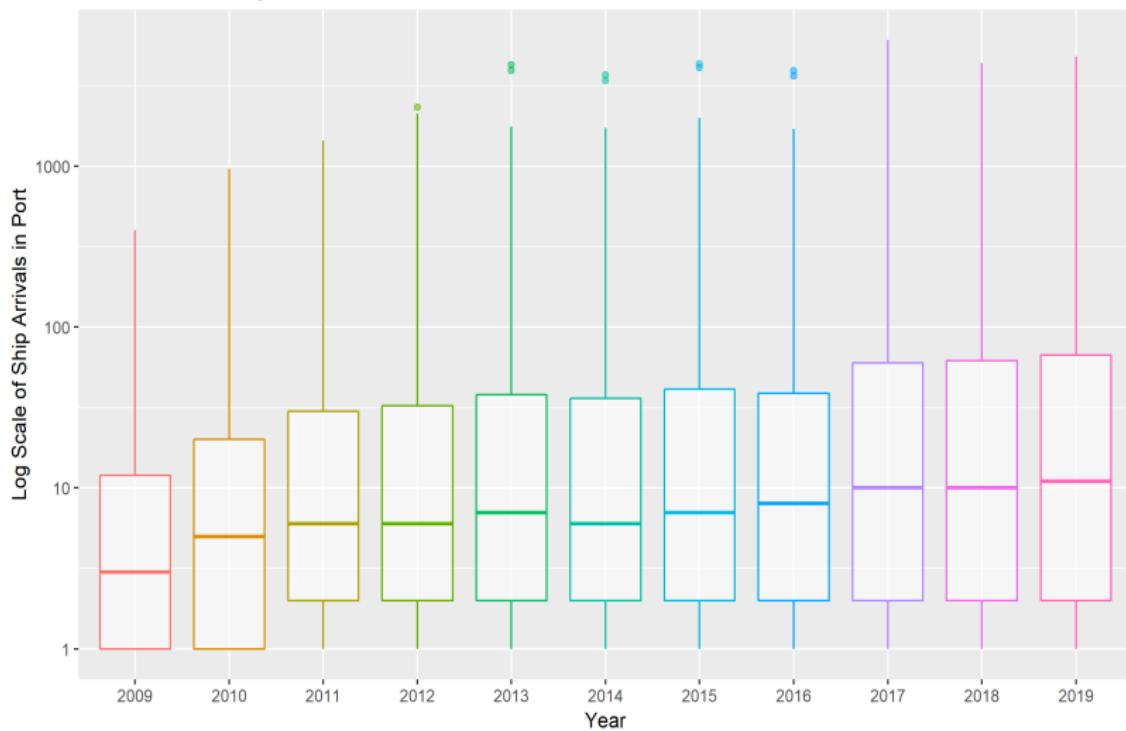
TOURISM VS NON-TOURISM CITIES



▶ AIS

TIME TREND

Global Cruise Ship Arrivals in Tourist Port Cities

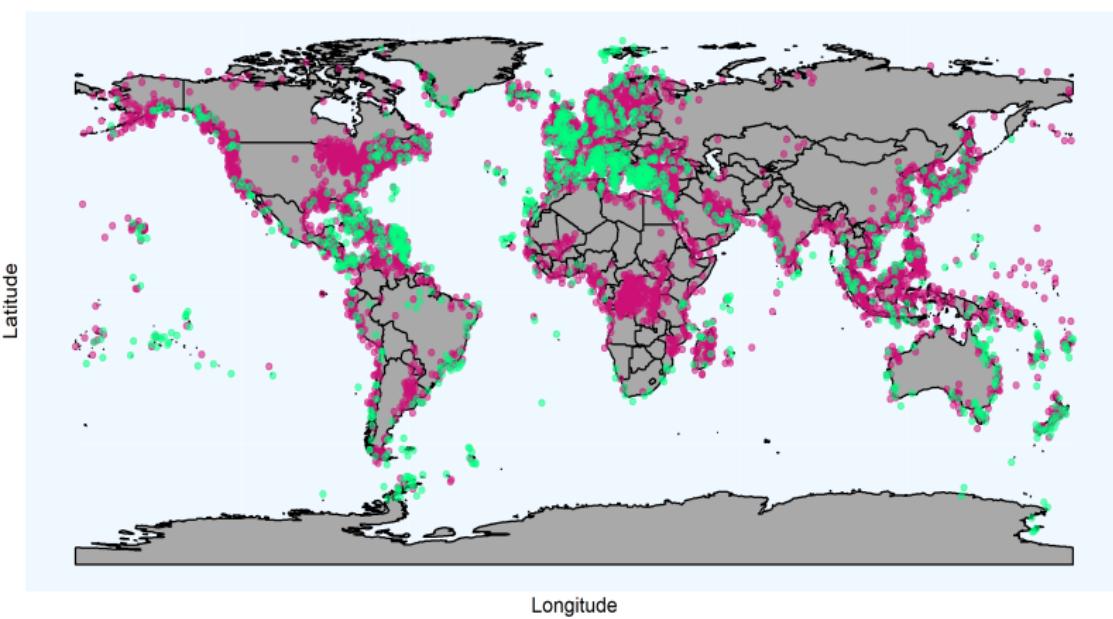


GLOBAL PORT SPATIAL DISTRIBUTION

Global Port Cities

(220 Countries / Territories, and 5644 Port Cities)

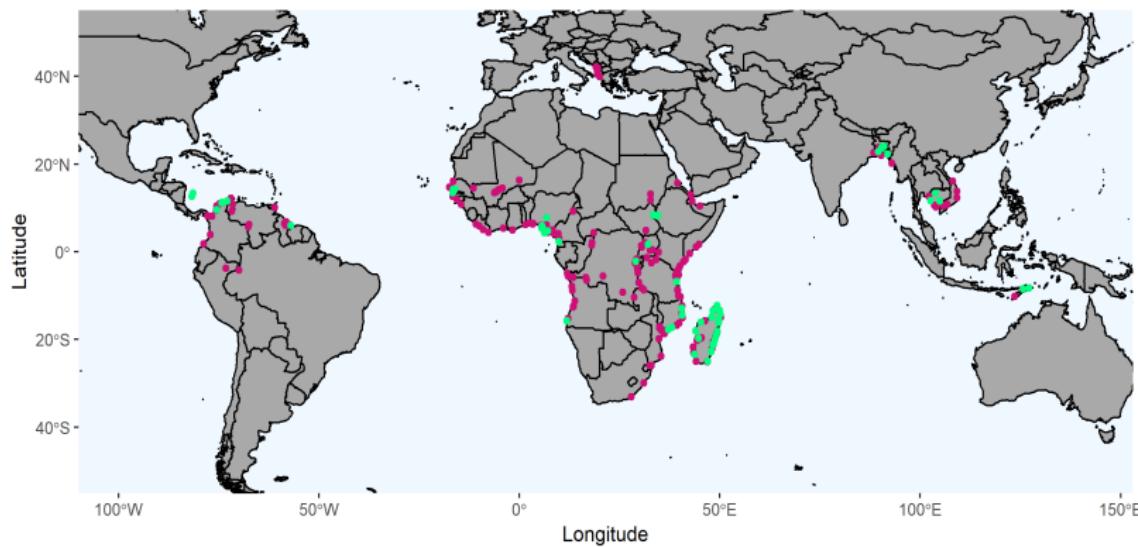
Cruise Ship Terminal • No ● Yes



DHS SPATIAL DISTRIBUTION

DHS Port Cities
(23 Countries, and 265 Port Cities)

Cruise Ship Activity ● None ● Yes



SUMMARY STATISTICS

Panel A: Cruise Tourism City Characteristics

	Mean	SD	Min	Max
Crew Capacity	833.66	424.71	18	2150
Passenger Capacity	2298.37	1255.45	54	6780
Cruise Ship Arrivals	43.28	118.26	1	671
Tourism Port Observations	61			

Panel B: Full DHS Individual Characteristics

Tourist City Resident	0.06	0.24	0	1
Port City Resident	0.24	0.43	0	1
Age	29.14	9.88	13	65
Young (< 30)	0.56	0.50	0	1
Urban Resident	0.37	0.48	0	1
Household Wealth Index	3.06	1.45	1	5
Individual Observations	355,489			

IDENTIFICATION STRATEGY

► Panel Fixed Effects Estimation

$$\gamma_{i,c,y} = \delta_{i,c,y} + \beta_2 \psi_i \times \delta_{i,c,y} + X'_{i,c,y} + \theta_c + \tau_y + \epsilon_{i,c,y} \quad (1)$$

- γ : Educational and Labor Outcomes
- δ : Log(Cruise Ship Arrivals) / Any Cruise Tourism
- $\psi \times \delta$: Young (< 30) Interaction with Cruise Tourism
- X' : Control Vector
 - Urban Resident, Household Wealth
- θ : City / DHS Admin Region Fixed Effects
- τ : Year / Country-Year Fixed Effects

HAZARD MODELS

- Unadjusted Kaplan-Meier Survivorship Curve

$$S(t) = \pi^{\frac{\text{DropOuts}}{\text{InSchool}} t} | \delta_{i,c,y} \quad (2)$$

- S: Survivorship (% Remaining in School)
- Backward Panel Assumptions:
 - All students start school at 6 years old
 - Continuous years of education

WOMEN'S LABOR FORCE PARTICIPATION

VARIABLES	Port Cities		Full Sample	
	(1) Employed	(2) Employed	(3) Employed	(4) Employed
Any Cruise Ship Arrivals	0.00822 (0.0436)		0.0213 (0.0224)	
Port City Resident			-0.0130 (0.0122)	-0.00732 (0.0124)
Old X Any Cruise Ship Arrivals		0.0127 (0.0403)		0.0319 (0.0263)
Young X No Cruise Ship Arrivals		-0.157*** (0.0202)		-0.155*** (0.0159)
Young X Any Cruise Ship Arrivals		-0.158*** (0.0417)		-0.139*** (0.0246)
Urban Resident		-0.0125 (0.0175)		-0.0122 (0.0160)
Household Wealth Index		-0.0139*** (0.00423)		-0.00474 (0.00372)
Constant	0.413*** (0.0119)	0.554*** (0.0234)	0.464*** (0.00235)	0.567*** (0.0161)
Observations	69,132	69,132	301,181	301,181
R-squared	0.369	0.396	0.366	0.390
Cities / Admin Regions	199	199	237	237
Countries	20	20	23	23
Country-Year FE	✓	✓	✓	✓
City FE	✓	✓		
DHS Admin Region FE			✓	✓

WOMEN'S YEARS OF EDUCATIONAL ATTAINMENT

VARIABLES	Port Cities		Full Sample	
	(1) Years Educated	(2) Years Educated	(3) Years Educated	(4) Years Educated
Any Cruise Ship Arrivals	-0.182 (0.314)		0.156 (0.301)	
Port City Resident			0.753*** (0.194)	0.0762 (0.0859)
Old X Any Cruise Ship Arrivals		-0.443* (0.250)		-0.144 (0.195)
Young X No Cruise Ship Arrivals		1.243*** (0.158)		1.309*** (0.0927)
Young X Any Cruise Ship Arrivals		1.147*** (0.234)		1.446*** (0.173)
Urban Resident		0.837*** (0.139)		1.158*** (0.141)
Household Wealth Index		1.207*** (0.0559)		1.071*** (0.0374)
Constant	6.380*** (0.0830)	1.119*** (0.281)	5.370*** (0.0386)	1.104*** (0.117)
Observations	85,025	85,025	355,286	355,286
R-squared	0.283	0.417	0.290	0.456
Cities / Admin Regions	199	199	237	237
Countries	20	20	23	23
Country-Year FE	✓	✓	✓	✓
City FE	✓	✓		
DHS Admin Region FE			✓	✓

INTENSIVE MARGIN FOR WOMEN'S OUTCOMES

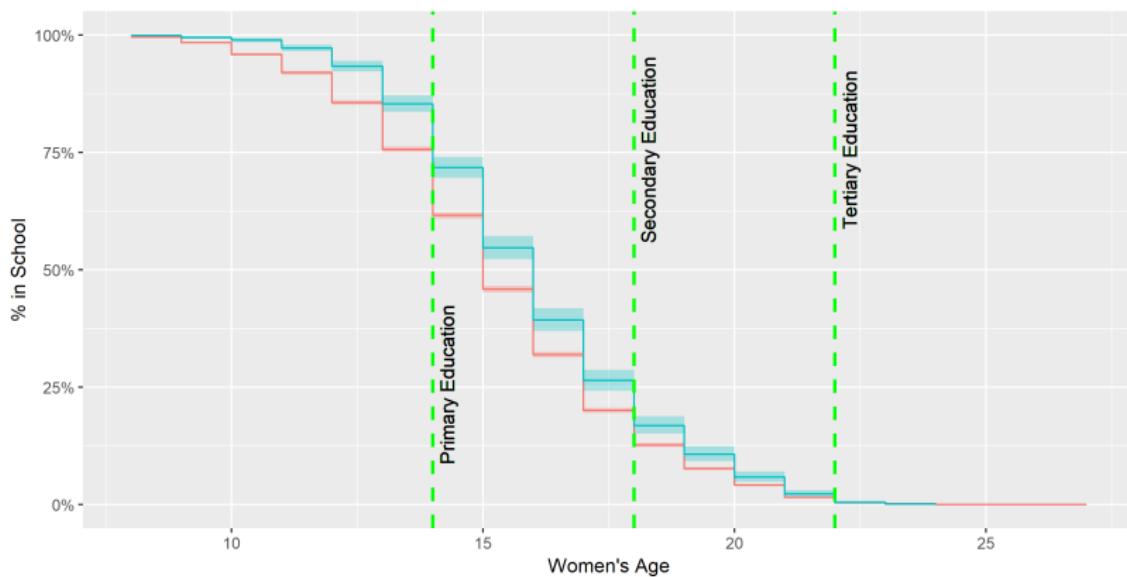
VARIABLES	Cruise Tourism Cities			
	(1) Employed	(2) Employed	(3) Years Educated	(4) Years Educated
Log(Cruise Ship Arrivals)	0.0719*** (0)		0.350** (0.163)	
Old X Log(Cruise Ship Arrivals)		0.0725* (0.0431)		-0.0721 (0.168)
Young X Log(Cruise Ship Arrivals)		0.00688 (0.0444)		0.302 (0.198)
Urban Resident		0.0115 (0.0346)		0.257 (0.206)
Household Wealth Index		-0.0213*** (0.00671)		1.315*** (0.0807)
Constant	0.380*** (0)	0.499*** (0.0915)	5.265*** (0.293)	1.343*** (0.428)
Observations	18,903	18,903	22,463	22,463
R-squared	0.277	0.303	0.276	0.409
Cities / Admin Regions	61	61	61	61
Countries	15	15	15	15
Year FE	✓	✓	✓	✓
City FE	✓	✓	✓	✓

KAPLAN MEIER SURVIVORSHIP CURVE

Kaplan-Meier Model for Staying in School

Dependent on Cruise Ship Activity in Full Sample

Cruise Arrival Status No Yes



ROBUSTNESS

- ▶ Cox Proportional Hazard Ratios ▶ Cox Model
- ▶ Simulated Hazard Ratios by Age ▶ Hazard Ratios by Age
- ▶ Oster Bounds ▶ Delta Estimations
- ▶ Examine Seasonal Employment, Primary Education,
Secondary Education and Higher Education ▶ Extended Results
- ▶ Weighting for Population Size ▶ Weighted Results
- ▶ Tested Proxy Correlation to New Zealand Reported Cruise
Passenger Arrivals ▶ Proxy Corr.

DISCUSSION

1. Take Aways

- 1.1 Female labor participation and education benefit from cruise tourism
- 1.2 Older women take advantage of current labor opportunities
- 1.3 Younger women stay in school in anticipation of increased opportunities

2. Implications

- 2.1 Tourism is strongly associated with human capital accumulation
- 2.2 Tourism is associated with female employment and human capital attainment
 - ▶ Key stage in development process
 - ▶ Potential mechanism behind TLGH
- 2.3 Novel micro-dataset as an avenue for studying tourism's regional welfare effects globally

THE END

Thank You for Your Time!

@Prof_Quackers

COX PROPORTIONAL HAZARD RATIOS

► Cox Proportional Hazard Ratios

$$h(t)_{i,c,y} = h(\emptyset)_{i,c,y} e^{\delta_{i,c,y} + X'_{i,c,y}} \quad (3)$$

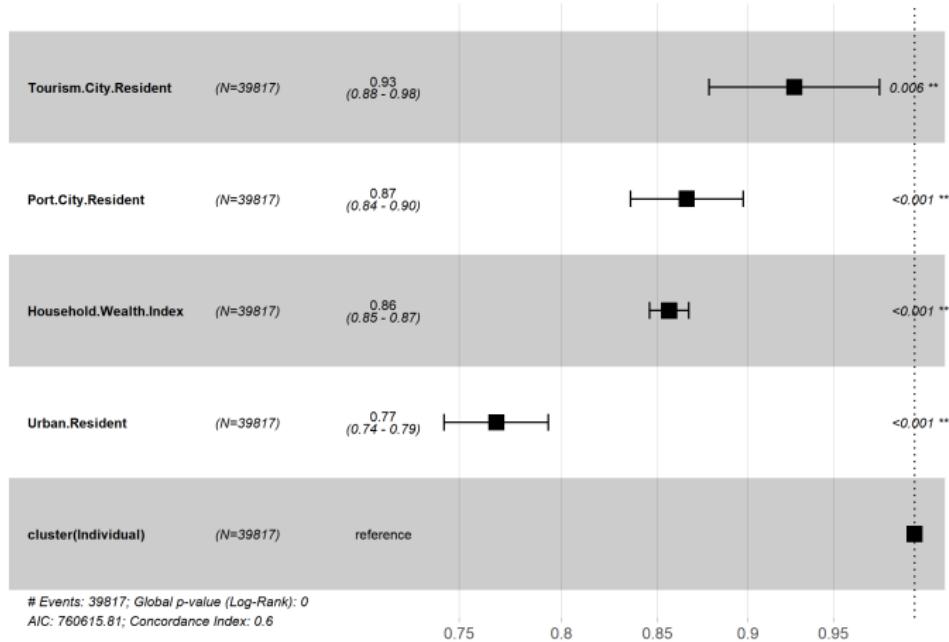
- $h(t)$: Hazard Ratio of Dropping Out for Given Age
- $h(\emptyset)$: Default Risk of Dropping Out
- δ : Cruise Tourism Activity
- X' : Characteristics influencing Hazard Ratio

◀ Robustness Checks

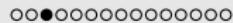


COX PROPORTIONAL HAZARD RATIOS

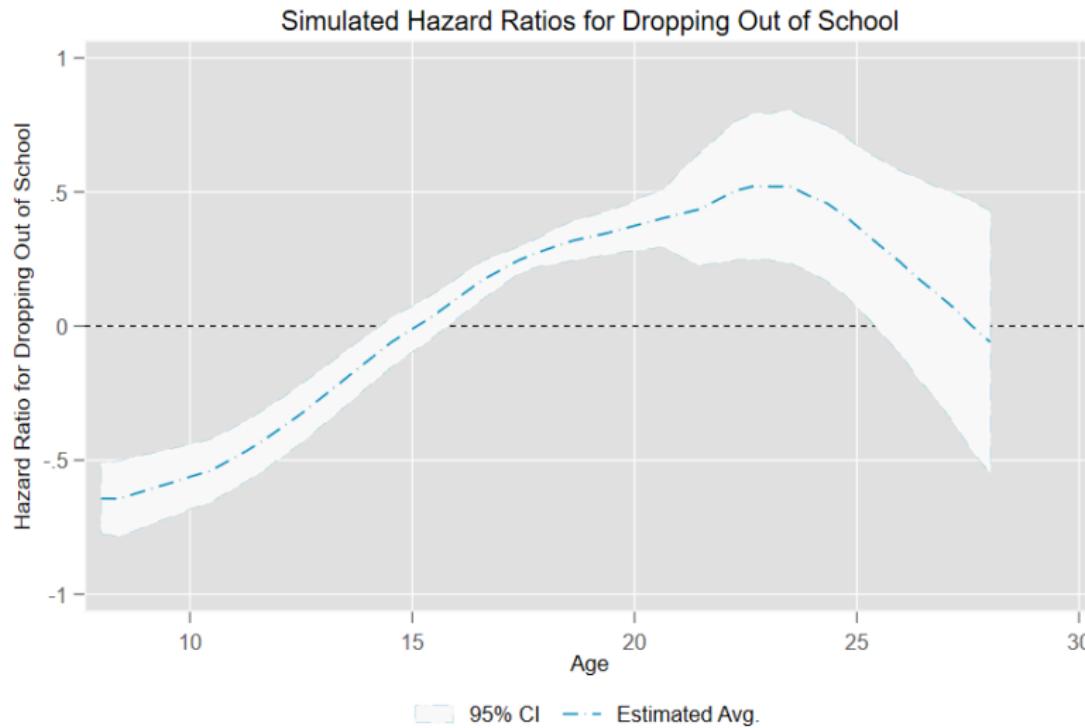
Risk Ratios of Dropping out of School



◀ Robustness Checks



SIMULATED PROPORTIONAL HAZARD RATIOS BY AGE



OSTER BOUNDS

VARIABLES	(1) Employed	(2) Employed	(3) Years Educated	(4) Years Educated
Delta	-0.60	-0.30	-65.39	-29.27
Rmax	0.7	1	0.7	1
Observations	301,181	301,181	355,286	355,286
Cities / Admin Regions	237	237	237	237
Countries	23	23	23	23
Country-Year FE	✓	✓	✓	✓
DHS Admin Region FE	✓	✓	✓	✓

◀ Robustness Checks

EXTENDED RESULTS: TOURIST CITIES

VARIABLES	(1) Seasonal Employment	(2) Seasonal Employment	(3) Literacy	(4) Literacy	(5) Primary Education	(6) Primary Education	(7) Secondary Education	(8) Secondary Education
Log(Cruise Ship Arrivals)	0.337*** (0)		0.0410** (0.0162)		0.0179 (0.0228)		0.0452*** (0.0133)	
Old X Log(Cruise Ship Arrivals)		0.146** (0.0706)		0.00410 (0.0144)		0.0337 (0.0229)		0.00554 (0.0131)
Young X Log(Cruise Ship Arrivals)		0.131 (0.0782)		0.0387** (0.0181)		0.0203 (0.0273)		0.0529** (0.0207)
Urban Resident		-0.0725** (0.0296)		0.0260 (0.0224)		-0.00262 (0.0206)		0.00591 (0.0263)
Household Wealth Index		-0.0380** (0.0143)		0.108*** (0.00996)		-0.0538*** (0.0115)		0.0847*** (0.0128)
Constant	-0.442*** (0)	0.0331 (0.178)	0.391*** (0.0291)	0.0674* (0.0385)	0.273*** (0.0412)	0.430*** (0.0724)	0.305*** (0.0240)	0.0573 (0.0477)
Observations	18,420	18,420	22,472	22,472	22,471	22,471	22,471	22,471
R-squared	0.115	0.170	0.312	0.392	0.091	0.112	0.121	0.180
Cities / Admin Regions	61	61	61	61	61	61	61	61
Countries	15	15	15	15	15	15	15	15
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓	✓	✓

◀ Robustness Checks

EXTENDED RESULTS: PORT CITIES VS TOURIST CITIES

VARIABLES	(1) Seasonal Employment	(2) Seasonal Employment	(3) Literacy	(4) Literacy	(5) Primary Education	(6) Primary Education	(7) Secondary Education	(8) Secondary Education
Tourist City	0.0783 (0.0583)		-0.000440 (0.0317)		0.0286 (0.0318)		0.00673 (0.0332)	
Old X Tourist City		0.0813 (0.0511)		-0.0339 (0.0318)		0.0438 (0.0348)		-0.0193 (0.0330)
Young X Non-Tourist City		-0.0321*** (0.00659)		0.114*** (0.0162)		-0.0242 (0.0171)		0.157*** (0.0157)
Young X Tourist City		0.0288 (0.0403)		0.132*** (0.0296)		-0.00275 (0.0334)		0.174*** (0.0327)
Urban Resident		-0.0736*** (0.0141)		0.0425*** (0.0118)		-0.0550*** (0.0154)		0.0611*** (0.0137)
Household Wealth Index		-0.0293*** (0.00559)		0.0942*** (0.00601)		-0.0462*** (0.00639)		0.0777*** (0.00653)
Constant	0.0890*** (0.0169)	0.242*** (0.0216)	0.510*** (0.00838)	0.101*** (0.0294)	0.346*** (0.00839)	0.546*** (0.0318)	0.377*** (0.00878)	-0.00781 (0.0256)
Observations	63,676	63,676	85,060	85,060	85,056	85,056	85,056	85,056
R-squared	0.135	0.169	0.365	0.436	0.106	0.126	0.131	0.205
Cities / Admin Regions	199	199	199	199	199	199	199	199
Countries	20	20	20	20	20	20	20	20
Country-Year FE	✓	✓	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓	✓	✓

◀ Robustness Checks



EXTENDED RESULTS: FULL SAMPLE VS TOURIST CITIES

VARIABLES	(1) Seasonal Employment	(2) Seasonal Employment	(3) Literacy	(4) Literacy	(5) Primary Education	(6) Primary Education	(7) Secondary Education	(8) Secondary Education
Tourist City	-0.0559 (0.0536)		0.0316 (0.0308)		0.0260 (0.0221)		0.00613 (0.0228)	
Port Household	-0.0311* (0.0178)	-0.00914 (0.0137)	0.0509*** (0.0169)	0.00237 (0.0120)	-0.0374*** (0.0127)	-0.00960 (0.0108)	0.0560*** (0.0141)	0.00942 (0.00871)
Old X Tourist City		-0.0335 (0.0332)		-0.00583 (0.0218)		0.0481** (0.0206)		-0.0242 (0.0169)
Young X Non-Tourist City		-0.0358** (0.00449)		0.118*** (0.0121)		-0.0144 (0.0210)		0.154*** (0.0114)
Young X Tourist City		-0.0869 (0.0561)		0.160*** (0.0237)		0.00362 (0.0305)		0.169*** (0.0161)
Urban Resident		-0.0987*** (0.0176)		0.0547*** (0.0143)		-0.0702*** (0.0145)		0.0851*** (0.0130)
Household Wealth Index		-0.0308*** (0.00525)		0.0864*** (0.00698)		-0.0370*** (0.00619)		0.0696*** (0.00644)
Constant	0.192*** (0.00440)	0.337*** (0.0231)	0.411*** (0.00356)	0.0727*** (0.0278)	0.399*** (0.00258)	0.540*** (0.0303)	0.295*** (0.00285)	-0.0239 (0.0173)
Observations	285,835	285,835	355,489	355,489	355,463	355,463	355,463	355,463
R-squared	0.205	0.243	0.341	0.422	0.120	0.140	0.140	0.230
Cities / Admin Regions	237	237	237	237	237	237	237	237
Countries	23	23	23	23	23	23	23	23
Country-Year FE	✓	✓	✓	✓	✓	✓	✓	✓
DHS Admin Region FE	✓	✓	✓	✓	✓	✓	✓	✓

◀ Robustness Checks

EXTENDED RESULTS: WEIGHTED FOR POPULATION

VARIABLES	Tourism Cities		Port Cities		Full Sample	
	(1) Employed	(2) Years Educated	(3) Employed	(4) Years Educated	(5) Employed	(6) Years Educated
Log(Cruise Ship Arrivals)	0.0626*** (0)	0.241 (0.147)				
Tourist City			0.0161 (0.0270)	-0.412 (0.429)	0.0199 (0.0291)	-0.0310 (0.392)
Port Household					-0.0182* (0.00978)	0.931*** (0.209)
Constant	0.316*** (0)	5.291*** (0.231)	0.299*** (0.00511)	6.848*** (0.0778)	0.339*** (0.00272)	5.419*** (0.0527)
Observations	18,883	22,443	69,099	84,992	301,088	355,193
R-squared	0.331	0.211	0.373	0.319	0.375	0.331
Cities / Admin Regions	61	61	199	199	237	237
Countries	15	15	20	20	23	23
Year FE	✓	✓				
Country-Year FE			✓	✓	✓	✓
City FE	✓	✓	✓	✓		
DHS Admin Region FE					✓	✓

◀ Robustness Checks

VERIFY PROXY WITH NEW ZEALAND PASSENGER ARRIVALS

Year	Est. Ship Arrivals	Est. Passenger Arrivals	Reported Passenger Arrivals	Difference	Correlation
2015	127	268,290.5	1,076,752	-808,461.5	.60
2016	152	324,969.3	1,267,016	-942,046.8	.69
2017	311	651,779.3	1,283,661	-631,881.8	.72
2018	439	973,007.8	1,308,305	-335,297.3	.73
2019	577	1,214,780	1,717,523	-502,743.5	.74

◀ Robustness Checks

OVERNIGHT-STAY TOURISM VS CRUISE TOURISM

◀ Literature

Characteristics of Overnight-Stay and Cruise Tourism

Characteristic	Overnight-Stay Tourism	Cruise Tourism
Global Capitalization	\$8 Trillion USD	\$126 Billion USD
Growth Rate	3.9%	4.5%
Avg. Host Nation	Asiatic Nations	European and Ameri-can
Avg. Trip Length	5.1 Nights	7.2 Nights
Tourist Avg. Age	42 years old	46 years old
Tourist Avg. Expendi-ture	\$1,364 per Trip	\$67.10 per disembark-ment

Sources: The results are condensed from findings found in the reports of ([FCCA, 2018a](#)), ([Cruise Market Watch, 2018](#)), ([CLIA, 2019](#)), ([WTTC, 2019](#)), ([UNWTO, 2019](#)), and ([FCCA, 2018b](#)).

HOW AIS WORKS

◀ Data

◀ Treatment

(1) For Safety Purposes

(2) To Communicate with Ports
of Call

TYPES OF CRUISE SHIPS

◀ Literature



COUNTRIES SAMPLED

◀ Data

DHS (N = 23)

- ▶ Albania
- ▶ Angola
- ▶ Bangladesh
- ▶ Burkina Faso
- ▶ Burundi
- ▶ Cambodia
- ▶ Cameroon
- ▶ Colombia
- ▶ Ethiopia
- ▶ Guyana
- ▶ Kenya
- ▶ Lesotho
- ▶ Liberia
- ▶ Madagascar
- ▶ Malawi
- ▶ Mozambique
- ▶ Nigeria
- ▶ Rwanda
- ▶ Senegal
- ▶ Tanzania
- ▶ Timor Leste
- ▶ Uganda
- ▶ Zimbabwe

COUNTRIES AND YEARS IN FULL SAMPLE

◀ Data

Countries and Years in Full Sample

Country	2009	2010	2011	2012	2013	2014	2015	2016
Albania	X							
Angola				X				
Bangladesh				X				
Burkina Faso		X						
Burundi		X		X				
Cambodia		X		X				
Cameroon			X					
Colombia	X	X						
Ethiopia			X		X			
Guyana	X							
Kenya	X							
Lesotho	X		X					
Liberia	X			X				
Madagascar	X			X		X		
Malawi		X			X		X	
Mozambique	X							
Nigeria		X						



DHS SURVEY QUESTIONS

Variable	Question
Years of Education	Highest year of education gives the years of education completed
Primary Education	Highest education level attended. This is a standardized variable providing level of education in the following categories: complete primary
Secondary Education	Highest education level attended. This is a standardized variable providing level of education in the following categories: complete secondary
Higher Education	Highest education level attended. This is a standardized variable providing level of education in the following categories: higher education
Literacy	The respondent is asked to read a written sentence and the interviewer would note whether the respondent could read it or not at all
Employment Status	Whether the respondent is currently working
Seasonal Employment	Whether the respondent works throughout the year, seasonally, or just occasionally
Age	Age of the household member
Urban Resident	De facto type of place of residence. Type of place of residence where the respondent was interviewed as either urban or rural. Note that this is not the respondent's own categorization, but was created based on whether the cluster or sample point number is defined as urban or rural.
Household Wealth Index	Wealth index factor score (5 decimals).

◀ Data

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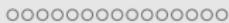
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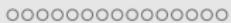
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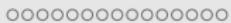
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