Distributional and Productivity Implications of Regulating Casual Labor: Evidence from Ridesharing in Indonesia

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Policy interventions may correct for frictions and failures in informal labor markets

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  - experience shocks and uncertainty
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- **It is difficult to directly regulate informal labor markets**
- **Effects are contingent upon spillovers and adjustments**

We address these challenges by studying regulations in Indonesian ridesharing market

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We address these challenges by studying regulations in Indonesian ridesharing market

- We evaluate the effects of an introduction of price-floor policy in Indonesia's ridesharing market.
- Increasingly relevant market to informal sector
  - App-based ridesharing is "informal-adjacent"
  - Regulatory frameworks are nascent and evolving
- Granular and (relatively) complete data help address mechanisms and their implications
  - Access to trip level data from 1 of 2 major platforms
  - Measures of prices, trip attributes, and productivity

Question: What are the consequences of price-floor regulations in a developing, informal labor market?

- Policy impact: How does the price-floor policy affect transaction volume, driver earnings, and wages?
- Mechanisms: What are the demand and supply-side responses that drive the policy impact?
- Implications: Does the policy affect distributional outcomes and/or worker productivity?

Empirical results: price-floor policy does not achieve distributional objectives at efficiency cost

- **Policy impact:**
  - 4.6% increase in average driver fare but no effects on quantity, average daily driver earnings, and wages
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  - Increased driver supply with inelastic demand leads to fewer transactions per worker
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Contributions

- Provides insights into the efficacy of applying standard regulatory tools to gig-economies and casual labor markets (minimum-wage-like policy)
  - mixed evidence of min wage on disemployment
    - e.g. Card and Kruger 1994; Cengiz et al. 2019; Jardim et al. 2018
  - positive productivity and distributional effects
    - Engbom and Moser, forthcoming; Derenoncourt et al. 2021
    - Ku 2022; Coviello et al. 2021; Dustmann et al. 2022
- First to evaluate gov't pricing regulation on ridesharing in developing economy
  - Hall, Horton, and Knoepfle (2021)

Indonesia: large market with high penetration, with a pricing policy intended to improve earnings

- Indonesia's app-based 2-wheel taxis (*ojeks*) market
  - Ridesharing platforms emerged in mid 2010's
  - Large share (40-60%) of ride-hailing transactions in Indonesia are app-mediated
  - 50% of internet users book rides online in Indonesia
- Driver groups have advocated for pay raises and protection

Drivers' groups advocated for pay raise and protection

HOME > TECH

PHOTOS: Uber drivers across the world are striking about pay, conditions, and the firm's 'orgy of greed'

Isobel Asher Hamilton and Megan Hernbroth May 8, 2019, 9:01 AM

SHARING ECONOMY

Grab and Go-Jek face the new challenge of fare regulators

Singapore and Indonesia say they want to safeguard drivers and riders alike

Regulators in Singapore and Indonesia could force ride-hailing operator Grab and Go-Jek to set parameters for their fares -- and kick off a global trend (Photo by Kosaku Mimura).

KENTARO IWAMOTO, Nikkei staff writer
August 14, 2019 17:31 JST

INDONESIA ISSUES NEW RULES FOR APP-BASED MOTORCYCLE TAXIS, BUT NEW MINIMAL TARIFFS STILL UNDECIDED

Driver Ojol Ancam Demo Jika Usulan Tarif Rp 3.000/Km Tak Dipenuhi

Achmad Dwi Afriyadi - detikFinance

Senin, 18 Mar 2019 13:07 WIB

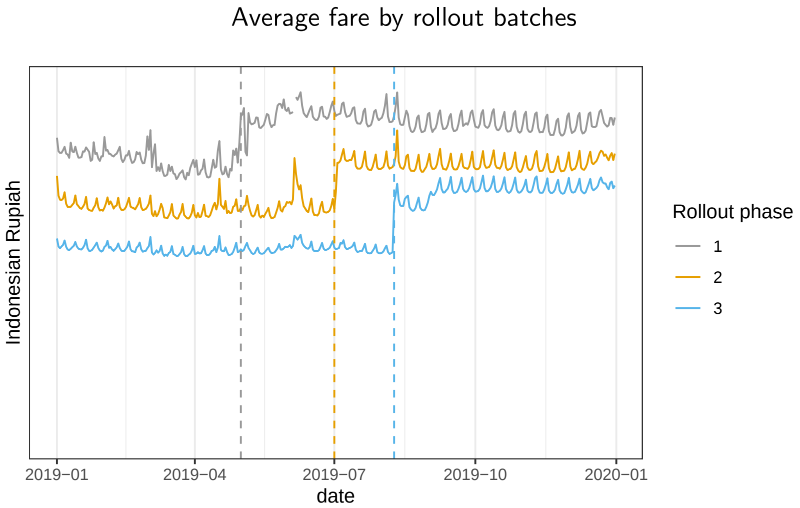
232 komentar BAGIKAN

We exploit city-level variation in policy introduction for causal inference

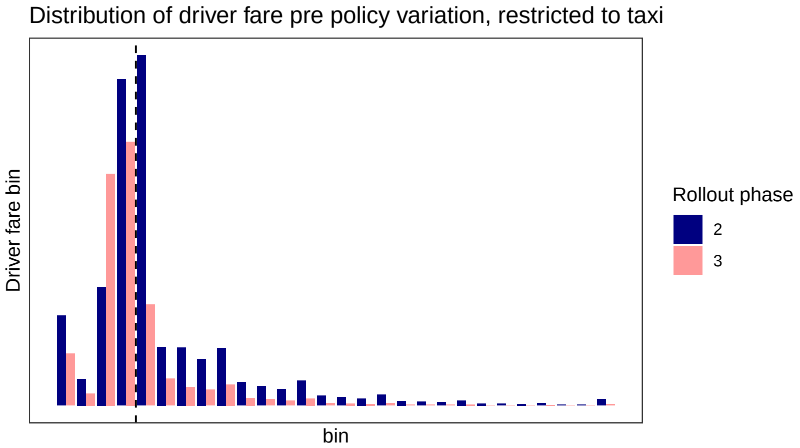
- In 2019, Indonesian Gov't introduced restrictions on **driver fare**, i.e. price the driver receives on a trip on **all** app-based platforms
- This applied only to taxi trips (not food/delivery)
- Rollout occurred in 3 batches over 4 months
  - May 1, 2019—Batch 1: Jakarta, Bandung, Yogyakarta, Surabaya, dan Makassar
  - July 2, 2019—Batch 2: 41 cities.
  - August 9, 2019—Batch 3: 123 cities.
- Effective variation for analysis: Batches 2 and 3.

Detailed regulation table

Prices respond visibly to policy



...through binding minimum driver fare



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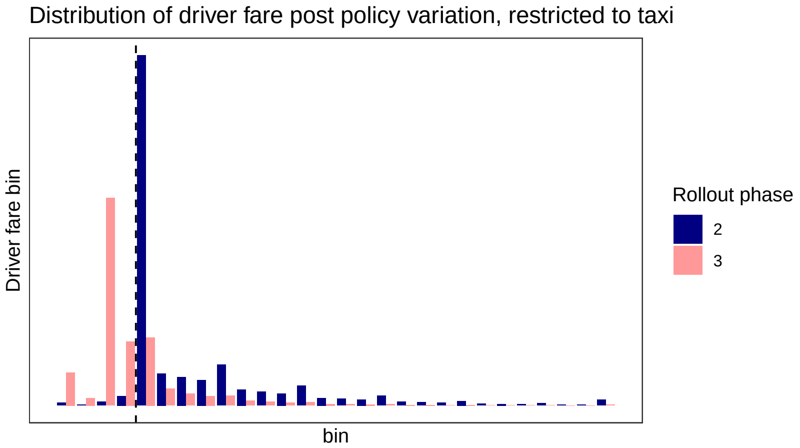

We aggregate novel data to analyze market-wide effects

- We partner with a dominant ridesharing platforms in Indonesia
    - Universe of transaction data across all (∼70) cities
    - Individual level ID on demand and supply sides
    - Worker-day level measures of productivity

We aggregate novel data to analyze market-wide effects

- We partner with a dominant ridesharing platforms in Indonesia
  - Universe of transaction data across all ($\sim$70) cities
  - Individual level ID on demand and supply sides
  - Worker-day level measures of productivity
- Aggregated panel data at the city-day, or city-bin-day level
- Bins:
  - drivers' and customers' pre-policy measures (transaction volume, productivity) in deciles

ID strategy: DiD on average outcomes

$$Y_{c,t} = \beta_1 * I_{c,t}(c \in Treat, t > 0) + \gamma_c + \rho_t + \epsilon_{c,t} \qquad (1)$$

- c: city
- t: time (day), where $t = 1$ is first day of treatment (July 1)
- *Treat*: city is in rollout batch 2, as opposed to 3
- γ_c: city FE
- ρ_t: time FE

Outcome variables:

- Price and quantity
  - “Driver fare”: total amount drivers receive per trip
  - Number of trips
- Earnings, supply, wages:
  - earnings/day: sum of driver fares per driver-day
  - supply hour: hours active on app, incl. idle time
  - wage: daily earnings/supply hour
- Productivity:
  - Quantity of work (km driven, hours on trip, N. trips)/supply hour

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Higher driver fare (P), noisy effect on Q

Table 1: Average treatment effects on driver fare and number of transaction

	log(Avg driver fare)		log(N trips)		log(Sum driver fare)	
	All services	Regulated	All services	Regulated	All services	Regulated
	(1)	(2)	(3)	(4)	(5)	(6)
Treat	0.0461**	0.1286***	0.0021	-0.0976	0.0483	0.0310
	(0.0177)	(0.0322)	(0.0829)	(0.0914)	(0.0751)	(0.0813)
Observations	12,760	12,760	12,760	12,760	12,760	12,760
R^2	0.93870	0.91247	0.98193	0.98331	0.98381	0.98426
Within R^2	0.03673	0.14282	3.5×10^{-6}	0.00605	0.00189	0.00066
Day fixed effects	✓	✓	✓	✓	✓	✓
City fixed effects	✓	✓	✓	✓	✓	✓

Notes: City-day level data. **"All services": Taxi, Food, Delivery. "Regulated": Taxi.** Standard errors clustered at the city level. Two-tailed significance: p<0.1*; p<0.05**; p<0.01***.

.. but no evidence of increased earnings or wages

Table 2: Average treatment effects on per-driver daily earnings and wage

	log(Avg earnings/day)		log(Avg wage)
	All services	Regulated	
	(1)	(2)	(3)
Treat	-0.0167	0.0199	-0.0674
	(0.0248)	(0.0347)	(0.0503)
Observations	12,760	12,760	10,962
R^2	0.92638	0.94523	0.82260
Within R^2	0.00132	0.00134	0.00902
Day fixed effects	✓	✓	✓
City fixed effects	✓	✓	✓

Notes: City-day level data. **"All services": Taxi, Food, Delivery. "Regulated": Taxi.** Standard errors clustered at the city level. Two-tailed significance: p<0.1*; p<0.05**; p<0.01***.

Preview of results: price-floor policy does not achieve distributional objectives at efficiency cost

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The policy induces excess supply

Table 3: Average treatment effects on total driver supply hours and trip duration

	log(Sum supply hrs) (1)	log(Sum transaction hrs) (2)	log(Sum idle hrs) (3)
Treat	0.0865*	0.0169	0.2430***
	(0.0500)	(0.0738)	(0.0886)
Observations	10,962	12,760	10,912
R^2	0.98475	0.98198	0.92888
Within R^2	0.00996	0.00024	0.01580
Day fixed effects	✓	✓	✓
City fixed effects	✓	✓	✓

Notes: City-day level data. **"All services": Taxi, Food, Delivery. "Regulated": Taxi.** Standard errors clustered at the city level. Two-tailed significance: p<0.1*; p<0.05**; p<0.01***.

$$SumSupply_{c,t} = \Sigma_i supply_{i,c,t} = \Sigma_i transaction_{i,c,t} + \Sigma_i idle_{i,c,t}$$

Driver entry and exit

Increased driver competition reduces number of trips/driver

Table 4: Average treatment effects on the intensive margin market participation

	log(Avg n. bookings/driver)		log(Avg n. bookings/customer)	
	All services	Regulated	All services	Regulated
	(1)	(2)	(3)	(4)
Treat	-0.0628*	-0.1087**	-0.0173	-0.0346***
	(0.0322)	(0.0409)	(0.0115)	(0.0116)
Observations	12,760	12,760	12,760	12,760
R^2	0.91089	0.95232	0.84742	0.83562
Within R^2	0.01750	0.03698	0.00751	0.03185
Day fixed effects	✓	✓	✓	✓
City fixed effects	✓	✓	✓	✓

Notes: City-day level data. **"All services": Taxi, Food, Delivery. "Regulated": Taxi.** Standard errors clustered at the city level. Two-tailed significance: $p<0.1$*; $p<0.05$**; $p<0.01$***.

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We estimate CATEs by pre-policy earnings decile bins

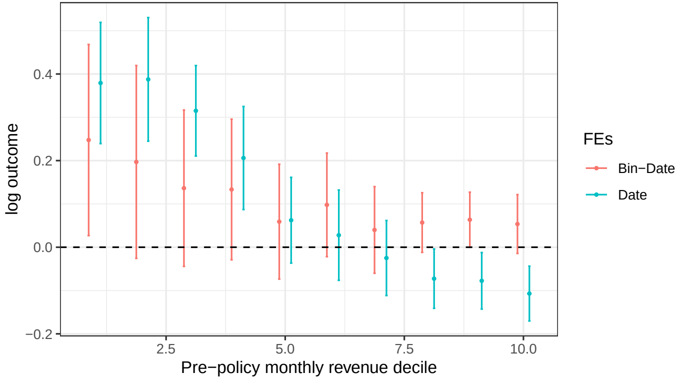
$$Y_{c,b,t} = \sum_{b \in B} \beta_b I_{c,b,t}(c \in Treat, t > 0, b) + \gamma_{c,b} + \rho_{b,t} + \epsilon_{c,b,t} \quad (2)$$

- c: city
- b: bin
- t: time (day), where $t = 1$ is first day of treatment (July 1)
- *Treat*: city is in rollout batch 2, as opposed to 3
- $\gamma_{c,b}$: city-bin FE—more precise definition of "i" in panel
- $\rho_{b,t}$: bin-time FE—to address variation in bin-specific time trend

CATEs by earnings decile | Specifications | Detail: customer side

Policy increases labor supply from low-earners

(a) Effects on log(aggregate supply hours) by prepolicy earnings decile

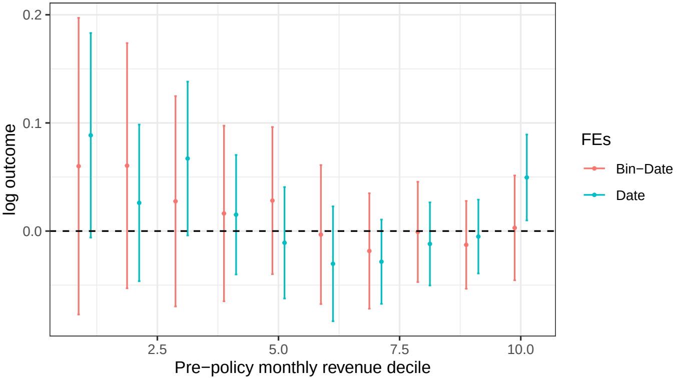


Notes: The dependent variable: log(aggregate supply hrs). The deciles: pre-policy driver earnings. Standard errors are clustered at the city-bin level.

Driver entry and exit

...but does not increase per-driver earnings of lower deciles

(a) Effects on log(avg earnings) by prepolicy earnings decile



Notes: The dependent variable: log(avg daily earnings). The deciles: pre-policy driver earnings. Standard errors are clustered at the city-bin level.

Aggregate earnings | Extensive supply | Intensive supply | Total supply by wage | Avg earnings by wage

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We find 8-11% reduction in average worker productivity

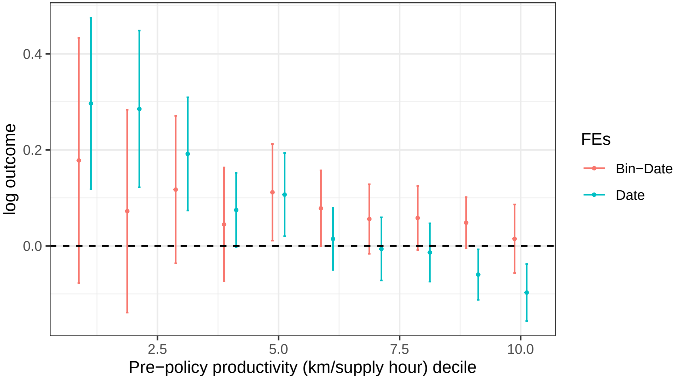
Table 5: Average treatment effects on productivity

	log(Avg util. rate) (1)	log(Avg km/supp hr) (2)	log(Avg rides/supp hr) (3)
Treat	-0.0800	-0.0919*	-0.1050*
	(0.0516)	(0.0521)	(0.0556)
Observations	10,962	10,962	10,962
R^2	0.75871	0.87826	0.83735
Within R^2	0.00852	0.01600	0.02264
Day fixed effects	✓	✓	✓
City fixed effects	✓	✓	✓

Notes: City-day level data. Standard errors clustered at the city level. Two-tailed significance: $p<0.1$*; $p<0.05$**; $p<0.01$***.

Effects driven by increased supply of less productive workers

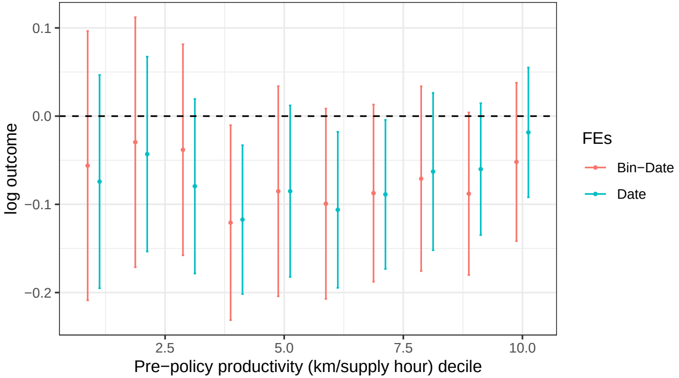
Figure 3: Effects on log(total supply hours) by prepolicy productivity decile



Notes: The dependent variable: log(total supply hours). The deciles: pre-policy productivity. Standard errors are clustered at the city-bin level.

... and reduction in individual productivity

Figure 4: Effects on log(km driven/supply hour) by prepolicy productivity decile



Notes: The dependent variable: log(Avg km/supp hr). The deciles: pre-policy productivity. Standard errors are clustered at the city-bin level.

External validity: Large labor supply responses may be a feature of developing cities

- No other work that evaluates government-led price floor policy in ridesharing market to our knowledge
- Similar work using Uber data in US to estimate effects of level shifts in prices on driver outcomes
  - Hall, Horton, and Knoepfle (2021)
- Significant contextual differences
  - platform policy vs. government regulation
  - average shift vs. price floor
  - U.S. vs. Indonesia
- Select outcomes (demand, supply hours, productivity, and wages) and compare elasticities
- Choices informed by a static search model with exogenous price shifts and labor supply as choice variable

Specification

Large labor supply responses in Indonesia, leading to larger reductions in driver efficiency and wages

Table 6: Elasticities to driver fare and comparisons from Hall, Horton, and Knoepfle (2021)

	log(N trips) (1)	log(Sum supply hrs) (2)	log(Avg km/supp hr) (3)	log(Avg wage) (4)
log(Avg customer fare)	0.0219 (0.8594)			
log(Avg driver fare)		1.756 (1.242)	-1.867** (0.7973)	-1.370 (0.8560)
Observations	12,760	10,962	10,962	10,962
R^2	0.98178	0.98004	0.84658	0.80637
Within R^2	-0.00832	-0.29534	-0.24009	-0.08163
Day fixed effects	✓	✓	✓	✓
City fixed effects	✓	✓	✓	✓
HHK estimates	-0.099	0.342***	-0.655***	0.075
HHK SEs	(0.081)	(0.034)	(0.059)	(0.064)

Notes: City-day level data. 2SLS estimates. Two-tailed significance: $p<0.1$*; $p<0.05$**; $p<0.01$***.

Conclusion

- The price-floor policy does not achieve the policy nor distributional objectives, at an efficiency cost.
    - no increase in average earnings or wages
- Mechanism: Increased excess supply drives down number of matches per driver.
    - large stock of informal labor force might exacerbate this
- Externalities of pricing policy: driver productivity declines from:
    - increased supply of less productive drivers
    - excess supply crowding out productive drivers.
- Shocks not large enough to affect drivers' outside options.
- Increased cost and reduced wait time for customers, though benefits are inefficiently allocated.

Thank you!

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Twitter: @NakamuraShotaro

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Should we be concerned about unobserved spillovers?

- Challenge: We do not observe what drivers do outside the platform
  - Spillovers and adjustments via multihoming, offline work, home production etc.
  - Large enough impact would affect values of outside options

Should we be concerned about unobserved spillovers?

- Challenge: We do not observe what drivers do outside the platform
  - Spillovers and adjustments via multihoming, offline work, home production etc.
  - Large enough impact would affect values of outside options
- Question: Does the price-floor policy meaningfully affect drivers' "reservation wage"?
- Method: new data at proposed-match level and subset by match outcomes (**completed**, **accepted**, and **not accepted**)
- Outcomes:
  - Driver fare
  - Driver fare/trip duration
- Analysis on regulated (i.e., taxi) segment from 4 April, 2019.

The policy increases the price of accepted and non-accepted matches

Table 7: Average treatment effects on the driver fare by trip status: driver-day level

	log(Avg driver cut)		
	Completed	Accepted	Not accepted
	(1)	(2)	(3)
Treat	0.1247***	0.1215***	0.1167***
	(0.0326)	(0.0315)	(0.0263)
Observations	7,112	7,112	7,094
R^2	0.89851	0.89768	0.78508
Within R^2	0.16088	0.15473	0.06983
Day fixed effects	✓	✓	✓
City fixed effects	✓	✓	✓

Notes: City-day level data. Standard errors clustered at the city level. Two-tailed significance: $p<0.1$*; $p<0.05$**; $p<0.01$***.

... but only increases per-minute fare (i.e., "wage") of completed trips

Table 8: Average treatment effects on the driver fare by trip status: driver-day level

	log(Avg driver cut/min)		
	Completed	Accepted	Not accepted
	(1)	(2)	(3)
Treat	0.1039**	0.0344	-0.0342
	(0.0409)	(0.0315)	(0.0431)
Observations	7,112	7,112	7,094
R^2	0.85475	0.72105	0.49115
Within R^2	0.08680	0.00358	0.00072
Day fixed effects	✓	✓	✓
City fixed effects	✓	✓	✓

Notes: City-day level data. Standard errors clustered at the city level. Two-tailed significance: $p<0.1$*; $p<0.05$**; $p<0.01$***.

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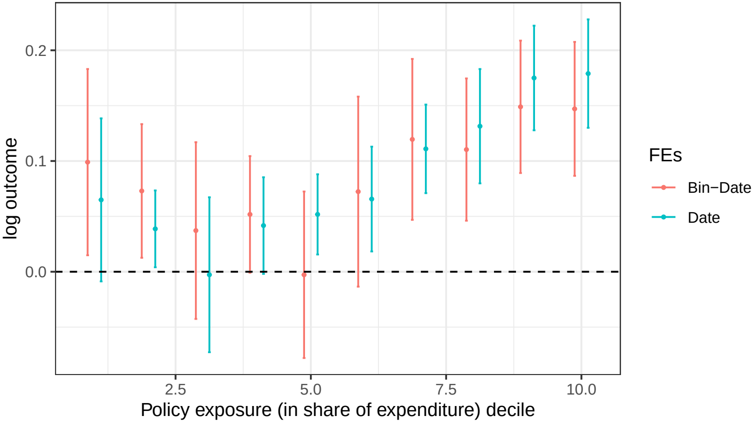
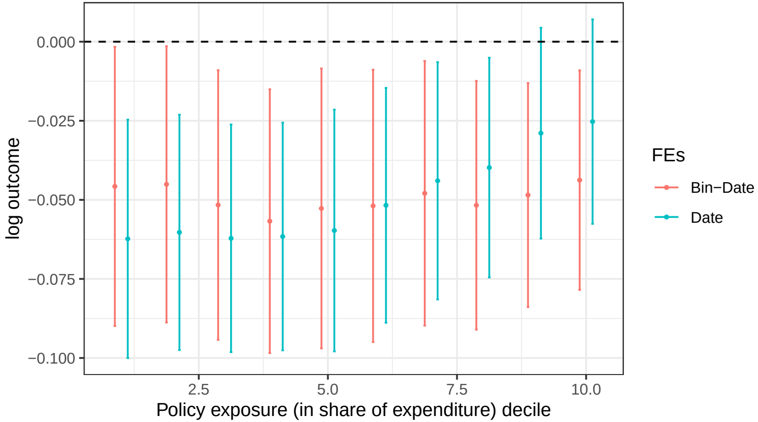
Most exposed customers' expenditures go up

(a) Daily expenditure/customer



…but they are not differentially compensated by wait time

(a) Customer-average wait distance

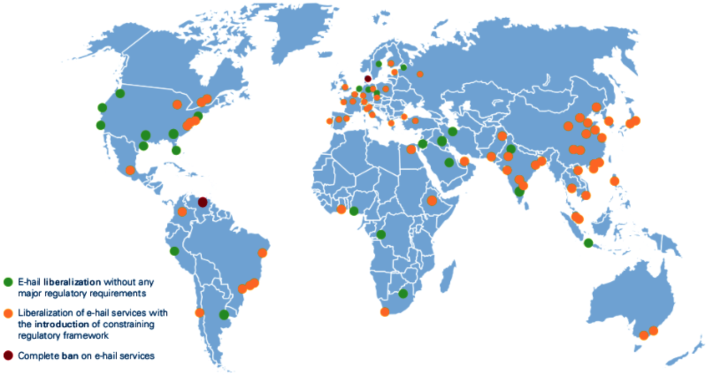


Online gig-economies, and interests in regulating them, are growing

- Rapid growth of gig economy in developed and developing countries
  - By 2023, 78 million workers, $298 billion in payroll in global gig economy
  - In 2019 in SE-Asia: 3.6 billion annual rides, 3.8 million active drivers
- Tandem growth of regulatory frameworks
  - Licensing/entry bans: platforms licensed in mid 2010's
  - Employment vs. casual contracts: California's AB5
  - **Price control**: restrictions on fare structures

Most jurisdictions regulate ridesharing in some way

Figure 4: Overview of regulatory pressure on e-hailing services in major cities across the globe

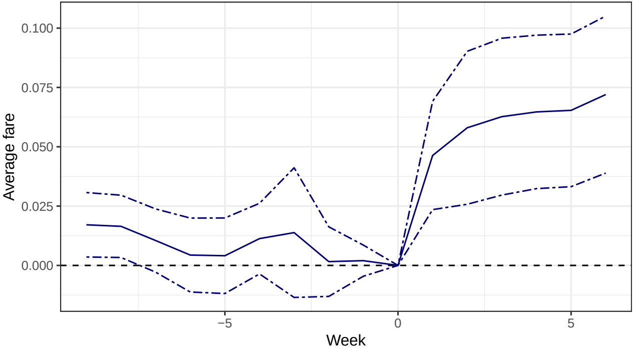


Source: Arthur D. Little analysis

Source: Arthur D. Little, 2020

Dynamic model: Price effect consistent across weeks

Figure 7: Weekly effects on average driver fare: distributed lag model

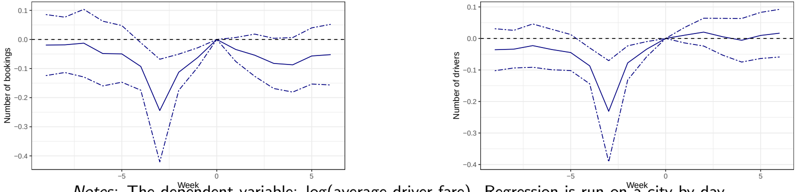


Notes: The dependent variable: log(average driver fare). Regression is run on a city by day panel data. Standard errors are clustered at the city level.

… but parallel trends on some other outcomes less robust

Figure 8: Weekly effects on N. trips and N. drivers

(a) Log(N trips) (b) log(Number of drivers)



Notes: The dependent variable: log(average driver fare). Regression is run on a city by day panel data. Standard errors are clustered at the city level.

- Differential reduction in worker availability and transactions during Eid al-Fitr
- Qualitatively similar results with:
  - excluding the Eid period
  - synthetic-control-based inference procedure