Online Appendix for "Effectiveness of Product Recommendations under Time and Crowd Pressures

Kohei Kawaguchi* Kosuke Uetake† Yasutora Watanabe‡

July 2018

Accepted at *Marketing Science*

*Department of Economics, School of Business and Management, Hong Kong University of Science and Technology: kkawaguchi@ust.hk

†Marketing Department, Yale School of Management: kosuke.uetake@yale.edu

‡Faculty of Economics, University of Tokyo: yasutorawatanabe@gmail.com

References

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A More Details on the Background Information

In this section, we report some details on price and category-level market shares.

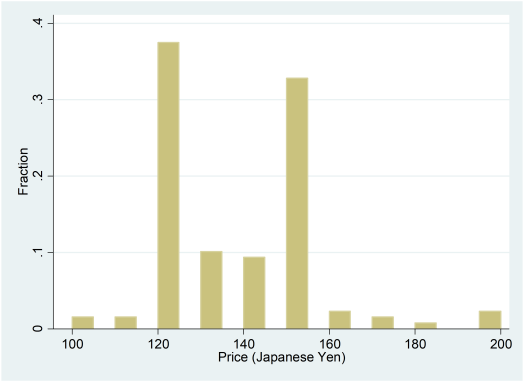

Figure A.1: Distribution of Price: The graph shows the distribution of price of a beverage. The unit is Japanese yen (approximately, $\$1 = 100$ yen).

Figure A.1 shows the price distribution of all available products. The prices of all products remain unchanged through the sample period. The price distribution ranges from 100 to 200 Japanese yen, but approximately 70% of products are priced at either 120 or 150 Japanese yen. Beverages in a small can (350 ml) are typically sold at 120 Japanese yen, whereas those in a large plastic bottle (500 ml) are sold at 150 Japanese yen. Some seasonal beverages with special flavor or taste are sold at a higher price than that of regular products, such as 200 Japanese yen. Figure A.1 illustrates limited price variation across products, indicating that the price of most products are determined by package size.

Figure A.2 reports market shares by category. The company categorizes each product into 1 of 11 categories. This distribution in our sample is similar to that of the entire beverage industry, including other channels such as supermarkets and convenience stores.[1] Hence, the consumer preference in our sample (i.e., customers who purchase from particular types

[1]The market shares in the Japanese beverage industry by categories are as follows: soda (18%), tea (28%), water (14%), and coffee (15%). See the following website for details, http://www.ccwest.co.jp/pdf/ir/annualreview/ccw/an_2012_06.pdf

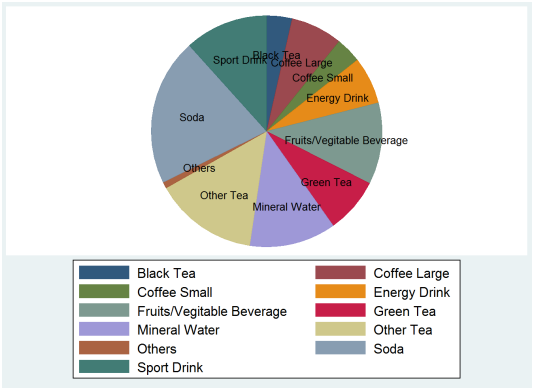

Figure A.2: Market Share by the Types of Drink.

of vending machines) might not differ significantly from that in the overall beverage market.

B Validity Check

In this section, we present the validity check for the variables used in our estimation, which we intend to capture the time and crowd pressures that consumers may experience when making purchase decisions in front of vending machine. Since time and crowd pressures are not directly observed in the data, we use the time until the next train's arrival as a main proxy for time pressure and number of passengers on the platform as proxy for crowd pressure. The validity check is to show that these proxies are meaningful for the purpose of this study.

Our validity checks follow the standard procedure used in the behavioral psychology literature. We conducted a series of experiments, where the subjects are expected to purchase beverages, as we will explain below. At the time of purchase, subjects respond to the survey question asking how they felt about the time and crowd pressures.

We first investigate our proxy variable for time pressure. We are interested in whether the time to the next train arrival correlates with the extent of the subjects' time pressure. For this, we recruited 29 undergraduate students from Hitotsubashi University in Tokyo. The experiment was conducted as follows (Online Appendix B provides the instructions and survey ques-

tionnaire given to the subjects):

1. The subjects were instructed to take a train from a particular station and to return to the station by taking a particular route, (which we call a trip hereafter). The subjects received a monetary payment that decreased as the time passed until they came back to the university.

2. During a trip, a subject was asked to purchase one beverage from each of three vending machines placed at three different stations on the route that each subject was instructed to take. These vending machines were the ones used in our main experiment. When each subject purchased a beverage, he/she was asked to record the time to the next train arrival; this was displayed on a board in the platform.

3. Each subject was also asked to complete a small task, such as to take a photo of every station during the trip. The purpose of assigning such small tasks is to ensure that the subjects took the route as instructed.

4. Once the subject returned to the university, he/she answered the survey questions, where they rated the degree of time pressure they felt.

We also confirm the validity of our proxy variable for crowd pressure. As in the previous experiment, we recruited 52 undergraduate students of Hitotsubashi University. The experiment was conducted as follows.

1. A subject was instructed to take a train from a particular station and to return by taking a particular route. The subjects traveled to these vending machines in groups of two, three, and four.

2. During the trip, each subject was asked to purchase one beverage from each of three vending machines placed at three different stations on the route that each subject was instructed. Those vending machines were also used in our main experiment. When each

subject purchased a beverage, he/she was asked to record the number of people around at the time of purchase.

3. Each subject was also asked to complete a small task such as to take a photo of every station during the trip. The purpose of assigning such small tasks was to ensure that the subjects took the route as instructed.

4. Once the subject returned to the university, he/she was instructed to provide their observations on how other subjects made their choices. They also answered the survey questions on the degree of their care about the people around them when making purchases.

Table A.1 reports the summary statistics of the subjects' answers to the survey questions Q1–Q4 and on two measures that we use as proxies for time and crowd pressures, respectively. We drop the observations with missing values from our analysis to have 86 observations in the first validity experiment and 144 in the second. Note that each subject made multiple purchases. On average, the subjects had to wait about three minutes until the next train arrived. The average degree of time pressure they felt was 5.36 out of 10 for the first question and 3.35 out of 5 for the second question, but they vary significantly by subject. As for crowd pressure, there were about 8 people around the subjects when they made a purchase and the average degree of crowd pressure was 3.92 out of 5 for the third question and 1.80 out of 10 for the fourth question, but again they varied significantly by subject.

In order to see whether the time to the next train works as a proxy for time pressure, we regress the recorded responses of subjects to Q1 and Q2 on the time to the next train. Similarly, in order to examine whether the number of people around would be a good proxy for pressure from the existence of other people around, we regress the recorded responses to Q3 and Q4 on the number of people around subjects at the time of purchase. We also include individual fixed effect in the regression.[2]

[2]The raw correlation between Q3, Q4 and the time pressure measure are 0.25 and 0.20 (both statistically significant), respectively.

	Obs	Mean	Std. Dev	Min	Max
Time to next train	86	3.23	2.33	0	11
Q1	86	5.36	3.05	0	10
Q2	86	3.35	1.37	1	5
# of people around	144	7.61	6.12	1	30
Q3	144	3.92	1.05	1	5
Q4	144	1.80	1.89	0	8

Table A.1: Summary Statistics for the Variables Used in Validity Check.

The following table reports the regression results. The first two columns report the results of the validity check for time pressure. For both questions, the coefficient on the time to next train is negative and statistically significant at the 1% level. Thus, the subject experienced more time pressure from the shorter time to the next train. The third and fourth columns report the results of the validity check for crowd pressure. For both questions, the coefficients are positive and statistically significant at the 1% level. Thus, the subjects felt more pressure from the presence of others when more people are around.

	Q1	Q2	Q3	Q4
Time to next	-0.75***	-0.29***		
	(-6.01)	(-5.01)		
# of people around			0.11***	0.06***
			(4.22)	(3.66)
Constant	6.15***	4.58***	3.94***	3.06***
	(4.66)	(7.38)	(5.42)	(6.65)
Individual FE	Yes	Yes	Yes	Yes
Observations	86	86	144	144
R^2	0.642	0.609	0.721	0.633

Table A.2: Regression Results on Validity Checks: t statistics are reported in parentheses. $***$ indicates statistical significance at 1% level.

In sum, the two experiments we conducted indicate that the time to the next train and number of people around at the time of purchase would be good proxy variables for time pres-

sure and crowd pressure, which we investigate in our main analysis.

C More Results

In this section, we report the estimation results that we omit in the main text. Tables A.3 and A.4 show the estimation results of the machine-level regression of equation (**??**) in which we use *crowdedness_minute_1* and *crowdedness_minute_2* for the crowdedness measure. We find that the coefficients on *machine_PR* × *crowdedness_minute_1* and *machine_PR* × *crowdedness_minute_2* are mostly positive as in the main text. Hence, crowd pressure tends to moderate the effectiveness of product recommendation.

Next, Tables A.5 and A.6 report the results for the machine-level regression with more fixed effects. The model is the same as equation (**??**), but μ_{kt} (instead of μ_k and μ_t) is included. With machine x timing fixed effects, the sign of the coefficients on *machine_PR* × *crowdedness* switched from positive to negative as we find in the main text with *crowdedness_hour* for the crowdedness measure.

Now, we report the product-level analysis results that we omit in the main text. First, Tables A.7 and A.8 report the results of the product-level regression model in equation (**??**) with *crowdedness_minute_1* and *crowdedness_minute_2* for the crowdedness measure. The results are consistent with Table **??** in the main text. We find that crowd pressure increases the choice effect of recommendations, while attenuates the spillover effect of recommendations.

Lastly, Tables report the estimation results of equation (**??**) with more fixed effects. The estimation results are reported in Tables A.11 and A.12. The estimated coefficients indicate that our results are robust to adding product x timing fixed effects.

D Robustness Checks

In this section we report the results of the robustness checks we discussed in Section 5.

	(1)	(2)	(3)
temperature	0.0795***	0.0795***	0.0787***
	(0.00315)	(0.00316)	(0.00318)
precipitation	-0.00203***	-0.00205***	-0.00213***
	(0.000372)	(0.000373)	(0.000377)
machine_PR	0.0732***	0.0722***	0.00777
	(0.00508)	(0.00524)	(0.00647)
crowdedness_minute_1	0.00754***	0.00740***	0.00491***
	(0.000465)	(0.000464)	(0.000432)
departure	0.220***		
	(0.0106)		
machine_PR × crowdedness_minute_1	0.000389*	0.000336*	0.0000968
	(0.000169)	(0.000170)	(0.000200)
machine_PR × departure	-0.0678***		
	(0.00675)		
departure_next1		0.286***	
		(0.00964)	
machine_PR × departure_next1		-0.0632***	
		(0.00734)	
time to next			-0.0831***
			(0.00250)
time to after next			-0.0595***
			(0.00284)
machine_PR × time to next			0.0126***
			(0.00142)
machine_PR × time to after next			0.00245
			(0.00138)
Constant	-3.797***	-3.808***	-2.923***
	(0.0860)	(0.0859)	(0.0870)
Observations	3399480	3399480	3146045

Table A.3: Poisson Regression Results: Machine Level, Minute Crowdedness: Standard errors are in parentheses. The standard errors are machine-level cluster robust. Machine, day, and time fixed effects are controlled.

	(1)	(2)	(3)
temperature	0.0789***	0.0790***	0.0783***
	(0.00316)	(0.00316)	(0.00319)
precipitation	-0.00187***	-0.00190***	-0.00205***
	(0.000371)	(0.000371)	(0.000375)
machine_PR	0.0651***	0.0645***	-0.00134
	(0.00511)	(0.00526)	(0.00704)
crowdedness_minute_2	0.0163***	0.0156***	0.00700***
	(0.00149)	(0.00149)	(0.00141)
departure	0.198***		
	(0.00962)		
machine_PR × crowdedness_minute_2	0.00154***	0.00142***	0.00102***
	(0.000270)	(0.000268)	(0.000289)
machine_PR × departure	-0.0669***		
	(0.00688)		
departure_next1		0.263***	
		(0.00904)	
machine_PR × departure_next1		-0.0623***	
		(0.00739)	
time to next			-0.0825***
			(0.00251)
time to after next			-0.0592***
			(0.00284)
machine_PR × time to next			0.0131***
			(0.00142)
machine_PR × time to after next			0.00309*
			(0.00141)
Constant	-3.843***	-3.851***	-2.939***
	(0.0873)	(0.0871)	(0.0891)
Observations	3399480	3399480	3146045

Table A.4: Poisson Regression Results: Machine Level, Smoothed Minute Crowdedness: Standard errors are reported in parentheses and clustered at the machine level. Machine, day, and time fixed effects are controlled.

	(1)	(2)	(3)
temperature	0.0783***	0.0784***	0.0770***
	(0.00297)	(0.00298)	(0.00304)
precipitation	-0.00275***	-0.00275***	-0.00284***
	(0.000362)	(0.000362)	(0.000371)
machine_PR	0.0765***	0.0757***	0.00665
	(0.00499)	(0.00511)	(0.00586)
crowdedness_minute_1	0.00939***	0.00925***	0.00643***
	(0.000514)	(0.000512)	(0.000434)
departure	0.212***		
	(0.0102)		
machine_PR × crowdedness_minute_1	-0.000180	-0.000236	-0.000553**
	(0.000169)	(0.000172)	(0.000205)
machine_PR × departure	-0.0724***		
	(0.00616)		
departure_next1		0.281***	
		(0.00927)	
machine_PR × departure_next1		-0.0679***	
		(0.00666)	
time to next			-0.0825***
			(0.00246)
time to after next			-0.0602***
			(0.00265)
machine_PR × time to next			0.0127***
			(0.00134)
machine_PR × time to after next			0.00331*
			(0.00130)
Constant	-3.835***	-3.851***	-2.956***
	(0.0765)	(0.0763)	(0.0789)
Observations	3399480	3399480	3146045

Table A.5: Poisson Regression Results: Machine-Level, Minute Crowdedness, Machine x Timing FE: Standard errors are in parentheses and clustered at the machine level. Day-of-week and machine x timing fixed effects are included.

	(1)	(2)	(3)
temperature	0.0784***	0.0785***	0.0771***
	(0.00299)	(0.00299)	(0.00305)
precipitation	-0.00279***	-0.00279***	-0.00284***
	(0.000364)	(0.000364)	(0.000371)
machine_PR	0.0741***	0.0732***	0.0119
	(0.00504)	(0.00512)	(0.00665)
crowdedness_minute_2	0.0308***	0.0297***	0.0172***
	(0.00227)	(0.00223)	(0.00186)
departure	0.158***		
	(0.00886)		
machine_PR × crowdedness_minute_2	-0.000877**	-0.000928**	-0.000783*
	(0.000307)	(0.000312)	(0.000313)
machine_PR × departure	-0.0567***		
	(0.00651)		
departure_next1		0.225***	
		(0.00852)	
machine_PR × departure_next1		-0.0524***	
		(0.00700)	
time to next			-0.0791***
			(0.00234)
time to after next			-0.0571***
			(0.00253)
machine_PR × time to next			0.0120***
			(0.00133)
machine_PR × time to after next			0.00278*
			(0.00131)
Constant	-3.949***	-3.959***	-3.068***
	(0.0775)	(0.0774)	(0.0811)
Observations	3399480	3399480	3146045

Table A.6: Poisson Regression Results: Machine-Level, Smoothed Miniute Crowdedness, Machine x timing Fixed Effects: Standard errors are in parentheses and are clustered at the machine level. Day-of-week and machine x timing fixed effects are included.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

	(1)	(2)	(3)
temperature	0.0802***	0.0802***	0.0802***
	(0.00306)	(0.00306)	(0.00330)
precipitation	-0.00172***	-0.00172***	-0.00218***
	(0.000353)	(0.000353)	(0.000411)
crowdedness_minute_1	0.00749***	0.00748***	0.00497***
	(0.000471)	(0.000471)	(0.000447)
machine_PR	0.0566***	0.0570***	0.0303***
	(0.00494)	(0.00496)	(0.00539)
product_PR	0.0716***	0.0710***	0.0328**
	(0.0109)	(0.0109)	(0.0120)
departure	0.211***		
	(0.0131)		
machine_PR × crowdedness_minute_1	0.000839***	0.000845***	0.000448*
	(0.000170)	(0.000171)	(0.000201)
product_PR × crowdedness_minute_1	-0.00273***	-0.00275***	-0.00281***
	(0.000426)	(0.000427)	(0.000508)
machine_PR × departure	-0.0503***		
	(0.00655)		
product_PR × departure	-0.0487***		
	(0.0132)		
departure_next1		0.214***	
		(0.0131)	
machine_PR × departure_next1		-0.0511***	
		(0.00652)	
product_PR × departure_next1		-0.0472***	
		(0.0134)	
time to next			-0.000740***
			(0.000200)
time to after next			0.0000588
			(0.000630)
machine_PR × time to next			0.000335*
			(0.000157)
machine_PR × time to after next			-0.000328
			(0.000903)
product_PR × time to next			0.000922***
			(0.000278)
product_PR × time to after next			0.000177
			(0.00171)
Constant	-7.422***	-7.422***	-7.181***
	(0.105)	(0.105)	(0.113)
Observations	108188100	108188100	81508353

Table A.7: Poisson Regression Results: Product-Level, Minute Crowdedness: Standard errors are in parentheses and clustered at the machine level. The standard errors are machine-level cluster robust. The machine, day-of-week, and time-of-week fixed effects are controlled.

	(1)	(2)	(3)
temperature	0.0794***	0.0794***	0.0794***
	(0.00307)	(0.00307)	(0.00334)
precipitation	-0.00158***	-0.00158***	-0.00211***
	(0.000351)	(0.000351)	(0.000414)
crowdedness_minute_2	0.0154***	0.0154***	0.00672***
	(0.00172)	(0.00172)	(0.00155)
machine_PR	0.0476***	0.0464***	0.0176***
	(0.00505)	(0.00509)	(0.00585)
product_PR	0.0834***	0.0827***	0.0577***
	(0.0115)	(0.0115)	(0.0141)
departure	0.191***		
	(0.0112)		
machine_PR × crowdedness_minute_2	0.00243***	0.00238***	0.00167***
	(0.000313)	(0.000311)	(0.000321)
product_PR × crowdedness_minute_2	-0.00530***	-0.00533***	-0.00487***
	(0.000896)	(0.000897)	(0.000961)
machine PR × departure	-0.0533***		
	(0.00673)		
product PR × departure	-0.0358**		
	(0.0139)		
departure_next1		0.190***	
		(0.0112)	
machine PR × departure within 1		-0.0499***	
		(0.00685)	
product PR × departure within 1		-0.0337*	
		(0.0138)	
time to next			-0.000783***
			(0.000195)
time to after next			-0.00122
			(0.000673)
machine_PR × time to next			0.000439**
			(0.000161)
machine_PR × time to after next			0.000941
			(0.000801)
product_PR=1 × time to next			0.000637*
			(0.000299)
product_PR=1 × time to after next			-0.00168
			(0.00155)
Constant	-7.460***	-7.459***	-7.169***
	(0.106)	(0.106)	(0.116)
Observations	108188100	108188100	81508362

Table A.8: Poisson Regression Results: Product-Level, Smoothed Minute Crowdedness: Standard errors are reported in parentheses and clustered at the machine level.

	(1)	(2)	(3)
temperature	0.0790***	0.0790***	0.0794***
	(0.00289)	(0.00289)	(0.00314)
precipitation	-0.00245***	-0.00245***	-0.00315***
	(0.000343)	(0.000343)	(0.000408)
size_passenger_m	0.00949***	0.00948***	0.00714***
	(0.000500)	(0.000500)	(0.000449)
machine_PR	0.0609***	0.0613***	0.0276***
	(0.00498)	(0.00499)	(0.00520)
product_PR	0.0610***	0.0604***	0.0409***
	(0.0106)	(0.0106)	(0.0114)
departure	0.202***		
	(0.0131)		
machine_PR=1 × size_passenger_m	0.000127	0.000133	-0.000437*
	(0.000178)	(0.000178)	(0.000207)
product_PR=1 × size_passenger_m	-0.00125**	-0.00127**	-0.000959*
	(0.000416)	(0.000417)	(0.000478)
tre_B_departure	-0.0583***		
	(0.00626)		
osusume_B_departure	-0.0229		
	(0.0133)		
departure_within1		0.205***	
		(0.0130)	
tre_B_departure_next1		-0.0592***	
		(0.00621)	
osusume_B_departure_next1		-0.0214	
		(0.0134)	
time to next			-0.000511**
			(0.000190)
time to after next			-0.00000369
			(0.000625)
machine_PR=1 × time to next			0.000572***
			(0.000150)
machine_PR=1 × time to after next			-0.000295
			(0.000904)
product_PR=1 × time to next			0.000410
			(0.000280)
product_PR=1 × time to after next			0.0000261
			(0.00171)
Constant	-7.479***	-7.479***	-7.131***
	(0.0969)	(0.0969)	(0.106)
Observations	108188100	108188100	81508353

Table A.9: Poisson Regression Results: Product-Level, Minute Crowdedness, Machine x Timing Fixed Effects: Standard errors are in parentheses and clustered at machine level. Day-of-week, product, and machine x timing fixed effects are included.

	(1)	(2)	(3)
temperature	0.0791***	0.0791***	0.0795***
	(0.00290)	(0.00290)	(0.00316)
precipitation	-0.00249***	-0.00248***	-0.00316***
	(0.000345)	(0.000345)	(0.000409)
crowdedness_SMOOTH	0.0302***	0.0302***	0.0197***
	(0.00263)	(0.00262)	(0.00214)
machine_PR	0.0584***	0.0588***	0.0344***
	(0.00506)	(0.00506)	(0.00591)
product_PR	0.0629***	0.0623***	0.0397**
	(0.0112)	(0.0111)	(0.0137)
departure	0.148***		
	(0.0100)		
machine_PR=1 × crowdedness_SMOOTH	-0.000506	-0.000490	-0.000974**
	(0.000340)	(0.000342)	(0.000351)
product_PR=1 × crowdedness_SMOOTH	-0.00110	-0.00112	-0.000714
	(0.000939)	(0.000938)	(0.000980)
tre_B_departure	-0.0442***		
	(0.00660)		
osusume_B_departure	-0.0256		
	(0.0140)		
departure_within1		0.150***	
		(0.0100)	
tre_B_departure_next1		-0.0452***	
		(0.00657)	
osusume_B_departure_next1		-0.0240	
		(0.0140)	
time to next			-0.000119
			(0.000174)
time to after next			0.000287
			(0.000622)
machine_PR=1 × time to next			0.000433**
			(0.000153)
machine_PR=1 × time to after next			-0.000371
			(0.000905)
product_PR=1 × time to next			0.000462
			(0.000288)
product_PR=1 × time to after next			0.0000280
			(0.00172)
Constant	-7.588***	-7.588***	-7.240***
	(0.0987)	(0.0987)	(0.108)
Observations	108188100	108188100	81508353

Table A.10: Poisson Regression Results: Product-Level, Smoothed Minute Crowdedness, Machine x Timing Fixed Effects: Standard errors are in parentheses and clustered at machine level. Day-of-week, product, and machine x timing fixed effects are controlled.

	(1)	(2)	(3)
temperature	0.0794***	0.0794***	0.0795***
	(0.00304)	(0.00304)	(0.00327)
precipitation	-0.00157***	-0.00157***	-0.00209***
	(0.000346)	(0.000346)	(0.000404)
crowdedness_hour	0.000157***	0.000157***	0.0000892***
	(0.0000122)	(0.0000123)	(0.0000116)
machine_PR	0.0437***	0.0440***	0.0191***
	(0.00495)	(0.00495)	(0.00561)
product_PR	0.139***	0.139***	0.0957***
	(0.0117)	(0.0117)	(0.0132)
departure	0.195***		
	(0.0120)		
machine_PR × crowdedness_hour	0.0000202***	0.0000204***	0.0000114***
	(0.00000315)	(0.00000317)	(0.00000345)
product_PR × crowdedness_hour	-0.0000251**	-0.0000254**	-0.0000209*
	(0.00000893)	(0.00000894)	(0.00000981)
machine_PR × departure	-0.0480***		
	(0.00662)		
product_PR × departure	-0.0534***		
	(0.0136)		
departure_within1		0.198***	
		(0.0120)	
machine_PR × departure_next1		-0.0489***	
		(0.00662)	
product_PR × departure_next1		-0.0519***	
		(0.0138)	
time to next			-0.000695***
			(0.000195)
time to after next			0.000100
			(0.000629)
machine_PR × time to next			0.000356*
			(0.000157)
machine_PR × time to after next			-0.000301
			(0.000904)
product_PR × time to next			0.000982***
			(0.000280)
product_PR × time to after next			0.000128
			(0.00170)
Constant	-7.941***	-7.941***	-7.744***
	(0.171)	(0.171)	(0.166)
Observations	108188100	108188100	81508353

Table A.11: Produce-level Poisson Regression with Hour Crowdedness and Product × Timing Fixed Effects

	(1)	(2)	(3)
temperature	0.0791***	0.0791***	0.0792***
	(0.00304)	(0.00304)	(0.00327)
precipitation	-0.00158***	-0.00158***	-0.00212***
	(0.000346)	(0.000346)	(0.000402)
crowdedness_minute_2	0.0156***	0.0155***	0.00687***
	(0.00171)	(0.00171)	(0.00154)
machine_PR	0.0420***	0.0424***	0.0147*
	(0.00505)	(0.00505)	(0.00587)
product_PR	0.141***	0.141***	0.0967***
	(0.0119)	(0.0119)	(0.0143)
departure	0.191***		
	(0.0112)		
machine_PR × crowdedness_minute_2	0.00190***	0.00192***	0.00118***
	(0.000312)	(0.000313)	(0.000326)
product_PR × crowdedness_minute_2	-0.00204*	-0.00207*	-0.00162
	(0.000877)	(0.000875)	(0.000954)
machine_PR × departure	-0.0512***		
	(0.00674)		
product_PR × departure	-0.0545***		
	(0.0142)		
departure_within1		0.193***	
		(0.0112)	
machine_PR × departure_next1		-0.0521***	
		(0.00672)	
product_PR × departure_next1		-0.0529***	
		(0.0143)	
time to next			-0.000769***
			(0.000194)
time to after next			0.0000427
			(0.000627)
machine_PR × time to next			0.000444**
			(0.000156)
machine_PR × time to after next			-0.000250
			(0.000904)
product_PR × time to next			0.000980***
			(0.000286)
product_PR × time to after next			0.000138
			(0.00170)
Constant	-7.968***	-7.969***	-7.743***
	(0.172)	(0.172)	(0.166)
Observations	108188100	108188100	81508353

Table A.12: Poisson Regression Results: Product-Level, Smoothed Minute Crowdedness, Product x Timing Fixed Effects: Standard errors are in parentheses and clustered at machine-level. Day-of-week, machine, and product x timing fixed effects are controlled.

D.1 Robustness Check 1: Negative Binomial Regression

In the main text, we use Poisson regression to estimate equations (**??**) and (**??**). In this appendix, we report the results using negative binomial regression instead of Poisson regression. Tables A.13, A.14, and A.15 report the results from the machine-level analysis and Tables **??**, **??**, and **??** report the results from the product-level analysis.

Our results are quantitatively quite similar to the main results in all specifications. Thus, our results are robust to a change in specification of probability distribution. This robustness check even supports our parametric model because, as suggested by Imbens (2014), more nonparametric approaches such as matching estimators would be more useful when the results are sensitive to model specification.

D.2 Robustness Check 2: Membership Information

In this robustness check, we investigate the robustness of our results to unobserved consumer heterogeneity by using detailed consumer demographic information.

Membership Information In our setup, consumers purchase beverages with either cash or debit card. The debit card works as commuter ticket as well, and we observe that more than half of the transactions have been carried out with debit cards. We consider that those who buy a beverage with their debit card are likely to be commuters who may need to rush into trains, while those who use cash for purchasing beverages are more likely to be non-commuters. Also consumers who use cash for buying beverages may have different tastes compared to those who use a debit card.

Tables A.19 and A.20 present the machine-level results, and Tables A.21 and A.22 present the product-level results. In each table, we split the sample into two subgroups based on the fraction of consumers who purchase beverages with debit cards. In order to save space, we do not report the results with *crowdedness_minute_1* as the proxy variable for crowd pressure, but the results are qualitatively similar to our main results.

	(1)	(2)	(3)
temperature	0.0788***	0.0789***	0.0783***
	(0.00310)	(0.00310)	(0.00315)
precipitation	-0.00181***	-0.00184***	-0.00199***
	(0.000370)	(0.000370)	(0.000375)
machine_PR	0.0662***	0.0655***	0.00383
	(0.00502)	(0.00516)	(0.00677)
crowdedness_hour	0.000166***	0.000160***	0.0000897***
	(0.0000120)	(0.0000120)	(0.0000112)
departure	0.204***		
	(0.00995)		
machine_PR × crowdedness_hour	0.0000161***	0.0000148***	0.00000987***
	(0.00000317)	(0.00000328)	(0.00000351)
machine_PR × departure	-0.0631***		
	(0.00677)		
departure_next1		0.269***	
		(0.00940)	
machine_PR × departure_next1		-0.0587***	
		(0.00750)	
time to next			-0.0826***
			(0.00247)
time to after next			-0.0586***
			(0.00280)
machine_PR × time to next			0.0126***
			(0.00142)
machine_PR × time to after next			0.00246
			(0.00138)
Constant	-3.812***	-3.823***	-2.935***
	(0.0850)	(0.0849)	(0.0870)
lnalpha	-0.696***	-0.711***	-0.982***
	(0.0432)	(0.0437)	(0.0502)
Observations	3399480	3399480	3146045

Table A.13: Negative Binomial Regression Results: Machine Level, Hour Crowdedness: Standard errors are in parentheses and clustered at machine-level. Machine, day-of-week, and timing fixed effects are controlled.

	(1)	(2)	(3)
temperature	0.0790***	0.0791***	0.0784***
	(0.00311)	(0.00311)	(0.00315)
precipitation	-0.00198***	-0.00199***	-0.00209***
	(0.000371)	(0.000371)	(0.000376)
machine_PR	0.0723***	0.0713***	0.00830
	(0.00504)	(0.00519)	(0.00644)
crowdedness_minute_1	0.00814***	0.00800***	0.00512***
	(0.000512)	(0.000512)	(0.000458)
departure	0.218***		
	(0.0104)		
machine_PR × crowdedness_minute_1	0.000371*	0.000308	0.0000805
	(0.000179)	(0.000181)	(0.000204)
machine_PR × departure	-0.0657***		
	(0.00675)		
departure_next1		0.285***	
		(0.00950)	
machine_PR × departure_next1		-0.0612***	
		(0.00731)	
time to next			-0.0834***
			(0.00249)
time to after next			-0.0593***
			(0.00282)
machine_PR × time to next			0.0125***
			(0.00142)
machine_PR × time to after next			0.00236
			(0.00138)
Constant	-3.786***	-3.798***	-2.915***
	(0.0847)	(0.0846)	(0.0862)
lnalpha	-0.682***	-0.699***	-0.980***
	(0.0429)	(0.0435)	(0.0503)
Observations	3399480	3399480	3146045

Table A.14: Negative Binomial Regression Results: Machine Level, Minute Crowdedness: Standard errors are in parentheses and clustered at machine-level. Machine, day-of-week, and timing fixed effects are controlled.

	(1)	(2)	(3)
temperature	0.0786***	0.0787***	0.0781***
	(0.00311)	(0.00311)	(0.00315)
precipitation	-0.00182***	-0.00185***	-0.00202***
	(0.000369)	(0.000370)	(0.000374)
machine_PR	0.0646***	0.0641***	-0.000700
	(0.00510)	(0.00523)	(0.00702)
crowdedness_minute_2	0.0167***	0.0160***	0.00714***
	(0.00150)	(0.00149)	(0.00140)
departure	0.199***		
	(0.00953)		
machine_PR × crowdedness_minute_2	0.00154***	0.00142***	0.00100***
	(0.000279)	(0.000277)	(0.000294)
machine_PR × departure	-0.0656***		
	(0.00688)		
departure_next1		0.264***	
		(0.00897)	
machine_PR × departure_next1		-0.0610***	
		(0.00735)	
time to next			-0.0829***
			(0.00250)
time to after next			-0.0591***
			(0.00283)
machine_PR × time to next			0.0130***
			(0.00142)
machine_PR × time to after next			0.00299*
			(0.00140)
Constant	-3.836***	-3.845***	-2.932***
	(0.0859)	(0.0857)	(0.0882)
lnalpha	-0.698***	-0.712***	-0.977***
	(0.0444)	(0.0448)	(0.0503)
Observations	3399480	3399480	3146045

Table A.15: Negative Binomial Regression Results: Machine Level, Smoothed Minute Crowdedness: Standard errors are in parentheses and clustered at machine-level. Machine, day-of-week, and timing fixed effects are controlled.

	(1)
temperature	0.0796***
	(0.00304)
precipitation	-0.00188***
	(0.000353)
machine_PR	0.0377***
	(0.00377)
product_PR	0.0362***
	(0.00902)
Constant	-7.325***
	(0.103)
lnalpha	
Constant	1.121***
	(0.0368)
Observations	108188100

Table A.16: Negative Binomial Regression Results: Product Level Base Model

We find our results quantitatively similar across subgroups, confirming that our main results are not driven solely by unobserved consumer heterogeneity as regards commuters or non-commuters.

Gender Information Moreover, among those who use commuter tickets, a significant fraction of consumers have signed up for the special loyalty program of the company, and their demographic information such as age, gender, and resident address is recorded. We use the demographic information to calculate the fraction of male consumers, and then split the sample into two subsamples with respect to the fraction of male customers. Some vending machines may attract more male than female consumers owing to location or assortment, and this difference may affect our main results, because male consumers may react differently to recommendations compared to female consumers. Also, male consumers and female consumers may experience time and crowd pressures differently. Tables A.23 and A.24 present the machine-level results, and Tables A.25 and A.26 present the product-level results. In each table, we split the sample into two subgroups based on the fraction of male customers. In order to save space, we do not report the results with *crowdedness_minute_1* as the proxy variable for crowd pressure, but the results are qualitatively similar to our main results.

	(1)	(2)	(3)
(sum) sales			
temperature	0.0796***	0.0796***	0.0801***
	(0.00304)	(0.00304)	(0.00330)
precipitation	-0.00155***	-0.00155***	-0.00214***
	(0.000351)	(0.000351)	(0.000410)
crowdedness_hour	0.000157***	0.000157***	0.0000879***
	(0.0000124)	(0.0000124)	(0.0000116)
machine_PR	0.0493***	0.0496***	0.0225***
	(0.00494)	(0.00492)	(0.00545)
product_PR	0.0804***	0.0800***	0.0548***
	(0.0112)	(0.0112)	(0.0129)
departure	0.196***		
	(0.0120)		
machine_PR × crowdedness_hour	0.0000271***	0.0000273***	0.0000185***
	(0.00000311)	(0.00000311)	(0.00000339)
product_PR × crowdedness_hour	-0.0000685***	-0.0000687***	-0.0000641***
	(0.00000879)	(0.00000880)	(0.00000950)
machine_PR × departure	-0.0495***		
	(0.00661)		
product_PR × departure	-0.0357**		
	(0.0133)		
departure_next1		0.199***	
		(0.0119)	
machine_PR × departure_next1		-0.0504***	
		(0.00656)	
product_PR × departure_next1		-0.0346**	
		(0.0132)	
time to next			-0.000774***
			(0.000193)
time to after next			0.000263
			(0.000691)
machine_PR × time to next			0.000464**
			(0.000158)
machine_PR × time to after next			-0.000753
			(0.000886)
product_PR × time to next			0.000714***
			(0.000293)
product_PR × time to after next			-0.00308
			(0.00165)
Constant	-7.439***	-7.439***	-7.189***
	(0.105)	(0.105)	(0.114)
lnalpha			
Constant	1.097***	1.097***	0.935***
	(0.0372)	(0.0372)	(0.0392)
Observations	108188100	108188100	81508361

Table A.17: Negative Binomial Regression Results: Product Level, Hour Crowdedness

	(1)	(2)	(3)
(sum) sales			
temperature	0.0800***	0.0800***	0.0804***
	(0.00304)	(0.00305)	(0.00329)
precipitation	-0.00171***	-0.00171***	-0.00225***
	(0.000352)	(0.000352)	(0.000411)
size_passenger_m	0.00766***	0.00764***	0.00503***
	(0.000485)	(0.000485)	(0.000454)
machine_PR	0.0563***	0.0567***	0.0296***
	(0.00493)	(0.00491)	(0.00528)
product_PR	0.0722***	0.0718***	0.0360**
	(0.0109)	(0.0109)	(0.0120)
departure	0.211***		
	(0.0130)		
machine_PR × size_passenger_m	0.000848***	0.000855***	0.000466***
	(0.000172)	(0.000172)	(0.000202)
product_PR × size_passenger_m	-0.00281***	-0.00282***	-0.00283***
	(0.000433)	(0.000434)	(0.000508)
machine_PR × departure	-0.0497***		
	(0.00655)		
product_PR × departure	-0.0489***		
	(0.0132)		
departure_next1		0.214***	
		(0.0129)	
machine_PR × departure_next1		-0.0506***	
		(0.00650)	
product_PR × departure_next1		-0.0479***	
		(0.0131)	
time to next			-0.000798***
			(0.000197)
time to after next			0.000193
			(0.000695)
machine_PR × time to next			0.000418***
			(0.000159)
machine_PR × time to after next			-0.000786
			(0.000886)
product_PR × time to next			0.000933**
			(0.000291)
product_PR × time to after next			-0.00293
			(0.00165)
Constant	-7.418***	-7.418***	-7.178***
	(0.104)	(0.104)	(0.113)
lnalpha			
Constant	1.103***	1.103***	0.936***
	(0.0371)	(0.0371)	(0.0392)
Observations	108188100	108188100	81508361

Table A.18: Negative Binomial Regression Results: Product Level Smoothed Minute Crowdedness

Table A.19: Poisson Regression Results by Membership Fraction: Machine Level, Smoothed Minute Crowdedness

	Member Low			Member High		
	(1)	(2)	(3)	(4)	(5)	(6)
temperature	0.0783***	0.0784***	0.0779***	0.0794***	0.0794***	0.0786***
	(0.00443)	(0.00443)	(0.00449)	(0.00444)	(0.00444)	(0.00446)
precipitation	-0.00344***	-0.00346***	-0.00358***	-0.000629	-0.000655	-0.000875
	(0.000524)	(0.000525)	(0.000552)	(0.000504)	(0.000503)	(0.000498)
machine_PR	0.0680***	0.0684***	-0.00114	0.0587***	0.0572***	0.000651
	(0.00712)	(0.00757)	(0.00989)	(0.00717)	(0.00707)	(0.00983)
crowdedness_minute_2	0.0129***	0.0120***	0.00377	0.0189***	0.0183***	0.00932***
	(0.00222)	(0.00221)	(0.00203)	(0.00171)	(0.00169)	(0.00161)
departure	0.171***			0.225***		
	(0.0128)			(0.0143)		
machine_PR × crowdedness_minute_2	0.00156***	0.00146***	0.00105*	0.00152***	0.00139***	0.00101*
	(0.000397)	(0.000388)	(0.000420)	(0.000381)	(0.000381)	(0.000408)
machine_PR × departure	-0.0667***			-0.0596***		
	(0.00981)			(0.00961)		
departure_next1		0.249***			0.278***	
		(0.0126)			(0.0129)	
machine_PR × departure_next1=1		-0.0639***			-0.0537***	
		(0.0103)			(0.0102)	
time to next			-0.0791***			-0.0864***
			(0.00390)			(0.00295)
time to after next			-0.0588***			-0.0609***
			(0.00411)			(0.00382)
machine_PR × time to next			0.0134***			0.0124***
			(0.00201)			(0.00207)
machine_PR × time to after next			0.00387*			0.00170
			(0.00192)			(0.00196)
Constant	-3.803***	-3.813***	-2.932***	-3.413***	-3.429***	-2.658***
	(0.120)	(0.119)	(0.123)	(0.137)	(0.136)	(0.136)
Observations	1651860	1651860	1520435	1747620	1747620	1625610

Table A.20: Poisson Regression Results by Member Fraction: Machine Level, Hour Crowdedness

	Member Low			Member High		
	(1)	(2)	(3)	(4)	(5)	(6)
(sum) sales						
temperature	0.0783***	0.0784***	0.0780***	0.0799***	0.0799***	0.0790***
	(0.00442)	(0.00442)	(0.00449)	(0.00443)	(0.00443)	(0.00445)
precipitation	-0.00344***	-0.00346***	-0.00355***	-0.000615	-0.000643	-0.000860
	(0.000524)	(0.000525)	(0.000551)	(0.000505)	(0.000504)	(0.000501)
machine_PR	0.0691***	0.0693***	0.0000746	0.0615***	0.0599***	0.00686
	(0.00697)	(0.00746)	(0.00955)	(0.00716)	(0.00704)	(0.00943)
crowdedness_hour	0.000158***	0.000149***	0.0000621***	0.000153***	0.000149***	0.0000888***
	(0.0000287)	(0.0000284)	(0.0000228)	(0.0000118)	(0.0000118)	(0.0000115)
departure	0.175***			0.236***		
	(0.0133)			(0.0152)		
machine_PR × crowdedness_hour	0.0000233***	0.0000221***	0.0000177**	0.0000129***	0.0000117**	0.00000708*
	(0.00000531)	(0.00000541)	(0.00000622)	(0.00000374)	(0.00000388)	(0.00000309)
machine_PR × departure	-0.0661***			-0.0577***		
	(0.00943)			(0.00950)		
departure_next1		0.253***			0.287***	
		(0.0131)			(0.0138)	
machine_PR × departure_next1		-0.0633***			-0.0518***	
		(0.0105)			(0.0105)	
time to next			-0.0789***			-0.0864***
			(0.00387)			(0.00296)
time to after next			-0.0584***			-0.0607***
			(0.00408)			(0.00379)
machine_PR=1 × time to next			0.0132***			0.0119***
			(0.00201)			(0.00209)
machine_PR=1 × time to after next			0.00367			0.00110
			(0.00190)			(0.00193)
Constant	-3.786***	-3.797***	-2.936***	-3.114***	-3.141***	-2.528***
	(0.120)	(0.119)	(0.123)	(0.123)	(0.122)	(0.122)
Observations	1651860	1651860	1520435	1747620	1747620	1625610

Table A.21: Poisson Regression Results by Membership Fraction: Product Level, Smoothed Minute Crowdedness

	Member Low			Member High		
	(1)	(2)	(3)	(4)	(5)	(6)
(sum) sales						
temperature	0.0712***	0.0713***	0.0710***	0.0909***	0.0909***	0.0921***
	(0.00396)	(0.00396)	(0.00427)	(0.00453)	(0.00453)	(0.00484)
precipitation	-0.00181***	-0.00181***	-0.00218***	-0.00191***	-0.00191***	-0.00277***
	(0.000462)	(0.000462)	(0.000525)	(0.000526)	(0.000526)	(0.000617)
size_passenger_m	0.00874***	0.00872***	0.00530***	0.00735***	0.00735***	0.00526***
	(0.00109)	(0.00109)	(0.000951)	(0.000532)	(0.000532)	(0.000513)
machine_PR	0.0632***	0.0638***	0.0328***	0.0496***	0.0497***	0.0301***
	(0.00674)	(0.00677)	(0.00821)	(0.00704)	(0.00692)	(0.00696)
product_PR	0.0637***	0.0631***	0.0332	0.0759***	0.0758***	0.0364*
	(0.0140)	(0.0139)	(0.0171)	(0.0171)	(0.0171)	(0.0167)
departure	0.156***			0.273***		
	(0.0142)			(0.0221)		
machine_PR × size_passenger_m	0.00121***	0.00122***	0.000987***	0.000574**	0.000575**	0.0000922
	(0.000340)	(0.000340)	(0.000427)	(0.000198)	(0.000198)	(0.000230)
product_PR × size_passenger_m	-0.00266***	-0.00268***	-0.00303**	-0.00245***	-0.00246***	-0.00223***
	(0.000890)	(0.000891)	(0.00109)	(0.000500)	(0.000502)	(0.000580)
machine_PR × departure	-0.0545***			-0.0427***		
	(0.00929)			(0.00923)		
product_PR × departure	-0.0473**			-0.0467**		
	(0.0183)			(0.0190)		
departure_next1		0.160***			0.275***	
		(0.0140)			(0.0219)	
machine_PR × departure_next1		-0.0562***			-0.0428***	
		(0.00918)			(0.00920)	
product_PR × departure_next1		-0.0456**			-0.0464**	
		(0.0176)			(0.0194)	
time to next			-0.000343			-0.00130***
			(0.000248)			(0.000320)
time to after next			0.000144			0.000307
			(0.000885)			(0.00110)
machine_PR × time to next			0.000571**			0.000503**
			(0.000212)			(0.000239)
machine_PR × time to after next			-0.00145			-0.0000264
			(0.00115)			(0.00137)
product_PR × time to next			0.000888**			0.000826**
			(0.000388)			(0.000334)
product_PR × time to after next			-0.00199			-0.00417
			(0.00206)			(0.00267)
Constant	-7.538***	-7.539***	-7.175***	-7.789***	-7.790***	-7.566***
	(0.115)	(0.116)	(0.129)	(0.144)	(0.144)	(0.155)
Observations	54777840	54777840	40625830	53410260	53410260	40882531

Table A.22: Poisson Regression Results by Membership Fraction: Product Level, Hour Crowdedness

	Member Low			Member High		
	(1)	(2)	(3)	(4)	(5)	(6)
(sum) sales						
temperature	0.0711***	0.0711***	0.0709***	0.0901***	0.0901***	0.0916***
	(0.00396)	(0.00396)	(0.00428)	(0.00455)	(0.00455)	(0.00488)
precipitation	-0.00171***	-0.00171***	-0.00214***	-0.00166**	-0.00166**	-0.00259***
	(0.000462)	(0.000462)	(0.000525)	(0.000518)	(0.000518)	(0.000615)
crowdedness_hour	0.000184***	0.000183***	0.0000922***	0.000159***	0.000159***	0.0000998***
	(0.0000246)	(0.0000246)	(0.0000197)	(0.0000150)	(0.0000150)	(0.0000146)
machine_PR	0.0592***	0.0599***	0.0308***	0.0386***	0.0386***	0.0200**
	(0.00675)	(0.00677)	(0.00806)	(0.00694)	(0.00683)	(0.00759)
product_PR	0.0682***	0.0676***	0.0421*	0.0895***	0.0894***	0.0630***
	(0.0143)	(0.0141)	(0.0177)	(0.0177)	(0.0178)	(0.0188)
departure	0.146***			0.248***		
	(0.0140)			(0.0192)		
machine_PR × crowdedness_hour	0.0000274***	0.0000277***	0.0000195**	0.0000247***	0.0000247***	0.0000145***
	(0.00000537)	(0.00000535)	(0.00000599)	(0.00000399)	(0.00000400)	(0.00000436)
product_PR × crowdedness_hour	-0.0000626***	-0.0000630***	-0.0000621**	-0.0000661***	-0.0000661***	-0.0000572***
	(0.0000180)	(0.0000180)	(0.0000200)	(0.0000103)	(0.0000103)	(0.0000110)
machine_PR × departure	-0.0517***			-0.0426***		
	(0.00928)			(0.00938)		
product_PR × departure	-0.0419*			-0.0481*		
	(0.0183)			(0.0192)		
departure_next1		0.150***			0.249***	
		(0.0138)			(0.0191)	
machine_PR × departure_next1		-0.0534***			-0.0427***	
		(0.00915)			(0.00938)	
product_PR × departure_next1		-0.0401*			-0.0478*	
		(0.0176)			(0.0196)	
time to next			-0.000336			-0.00118***
			(0.000247)			(0.000299)
time to after next			0.000189			0.000460
			(0.000885)			(0.00109)
machine_PR × time to next			0.000570**			0.000150
			(0.000208)			(0.000241)
machine_PR × time to after next			-0.00145			0.00000987
			(0.00115)			(0.00137)
product_PR × time to next			0.000794*			0.000535*
			(0.000391)			(0.000238)
product_PR × time to after next			-0.00205			-0.00438
			(0.00206)			(0.00267)
Constant	-7.547***	-7.548***	-7.178***	-7.815***	-7.815***	-7.587***
	(0.116)	(0.116)	(0.129)	(0.146)	(0.146)	(0.157)
Observations	54777840	54777840	40625830	53410260	53410260	40882531

Table A.23: Poisson Regression Results by Gender Fraction: Machine Level, Smoothed Minute Crowdedness

	Male Low			Male High		
	(1)	(2)	(3)	(4)	(5)	(6)
temperature	0.0696***	0.0696***	0.0685***	0.0904***	0.0905***	0.0904***
	(0.00403)	(0.00403)	(0.00402)	(0.00472)	(0.00472)	(0.00477)
precipitation	-0.00191***	-0.00193***	-0.00204***	-0.00217***	-0.00220***	-0.00242***
	(0.000485)	(0.000485)	(0.000480)	(0.000545)	(0.000546)	(0.000574)
machine_PR	0.0745***	0.0754***	0.00617	0.0538***	0.0513***	-0.00314
	(0.00682)	(0.00682)	(0.0101)	(0.00752)	(0.00801)	(0.00981)
crowdedness_minute_2	0.0176***	0.0166***	0.00734***	0.0171***	0.0166***	0.00794***
	(0.00200)	(0.00197)	(0.00189)	(0.00204)	(0.00205)	(0.00196)
departure	0.167***			0.225***		
	(0.0126)			(0.0138)		
machine_PR × crowdedness_minute_2	0.00159***	0.00149***	0.000891	0.00138***	0.00124***	0.00103**
	(0.000435)	(0.000429)	(0.000469)	(0.000366)	(0.000364)	(0.000385)
machine_PR × departure	-0.0703***			-0.0569***		
	(0.00915)			(0.0104)		
departure_next1		0.255***			0.264***	
		(0.0114)			(0.0137)	
machine_PR × departure_next1		-0.0684***			-0.0492***	
		(0.00935)			(0.0115)	
time to next			-0.0837***			-0.0802***
			(0.00338)			(0.00364)
time to after next			-0.0578***			-0.0614***
			(0.00379)			(0.00409)
machine_PR × time to next			0.0138***			0.0114***
			(0.00192)			(0.00208)
machine_PR × time to after next			0.00334			0.00173
			(0.00196)			(0.00200)
Constant	-3.799***	-3.812***	-2.832***	-4.247***	-4.251***	-3.333***
	(0.111)	(0.111)	(0.112)	(0.127)	(0.127)	(0.132)
Observations	1739640	1739640	1609585	1659840	1659840	1536460

Table A.24: Poisson Regression Results by Gender Fraction: Machine Level, Hourly Crowdedness

	Male Low			Male High		
	(1)	(2)	(3)	(4)	(5)	(6)
(sum) sales						
temperature	0.0697***	0.0697***	0.0685***	0.0907***	0.0908***	0.0908***
	(0.00403)	(0.00403)	(0.00402)	(0.00468)	(0.00468)	(0.00474)
precipitation	-0.00192***	-0.00194***	-0.00203***	-0.00215***	-0.00218***	-0.00240***
	(0.000486)	(0.000486)	(0.000482)	(0.000546)	(0.000548)	(0.000576)
machine_PR	0.0755***	0.0763***	0.00840	0.0562***	0.0535***	0.00503
	(0.00673)	(0.00677)	(0.0100)	(0.00740)	(0.00787)	(0.00931)
crowdedness_hour	0.000196***	0.000186***	0.0000943***	0.000159***	0.000156***	0.0000942***
	(0.0000272)	(0.0000265)	(0.0000202)	(0.0000135)	(0.0000136)	(0.0000136)
departure	0.169***			0.234***		
	(0.0135)			(0.0144)		
machine_PR × crowdedness_hour	0.0000176**	0.0000166**	0.0000101	0.0000130***	0.0000116**	0.00000774
	(0.00000572)	(0.00000582)	(0.00000573)	(0.00000394)	(0.00000409)	(0.00000435)
machine_PR × departure	-0.0684***			-0.0538***		
	(0.00909)			(0.0102)		
departure_next1		0.256***			0.273***	
		(0.0125)			(0.0142)	
machine_PR × departure_next1		-0.0665***			-0.0462***	
		(0.00978)			(0.0117)	
time to next			-0.0835***			-0.0798***
			(0.00338)			(0.00359)
time to after next			-0.0575***			-0.0608***
			(0.00378)			(0.00403)
machine_PR × time to next			0.0136***			0.0107***
			(0.00193)			(0.00208)
machine_PR × time to after next			0.00308			0.000850
			(0.00195)			(0.00197)
Constant	-3.803***	-3.815***	-2.841***	-4.223***	-4.227***	-3.341***
	(0.111)	(0.111)	(0.111)	(0.125)	(0.125)	(0.128)
Observations	1739640	1739640	1609585	1659840	1659840	1536460

Table A.25: Poisson Regression Results by Gender Fraction: Product-Level, Smoothed Miniute Crowdedness

	Male Low			Male High		
	(1)	(2)	(3)	(4)	(5)	(6)
(sum) sales						
temperature	0.0712***	0.0713***	0.0710***	0.0909***	0.0909***	0.0921***
	(0.00396)	(0.00396)	(0.00427)	(0.00453)	(0.00453)	(0.00484)
precipitation	-0.00181***	-0.00181***	-0.00218***	-0.00191***	-0.00191***	-0.00277***
	(0.000462)	(0.000462)	(0.000525)	(0.000526)	(0.000526)	(0.000617)
size_passenger_minute	0.00874***	0.00872***	0.00530***	0.00735***	0.00735***	0.00526***
	(0.00109)	(0.00109)	(0.000951)	(0.000532)	(0.000532)	(0.000513)
machine_PR	0.0632***	0.0638***	0.0328***	0.0496***	0.0497***	0.0301***
	(0.00674)	(0.00677)	(0.00821)	(0.00704)	(0.00692)	(0.00696)
product_PR	0.0637***	0.0631***	0.0332*	0.0759***	0.0758***	0.0364***
	(0.0140)	(0.0139)	(0.0151)	(0.0171)	(0.0171)	(0.0167)
departure	0.156***			0.273***		
	(0.0142)			(0.0221)		
machine_PR × size_passenger_minute	0.00121***	0.00122***	0.000987**	0.000574**	0.000575**	0.0000922
	(0.000340)	(0.000340)	(0.000427)	(0.000198)	(0.000198)	(0.000230)
product_PR × size_passenger_minute	-0.00266**	-0.00268**	-0.00303**	-0.00245***	-0.00246***	-0.00223***
	(0.000890)	(0.000891)	(0.00109)	(0.000500)	(0.000502)	(0.000580)
machine_PR × departure	-0.0545***			-0.0427***		
	(0.00929)			(0.00923)		
product_PR × departure	-0.0473**			-0.0467*		
	(0.0183)			(0.0190)		
departure_next1		0.160***			0.275***	
		(0.0140)			(0.0219)	
machine_PR × departure_next1		-0.0562***			-0.0428***	
		(0.00918)			(0.00920)	
product_PR × departure_next1		-0.0456**			-0.0464*	
		(0.0176)			(0.0194)	
time to next			-0.000343			-0.00130***
			(0.000248)			(0.000320)
time to after next			0.000144			0.000307
			(0.000885)			(0.00110)
machine_PR × time to next			0.000571**			0.000103
			(0.000212)			(0.000239)
machine_PR × time to after next			-0.00145			-0.0000264
			(0.00115)			(0.00137)
product_PR × time to next			0.000888*			0.000826*
			(0.000388)			(0.000404)
product_PR × time to after next			-0.00199			-0.00417
			(0.00206)			(0.00267)
Constant	-7.538***	-7.539***	-7.175***	-7.789***	-7.790***	-7.566***
	(0.115)	(0.116)	(0.129)	(0.144)	(0.144)	(0.155)
Observations	54777840	54777840	40625830	53410260	53410260	40882531

Table A.26: Poisson Regression Results by Gender Fraction: Product Level, Hour Crowdedness

	Male Low			Male High		
	(1)	(2)	(3)	(4)	(5)	(6)
(sum) sales						
temperature	0.0794***	0.0794***	0.0812***	0.0799***	0.0799***	0.0796***
	(0.00440)	(0.00440)	(0.00472)	(0.00421)	(0.00421)	(0.00459)
precipitation	-0.00296***	-0.00296***	-0.00383***	-0.000432	-0.000434	-0.000832
	(0.000498)	(0.000498)	(0.000589)	(0.000482)	(0.000482)	(0.000544)
crowdedness_hour	0.000141***	0.000141***	0.0000550***	0.000155***	0.000155***	0.0000946***
	(0.0000300)	(0.0000300)	(0.0000252)	(0.0000120)	(0.0000120)	(0.0000117)
machine_PR	0.0516***	0.0525***	0.0232**	0.0447***	0.0444***	0.0226**
	(0.00680)	(0.00676)	(0.00766)	(0.00715)	(0.00715)	(0.00763)
product_PR	0.0721***	0.0711***	0.0613***	0.0874***	0.0877***	0.0453*
	(0.0151)	(0.0149)	(0.0181)	(0.0168)	(0.0168)	(0.0186)
departure	0.161***			0.236***		
	(0.0142)			(0.0194)		
machine_PR × crowdedness_hour	0.0000319***	0.0000324***	0.0000237***	0.0000249***	0.0000248***	0.0000164***
	(0.00000591)	(0.00000589)	(0.00000655)	(0.00000372)	(0.00000371)	(0.00000403)
product_PR × crowdedness_hour	-0.0000546**	-0.0000551**	-0.0000530**	-0.0000708***	-0.0000707***	-0.0000632***
	(0.0000170)	(0.0000171)	(0.0000193)	(0.0000101)	(0.0000101)	(0.0000107)
machine_PR × departure	-0.0506***			-0.0449***		
	(0.00903)			(0.00954)		
product_PR × departure	-0.0445*			-0.0462*		
	(0.0184)			(0.0190)		
departure_next1		0.164***			0.239***	
		(0.0141)			(0.0192)	
machine_PR × departure_next1		-0.0532***			-0.0441***	
		(0.00894)			(0.00952)	
product_PR × departure_next1		-0.0216			-0.0470*	
		(0.0178)			(0.0192)	
time to next			-0.000533*			-0.00110***
			(0.000259)			(0.000290)
time to after next			0.000318			0.000177
			(0.000855)			(0.00112)
machine_PR × time to next			0.000532**			0.000510*
			(0.000202)			(0.000244)
machine_PR × time to after next			-0.000606			-0.000981
			(0.00105)			(0.00148)
product_PR × time to next			0.000815*			0.000907*
			(0.000396)			(0.000427)
product_PR × time to after next			-0.00519*			-0.000796
			(0.00228)			(0.00235)
Constant	-7.397***	-7.398***	-7.211***	-6.546***	-6.548***	-6.213***
	(0.137)	(0.137)	(0.145)	(0.151)	(0.152)	(0.162)
Observations	52337820	52337820	38912074	55850280	55850280	42596287

Again, the main results hold for both groups. The results show that our estimates are consistent across both groups and thus the main results are not driven by consumer heterogeneity due to gender.

D.3 Robustness Check 3: Location of Vending Machines

Another robustness check discussed in Section 4.5 is regarding the location where the vending machines are placed. In particular, we consider the vending machines placed on platforms and those placed on the concourse. Consumers may experience different time and crowd pressure levels when making purchases at platform and concourse. Also, consumers may self-select into different vending machines depending on the time pressure and crowd pressure they experience. Tables A.27 (*crowdedness_minute_2* as the proxy for crowd pressure) and A.28 (*crowdedness_hour* as the proxy for crowd pressure) present the machine-level results for the subsamples of vending machines placed on the platform and on the concourse, respectively. Tables A.29 (*crowdedness_minute_2* as the proxy for crowd pressure) and A.30 (*crowdedness_hour* as the proxy for crowd pressure) present the product-level results for the two-subsamples. In order to save space, we do not report the results with *crowdedness_minute_1* as the proxy variable for crowd pressure, but the results are qualitatively similar to our main results.

We find the results quite consistent across subgroups. Although some coefficients are statistically significant for only the platform subsample due to its larger sample size, the signs are always consistent. Therefore, we confirm that our main results hold even when we split the sample based on the location where the vending machines are placed.

D.4 Robustness Check 4: Hourly Fixed Effects

One of the robustness checks discussed in Section 5 relates to the inclusion of hour fixed effect instead of time-of-day fixed effect. We report the machine-level results in Tables A.31, A.32, and A.33, and the product-level results in Tables A.34 and A.35. As the measure of crowd pres-

Table A.27: Poisson Regression Results: Machine Level, Smoothed Minute Crowdedness, Platform and Concourse

	Platform			Concourse		
	(1)	(2)	(3)	(4)	(5)	(6)
temperature	0.0780***	0.0781***	0.0772***	0.0805***	0.0806***	0.0795***
	(0.00358)	(0.00358)	(0.00359)	(0.00713)	(0.00714)	(0.00727)
precipitation	-0.00209***	-0.00213***	-0.00236***	-0.00146**	-0.00147**	-0.00157**
	(0.000506)	(0.000506)	(0.000504)	(0.000552)	(0.000551)	(0.000561)
machine_PR	0.0665***	0.0675***	-0.00915	0.0527***	0.0478***	0.00922
	(0.00560)	(0.00586)	(0.00821)	(0.0112)	(0.0108)	(0.0145)
crowdedness_minute_2	0.0153***	0.0141***	0.00445*	0.0168***	0.0171***	0.0102***
	(0.00205)	(0.00203)	(0.00189)	(0.00211)	(0.00212)	(0.00207)
departure	0.179***			0.251***		
	(0.0119)			(0.0148)		
machine_PR × crowdedness_minute_2	0.00125***	0.00113***	0.000713*	0.00259***	0.00242***	0.00204***
	(0.000329)	(0.000329)	(0.000359)	(0.000442)	(0.000447)	(0.000476)
machine_PR × departure	-0.0692***			-0.0567***		
	(0.00758)			(0.0143)		
departure_next1		0.277***			0.224***	
		(0.0109)			(0.0157)	
machine_PR × departure_next1		-0.0672***			-0.0442**	
		(0.00817)			(0.0151)	
time to next			-0.0896***			-0.0666***
			(0.00318)			(0.00347)
time to after next			-0.0602***			-0.0560***
			(0.00355)			(0.00466)
machine_PR × time to next			0.0158***			0.00799**
			(0.00159)			(0.00258)
machine_PR × time to after next			0.00398*			0.000631
			(0.00165)			(0.00277)
Constant	-3.847***	-3.859***	-2.906***	-3.304***	-3.298***	-2.659***
	(0.0990)	(0.0988)	(0.101)	(0.213)	(0.213)	(0.216)
Observations	2290260	2290260	2127809	1005480	1005480	928265

Table A.28: Poisson Regression Results: Machine-Level, Hour Crowdedness, Platform and Concourse

	Platform			Concourse		
	(1)	(2)	(3)	(4)	(5)	(6)
(sum) sales						
temperature	0.0780***	0.0781***	0.0773***	0.0814***	0.0815***	0.0802***
	(0.00356)	(0.00356)	(0.00358)	(0.00713)	(0.00714)	(0.00726)
precipitation	-0.00208***	-0.00212***	-0.00232***	-0.00143**	-0.00144**	-0.00155**
	(0.000506)	(0.000506)	(0.000504)	(0.000554)	(0.000553)	(0.000563)
machine_PR	0.0673***	0.0682***	0.00668	0.0569***	0.0519***	0.0217
	(0.00556)	(0.00582)	(0.00788)	(0.0110)	(0.0106)	(0.0142)
crowdedness_hour	0.000156***	0.000146***	0.0000689***	0.000155***	0.000158***	0.000107***
	(0.0000169)	(0.0000167)	(0.0000147)	(0.0000151)	(0.0000152)	(0.0000153)
departure	0.184***			0.256***		
	(0.0124)			(0.0162)		
machine_PR × crowdedness_hour	0.0000147***	0.0000135***	0.00000896*	0.0000221***	0.0000204***	0.0000158**
	(0.00000359)	(0.00000380)	(0.00000423)	(0.00000564)	(0.00000583)	(0.00000609)
machine_PR × departure	-0.0680***			-0.0492***		
	(0.00731)			(0.0144)		
departure_next1		0.282***			0.229***	
		(0.0112)			(0.0174)	
machine_PR × departure_next1		-0.0660***			-0.0369**	
		(0.00826)			(0.0157)	
time to next			-0.0891***			-0.0665***
			(0.00314)			(0.00346)
time to after next			-0.0596***			-0.0556***
			(0.00350)			(0.00459)
machine_PR × time to next			0.0155***			0.00725**
			(0.00159)			(0.00261)
machine_PR × time to after next			0.00360*			-0.000559
			(0.00163)			(0.00274)
Constant	-3.823***	-3.838***	-2.914***	-3.067***	-3.058***	-2.533***
	(0.0981)	(0.0979)	(0.100)	(0.196)	(0.196)	(0.199)
Observations	2290260	2290260	2127809	1005480	1005480	928265

Table A.29: Poisson Regression Results: Product-Level, Smoothed Minute Crowdedness, Platform and Concourse

	Platform			Concourse		
	(1)	(2)	(3)	(4)	(5)	(6)
(sum) sales						
temperature	0.0786***	0.0787***	0.0794***	0.0843***	0.0843***	0.0845***
	(0.00347)	(0.00347)	(0.00366)	(0.00636)	(0.00637)	(0.00721)
precipitation	-0.00200***	-0.00200***	-0.00264***	-0.00135***	-0.00135***	-0.00169***
	(0.000479)	(0.000479)	(0.000549)	(0.000515)	(0.000515)	(0.000593)
size_passenger_m	0.00709***	0.00707***	0.00414***	0.00759***	0.00760***	0.00579***
	(0.000642)	(0.000642)	(0.000575)	(0.000608)	(0.000609)	(0.000595)
machine_PR	0.0576***	0.0586***	0.0261***	0.0559***	0.0547***	0.0376***
	(0.00557)	(0.00555)	(0.00620)	(0.0103)	(0.0103)	(0.0103)
product_PR	0.0564***	0.0561***	0.0364***	0.0986***	0.0981***	0.0307**
	(0.0123)	(0.0121)	(0.0143)	(0.0221)	(0.0228)	(0.0113)
departure	0.173***			0.314***		
	(0.0155)			(0.0223)		
machine_PR × size_passenger_m	0.000764***	0.000783***	0.000390	0.000955***	0.000935***	0.000584*
	(0.000221)	(0.000221)	(0.000269)	(0.000265)	(0.000264)	(0.000297)
product_PR × size_passenger_m	-0.00248***	-0.00249***	-0.00258***	-0.00271***	-0.00272***	-0.00256***
	(0.000476)	(0.000479)	(0.000591)	(0.000726)	(0.000725)	(0.000804)
machine_PR × departure	-0.0557***			-0.0394***		
	(0.00733)			(0.0137)		
product_PR × departure	-0.0280*			-0.0878***		
	(0.0133)			(0.0230)		
departure_next1		0.178***			0.313***	
		(0.0153)			(0.0226)	
machine_PR × departure_next1		-0.0580***			-0.0364***	
		(0.00733)			(0.0134)	
product_PR × departure_next1		-0.0371*			-0.0866***	
		(0.0149)			(0.0240)	
time to next			-0.000490**			-0.00182***
			(0.000227)			(0.000391)
time to after next			0.000141			0.000288
			(0.000806)			(0.00137)
machine_PR × time to next			0.000559**			0.000103
			(0.000184)			(0.000314)
machine_PR × time to after next			-0.00115			0.000355
			(0.00106)			(0.00160)
product_PR × time to next			0.000732*			0.00120*
			(0.000331)			(0.000560)
product_PR × time to after next			-0.00285			-0.00333
			(0.00189)			(0.00343)
Constant	-7.408***	-7.409***	-7.182***	-6.479***	-6.478***	-6.187***
	(0.109)	(0.109)	(0.113)	(0.250)	(0.250)	(0.268)
Observations	71210280	71210280	54835915	36977820	36977820	26672446

Table A.30: Poisson Regression Results: Product-Level, Hour Crowdedness, Platform and Concourse

	Platform			Concourse		
	(1)	(2)	(3)	(4)	(5)	(6)
(sum) sales						
temperature	0.0783***	0.0783***	0.0792***	0.0837***	0.0837***	0.0840***
	(0.00347)	(0.00347)	(0.00367)	(0.00636)	(0.00637)	(0.00723)
precipitation	-0.00185***	-0.00185***	-0.00256***	-0.00115*	-0.00116*	-0.00152*
	(0.000480)	(0.000480)	(0.000550)	(0.000507)	(0.000506)	(0.000583)
crowdedness_hour	0.000144***	0.000143***	0.0000652***	0.000129***	0.000161***	0.000111***
	(0.0000176)	(0.0000176)	(0.0000159)	(0.0000134)	(0.0000138)	(0.0000137)
machine_PR	0.0522***	0.0532***	0.0211***	0.0443***	0.0434***	0.0253*
	(0.00554)	(0.00553)	(0.00632)	(0.0104)	(0.0103)	(0.0110)
product_PR	0.0620***	0.0616***	0.0476**	0.115***	0.115***	0.0673**
	(0.0125)	(0.0123)	(0.0150)	(0.0232)	(0.0238)	(0.0250)
departure	0.162***			0.289***		
	(0.0144)			(0.0195)		
machine_PR × crowdedness_hour	0.0000238***	0.0000242***	0.0000147***	0.0000317***	0.0000311***	0.0000237***
	(0.00000395)	(0.00000395)	(0.00000437)	(0.00000504)	(0.00000497)	(0.00000535)
product_PR × crowdedness_hour	-0.0000564***	-0.0000565***	-0.0000520***	-0.0000883***	-0.0000787***	-0.0000718***
	(0.0000104)	(0.0000104)	(0.0000114)	(0.0000199)	(0.0000146)	(0.0000153)
machine_PR × departure	-0.0552***			-0.0395**		
	(0.00733)			(0.0139)		
product_PR × departure	-0.0201			-0.0637**		
	(0.0156)			(0.0229)		
departure_next1		0.167***			0.290***	
		(0.0142)			(0.0195)	
machine_PR × departure_next1		-0.0576***			-0.0370**	
		(0.00735)			(0.0135)	
product_PE × departure_next1		-0.0191			-0.0619**	
		(0.0152)			(0.0237)	
time to next			-0.000498*			-0.00172***
			(0.000223)			(0.000368)
time to after next			0.000172			0.000451
			(0.000803)			(0.00136)
machine_PR × time to next			0.000602***			0.000159
			(0.000183)			(0.000112)
machine_PR × time to after next			-0.00112			0.000396
			(0.00106)			(0.00160)
product_PR × time to next			0.000702*			0.000792*
			(0.000337)			(0.000359)
product_PR × time to after next			-0.00294			-0.00360
			(0.00189)			(0.00342)
Constant	-7.425***	-7.426***	-7.186***	-6.578***	-6.581***	-6.263***
	(0.109)	(0.109)	(0.114)	(0.253)	(0.253)	(0.272)
Observations	71210280	71210280	54835915	36977820	36977820	26672446

sure, we use *crowd_hour* in Table A.31, *crowd_minute1* in Table A.32 and *crowd_minute2* in Table A.33. Similarly, we use *crowd_hour* in Table A.34 and *crowd_minute2* in Table A.35. In each table, as in the main text, there are three variables to measure time pressure, *departure*, *departure_next1*, and *time_to_next*.

Table A.31: Poisson Regression Results: Machine Level, Hour Crowdedness, Hour Fixed Effect

	(1)	(2)	(3)
temperature	0.0791***	0.0791***	0.0789***
	(0.00318)	(0.00317)	(0.00321)
precipitation	-0.00228***	-0.00228***	-0.00232***
	(0.000373)	(0.000373)	(0.000380)
machine_PR	0.0471***	0.0458***	0.0267***
	(0.00498)	(0.00508)	(0.00661)
crowdedness_hour	-0.0000679***	-0.0000677***	-0.0000507***
	(0.0000137)	(0.0000138)	(0.0000133)
departure	-0.0568***		
	(0.00719)		
machine_PR × crowdedness_hour	0.00000774*	0.00000695	0.00000821*
	(0.00000355)	(0.00000364)	(0.00000364)
machine_PR × departure	-0.0151*		
	(0.00663)		
departure_next1		0.0120	
		(0.00673)	
machine_PR × departure_next1		-0.0111	
		(0.00730)	
time to next			-0.0368***
			(0.00207)
time to after next			-0.0178***
			(0.00241)
machine_PR × time to next			0.00664***
			(0.00143)
machine_PR × time to after next			-0.000748
			(0.00132)
Constant	-5.844***	-5.826***	-5.063***
	(0.104)	(0.104)	(0.115)
Observations	3399480	3399480	3146045

Standard errors are in parentheses and are clustered at the machine level.

We find the results quantitatively quite similar to the results in the main text. Although some coefficients are statistically insignificant, their sign never change. Since the hour fixed

Table A.32: Poisson Regression Results: Machine Level, Minute Crowdedness, Hour Fixed Effect

	(1)	(2)	(3)
temperature	0.0793***	0.0793***	0.0792***
	(0.00317)	(0.00317)	(0.00320)
precipitation	-0.00221***	-0.00221***	-0.00227***
	(0.000374)	(0.000374)	(0.000381)
machine_PR	0.0463***	0.0448***	0.0336***
	(0.00495)	(0.00506)	(0.00636)
crowdedness_minute_1	-0.00148**	-0.00152**	-0.000922
	(0.000504)	(0.000510)	(0.000480)
departure	-0.0612***		
	(0.00721)		
machine_PR × crowdedness_minute_1	0.000186	0.000134	0.000185
	(0.000247)	(0.000249)	(0.000245)
machine_PR × departure	-0.00717		
	(0.00673)		
departure_next1		0.00708	
		(0.00669)	
machine_PR × departure_next1		-0.00330	
		(0.00718)	
time to next			-0.0374***
			(0.00209)
time to after next			-0.0188***
			(0.00240)
machine_PR × time to next			0.00602***
			(0.00142)
machine_PR × time to after next			-0.00157
			(0.00131)
Constant	-5.838***	-5.820***	-5.033***
	(0.104)	(0.104)	(0.115)
Observations	3399480	3399480	3146045

Table A.33: Poisson Regression Results: Machine Level, Smoothed Minute Crowdedness, Hour Fixed Effect

	(1)	(2)	(3)
temperature	0.0792***	0.0792***	0.0790***
	(0.00317)	(0.00317)	(0.00321)
precipitation	-0.00231***	-0.00232***	-0.00235***
	(0.000373)	(0.000373)	(0.000380)
machine_PR	0.0474***	0.0462***	0.0269***
	(0.00507)	(0.00519)	(0.00682)
crowdedness_minute_2	-0.00713***	-0.00720***	-0.00570***
	(0.00148)	(0.00149)	(0.00145)
departure	-0.0556***		
	(0.00724)		
machine_PR × crowdedness_minute_2	0.000454	0.000377	0.000519
	(0.000288)	(0.000288)	(0.000289)
machine_PR × departure	-0.0145*		
	(0.00671)		
departure_next1		0.0132*	
		(0.00670)	
machine_PR × departure_next1		-0.0105	
		(0.00718)	
time to next			-0.0369***
			(0.00208)
time to after next			-0.0180***
			(0.00241)
machine_PR × time to next			0.00666***
			(0.00143)
machine_PR × time to after next			-0.000684
			(0.00133)
Constant	-5.846***	-5.829***	-5.065***
	(0.104)	(0.104)	(0.115)
Observations	3399480	3399480	3146045

Table A.34: Poisson Regression Results Robustness: Product Level, Hour Crowdedness, Hour Fixed Effect

	(1)	(2)	(3)
temperature	0.0798***	0.0798***	0.0798***
	(0.00308)	(0.00308)	(0.00334)
precipitation	-0.00195***	-0.00195***	-0.00250***
	(0.000356)	(0.000356)	(0.000411)
crowdedness_hour	-0.0000726***	-0.0000727***	-0.0000707***
	(0.0000151)	(0.0000151)	(0.0000149)
machine_PR	0.0318***	0.0321***	0.0282***
	(0.00497)	(0.00498)	(0.00564)
product_PR	0.0896***	0.0890***	0.0572**
	(0.0113)	(0.0112)	(0.0129)
departure	-0.0585***		
	(0.00715)		
machine_PR × crowdedness_hour	0.0000186***	0.0000187***	0.0000175***
	(0.00000369)	(0.00000371)	(0.00000374)
product_PR × crowdedness_hour	-0.0000748***	-0.0000751***	-0.0000738***
	(0.0000103)	(0.0000103)	(0.0000103)
machine_PR × departure	-0.00579		
	(0.00655)		
product_PR × departure	-0.0378**		
	(0.0134)		
departure_next1		-0.0561***	
		(0.00714)	
machine_PR × departure_next1		-0.00666	
		(0.00653)	
product_PR × departure_next1		-0.0363**	
		(0.0135)	
time to next			0.00141***
			(0.000152)
time to after next			0.000199
			(0.000629)
machine_PR × time to next			0.00000564
			(0.000155)
machine_PR × time to after next			-0.000254
			(0.000912)
product_PR × time to next			0.000976***
			(0.000279)
product_PR × time to after next			0.0000551
			(0.00173)
Constant	-8.351***	-8.351***	-8.185***
	(0.114)	(0.114)	(0.130)
Observations	108188100	108188100	81508353

Table A.35: Poisson Regression Results Robustness: Product Level, Smoothed Minute Crowdedness, Hour Fixed Effect

	(1)	(2)	(3)
temperature	0.0798***	0.0798***	0.0798***
	(0.00308)	(0.00308)	(0.00333)
precipitation	-0.00199***	-0.00199***	-0.00254***
	(0.000357)	(0.000357)	(0.000411)
crowdedness_minute2	-0.00775***	-0.00776***	-0.00765***
	(0.00164)	(0.00164)	(0.00163)
machine_PR	0.0320***	0.0323***	0.0283***
	(0.00509)	(0.00510)	(0.00590)
product_PR	0.0900***	0.0894***	0.0560***
	(0.0116)	(0.0116)	(0.0143)
departure	-0.0568***		
	(0.00721)		
machine_PR × crowdedness_minute2	0.00120***	0.00122***	0.00117***
	(0.000341)	(0.000342)	(0.000337)
product_PR × crowdedness_minute2	-0.00496***	-0.00498***	-0.00487***
	(0.00103)	(0.00102)	(0.00102)
machine_PR × departure	-0.00523		
	(0.00662)		
product_PR × departure	-0.0397**		
	(0.0140)		
departure_next1		-0.0543***	
		(0.00720)	
machine_PR × departure_next1		-0.00612	
		(0.00659)	
product_PR × departure_next1		-0.0381**	
		(0.0140)	
time to next			0.00139***
			(0.000153)
time to after next			0.000177
			(0.000628)
machine_PR × time to next			0.00000924
			(0.000154)
machine_PR × time to after next			-0.000272
			(0.000911)
product_PR × time to next			0.000996***
			(0.000287)
product_PR × time to after next			0.000104
			(0.00173)
Constant	-8.357***	-8.357***	-8.193***
	(0.113)	(0.113)	(0.129)
Observations	108188100	108188100	81508353

effect can capture time-varying unobserved heterogeneity, such as the time-varying mix of consumers, this robustness check confirms that our main results cannot be explained solely by the unobserved heterogeneity that varies by hour and machine.

E Zero Inflated Poisson Regression

In the main text, we estimate Poisson regression models. A concern one might wonder is that customers do not buy beverages very frequently and hence there are too many zeros in the data. To see whether our results are driven by this fact, we estimate Zero Inflated Poisson (ZIP) models and report the results of the machine-level models.

Tables A.36 and A.37 report the results of ZIP models. We find that the results are similar to the ones in the main text. Hence, our results are robust to the existence of excessive amount of zeros in sales.

F Details on the Validity Check

F.1 Instruction for the first manipulation check experiment

The purpose of this experiment is to investigate what kind of factors affects performance when a subject conducts various tasks using public transportation within limited time.

I would like you to conduct the specified tasks at the specified stations. After leaving this room, take JR train from Kunitachi station and follow the route specified below. Fill in the survey immediately after the tasks are completely in each station.

- Kunitachi Station
  - Buy a ticket to Tachikawa station.
- Tachikawa Station
  - Task 1: Record the words written under the big display at Isetan store at North exit.

	(1)	(2)	(3)	(4)	(5)	(6)
temperature	0.0790***	0.0791***	0.0784***	0.0787***	0.0787***	0.0781***
	(0.00309)	(0.00310)	(0.00314)	(0.00310)	(0.00310)	(0.00314)
precipitation	-0.00199***	-0.00200***	-0.00210***	-0.00183***	-0.00185***	-0.00202***
	(0.000371)	(0.000371)	(0.000376)	(0.000369)	(0.000369)	(0.000373)
machine_PR	0.0721***	0.0712***	0.00808	0.0644***	0.0641***	-0.000794
	(0.00507)	(0.00521)	(0.00641)	(0.00512)	(0.00525)	(0.00700)
crowdedness_minute_1	0.00787***	0.00774***	0.00500***			
	(0.000518)	(0.000516)	(0.000454)			
departure	0.217***			0.197***		
	(0.0104)			(0.00948)		
machine_PR × crowdedness_minute_1	0.000383*	0.000330*	0.0000955			
	(0.000166)	(0.000166)	(0.000200)			
machine_PR × departure	-0.0657***			-0.0654***		
	(0.00678)			(0.00689)		
departure_next1		0.283***			0.263***	
		(0.00947)			(0.00891)	
machine_PR × departure_next1		-0.0616***			-0.0614***	
		(0.00729)			(0.00733)	
time to next			-0.0833***			-0.0828***
			(0.00249)			(0.00250)
time to after next			-0.0591***			-0.0589***
			(0.00282)			(0.00282)
machine_PR × time to next			0.0125***			0.0130***
			(0.00142)			(0.00142)
machine_PR × time to after next			0.00238			0.00300*
			(0.00137)			(0.00140)
crowdedness_minute_2				0.0164***	0.0157***	0.00700***
				(0.00147)	(0.00146)	(0.00139)
machine_PR=1 × crowdedness_minute_2				0.00154***	0.00142***	0.000996***
				(0.000276)	(0.000275)	(0.000292)
Constant	-3.417***	-3.436***	-2.631***	-3.473***	-3.487***	-2.647***
	(0.0848)	(0.0846)	(0.0853)	(0.0863)	(0.0860)	(0.0873)
inflate						
Constant	-0.819***	-0.837***	-1.103***	-0.834***	-0.849***	-1.098***
	(0.0492)	(0.0499)	(0.0545)	(0.0503)	(0.0506)	(0.0541)
Observations	3399480	3399480	3146045	3399480	3399480	3146045

Table A.36: ZIP Results: Machine-Level, Minute & Smoothed Miniute Crowdedness: Standard errors are in parentheses and clustered at machine level. Machine, day-of-week, and timing fixed effects are controlled.

	(1)	(2)	(3)	(4)	(5)	(6)
temperature	0.0779***	0.0781***	0.0769***	0.0783***	0.0784***	0.0771***
	(0.00293)	(0.00293)	(0.00300)	(0.00295)	(0.00295)	(0.00302)
precipitation	-0.00270***	-0.00270***	-0.00280***	-0.00273***	-0.00273***	-0.00280***
	(0.000359)	(0.000360)	(0.000369)	(0.000361)	(0.000362)	(0.000369)
machine_PR	0.0756***	0.0750***	0.00742	0.0734***	0.0727***	0.0124
	(0.00498)	(0.00508)	(0.00586)	(0.00504)	(0.00511)	(0.00661)
crowdedness_minute_1	0.00990***	0.00974***	0.00660***			
	(0.000575)	(0.000570)	(0.000451)			
departure	0.208***			0.156***		
	(0.0100)			(0.00874)		
machine_PR × crowdedness_minute_1	-0.000240	-0.000292	-0.000566**			
	(0.000172)	(0.000176)	(0.000208)			
machine_PR × departure	-0.0700***			-0.0553***		
	(0.00620)			(0.00648)		
departure_next1		0.277***			0.224***	
		(0.00914)			(0.00839)	
machine_PR × departure_next1		-0.0662***			-0.0518***	
		(0.00667)			(0.00693)	
time to next			-0.0826***			-0.0793***
			(0.00245)			(0.00233)
time to after next			-0.0600***			-0.0570***
			(0.00264)			(0.00252)
machine_PR × time to next			0.0126***			0.0119***
			(0.00135)			(0.00133)
machine_PR × time to after next			0.00318*			0.00269*
			(0.00130)			(0.00131)
crowdedness_minute_2				0.0310***	0.0300***	0.0174***
				(0.00227)	(0.00224)	(0.00185)
machine_PR × crowdedness_minute_2				-0.000877**	-0.000922**	-0.000775*
				(0.000304)	(0.000310)	(0.000311)
Constant	-3.518***	-3.542***	-2.731***	-3.654***	-3.669***	-2.847***
	(0.0756)	(0.0754)	(0.0776)	(0.0770)	(0.0767)	(0.0798)
inflate						
Constant	-1.013***	-1.035***	-1.367***	-1.061***	-1.077***	-1.377***
	(0.0469)	(0.0477)	(0.0545)	(0.0499)	(0.0503)	(0.0550)
Observations	3399480	3399480	3146045	3399480	3399480	3146045

Table A.37: ZIP Results: Machine-Level, Smoothed Minute Crowdedness, Machine x timing Fixed Effects: Standard errors are in parentheses and clustered at machine-level. Day-of-week and machine x timing fixed effects are controlled.

  - Task 2: Buy a bevarage at the vending machine near the mark for Car 5 on platform 7-8.
  - Fill in the survey

- Fuchuu Honmachi Station
  - Task 3: Record the phone number written on the photo-taking machine on the concourse.
  - Task 4: Buy a bevarage at the vending machine in front of Newdays store.
  - Fill in the survey

- Nishi Kokubunji Station
  - Task 5: Record the number of train toward Tachikawa on the train schedule between 8am and 9am.
  - Task 6: Buy a bevarage at the vending machine near the mark for Car 6 on platform 2.
  - Fill in the survey

- Kunitachi Station
  - Exit and return to this room.

All participants receive basic participation compensation of 800 yen. In addition to this basic compensation, extra performance pay will be made depending on the time it takes to complete all the tasks. If a subject returns this room within 50 minutes, we pay extra 2500 yen. If it takes more than 50 minutes, 50 yen per minute of delay will be deducted from the 2500 yen performance pay. Moreover, any wrong answer on Tasks 1, 3, and 5 will result in 200 yen reduction in the performance pay. Failure to present the drinks you bought also results in 200 yen reduction in the performance pay.

F.2 Survey response sheet for the first manipulation check experiment. Responses to first question for Tasks 2, 4, and 6 corresponds to Q1 and second question to Q2 in Appendix A2.

- Name:
- Station at which the tasks are conducted:
- Time the task was started:
- Time to the next train:

Task 1

1. Please rate the degree to which you are hurried out of ten, 0 being least hurried, an 10 being extremely hurried.
2. What is the extent to which you feel hurried? The answer is one of the following: 1 strongly disagree, 2 disagree, 3 neither agree nor disagree, 4 agree, 5 strongly agree.

Task 2

1. Please rate the degree to which you are hurried out of ten, 0 being least hurried, an 10 being extremely hurried.
2. What is the extent to which you feel hurried? The answer is one of the following: 1 strongly disagree, 2 disagree, 3 neither agree nor disagree, 4 agree, 5 strongly agree.

Task 3

1. Please rate the degree to which you are hurried out of ten, 0 being least hurried, an 10 being extremely hurried.
2. What is the extent to which you feel hurried? The answer is one of the following: 1 strongly disagree, 2 disagree, 3 neither agree nor disagree, 4 agree, 5 strongly agree.

Task 4

1. Please rate the degree to which you are hurried out of ten, 0 being least hurried, an 10 being extremely hurried.

2. What is the extent to which you feel hurried? The answer is one of the following: 1 strongly disagree, 2 disagree, 3 neither agree nor disagree, 4 agree, 5 strongly agree.

Task 5

1. Please rate the degree to which you are hurried out of ten, 0 being least hurried, an 10 being extremely hurried.

2. What is the extent to which you feel hurried? The answer is one of the following: 1 strongly disagree, 2 disagree, 3 neither agree nor disagree, 4 agree, 5 strongly agree.

Task 6

1. Please rate the degree to which you are hurried out of ten, 0 being least hurried, an 10 being extremely hurried.

2. What is the extent to which you feel hurried? The answer is one of the following: 1 strongly disagree, 2 disagree, 3 neither agree nor disagree, 4 agree, 5 strongly agree.

F.3 Instruction for the second manipulation check experiment

The purpose of this experiment is to investigate the effects of other people in making a purchasing decision.

I form a group of two, three, and four right now. I would like each group to take a train from Kunitachi station to Tachikawa staion, and then from Tachikawa station to Kunitachi station, making a beverage purchases at the vending machines specified below. Fill in the survey immediately after the tasks are completely in each station. In addition, take a memo observing

how other people make purchases as we will ask you to provide us with your observation after you return to this room.

- Kunitachi station
  - Buy ticket to Tachikawa station
  - Task 1: Buy a beverage at the vending machine on the platform toward Tachikawa station at the mark Car 6. If this vending machine is not available to make a purchase, buy a beverage at the vending machine on the same platform at the mark Car 4.
  - Fill in the survey
- Tachikawa station
  - Exit, and buy ticket to Kunitachi staion
  - Task 2: Buy a beverage at the vending machine on the platform 3-4 at the mark Car 10. If this vending machine is not available to make a purchase, buy a beverage at the vending machine on platform 7-8 at the mark Car 5.
  - Fill in the survey
- Tachikawa station
  - Kunitachi station
  - Task 3: Buy a beverage at the vending machine on the platform toward Tokyo station at the mark Car 6. If this vending machine is not available to make a purchase, buy a beverage at the vending machine on the same platform at mark Car 5.
  - Fill in the survey
  - Exit, and return to this room

F.4 Survey response sheet for the second manipulation check experiment. Three sheets corresponding to Tasks 1, 2, and 3 are provided to the subjects. Response to the first question corresponds to Q3 and the second question to Q4 in Appendix A2.

- Name:
- Station you make a purchase:
- Number of people in your group:
- How many people are around you (within 5 meters) at the time you make the purchase:

1. Please rate the degree to which you care about the people around you, 0 being not cared at all, and 10 being extremely extremely.
2. What is the extent to which you care about other people around you? The answer is one of the following: 1 strongly disagree, 2 disagree, 3 neither agree nor disagree, 4 agree, 5 strongly agree.