Hobo Economicus

Peter T. Leeson*

R. August Hardy

Paola A. Suarez

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Abstract

The central implication of maximising behaviour amid competition is that rates of return tend toward equality. We test that implication in a market whose participants have the traits that behavioural economics suggests should make it hardest to find evidence of maximisation: the market for panhandling at Metrorail stations in Washington, DC. We find that stations with more panhandling opportunities attract more panhandlers and that cross-station differences in hourly panhandling receipts are statistically indistinguishable from zero. Panhandling rates of return thus tend toward equality. Extreme 'behavioural' traits do not prevent maximisation in this market.

Keywords: Panhandling; panhandlers; begging; beggars; behavioural economics; homeless; street people; rationality; irrationality; maximisation

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* Email: PLeeson@gmu.edu. Address: Department of Economics, George Mason University MS 3G4, Fairfax, VA 22030, USA. We thank the Editor, Hans-Joachim Voth, and three anonymous reviewers for comments. Joshua Bedi, Bryan Cutsinger, Tate Fegley, Colin Harris, Peter Jacobsen, Scott King, Ennio Piano, Louis Rouanet, Henry Thompson, Garrett Wood, and Andrew Vine provided invaluable assistance with data collection. We also thank Travis Boatright for helping us map Metrorail. Leeson is grateful to Oliva Melanio for stimulating thoughts. This research received IRB approval [959446] from the Office of Research Development, Integrity, and Assurance at George Mason University. The authors have no conflicts of interest to declare.

1 Introduction

'There is no more important proposition in economic theory', George Stigler observed, 'than that, under competition, the rate of return on investment tends toward equality in all industries' (1963, p.54).[1] That proposition is implied by maximising behaviour, the foundation of traditional economics. If the rate of return on, say, janitorial labour in one industry or location is higher than in another, maximising janitors will move out of the latter and into the former until rates of return equalise. The equalisation principle has different names depending upon its market application: the law of one price, the no-arbitrage condition, spatial equilibrium. In every case, however, it is the central implication of maximisation amid competition.

Behavioural economics challenges the premise of maximising behavior (Jolls et al., 1998; Mullainathan and Thaler, 2000). Homo sapiens differ from homo economicus in three ways: they have limited cognitive abilities, limited self-control, and care about others (Jolls et al., 1998; Mullainathan and Thaler, 2000; Thaler, 2015). The first two differences mean that humans may behave irrationally, with the result that rates of return may substantially differ amid competition. And, it is alleged, they do—even in financial markets, where 'we might expect rationality to abound' (Thaler, 2016, p.1577).

Apparent violations of the equalisation principle in financial markets are compelling because 'financial markets have the features that should make it hardest to find evidence of misbehavior' (Thaler, 2016, p.1586). Their participants tend to have superior cognitive abilities and self-control (see, for instance, Benjamin et al., 2006). Hence, 'If there is anywhere in the economy where neoclassical economics should be an accurate description of reality it should be

[1] Kenneth Arrow agreed: 'the most fundamental of economic balance relations [is] the equalization of rates of return, as enforced by the tendency of factors to move from low to high returns' (1983, p.107).

on Wall Street' (Thaler, 2018, p.1274). That financial-market participants do not appear to be maximising is thus considered powerful evidence against the foundation of traditional economics.

By the same token, observing rate-of-return equalisation where we might expect *irrationality* to abound would constitute powerful evidence *for* the foundation of traditional economics. Behavioural economics suggests that it should be hardest to find evidence of maximisation in markets whose participants have exceptionally limited cognitive abilities, even mental disorders, and exceptionally limited self-control, even drug and alcohol addictions. If rates of return nevertheless tend toward equality in *these* markets, then perhaps maximisation is a more robust foundation for economics than behavioural considerations suggest.

We study such a market: the market for panhandling. Panhandlers—often called 'hobos' or 'beggars'—are street people who solicit donations from passersby in public spaces.[2] Mental and substance disorders are highly prevalent among panhandlers (Zlotnick and Robertson, 1996; Lee and Farrell, 2003), who therefore allegedly 'cannot be comfortably categorized as rational decision makers' (Mitchell, 2012, p.490; see also, Goldstein, 1993; Conroy, 2001; Lee and Farrell, 2003).

We collect data on the number of panhandlers at 26 Metrorail stations in Washington, DC and on hourly panhandling receipts at five of those stations. Metrorail is Washington's public rapid-transit system. Panhandlers solicit passersby outside its station exits. Some Metrorail stations are trafficked by more passersby and thus offer more panhandling opportunities. If panhandlers respond rationally to incentives, such stations should attract more panhandlers. And if

[2] Street people are often called 'the homeless'. Most homeless people do not panhandle, but most panhandlers are homeless (see, for instance, O'Flaherty, 1996; Kennedy and Fitzpatrick, 2001; Lee and Farrell, 2003; and Lei, 2013). The term 'hobo' was originally used in the nineteenth century to refer to vagrants. Today the term is used synonymously with the term 'beggar' (https://www.lexico.com/synonyms/beggar). Unlike some other terms used to describe such individuals, 'hobo' is not derogatory (https://nationalhomeless.org/hoboes-bums-tramps).

panhandlers' station choices are maximising, panhandling rates of return across stations should tend toward equality.

We find that stations with more panhandling opportunities attract more panhandlers and that cross-station differences in hourly panhandling receipts are statistically indistinguishable from zero. Panhandling rates of return thus tend toward equality. Extreme 'behavioural' traits do not prevent maximisation in this market. Panhandlers choose stations as homo economicus would if homo economicus were a street person who solicited passersby at Metrorail.

2 Setting

Metrorail (Metro) is the public rapid-transit system that serves the Washington metropolitan area.[3] It has six lines, 91 stations, and is the third busiest rapid-transit system in the United States, hosting more than 260 million riders annually (APTA, 2017).[4] Metro provides an ideal setting to study the behaviour of panhandlers. Its stations furnish well-defined public spaces where we can observe panhandlers work.

DC code permits panhandling on public property but not at transportation stations. It does not, however, specify the distance from Metro station exits at which panhandling becomes permissible. Whatever that distance, it is satisfied by the panhandlers who solicit at the Metro stations in our study. We observed hundreds of panhandlers for hundreds of hours over a period of 13 months and did not observe a single panhandler being interfered with by Metro Transit Police or other authorities. Lawful or simply ignored, panhandling in the Metro spaces we study proceeds unmolested.

[3] Also known as the National Capital Region.
[4] Behind the NYC Subway and the Chicago L.

The market for panhandling in those spaces exhibits free entry and exit. We observed no effort by any panhandler to limit or otherwise control the presence of other panhandlers (or anyone else) at any Metro station. Panhandlers frequently came and went from stations where other panhandlers were present and did so without conflict or even acknowledging one another. We saw no evidence of panhandler property rights to solicit at certain Metro stations. To the contrary, we encountered different panhandlers on different visits to the same stations. Nor did we see evidence of panhandler property rights to occupy certain spots at a given station, save the fact that no panhandler attempted to occupy a spot while it was occupied by another panhandler. Panhandlers do not sleep at Metro stations, so spots are reallocated daily, if not sooner when a panhandler moves on.

Neither entry barriers nor property rights therefore limit the number of panhandlers who choose to solicit at a Metro station. Competition, however, limits that number if panhandlers are maximisers. As more panhandlers choose to solicit at a station, expected hourly panhandling receipts at the station fall relative to at another. When they fall enough, the latter station attracts panhandlers from the former station until expected hourly receipts at the stations are equal. In equilibrium, more panhandlers solicit at the station that offers more panhandling opportunities, but some panhandlers solicit at the station that offers fewer. In other words, the same competitive force that limits, for instance, the number of convenience stores that choose to locate on a given block in DC likewise limits the number of panhandlers who choose to solicit at a given Metro station.

3 Data and Procedures

3.1 Number of Panhandlers and Passersby

For ten months in 2016-2017 we visited 25 Metrorail stations and the intersection of Wisconsin Avenue and M Street in Georgetown—a popular shopping corridor—to collect data on the number of panhandlers.[5] Appendix A maps Metrorail. Solid circles identify sample stations.[6] They cover all six Metro lines and serviced nearly half of all Metro riders during our study period.[7]

We made a total of 242 Metro station visits to collect data on the number of panhandlers. We visited each sample station an average of approximately nine times over four months. On each visit we canvassed a one square-block area around the station exit(s) to count panhandlers.[8] Every street person observed soliciting donations from passersby was considered a panhandler. Street people were identified by appearance: the 'disheveled, [and] apparently destitute' (O'Flaherty, 1996, p.7). Our data contain 258 panhandlers, 218 of whom are unique. We use them to create a variable that measures the number of panhandlers at each Metro station on each visit.

Some Metro stations are trafficked by more passersby and thus offer more panhandling opportunities. The busiest sample station, for example, averages nearly 600,000 exiting Metro riders per month. The least busy station averages just over 40,000 exiting riders per month. The Washington Metropolitan Area Transit Authority (WMATA) tracks Metrorail ridership. We use its data (WMATA, 2016-2019) on the number of people who exit each Metro station every month during our study period to measure panhandling opportunities.[9]

Some Metro stations are located closer to homeless-service providers, such as shelters and 'soup kitchens', on which panhandlers may rely. We use Google Maps to identify the presence or

[5] In 2016 we visited during October, November, and December. In 2017 we visited during February, March, April, May, June, October, and November.
[6] Appendix B enumerates stations in our sample.
[7] We call Georgetown a station for convenience of exposition. Georgetown is thus our twenty-sixth 'station'.
[8] In Georgetown, a one square-block area around the intersection of Wisconsin Avenue and M Street.
[9] Georgetown is assigned the number of people who exit Foggy Bottom-GWU, the Metro station closest to the intersection of Wisconsin Avenue and M Street.

absence of such a service near each Metro station. We create an indicator variable that equals one if a station is within a ten-minute walk of a homeless service and equals zero otherwise.

Some Metro stations are more accessible to panhandlers. The District of Columbia contracts with United Planning Organization, a community action agency, to operate a shuttle that provides homeless people free daily transportation to several stops in the city. We use Google Maps and data from DC Human Services (DC Data Catalog, 2018) to identify the presence or absence of such a stop near each Metro station. We create an indicator variable that equals one if a station is within a ten-minute walk of a homeless shuttle-stop and equals zero otherwise.

Finally, some Metro stations' passersby may be friendlier to panhandlers. We collected data on the friendliness of passersby whom panhandlers solicit during 93 of our 242 Metro station visits. We visited each sample station for that purpose an average of approximately four times over two months. Any adult observed exiting a Metro station escalator was considered a passerby.[10] We approached them with the following request: 'Hello, can you give me directions to [local landmark]'? After an approached passerby had traveled at least a block away, we approached the next person to exit the station escalator. This procedure was repeated for three train arrivals.[11]

We assigned the friendliness of each passerby's response to one or more of five categories. From least friendly to friendliest response, the categories are: (1) ignored solicitation; (2) acknowledged solicitation but kept walking; (3) stopped to acknowledge solicitation; (4) stopped and provided directions; (5) stopped and provided directions by sharing a map. Our data contain the solicitation responses of 701 passersby. We use them to create a variable that measures the

[10] In Georgetown, anyone walking through the northwest intersection of Wisconsin Avenue and M Street.
[11] In Georgetown, for 15 minutes—the approximate time it takes for three train arrivals at a Metro station. Appendix B identifies the local landmark to which we solicited directions from passersby at each station. All landmarks would be known to passersby familiar with the area and are within walking distance of their respective stations. No landmarks are visible from the data collection area.

average of passersby's friendliest response at each station. Panel A in Table 1 presents summary statistics for all variables in our full sample.

Other features of Metro stations about which panhandlers might care are identical or very similar across sample stations: coverings that provide protection from precipitation; benches on which panhandlers might sit or lie; garbage cans from which panhandlers might retrieve recyclables or food waste. WMATA follows a common manual for the physical design of Metro stations, whose designs are therefore shared. All but four sample stations have covered exit areas.[12] No sample stations have exit-area seating. And all sample stations have exit-area garbage cans, whose precise number depends on need and thus on the number of people who exit the station.

Garbage-can availability, moreover, is unlikely to matter to the panhandlers in our study. In contrast to New York, for instance, the District of Columbia does not have refundable container deposits, nor does Virginia or Maryland. DC-area panhandlers therefore do not search in garbage cans for refundable containers, and we did not observe any panhandlers search in garbage cans for food (or anything else). WMATA prohibits food in Metro stations, so exit-area garbage cans are unlikely to contain much edible waste. Further, as indicated above, numerous homeless services offer food to DC-area street people, who therefore do not need to eat garbage.

3.2 Panhandling Receipts

For three months in 2019 we visited five Metrorail stations in our sample to collect data on panhandling receipts.[13] We visited each station four times and on the same dates. Our subsample stations are Farragut North, Farragut West, Gallery Place-Chinatown, McPherson Square, and

[12] The exceptions are Archives, Arlington Cemetery, Dupont Circle (where exit-area covering is being constructed), and Smithsonian, none of which are among the subsample stations we use to investigate whether panhandling rates of return tend toward equality.
[13] We visited during February, March, and April.

Metro Center. These stations are well suited for investigating whether panhandling rates of return tend toward equality.

Economic theory predicts rate-of-return equalisation when it is costless to acquire information about arbitrage opportunities and costless to exploit them. Those requirements are violated for most of Metrorail's 91 stations, including many stations that are within the District of Columbia. Because such stations are far from one another, walking between them and acquiring information about their panhandling opportunities is costly. Consider, for example, the Metro stations Friendship Heights and Congress Heights, both of which are in DC. They are separated by more than 11 miles and approximately four hours' walking time—one way. Economic theory does not predict that panhandling rates of return across such stations will tend toward equality, and there is no reason that maximising panhandler behaviour would produce that result.

Within a cluster of neighbouring Metro stations, in contrast, the theoretical requirements for equalisation are approximated. Panhandlers can walk between these stations and acquire information about their panhandling opportunities with ease. The five Metro stations in our subsample constitute such a cluster. As Appendix A shows, those stations are clustered at the center of the Metrorail system in downtown DC. Each subsample station is within a 24-minute walk of the others and within a 14-minute walk of a homeless shuttle-stop. Economic theory thus predicts that panhandling rates of return across subsample stations will tend toward equality.

Panhandling rates of return depend not only panhandling receipts but also on panhandling costs. Panhandling costs consist of potential legal penalties (where panhandling is illegal), time spent panhandling, and time spent traveling to/from panhandling sites. As indicated above, Metro Transit Police tolerate panhandling in the Metro spaces we study. For all panhandlers in our data, legal costs are therefore zero. We account for differences in time spent panhandling by measuring

panhandling receipts per hour. Finally, because each subsample station is within similar walking distance of the others and a homeless shuttle-stop, differences in time spent traveling to/from these stations should be small. Across subsample stations, hourly panhandling receipts thus approximately compare panhandling rates of return.

All subsample stations were visited simultaneously between 7:30 am and 11:30 am. On each visit we canvassed a one square-block area around the station exit(s) for panhandlers and selected one or more panhandlers for observation. Panhandler selection was guided by the practicality of discreetly observing panhandlers work, and preference was given to panhandlers whose observation would permit simultaneous observation of other, neighbouring panhandlers. Selected panhandlers were observed until they departed the station. After they did, the station was canvassed again and new panhandlers were selected for observation. This procedure was repeated until the collection day ended at 11:30 am. We observed a total of 67.6 hours of panhandling work.

Panhandlers were observed at work without their knowledge. We recorded the number of donations each panhandler received and the number of minutes he was observed working. The average panhandler in our subsample was observed working for 51 minutes. When a panhandler departed the station, if he received any donations, we approached and offered him $5 to count in front of us the money he just received. Eighty-two percent of approached panhandlers accepted our offer.[14] After watching a panhandler count his money, we recorded the dollar amount.[15]

Our subsample data contain 80 panhandlers, 76 of whom are unique. We use them to create two variables that measure panhandling receipts. The first variable calculates the number of

[14] Our $5 payment is not included in these panhandlers' receipts.

[15] In several instances passersby made in-kind donations to panhandlers, such as Starbucks coffee, cigarettes, and a McDonald's value meal. In these cases we recorded the in-kind receipts, whose value we monetised using their market prices.

donations each panhandler received per hour. The second variable calculates the dollars he received per hour. Panel B in Table 1 presents summary statistics for these variables.

The average panhandler in our subsample receives 2.8 donations per hour, the value of which is $6.10. That is equal to 46 percent of the DC minimum wage and to 84 percent of the federal minimum wage at the time of data collection. The median panhandler in our subsample receives 1.8 donations per hour, the value of which is $1.40. Figure 1 illustrates why average and median hourly panhandling receipts differ. Panel A in Figure 1 depicts the distribution of the number of panhandling donations received per hour at each Metro station. Panel B depicts the distribution of panhandling dollars received per hour at each station. In both panels, a small fraction of panhandlers receives large receipts, and a large fraction of panhandlers receives none. Panhandling is like fishing: often it's a bust, but occasionally one lands a 'whale' that makes the effort worthwhile.

4 Analysis

Table 2 investigates whether panhandlers' station choices respond rationally to incentives. We regress the number of panhandlers at each station-visit on the number of passersby at each station in the month of visitation. Stations with more passersby offer more panhandling opportunities. Hence, if panhandlers respond rationally to incentives, such stations should attract more panhandlers. The first column in Table 2 considers our full sample. The second column considers our five-station subsample. Both columns estimate OLS models, calculate robust standard errors clustered by Metro station, and include date fixed effects.

Panhandlers' station choices respond rationally to incentives. Metro stations with more panhandling opportunities attract more panhandlers. A one standard deviation increase in the

number of passersby is associated with a 0.53 and 0.40 standard deviation increase in the number of panhandlers in the full sample and subsample, respectively. Passerby friendliness is associated with significantly more panhandlers in the full sample but not in the subsample. In both samples, stations that are near a homeless shuttle-stop also attract more panhandlers.

Tables 3-5 investigate whether panhandlers' station choices are maximising. We test the equality of variances, means, and medians of hourly panhandling receipts across stations. If panhandler behaviour is maximising, hourly receipts across stations should tend toward equality. Figure 1 previews our results: variances, means, and medians of hourly panhandling receipts are similar across stations.

Table 3 uses the Brown-Forsythe test to evaluate the equality of variance in hourly panhandling receipts across stations.[16] Table 4 uses the one-way analysis of variance (ANOVA) test to evaluate the equality of mean hourly panhandling receipts across stations. Table 5 uses the Kruskal-Wallis test to evaluate the equality of median hourly panhandling receipts across stations. In each table, Panel A considers the number of donations received per hour, and panel B considers dollars received per hour.

Panhandlers' station choices are maximising. In both panels, cross-station differences in the variances, means, and medians of hourly panhandling receipts are statistically indistinguishable from zero.[17]

[16] The Brown-Forsythe test is appropriate for skewed distributions like those in Figure 1. Our results, however, are qualitatively unchanged using Levene's test, which considers deviations from the mean instead of the median.

[17] We repeat the analyses in Tables 3-5 using lower and upper bounds on the amount of time that panhandlers were observed working. First, we bound minutes observed working to 10 for panhandlers observed less than 10 minutes and bound minutes observed working to three standard deviations above the mean (191.55 minutes) for panhandlers observed longer. Second, we bound minutes observed working to 10 for panhandlers observed less than 10 minutes and bound minutes observed working to two standard deviations above the mean (144.6 minutes) for panhandlers observed longer. In every case our results are qualitatively unchanged using either set of bounds (and using only the lower or only the upper bound).

A potential concern is that this finding reflects limited statistical power. To examine that possibility, we perform power calculations for the ANOVA test of equality of means. We calculate the probability of detecting cross-station differences at the five-percent significance level if true differences exist, using our sample sizes and three alternative assumptions about the variance of hourly panhandling receipts within and between Metro stations: (1) within- and between-variance equal the sample estimate; (2) within-variance is 15 percent larger and between-variance is 15 percent smaller than the sample estimate; (3) within-variance is 15 percent smaller and between-variance is 15 percent larger than the sample estimate. These alternatives thus correspond to assuming that the ratio of between- to within-variance in hourly receipts (1) equals the sample estimate, (2) is 0.74 times the sample estimate, or (3) is 1.35 times the sample estimate.

We calculate power using both measures of hourly panhandling receipts. Using the number of donations received per hour, calculated power is (1) 0.997, (2) 0.978, and (3) 1. Using dollars received per hour, calculated power is (1) 0.684, (2) 0.535, and (3) 0.826. We hasten to emphasize that these calculations can provide only a crude idea of our test's power. There is no way of knowing the true variance without large samples, and while assumption (1) is the best estimate of the true variance given the available data, those data are from small samples.

Price uniformity may be an outcome of market competition or its opposite: collusion. Another potential concern is therefore that uniform hourly panhandling receipts across stations may reflect panhandler collusion. We can be confident that collusion is not responsible for our results for two reasons. First, as Section 2 described, we observed hundreds of panhandlers for hundreds of hours in their work environment and detected no hint of market restrictions or of panhandler coordination at any Metro station, let alone across stations. Indeed, managing collusion in our study's setting is hard to imagine. How, for instance, would 76 panhandlers monitor each

other across five stations to enforce collusive terms? And how could a panhandler cartel prevent other panhandlers from entering public spaces patrolled by Metro Transit Police? Like panhandlers in other US cities such as Manhattan, where 'free-rider problems for panhandlers are large, because most work independently, [and] they have few common meeting places' (Dordick et al., 2018, p.78), panhandlers who solicit at Metro stations in Washington, DC work independently and would find it difficult to coordinate their activity.

Second, our data measure panhandling receipts when panhandlers first received them. Colluding panhandlers might depart their respective stations and congregate somewhere to pool receipts and divide them equally. But panhandlers could not have done that before we observed their receipts because each panhandler in our data tallied his receipts in front of us before he was gone from the station and after we watched him receive the receipts from passersby. To produce the cross-station pattern of hourly receipts in our data, panhandler collusion would thus need to somehow produce equal hourly receipts across stations without panhandlers pooling and dividing receipts.[18]

A final potential concern is that our results may reflect passersby choosing between stations with different numbers of inert panhandlers rather than maximising panhandlers choosing between stations trafficked by different numbers of passersby. Yet if passersby regard panhandlers as a nuisance, which most passersby do (Ellickson, 1996), the former possibility cannot explain our findings. Passersby who regard panhandlers as a nuisance might divert their travel from stations with more panhandlers to stations with fewer. But then stations with more passersby would have fewer panhandlers and larger hourly panhandling receipts, which they do not. Rather, stations with

[18] Note also that 76 panhandlers who could manage to successfully collude across five Metro stations—let alone manage to do so in a manner that equalised hourly receipts across stations without pooling and dividing receipts—would need to be far more sophisticated than 76 panhandlers who merely maximised as autonomous actors.

more passersby have more panhandlers, and hourly panhandling receipts across stations tend toward equality. Moreover, passerby diversion is unlikely in the environment we study. Most passersby exiting our subsample stations are work commuters, who are unlikely to change their commute routes to avoid walking past panhandlers. And passersby exiting subsample stations who are not work commuters are unlikely to know ex ante which stations tend to have more panhandlers and thus which stations they might desire to avoid.

5 Conclusion

The central implication of maximising behavior amid competition is that rates of return tend toward equality. We tested that implication in a market whose participants have the traits that behavioural economics suggests should make it hardest to find evidence of maximisation: the market for panhandling. Mental and substance disorders are highly prevalent among panhandlers, who thus tend to have exceptionally limited cognitive abilities and self-control. We collected data on the number of panhandlers at 26 Metrorail stations in Washington, DC and on hourly panhandling receipts at five of those stations. Stations with more panhandling opportunities attract more panhandlers, and cross-station differences in hourly panhandling receipts are statistically indistinguishable from zero. Panhandling rates of return thus tend toward equality.[19] Panhandlers choose stations as homo economicus would if homo economicus were a street person who solicited passersby at Metrorail.

[19] According to one critic of our study, ours is but 'a test of rationality at the lowest possible level, little different from studies in the 1970s and 1980s testing whether dogs and a few other animals respond to what might be called economic incentives'. The bar, however, was not set by us. It was set by behavioural economists who claim that because people have limited cognitive abilities and self-control, people's behavior, even in markets, is often irrational. Our study, moreover, does not test only whether panhandling behavior responds to incentives. It tests whether panhandling behavior is *maximising*, a considerably stronger condition.

That extreme ‘behavioural’ traits do not prevent maximisation in the market for panhandling begs the question of why modest behavioural traits seemingly often prevent maximisation in other markets. One possibility is that the stakes for panhandlers who fail to maximise are more dire than for participants in most other markets because, unlike participants in those markets, panhandlers live at the edge of subsistence. If panhandlers did not maximise, they might not survive. Another, non-mutually exclusive, possibility is that modest behavioural traits do not prevent maximisation in other markets as often as some have claimed. Maximisation may be a more robust foundation for economics than behavioural considerations suggest.

George Mason University

Sweet Briar College

Seton Hall University

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Table 1. *Summary statistics*

Panel A: Number of panhandlers and passersby					
Variable	Obs.	Mean	SD	Min.	Max.
	Full sample				
Number of panhandlers	242	1.066	1.582	0.00	10.00
Number of passersby	242	348.954	168.050	67.12	690.53
Passerby friendliness	242	3.112	0.194	2.79	3.75
Homeless service	242	0.401	0.491	0.00	1.00
Homeless shuttle-stop	242	0.368	0.483	0.00	1.00
	Five-station subsample				
Number of panhandlers	102	1.922	1.811	0.00	10.00
Number of passersby	102	485.523	120.044	270.82	690.53
Passerby friendliness	102	3.025	0.118	2.88	3.19
Homeless service	102	0.578	0.496	0.00	1.00
Homeless shuttle-stop	102	0.667	0.474	0.00	1.00
Panel B: Panhandling receipts					
Variable	Obs.	Mean	SD	Min.	Max.
Donations per hour	80	2.804	3.175	0.00	15.00
Dollars per hour	67	6.096	11.039	0.00	63.53

Notes: In Panel A, observations are Metro station-visits. In Panel B, observations are panhandlers.

Table 2. *Determinants of the number of panhandlers across Metro stations*

	Full sample (1)	Five-station subsample (2)
Number of passersby	0.005	0.006
	(0.001)	(0.002)
Passerby friendliness	1.595	1.462
	(0.851)	(2.793)
Homeless shuttle-stop	0.781	0.890
	(0.182)	(0.227)
Homeless service	0.450	0.815
	(0.278)	(0.525)
Date fixed effects	X	X
Adjusted R^2	0.39	0.06
Observations	242	102

Notes: Observations are Metro station-visits. Robust standard errors clustered by Metro station in parentheses. Appendix A maps and Appendix B enumerates stations in both samples.

Table 3. *Test of equality of variance in panhandling receipts across Metro stations*

Panel A: Donations per hour			
Metro station	Mean	SD	Obs.
Farragut North	3.287	2.786	14
Farragut West	3.078	3.717	12
Gallery Pl-Chinatown	3.160	3.689	17
McPherson Sq	2.689	3.537	17
Metro Center	2.096	2.394	20
All	2.804	3.175	80
		Brown-Forsythe W-statistic	
		0.541	
		(0.706)	
Panel B: Dollars per hour			
Metro station	Mean	SD	Obs.
Farragut North	5.957	6.918	11
Farragut West	7.458	13.670	9
Gallery Pl-Chinatown	4.325	5.845	15
McPherson Sq	6.166	10.796	16
Metro Center	7.015	15.844	16
All	6.096	11.039	67
		Brown-Forsythe W-statistic	
		0.276	
		(0.893)	

Notes: Brown-Forsythe test of equality of variances with p-values in parentheses.

Table 4. *Test of equality of mean panhandling receipts across Metro stations*

Panel A: Donations per hour			
	Sum of squares	Degrees of freedom	Mean square
Within Metro stations	16.569	4	4.142
Between Metro stations	779.724	75	10.396
Total	796.293	79	10.080
		ANOVA F-statistic	
		0.40	
		(0.809)	
Panel B: Dollars per hour			
	Sum of squares	Degrees of freedom	Mean square
Within Metro stations	77.539	4	19.385
Between Metro stations	7965.676	62	128.479
Total	8043.215	66	121.867
		ANOVA F-statistic	
		0.15	
		(0.962)	

Notes: One-way ANOVA test of equality of means with p-values in parentheses.

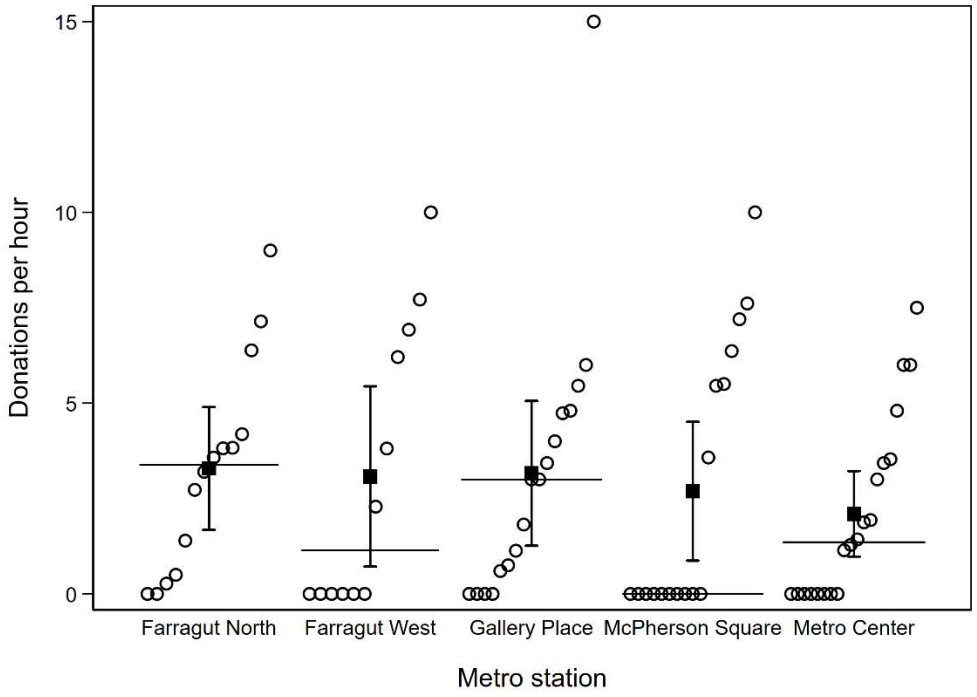
Table 5. *Test of equality of median panhandling receipts across Metro stations*

Panel A: Donations per hour			
Metro station	Median	Rank sum	Obs.
Farragut North	3.386	664.0	14
Farragut West	1.143	483.5	12
Gallery Pl-Chinatown	3.000	730.5	17
McPherson Sq	0.000	630.0	17
Metro Center	1.357	732.0	20
All	1.847		80
		Kruskal-Wallis chi-squared adj. for ties	
		2.506	
		(0.644)	
Panel B: Dollars per hour			
Metro station	Median	Rank sum	Obs.
Farragut North	3.409	452.0	11
Farragut West	0.000	266.5	9
Gallery Pl-Chinatown	1.818	554.0	15
McPherson Sq	0.000	488.0	16
Metro Center	0.214	517.5	16
All	1.395		67
		Kruskal-Wallis chi-squared adj. for ties	
		3.170	
		(0.530)	

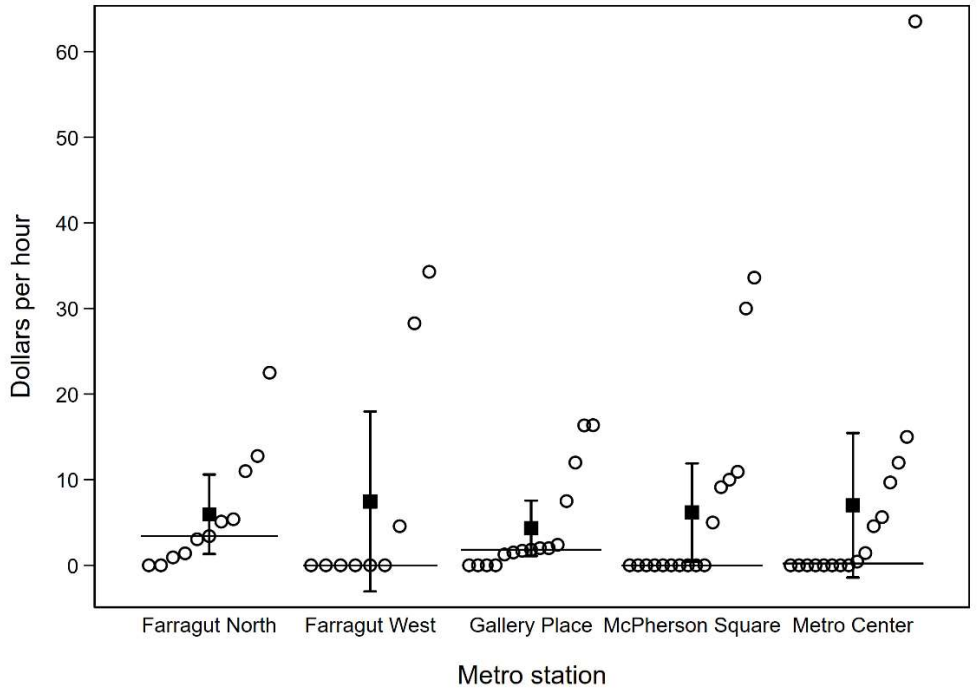
Notes: Kruskal-Wallis test of equality of medians with p-values in parentheses.

Figure 1. *Distribution of panhandling receipts at each Metro station*

Panel A: Donations per hour



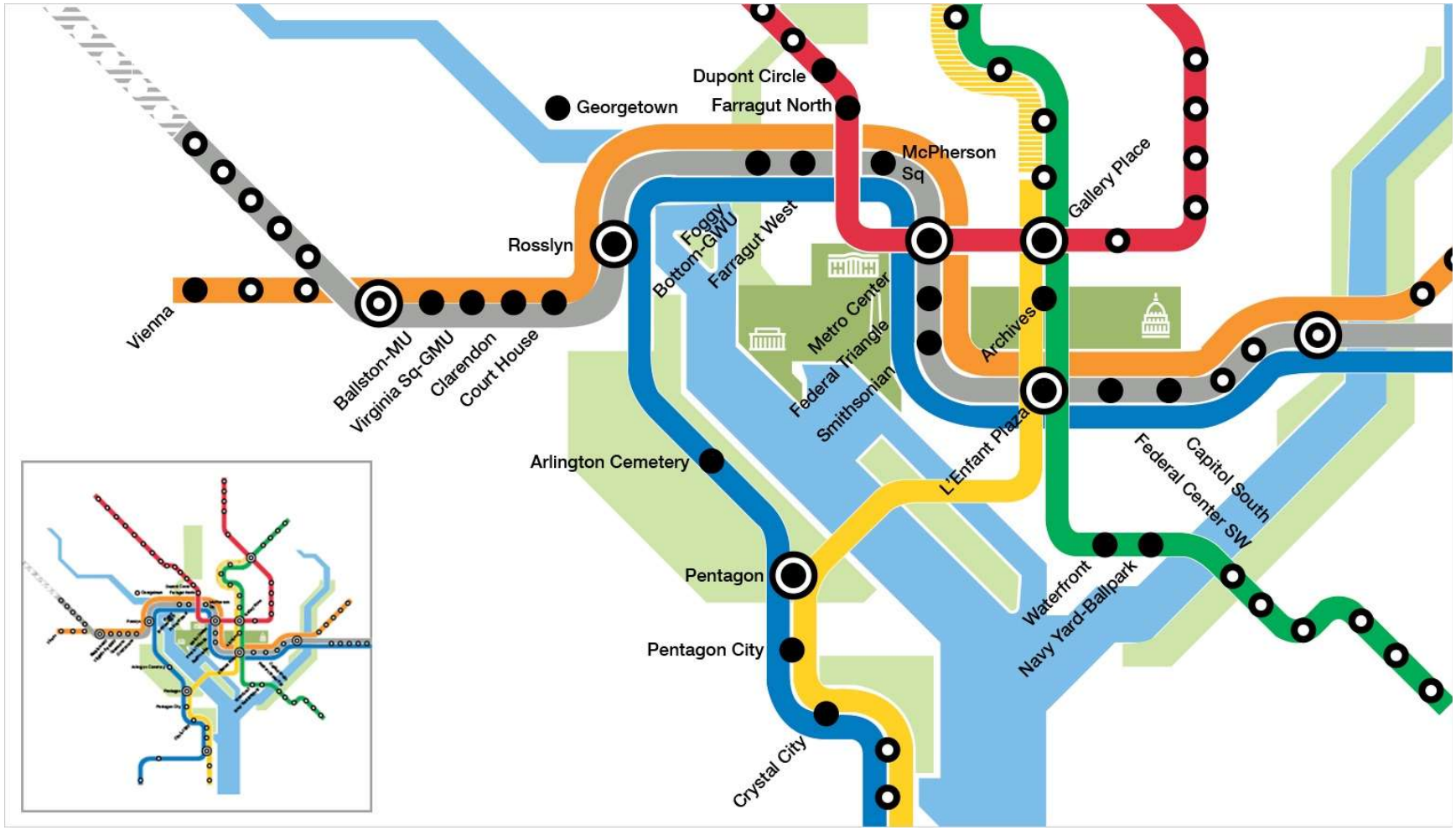
Panel B: Dollars per hour



Notes: Panhandler observations plotted for each station to reflect a cumulative probability scale. Means depicted by solid squares with 95% confidence intervals depicted by vertical bars. Medians depicted by horizontal bars.

Appendix A

Figure A1. *Metrorail*



Notes: Sample stations named and denoted with solid circles. Subsample stations are Farragut North, Farragut West, Gallery Pl-Chinatown, McPherson Square, Metro Center.

Appendix B

Table B1. *Sample Metro stations and local landmarks*

Metro station	Local landmark
Archives	Washington Monument
Arlington Cemetery	White House
Ballston-MU	Ballston Common Mall
Capitol South	Capitol Building
Clarendon	Northside Social
Courthouse	Court House Movie Theater
Crystal City	Reagan National Airport
Dupont Circle	Embassy Row
Farragut North	White House
Farragut West	White House
Federal Center SW	Capitol Building
Federal Triangle	Washington Monument
Foggy Bottom-GWU	White House
Gallery Place-Chinatown	Metro Center
Georgetown	Key Bridge
L'Enfant Plaza	Washington Monument
McPherson Square	White House
Metro Center	Verizon Center
Navy Yard-Ballpark	Canal Park
Pentagon	Pentagon Memorial
Pentagon City	Pentagon Memorial
Rosslyn	USMC Memorial
Smithsonian	Museum of Natural History
Vienna/Fairfax-GMU	Vienna (town of)
Virginia Square-GMU	George Mason University
Waterfront	Washington Channel

Notes: Georgetown is the intersection of Wisconsin Avenue and M Street. Bold denotes stations in five-station subsample.