On the Effects of the Availability of Means of Payments: The Case of Uber

Fernando Alvarez[*] University of Chicago

David Argente[†] Pennsylvania State University

November 2020

[Link to the latest version]

Contents

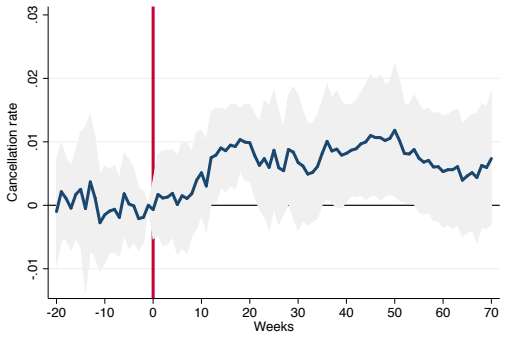
[*]Email: f-alvarez1@uchicago.edu. Address: 1126 E. 59th St., Chicago, IL 60637

[†]Email: dargente@psu.edu. Address: 403 Kern Building, University Park, PA 16801.

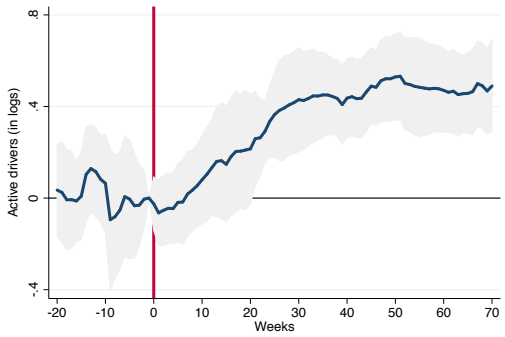
A Event Study

Figure A1: Event Study: Additional Results

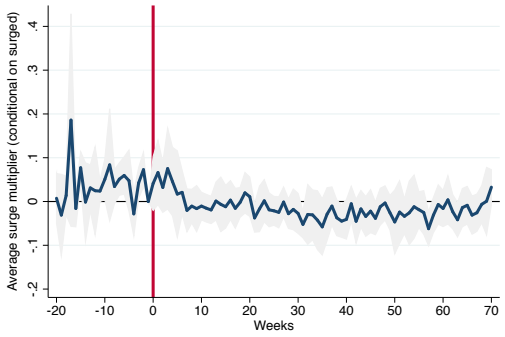
(a) Cancellation Rate



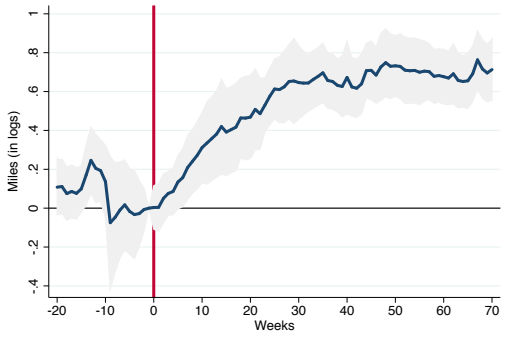
(b) Active Drivers



(c) Avg. Surge Multiplier Conditional on Trip



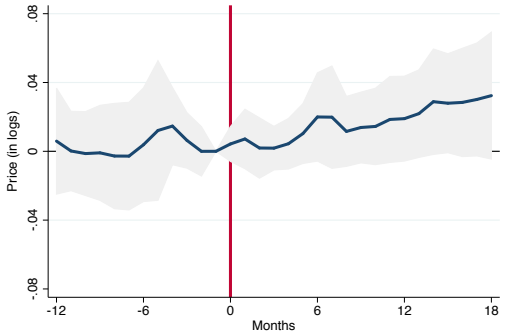
(d) Miles



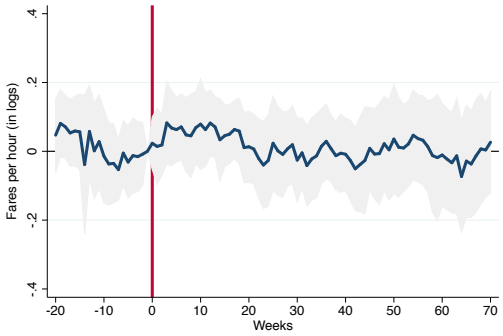
Note: The graph shows the evolution of the number of active drivers, the cancellation rate, the average surge multiplier conditional on the trip being surged, and the total miles before and after the introduction of cash. The figure plots the coefficients of γ_k after estimating equation (1). The red line denotes the week of the introduction of cash as a payment method. The gray area depicts the 95% confidence interval computed using Driscoll and Kraay standard errors.

Figure A2: Event Study: Average Price of Taxis and Earnings per Hour

(a) Taxi Prices



(b) Fares per Hour



Note: Panel (a) shows the evolution of the average price of taxis before and after the introduction of cash. The frequency of the variable is monthly. The data for the average price of taxis comes from the Mexican Consumer Price Index at the city level. Panel (b) shows the patterns of the drivers' income per hour computed as the total fares earned over total hours. The figure plots the coefficients of γ_k after estimating equation (1). The red line denotes the week of the introduction of cash as a payment method. The gray area depicts the 95% confidence interval computed using Driscoll and Kraay standard errors.

B Greater Mexico City

B.1 Geolocalization

We use the latitude, ϕ, and longitude, λ, of an Uber ride and transform them into xy grid coordinates that follow the Lambert Conformal Conic (LCC) map projection. A LCC map projection is defined by two ellipsoidal parameters a and f, grid origin (ϕ_0, λ_0), latitude of the north standard parallel, ϕ_N, and south standard parallel, ϕ_S, false easting, E_0, and false northing, N_b. We use the following three functions:[1]

$$W(\phi) = \sqrt{1 - e^2 \sin^2(\phi)} \tag{1}$$

$$M(\phi) = \frac{\cos(\phi)}{W(\phi)} \tag{2}$$

$$T(\phi) = \sqrt{\left(\frac{1 - \sin(\phi)}{1 + \sin(\phi)}\right)\left(\frac{1 + e\sin(\phi)}{1 - e\sin(\phi)}\right)} \tag{3}$$

The remaining zone constants are:

$$w_1 = W(\phi_S) \tag{4}$$

$$w_2 = W(\phi_N) \tag{5}$$

$$m_1 = M(\phi_S) \tag{6}$$

$$m_2 = M(\phi_N) \tag{7}$$

$$t_0 = T(\phi_0) \tag{8}$$

$$t_1 = T(\phi_S) \tag{9}$$

$$t_2 = T(\phi_N) \tag{10}$$

$$n = \sin(\phi_0) = \frac{\ln(m_1) - \ln(m_2)}{\ln(t_1) - \ln(t_2)} \tag{11}$$

$$F = \frac{m_1}{n t_1^n} \tag{12}$$

$$R_b = aFt_0^n \tag{13}$$

Given the geodetic coordinates of an Uber ride, the northing (y), easting (x), scale, k, and convergence angel, γ, of the point are computed as:

[1] An ellipsoid is defined by the length of its semi-major axis, a, and its flattening factor, f. The GRS 80 ellipsoid used by the Mexican census has defining parameters $a = 6,378,137.0$ m and $f = 1/298.257222101$. The first eccentricity is computed as $e = \sqrt{2f - f^2}$. In addition, the Mexican census indicates the following grid origin $\phi_0 = 102°00'00''$ W, $\lambda_0 = 12°00'00''$ N, $\phi_N = 17°30'$ N, $\phi_S = 29°30'$ N, $E_0 = 2500000$, $N_b = 0$. We use the Mexican Geostatistical Framework of June 2018.

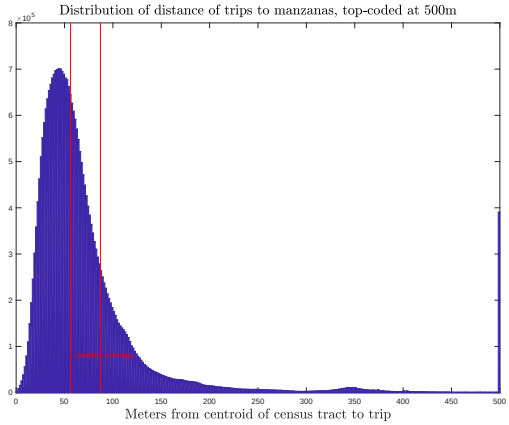
$$t = T(\phi) \tag{14}$$
$$m = M(\phi) \tag{15}$$
$$R = aFt^n \tag{16}$$
$$\gamma = (\lambda - \lambda_0)n \tag{17}$$
$$E = R\sin(\gamma) + E_0 \tag{18}$$
$$N = R_b - R\cos(\gamma) + N_b \tag{19}$$
$$k = \frac{Rn}{am} \tag{20}$$
$$\tag{21}$$

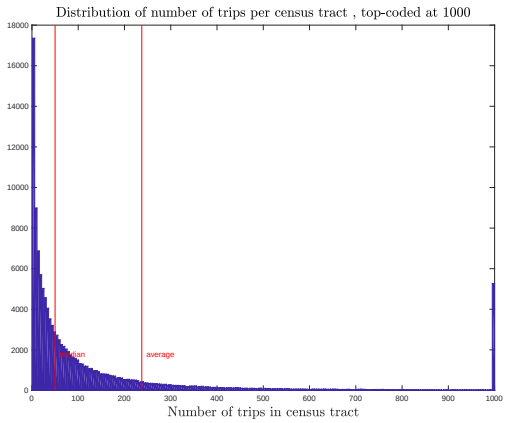
Next, we find the centroid of the polygon around each census block by minimizing the sum of squared Euclidean distances between itself and each point in the set. The centroid of a finite set k points $\mathbf{x}_1, \mathbf{x}_2, \ldots, \mathbf{x}_k$ in $\mathbb{R}^n$ is:

$$\mathbf{C} = \frac{\mathbf{x}_1 + \mathbf{x}_2 + \cdots + \mathbf{x}_k}{k}$$

To find the closest centroid for each Uber trip, we compute the Euclidean distance between the trip and the centroid of each census block. Lastly, we correct for differences in Uber's geofence (the polygon that defines the area for cash acceptance) and the political boundaries of the State of Mexico. We use the shape files of the geofence generated by Uber and redefine the boundaries of the State of Mexico so that it is consistent with their geofence. After geolocalizing the trips with a grid using centroids of census tracts, the average of a trip to a centroid using our methodology is 60 meters (median 50 meters) as shown in Figure B1.

Figure B1: Distance of Trips to Census Block and Number of Trips per Census Block



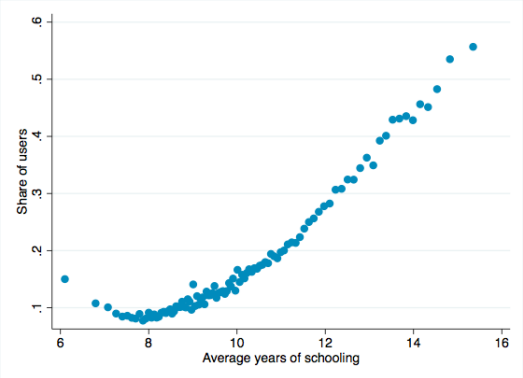


Note: The figure shows the distribution of distance of trips to the closest census block, top-coded at 500m. The coordinates are those of the origin of the trips. The red lines show the median and the mean distance. The median is approximately 60 meters. The figure shows the distribution of number of trips per census block for August 2016, August 2017, and August 2018. The red lines show the median and the mean number of trips. The median is approximately 50 trips per census block.

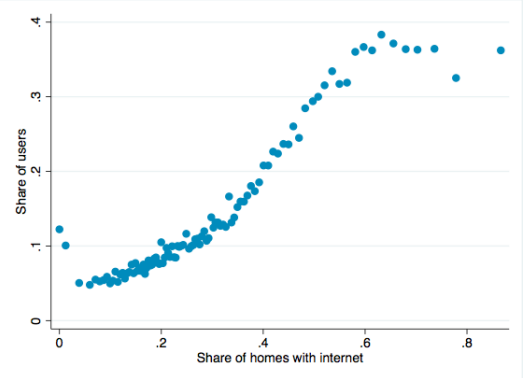
B.2 Income

Figure B2: Share of Uber Users by Demographics

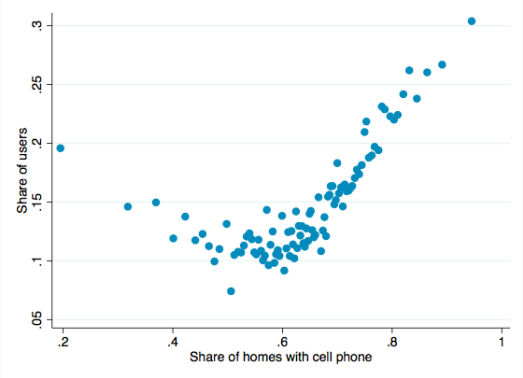
(a) Education



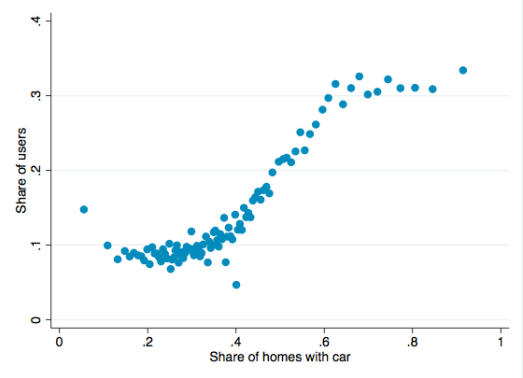
(b) Share of Homes with Internet



(a) Share of Homes with Cell Phone



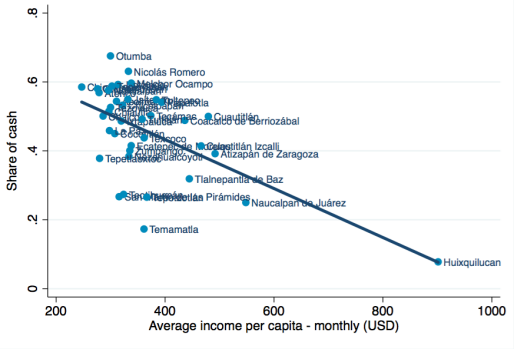
(b) Share of Homes with Car



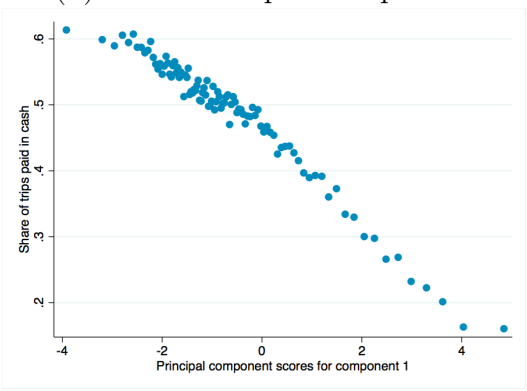
Note: The figure shows the relationship between the share of Uber users to population and several demographic variables from the Mexican Census. The share of Uber users to population considers users active in August of 2017. The demographic variables included are the average years of schooling, the share of homes with internet, the share of homes with cell phone, and the share of homes with a car. The census blocks are grouped into 100 equal-sized bins.

Figure B3: Share of Cash Fares by Income per Capita (Municipality)

(a) Income



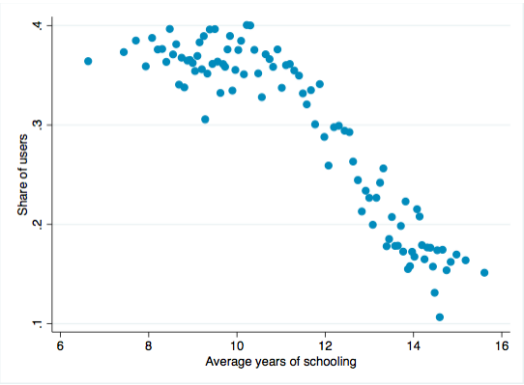
(b) First Principal Component



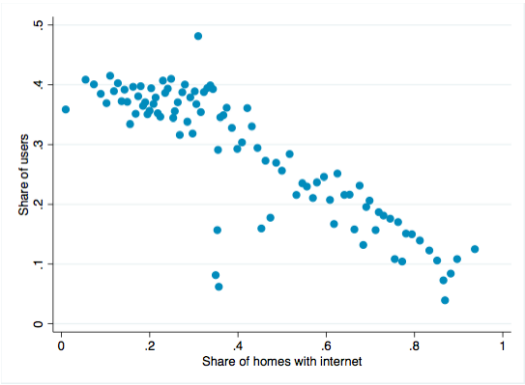
Note: Panel (a) shows the share of cash fares and the average income per capita per month in USD. The income data comes from individuals that report labor income surveyed in the Intercensal Survey of 2015. The data of Uber rides are from August of 2017 in the State of Mexico. Panel (b) shows the relationship between the share of trips paid for in cash and the first principal component of the following demographic variables: average years of schooling, share of homes with internet, share of homes with cell phone, and share of homes with a car. The census blocks are grouped into 100 equal-sized bins. The source of the demographic variables is the Mexican Census.

Figure B4: Share of Pure-Card Users Becoming Mixed After the Entry of Cash

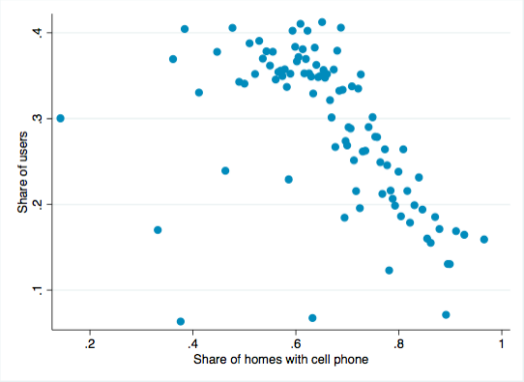
(a) Education



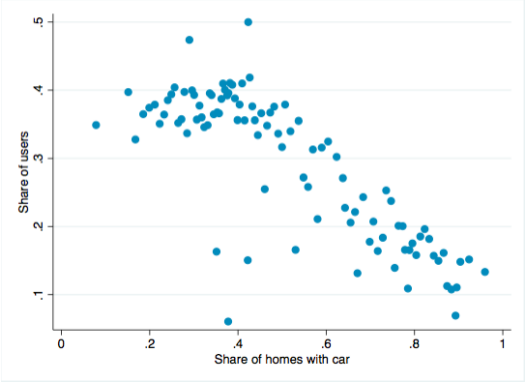
(b) Share of Homes with Internet



(a) Share of Homes with Cell Phone



(b) Share of Homes with Car

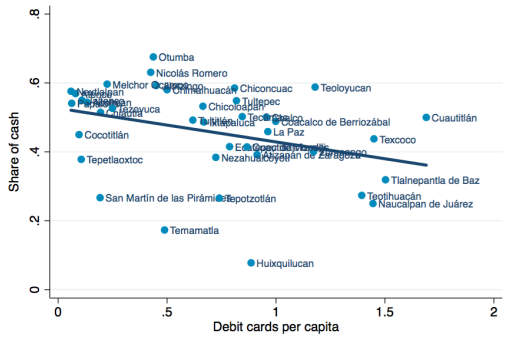


Note: The figure shows the relationship between the share of pure card that became mixed users (have at least one trip paid for in cash after the introduction of cash) and several demographic variables from the Mexican Census. The share of Uber users to population considers users active in August of 2017. The demographic variables included are the average years of schooling, the share of homes with internet, the share of homes with cell phone, and the share of homes with a car. The census blocks are grouped into 100 equal-sized bins.

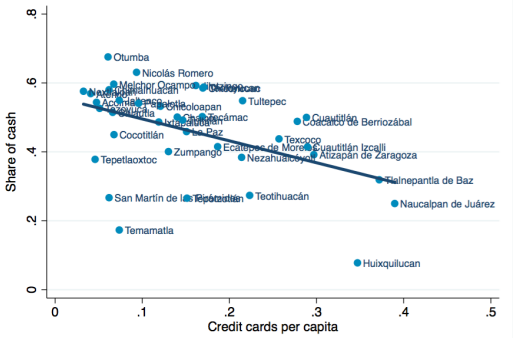
B.3 Banking services

Figure B5: Share of Cash Fares - Banking Services

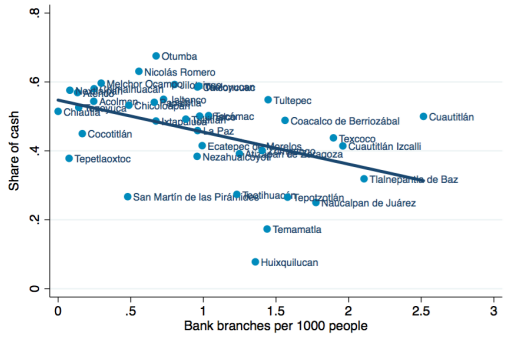
(a) Debit Cards



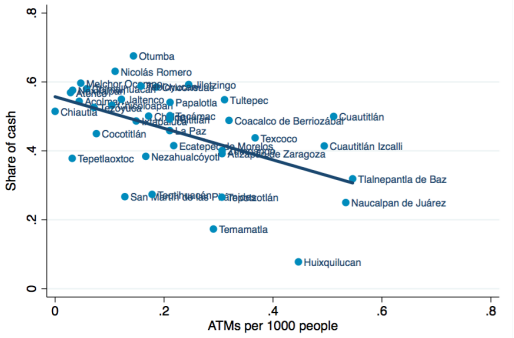
(b) Credit Cards



(c) Bank Branches

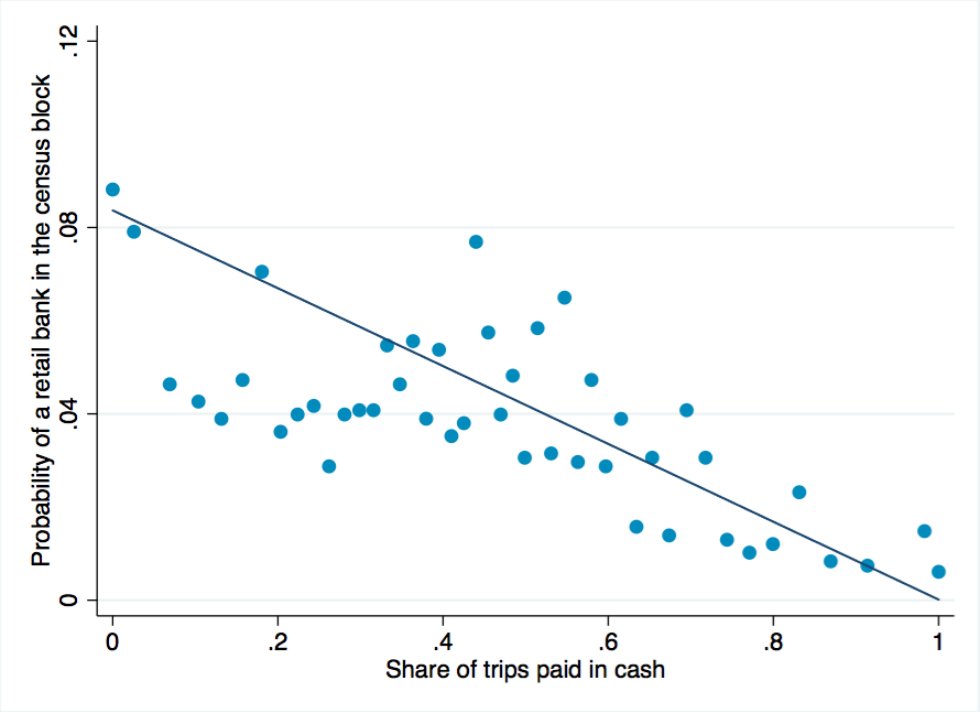


(d) ATMs



Note: The figure shows the share of cash fares and several measures of the availability of banking services in each municipality of the State of Mexico, where Uber trips were taken in August 2017. The data on debit cards, credit card, bank branches, and ATMs comes from the Financial Inclusion Database (BDIF). The figure shows the average for 2017.

Figure B6: Share of Cash Fares - Probability of a Retail Bank in the Census Block

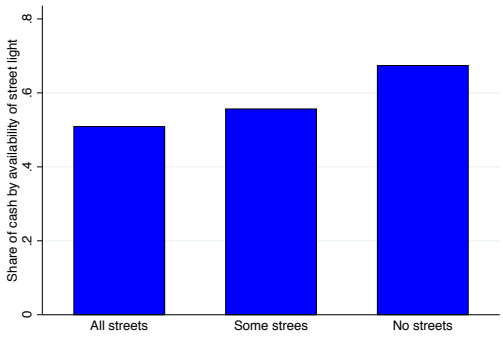


Note: The figure shows the binscatter plot of the probability a census block has a retail bank and the share of trips paid for in cash in that census block group into 50 equal-sized bins. The data for retail bank branches comes from the National Statistical Directory of Economic Units (DENUE), geolocalized data of all establishments in Mexico. The data for Uber rides is from August 2017 in the State of Mexico.

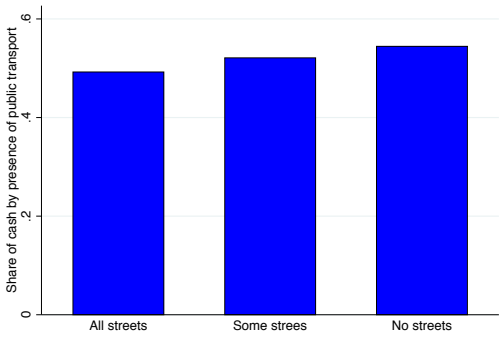
B.4 Infrastructure

Figure B7: Share of Cash by Availability of Public Infrastructure

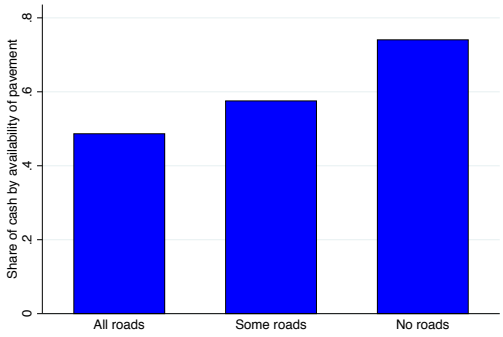
(a) Street Light



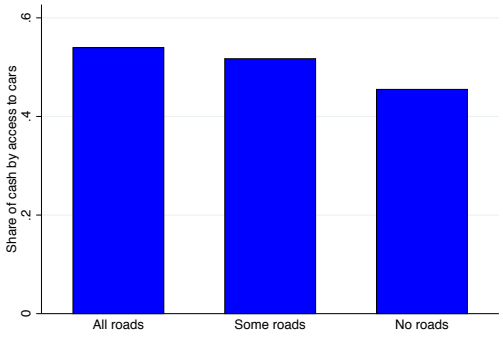
(b) Public Transport



(c) Pavement



(d) Access to Cars

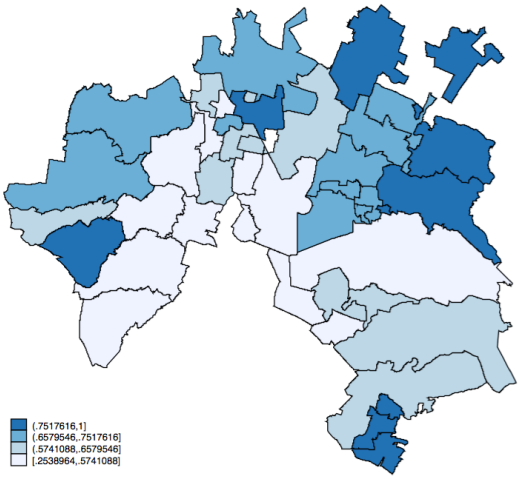


Note: The figure shows the share of cash fares if the streets in the census block have public infrastructure. The date period is August 2017 and the census blocks are those located in the State of Mexico. "All streets" refers to census blocks where all the streets have public infrastructure. "No streets" refers to census blocks that do not have infrastructure. The public infrastructure considered are street light, public transport, pavement, and access to cars. The infrastructure information was collected through the Survey of Urban Environment (Cuestionario de Entorno Urbano y de Localidad) applied in the census blocks of census tracts with more than 5 thousands inhabitants or in the census tracts that registered less than 5 thousands inhabitants according to the last population count.

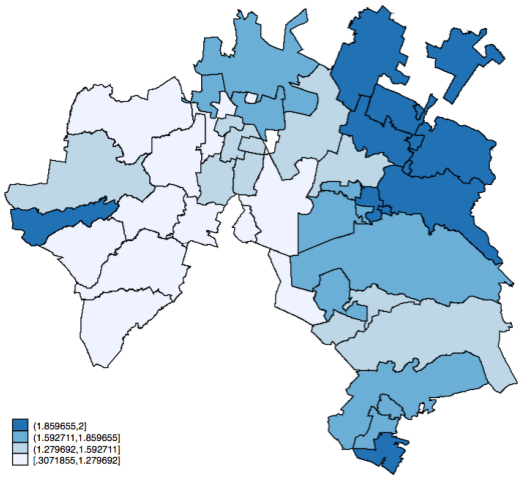
B.5 Maps: Urban and Suburban Regions

Figure B8: Share of Trips Paid For in Cash and Change in Trips (State of Mexico)

(a) Share of Trips Paid in Cash



(b) Change in Trips 2016-2017



Note: Panel (a) shows the number of total Uber rides in each municipality in the State of Mexico in August of 2017. Darker colors represent a larger share of trips paid for in cash. Panel (b) shows the change in the number of trips in each municipality before and after the introduction of cash as payment method. Darker colors represent a larger change in trips.

B.6 Regression Discontinuity: Robustness

Table B1: Regression Discontinuity Approach: Effect on Trips (less than 5 km)

Note: Note: The table reports the results for the coefficient of β after estimating equation (2). The estimates report the local treatment effect at the border between the State of Mexico and Mexico City of the introduction of cash as a payment method. Each column reports the results using polynomials of different degrees. The dependent variable is the change in the total trips of each census block. The results consider only the sample of census blocks that are less than 5 kilometers from the border. The standard errors are clustered at the basic geostatistical area level (AGEB).

	(1)	(2)	(3)	(4)	(5)
State of Mexico	0.238***	0.218***	0.272***	0.215***	0.190***
	(0.021)	(0.031)	(0.043)	(0.054)	(0.067)
Observations	37,744	37,744	37,744	37,744	37,744
R-squared	0.255	0.255	0.255	0.255	0.255
Controls	Yes	Yes	Yes	Yes	Yes
Distance	<5 Km	<5 Km	<5 Km	<5 Km	<5 Km
Degree	1	2	3	4	5

Table B2: Regression Discontinuity Approach: Effect on Fares (less than 5 km)

Note: The table reports the results for the coefficient of β after estimating equation (2). The estimates report the local treatment effect at the border between the State of Mexico and Mexico City of the introduction of cash as a payment method. Each column reports the results using polynomials of different degrees. The dependent variable is the change in the total fares of each census block. The results consider only the sample of census blocks that are less than 5 kilometers from the border. The standard errors are clustered at the basic geostatistical area level (AGEB).

	(1)	(2)	(3)	(4)	(5)
State of Mexico	0.174***	0.163***	0.212***	0.159***	0.148**
	(0.018)	(0.028)	(0.038)	(0.048)	(0.061)
Observations	37,744	37,744	37,744	37,744	37,744
R-squared	0.180	0.180	0.180	0.180	0.181
Controls	Yes	Yes	Yes	Yes	Yes
Distance	<5 Km	<5 Km	<5 Km	<5 Km	<5 Km
Degree	1	2	3	4	5

Table B3: Regression Discontinuity Approach: Effect on Trips (Exclude trips that started less 100 meters from the border)

Note: Note: The table reports the results for the coefficient of β after estimating equation (2). The estimates report the local treatment effect at the border between the State of Mexico and Mexico City of the introduction of cash as a payment method. Each column reports the results using polynomials of different degrees. The dependent variable is the change in the total trips of each census block. The results does not consider trips that started less than 100 meters from the border. The standard errors are clustered at the basic geostatistical area level (AGEB).

	(1)	(2)	(3)	(4)	(5)
State of Mexico	0.391***	0.314***	0.216***	0.173***	0.240***
	(0.013)	(0.018)	(0.023)	(0.029)	(0.035)
Observations	86,889	86,889	86,889	86,889	86,889
R-squared	0.352	0.352	0.354	0.354	0.354
Controls	Yes	Yes	Yes	Yes	Yes
Distance	All	All	All	All	All
Degree	1	2	3	4	5

Table B4: Regression Discontinuity Approach: Effect on Fares (Exclude trips that started less 100 meters from the border)

Note: The table reports the results for the coefficient of β after estimating equation (2). The estimates report the local treatment effect at the border between the State of Mexico and Mexico City of the introduction of cash as a payment method. Each column reports the results using polynomials of different degrees. The dependent variable is the change in the total fares of each census block. The results does not consider trips that started less than 100 meters from the border. The standard errors are clustered at the basic geostatistical area level (AGEB).

	(1)	(2)	(3)	(4)	(5)
State of Mexico	0.284***	0.246***	0.156***	0.119***	0.192***
	(0.011)	(0.016)	(0.021)	(0.026)	(0.032)
Observations	86,886	86,886	86,886	86,886	86,886
R-squared	0.250	0.250	0.251	0.251	0.252
Controls	Yes	Yes	Yes	Yes	Yes
Distance	All	All	All	All	All
Degree	1	2	3	4	5

Table B5: Regression Discontinuity Approach: Effect on Prices

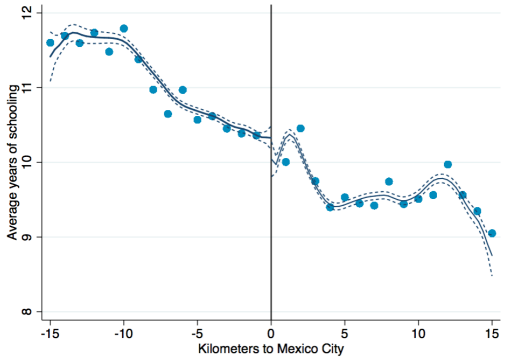
Note: Note: The table reports the results for the coefficient of β after estimating equation (2). The estimates report the local treatment effect at the border between the State of Mexico and Mexico City of the introduction of cash as a payment method. Each column reports the results using polynomials of different degrees. The dependent variable is the change in the price of each census block. The prices are calculated dividing the total fares by the total driving distance given the coordinates of each trip in each census block. The standard errors are clustered at the municipality level.

	(1)	(2)	(3)	(4)	(5)
State of Mexico	0.002	0.002	-0.018*	-0.021*	-0.015
	(0.007)	(0.008)	(0.009)	(0.012)	(0.009)
Observations	74,079	74,079	74,079	74,079	74,079
R-squared	0.003	0.004	0.004	0.004	0.004
Controls	Yes	Yes	Yes	Yes	Yes
Distance	All	All	All	All	All
Degree	1	2	3	4	5

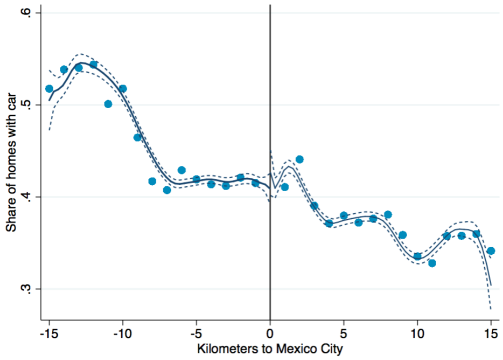
B.7 Regression Discontinuity: Observables

Figure B9: Observables Characteristics at the Border

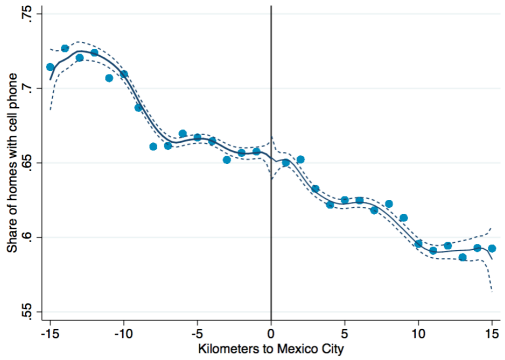
(a) Education



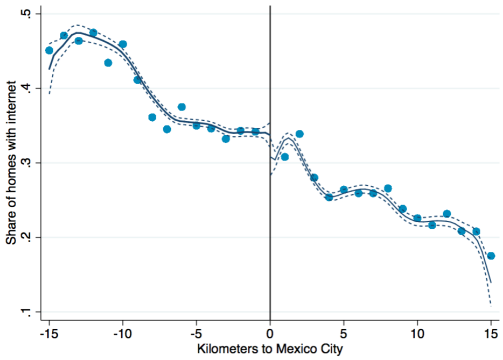
(b) Share of Homes with Car



(a) Share of Homes with Cell Phone



(b) Share of Homes with Internet



Note: The graphs show the relationship between several observables variables in each census block and the distance to Mexico City. The observable variables plotted are the average years of education, the share of homes with car, the share of homes with cell phone, and the share of homes with internet. Negative numbers in the x-axis indicate the census block is in Mexico City. Each bin corresponds to one kilometer. The dots show the average level of each variable in each bin. The line is a kernel-weighted (epanechnikov) local polynomial of degree 3. The dashed lines are the 99% confidence intervals.

B.8 OLS: Additional Results

Table B6: OLS: Effect of the Introduction of Cash on Trips (State of Mexico)

Note: The table reports the results of estimating the effect of the introduction of cash in the State of Mexico. The dependent variable is the change in the number of trips of all census blocks, both those that were active in Uber before the introduction of cash (intensive margin) and those that were not (extensive margin). The controls used are the average education of each census block, the share of households with cell phones, the share of households with internet access, the share of economically active population, share of households that own a car, and an indicator variable that equals one if a bank is present in the census block. Columns (3) and (4) consider census blocks at less than 5 kilometers and less than 1 kilometer from Mexico City respectively.

	(1)	(2)	(3)	(4)
State of Mexico	0.824***	0.615***	0.460***	0.294***
	(0.005)	(0.009)	(0.011)	(0.023)
Observations	108,272	87,036	37,744	7,702
R-squared	0.227	0.326	0.245	0.142
Controls	No	Yes	Yes	Yes
Distance	All	All	<5Km	<1Km

Table B7: OLS: Effect of the Introduction of Cash on Fares (State of Mexico)

Note: The table reports the results of estimating the effect of the introduction of cash in the State of Mexico. The dependent variable is the change in the total of fares of all census blocks, both those that were active in Uber before the introduction of cash (intensive margin) and those that were not (extensive margin). The controls used are the average education of each census block, the share of households with cell phones, the share of households with internet access, the share of economically active population, share of households that own a car, and an indicator variable that equals one if a bank is present in the census block. Columns (3) and (4) consider census blocks at less than 5 kilometers and less than 1 kilometer from Mexico City respectively.

	(1)	(2)	(3)	(4)
State of Mexico	0.665***	0.471***	0.347***	0.223***
	(0.005)	(0.008)	(0.010)	(0.020)
Observations	108,269	87,033	37,744	7,702
R-squared	0.156	0.230	0.174	0.105
Controls	No	Yes	Yes	Yes
Distance	All	All	<5Km	<1Km

Table B8: OLS: Effect of the Introduction of Cash on Trips (State of Mexico) - Heterogeneous Effects

Note: The table reports the results of estimating the effect of the introduction of cash in the State of Mexico. The dependent variable is the change in the number of trips of all census blocks, both those that were active in Uber before the introduction of cash (intensive margin) and those that were not (extensive margin). The controls used are the average education of each census block, the share of households with cell phones, the share of households with internet access, the share of economically active population, share of households that own a car, and an indicator variable that equals one if a bank is present in the census block.

	(1)	(2)	(3)	(4)	(5)	(6)
State of Mexico	0.615***	0.846***	1.316***	0.924***	1.009***	0.904***
	(0.010)	(0.014)	(0.038)	(0.040)	(0.031)	(0.017)
Bank	-0.028***					
	(0.010)					
State of Mexico x Bank	-0.027					
	(0.025)					
Internet		-0.279***				
		(0.038)				
State of Mexico x Internet		-0.726***				
		(0.035)				
Education			-0.020***			
			(0.003)			
State of Mexico x Education			-0.068***			
			(0.004)			
Econ. Active				-0.022		
				(0.050)		
State of Mexico x Econ. Active				-0.703***		
				(0.087)		
Cell phone					0.364***	
					(0.039)	
State of Mexico x Cell phone					-0.603***	
					(0.046)	
Car						0.339***
						(0.030)
State of Mexico x Car						-0.693***
						(0.034)
Observations	87,036	87,036	87,036	87,036	87,036	87,036
R-squared	0.326	0.334	0.333	0.327	0.328	0.333
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Distance	All	All	All	All	All	All

Table B9: OLS: Effect of the Introduction of Cash on Trips (State of Mexico) - Intensive Margin

Note: The table reports the results of estimating the effect of the introduction of cash in the State of Mexico. The dependent variable is the change in the number of trips of census blocks that already were already active using Uber before the introduction of cash (intensive margin). The controls used are the average education of each census block, the share of households with cell phones, the share of households with internet access, the share of economically active population, share of households that own a car, and an indicator variable that equals one if a bank is present in the census block. Columns (3) and (4) consider census blocks at less than 5 kilometers and less than 1 kilometer from Mexico City respectively.

	(1)	(2)	(3)	(4)
State of Mexico	0.368***	0.400***	0.400***	0.364***
	(0.004)	(0.008)	(0.011)	(0.023)
Observations	108,272	87,036	37,744	7,702
R-squared	0.084	0.115	0.143	0.141
Controls	No	Yes	Yes	Yes
Distance	All	All	<5Km	<1Km

Table B10: OLS: Effect of the Introduction of Cash on Trips (State of Mexico) - Extensive Margin

Note: The table reports the results of estimating the effect of the introduction of cash in the State of Mexico. The dependent variable is the change in the number of trips of census blocks that were not active in Uber before the introduction of cash (extensive margin). The controls used are the average education of each census block, the share of households with cell phones, the share of households with internet access, the share of economically active population, share of households that own a car, and an indicator variable that equals one if a bank is present in the census block. Columns (3) and (4) consider census blocks at less than 5 kilometers and less than 1 kilometer from Mexico City respectively.

	(1)	(2)	(3)	(4)
State of Mexico	0.456***	0.215***	0.060***	-0.070***
	(0.005)	(0.011)	(0.013)	(0.022)
Observations	108,272	87,036	37,744	7,702
R-squared	0.074	0.112	0.060	0.032
Controls	No	Yes	Yes	Yes
Distance	All	All	<5Km	<1Km

Table B11: OLS: Effect of the Introduction of Cash on Trips (State of Mexico) - Intensive Margin, Heterogeneous Effects

Note: The table reports the results of estimating the effect of the introduction of cash in the State of Mexico. The dependent variable is the change in the total number of trips of all census blocks that were active in Uber before the introduction of cash (intensive margin). The controls used are the average education of each census block, the share of households with cell phones, the share of households with internet access, the share of economically active population, share of households that own a car, and an indicator variable that equals one if a bank is present in the census block.

	(1)	(2)	(3)	(4)	(5)	(6)
State of Mexico	0.395***	0.337***	0.181***	0.005	0.303***	0.347***
	(0.008)	(0.015)	(0.044)	(0.038)	(0.031)	(0.018)
Bank	-0.032***					
	(0.008)					
State of Mexico x Bank	0.210***					
	(0.025)					
Internet		-0.261***				
		(0.031)				
State of Mexico x Internet		0.197***				
		(0.043)				
Education			-0.016***			
			(0.003)			
State of Mexico x Education			0.021***			
			(0.004)			
Econ. Active				-0.135***		
				(0.041)		
State of Mexico x Econ. Active				0.897***		
				(0.085)		
Cell phone					0.012	
					(0.032)	
State of Mexico x Cell phone					0.148***	
					(0.046)	
Car						-0.119***
						(0.029)
State of Mexico x Car						0.126***
						(0.039)
Observations	87,036	87,036	87,036	87,036	87,036	87,036
R-squared	0.116	0.116	0.116	0.117	0.115	0.115
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Distance	All	All	All	All	All	All

Table B12: OLS: Effect of the Introduction of Cash on Trips (State of Mexico) - Extensive Margin, Heterogeneous Effects

Note: The table reports the results of estimating the effect of the introduction of cash in the State of Mexico. The dependent variable is the change in the number of trips of census blocks that were not active in Uber before the introduction of cash (extensive margin). The controls used are the average education of each census block, the share of households with cell phones, the share of households with internet access, the share of economically active population, share of households that own a car, and an indicator variable that equals one if a bank is present in the census block.

	(1)	(2)	(3)	(4)	(5)	(6)
State of Mexico	0.220***	0.508***	1.135***	0.919***	0.706***	0.557***
	(0.011)	(0.021)	(0.052)	(0.049)	(0.041)	(0.024)
Bank	0.004					
	(0.008)					
State of Mexico x Bank	-0.237***					
	(0.023)					
Internet		-0.019				
		(0.038)				
State of Mexico x Internet		-0.924***				
		(0.044)				
Education			-0.004			
			(0.003)			
State of Mexico x Education			-0.089***			
			(0.004)			
Econ. Active				0.113***		
				(0.044)		
State of Mexico x Econ. Active				-1.600***		
				(0.103)		
Cell phone					0.352***	
					(0.038)	
State of Mexico x Cell phone					-0.751***	
					(0.055)	
Car						0.459***
						(0.032)
State of Mexico x Car						-0.819***
						(0.039)
Observations	87,036	87,036	87,036	87,036	87,036	87,036
R-squared	0.113	0.127	0.127	0.118	0.117	0.124
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Distance	All	All	All	All	All	All

Table B13: OLS: Effect of the Introduction of Cash on Fares (State of Mexico) - Heterogeneous Effects

Note: The table reports the results of estimating the effect of the introduction of cash in the State of Mexico. The dependent variable is the change in the total of fares of all census blocks, both those that were active in Uber before the introduction of cash (intensive margin) and those that were not (extensive margin). The controls used are the average education of each census block, the share of households with cell phones, the share of households with internet access, the share of economically active population, share of households that own a car, and an indicator variable that equals one if a bank is present in the census block.

	(1)	(2)	(3)	(4)	(5)	(6)
State of Mexico	0.472***	0.673***	1.098***	0.770***	0.815***	0.718***
	(0.009)	(0.014)	(0.035)	(0.038)	(0.030)	(0.015)
Bank	-0.025***					
	(0.009)					
State of Mexico x Bank	-0.030					
	(0.023)					
Internet		-0.217***				
		(0.036)				
State of Mexico x Internet		-0.636***				
		(0.032)				
Education			-0.018***			
			(0.003)			
State of Mexico x Education			-0.060***			
			(0.003)			
Econ. Active				-0.010		
				(0.048)		
State of Mexico x Econ. Active				-0.680***		
				(0.082)		
Cell phone					0.318***	
					(0.037)	
State of Mexico x Cell phone					-0.526***	
					(0.043)	
Car						0.280***
						(0.029)
State of Mexico x Car						-0.592***
						(0.031)
Observations	87,033	87,033	87,033	87,033	87,033	87,033
R-squared	0.230	0.237	0.237	0.231	0.232	0.236
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Distance	All	All	All	All	All	All

Table B14: OLS: Effect of the Introduction of Cash on Fares (State of Mexico) - Intensive Margin

Note: The table reports the results of estimating the effect of the introduction of cash in the State of Mexico. The dependent variable is the change in the number of trips of census blocks that already were already active using Uber before the introduction of cash (intensive margin). The controls used are the average education of each census block, the share of households with cell phones, the share of households with internet access, the share of economically active population, share of households that own a car, and an indicator variable that equals one if a bank is present in the census block. Columns (3) and (4) consider census blocks at less than 5 kilometers and less than 1 kilometer from Mexico City respectively.

	(1)	(2)	(3)	(4)
State of Mexico	0.210***	0.256***	0.287***	0.293***
	(0.004)	(0.008)	(0.011)	(0.021)
Observations	108,269	87,033	37,744	7,702
R-squared	0.027	0.043	0.071	0.089
Controls	No	Yes	Yes	Yes
Distance	All	All	<5Km	<1Km

Table B15: OLS: Effect of the Introduction of Cash on Fares (State of Mexico) - Extensive Margin

Note: The table reports the results of estimating the effect of the introduction of cash in the State of Mexico. The dependent variable is the change in the total fares of census blocks that were not active in Uber before the introduction of cash (extensive margin). The controls used are the average education of each census block, the share of households with cell phones, the share of households with internet access, the share of economically active population, share of households that own a car, and an indicator variable that equals one if a bank is present in the census block. Columns (3) and (4) consider census blocks at less than 5 kilometers and less than 1 kilometer from Mexico City respectively.

	(1)	(2)	(3)	(4)
State of Mexico	0.455***	0.215***	0.060***	-0.070***
	(0.005)	(0.011)	(0.013)	(0.022)
Observations	108,269	87,033	37,744	7,702
R-squared	0.074	0.112	0.060	0.032
Controls	No	Yes	Yes	Yes
Distance	All	All	<5Km	<1Km

Table B16: OLS: Effect of the Introduction of Cash on Fares (State of Mexico) - Intensive Margin, Heterogeneous Effects

Note: The table reports the results of estimating the effect of the introduction of cash in the State of Mexico. The dependent variable is the change in the total fares of census blocks that already were already active using Uber before the introduction of cash (intensive margin). The controls used are the average education of each census block, the share of households with cell phones, the share of households with internet access, the share of economically active population, share of households that own a car, and an indicator variable that equals one if a bank is present in the census block.

	(1)	(2)	(3)	(4)	(5)	(6)
State of Mexico	0.251***	0.165***	-0.036	-0.148***	0.110***	0.161***
	(0.008)	(0.015)	(0.042)	(0.038)	(0.031)	(0.018)
Bank	-0.029***					
	(0.009)					
State of Mexico x Bank	0.207***					
	(0.025)					
Internet		-0.198***				
		(0.031)				
State of Mexico x Internet		0.288***				
		(0.041)				
Education			-0.014***			
			(0.003)			
State of Mexico x Education			0.028***			
			(0.004)			
Econ. Active				-0.123***		
				(0.043)		
State of Mexico x Econ. Active				0.919***		
				(0.084)		
Cell phone					-0.034	
					(0.033)	
State of Mexico x Cell phone					0.224***	
					(0.045)	
Car						-0.179***
						(0.029)
State of Mexico x Car						0.227***
						(0.036)
Observations	87,033	87,033	87,033	87,033	87,033	87,033
R-squared	0.044	0.045	0.045	0.045	0.043	0.044
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Distance	All	All	All	All	All	All

Table B17: OLS: Effect of the Introduction of Cash on Fares (State of Mexico) - Extensive Margin, Heterogeneous Effects

Note: The table reports the results of estimating the effect of the introduction of cash in the State of Mexico. The dependent variable is the change in the total fares of census blocks that were not active in Uber before the introduction of cash (extensive margin). The controls used are the average education of each census block, the share of households with cell phones, the share of households with internet access, the share of economically active population, share of households that own a car, and an indicator variable that equals one if a bank is present in the census block.

	(1)	(2)	(3)	(4)	(5)	(6)
State of Mexico	0.220***	0.508***	1.134***	0.919***	0.705***	0.557***
	(0.011)	(0.021)	(0.052)	(0.049)	(0.041)	(0.024)
Bank	0.004					
	(0.008)					
State of Mexico x Bank	-0.237***					
	(0.023)					
Internet		-0.019				
		(0.038)				
State of Mexico x Internet		-0.923***				
		(0.044)				
Education			-0.004			
			(0.003)			
State of Mexico x Education			-0.089***			
			(0.004)			
Econ. Active				0.113***		
				(0.044)		
State of Mexico x Econ. Active				-1.599***		
				(0.103)		
Cell phone					0.352***	
					(0.038)	
State of Mexico x Cell phone					-0.750***	
					(0.055)	
Car						0.459***
						(0.032)
State of Mexico x Car						-0.818***
						(0.039)
Observations	87,033	87,033	87,033	87,033	87,033	87,033
R-squared	0.113	0.127	0.127	0.118	0.117	0.124
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Distance	All	All	All	All	All	All

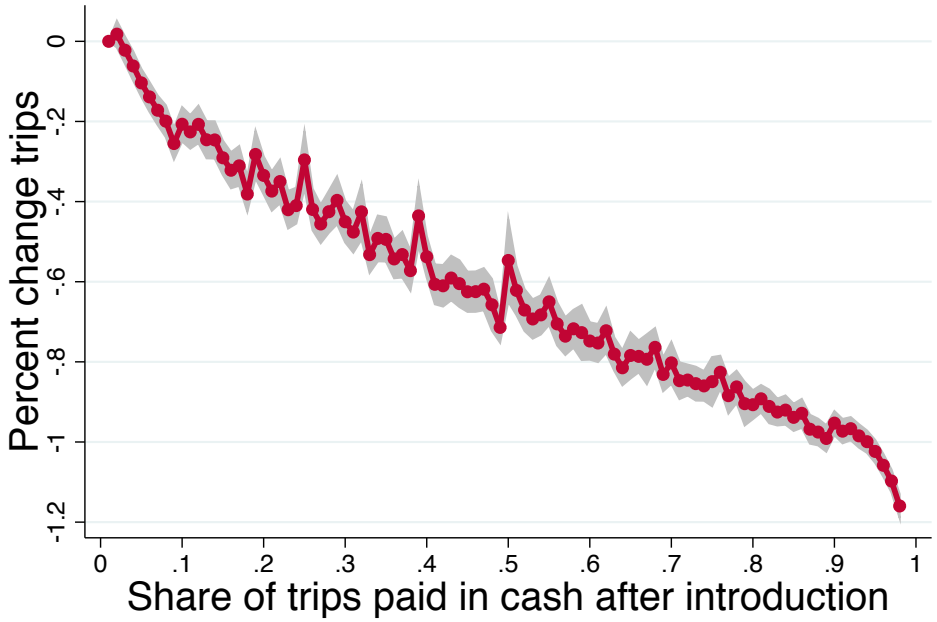
Table B18: OLS: Effect of the Introduction of Cash by Origin and Destination

Note: The table reports the effects of estimating the change in trips and fares before and after the introduction of cash by origin-destination pairs. Each observation in the regression is an origin and destination pair at the basic geostatistical area level (AGEB). The dependent variables are the change in trips (columns 1-2 and 5-6) and the change in fares (columns 3-4 and 7-8) from 2016 to 2017 (columns 1-4) and from 2017 to 2018 (columns 5-8). The independent variables are indicator variables of origin-destination pairs. "SM to SM" are pairs of AGEBs where the origin is in the State of Mexico and the destination as well. For "SM to MC" the origin of the trip is in the State of Mexico and the destination is in Mexico City and for "MC to SM" the origin is in Mexico City and the destination is the State of Mexico. The omitted pair is "MC to MC", trips within Mexico City. The estimates with controls include the average education of each AGEB, the share of households with cell phones, the share of households with internet access, the share of economically active population, share of households that own a car, and an indicator variable that equals one if a bank is present in the AGEB.

	(1) Δ Trips	(2) Δ Trips	(3) Δ Fares	(4) Δ Fares	(5) Δ Trips	(6) Δ Trips	(7) Δ Fares	(8) Δ Fares
SM to SM	0.786***	0.414***	0.742***	0.369***	0.034***	-0.069***	0.044***	-0.050***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
SM to MC	0.274***	0.330***	0.238***	0.299***	-0.031***	0.231***	-0.028***	0.239***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
MC to SM	0.063***	0.358***	0.034***	0.327***	-0.025***	0.365***	-0.021***	0.370***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Observations	2,582,361	1,846,123	2,582,322	1,846,088	3,011,395	1,975,550	3,011,335	1,975,521
R-squared	0.033	0.115	0.030	0.108	0.000	0.061	0.000	0.059
Controls	N	Y	N	Y	N	Y	N	Y
Year	2017	2017	2017	2017	2018	2018	2018	2018

B.9 Mixed Users

Figure B1: State of Mexico: Intensive Margin Adjustment to Ban given Past Cash Intensity (Reversed Time)



Note: We use the period when both cash and debit/credit were available as the initial period and the period when only debit/credit were available as the final period. Since these two periods occurred in the opposite order in the data, it is in this sense that we "reversed" time to study the implications of mixed users before and after a "ban" on cash in the State of Mexico. The figure shows the change in the average weekly trips of mixed users after the ban on cash as a function of the share of cash fares of different users before the ban. Mixed users are defined as those whose share of cash fares before the ban was between 1% and 99%. The panel plots the coefficient of β_k estimated using equation (3) for different shares of cash (indexed by k). The users considered are those that were active in 2017, the year before the ban on cash, and that had at least 10 trips that year.

C Puebla

C.1 Synthetic Control

C.1.1 Inference: Confidence Sets

Our inference procedure examines whether or not the estimated effect of the ban is large relative to the distribution of the effects estimated for the cities that did not experience the ban. To do so we run permutation tests where each city is assumed to be treated and estimate $\hat{\alpha}_{jt}$ for each $j \in 2, ..., J+1$ and $t \in \{1, ..., T\}$. Following Firpo and Possebom (2018), we use the empirical distribution of a summary statistic:

$$RMSPE_j \equiv \frac{\sum_{t=T_0+1}^{T} \left(Y_{jt} - \hat{Y}_{jt}^N\right)^2 / (T - T_0)}{\sum_{t=1}^{T_0} \left(Y_{jt} - \hat{Y}_{jt}^N\right)^2 / (T_0)}$$

which is known as the ratio of the mean squared prediction errors. We calculate the a p-value as follows:

$$p \equiv \frac{\sum_{j=1}^{J+1} \mathbb{1}\left[RMSPE_j \geq RMSPE_1\right]}{J+1} \leq \gamma \tag{22}$$

where γ is some pre-specified significance level.

We want to test

$$\mathrm{H}_0 : Y_{jt}^I = Y_{jt}^N + \mathrm{f}(t)$$

where for a given intervention function is $\mathrm{f} : \{1, ..., T\} \to \mathbb{R}$, the test statistic RMSPE is given by equation (22). Following this inference procedure we estimate γ-confidence intervals for the effect of the ban as

$$\mathrm{CI}_{\gamma,\theta} \equiv \left\{\mathrm{f} \in \mathbb{R}^{\{1,...,T\}} : \mathrm{f}(t) = \mathrm{c} \text{ and } p_{\theta^{\mathrm{c}}} > \gamma\right\}$$

where $\mathrm{c} \in \mathbb{R}$ and $\gamma \in (0, 1)$. We assume that there is a constant effect of the ban and estimate the empirical distribution of RMSPE following Firpo and Possebom (2018) to perform inference. The effect of the ban on cash on the percent change in the number of trips per capita is significant at the 99% confidence level.

C.1.2 Inference: Size and Power

We also analyze the size and the power of eleven different test statistics and report them in Table C1. Overall, the effect of the ban on cash on the number of trips is significant under each of the statistical tests. Let $\tilde{j}$ be the city that is assumed to face the intervention permutation.

- $\theta^1 \equiv \text{mean}\left(\left|\hat{\alpha}_{\tilde{j}t}\right| | t \geq T_0 + 1\right)$
- $\theta^2 \equiv \text{RMSPE}$
- θ^3 is the absolute value of the statistic of a t-test that compares the estimated average post-ban effect against zero. As follows:

$$\theta^3 \equiv \left| \frac{\bar{\alpha}_{\text{post}}/T - T_0}{\hat{\sigma}/\sqrt{T - T_0}} \right| |$$

where $\bar{\alpha}_{\text{post}} \equiv \frac{\left(\sum_{t=T_0+1}^{T} \hat{\alpha}_{\tilde{j}t}\right)}{(T-T_0)}$ and $\hat{\sigma} \equiv \frac{\left(\sum_{t=T_0+1}^{T} \left(\hat{\alpha}_{\tilde{j}t} - \bar{\alpha}_{\text{post}}\right)\right)}{(T-T_0)}$

- $\theta^4 \equiv \left| \text{mean}\left(Y_{\tilde{j}t} | t \geq T_0 + 1\right) - \frac{\sum_{t=T_0+1}^{T} \sum_{j \neq \tilde{j}} Y_{jt}}{(T-T_0) \times J} \right|$
- θ^5 is the coefficient of the interaction term in a differences-in-differences model.

$$Y_{jt} = \eta_1 \times \mathbb{1}[j = \tilde{j}] + \eta_2 \times [j = \tilde{j}] \times \mathbb{1}[t \geq T_0 + 1] + Z_{jt} \times \zeta + \xi_j + \mu_t + \epsilon_{jt}$$

  where ξ_j and μ_t are region and time effects and $\hat{\theta}^5 = |\hat{\eta}_2|$.

- $\theta^6 \equiv \left|\text{mean}\left(\hat{\alpha}_{\tilde{j}t} | t \geq T_0 + 1\right)\right|$
- $\theta^7 \equiv \text{mean}\left(\hat{\alpha}^2_{\tilde{j}t} | t \geq T_0 + 1\right)$
- $\theta^8 \equiv \left|\text{median}\left(\hat{\alpha}_{\tilde{j}t} | t \geq T_0 + 1\right)\right|$
- $\theta^9 \equiv \text{median}\left(\hat{\alpha}_{\tilde{j}t} | t \geq T_0 + 1\right)$
- $\theta^{10} \equiv \text{median}\left(\hat{\alpha}^2_{\tilde{j}t} | t \geq T_0 + 1\right)$
- $\theta^{11} \equiv \min\left(\hat{\alpha}_{\tilde{j}t} | t \geq T_0 + 1\right)$

Table C1: Synthetic Control: Inference

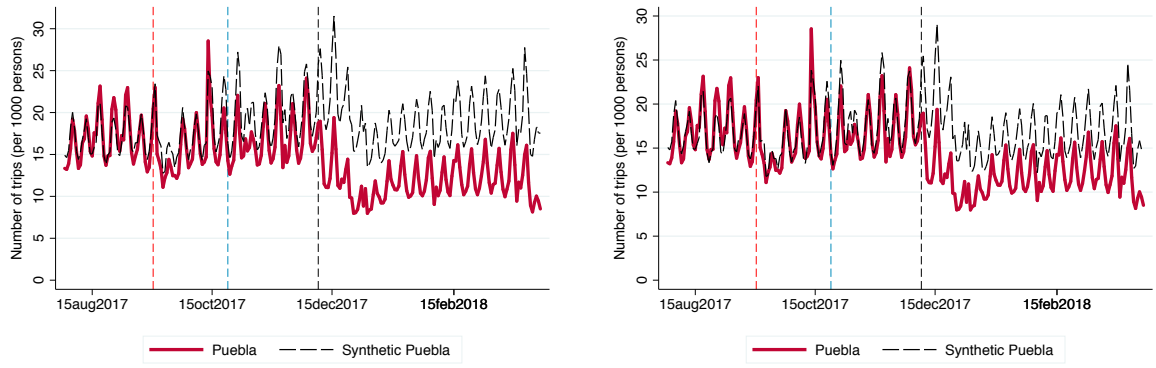
Note: The table reports the size and the power of different test statistics. The first column, θ, reports the statistics excluding cities were promotions were implemented the week of the ban on cash in Puebla (i.e. Aguascalientes, Cuernavaca, Mazatlán, Torreón). The second column, θ_{all}, includes all the cities. The ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	θ	θ_{all}
1	0.0690*	0.0938*
2	0.0345**	0.0312**
3	0.0345**	0.0312**
4	0.0714*	0.0625*
5	0.0714*	0.0625*
6	0.0690*	0.0938*
7	0.0690*	0.0938*
8	0.0690*	0.0625*
9	0.0690*	0.0625*
10	0.0690*	0.0625*
11	0.0345*	0.0312*

C.1.3 Additional Results

Figure C1: Puebla: Synthetic Control - Trips

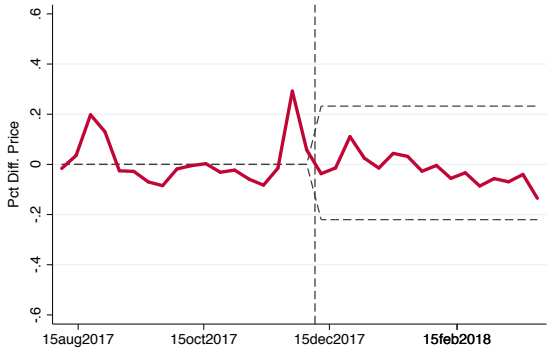
(a) Murder (b) Announcement of the Ban



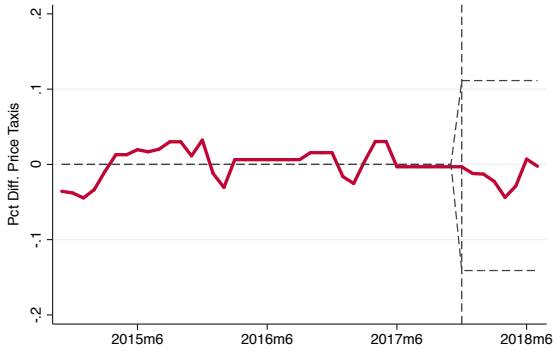
Note: The figure show the evolution of daily trips per 1000 persons in the city of Puebla (red line) and the evolution of trips of the synthetic city constructed using the synthetic control method (dotted black line). The construction of synthetic Puebla shown in panel (a) uses only data prior to September 15th (dotted red line), the day a student was murdered in Puebla. The construction of synthetic Puebla shown in panel (b) uses only data prior to October 31st (dotted blue line), the announcement of the ban on cash.

Figure C2: Puebla Synthethic Control - ETA and Prices of Taxis

(a) ETA



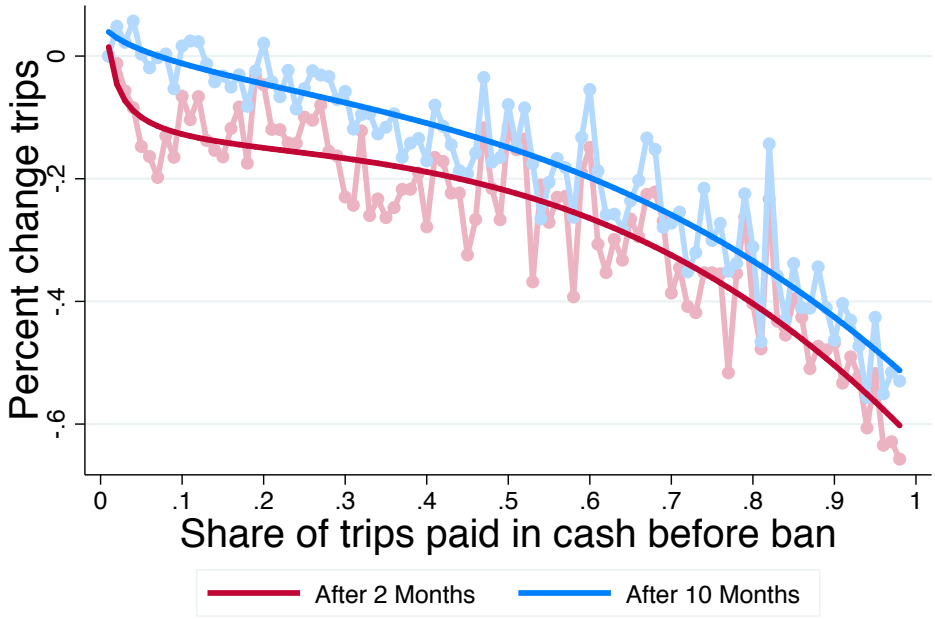
(b) Prices of Taxis



Note: Panel (a) shows the percent difference in estimated time of arrival (ETA) between the data of Puebla and the synthetic Puebla constructed using the synthetic control method. The frequency of the data is weekly. Panel (b) shows the percent difference in the price of taxis between the data of Puebla and the synthetic Puebla constructed using the synthetic control method. The frequency of the data is monthly. The prices are those collected for the construction of the Mexican CPI, the sample includes the 14 cities with Uber services that also collect the average price of taxis. The gray dotted lines in both panels show the 95% confidence interval computed using permutation tests as in Firpo and Possebom (2018).

C.2 Mixed Users

Figure C3: Puebla: Intensive Margin Adjustment to Ban given Past Cash Intensity - Short and Long Run



Note: The figure shows the change in the average weekly trips of mixed users two months after the ban (red line) and ten months after the ban on cash (blue line) as a function of the share of cash fares of different users before the ban. Mixed users are defined as those whose share of cash fares before the ban was between 1% and 99%. The panel plots the coefficient of β_k estimated using equation (4) for different shares of cash (indexed by k). The users considered are those that were active in 2017, the year before the ban on cash, and that had at least 10 trips that year.

Table C2: Puebla: Change in the Number of Trips (Mixed Users)

Note: The table reports the results of estimating equation (4) using the change in average weekly trips (before and after the ban) as dependent variable. The sample considers all mixed users, including those not observed after the ban. Mixed users are defined as those that had used both payment methods before the ban. The regression is at the user level and includes controls for the log total fares before the ban and for the entry cohort of the user. Column (1) does not restrict the minimum number of trips a user must have taken to enter the sample. Column (2)-(4) considers only users with a certain minimum of trips before and after the ban. The ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Δ Trips				
Share cash (t-1)	-0.292***	-0.314***	-0.336***	-0.377***
	(0.012)	(0.012)	(0.013)	(0.015)
Log fares (t-1)	-0.019***	0.031***	0.027***	0.017***
	(0.003)	(0.003)	(0.004)	(0.005)
Observations	128,135	117,875	106,482	82,135
R-squared	0.034	0.040	0.040	0.040
Cohort	Yes	Yes	Yes	Yes
Min. Trips	No	At least 3	At least 5	At least 10

Table C3: Puebla: Change in the Number of Trips in Credit (Mixed Users)

Note: The table reports the results of estimating equation (4) using the change in average weekly trips paid in credit (before and after the ban) as dependent variable. The sample considers all mixed users, including those not observed after the ban. Mixed users are defined as those that had used both payment methods before the ban. The regression is at the user level and includes controls for the log total fares before the ban and for the entry cohort of the user. Column (1) does not restrict the minimum number of trips a user must have taken to enter the sample. Column (2)-(4) considers only users with a certain minimum of trips before and after the ban. The ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Δ Trips Credit				
Share cash (t-1)	0.834***	0.784***	0.743***	0.678***
	(0.016)	(0.016)	(0.017)	(0.020)
Log fares (t-1)	0.084***	0.134***	0.127***	0.109***
	(0.004)	(0.004)	(0.004)	(0.005)
Observations	128,135	117,875	106,482	82,135
R-squared	0.033	0.037	0.035	0.030
Cohort	Yes	Yes	Yes	Yes
Min. Trips	No	At least 3	At least 5	At least 10

Table C4: Puebla: Probability of Returning After Ban (Mixed Users)

Note: The table reports the results of estimating equation (4) using an indicator that equals one if the user had trips before and after the ban. The regression is at the user level and includes controls for the log total fares before the ban and for the entry cohort of the user. The sample of users includes pure cash users and mixed users (defined as those that had used both payment methods before the ban). Column (1) does not restrict the minimum number of trips a user must have taken to enter the sample. Column (2)-(4) considers only users with a certain minimum of trips before and after the ban. The ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Survived				
Share cash (t-1)	-0.235***	-0.235***	-0.235***	-0.239***
	(0.004)	(0.004)	(0.004)	(0.004)
Log fares (t-1)	0.066***	0.066***	0.066***	0.057***
	(0.002)	(0.002)	(0.002)	(0.002)
Observations	98,044	98,044	98,044	94,353
R-squared	0.083	0.083	0.083	0.076
Cohort	Yes	Yes	Yes	Yes
Min. Trips	No	At least 3	At least 5	At least 10

Table C5: Puebla: Change in the Number of Trips (Mixed Users - Intensive Margin)

Note: The table reports the results of estimating equation (4) using the change in average weekly trips (before and after the ban) as dependent variable. The sample considers only users that had trips before and after the ban. The regression is at the user level and includes controls for the log total fares before the ban and for the entry cohort of the user. Column (1) does not restrict the minimum number of trips a user must have taken to enter the sample. Column (2)-(4) considers only users with a certain minimum of trips before and after the ban. The ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Δ Trips				
Share cash (t-1)	0.086***	0.011*	-0.031***	-0.075***
	(0.005)	(0.006)	(0.006)	(0.007)
Log fares (t-1)	-0.252***	-0.302***	-0.328***	-0.370***
	(0.002)	(0.002)	(0.002)	(0.002)
Observations	227,609	175,768	148,132	103,242
R-squared	0.174	0.196	0.219	0.260
Cohort	Yes	Yes	Yes	Yes
Min. Trips	No	At least 3	At least 5	At least 10

Table C6: Puebla: Change in the Number of Trips in Credit (Mixed Users - Intensive Margin)

Note: The table reports the results of estimating equation (4) using the change in average weekly trips paid in credit (before and after the ban) as dependent variable. The sample considers only users that had trips before and after the ban. The regression is at the user level and includes controls for the log total fares before the ban and for the entry cohort of the user. Column (1) does not restrict the minimum number of trips a user must have taken to enter the sample. Column (2)-(4) considers only users with a certain minimum of trips before and after the ban. The ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Δ Trips Credit				
Share cash (t-1)	1.964***	2.045***	2.030***	1.968***
	(0.008)	(0.007)	(0.007)	(0.007)
Log fares (t-1)	-0.216***	-0.225***	-0.243***	-0.286***
	(0.002)	(0.002)	(0.002)	(0.003)
Observations	138,033	113,607	98,312	71,719
R-squared	0.593	0.621	0.633	0.644
Cohort	Yes	Yes	Yes	Yes
Min. Trips	No	At least 3	At least 5	At least 10

C.3 Probability of Returning After the Ban

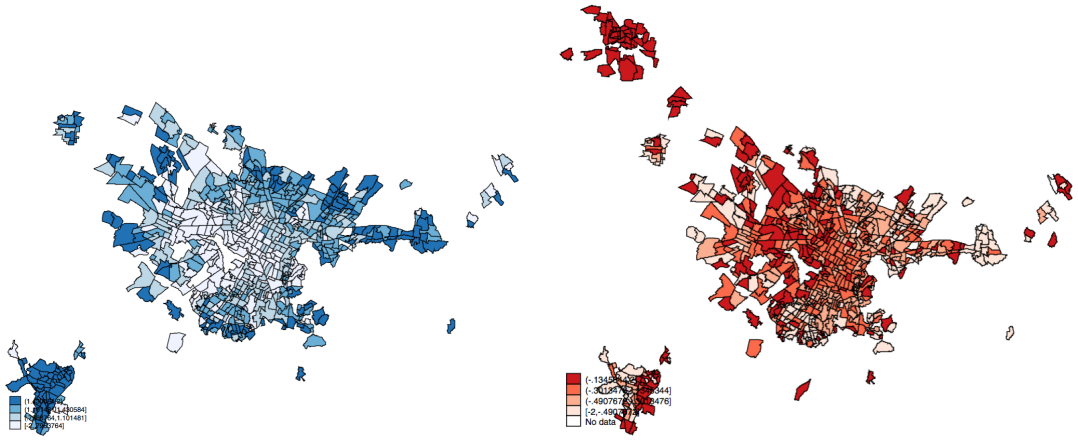
Figure C4: Probability of Returning After the Ban - Income and Banking Services

Note: The figure shows the probability of users' using the application again after the ban on cash in the city of Puebla as a function of the income per capita, debit cards per capita , credit cards per capita, and ATMS per capita in each municipality in the city of Puebla. The users are those that took trips in October and November of 2017. The data on debit cards, credit card, and ATMs comes from the Financial Inclusion Database (BDIF). The figure shows the average for 2017. The income data comes from Inter-censal Survey of 2015.

C.4 Maps

Figure C5: Puebla: Changes in Trips (Introduction and Ban of Cash)

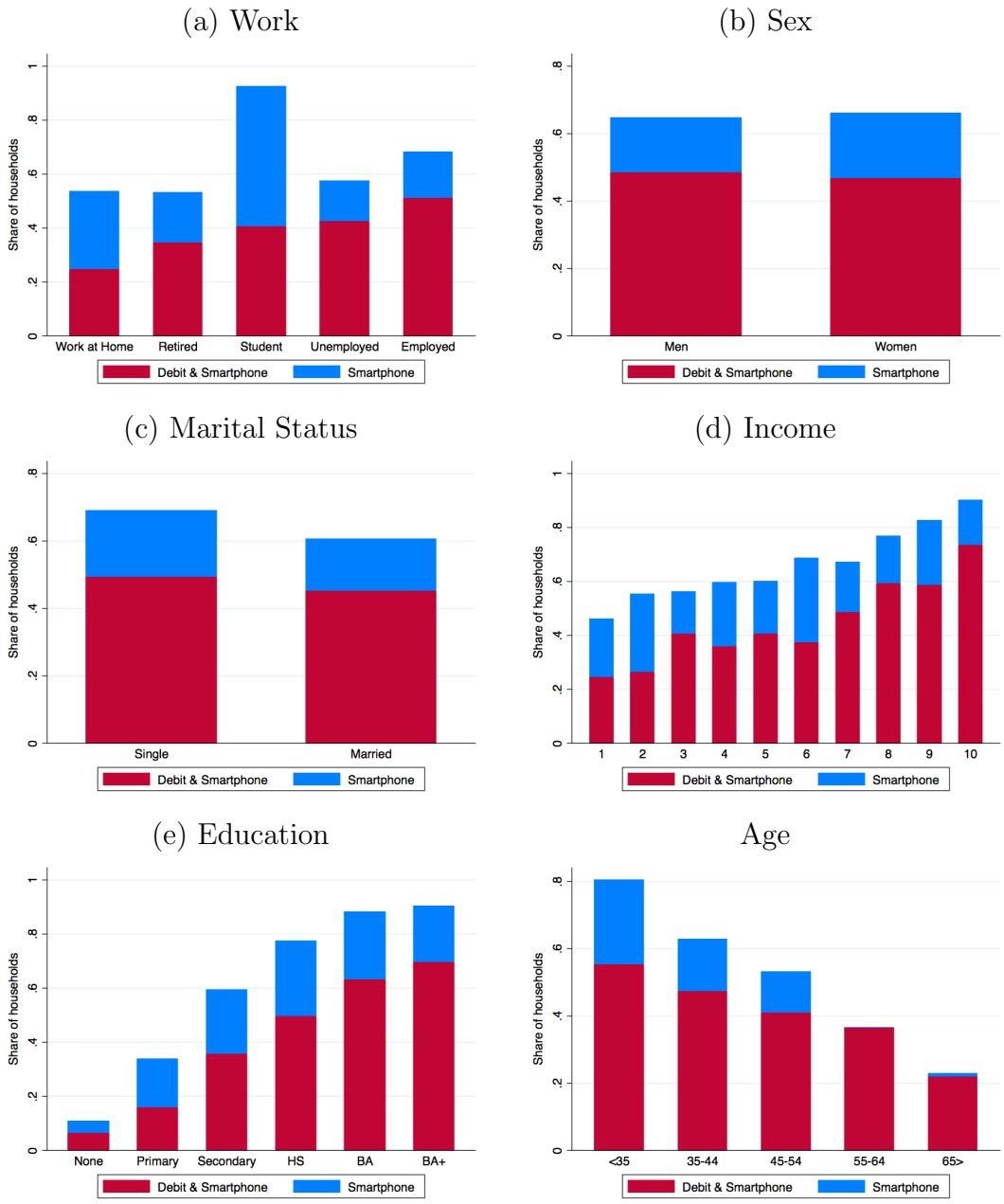
(a) Introduction of Cash (b) Ban of Cash



Note: The figure shows the changes in percent change in the number of trips in each basic geostatistical area of Puebla. The map on the left shows the changes in the number of trips before and after the introduction of cash (2016-2017). The map on the right shows the changes in the number of trips before and after the ban on cash (2017-2018).

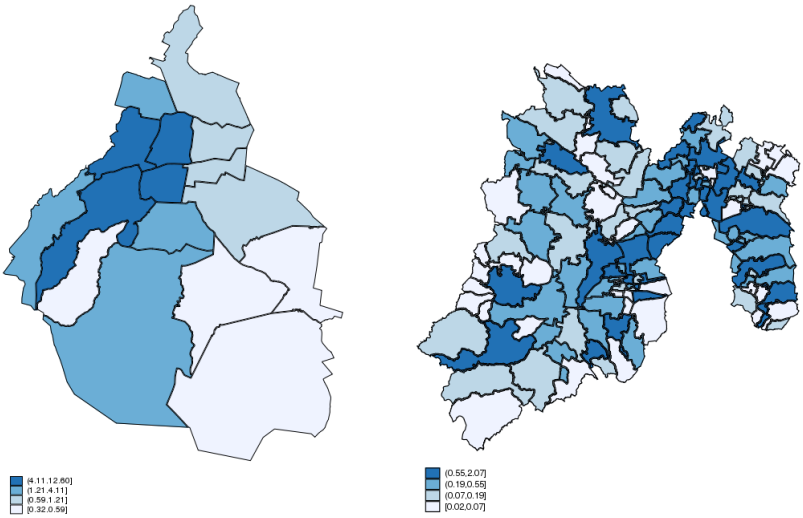
D Demographics in Mexico

Figure D1: Availability of Debit Card and Smartphone



Note: The figure shows the share of households in Mexico who have used a debit card in the last three months (from the time they were surveyed) and that own a smartphone by work status. The data comes from the 2015 National Survey of Financial Inclusion (ENIF).

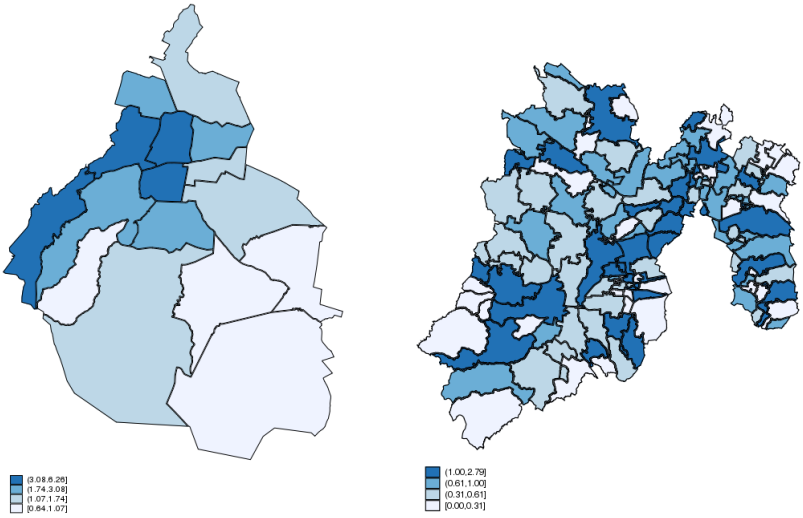
Figure D2: Debit Cards per Capita by Municipality



(a) Mexico City (b) State of Mexico

Note: Figure maps the number of debit cards per inhabitant by municipality in 2017. Darker colors represent a higher number of debit cards per capita. Data come from the Financial Inclusion Databases from the National Banking and Securities Commission.

Figure D3: Bank Branches per 10,000 Inhabitants by Municipality



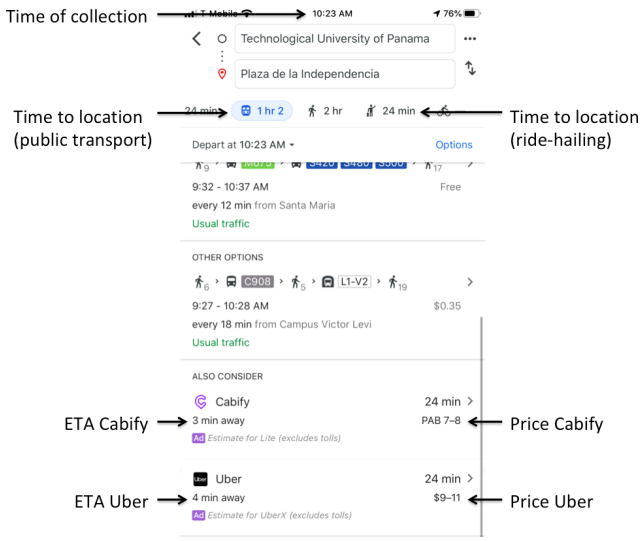
(a) Mexico City (b) State of Mexico

Note: Figure maps the number of bank branches per 10,000 inhabitants by municipality in 2017. Darker colors represent a higher number of branches per capita. Data come from the Financial Inclusion Databases from the National Banking and Securities Commission.

E Additional Data Sets

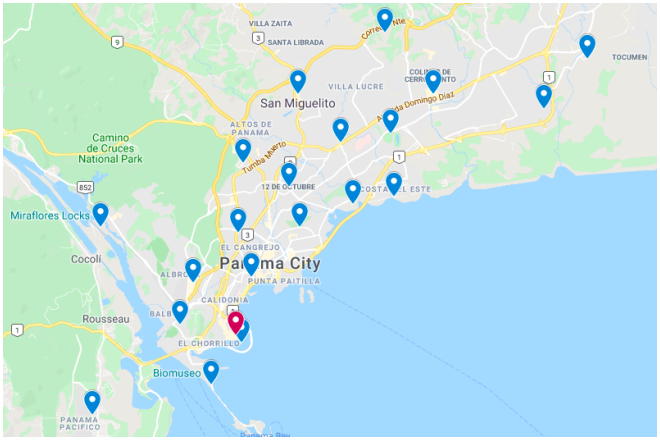
E.1 Google Maps: Panama

Figure E1: Google Maps: Application and Location of Trips



Note: The figure shows the information displayed and collected by use using Google Maps. The figure shows that, after specifying a given location and destination, Google Maps displays the following information: time of collection, time to location (in public transport or taxi), Uber price, Cabify Price, Uber ETA, and Cabify ETA.

Figure E2: Google Maps: Application and Location of Trips



Note: The figure shows the location in the map of the 20 different addresses across Panama City we use to collect data. The data was gathered specifying each of the blue pins as origin address and the red pin as destination address.

E.1.1 List of Addresses

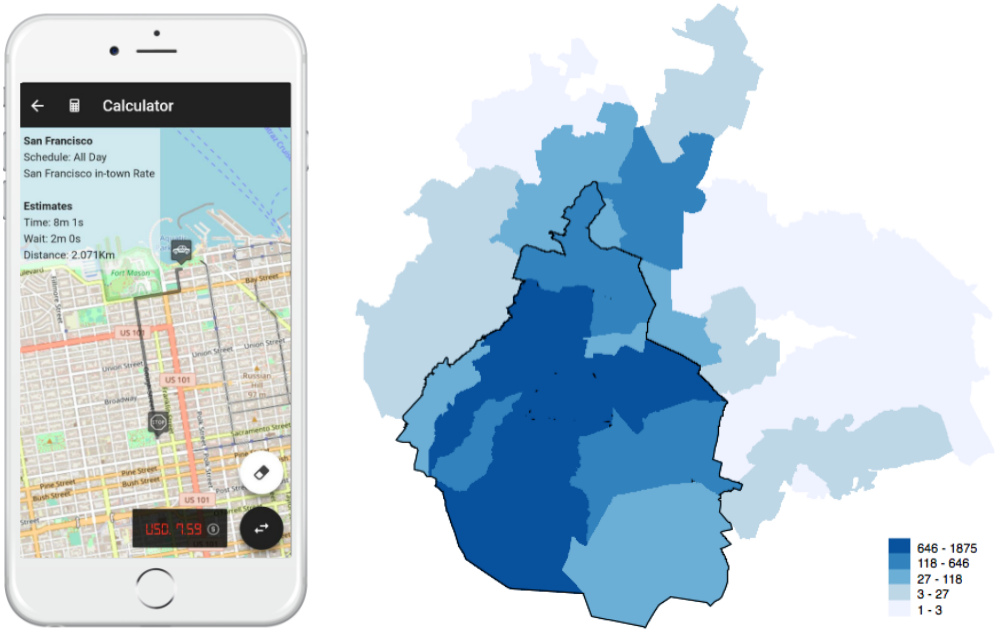
The destination address ("To") was in every case "Plaza de la Independencia, Calle 5a Este, Panama City, Panama", the red pin in Figure E2. The origin addresses (blue pins in Figure Figure E2) were the following:

1. Aeropuerto Internacional Panama Pacifico, Avenida Mulvehill, Panama
2. Miraflores Locks, Panama City, Panama
3. Panama Viejo, Via Cincuentenario, Panama City, Panama
4. Tocumen International Airport, Avenida Domingo Diaz, Panama City, Panama
5. Metromall Panama, Avenida Domingo Diaz, Panama City, Panama
6. Biomuseo, amador Causeway, Panama City, Panama
7. Weil Art Gallery, Calle 48, Panama City, Panama
8. Technological University of Panama, Panama City, Panama
9. Albrook Mall, Panama City, Panama
10. Recreational Park Omar Torrijos, Via Porras, Panama City, Panama
11. Estadio Rommel Fernandez Gutierrez, Calle 121 Este, Panama City, Panama
12. Avenida Paseo del Mar, Panama City, Panama
13. Plaza Edison, Via Ricardo J. Alfaro, Panama City, Panama
14. International School of Panama, Panama City, Panama
15. Los Andes Mall, Transistmica, San Miguelito, Panama
16. Ministerio Publico San Miguelito, San Miguelito, Panama
17. Municipality of Panama, Jarwin Street, Panama City, Panama
18. Riviera de Don Bosco Park, Calle 7ma, Panama City, Panama
19. 12 de Octubre, Panama City, Panama
20. Plaza de Francia, Calle 2a Oeste, Panama City, Panama

E.2 EC Taximeter

Figure E3: EC Taximeter: Application and Location of Trips

(a) Application (b) Total Trips



Note: Panel (a) shows the information displayed by EC Taximeter after a user requests a ride. Panel (b) shows the total number of trips in the Greater Mexico City area, where darker colors represents areas with more trips.

E.3 Other Data

Financial Inclusion Database (BDIF)

The Financial Inclusion Databases (BDIF in Spanish) from the National Banking and Securities Commission (CNBV) consist on quarterly data gathered from commercial banks and other financial entities related to financial inclusion. The databases include variables such as bank branches, ATMs, point-of-sale terminals (POS), bank accounts and debit and credit cards. Data is disaggregated at the state and municipality level. The data gathered for this paper corresponds to the period 2012-2017.

National Survey of Household Income and Expenditure (ENIGH)

The National Survey of Household Income and Expenditure (ENIGH in Spanish) is a biannual household survey representative at the National level gathered by the National Institute of Statistics and Geography (INEGI). It gives information on the characteristics of housing units and socio-demographic and economic characteristics of the household members. It provides detailed information about expenditures, such as the type of goods purchased and the method

of payment, which are gathered using a diary. We use the latest survey corresponding to 2016.

National Survey of Financial Inclusion (ENIF)

The National Survey of Financial Inclusion (ENIF in Spanish) is a triannual household survey representative at the National level gathered by INEGI. It provides information about access and use of payment methods, saving products, loans and other financial products. We use the latest survey corresponding to 2016.

Census and Inter-censal Survey

The Census of Population and Housing Units is conducted every 10 years by INEGI—with the latest data available corresponding to 2010. It provides information about housing units and socio-demographic characteristics of households and individuals. Some population variables are publicly available at the block level (which is the lowest level of aggregation). The Intercensal Surveys are carried to update some socio-demographic information at the midpoint between censuses. It provides information at the municipality level and at the town level for towns with population bigger than 50 thousand people.

National Statistical Directory of Economic Units (DENUE)

The National Statistical Directory of Economic Units (DENUE) provided information on identification, location, economic activity and size the universe of active economic units in Mexico. The data allow the identification of the economic units by the type of juridical organization (individual or legal entity), by its economic activity and/or by its size (stratum of employees), as well as locating them in the Mexican territory by regions, localities, blocks and streets. The Directory also provides the geographical coordinates for the location of establishments.

National Employment Survey (ENOE)

The National Employment Survey (ENOE), conducted by the National Institute of Statistics and Geography (INEGI), is the main source of statistical information on occupational characteristics of the population nationwide. The data gathered by the survey on a quarterly basis and it is representative at the level of locations of less than 2.500 inhabitants. The economically active population, used as control in some of our estimations, includes people who during the reference period carried out or had an economic activity (employed population) or actively sought to carry out one at some moment of the month prior to the day of the interview (unemployed population).

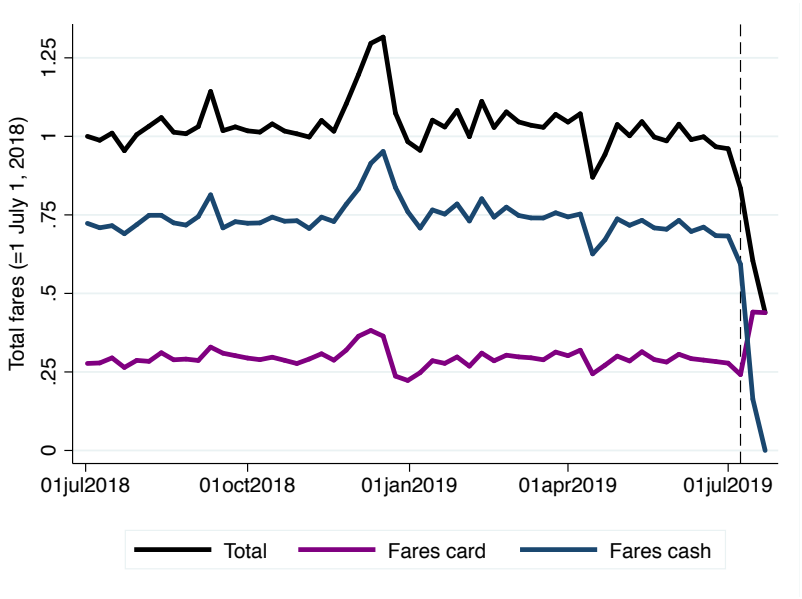
Precipitation Data

The Precipitation Data are gathered on a daily basis by the National Water Comission (CONAGUA). The database used in this project contains daily precipitation levels, between 2013-2018, for each group of pluviometric stations integrated by the Hydrological Information System (SIH). A group of pluviometric stations is identified by a geographical coordinate (i.e., latitude and longitude).

F Ban on the Use of Cash: San Luis Potosí

The Transportation Law in San Luis Potosí prohibits ride-hailing companies from receiving payments in cash. Uber had requested a suspension of the established norm but a judged did not grant the suspension and, as a result, cash was turn off from the application on July 17th 2019. Figure F1 shows the evolution of the total fares paid in San Luis Potosí by payment method. Importantly, before the ban on cash, around 75% of total fares in the city were paid for in cash. The week after the ban on cash, as the total cash fares dropped to zero, the fares paid in credit increased 60%; nonetheless, the total fares in the city decreased 60% after the ban.[2]

Figure F1: San Luis Potosí: Total Fares by Payment Method



Note: The figure shows the evolution of the fares paid by users in the city of San Luis Potosí. The black line shows the total fares, the purple line shows those paid in card, and the blue the cash fares. The dotted lines show the date of the ban on cash as a payment method in the city. Total fares are normalized to equal 1 on July 1st 2018.

[2]Unfortunately, the ban took place at the end of the time periods covered by our data; we are thus unable to extend the figure to more recent periods.

G Details on the Rider's Model

G.1 CES Sub-utility for Means of Payments Choice

Let $H(a,c) = \left[\alpha^{\frac{1}{\eta}} c^{\frac{\eta-1}{\eta}} + (1-\alpha)^{\frac{1}{\eta}} a^{\frac{\eta-1}{\eta}}\right]^{\frac{\eta}{\eta-1}}$ so α and $1-\alpha$ are the share of rides in credit and cash when both prices are the same. In this case, p_a denotes the price of trips paid in cash and p_c the price of trips paid in credit. The parameter η is the elasticity of substitution. The optimal credit and cash trips, which minimize expenditure subject to obtaining one util of composite trips are:

$$c(p_a,p_c) = c\left(\frac{p_a}{p_c},1\right) = \alpha\left[\alpha + (1-\alpha)\left(\frac{p_a}{p_c}\right)^{1-\eta}\right]^{\frac{\eta}{1-\eta}}$$

$$a(p_a,p_c) = a\left(\frac{p_a}{p_c},1\right) = (1-\alpha)\left[\alpha\left(\frac{p_c}{p_a}\right)^{1-\eta} + (1-\alpha)\right]^{\frac{\eta}{1-\eta}}$$

Note that $c(p,p) = \alpha$ and $a(p,p) = 1-\alpha$, i.e. α and $1-\alpha$ are the shares at equal prices. The ideal price index is:

$$\mathbb{P}(p_a,p_c) = \left[\alpha p_c^{1-\eta} + (1-\alpha)p_a^{1-\eta}\right]^{\frac{1}{1-\eta}}$$

We normalize the units of a trip so that when both means of payments are available, the price of a trip is 1, i.e. we normalize the length of rides so that prices before the ban are $p_a = p_c = 1$.

G.2 Exponential Utility for Composite Rides

Let denote the aggregate composite trips by x. Assume that:

$$U(x) = -k\exp\left(-\left(x+\bar{x}\right)/k\right)$$

We are interested in:

$$U'(x) = P$$

or

$$\exp\left(-\left(x+\bar{x}\right)/k\right) = P \text{ or } -\left(x+\bar{x}\right)/k = \log P \text{ or } x = -k\log P - \bar{x}$$

In general:

$$X(P) = -k\log P - \bar{x}$$

The choke point is:

$$X(\bar{P}) = 0 = -k \log \bar{P} - \bar{x} \text{ or } \log \bar{P} = -\bar{x}/k$$

Demand, Choke price and elasticity. Note we can write:

$$X(P) = -k \log P + k \log \bar{P} \tag{23}$$

so that the intercept divided by the slope is the choke point. Also note:

$$-P \frac{\partial X(P)}{\partial P} = k$$

thus

$$-\frac{P}{X(P)} \frac{\partial X(P)}{\partial p} = \frac{k}{k \log(\bar{P}/P)} = \frac{1}{\log(\bar{P}/P)} \text{ or}$$
$$\bar{P}/P = \exp\left(\frac{1}{-\frac{P}{X(P)} \frac{\partial X(P)}{\partial P}} \right)$$

We can define the elasticity as:

$$\epsilon(P) \equiv -\frac{P}{X(P)} \frac{\partial X(P)}{\partial P}$$

$$\bar{P}/P = \exp\left(\frac{1}{\epsilon(P)} \right)$$

G.3 Total Trips Before and After the Ban

When both means of payments are available, total trips $T = X(1) = k \ln \bar{P}$. This is because the total demand for trips paid in credit is $\tilde{c}(1,1) = \alpha X(1)$ and the total demand for trips paid in cash is $\tilde{a}(1,1) = (1-\alpha)X(1)$ so that $T = \tilde{c}(1,1) + \tilde{a}(1,1) = X(1)$.

During the ban on cash payments, $\tilde{a}(\infty, 1) = 0$ and the total trips $T = \tilde{c}(\infty, 1)$ where

$$\tilde{c}(\infty,1) = \begin{cases} k\alpha^{\frac{1}{1-\eta}} \left[\log\left(\frac{\bar{P}}{\alpha^{\frac{1}{1-\eta}}} \right) \right] & \text{if } \alpha^{\frac{1}{1-\eta}} < \bar{P} \\ 0 & \text{otherwise} \end{cases}$$

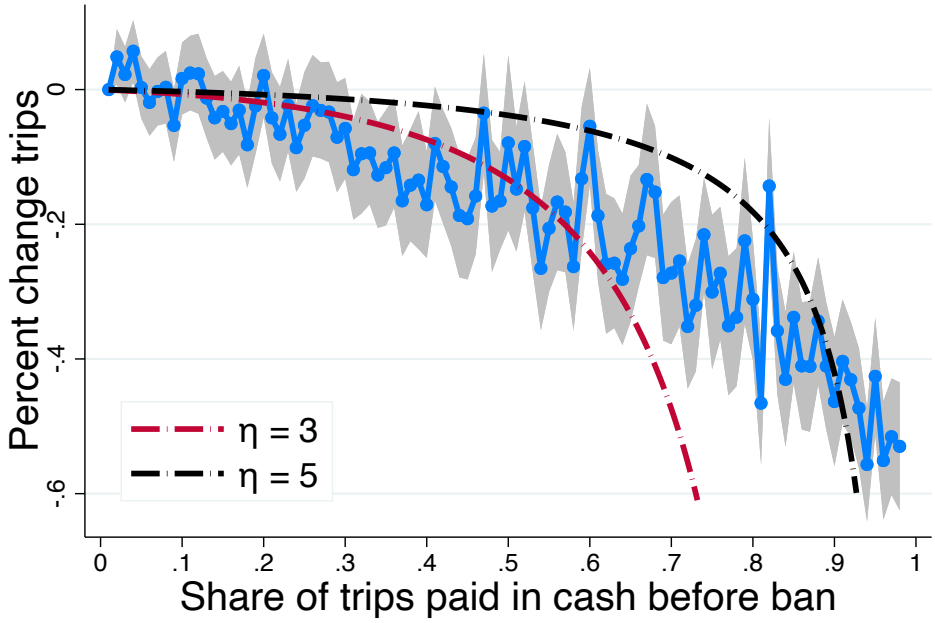
Then the change in total trips before and after the ban on cash can be written as:

$$\Delta T = \frac{T(\infty,1)}{T(1,1)} = \alpha^{\frac{1}{1-\eta}}\left(1 - \frac{\epsilon}{1-\eta}\ln\alpha\right)$$

where we use that $\epsilon(1) = k/X(1) = 1/\log\bar{P}$.

G.4 Elasticity of Substitution η

Figure G1: Puebla: Intensive Margin Adjustment to Ban given Past Cash Intensity - Model Prediction



Note: The figure shows the change in the average weekly trips of mixed users ten months after the ban on cash (blue line) as a function of the share of fares paid in cash of different users before the ban. Mixed users are defined as those whose share cash fares before the ban was between 1% and 99%. The panel plots the coefficient of β_k estimated using equation (4) for different cash shares (indexed by k). The users considered are those that were active in 2017, the year before the ban on cash, and that had at least 10 trips that year. The dashed lines show the model predicted change in the average weekly trips of mixed users for different elasticities of substitution, η. The red dashed line show the predictions for $\eta = 3$ and the black line for $\eta = 5$.

We then use the information of the ban on cash in Puebla and the estimates of the elasticity of demand reported by Alvarez and Argente (2020) (i.e. ϵ=1.1) to approximate η, the elasticity of substitution between paying for trips in cash versus credit. Figure G1 shows the predictions of the model for different values of η and the estimates of the change in trips for mixed users in Puebla. Recall that the coefficients presented in the figure are estimated using data ten

months after the ban on cash, so we consider the estimates of η as the long-run elasticity of substitution. The figure shows that, values of η between 3 and 5 are consistent with the evidence of the ban on cash in Puebla particularly since Figure C3 shows evidence that the elasticity of substitution two months after the ban on cash (medium-run elasticity) is smaller than the long-run elasticity.

References

Alvarez, F., Argente, D., 2020. Consumer surplus of alternative payment methods: Paying uber with cash .

Firpo, S., Possebom, V., 2018. Synthetic control method: Inference, sensitivity analysis and confidence sets. Journal of Causal Inference 6.