Hobo Economicus

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Abstract

We collect data on hundreds of panhandlers and the passersby they encounter at Metrorail stations in Washington, DC. Panhandlers solicit more actively when they have more human capital, when passersby are more responsive to solicitation, and when passersby are more numerous. Panhandlers solicit less actively when they compete. Panhandlers are attracted to Metrorail stations where passersby are more responsive to solicitation and to stations where passersby are more numerous. Across stations, potential-profit per panhandler is nearly equal. Most panhandlers use pay-what-you-want pricing. These behaviors are consistent with a simple model of rational, profit-maximizing panhandling.

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1 Introduction

Near a subway station. Outside a convenience store. At a public park. If you've spent any time in a major city, chances are, you've encountered a panhandler. Often called "beggars" or "hobos," panhandlers are "street people" who solicit donations from passersby in public spaces.[1] Despite their ubiquity, little is known about these people, whose behavior literally begs for explanation.

Some panhandlers beckon you with cardboard signs. Others beseech you with impassioned vocal pleas or by noisily shaking a cup. Some panhandlers stand passively, like urban wishing wells, waiting to receive your change. Others perform music or give away newspapers, and still others lie on the ground practically asleep. Panhandlers may solicit fixed sums from passersby, or they may invite you to pay what you want. And while panhandlers solicit in many public spaces, their locational distribution varies widely. Do panhandling behaviors display patterns? If so, what do they look like, and what explains them?

To study these questions, we collect data on hundreds of panhandlers and the passersby they encounter at Metrorail stations in Washington, DC. To measure how actively panhandlers solicit and to discern their pricing schemes, we observe panhandlers soliciting. To measure panhandlers' human capital, we give them a written quiz containing mathematical story problems. To measure passerby responsiveness to solicitation, we solicit Metrorail riders for directions. And to measure the locational distribution of panhandlers and competition between them, we count panhandlers at Metrorail stations.

The data reveal clear panhandling behavioral patterns. Panhandlers solicit more actively when they have more human capital, when passersby are more responsive to solicitation, and when passersby are more numerous. Panhandlers solicit less actively when they compete. Panhandlers are attracted to Metrorail stations where passersby are more responsive to solicitation and to stations where passersby are more numerous. Across stations, potential-profit per panhandler is nearly equal. Most panhandlers use pay-what-you-want pricing. These behaviors are consistent with a simple model of rational, profit-maximizing panhandling.

[1] "Street people" are the "disheveled, [and] apparently destitute" individuals you often see in urban public spaces (O'Flaherty 1996: 7). They include, for instance, "the homeless," who lack homes, and panhandlers, who solicit donations from passersby. Some of the homeless panhandle, and many, though not all, panhandlers are homeless. According to Stark, a little more than a third of the homeless in Washington, DC panhandle (1992: 343). See also, Goldstein (1993), Mabry (1993), and O'Flaherty (1996).

Studies of American panhandlers are rare.[2] Goldstein (1993) interviews a dozen panhandlers in New Haven. O'Flaherty (1996) interviews 74 panhandlers in New York City. And Lankenau (1999a,b) interviews 37 panhandlers in Washington, DC. Lee and Farrell (2003) report on a 1996 survey of homeless people that asks about panhandling and on a 1990 survey of the public that asks about encounters with panhandlers.[3] Dordick et al. (2017) study panhandling amidst a tourist influx in Manhattan: their "main finding is that…the amount of panhandling is primarily circumscribed by the willingness of people to panhandle, not by the availability of good places to panhandle" (Dordick et al. 2017: 5).

Panhandlers are commonly considered "mentally ill" or degenerate substance abusers, and perhaps many are (see, for instance, Snow et al. 1986; Stark 1992; Goldstein 1993; Duneier 1999; Lankenau 1999a; Taylor 1999).[4] Even so, this does not seem to prevent them from panhandling optimally. We find that panhandlers behave as homo economicus would behave if homo economicus were a street person who solicited donations from passersby in public spaces.

This finding is congruent with T.W. Schultz's (1964) "poor but efficient" hypothesis, offered to describe the behavior of impoverished farmers in the developing world who are ostensibly "guided by tradition or culture" (Abler and Sukhatme 2013: 338). Our results suggest that "poor but efficient" fairly describes the behavior of a class of impoverished persons in the developed world who are ostensibly guided by psychopathy or drug addiction: American panhandlers.

2 A Model of Profit-Maximizing Panhandling

We ground our model of panhandling in a few observations. First, panhandlers "support themselves by…engaging the consciences of passersby" through solicitation (Lankenau 1999a: 204). Second, panhandler solicitation is generally regarded as a nuisance; it threatens to create

[2] Studies concerned with street people more generally but in which panhandlers receive significant attention include, for instance, Snow and Anderson (1993), Dordick (1997), and Duneier (1999).

[3] A well-known problem with survey and interview data is that people lie (or recollect inaccurately). In the panhandler population, this problem may be especially pronounced. One panhandler who agreed to take our math quiz spontaneously offered that he had "a doctorate in Euclidean mathematics." He proved unable to subtract.

[4] Or perhaps many aren't. The incidence of "mental illness" among the homeless population, and thus conceivably the panhandling population, is contested. However, there seems to be broad agreement that this incidence is higher than among the general population. See, for instance, Arce et al. (1983); Lipton et al. (1983); Bassuk (1984); Robertson (1986); Roth and Bean (1986); Snow et al. (1986); Drake et al. (1991); Shlay and Rossi (1992); Baum and Burnes (1993). For a compelling critique of "mental illness" as a meaningful concept, see Szaz (1961).

"psychological discomfort…in pedestrians," such as guilt, awkwardness, shame, even fear (Ellickson 1996: 1181; Skogan 1990; Burns 1992).[5] Third, pedestrians are willing to pay a modest price to avoid this discomfort. For example, people seek ordinances that restrict or prohibit panhandling. And if they can do so easily, pedestrians divert their paths to circumvent panhandlers (Goldstein 1993; Ellickson 1996; Lee and Farrell 2003; Smith 2005).[6]

In light of these observations, we treat panhandling as a form of extortion. We follow Becker (1996: 232), according to whom the "appeals of beggars make" passersby "feel uncomfortable or guilty" if they decline, "induc[ing] them to part with a little of their wealth." In our model, solicitation by a panhandler imposes psychological discomfort on passersby unless they pay him their value of avoiding that discomfort.

To begin, consider a single public space, worked by a single rational, profit-maximizing panhandler. The space is traveled by a continuum of $\dot{n}$ passersby (per unit of time) who encounter the panhandler and whom he solicits. Each passerby is capable of feeling some maximum amount of panhandling-imposed discomfort, whose avoidance she values g_i. Passersby have unit demand for avoiding this discomfort, distributed uniformly on the interval $[0, g]$.

If the panhandler's solicitation threatened passersby with the maximum discomfort they're capable of feeling, the panhandler would face the aggregate discomfort-avoidance demand curve $D_{max} \equiv P = g - ng/\dot{n}$, the highest demand curve achievable in this space, where the panhandler's total revenue equals the area under D_{max}. However, the demand curve the panhandler actually faces depends on two additional factors: how actively he solicits, $a \in [0, 1]$, and his human capital endowment, $k \in [0, 1]$. Call this realized demand curve $D \equiv P = ga^{1/2}k - ng/\dot{n}$, which may lie on or below D_{max}, where the panhandler's total revenue equals the area under D.

The panhandler chooses how actively to solicit, a. For instance, he might simply sit on the ground in view of passersby, which is minimally active. He might present a sign to passersby or, more actively, address them vocally. More actively still, the panhandler might give away newspapers to passersby or perform music.

[5] Occasionally the threat is quite explicit, such as when a passerby attempts to walk away from a panhandler without making a donation and the panhandler publicly shames him, "calling him out" to other passersby.

[6] Although they consider solicitors of charitable donations who are not street people, see also DellaVigna et al. (2012) and Andreoni et al. (2017), who find that a common motivation for donating is to avoid psychological discomfort rather than altruism.

The panhandler knows the distribution of g_i but not its value for any passerby. Thus, he solicits all $\dot{n}$ passersby and does so with the same a. More active solicitation extracts larger payments from passersby by threatening them with more discomfort. For example, Andreoni et al. (2017) find that Salvation Army bell-ringers who solicit passersby vocally collect larger donations than their non-vocal counterparts by more strongly stimulating passersby's emotions. Similarly, passersby feel guiltier declining a panhandler who, for instance, makes an impassioned vocal plea for help than one who stands silently in their view.

By threatening more discomfort, more active panhandler solicitation extracts larger payments through two channels. First, it makes passersby who would have felt the threat of some discomfort and thus paid the panhandler something even if he had solicited less actively feel a still greater threat and thus pay him more. Second, it makes passersby who would not have felt the threat of any discomfort and thus not paid the panhandler anything if he had solicited less actively feel a threat and thus pay him a positive amount.

The panhandler's human capital endowment, k, moderates the effectiveness of his solicitation activeness in extracting payments from passersby by moderating its effectiveness in threatening them with discomfort. For a given activeness, the more human capital the panhandler has, the more discomfort his solicitation threatens. A panhandler who solicits with a sign, for example, is able to beg more persuasively if he has more human capital, which imposes more discomfort on passersby if they decline him.

When the panhandler solicits as actively as possible ($a = 1$) and his human capital endowment is as large as possible ($k = 1$), $D = D_{max}$; he receives payments from $\dot{n}$ passersby and earns total revenue $g\dot{n}/2$. When the panhandler solicits less actively ($a < 1$) or has less human capital ($k < 1$), $D < D_{max}$; he receives payments from $a^{1/2}k\dot{n}$ passersby and earns total revenue $gak^2\dot{n}/2$.

Although it yields him more revenue, soliciting more actively is more costly to the panhandler. Performing, for example, requires more effort than simply sitting. The amount of effort the panhandler must expend to solicit with a given activeness (per unit of time) is the same whether he encounters few passersby or many, such that his total cost of panhandling is a^2.

Figure 1 illustrates the panhandler's choice problem graphically. The panhandler maximizes

$$\max_a \; gak^2\dot{n}/2 - a^2.$$

So, he chooses

$$a^* = \begin{cases} gk^2\dot{n}/4 & \text{if } g < 4/k^2\dot{n} \\ 1 & \text{if } g \geq 4/k^2\dot{n} \end{cases}$$

and by doing so earns

$$\Pi^* = \begin{cases} (gk^2\dot{n}/4)^2 & \text{if } a^* < 1 \\ (gk^2\dot{n} - 2)/2 & \text{if } a^* = 1. \end{cases}$$

a^* and Π^* are increasing in k, g and $\dot{n}$. The panhandler solicits more actively and earns more profit when he has more human capital, when passersby are more responsive to solicitation, and when passersby are more numerous.

To analyze panhandler locational choice, we need only introduce multiple public spaces so that the panhandler chooses where he solicits. Suppose, then, that there are $m > 1$ public spaces that vary in g and $\dot{n}$, whose values are known to the panhandler.

Although Π^* is increasing in k, g, and $\dot{n}$, only g and $\dot{n}$—the attributes of spaces—affect the relative profitability of soliciting at different spaces. Thus, regardless of his k, the panhandler chooses the space with the largest g and $\dot{n}$. He is attracted to the space where, ceteris paribus, passersby are more responsive to solicitation and, ceteris paribus, passersby are more numerous.

To analyze panhandling competition, return to the case of a single public space, but suppose it is worked by $s > 1$ panhandlers who vary in k. Competition reduces the number of passersby that each panhandler encounters proportionately, such that each solicits only $\dot{n}/s$ passersby. At a subway station, for example, when multiple panhandlers are present, each establishes his own "space within the space," for instance by positioning himself such that he encounters a stream of passersby coming up one escalator while another panhandler does the same for a different escalator. Exiting subway riders tend to distribute themselves equally across escalators, as doing so permits them to exit more quickly. The result is an equal stream of passersby for each panhandler.

A panhandler, j, who competes with $s - 1$ other panhandlers therefore chooses

$$A_j^* = \begin{cases} a_j^*/s & \text{if } g < 4s/k_j^2\dot{n} \\ 1 & \text{if } g \geq 4s/k_j^2\dot{n} \end{cases}$$

and earns

$$\pi_j^* = \begin{cases} \Pi_j^*/s^2 & \text{if } A_j^* < 1 \\ \Pi_j^*[(gk_j^2\dot{n} - 2s)/(gk_j^2\dot{n}s - 2s)] & \text{if } A_j^* = 1. \end{cases}$$

A^* and π^* are decreasing in s. Panhandlers solicit less actively and earn less profit when they encounter more panhandling competition.

With these results, it's straightforward to analyze the case of multiple panhandlers, each of whom chooses where to solicit from among multiple spaces. Consider two panhandlers and two public spaces, the latter denoted m_1 and m_2. At both spaces, for both panhandlers, $g < 4/k^2\dot{n}$. However, at m_1, g is higher, $\dot{n}$ is larger, or both.

From above, we know that m_1 therefore offers more potential profit for each panhandler regardless of his k: $\Pi_{m1} > \Pi_{m2}$. So, if either panhandler existed alone, he would always choose to solicit at m_1. Also from above, we know that if the panhandlers choose different spaces, each solicits with a and earns Π, and if they choose the same space, each solicits with $A = a/2$ and earns $\pi = \Pi/4$.

The panhandlers choose spaces sequentially. The first-moving panhandler may be the panhandler who sleeps closer to the spaces, the panhandler whose profit is affected more strongly by the space at which solicits (the panhandler with higher k), or the first-mover could be determined by chance. For our purpose his identity is unimportant, only that there is a first mover who consequently enjoys a first-mover advantage. Since bargains between panhandlers cannot be enforced, side payments between them are not possible. The panhandlers play the location game in Figure 2.

This game has two subgame-perfect Nash equilibria. If $\Pi_{m1} \geq 4\Pi_{m2}$, both panhandlers choose to solicit at m_1. If $\Pi_{m1} < 4\Pi_{m2}$, the first-moving panhandler chooses to solicit at m_1 and the other chooses to solicit at m_2. Never do both panhandlers choose to solicit at m_2. The space where, ceteris paribus, passersby are more responsive to solicitation and, ceteris paribus, passersby are more numerous therefore tends to attract more panhandlers. An arbitrarily large number of panhandlers who choose sequentially among spaces at which to solicit will locate such that the potential profit available to a panhandler at each space is equal—panhandling spatial equilibrium.

Finally, consider panhandler pricing. Recall that to avoid the discomfort with which a panhandler's solicitation threatens her, a passerby must pay the panhandler her value of avoiding that discomfort, g_i—the "pizzo" required by her conscience to protect itself against the

psychological injury of declining his solicitation. This is extremely useful to panhandlers who, recall, know the distribution of g_i but not its value for any passerby, for by simply letting them pay what they want, panhandlers let passersby "price discriminate themselves" perfectly. "True" fixed pricing, wherein a panhandler solicits a fixed sum from passersby and refuses donations that are smaller, can therefore never increase his profit.

In contrast, "suggested-sum" fixed pricing, wherein a panhandler solicits a fixed sum from passersby but accepts donations of any size—which does not sacrifice perfect price discrimination—may increase profit for some panhandlers. To see how, consider a panhandler who solicits passersby by freely giving them newspapers he has purchased. Such a panhandler's higher solicitation cost goes beyond exerting more effort, which is largely observable to passersby; it includes non-effort inputs—the purchase of newspapers—whose cost to the panhandler is not observable to passersby and of which many passersby are unaware.

This may matter to the panhandler, since the discomfort with which his solicitation threatens passersby may depend partly on his cost of soliciting. For example, passersby may feel guiltier declining a panhandler from whom they've received a newspaper if they know he had to buy the paper than if they think it was given to him for free, for in the former case, passersby impose a pecuniary loss on the panhandler if they decline him. To ensure that his solicitation threatens the most discomfort and thus extracts the largest payment from passersby possible, such a panhandler would like to communicate to passersby the unobservable portion of his higher cost. Soliciting a fixed sum that includes this cost allows the panhandler to do so and, if the party from whom he purchased the newspapers will verify this fact, allows him to do so credibly.

3 Data and Procedures

3.1 Metrorail Stations

For ten months in 2016 and 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 panhandlers and the passersby they encounter.[7] Metrorail (Metro) is the public rapid-transit system that serves the Washington metropolitan area.[8] It has six lines, 91 stations, and is the third busiest

[7] These months are, in 2016: October, November, and December; in 2017: February, March, April, May, June, October, and November.
[8] Also known as the "National Capital Region."

rapid-transit system in the United States, hosting more than 260 million riders annually (APTA 2017).[9]

Metro provides an ideal setting to study the behavior of panhandlers. Its stations furnish well-defined public spaces where we can observe large numbers of panhandlers and the passersby they encounter in their natural environments. DC code permits panhandling on public property but not at transportation stations.[10] The law doesn't specify a distance from station exits at which panhandling becomes permissible, but in the course of collecting data over ten months, we observed hundreds of panhandlers in the one square-block areas surrounding Metro station exits that we canvassed yet observed no panhandlers being interfered with by police or Metro authorities. Lawful or simply ignored, panhandling in the Metro spaces we study proceeds unmolested.

Figure 3 maps Metrorail. Solid circles locate stations in our sample. They cover all Metro lines and serviced nearly half of all riders who used Metro during our period of study. Table 1 reports the average number of riders who exited each sample station per sample month.[11] The busiest station averages more than 500,000 riders per month; the least busy, less than 50,000.

3.2 Panhandlers

We visited Metrorail 242 times to collect data on panhandlers, at different times of day and on different days of the week. On average, we visited each station for this purpose approximately nine times total, in four different months.[12]

At each visit we canvassed a one square-block area around the station exit(s) for panhandlers.[13] Every "street person" observed soliciting donations from passersby was considered a panhandler. This includes street people handing out items freely, most notably the "street newspaper" *Street Sense*, for which, the masthead informs, a "donation" is "suggested" but optional.[14] It excludes merchandise vendors selling, for instance, flowers and umbrellas, for which payment is required. "Street people" were identified by appearance—the "disheveled, [and]

[9] Behind the NYC Subway and Chicago "L."
[10] Provided that solicitation isn't physically coercive ("aggressive"). See Chapter 23 of the Code of the District of Columbia.
[11] Georgetown is assigned the number of riders who exited Foggy Bottom-GWU, the Metro station closest to the intersection of Wisconsin Avenue and M Street.
[12] For convenience of exposition, we refer to Georgetown as a "station" throughout.
[13] In Georgetown, a one square-block area around the intersection of Wisconsin Avenue and M Street.
[14] *Street Sense* contains stories written by, and highlighting the plights of, Washington-area street people.

apparently destitute" (O'Flaherty 1996: 7; Lee and Farrell 2003). Our data contain 258 panhandlers, 218 of whom are unique.

For each panhandler, we collected five kinds of data: his solicitation activities; his pricing scheme; his willingness to take a short math quiz in exchange for cash payment; his quiz performance (if so willing); and his observable demographic characteristics.

To collect data on panhandlers' solicitation activities, we covertly observed them solicit. We assigned their activities to one or more of five categories, "according to the degree of physical activity or directness shown in their begging deportment" (Fabrega 1971: 282). From the least active to the most, these are: (1) lying or sitting on the ground in view of passersby; (2) standing in view of passersby; (3) presenting a sign to passersby; (4) addressing passersby vocally or noisily shaking a cup; (5) performing or giving away items to passersby.[15] Table 2 reports the frequency with which the unique panhandlers in our data solicit with these activities. Approximately 60 percent lie or sit the ground; 40 percent stand; 20 percent use a sign; 55 percent are vocal or noisily shake a cup; 22 percent perform or give away items.

We used the same procedure to collect data on panhandlers' pricing behavior. We assigned their pricing schemes to one of two categories: requested a fixed amount from passersby or did not, in which case "an amount is…left to the hit [i.e., passerby] to decide" (Stark 1992: 346).[16] Table 2 reports the frequency with which the unique panhandlers in our data request a fixed sum. Only 17.4 percent do so, and all give away *Street Sense*, whose masthead requests a donation of $2.

To every panhandler, we extended the following offer: "Hello, would you like to earn some money by taking a short math quiz? You'll receive a dollar for your participation and an additional dollar for each correct answer. You can earn a total of $4. Would you like to participate?" We did not inform panhandlers that our offer or the quiz was part of a study.

One hundred fifty unique panhandlers, approximately 70 percent in our data, accepted our offer. Each was given a pen and a piece of paper with the following questions:

[Q1] Andy has $22. If he buys dinner for $7, how much money does he have left?

[15] Category 1 includes four panhandlers who were sitting in wheelchairs; all other "sitters" were on the ground.
[16] "Hit" is a slang reference to a person whom a panhandler "hits up" for a donation, i.e., a passerby he solicits.

[Q2] There are twenty-one men on the bus. This is three times the number of women on the bus. How many women are on the bus?

[Q3] If you flip a quarter four times, what is the probability it is heads all four times?

Answering Q1 correctly requires the ability to add/subtract; Q2, the ability to multiply/divide; Q3, the ability to calculate probability.

If a panhandler indicated that he couldn't read the quiz, he was recorded as illiterate and the questions were read to him; if not, he was recorded as literate. Written and oral answers were accepted, and there was no time limit. When a panhandler indicated that he was done with the quiz, his score was tabulated and he was paid cash.

We assigned panhandlers' quiz outcomes, including literacy, to one or more of five categories. From the "worst" outcome to the "best," these are: (1) illiterate; (2) literate; (3) answered Q1 correctly; (4) answered Q2 correctly; (5) answered Q3 correctly. Table 2 reports the frequency with which the unique panhandlers in our data achieve these outcomes. Ninety-six percent are literate; 73 percent answer Q1 correctly; nearly a third answer Q2 correctly; 1.3 percent answer Q3 correctly.[17]

Although we couldn't observe panhandlers' ages or revenues, with few exceptions, we could observe whether they were black, white, or another race; their gender; whether they had difficulty speaking English; and whether they appeared physically disabled. Table 2 reports the frequency of these demographic traits among the unique panhandlers in our data. More than 86 percent are black, approximately nine percent are white, and five percent are other races. More than three quarters of panhandlers are male, about three percent have difficulty speaking English, and 1.8 percent appear physically disabled.

3.3 Passersby

We visited Metrorail 93 times to collect data on the passersby who panhandlers encounter. Each was also a visit during which we collected data on panhandlers. On average, we visited each station to collect data on passersby approximately four times total, in two different months.

[17] As a point of comparison, during the same data collection visits, we offered the same quiz, under the same terms, to any merchandise vendors we encountered outside Metro station exits, such as people selling flowers or umbrellas. Thirteen accepted our offer. All were literate; all answered Q1 correctly; 85 percent answered Q2 correctly; 15 percent answered Q3 correctly.

Any adult observed exiting a Metro station escalator was considered a passerby.[18] We solicited them with the following request: "Hello, can you give me directions to [local landmark]?" We approached passersby as "ordinary" people seeking assistance and did not inform them that their response was recorded or was part of study. After a passerby had traveled at least a block away, we solicited the next rider to exit the station escalator. We repeated this procedure for three train arrivals.[19] Our data contain 701 passersby.

Table 1 identifies the local landmark to which we solicited directions at each station. All landmarks would be known to passersby familiar with the area and are within walking distance of their respective stations, but none are visible from the data collection area.

We assigned passerby responses to solicitation to one or more of five categories. From the least responsive to the most, these 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. Table 2 reports the frequency with which the passersby in our data respond to solicitation with these reactions. Approximately 23 percent ignore solicitation; 15 percent acknowledge solicitation but keep walking; 61 percent stop to acknowledge solicitation; 52 percent stop and provide directions; 23 percent stop and provide directions by sharing a map.

3.4 Variables

We use these data to construct several variables for empirical analysis. The first measures how actively each panhandler solicits. Its value ranges from one to five, corresponding to a panhandler's most active solicitation activity, where a higher value means more activeness. For example, our panhandler activeness variable assigns a value of four to a panhandler who addressed passersby vocally (category 4) while lying on the ground (category 1) but didn't perform or give away items (category 5). We measure each panhandler's human capital the same way, corresponding to his best quiz outcome, one to five, where a higher value means more human capital. Our third variable measures passerby responsiveness to solicitation at each Metro station. It tabulates the station average of each passerby's most responsive reaction to solicitation, one to five, where a higher value means more responsiveness.

[18] In Georgetown, anyone walking through the northwest intersection of Wisconsin Avenue and M Street.
[19] In Georgetown, for 15 minutes—approximately the amount of time it takes for three train arrivals at a Metro station.

As an alternative way to measure these variables, we create an additive version of each. Our additive panhandler activeness variable sums the values, one to five, of each solicitation activity in which a panhandler engaged, where a higher value means more activeness. For example, our additive panhandler activeness variable assigns a value of five to a panhandler who addressed passersby vocally (category 4) while lying on the ground (category 1) but didn't use a sign (category 3), perform or give away items (category 5). We construct our additive panhandler human capital variable the same way. Similarly, our additive passerby responsiveness variable tabulates the station average of each passerby's summed reactions to solicitation.

To measure each panhandler's demographic characteristics, we create indicator variables for his (or her) gender, race, difficulty speaking English, and physically disabled appearance. To measure the number of panhandlers at each Metro station, we count panhandlers at each station on each visit. And to measure the degree of panhandling competition each panhandler encounters, we count other panhandlers at the same station in the same hour.

We create three additional variables using data we did not collect in the field. The first measures the number of passersby that panhandlers encounter. This variable uses data from the Washington Metropolitan Area Transportation Authority (WMATA) on the number of Metro riders who exited each station in each month. Second, we use Google Maps to identify the presence or absence of a homeless service, such as a shelter or "soup kitchen," near each Metro station. With this information, 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. Finally, the District of Columbia contracts with the United Planning Organization, a community action agency, to operate a homeless shuttle-service that provides daily transportation for homeless people to several stops in the city.[20] We use Google Maps and data from DC Human Services to identify the presence or absence of such a stop near each Metro station. With this information, 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. Table 3 presents summary statistics for all variables.

[20] The shuttle, called "Access Hotline Vans," also transports homeless people to individualized locations in emergency situations and may be contacted by concerned citizens to check on homeless people spotted in dangerous situations, in particular those sleeping outdoors under freezing conditions.

4 Empirical Analysis

Tables 4 and 5 explore predictors of how actively panhandlers solicit. Each observation is a unique panhandler. Table 4 estimates ordered probit and OLS models that use the benchmark version of our panhandler activeness, panhandler human capital, and passerby responsiveness variables. Table 5 estimates OLS models that use the additive version of these variables. All regressions calculate robust standard errors clustered by Metro station and include hour and date fixed effects. Station fixed effects are possible only in specifications that exclude passerby responsiveness, since this variable is measured at the station level.

The results reveal panhandling behavioral patterns consistent with rational profit-maximization. Panhandlers solicit more actively when they have more human capital, when passersby are more responsive to solicitation, and when passersby are more numerous. Panhandlers solicit less actively when they encounter more panhandling competition. Female panhandlers also solicit less actively.

Using the benchmark version of our variables, a one standard deviation increase in panhandler human capital, passerby responsiveness, and the number of passersby is associated with a 0.21, 0.45, and 0.19 standard deviation increase in panhandler activeness, respectively. A one standard deviation increase in panhandling competition is associated with a 0.38 standard deviation decrease in panhandler activeness. Using the additive version of our variables yields similar results. A one standard deviation increase in panhandler human capital, passerby responsiveness, and the number of passersby is associated with a 0.33, 0.40, and 0.20 standard deviation increase in panhandler activeness, respectively. A one standard deviation increase in panhandling competition is associated with a 0.44 decrease in panhandler activeness.

Table 6 explores predictors of the number of panhandlers at Metro stations. Each observation is a station-visit. We estimate Poisson and OLS models that use the benchmark and additive versions of our passerby responsiveness variable. All regressions calculate robust standard errors clustered by Metro station and include hour and date fixed effects.[21] Station fixed effects are not possible in Table 6, since (with the exception of number of passersby) all regressors are measured at the station level.

[21] Since panhandlers at a station-visit were sometimes observed over a period that overlapped two hours, in Table 6, hour fixed effects reflect the hour the first panhandler was observed at a station-visit (or, if no panhandlers were observed, the hour the visit to that station began).

The results reveal further panhandling behavioral patterns consistent with rational profit-maximization. Panhandlers are attracted to Metro stations where passersby are more responsive to solicitation and to stations where passersby are more numerous. Panhandlers are also attracted to Metro stations that are near a homeless shuttle-stop and are more numerous at stations that are near a homeless service.

Using our benchmark passerby responsiveness variable, a one standard deviation increase in passerby responsiveness and the number of passersby is associated with a 0.22 and 0.53 standard deviation increase in the number of panhandlers, respectively. Using our additive passerby responsiveness variable yields similar results. A one standard deviation increase in passerby responsiveness and the number of passersby is associated with a 0.21 and 0.53 standard deviation increase in the number of panhandlers, respectively.

We do not observe panhandler profit directly, precluding a direct test of spatial equilibrium—the equalization of potential-profit per panhandler across Metro stations. However, it is possible to evaluate spatial equilibrium indirectly. Recall that three station characteristics determine the potential profit that a station offers a panhandler: the number of passersby at the station, passersby's responsiveness to solicitation at the station, and the number of other panhandlers who work the station. We observe each of these characteristics. To use our data to proxy the potential profit available to a panhandler at each station, we therefore multiply the average number of passersby at a station by passersby's solicitation responsiveness at that station and divide the product by the average number of panhandlers observed at the station on visits where at least one panhandler was observed. We also consider two other proxies for the potential profit that each station offers a panhandler: the first is the same as above but uses the square root of the station's number of passersby; the second uses the natural logarithm of its number of passersby.

If every Metro station were equally accessible to panhandlers, spatial equilibrium would imply equalization of the foregoing proxies. However, Metro stations vary considerably in their accessibility to panhandlers. Some stations are but a few minutes' walk to/from the closest shuttle-stop servicing the Washington-area homeless; others are an hour or more walk to/from the closest homeless shuttle-stop. A test of profit equalization must account for these differences.

To do that, for each station, we regress one of the three proxies for potential-profit per panhandler described above on the number of minutes it takes to walk to/from the station to its

closest homeless shuttle-stop according to Google Maps.[22] Spatial equilibrium implies that predicted potential-profit per panhandler will be equal across stations.

Table 7 reports predicted potential-profit per panhandler by station. For each proxy, it is nearly equal across stations. The sole exception is Vienna/Fairfax-GMU, a station that lies at the remote western edge of the Metro system (see Figure 3), some 15 miles from Metro Center. Here, there are "too few" panhandlers: predicted potential-profit per panhandler is higher than at the other stations.

Finally, return to Table 2, which contains data on panhandler pricing. These data, too, are consistent with rational profit-maximization. Eighty-three percent of panhandlers in our sample do not request a fixed sum. The remaining panhandlers—all of whom, recall, give away *Street Sense*—are those who may benefit from "suggested-sum" fixed pricing.

Before these panhandlers have papers to give away, they must buy copies from the publisher, Street Sense Media, for 50 cents apiece. Requesting a fixed sum permits them to communicate to passersby their higher input cost and, since the sum is fixed by Street Sense Media—printed on the paper's masthead—rather than by panhandlers, permits them to do so credibly.

Fixed pricing is profit-maximizing for *Street Sense*-distributing panhandlers only if it is the "suggested sum" variety, which does not sacrifice perfect price discrimination. In contrast, if *Street Sense* distributors reject donations smaller than $2—in other words, if they use "true" fixed pricing—their pricing behavior would reduce profits. We cannot observe whether any panhandler in our sample declined a donation, so we cannot rule out this possibility. However, since it's hard to imagine a panhandler declining a donation—no matter how modest—it seems likely that the fixed-pricing behavior of panhandlers who give away *Street Sense* is profit-maximizing.

5 Conclusion

Economists have shown that a variety of unorthodox behaviors seemingly unamenable to orthodox economics—from the behavior of pirates and prisoners to that of clerics, cults, duelers, diviners, even human sacrificers—belie rational maximization (see, for instance, Schwartz, Baxter, and

[22] The coefficients on minutes' walk to closest homeless shuttle-stop in these regressions are as follows (robust standard errors in parentheses): using the number of passersby, 0.213 (0.339); using the square root of the number of passersby, 0.028 (0.005); using the natural logarithm of the number of passersby, 0.058 (0.014).

Ryan 1984; Suchman 1989; Iannaccone 1992; Leeson 2007, 2013a,b, 2014a,b; Piano 2017a,b; Skarbek 2011, 2016; Leeson and Russ 2018).[23] Our study finds that the behavior of panhandlers, who are commonly seen as "mentally ill" or degenerate substance abusers, does too. This finding is consistent with T.W. Schultz's (1980: 649) supposition that "poor people are no less…competent in obtaining the maximum benefit from their limited resources" than "those of us who have comparably greater advantages." Beggars, it turns out, can be choosers—and they appear to be rational ones.

[23] Gordon Tullock and Gary Becker pioneered this approach. See, for instance, McKenzie and Tullock (1975) and Becker (1976).

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Table 1. Metrorail Ridership and Landmarks

Metro station	Average riders exiting per sample month (thousands)	Local landmark
Archives	203.152	Washington Monument
Arlington Cemetery	41.546	White House
Ballston-MU	214.930	Ballston Common Mall
Capitol South	162.199	Capitol Building
Clarendon	106.044	Northside Social
Courthouse	146.403	Court House Movie Theater
Crystal City	242.868	Reagan National Airport
Dupont Circle	421.910	Embassy Row
Farragut North	491.499	White House
Farragut West	441.299	White House
Federal Center SW	121.004	Capitol Building
Federal Triangle	177.617	Washington Monument
Foggy Bottom-GWU	453.115	White House
Gallery Pl-Chinatown	597.374	Metro Center
Georgetown	453.115	Key Bridge
L'Enfant Plaza	442.591	Washington Monument
McPherson Square	313.216	White House
Metro Center	577.024	Verizon Center
Navy Yard-Ballpark	204.820	Canal Park
Pentagon	278.700	Pentagon Memorial
Pentagon City	306.030	Pentagon Memorial
Rosslyn	277.979	USMC Memorial
Smithsonian	264.453	Museum of Natural History
Vienna/Fairfax-GMU	192.499	Vienna (town of)
Virginia Square-GMU	81.170	George Mason University
Waterfront	95.348	Washington Channel

Notes: Ridership data from WMATA. Sample months: 2016: October, November, December; 2017: February, March, April, May, June, October, November. "Georgetown" is the intersection of Wisconsin Avenue and M Street; it is assigned the ridership of Foggy Bottom-GWU, the station closest that intersection. Local landmark is the landmark to which we solicited directions from passersby at each Metro station.

Table 2. Panhandler and Passerby Characteristics

Panel A: Categories	1	2	3	4	5	Use fixed pricing	Total
Panhandler activeness, %	59.63	40.37	20.18	54.59	21.56	17.43	
[Number of panhandlers]	[130]	[88]	[44]	[119]	[47]	[38]	[218]
Panhandler human capital, %	4.0	96.0	72.67	32.0	1.33		
[Number of panhandlers]	[6]	[144]	[109]	[48]	[2]		[150]
Passerby responsiveness, %	23.11	15.41	61.48	51.78	22.68		
[Number of passersby]	[162]	[108]	[431]	[363]	[159]		[701]
Panel B: Demographics	Male	Female	Black	White	Other race	English difficulty	Physically disabled
%	75.23	24.77	86.19	8.57	5.24	3.21	1.83
[Number of panhandlers]	[164]	[54]	[181]	[18]	[11]	[7]	[4]

Notes: Panhandler activeness: Category 1 = lies or sits on ground; Category 2 = stands; Category 3 = presents sign; Category 4 = vocal or noisily shakes cup; Category 5 = performs or gives away items. Panhandler human capital: Category 1 = illiterate; Category 2 = literate; Category 3 = answers Q1 correctly; Category 4 = answers Q2 correctly; Category 5 = answers Q3 correctly. Passerby responsiveness: Category 1 = ignores; Category 2 = acknowledges but keeps walking; Category 3 = stops to acknowledge; Category 4 = stops and provides directions; Category 5 = stops and provides directions with map. Use fixed pricing = requests fixed sum from passersby. Race unknown for 8 panhandlers (not included in race columns).

Table 3. Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Panel A: Unique panhandlers					
Panhandler activeness	218	3.234	1.480	1	5
Panhandler activeness, additive	218	5.271	3.507	1	13
Panhandler human capital	150	3.047	0.822	1	5
Panhandler human capital, additive	150	5.487	2.887	1	14
Passerby responsiveness	218	3.104	0.175	2.885	3.60
Passerby responsiveness, additive	218	5.736	0.631	4.769	7.467
Number of passersby	218	478.163	138.021	125.967	690.533
Panhandling competition	218	2.390	2.336	0	9
Female	218	0.248	0.433	0	1
White	210	0.086	0.281	0	1
Other race	210	0.052	0.223	0	1
English difficulty	218	0.032	0.177	0	1
Physically disabled	218	0.018	0.135	0	1
Panel B: Metro station-visits					
Number of panhandlers	242	1.066	1.582	0	10
Number of passersby	242	348.954	168.050	67.117	690.533
Passerby responsiveness	242	3.112	0.194	2.794	3.750
Passerby responsiveness, additive	242	5.613	0.612	4.588	7.467
Homeless service	242	0.401	0.491	0	1
Homeless shuttle-stop	242	0.384	0.487	0	1

Notes: In Panel A, observations are unique panhandlers. In Panel B, observations are Metro station-visits. See Appendix for variable definitions.

Table 4. Determinants of Panhandler Activeness

Dependent variable:	Ordered Probit					OLS
Panhandler activeness	(1)	(2)	(3)	(4)	(5)	(6)
Panhandler human capital		0.795***	0.650***	0.642***	0.614***	0.384**
		(0.105)	(0.112)	(0.107)	(0.104)	(0.152)
Passerby responsiveness			4.671***	4.220***	4.770***	3.792***
			(1.268)	(1.044)	(0.959)	(1.084)
Number of passersby				0.001*	0.003***	0.002**
				(0.001)	(0.001)	(0.001)
Panhandling competition					-0.267***	-0.240**
					(0.082)	(0.098)
Female	-0.692***	-1.398***	-0.927***	-0.991***	-1.064***	-0.736***
	(0.192)	(0.207)	(0.155)	(0.168)	(0.161)	(0.208)
White	-0.474	-2.181***	-0.891*	-0.941*	-1.124**	-0.920
	(0.289)	(0.250)	(0.541)	(0.546)	(0.503)	(0.667)
Other race	-0.729	0.020	-0.535	-0.442	-0.787	-0.710
	(0.556)	(0.966)	(0.877)	(0.835)	(0.968)	(0.947)
English difficulty	-0.268	-0.955	0.005	-0.206	0.738	0.775
	(0.684)	(1.043)	(1.128)	(1.141)	(1.095)	(1.010)
Physically disabled	-1.131	-1.504**	-0.423	-0.600	-0.727**	-0.299
	(0.832)	(0.633)	(0.353)	(0.377)	(0.352)	(0.312)
Station fixed effects	X	X				
Hour fixed effects	X	X	X	X	X	X
Date fixed effects	X	X	X	X	X	X
Adjusted R^2						0.25
Observations	186	131	131	131	131	131

Notes: Observations are unique panhandlers. Columns 1-5 present ordered probit estimates; column 6 presents OLS estimates. Robust standard errors clustered by Metro station in parentheses. See Appendix for variable descriptions. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

Table 5. Determinants of Panhandler Activeness, Additive

Dependent variable: Panhandler activeness, additive	(1)	(2)	(3)	(4)	(5)
Panhandler human capital, additive		0.398*** (0.087)	0.435*** (0.065)	0.427*** (0.066)	0.401*** (0.075)
Passerby responsiveness, additive			1.886* (0.936)	1.684* (0.815)	2.205** (0.779)
Number of passersby				0.002 (0.002)	0.005** (0.002)
Panhandling competition					-0.659*** (0.218)
Female	-1.559** (0.556)	-1.982** (0.661)	-1.410*** (0.426)	-1.460*** (0.471)	-1.589*** (0.377)
White	-0.793 (0.950)	-3.678*** (0.605)	-1.689 (1.478)	-1.778 (1.554)	-2.195 (1.343)
Other race	-1.581 (1.495)	-0.641 (2.200)	-1.393 (2.091)	-1.369 (2.084)	-2.083 (2.383)
English difficulty	-0.220 (1.467)	0.869 (2.561)	1.744 (2.746)	1.624 (2.758)	3.365 (2.568)
Physically disabled	-3.037 (2.597)	-2.874 (2.231)	-0.927 (1.734)	-1.084 (1.799)	-1.434 (1.759)
Station fixed effects	X	X			
Hour fixed effects	X	X	X	X	X
Date fixed effects	X	X	X	X	X
Adjusted R^2	0.12	0.37	0.29	0.28	0.31
Observations	186	131	131	131	131

Notes: Observations are unique panhandlers. All columns present OLS estimates. Robust standard errors clustered by Metro station in parentheses. See Appendix for variable descriptions. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

Table 6. Determinants of the Number of Panhandlers at a Metro Station

Dependent variable:	Poisson				OLS	
Number of panhandlers	(1)	(2)	(3)	(4)	(5)	(6)
Homeless shuttle-stop	0.534*	0.313**	0.413***	0.371***	0.806***	0.744***
	(0.306)	(0.129)	(0.117)	(0.126)	(0.170)	(0.180)
Homeless service	0.272	0.411***	0.639***	0.542***	0.559**	0.449*
	(0.285)	(0.115)	(0.187)	(0.141)	(0.255)	(0.226)
Number of passersby		0.004***	0.004***	0.004***	0.005***	0.005***
		(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Passerby responsiveness			1.453**		1.782**	
			(0.693)		(0.770)	
Passerby responsiveness, additive				0.403**		0.547**
				(0.177)		(0.247)
Hour fixed effects	X	X	X	X	X	X
Date fixed effects	X	X	X	X	X	X
Adjusted R^2					0.42	0.42
Observations	222	222	222	222	222	222

Notes: Observations are Metro-station visits. Columns 1-4 present Poisson estimates; columns 5-6 present OLS estimates. Robust standard errors clustered by Metro station in parentheses. See Appendix for variable descriptions. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

Table 7. Predicted Potential-Profit per Panhandler by Metro Station

	[Passersby*Responsiveness]/ Panhandlers	[Passersby$^{1/2}$*Responsiveness]/ Panhandlers	[ln(Passersby)*Responsiveness]/ Panhandlers
Archives	650.613	10.387	33.286
Ballston-MU	670.207	12.994	38.648
Farragut North	651.891	10.557	33.636
Farragut West	652.104	10.586	33.694
Federal Center SW	653.595	10.784	34.102
Federal Triangle	650.826	10.416	33.345
Foggy Bottom-GWU	653.808	10.812	34.161
Gallery Pl-Chinatown	649.122	10.189	32.879
Georgetown	657.215	11.266	35.093
L'Enfant Plaza	652.956	10.699	33.928
McPherson Square	650.187	10.331	33.170
Metro Center	649.122	10.189	32.879
Smithsonian	652.105	10.586	33.694
Vienna/Fairfax-GMU	710.246	18.322	49.604

Notes: Columns 2-4 report predicted potential-profit per panhandler, as measured by the variable described in the top row, from OLS regressions that use the number of minutes it takes to walk to/from a station to its closest homeless shuttle-stop as the regressor.

Figure 1. Panhandler Choice Problem

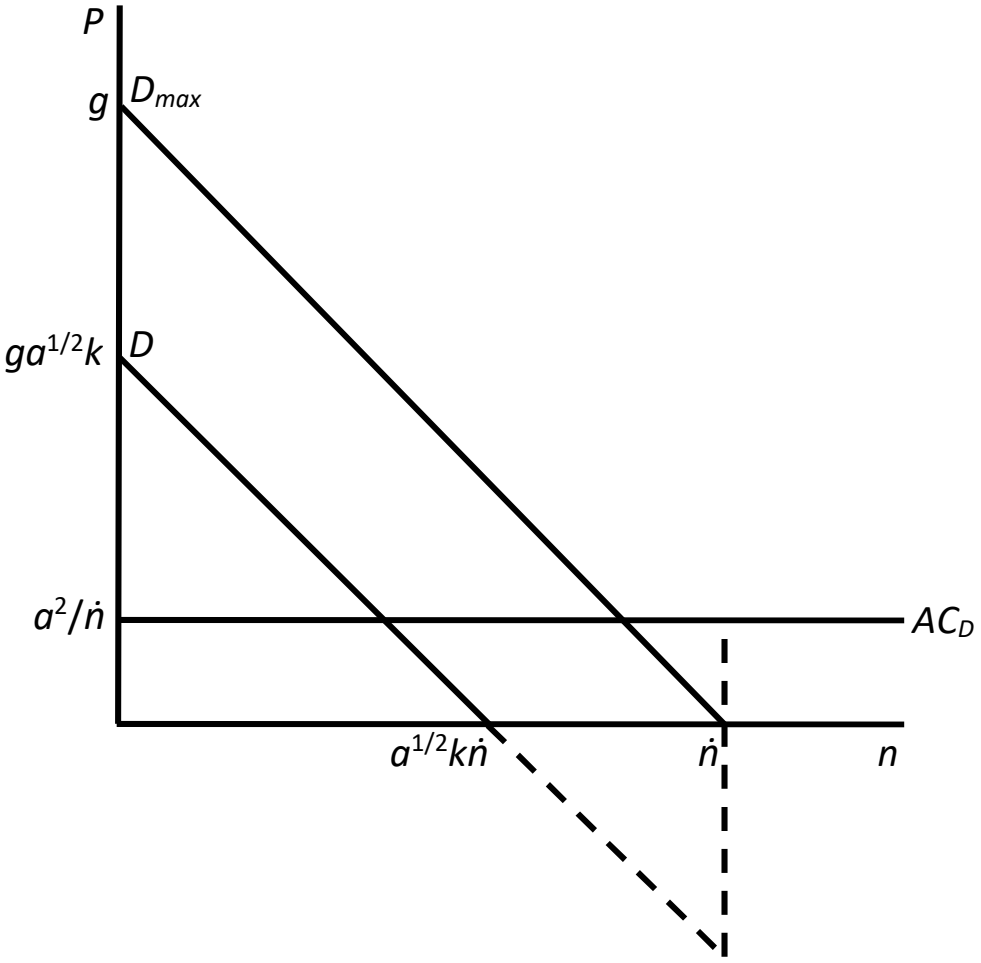


Figure 2. Panhandler Location Game

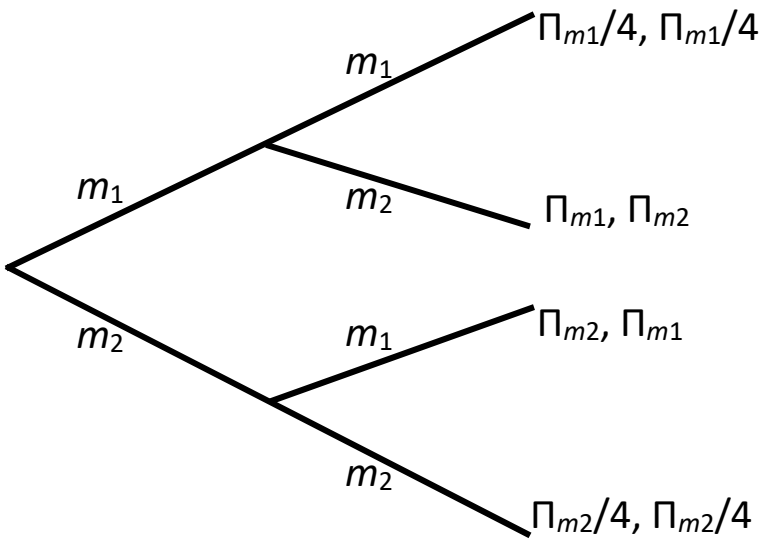
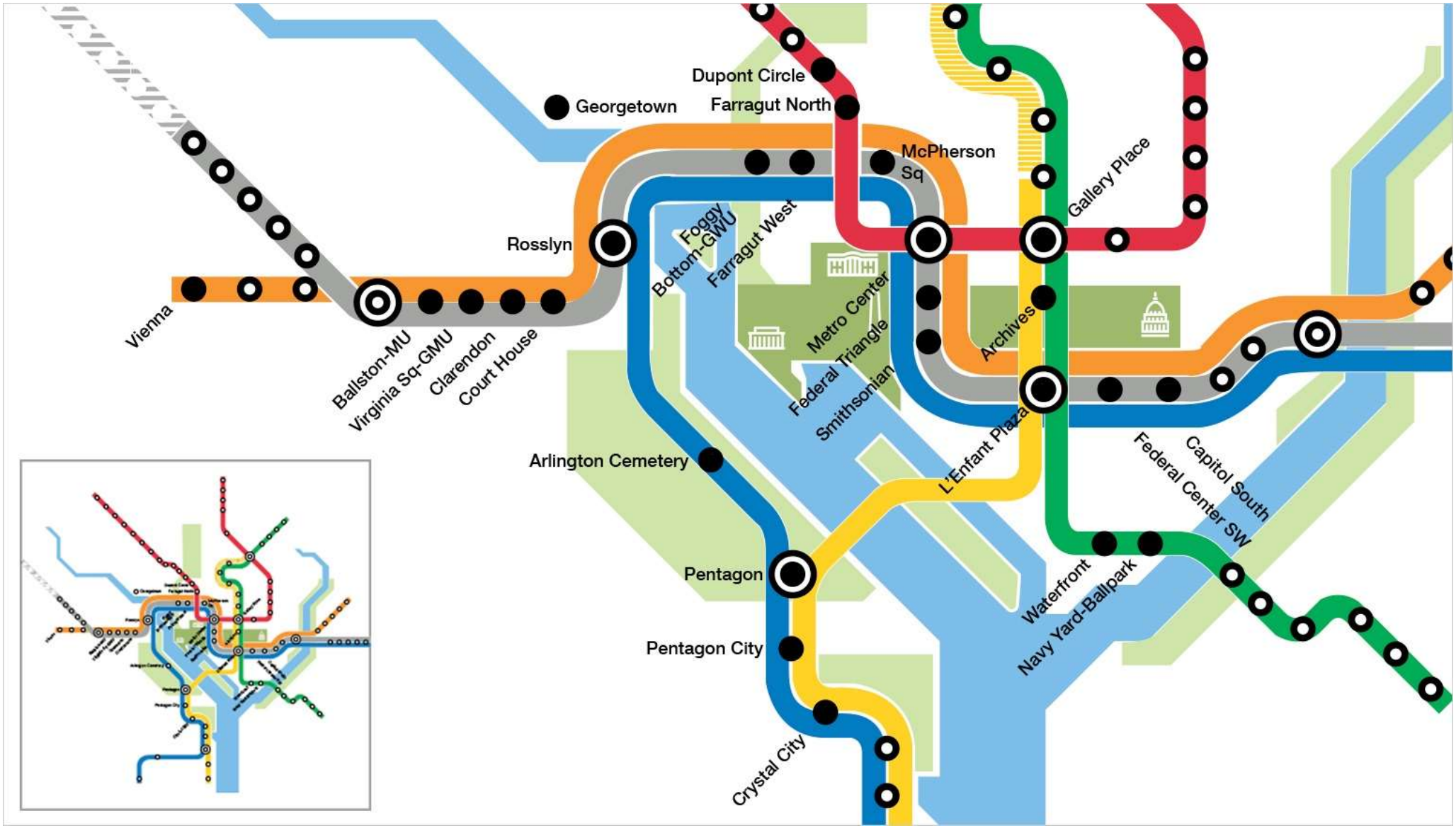


Figure 3. Metrorail



Notes: Sample stations named and denoted with solid circles.

Appendix.

Variable	Description
Panhandler activeness	Index of a panhandler's most active solicitation activity, scaled from 1 to 5, where 1 = lies or sits on ground; 2 = stands; 3 = presents sign; 4 = vocal or noisily shakes cup; 5 = performs or gives away items. Higher scores indicate more active solicitation. Data source: Authors' field work.
Panhandler activeness, additive	Index of a panhandler's combined solicitation activities. A 1 to 14 scale is constructed by adding each solicitation activity in which a panhandler engages, where 1 = lies or sits on ground; 2 = stands; 3 = presents sign; 4 = vocal or noisily shakes cup; 5 = performs or gives away items. Higher scores indicate more active solicitation. Data source: Authors' field work.
Panhandler human capital	Index of a panhandler's best quiz outcome, scaled from 1 to 5, where 1 = illiterate; 2 = literate; 3 = answers Q1 correctly; 4 = answers Q2 correctly; 5 = answers Q3 correctly. Higher scores indicate more human capital. Data source: Authors' field work.
Panhandler human capital, additive	Index of a panhandler's combined quiz outcomes. A 1 to 14 scale is constructed by adding each quiz outcome a panhandler achieves, where 1 = illiterate; 2 = literate; 3 = answers Q1 correctly; 4 = answers Q2 correctly; 5 = answers Q3 correctly. Higher scores indicate more human capital. Data source: Authors' field work.
Panhandling competition	Number of other panhandlers at the same Metro station in the same hour as a panhandler. Data source: Authors' field work.
Female	Binary variable equal to one if a panhandler is female and equal to zero otherwise. Data source: Authors' field work.
White	Binary variable equal to one if a panhandler is white and equal to zero otherwise. Data source: Authors' field work.
Other race	Binary variable equal to one if a panhandler is a race other than black or white and equal to zero otherwise. Data source: Authors' field work.
English difficulty	Binary variable equal to one if a panhandler has difficulty speaking English and equal to zero otherwise. Data source: Authors' field work.

Physically disabled	Binary variable equal to one if a panhandler appears physically disabled and equal to zero otherwise. Data source: Authors' field work.
Passerby responsiveness	Average of an index of each passerby's most responsive reaction to solicitation at a Metro station. The index is scaled from 1 to 5, where 1 = ignores; 2 = acknowledges but keeps walking; 3 = stops to acknowledge; 4 stops and provides directions; 5 = stops and provides directions with a map. Higher scores indicate more responsiveness. Data source: Authors' field work.
Passerby responsiveness, additive	Average of an index of each passerby's combined responses to solicitation at a Metro station. The index is scaled from 1 to 12 and constructed by adding each of a passerby's responses to solicitation, where 1 = ignores; 2 = acknowledges but keeps walking; 3 = stops to acknowledge; 4 stops and provides directions; 5 = stops and provides directions with a map. Higher scores indicate more responsiveness. Data source: Authors' field work.
Number of passerby	Number of Metro riders (in thousands) who exit a Metro station in a month. Data source: WMATA.
Number of panhandlers	Number of panhandlers at a Metro station on a visit. Data source: Authors' field work.
Homeless shuttle-stop	Binary variable equal to one if the United Planning Organization's homeless transportation shuttle has a stop within a ten-minute walk of a Metro station and equal to zero otherwise. Data source: DC Human Services and Google Maps.
Homeless service	Binary variable equal to one if a homeless service, such as a shelter or "soup kitchen," is within a ten-minute walk of a Metro station and equal to zero otherwise. Data source: Google Maps.