

RATIONALITY ON THE FRINGES

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Robert Augustus Hardy
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Committee:

_____ Director

_____ Department Chairperson

_____ Program Director

_____ Dean, College of Humanities
and Social Sciences

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A Dissertation submitted in partial fulfillment of the requirements for the degree of
Doctor of Philosophy at George Mason University

by

Robert Augustus Hardy
Master of Arts
George Mason University, 2015
Bachelor of Arts
The University of Virginia, 2012

Director: Peter T. Leeson, Duncan Black Professor of Economics and Law
George Mason University

Spring Semester 2019
George Mason University
Fairfax, VA

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DEDICATION

For my ever-patient wife Alison, who has always been there. For the support of my family, and to the dog that kept me moving.

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ABSTRACT

RATIONALITY ON THE FRINGES

Robert Augustus Hardy, Ph.D.

George Mason University, 2019

Dissertation Director: Dr. Peter T. Leeson

This dissertation explores applications of rational choice theory in extra-market contexts. Together, these chapters demonstrate the power of rationality as a predictor for the behavior of economic actors within their context. Behaviors which may seem strange, such as panhandling or leaving a review after purchasing drugs, are in fact rational responses to incentives.

The first chapter, titled “Reputation in the Internet black market: an empirical and theoretical analysis of the Deep Web”, is co-authored with Julia R. Norgaard and published in the *Journal of Institutional Economics*. It studies the role of reputation on the now-defunct Silk Road, an illegal, digital drug marketplace. Using a model informed by Houser’s and Wooder’s (2016) analysis of eBay auctions, we find empirical evidence that reputation allows sellers to charge premium prices. The market was thus far from a digital free-for-all; it created a system incentivizing rational buyers and sellers to good behavior in the absence of third-party enforcement.

The second chapter, “American Panhandlers”, explores existing literature on panhandlers, and how this literature impacts government policy. I find that we know what the average panhandler looks like, as well as their precarious housing situation, but our knowledge ends there. Few (and often conflicting) estimates exist on panhandler mental health, substance abuse, and methods. Both what we do and do not know about panhandlers suggest that current public policy to deal with the problem of the panhandling will fail to achieve policymakers’ goals. The paper closes with a new approach to panhandling: assuming rationality. This has dramatic policy implications and goes counter to the common view that panhandlers are irrational.

The final chapter, “Hobo Economicus”, empirically tests the claim that panhandlers are rational. Data was collected on panhandlers in Washington D.C. by observing their methods, paying them to take a math quiz to measure human capital, and asking Metro riders for directions to measure their responsiveness to solicitation. We find strong results supporting the claim that panhandlers act in a rational manner. Panhandlers exhibit more active panhandling methods when they have more human capital, when passersby are more responsive to solicitation, and when passersby are more numerous, consistent with our unique model of profit-maximizing behavior. Panhandlers exhibit less active panhandling methods when competing. In addition, the distribution of panhandlers creates an equalization of profit potential per panhandler at each observed Metro station, as would be expected in a competitive market.

REPUTATION IN THE INTERNET BLACK MARKET: AN EMPIRICAL AND THEORETICAL ANALYSIS OF THE DEEP WEB

This paper is an analysis of the role reputation plays in the Deep Web using data from the Internet black market site, The Silk Road. This encrypted online marketplace employed crypto currency and functioned over the Tor network. Utilizing a modeling technique, informed by trade auction theory, we investigate the effect of seller reputation. Analysis of the seller's reputation gives us insights into the factors that determine the prices of goods and services in this black marketplace. Data on cannabis listings is parsed from the Silk Road website and covers an 11-month time period, from November 2013 to October 2014. This data demonstrates that reputation acts as a sufficient self-enforcement mechanism to allow transactions. These findings exemplify the robustness of spontaneous order with respect to the Deep Web as an emergent marketplace.

1. Introduction

Modern black markets have in place numerous institutions to facilitate trade and evade law enforcement. Cash makes transactions untraceable, hierarchy delineates roles and responsibilities, and violence encourages participants to abide by norms. The advent of the Internet razes this system; entirely new institutions are required for black market trades in this environment. The increased anonymity lowers the risk of detection by law enforcement (LE) in exchange for an increase in the risk of impropriety between buyer

and seller. This paper examines the use of seller ratings to facilitate trade through lower transaction and information costs.

Illegal Internet activities are conducted on a portion of the Internet referred to as the Deep Web and is estimated to be thousands of times larger than the Surface Web, the Internet we use every day.¹ The Deep Web is unregulated, untaxed, and hidden from a typical Internet search. It is a self-contained market place that functions under a set of informal institutions. Using a representative data set mined from The Silk Road, one of the most popular sites on the Deep Web, we investigate the operation of these black-market transactions. We observe that the institution of seller reputations create a stable trading environment among those least expected to deal honestly: criminals.

Black market activity on the Deep Web is attractive because of the anonymity it provides. Cryptocurrencies such as Bitcoin function like cash; they are untraceable. The TOR network anonymizes web traffic. PGP encryption programs mask data within emails sent between users. These three elements form the technological base upon which Deep Web black markets build, allowing exchange at a much lower cost than previously. Before this technology, sellers and buyers in the black market relied heavily on face-to-face interaction and building a reputation through personal encounters. This shift led to a flourishing peer-to-peer underground marketplace expanding on a global scale.

But anonymous Internet trading incurs an additional cost. Like buyers and sellers on any peer-to-peer Internet site such as eBay or Amazon, buyers and sellers on the Deep Web rarely, if ever, meet in person. This makes transactions particularly risky because

¹ For a more detailed analysis of the Deep Web and surface web, see Chandler, 2013.

there is no recourse for failure. And unlike goods on Surface Web sites, Deep Web users are buying products much more harmful than ordinary consumer purchases. The unique nature of this marketplace makes the accumulated reputation of users critical to its emergence and sustainability. Like Avner Greif's work on the Maghribi Traders, these Internet traders have asymmetric information (Greif, 1989). However, unlike the Maghribi Traders, these Internet traders have no legal contract enforceability (Skarbak, 2008). Analyzing this reputation component will enlighten, more fully, how this marketplace can exist without any ability to seek recourse ex post and without any prevalence of contract enforceability (Greif, 2010). We empirically answer the questions; does investment in reputation allow sellers to charge premium prices, or to simply remain in the market? How does reputation play a role in this marketplace?

The most important institution of the Deep Web is anonymity. Each buyer and seller is known by a unique username; their true identity is secret. Users of the Deep Web, through forums and blogs, create a wealth of information to keep users updated on the happenings of the market (DarkNet Markets, 2014). Images 1-3 show Reddit's Deep Web forum and how the users communicate. They use these "news outlets" to keep users informed on frauds, scams, and imposters. Deep Web markets take a cut of each transaction to cover their operation costs and to make a profit. Buyers write and read extensive reviews on sellers and their products. Markets allow ratings from 0 to 5 stars, accompanied by a brief note explaining the rating. More extensive reviews are commonly posted on internal forums and Reddit. These jointly create the seller's reputation. Some

sellers, to differentiate, offer free samples or extra secure shipping techniques to attract positive reviews.

This paper investigates a market place where feedback mechanisms and reputation are the only things keeping the market functioning, without any government taxation and regulation (Greif, 1989, Clay 1997). Deep Web markets are an empirical example of the depth of robustness of spontaneous order. It shows that the principles of an unfettered market rooted in reputation and accountability can be applied to an extremely vast array of goods and services. We are fundamentally analyzing how individuals interact with each other and without government (Powell & Stringham, 2009; Leeson, 2010). In section 2 we delve into the factors that differentiate the Deep Web from other online marketplaces. Section 3 explores how reputation provides a market mechanism to keep buyers and sellers accountable and honest. We outline and describe our theoretical model in section 4, analyzing how reputation functions in the market. Our empirical method of analysis is laid out in section 5. Section 6 includes a description of our data, our collection procedure, and detailed definitions of all our variables. Section 7 reviews our results and estimates the buyers' and sellers' discount factors. Our concluding remarks about the implications and impact of our findings are enclosed in section 8.

2. An Overview of the Deep Web, What Differentiates it from Other Online

Marketplaces

The currency used to make transactions in the Deep Web is Bitcoin. A Bitcoin is a solution to a mathematical equation, and a pseudo-anonymous crypto currency (Grinberg,

2011). They are stored in virtual wallets and are exchanged through anonymous virtual transactions with low transaction fees (Briere, 2013). To “mine” Bitcoins, “miners” use computing power to solve mathematical problems to which there are a fixed number of solutions. Because of the fixed nature of the number of possible solutions (Bitcoins), this crypto currency, by design, cannot be inflated. Therefore, this alternative currency is free from central bank policies or intervention (ECB, 2012).

According to Nicolas Christin, in his paper *Traveling the Silk Road: A measurement analysis of a large anonymous online marketplace*, “Bitcoin is a peer-to-peer, distributed payment system that offers its participants to engage in verifiable transactions without the need for a central third-party” (Christin, 2012). Bitcoins are used for Deep Web transactions because they are anonymous, like cash, and can be transacted electronically. A Bitcoin wallet functions like a physical wallet with cash: once you transfer Bitcoins from one wallet to another, it is untraceable and permanent.

The Deep Web exists on Tor, a computer networking system that allows for anonymous communication and transactions. The communications sent on Tor are encrypted and then sent through numerous network servers and nodes. When users communicate through the Surface Web their messages are unencrypted and travel directly from sender to receiver. Messages are ‘bounced’ between nodes in the Tor network, making them virtually untraceable. The random path the message takes, coupled with its encryption while traveling through the network secures the anonymity of the users and security of the content. This message ‘bouncing’ cause the Tor network to be much slower than Surface Web networks. The identity of the sender and receiver of a message

over Tor is hidden unless the user explicitly wishes to reveal their identity (Onion Routing, 2014). Because Bitcoin is an anonymous crypto currency, it is used as a medium of exchange on Tor.

The barriers to entry into the deep web are very high. The use and knowledge of Bitcoin takes some degree of computer sophistication. However, Bitcoins are becoming increasingly popular and information about how to obtain and use them is readily available. The use and implementation of Tor, on the other hand, suffers from a very large knowledge problem. Jeffrey Tucker, founder of Liberty.me, describes the skills it takes to feasibly and securely make transactions over the Deep Web; “you have to be a sophisticated person to get into commercial buying and selling on the Silk Road” (Tucker, 2014). Users thus turn to this type of market place because it provides them with goods and services more cheaply, more safely, or of a higher quality than their local black market would allow them to access. According to Tucker; “People have an intensity of demand to overcome technical barriers” because there are no online tutorials and much of what goes on in Tor is illegal. There are also very high risk factors when it comes to anonymizing oneself, detection of one’s identity could result in stolen goods, personal safety issues, or imprisonment.

A primary difference between traditional online sites, such as eBay, and the Silk Road is escrow implementation. Standard escrow requires the ability to undo a transaction. Fraudulent items are returned to the seller, and then the escrow service refunds the buyer. Hu et al. preface their model on the assumption that “in the case of fraud, [escrow] users lose only the service fee” (Hu et al. 2004). Silk Road purchases

cannot be undone; drug dealers don't provide return addresses. An escrow service cannot exist which simultaneously satisfies buyer and seller.

The Deep Web is an untaxed and unregulated marketplace, it exists as a completely unfettered free-market. This marketplace functions much like the historical Law Merchant market did in medieval Europe and the medieval Maghribi Traders in the Mediterranean (Greif, 1989; Greif 2012). According to Benson the rules of property and contract necessary for a market economy, which most economists and legal scholars feel must be "imposed," have evolved without the design of any absolute authority. Commerce and commercial law have developed conterminously, without the aid of and often despite the interferences of the coercive power of nation-states because there is a mechanism in place (Benson 644-645). With respect to the Silk Road, the 'internal policing' mechanism that Benson refers to is the reputation of sellers and buyers.

Because the users in this marketplace cannot seek legal recourse for their illegal transactions, they must police themselves (Milgrom, North, and Weingast, 2010). The Deep Web Culture promotes transparency with respect to the quality of the goods and services as well as honesty amongst buyers and sellers. Users have created checks and balances on each other to feel confident and safe on the Deep Web. Just like historical pirates (Leeson, 2007), buyers use checks and balances to constrain seller predation. In the absence of a central coercive force for recursive action, users must rely on each other for feedback and information. The security and reliability of this network is what keeps users confident in the marketplace because they provide internal checks on each other. Many forums contain information about people who are masquerading as prominent

sellers, or users that are committing fraud. This emergent order is no surprise.

According to Peter Leeson, in his paper *Anarchy Unbound: How Much Order Can Spontaneous Order Create?* (2010), and Dennis Mueller in his paper *Anarchy, the Market, and the State* (1988), organization and structural norms emerge without the use of a central planner in the marketplace and these norms are effective at keeping users in the marketplace safe and satisfied with their services and products.

This marketplace has allowed for anonymous peer-to-peer engagement with only the Silk Road and other hosting sites to facilitate the exchange and take a small fee. In their paper, *Trust Among Strangers in Internet Transactions: Empirical Analysis of eBay's Reputation System*, Resnick and Zeckhauser (2001) stress that when there is repeated play among individuals in a marketplace it reduces the likelihood of dishonest people continuously dealing in the market and reduces moral hazard. This type of transaction has revolutionized the illegal goods and services trade because it has made it more convenient, accessible, and has allowed users to access a larger variety of the good of their choice. This online network has enabled local sellers of illegal goods to expand to a global setting and increasing worldwide price and quality competition. In terms of the global drug market, the Silk Road is a small fraction. Kilmer and Pacula (2009) estimate a 2003 trade volume of \$142 billion. Court documents used in the trial of Silk Road Founder Ross Ulbricht (U.S. vs.) allege the original Silk Road grossed approximately \$214 million during its two years of operation.

The latest estimate of marijuana street prices comes from the Office of National Drug Control Policy (ONDCP). The ONDCP uses data from the National Survey on Drug Use and Health (NSDUH) to predict price per gram on the street. They find relatively stable prices, though the 2010 estimate of \$7.11/gram has declined from 2004's \$7.50/gram. They also extend the analysis to Fries et al. data set, estimating a 2010 street price of \$10.70/gram (Rand Corporation 2014; Fries et al. 2008). Our data set's median 2014 price of \$13.61/gram is consistent with a number of theories: higher quality marijuana, an Internet premium, or price inflation over the past four years. J.P. Morgan (2012) finds that revenue lost to online fraud is falling, estimated to 0.9% in 2011.

3. Reputation as a mechanism for market accountability

Because of the nature of the goods sold in the Deep Web, on the Silk Road in particular, sellers are anonymous to buyers and buyers are anonymous to sellers. Before a first transaction, they have no personal knowledge of another's personality and no formal enforcement mechanism if a transaction goes awry. The characteristics of this particular marketplace pose risks to the traders involved. The buyer could refuse to pay the seller after their items have been received, or, if the buyer pays first, the seller could fail to send the purchased items because they received the payment upfront. There is no way to recoup lost Bitcoins or products once the transaction is finalized. This marketplace exists due to the importance of a bilateral reputation mechanism that instills confidence in the traders and facilitates repeated transactions (Greif, 2012).

In his paper *Endogenizing Fractionalization*, Peter Leeson (2005) makes the point that users "need to establish ex ante whether or not the outsiders they would like to trade

with are ‘cheaters’ or ‘cooperators’. In other words, they need a means of screening outsiders” (Leeson, 79). Collecting as much data as possible on the other party is necessary to making a smart and calculated transaction. Initially, buyers and sellers are dependent upon previous users’ feedback for information on the legitimacy of their potential trade. Recognizing this potential risk, traders utilize forums such as Reddit and the Silk Road itself for feedback, bringing attention to fraudulent behavior and informing traders of transaction malfeasance.

The codification of buyer and seller feedback makes up each party’s user profile (Houser and Wooders, 2006). A user’s feedback profile in this marketplace is made up of the comments and ratings left on the Silk Road site as well as other feedback forums. This feedback is both comments and a number rating. The collection of this user feedback on other users makes up the reputation of the trader in the marketplace. Due to the anonymity aspects of The Silk Road, buyer information is not formally posted like seller information and feedback is on the site. Unlike Surface Web marketplaces, if a buyer leaves a comment and/or rating, an individual identifier is not attached to their message. The reason for this is to protect buyer anonymity. The only information that we can glean about the buyer in particular is that they did in fact make a purchase; buyers cannot leave feedback on a product they did not buy.

Potential buyers utilize this feedback about sellers. They can read comments about previous buyer’s experiences, whether or not the buyer received the items, and view the seller’s 30-day and 60-day and overall rating score. This score is an average of past reviews and it is out of 5 possible points. Sellers, however, do not have access to

this information about potential buyers. Repeated trade will reveal buyer reputation, but the first is made with little information. The promise of future trade can incentivize honest behavior from the beginning; sellers can cease trade with dishonest buyers.

Discovery of a dishonest buyer can have positive externalities for other sellers. But, sellers' outlets for relaying the information that they have learned from buyers are limited. Because buyers do not have publicly available profiles, the seller must seek alternative forms of feedback. They can leave feedback on the internal Silk Road forums or various forums on the Surface Web but cannot add to a collected reputation buyer profile because they do not exist. Gambetta, in his book "Codes of the Underworld: How Criminals Communicate", identifies that criminals need both a costly signal of the trader's credentials and a costless arbitrary group signal in order for this type of market place to run smoothly underground (2010). Leeson (2005) further breaks down the components necessary for a successful reputation signal in general. He states that they must be easily observable and that they also must be costly for cheaters to signal a stellar reputation and inexpensive for honest users to signal that they are authentic.

Applying these characteristics to the Silk Road marketplace, the seller feedback mechanisms of readily observable ratings, comments, and thus reputation fit these criteria and send a signal that the seller is honest or dishonest. It would be difficult for a repeatedly dishonest seller to trick its buyers to leave positive reviews and ratings even though the products and services were a sham. On the other hand, if an honest seller provides their customer's with quality products in a timely manner, it will be relatively easy to receive truthful positive reviews about the seller's quality performance. This

dovetails very nicely with what we know about the Silk Road community from studying Silk Road forums: the community is very active at giving feedback. These criteria, easily observable signaling and costly signaling for cheaters, do not necessarily apply to the buyers in this marketplace. This failure of buyer feedback to meet the strong signal criteria proposes that buyer signals could contain a great deal of noise and potential for misread signals. For the purposes of this paper, we will analyze the impact of seller's reputation as a signal.

However imperfect these feedback mechanisms may be, they provide users information on reputation. Reputation is crucial in this market because it acts as a signal to other users that they are honest and credible individuals. This signal works to differentiate between honest and dishonest users to ensure that honest users are not driven out of the marketplace by dishonest users that are not properly identified. Leeson (2005) emphasizes that the traders' identities work to reduce social distance in the marketplace. Deep Web traders do not have an identity in the traditional sense, however; they foster an identity through their online reputation. Leeson (2005) makes it clear that

cheaters, however, have higher discount rates than cooperators. This is in fact why they cheat. Because they discount the gains from future exchange more heavily than cooperators, cheaters find it relatively more costly to invest in creating some degree of homogeneity with an outsider, the value of which will only be recouped some time down the road (Leeson, 80). Our analysis in this paper estimates the discount factors of all users. An essential component to the reputation system is that, if reputation does allow sellers to charge their customers a premium, it behooves the sellers to increase their

reputation so as to be able to collect premium profits. Therefore, the existence of the reputation system itself acts to ensure honesty with each transaction.

This phenomenon is what this paper analyzes in great detail, whether or not an increase in reputation empirically and statistically significantly allows sellers to actually charge premium prices. We analyze if favorable reputation allows sellers to capitalize on their positive feedback and signal to buyers that their items are of high quality like Shapiro (1983) found in his paper *Premiums for High Quality Products as Returns to Reputation*.

4. Theoretical and empirical model

We seek to accomplish two goals. First, we disentangle the role of reputation on the Silk Road. Does investment in reputation allow sellers to charge premium prices, or to simply remain in the market? Houser and Wooders (2006) posit a market with *honest* and *dishonest* sellers. Reputation serves as a signal that a seller is honest. Thus, a buyer's utility, as well as willingness to pay, increases with increased seller reputation. This reputation enables sellers to earn a premium. Houser and Wooders find evidence supporting this theory using their data on eBay auctions. Other papers find similar results. Klein and Leffler (1981) examines the use of higher prices to ensure contractual performance, Shapiro (1983) as well as Allen (1984) examine prices above marginal cost to forestall quality cutting, and McDonald and Slawson (2000) examine returns to reputation in electronic auction markets.

Alternate theoretical models can be constructed such that reputation does not convey a premium. Rather, in equilibrium all sellers are *honest*. One could suppose that

above a certain threshold a seller is considered *honest* by buyers and remains in the market, below that threshold the seller is considered *dishonest* and exits the market or creates a new identity. Melnik and Alm (2002) find some support for this theory. They show a positive relationship between reputation and price, but the predicted effect is quite small.

Second, what assumptions about time discounting must be made to sustain the market? Using the estimates of return to honesty, we can determine a lower bound to a seller's time preference. A seller with a higher time preference would be less patient for payment and would prefer the buyer to pay for the goods before they had received them. This is called finalizing early (FE) and occurs when buyers transfer their payment in Bitcoins to the seller before the product is received. If the seller has a relatively low time preference, they would not necessarily request an FE payment. Not much work has been done on estimating this variable, though it has vast implications for the functioning of a market dependent upon repeated trade and weak punishments. FE was prevalent on the Silk Road prior to its shutdown. As markets have evolved, multi-signature escrow has become the norm.

We begin with a simple model, discussing the interaction between a single seller and buyer. We later expand this simple model's insight to a broader model. Choice nodes exist for buyers and sellers, each dependent upon the expectation of actions at the subsequent nodes. First, we analyze the nodes chronologically and then, by backwards induction, create a theory to predict market action and the general qualities of equilibrium.

We posit a good j sold by seller j to buyer i . The item is listed at a price p , and has a value of V_i to the buyer. Both buyer and seller have initial, publicly known, reputations r^b and r^s . Reputation serves as a proxy for the probability that the individual will act honestly. The model incorporates a signal extraction problem: honest behavior can be perceived as dishonest. A package may fail to arrive because it was intercepted by LE (honest), or because it was never shipped (dishonest). We create a variable, r^c , representing signal clarity. r^c takes a value from 0 to 1; 1 implies perfect signal transmission, and 0 complete signal failure. There is a probability, $(1-r^c)$, that an honest signal is received as dishonest. Reputations are therefore imperfectly updated. Production for a single unit of good j costs c , which includes production costs as well as shipping costs in most cases (many sellers offer free shipping). Finally, actors discount future periods by β_i and β_j . Each of these discount factors depends on the buyer and seller's time preferences.

The seller takes the first step, creating a listing. The seller sets all aspects of this listing: product, price, and method of payment. Product description and price have an unbounded set of possibilities, and equilibrium occurs within the intersection of this possibility set and the buyer's demand set. Assume that buyer and seller interact within this intersection. Action outside of this intersection is uninteresting; no trade occurs.

The meaningful choice we are left with at this node is method of payment. The seller chooses what occurs first: buyer payment or seller shipment. If the seller requests that the buyer finalize early (FE), the buyer pays for the product before shipment. We analyze buyer pays first.

The buyer's decision in the case of 'buyer pays first' is simple. Do I value the item above the cost? Similar to Houser's treatment of reputation and value, any purchase must satisfy the equation

$$p \leq r^s V_i \quad (1)$$

The expected benefit to the buyer must be greater than the price of the item. If this equation holds, the buyer will make the purchase. Otherwise, no transaction occurs. We assume, in equilibrium, that the seller will raise price until the previous equation is binding, that is

$$p = r^s V_i \quad (2)$$

The seller now faces the decision to be honest or cheat. If the seller is honest, item j is shipped and the seller's reputation increases. If the seller cheats, item j is not shipped and the seller's reputation decreases. Because price is a function of seller reputation, honest sellers can charge premiums. The price that an honest seller can charge is p_h and the price that a cheating seller can charge is p_c . Cheating once followed

by honesty results in a payoff of $p + \overset{\forall}{\underset{t=1}{\overset{\circ}{\Delta}}} b_j^t (p_c - c)$. The payoff to honesty is thus

$$(p - c) + r^c \overset{\forall}{\underset{t=1}{\overset{\circ}{\Delta}}} b_j^t (p_h - c) + (1 - r^c) \overset{\forall}{\underset{t=1}{\overset{\circ}{\Delta}}} b_j^t (p_c - c) .$$

The actions of the seller alter his reputation, such that it increases with honest action and falls with dishonest behavior. The reputation of an honest seller is thus r_h^s and

the reputation for a dishonest seller is r_c^s . Put mathematically, $r_c^s < r^s < r_h^s$. Recall that in equilibrium $p = r^s V_i$.

Thus,

$$\sum_{t=1}^{\infty} b_j^t (p_c - c) < \sum_{t=1}^{\infty} b_j^t (p_h - c). \quad (3)$$

$$R_h = \sum_{t=1}^{\infty} b_j^t (p_h - c) \quad (4)$$

$$R_c = \sum_{t=1}^{\infty} b_j^t (p_c - c) \quad (5)$$

Equation (3) demonstrates that the expected future revenue stream from honesty is strictly larger than that from cheating. This is because honesty raises a seller's reputation, allowing seller j to charge premium prices indefinitely. These revenue streams are simplified to R_h and R_c in equation (4) and equation (5) respectively. We can now analyze the conditions under which a seller will remain honest.

$$(p - c) + r^c R_h + (1 - r^c) R_c \geq p + R_c$$

$$r^c (R_h - R_c) \geq c \quad (6)$$

A seller remains honest when the expected cost of cheating is greater than or equal to the cost of production. Honesty is increasing with both signal clarity and future returns to high reputation. It is decreasing with future returns to cheating and cost.

A buyer has no way of knowing that equation (6) holds, instead inferring the seller's honesty through r^s . The buyer's decision being unaffected by equation (6) suggests that equilibrium is reached. Attention should be paid to three facets of this

equilibrium. As previously mentioned, the seller will raise price to meet the buyer's valuation, $p = r^s V_i$. Increases in the return to honesty, $(R_h - R_c)$, will make the equilibrium more stable. The signal of an honest seller will be stronger if sellers are incentivized to be honest because the signal clarity is important for trade reoccurrence.

Now, the case of 'seller ships first.' The buyer still purchases when $p \leq r^s V_i$, but the seller now assumes all risk; r^s is effectively 1. If the expected product is not delivered, the buyer will withhold payment at no loss.

The seller's choice is to engage in the transaction, or decline. When the expected revenue exceeds the expected costs, the seller engages in the transaction

$$r^b V_j \geq r^b p + c \quad (7)$$

A seller remains in the market while equation (7) holds. Unlike r^s , r^b is not known.

Buyers do not have public reputations, thus r^b is the average expected buyer reputation.

After receipt of good j , buyers choose to cheat or be honest. Cheating buyers withhold payment, and receive a payoff

$$V_i + (1 - r^c) \sum_{t=1}^{\infty} b_i^t (V_i - p) \quad (8)$$

honest buyers receive payoff

$$(V_i - p) + \sum_{t=1}^{\infty} b_i^t (V_i - p) \quad (9)$$

When the seller doesn't receive payment, either the buyer is cheating or the good was intercepted. If seller j believes the buyer is honest, trade may occur again. Combining both equations gives conditions of buyer honesty.

$$r^c \sum_{t=1}^{\infty} \beta_i^t (V_i - p) \geq p \quad (10)$$

This inequality states that when the future benefits from trade, discounted by signal clarity, exceed price the buyer will behave honestly. It is important to note that lowering price unambiguously makes equation (10) more likely to hold. This incentivizes the seller to lower price until equation (7) binds

$$r^b p = c \quad (11)$$

A few qualities of this equilibrium emerge. Honest buyers enjoy a surplus of $V_i - p$, because a surplus of 0 would cause equation (10) to not hold. This surplus allows the market to function, by rewarding honest buyers at the expense of cheaters. Price is a function of production costs as well as buyer reputation. Market durability is increasing in r^c and β_i . V_i can have positive effects, but it depends upon the marginal cost increase of an increase in value.

The addition of more buyers and sellers strengthens the market. The equalities previously derived now apply to the marginal buyer and seller. Different V_i 's, β_i 's, and β_j 's may allow some to benefit more than others in equilibrium. In the case of buyer 1st, equation (2) will still hold. The increase in market size will likely drive equation (6) to the binding point. Seller entry will put downward pressure on the returns to reputation, until entry ceases at the binding point.

$$r^c (R_h - R_c) = c \quad (12)$$

Plugging equations (4) and (5) into (12) generates an enlightening equation for seller patience

$$r^c [\overset{\forall}{\underset{t=1}{\dot{\hat{a}}}} b_j^t (p_h - c) - \overset{\forall}{\underset{t=1}{\dot{\hat{a}}}} b_j^t (p_c - c)] = c$$

$$\frac{r^c b_j}{1 - b_j} (p_h - p_c) = c$$

$$\frac{b_j}{1 - b_j} = \frac{1}{r^c} \frac{c}{p_h - p_c} \quad (13)$$

The marginal seller in equilibrium must discount the future such that (13) holds.

Similar price pressure will occur in the case of seller 1st. The price equation, (11), still holds. Taking equation (10) further calculates an equality similar to (13)

$$\frac{b_i}{1 - b_i} = \frac{p}{V_i - p} \frac{1}{r^c r^e} \quad (14)$$

The marginal buyer has a β or V_i low enough to make equation (10) binding.

5. Empirical Method

Recall that in ‘buyer pays first’ equilibrium, the price of j is given by equation (2).

Thus, by taking logs of both side

$$\ln(p) = \ln(r^s) + \ln(V_i) \quad (15)$$

The log of price is a function of the observable seller characteristics, r^s , and the observable item value, V_i . Because our data contains sellers of multiple products, we expect heteroskedastic errors correlated by seller. This equation can thus be estimated using generalized least squares and standard regularity conditions. We follow the basic estimation method used in Houser and Wooders (2006).

In addition, equation (13) can be estimated. We don't have sufficient data to attempt equation (14), because buyer's personal values can't be directly observed. To empirically estimate equation (13), we first make a slight transformation.

$$\frac{b_j}{1 - b_j} = \frac{1}{r^c} \frac{c/p}{[(p_h/p) - (p_c/p)]} \quad (16)$$

Our previous regression will estimate for us $\frac{p_h}{p}$, the percent increase in price given one more positive review. Assuming linearity in returns to reputation, the percent decrease in price given a negative review will equal the increase given a positive review. Thus,

$$\frac{b_j}{1 - b_j} = \frac{1}{r^c} \frac{c/p}{(2 * p_h/p)} \quad (17)$$

In a market with mixed payment methods, such as our data set, we assume that price fulfills a combination of equation (1) and equation (7), price is less than or equal to $r^b V_i$ and greater than or equal to c/r^b . This means our estimates will be imperfect, but can be checked later for robustness. In theory, competition will minimize this gap. Therefore,

$$\frac{b_j}{1 - b_j} \gg \frac{1}{r^c} \frac{r^b}{(2 * p_h/p)} \quad (18)$$

We later estimate r^b and r^c .

6. Data from the Silk Road

We use sales data on 119 cannabis listings from 41 sellers, for a total of 9,604 sales. Transaction volume ranges from a single sale to 688. Though they can be used in a variety of ways, cannabis products have a single purpose. We assume that different strains are highly competitive, and similarly that if a well-recognized strain exists it

doesn't command a premium. Our data set is parsed from the Silk Road website and covers an 11 month time period, from the opening of Silk Road II in November 2013 to our collection date in October 2014. We chose cannabis sales exclusively because it is one of the biggest portions of the market with a lot of differentiation of product type and strain. We also want to look into one type of market, presuming the marketplaces for other products are differentiated.

It is important for our empirics that we use data on sales of marijuana for personal use. Our theoretical model requires that item value assessments must use private values, not common values. In Virginia, the cutoff for misdemeanor possession charges is less than ½ oz, or approximately 14 grams. Anything above ½ oz is considered intent to sell and carries a felony charge. By contrast, Florida draws the line at 20 grams. Our data has a fairly natural break at 15 grams, so we will perform empirics on weights of 15 grams and below, ensuring that we ignore listings meant for resale.

6.1 Data Collection Procedure

Data was collected from the Silk Road (silkroad6ownowfk.onion) using a web crawler called HTTrack. HTTrack utilized the Tor network to download the web pages and structure of the Silk Road over the course of four days in early October. This was a slow process; the Tor network limited the download to around 4 KB/sec. To economize on bandwidth, the download ignored all images and only downloaded the text of web pages. Appendix A includes sample web page images. The downloaded webpage data was then used to create a local mirror of the site.

Data was then parsed from the site into an Excel file using a custom parser. This created three unique data sets: seller data, feedback data, and item data. Our focus for this paper is the item data. Our parser gathered data on the listing name, price, aggregate item feedback values, aggregate seller feedback values, free shipping, number of sales, days sold for, and weight.

We will now outline some of the major difficulties with the data. The crawler is imperfect and known to make mistakes. Of the over 30,000 files downloaded, HTTrack reported approximately 300 errors. Given the extended download period, nature of the connection and size of the download, these errors were expected. The key is that they are random. Errors typically occurred singly, at a rate of a few an hour. Also, few errors eliminated information on a seller or listing. Rather, they removed a page of feedback details for a user. Finally, errors didn't change any data points; it instead makes them unreadable.

Price data also presented complications. Bitcoin (BTC) prices can fluctuate dramatically. To alleviate this, the Silk Road appears to pin listing prices to some more stable currency. The mechanism is not public knowledge, but we theorize that seller's indicate a price in USD that is then converted to BTC. This value is then periodically updated as the conversion rate changes. This creates problems when downloading over multiple days, as relative prices change due to adjustments in BTC exchange rates rather than value. To correct for this, the parser converted BTC prices to USD based upon the date of download and exchange data from the Coindesk.

Weight is our restrictive variable. The Silk Road provides no universal way to list the products weight, which creates complications for the parser. Some listings show weight in the title, others somewhere in the description. Different countries deal with decimals differently; one may list 3.14 grams, another 3,14 grams. Finally, ‘grams’ can be abbreviated as g, gr, or omitted entirely in the case of ‘sample packs’. The parser was created to grab as many weights as possible but could not grab them all. For future work, we will likely enter more data by hand.

The key difference in our model between ‘buyer pays first’ and ‘seller pays first’ is the price function. In ‘buyer pays first’ price is determined by the reputation of the seller and the value of the good. In ‘seller pays first’ it is a function of production cost and the reciprocal of buyer reputation. The Silk Road is a mixture of both systems.

Silk Road uses two payment methods: finalize early and an escrow system. FE closely approximates our Buyer 1st model previously outlined. A seller requires that a buyer complete payment before the item ships. Escrow is similar to Seller 1st, but imperfect. A buyer indicates willingness to purchase by sending funds to the Silk Road’s escrow account. When the item arrives, the buyer is then expected to release the funds to the seller. If the item doesn’t arrive, the Silk Road fully or partially refunds the buyer. Typically, this favors the buyer, who receives a full refund. In terms of our model, this system works to increase r^b and r^e by raising the cost of cheating.

It is difficult to determine what payment method a seller offers. Many shift over time, depending on the item, or perhaps offer both (with bonuses to FE). Our data covers a unique period in the Silk Road’s history; the centralized escrow account was hacked on

February 13th of 2014. This pushed sales to mandatory FE for approximately 2 months before allowing individual choice again.

6.2 Variables Used in Empirical Analysis

Our dependent variable, *lnPricebyWgt*, is the log of an item's list price divided by its weight in grams. As previously mentioned, the price is converted to USD from BTC using Coindesk price data. Weight is converted from its list unit to grams. This creates a value in USD/gram. Listings with no feedback, either because no sales have been made or feedback posted (we cannot differentiate between the two), are ignored.

Our seller reputation variables are *VendorRatingOverall*, *VendorRepFall*, *ItemRatingOverall* and *ItemRatingSum100*. *VendorRatingOverall* aggregates seller feedback. Sales are concluded when a buyer leaves a feedback rating, from 0 to 5 stars. This feedback is averaged over the life of the listing and reported on an item and seller's listing page. *VendorRepFall* is a dummy variable capturing dynamic effects of reputation. Buyers observe three measures of reputation: overall, 60 day, and 30 day. *VendorRepFall* takes a value of '1' if 30-day reputation is less than overall reputation. We include *ItemRatingOverall* and *ItemRatingSum100* as seller reputation variables though they appear to be value related. Firstly, Item Rating and Vendor Rating are highly correlated; Vendor Rating is an aggregate of a sellers' Item Ratings. In addition, feedbacks don't typically include value assessments. They are a bimodal distribution: 5 if the good is received, 0 if it isn't. Thus, ratings better reflect a seller's honesty than the goods quality. *ItemRatingSum100* is the sum of feedbacks for the item. This is calculated by multiplying overall feedback by number of feedbacks, then dividing by 100

to make the numbers more manageable. This coefficient will be used to estimate (18). It is worth noting that we do not include number of feedbacks in our regressions due to its strong correlation with *ItemRatingSum100*. Finally, *ItemRepFall* is a dummy variable similar to *VendorRepFall* for the item rating.

Our item value variables are *WgtGrams*, *FreeShip*, *NumFeedbacks*, and *Advert*. *WgtGrams* is a variable, measured in grams, which controls for the weight of the product. This controls for quantity discounts. *FreeShip* is a dummy variable, which takes a value of '1' if the seller offers free shipping. It is difficult to disentangle the various shipping options offered by seller. This variable captures the added value of free shipping. *NumFeedbacks* is the number of feedbacks received on this listing. Higher sales numbers may signal to potential buyers that the product is as advertised. *Advert* is a dummy that takes a value of one if the following words appear in the listing name: Premium, AAA, High Grade, Top Quality, or Strong. Marijuana's varying levels of quality are difficult to measure. This dummy weakly controls for quality differences among listings. These only hold analytical strength if we assume both that buyers can tell the difference between high- and low-quality product, and sellers communicate quality through these words.

7. Results

GLS

Table I – Summary Statistics

	Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent Variable	PricebyWgt	119	14.88	5.56	4.06	32.04
	PriceUSD	119	58.39	51.48	4.30	360.76
Seller Reputation Variables	VendorRatingOverall	119	4.84	0.20	4	5
	VendorRepFall	119	0.57	0.50	0	1
	ItemRatingOverall	119	4.86	0.21	4	5
	ItemRatingSum100	119	3.94	0.49	.04	33.64
Item Value Variables	Advert	119	0.15	0.36	0	1
	FreeShip	119	0.66	0.48	0	1
	NumFeedbacks	119	80.71	108.59	1	688
	WgtGrams	119	4.70	4.47	.5	15
	ItemRepFall	119	0.40	0.49	0	1

The results of our GLS regressions estimating (15) are presented in Table II. We report 7 regressions, exploring different measures of seller reputation and controls. The regressions provide evidence supporting the hypothesis that reputation provides a premium.

Our estimates of *ItemRatingOverall* are significant across all the regressions it is included in. The magnitude of the coefficient overshadows our other controls. In contrast, *VendorRatingOverall* is only significant in regression (4). It is insignificant and has the opposite of expected sign in the presence of *ItemRatingOverall*, suggesting that most reputation information is contained within the item’s rating rather than the vendor’s

rating. *ItemRatingSum100* is insignificant in all regressions, though the addition of more controls raises its Z score. It maintains the expected positive sign throughout.

VendorRepFall and *ItemRepFall* return expected results. Given the item value controls, they are significant and negative. Despite the insignificance of *VendorRatingOverall*, changes in the rating are related to changes in the price. Changes in seller rating may be more important than the actual rating because of the inherent risks of these transactions. Sellers face forces largely outside of their control (law enforcement) and can expect a percentage of shipments to be intercepted. A stable, less than perfect, seller rating reflects this. When buyers observe a fall in a vendor's rating, there is thus confusion about the source: seller behavior or law enforcement action.

Estimates of *WgtGrams* are as expected, negative and significant. This indicates a bulk discount of sorts; the more grams purchased the lower the price per gram. *Advert* and *FreeShip* are both significant and negative. We theorize that this is because lower quality (and thus price) goods compete on more margins than high quality specialized goods. Free shipping and quality descriptions are thus more likely for a low quality good to entice buyers from competitors' products.

Table II – GLS Regressions of Effect of Reputation on Log Price per Gram

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variable							
<i>VendorRatingOverall</i>	-0.098 (0.50)	-0.109 (0.55)	-0.130 (0.64)	0.477 **(4.62)			
<i>ItemRatingOverall</i>	0.693 **(4.14)	0.694 **(4.09)	0.728 **(4.2)		0.547 **(8.06)		0.546 **(8.30)
<i>ItemRatingSum100</i>		.0027 (0.63)	.0037 (0.73)			.0056 (1.48)	.0049 (1.68)
<i>VendorRepFall</i>			-0.000 (0.00)	-0.079 *(2.33)	-0.062 *(2.31)	-0.087 **(2.61)	-0.066 *(2.44)
<i>ItemRepFall</i>			-0.032 (0.61)	-0.080 **(3.08)	-0.067 **(3.18)	-0.088 **(3.38)	-0.082 **(3.61)
<i>FreeShip</i>				-0.145 **(4.45)	-0.131 **(4.47)	-0.110 **(2.86)	-0.130 **(4.53)
<i>WgtGrams</i>				-0.044 **(14.48)	-0.044 **(15.76)	-0.044 **(14.64)	-0.042 **(15.24)
<i>Advert</i>				-0.193 **(5.86)	-0.150 **(3.52)	-0.214 **(6.61)	-0.148 **(3.59)
Constant	-0.264 (0.74)	-0.225 (0.61)	-0.278 (0.65)	0.733 (1.41)	0.357 (1.05)	3.015 **(60.54)	0.343 (1.03)
Observations	119	119	119	119	119	119	119
Number of VENDOR	41	41	41	41	41	41	41

Absolute value of z statistics in parentheses

* Significant at 5%; ** significant at 1%

7.1 Estimating Beta

Now we use the estimated coefficient of *ItemRatingSum100* to estimate β_j . The coefficients are not significant, but they are consistently positive across regressions, which is what we predicted, and approximately the same magnitudes. We will show that the actual estimate matters little at this point.

$$\frac{b_j}{1 - b_j} \gg \frac{1}{r^c} \frac{r^b}{(2 * p_h / p)} \quad (19)$$

We begin using the *ItemRatingSum100* coefficient of 0.0049; regression (7) estimated the highest Z score for the variable. We first divide by 100, to determine the estimated return to a single star review. A positive review is typically 5-stars, so we then multiply this number by 5 to determine the estimated percent increase in price given a five-star review. This gives us $p_h / p = 0.000245$.

Do these results suggest that we should we expect the quality of buyers to significantly differ from that of sellers? Perhaps sellers have stronger incentives to be honest; they must make a larger investment in reputation. But because we cannot directly measure r^b given our current data set we must make some assumptions. We thus calculate β_j assuming that r^b is the average *ItemRatingOverall* (.972), the average *VendorRatingOverall* (.968), and some lesser values. Though we can't explicitly say that these ratings approximate buyer reputation, we can weakly say that they are an upper bound.

Similarly, we do not currently have good estimates of r^c . We expect signal clarity to vary greatly depending on location, package size, even the time of year. We thus see how various values of r^c affect β . An interception rate of 1% gives a value of .99, 5% gives a value of .95, etc. For example, a 5% interception rate means that for every hundred illegal packages moving passing through the postal service, 5 are confiscated. Further work needs to be done to estimate the variable.

Table III - β , given a $\frac{P_h}{p}$ of 0.00245

$r^c \backslash r^b$.972	.968	.9	.75	.5
.99	0.9995	0.9995	0.9995	0.9994	0.9990
.95	0.9995	0.9995	0.9995	0.9994	0.9991
.9	0.9995	0.9995	0.9995	0.9994	0.9991
.75	0.9996	0.9996	0.9996	0.9995	0.9993
.5	0.9997	0.9997	0.9997	0.9997	0.9995

As Table III shows, the low return to honesty appears to overshadow any considerations of r^c and r^b . This incredibly high β is intuitive given the frequency of transactions. Given this is the time preference between sales, which occur relatively frequently, we should expect the seller to not discount very much. A retailer doesn't discount sales that will occur in the evening relative to sales in the morning. Sales are typically thought of in terms of days or weeks, not individually. As a thought exercise, the average seller has been active for 10 months, and the average listing has received approximately 80 feedbacks. This reduces to an average of 8 feedbacks per month, or two feedbacks per week, or 1 feedback every 3.5 days. Approximately 104 3.5-day sets occur every year. By taking our high (.9997) and low (.9990) estimates of β to the 104th power we can estimate an annual β range. This works out to be $0.9012 \leq \beta \leq 0.9693$, and can be converted to an interest rate so that $0.0317 \leq r \leq 0.1096$. More robust analysis of these estimates is required.

8. Conclusion

We note some possible objections to our model. This model ignores the possibility of utility of action. Utility of actions means that an individual may receive utility from the

action of honest behavior. This can be added to the model by creating a constant value to one of the payoffs. A positive constant added to the payoff for honesty or payoff for cheating could simply model utility of honesty or cheating respectively. This possibility makes any estimates of β upper bounds. Our meaningful choice node is payment method. Perhaps others should be explored. Buyers and sellers may choose marketplaces on a large number of different margins, such as: market fees, network effects, intensity of competition, encryption methods, etc. These other features of markets certainly bear further research.

Our results add to the current literature on both spontaneous order and reputation systems. Like the Law Merchant, they demonstrate how a marketplace, where feedback mechanisms and reputation are the only things keeping the market functioning, can exist without government regulation. These feedback mechanisms have created an informal institutional framework within which traders exchange goods with confidence (Milgrom, North, and Weingast, 2010). This marketplace demonstrates the shifting institutional structure of black markets in response to new technologies and threats. Silk Road cannabis sales data support the theory that investment in reputation provides a premium to sellers, creating a framework that incentivizes sellers to deliver good service to buyers, despite anonymity and an absence of ex-post recourse. Reputation's role is especially powerful in this case; it is fundamental to the community's existence.

Because sellers are able to charge premium prices due to their higher relative reputations, this incentivizes them to work to increase their reputation. This particular incentive structure further solidifies the theory that reputation mechanisms are effective.

Good reputations allow sellers to make more money and sellers are incentivized to provide quality service to their customers so that they increase their reputation and thus, make higher profits. This supports the Leeson (2005) criteria for an effective signal insomuch as seller reputation is readily observable, cheap for honest sellers to obtain, and costly for dishonest sellers to garner.

Our results also demonstrate that other factors are certainly at play. Our estimates of β suggest that future revenue streams may not be enough to keep smaller sellers honest. This could reveal itself as a tendency for larger sellers to dominate the marketplace, or cause other honesty-encouraging mechanisms to emerge. Markets, following the fall of Silk Road, are increasingly outsourcing escrow services. These third-party providers supply different bundles of service; it will be interesting to see which escrow features consumers cluster around.

Further research could analyze this process over a much longer period and track certain sellers to see when they enter and exit the market due to reputation. An analysis of the creation of transaction networks, behaviors of entering and exiting sellers, and buyer behavior are also enlightening questions to be explored.

Appendix A

Image 1

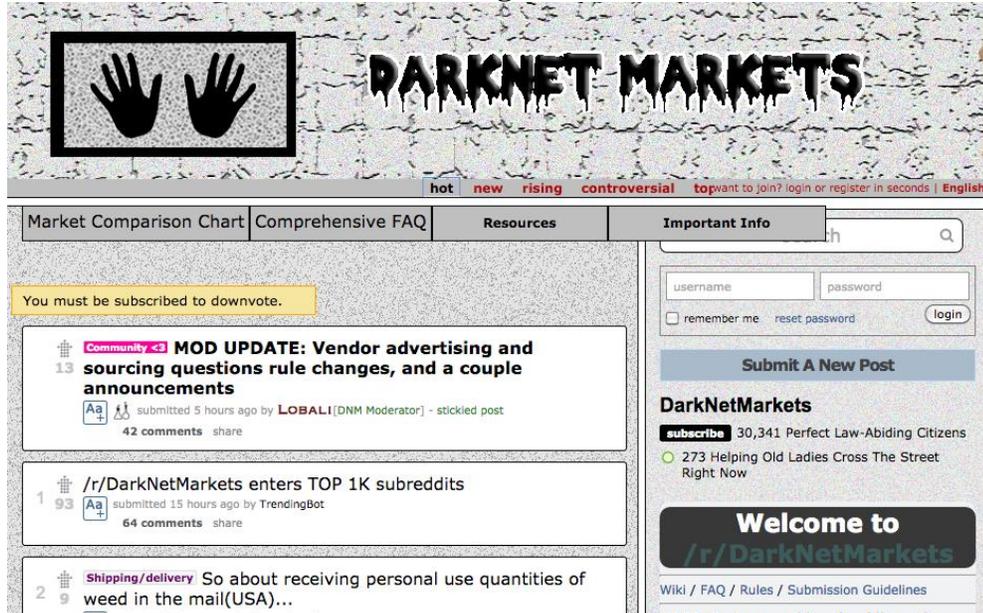


Image 2

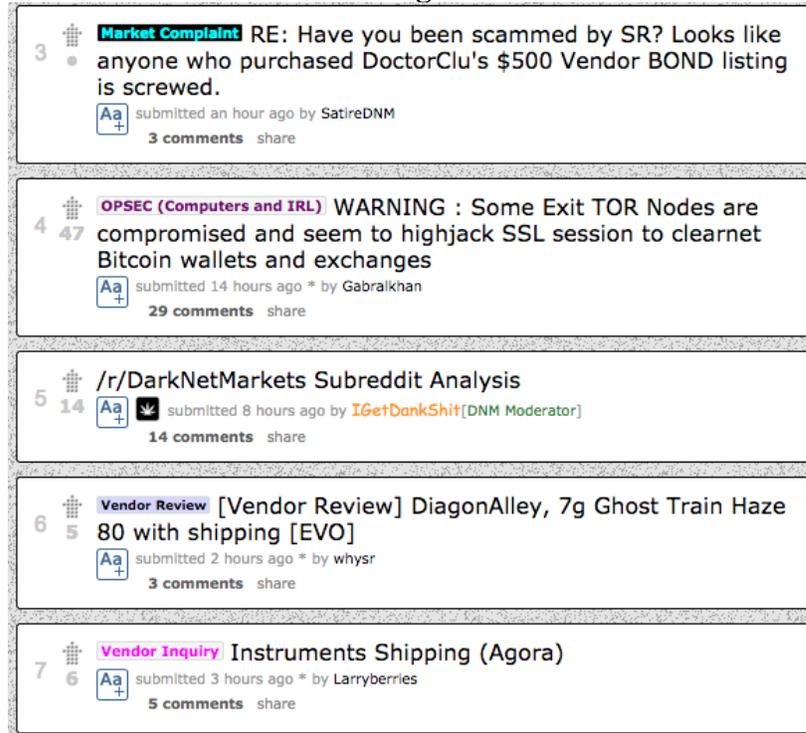


Image 3

 **Silk Road**
anonymous market

messages 0 | orders 0 | account B0.00

Search

Shop by Category

- Drugs 7,052
 - Cannabis 1,275
 - Dissociatives 165
 - Ecstasy 787
 - Opioids 474
 - Other 439
 - Precursors 69
 - Prescription 1,585
 - Psychedelics 875
 - Stimulants 1,044
- Apparel 259
- Art 114
- Biotic materials 7
- Books 856
- Computer equipment 39
- Custom Orders 65
- Digital goods 519
- Drug paraphernalia 239
- Electronics 69

		
1g crack pure!!only coke colombia!!very strong B2.06	1 oz White Rhino B3.92	100 Restoril 30mg (Novartis) B2.33
		
ICE / 1 POINT (0.1G)	20x 1MG Alprazolam	50x MDMA / 1gr pure

Image 4

 **Silk Road**
anonymous market

messages 0 | orders 0 | account B0.000

Search

- Weed 727
 - High CBD 12
 - Indica dominant 47
 - Sativa dominant 121
 - Unknown genetics 4
 - Blends and Hybrids 29
- Alcohol 411
- Apparel 539
- Art 8
- Biotic materials 2
- Books 566
- Collectibles 2
- Computer equipment 26
- Custom Orders 290
- Digital goods 846
- Drug paraphernalia 203
- Drugs 13444
- Electronics 53
- Erotica 83
- Forgeries 88
- Hardware 23
- Herbs & Supplements 2
- Jewelry 38
- Lab Supplies 1
- Lotteries & games 24
- Medical 12
- Money 350
- Packaging 33
- Services 202
- Writing 12



10g White Widow

★★★★★ (688)

B0.262237

vendor: **DutchMagic** 93

ships from: Netherlands
ships to: Worldwide

Image 5

rating	feedback	freshness
★★★★★	Extremely good product for the price, I am a satisfied customer. Will call again.	1 day
★★★★★	awesome	1 day
★★★★★	Perfect	1 day
★★★★★	perfect as usual xxx	1 day
★★★★★	Fuck I was getting really worried! Delivery to Germany 13 days after marked shipped! I was starting to doubt anything in the world. Bit sticky but it will be excellent. Love you DM, sorry for the unnecessary message! efwnlirewtn435ds	1 day
★★★★★	always the same shit!!!! THE BEST SHIT YOU CAN GEET HERE ;j 10/10	2 days
★★★★★	good communication with the vendor. not the same hight quality as othertimes but still good	2 days
★★★★★	Quick delivery, excellent stealth	2 days
★★★★★	Received the weed, great grass great stealth, recommended vendor.	2 days
★★★★★	8 Working days to UK - Great Product *****	2 days
★★★★★	5 Days to UK; Fantastic product for price, extrememly kiefy; 1g overweight, quite stalky; Reliable and speedy vendor! 5/5	2 days
★★★★★	My 2nd order, and as before im amazed with this guy :-) 7 days to UK and quality is top standard. I will be back very soon...	2 days
★★★★★	Good Delivery and good smoke	2 days

Image 6

shipping options

description	est. delivery	shipping price	
Free Shipping (non-tracked mail)	9 days	฿0.000000	add to cart

item feedback

30 day average: **4.90**
 60 day average: **4.90**
 Overall average: **4.89**

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AMERICAN PANHANDLERS

This paper studies American panhandlers and public policy that addresses them. It surveys what we know about panhandlers, what we don't know about them, what we think we know about panhandlers and analyzes how this stock of "knowledge" affects law directed at panhandling. We know about panhandlers' demographics, housing, and sources of income: panhandlers are typically homeless, but they are not the "typical homeless." We know little about panhandlers' behavior: determinants of the decision to panhandle and of panhandling activities have not been studied. We think we know that many panhandlers abuse substances and are mentally ill: these phenomena are relatively prevalent among the homeless and appear to be still more prevalent among the homeless who panhandle. This stock of "knowledge" about panhandlers leads easily but incorrectly to the supposition that panhandler behavior is "irrational." Public policy reflects this supposition: it ignores how interventions affect panhandler incentives, undermining its effectiveness.

1. Introduction

Panhandlers are "street people" who solicit donations from passersby in public places.² They are common in US cities; many urban travelers encounter panhandlers almost daily. And they are common in US cities' policy: an estimated 75 percent of American municipal

² "Street people" are the "disheveled, [and] apparently destitute" individuals who work and/or inhabit the streets in urban areas during the day (O'Flaherty 1996: 7).

codes ban or regulate panhandling (NLCHP 2017). In 2015, a US Supreme Court decision relating to religious speech unexpectedly prompted federal courts across the country to adjudicate municipal laws on panhandlers (NLCHP 2017: 25), generating much controversy and catapulting the social and policy significance of panhandling in the United States.³

This paper studies American panhandlers and public policy that addresses them. It surveys the literature to establish what we know about panhandlers, what we don't know about them, what we think we know about panhandlers and analyzes how this stock of "knowledge" affects law directed at panhandling.

Our analysis has four findings: (1) We know about panhandlers' demographics, housing, and sources of income: panhandlers are typically homeless, but they are not the "typical homeless." (2) We know little about panhandlers' behavior: determinants of the decision to panhandle and of panhandling activities have not been studied. (3) We think we know that many panhandlers abuse substances and are mentally ill: these phenomena are relatively prevalent among the homeless and appear to be still more prevalent among the homeless who panhandle. (4) This stock of "knowledge" about panhandlers leads easily but incorrectly to the supposition that panhandler behavior is "irrational." Public policy reflects this supposition: it ignores how interventions affect panhandler incentives, undermining its effectiveness.

³ See, *Reed v. Town of Gilbert*, 135 S.Ct. 2218, 576 U.S. ____ (2015).

2. What We Know About Panhandlers

What we know about American panhandlers is based on a variety of studies—from ethnographic accounts to large-N surveys—covering different years and US cities. Some of these studies are focused on panhandlers, but many are concerned with homeless or street people more generally, picking up some panhandlers incidentally. Declaring that we “know” the items reviewed here is thus somewhat optimistic. Still, the level of investigation into and amount information collected on them is substantial, distinguishing the contents of this section from that which we “don’t know” about panhandlers, reviewed in Section 3, and that which we “think we know” about panhandlers, reviewed in Section 4.

2.1 Panhandling Defined

We begin with what we surely know: what panhandling is. Lankenau (1999b: 292), for example, “define[s] *panhandler* as a person who publicly and regularly requests money or goods for personal use in a face-to-face manner from unfamiliar others without offering a readily identifiable or valued consumer product or service in exchange for items received” (see also, Snow and Anderson 1993; Lankenau 1999a; Lee and Farrell 2003). This definition is useful for most purposes, but two aspects merit clarification.

First, while “exchange” implies a voluntary transaction, not every person who interacts with a panhandler, let alone contributes to one, does so voluntarily. Some give out of fear or are guilted or shamed into doing so. Such transactions are closer to “extortion” than to being purely voluntary, which is not essential to panhandling. Second, while a person who contributes to a panhandler does not receive a “valued consumer product or

service,” this does not mean she receives nothing. Whether the transaction is purely voluntary or not, the contributor receives something—if only the knowledge that she contributed—or else she would not contribute. That something may have substantial value to the contributor—emotional, psychological, or other—despite having no market value.

2.2 Demographics and Housing

Research that addresses panhandling commonly reports on panhandler demographics. It finds that most panhandlers are male. For example, in Lee and Farrell’s (2003: 310) sample of 372 panhandlers gleaned from the *National Survey of Homeless Assistance Providers and Clients (NSHAPC)*, 81.6 percent are male. Sixty-four percent are male in Ferguson et al.’s (2015: 51) sample of 300 panhandlers identified from interviews with homeless youth in Austin, Denver, and Los Angeles (see also, Taylor 1999: 132, 141; see also, Tillotson and Lein 2017: 87). Nearly 92 percent are male in Lankenau’s (1999a: 189, 1999b: 316) smaller sample of 37 panhandlers interviewed in Washington, DC. And in a sample of 108 homeless adolescents who Whitbeck et al. (1997: 383) interview in Missouri, Iowa, Nebraska, and Kansas, males are more than twice as likely as females to report panhandling for food and nearly 1.5 times more likely to report panhandling for money (see also, Whitbeck and Simons 1993: 145).

Most panhandlers are also African-American and young-to-middle-aged. Only 10 percent of the Austin panhandlers surveyed by Tillotson and Lein (2017: 87) are African-American, and 82 percent are between the ages of 45 and 63. Such findings, however, are unusual. Lankenau (1999a: 189), for example, describes “the profile of a typical panhandler in [his] sample...as...a Black...man in his early 40s.” Duneier’s (1999: 44) ethnographic

study of street people in New York City finds panhandlers who are exclusively African-Americans males between their mid-thirties and late-fifties. More than 90 percent of the 71 panhandlers who Garibaldi et al. (2005: 728) identify in their sample of the Pittsburgh homeless are under age 50. And the average age of the panhandlers in Lee and Farrell's (2003: 310) national sample is 38.4, approximately 60 percent of whom are minorities.

Research that addresses panhandling also commonly reports on panhandlers' housing status. It finds that most, but not all, panhandlers are homeless. Eight of the dozen panhandlers in New Haven, CT who Goldstein (1993: 308) interviews enjoy conventional dwellings—six of them living “in apartments paid for entirely by Connecticut's General Assistance program”; the other two, with family members. However, studies based on larger samples find that the majority of panhandlers lack regular, stable housing. Eighty-one percent of the 74 Manhattan panhandlers surveyed by O'Flaherty (1996: 94), for example, report having been homeless the night before. Remarkably, only three percent report having slept in a shelter the night before, despite it being March; the rest slept on trains, in stations, on park benches, or in abandoned buildings. These results comport with Kennedy and Fitzpatrick's (2001: 2006) observation that homeless panhandlers tend to “sleep rough”—outdoors rather than in a shelter. They are corroborated in Lee and Farrell's (2003: 310) data, according to which 71.1 percent of panhandlers slept outdoors in the past week—for example, in an abandoned building, a park, or a transportation site. In contrast, just a quarter of other homeless people in those data slept outdoors in the past week (Lee and Farrell 2003). Lei's (2013: 260) analysis of the *NSHAPC* data finds that 89.8 percent of her 305 panhandlers are currently homeless, 10.2 percent are formerly homeless.

Compared to other homeless people, panhandlers have also been living longer on the streets. Lee and Farrell (2003: 311), for example, find that “panhandlers tend to have been homeless more often and for longer periods of time than those not engaging in” panhandling. Similarly, Snow and Anderson’s (1993: 159) study of 168 homeless people in Austin concludes that “the more time homeless people spent on the street...the greater the probability that they engaged in various forms of shadow work,” such as panhandling.

These differences between panhandlers and the homeless population in general are unsurprising, since panhandlers comprise a distinct, modest-sized subgroup within that population. Estimates of panhandler prevalence among the homeless derived from national samples range from 7.8 percent (Lei 2013: 260) to “less than 20 percent” (Burt and Cohen 1990: 24; see also, Zlotnick and Robertson 1996: 149; Lee and Farrell 2003: 310; Lee and Schreck 2005: 1064). Estimates tend to be higher in particular cities, ranging from 20.6 percent in Chicago (Rossi 1988: 97) to 23.1 percent in Los Angeles (Conroy 2001: 302; Schoeni and Koegel 1998: 299); 13.4 percent in Pittsburgh (Garibaldi et al. 2005: 728); 22.8 percent in Detroit; 30.4 percent in Philadelphia; and 24.5 percent in Tucson (Snow et al. 1996: 90). Approximately a third of the homeless people that Simons et al. (1989: 491) interview in Iowa “panhandled, obtained food from dumpsters, or shoplifted,” but this category includes some homeless people who do not panhandle. A higher estimate is also found in Ferguson et al.’s (2015: 51) study of homeless youth in Los Angeles, Austin, and Denver, just under half of whom panhandle (see also, Ferguson et al. 2012: 394). However, this unusually high estimate likely reflects Ferguson et al.’s (2015) exclusive consideration

of homeless people between the ages of 18 and 24, who it seems are especially likely to panhandle (see, for instance, Lei 2013: 265).

Thus, while as Stark (1992: 342) observes, research suggests that “the modern street beggar is generally representative in age and ethnicity of the general homeless population,” it also suggests that he is generally not representative of that population in reliance on shelters, street-living duration or, as we survey below, important ways connected to his economic activity.

2.3 Panhandling Revenue and Panhandler Sources of Income

Research that addresses panhandling furnishes a sense of panhandling revenue and identifies panhandlers’ sources of income. Unlike panhandler race or gender, panhandling revenue is difficult to measure. Unless panhandling collections are observed—and they almost never are—researchers must rely on figures that panhandlers report. Even if panhandlers have perfect recall, they generally have no incentive to report accurately. Moreover, since earnings are typically reported by the “day,” “week,” or “month” rather than hourly, comparing them is problematic. The figures presented below should be considered with this in mind. Still, on their basis, we know that panhandling revenue is low, generally yielding earnings that are below the poverty line (Adriaenssens and Hendrickx 2011: 34).

Starting at the lowest end: Rossi (1991: 112) estimates monthly panhandling income in his sample of Chicago homeless people to be \$6.92. Likewise, the median panhandler in Zlotnick and Robertson’s (1996: 150) nationally based sample earned just \$10 from panhandling in the previous 30 days. These figures, however, almost surely

reflect the fact that the individuals sampled spent very little time panhandling. Higher, but still very modest, figures are reported by panhandlers who likely devote more time to panhandling.

A Phoenix panhandler who Stark (1992: 346) interviews, for example, reports that a “lucky” day would be one on which he earned \$2 in panhandling revenue. A panhandler that Lankenau (1999b: 311) interviews in Washington DC reports earning between \$6 and \$10 a day, depending on whether or not he encounters his “regular” donors. In a sample of Los Angeles homeless people containing more than 300 panhandlers interviewed by Schoeni and Koegel (1998: 299), mean panhandling revenue earned in the past 30 days is \$86. And Lee and Farrell (2003: 311) find that a “panhandler’s monthly income from all sources averages \$220”; however, the share of this figure attributable to panhandling revenue is uncertain.

The Los Angeles “Bridge People” who Underwood (1993: 125, 146, 147, 191) interviews report earning on various occasions: \$7 jointly between two of them; \$2 or \$3 in two hours; \$15 in two and a half hours; and \$4.50 in two and a half hours. These figures suggest that panhandling revenue varies considerably for the same panhandlers, hour-to-hour and day-to-day. This is corroborated in O’Flaherty’s (1996: 86) Manhattan sample, which finds still larger variance in daily panhandling revenue: there, the median panhandler reports earning \$32.50 on his best day in the previous week and earning \$2.50 on his worst day.

It is possible to find higher estimates of panhandling revenue in the literature. Some of Goldstein’s (1993: 314-315) panhandlers in New Haven, for instance, report making

between \$20 and \$50 per five-hour day—the highest earner claiming to earn more than \$300 a week; the lowest two earners, less than \$50 a week.⁴ In a rare study that observes panhandling collections, Whyte (1988) finds that blind panhandlers in New York City earn approximately \$18 an hour, or \$100-150 per day. This may be the source of Ellickson's (1996: 1179) suggestion that “an ordinary beggar...takes in more in the range of two dollars to ten dollars per hour” and that “the most skillful panhandlers...can garner as much as twenty dollars per hour.” However, the figures reported above indicate that panhandling revenues are decidedly lower.

Those revenues, though, are not panhandlers' only source of income. Other sources of income include earnings from alternative kinds of “shadow work”—economic activities that, like panhandling, are not traditionally seen as “work”—such as scavenging, selling blood plasma, and theft (Snow et al. 1996: 92). Research finds that panhandlers are more likely to engage in such work than the homeless in general. In Lee and Farrell's (2003: 310) sample, for example, 33.7 percent of panhandlers received income from shadow work in the previous month, compared to just 10.1 percent of the non-panhandling homeless. Further, panhandlers are less likely to engage in traditional work than the homeless in general. In a study of young homeless people in Los Angeles, Austin, Denver, New Orleans, and St. Louis, for instance, Ferguson et al. (2012: 393-394) find that “those who reported earning an income from panhandling were over 2 times more likely to be unemployed” (see also, Lee and Farrell 2003: 311).

⁴ Goldstein's (1993: 317) panhandlers solicited five hours a day, four days a week on average.

Gifts from family and friends provide another source of income for some. Among street people on LA's Skid Row, for example, traditional work and gifts from family or friends are the most common sources of income, followed by panhandling (Schoeni and Koegel 1998: 299). Rossi (1991: 112) finds that panhandling revenue is the second-most common source of income for the homeless in Chicago but that it contributes the second-least to their total income. In contrast, Lankenau's (1999b: 315) panhandlers in Washington, DC report that panhandling is their primary source of income—a difference likely attributable to the fact that the former two studies consider homeless or street people in general, most of whom, recall, do not panhandle, while Lankenau's study considers only those who do.

Government assistance offers yet another potential source of income for panhandlers. Few, however, seem to take advantage of it. Lee and Farrell (2003: 310) find that just 26.7 of panhandlers received government benefits in the past month, compared to 48.7 percent of the non-panhandling homeless. This difference may be related to panhandlers' lesser reliance on shelters and suggests another way in which they differ from the homeless in general.

3. What We Don't Know About Panhandlers

Panhandlers are defined by their behavior: panhandling. Knowledge about that behavior—why some street people panhandle but others don't and what factors influence the solicitation choices of those who do—is thus central to knowledge about panhandlers and, as Section 5 considers, more effective panhandling policy. Yet, with few exceptions, existing work has not investigated these questions. Below, we survey this lacuna and

develop some hypotheses whose empirical examination might help to illuminate the determinants of panhandler behavior.

3.1 Determinants of the Decision to Panhandle

The decision to panhandle is puzzling. On nearly every dimension, it is terrible work. Panhandling is widely considered degrading; it is, after all, literally begging. Panhandling can lead to extreme social stigma (Fabrega 1971: 284-285; Lankenau 1999a, 1999b). And according to the National Opinion Center's *General Social Survey*, panhandling has the lowest prestige score of all work—substantially lower than that of even drug-dealing and prostitution (Smith 2005: 554).

Panhandling is also dangerous work. The street community can be cooperative, but it can also be predatory (see, for instance, Cavender et al. 1993: 58). Forty-five percent of the non-panhandling homeless in Lee and Farrell's (2003: 310) sample report being "victimized while homeless" (see also, Simons et al. 1989: 492; Padgett and Struening 1992: 528; Fitzpatrick et al. 1993: 360). And "homeless people who engage in begging or panhandling are at a" still "greater risk of victimization" (Lee and Schreck 2005: 1070; see also, Whitbeck and Simons 1993: 146)—in Lee and Farrell's (2003: 310) data, almost twenty percentage points greater. Panhandling work conditions can be grueling, subject to intense heat or cold. They can also be risky, subject to police harassment or even arrest (see, for instance, Amster 2003; Lankenau's 1999b).

Unlike many other kinds of dangerous or risky work, panhandling, as reviewed above, does not pay well. Indeed, panhandlers' income is "well below" that of even the homeless in general (Lee and Farrell 2003: 311). It's not all bad, of course: a panhandler

can control his own schedule; he has no boss to satisfy; and he may take leisure when and in whatever quantities suit him. Still, no one dreams of one day becoming a panhandler. While some street people may not mind panhandling—the comparatively high-earning panhandlers who Goldstein (1993: 303) interviews, for instance, claim to be uninterested in minimum-wage work—it's doubtful that this is true in general.

Why, then, do some 20 percent of street people panhandle instead of regularly engaging in traditional work? Stated differently, what are the determinants of a street person's decision to panhandle? On this important question, existing research is silent. A few facts contained in that literature, however, offer clues from which hypotheses may be developed—and ultimately, we hope, tested.

One such fact is highlighted by the experiences of a panhandler named Stu, interviewed by Lankenau (1999b: 308): some street people do not have easy, regular access to facilities necessary to maintain basic hygiene, such as a place to clean oneself and one's clothes. Most traditional employments, however, require a clean person and wardrobe. The cost of satisfying such requirements for street people like Stu is therefore high and, if high enough, may exceed the benefit of regularly engaging in traditional work, leading them to engage in economic activities that do not impose those requirements—shadow work, such as panhandling.

A second useful fact contained in existing research is Calsyn and Morse's (1991: 162) finding that amount of education and current employment is “inversely related to the length of time since first homeless” (see also, Calsyn and Roades 1994: 276). Panhandlers, recall, tend to have been homeless longer (and more often) than the homeless in general,

and more than a third of the panhandlers in Lee and Farrell's (2003: 310) sample did not graduate high school (see also, Tillotson and Lein 2017: 90). This may affect the decision to panhandle, since education critically affects one's human capital—her stock of knowledge and skills—which in turn affects one's relative returns from alternative forms of work. Given their unusually low levels of formal education, one possibility is thus that panhandlers have unusually low human capital relevant for traditional employment, making low human-capital intensive economic activity, such as panhandling or other kinds of shadow work, their comparative advantage.

Substance abuse and mental illness, which we consider in Section 4, as well as physical disability, may also negatively affect some street persons' human capital, making them more likely to panhandle. As one panhandler queried rhetorically, "who's going to hire a thirty-two-year-old alcoholic?" (Stark 1992: 350). In the words of a Los Angeles "bridge person": "I'm not economically stable and so I HAVE TO DO SOMETHING! If I want to have a hamburger on the table tonight" (Underwood 1993: 54).

But of course, that something needn't be panhandling, which is only one of several shadow-work activities, none of which are human-capital intensive. What, then, determines whether a street person panhandles or engages in one of these other shadow-work activities instead? On this question, too, existing research is silent. However, it again contains the germ of a testable hypothesis, which may help to answer it.

According to Snow et al. (1996: 92), when in search of cash, street people's first choice is selling blood plasma, followed second by panhandling. For the typical street person, plasma selling almost surely yields more revenue per unit of time than panhandling.

Plasma, however, can be sold only periodically. Thus, it seems likely that when both options are available, street people sell plasma; when plasma selling isn't possible, they panhandle.

Or consider Schoeni and Koegel's (1998: 299) finding from above, according to which money from family and friends contributes more to street people's income than panhandling. This may reflect the fact that larger sums can be procured by approaching family and friends than by soliciting strangers. But it may also reflect the fact that seeking money from family and friends is preferred to panhandling—and even to selling plasma—since the former probably yields still higher revenue per unit of time. Most family and friends, unfortunately, are not bottomless wells. Thus, similar to the constraints a street person faces in continuously selling plasma, he may also be constrained in his ability to continuously draw from family and friends. When he can draw from them, he does so; when he cannot, he turns to his next-best option, which at some point may be panhandling. In short, just as the decision to engage in panhandling instead of traditional work is determined (partly) by these activities' relative returns, the decision to engage in panhandling instead other kinds of shadow work is determined (partly) by the relative returns of shadow-work alternatives.

Another fact from existing research that is useful for hypothesizing determinants of a street person's decision to panhandle is that panhandling, as discussed above, is particularly dangerous work (Lee and Schreck 2005: 1070; Whitbeck and Simons 1993: 146; Lee and Farrell 2003: 310). Such danger may depend (partly) on gender, since females tend to be more frequent targets of harassment than males and may present more attractive

targets of theft or assault. If so, it is relatively more costly for females to panhandle, which may contribute to the predominance of male panhandlers. Further, Passaro (1996: 2-3, 85-89) contends that it is more socially acceptable for women to rely on institutionalized assistance than men. If this is correct, homeless females have a larger income-source opportunity set than homeless males, also resulting in fewer females choosing to panhandle.

The foregoing hypotheses about panhandler behavior share an approach to panhandling decisions that treats them as responsive to (economic) incentives—what might be called “purposeful panhandling.” Panhandling is an undesirable work choice. But given the costs of maintaining a regular job, human capital limitations, a limited ability to continuously exploit more preferred shadow-work options, or the constraints of one’s gender, panhandling may nevertheless be the least undesirable choice available to the street people who choose to engage in it. “Panhandling,” in other words, “is an economic and rational decision” (Taylor 1999: 161-62). We build on this idea below—one that, as we explore later, is absent from policy that addresses panhandling.

3.2 Determinants of Panhandling Activities

While, at root, panhandling is “simply begging,” this belies the more nuanced, and more important, specific activities that panhandling behavior consists of. As anyone who frequently encounters panhandlers is aware, there is not one mode of panhandling, but many. Some panhandlers solicit passersby passively—standing, sitting, or even laying on the ground in public view awaiting donations. Other panhandlers solicit more actively, with cardboard signs or by addressing passersby vocally. Still other panhandlers solicit with

great activeness: performing for passersby, giving away token items in hopes of a contribution, or following passersby as they move down the street.

Moreover, each of these panhandling activities (and there are surely others) exhibits its own “micro-varieties.” For example, vocal solicitations are sometimes made aggressively, other times as impassioned pleas for help, and still other times with humor (“Need money for beer”). Sign-made solicitations can be word-based, picture-based, require passersby to come close to see or be legible from far away. A sign-using panhandler that one of us encountered in New York City had a “rolodex” of perhaps 20 different signs through which he flipped periodically. Performance types (song, instrumental, comedy, dance) and “gifts” (tissues, newspapers) given by panhandlers vary. Micro-varieties are apparent even among panhandlers who “merely” sit or lay silently on the ground but nevertheless exhibit a range of countenances, from helpless to menacing.

What determines which of the many panhandling solicitation activities available to him that a panhandler chooses to employ? These activities are at the heart of panhandling. And while some research has taken notice of the tremendous creativity and entrepreneurship they display (see, for instance, Fabrega 1971: 282-283; Stark 1992: 342; Swanson 2007: 711-712; Lankenau 1999a, 1999b), no research has investigated the factors that drive their variation. In this arena of panhandler behavior, we know nothing.

In other important arenas of panhandler behavior we know scarcely more. For example, what determines where panhandlers choose to solicit? In major cities, panhandlers are found in many public spaces, but their distribution across those spaces varies widely. A study of Manhattan panhandlers by Dordick et al. (2017) provides an

important glimpse into panhandler locational choice. While this study's "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), it also finds that more panhandlers locate at block-fronts rated as more attractive by an experienced busker than at block-fronts rated as less attractive—a finding consistent with "purposeful panhandling."

Other research contains tantalizing facts from which we may hypothesize more particular determinants of panhandler locational choice. Foremost among them: differences in passersby's responsiveness to panhandler solicitation. Most passersby see panhandlers as a "minor annoyance" (Skogan 1990: 21) and attach to them "negative stereotypes...such as being dangerous, dirty, diseased, and mentally ill" (Lankenau 1999a: 185; see also, Liebow 1993; Wagner 1993: 3). Avoidance of panhandlers is therefore common. Some passersby, however, are openly hostile to panhandlers. Lankenau (1999b: 301-305), for example, documents verbal and physical harassment of panhandlers in Washington, DC. Other passersby, in contrast, are highly receptive to panhandler solicitation, even becoming "regular" donors to certain panhandlers they encounter frequently. Goldstein (1993: 324), for instance, documents panhandler "patrons" who give "significant amounts of money" and are "far more likely than other passersby to offer...clothing or food." Such differences in passerby responsiveness to panhandling may vary spatially, which may in turn (partly) determine panhandlers' decisions about where to solicit. Public spaces frequented by work commuters, for example, may facilitate exposure to "regulars," leading those spaces to offer higher panhandling revenues and to attract more panhandlers, while spaces

frequented by passersby on out-of-town business—most of whom will never return to those spaces again—may offer lower potential revenues and thus attract fewer panhandlers.

Race might also play a role in passerby responsiveness to panhandling and thus influence panhandler locational choice. Lankenau's (1999b) panhandlers, for instance, report receiving larger contributions from passersby whose race differs from their own. As one African-American panhandler relates, "my own race...they don't give me nutin" (Lankenau 1999b: 300). Conversely, according to a Caucasian panhandler, "Minorities give more money—to me they do" (Lankenau 1999b: 300). Passerby race may vary spatially, leading passerby responsiveness to do so as well—public spaces typically traveled by white passersby possibly offering more promising returns to black panhandlers, and vice versa.

The results of Goldberg's (1995: 84-85) study of panhandler-passerby interactions in Boston imply that even gender and relationship status could affect passerby responsiveness to panhandling. His study finds that single, male passersby give more often to female panhandlers and that male passersby accompanied by women give less often to female panhandlers. If these passerby demographics vary spatially, they, too, could influence panhandlers' locational distribution. This same is true of differences in passerby religiosity; though, a survey conducted Dhanani and Donley (2011: 58) doesn't find a clear relationship between religiosity and willingness to give to the homeless.

Spatial heterogeneity in passerby responsiveness is not the only class of potential determinants of panhandler locational choice. As others have suggested, differences in the number of passersby across locations may be important, and differences in the number of

other panhandlers at those locations could be too. Police presence may vary spatially; so may the availability of alcohol or drugs, which Stark (1992: 343) suggests influences where panhandlers choose to solicit.

A final important arena of panhandler behavior about which we know little is panhandler “pricing.” One thing we do know is that panhandlers can and do rely on different pricing schemes. Stark (1992: 344-346) identifies two: “frame” pricing, where a panhandler requests money for a specific, ostensible purpose, such as gas, bus fare or food, and “pique” pricing (Santos et al. 1994: 756), where a panhandler requests a specific, atypical sum, such as 17 cents instead of a quarter. A third panhandler pricing scheme—perhaps the most common—is “pay-what-you-want” pricing, where a panhandler invites passersby to give whatever they’d like, either explicitly, “Can you spare some change?” or implicitly, such as when a panhandler shakes a cup and says nothing at all. What are the determinants of how panhandlers choose to price their solicitations? This question, too, awaits study.

4. What We Think We Know About Panhandlers

Between what we know about panhandlers, surveyed in Section 2, and what we don’t know about panhandlers, surveyed above, lies a third category of panhandler “knowledge,” considered here: what we think we know about panhandlers. What we think we know about panhandlers is that many of them are substance abusers and mentally ill. As we review below, there is evidence to support this thinking. However, compared to the evidence that informs what we know about panhandlers, this evidence is almost entirely indirect; indeed, it is not based on research concerned with panhandlers at all.

4.1 Substance Abuse

Studies of panhandlers often contain individuals who use alcohol or drugs. Yet almost no work estimates substance-abuse prevalence among panhandlers. In contrast, a large body of work estimates substance-abuse prevalence among the homeless in general. Substance-abuse prevalence is deceptively difficult to explore. What “substances” should we count? Is it reasonable to lump intravenous drug use in with marijuana? What about alcohol? Nicotine? More troubling still, what do we mean by substance “abuse” or substance “disorder”? Is daily consumption enough, or does one have to experience withdrawal pangs from non-use? Is it sufficient if an interviewer sees abuse, or does a user have to consider his use problematic? Is having ever abused substances what we care about, or only in the last year? Or only in the last month?

These and myriad other questions—none of which have “correct” answers—must be answered by researchers who seek to estimate substance-abuse prevalence. Unsurprisingly, different researchers who have examined substance-abuse prevalence among the homeless have seen fit to answer them in different ways. The result is a diverse range of findings—many of which cannot be sensibly compared.

To wit: Fischer et al. (1986: 519, 522) consider 51 “homeless persons drawn as a probability sample for the National Institute of Mental Health (NIMH) Epidemiologic Catchment Area (ECA) program conducted in Eastern Baltimore.” They find that 70.6 percent experience substance “abuse/dependence” in their lifetimes (see also, Koegel et al. 1988: 1087); when only the previous six months are considered, this figure falls to approximately 32 percent; and when only the previous month is considered, it falls to less

than 20 percent. In contrast, Roth and Bean (1986: 718), who conduct interviews with 979 homeless people in 19 Ohio counties, find that 32.2 percent currently use drugs or medication, but only a 4.8 percent report that their use is problematic; 64.2 currently use alcohol, but only 26.6 percent have sought treatment for alcohol use. What should one conclude from these figures about the rate of substance abuse in the homeless population? Depending upon how she thinks about substance abuse, anything from “most homeless people are substance abusers” to “most of them are not.”

More recent studies of substance-abuse prevalence among the homeless tend to be more uniform in their methods. Still, variety continues to flourish, and ambiguity about how to interpret diverse findings remains. For example, Levitt et al.’s (2009: 980) study of 1,093 homeless people in New York City, Robertson et al.’s (1997: 223) interviews with 564 homeless people in Alameda County, CA, and Koegel et al.’s (1999: 313) sample of 1,524 homeless people in LA find that between approximately 65 and 70 percent of the homeless have abused substances in their lifetimes. In contrast, much lower prevalence is estimated in Lebrun-Harris et al.’s (2013: 1004) national sample of 618 homeless health-center patients, according to which 12.1 percent have a “high risk of alcohol dependence”; 15 percent, a “high risk of drug dependence”; 14.3 percent have ever injected a drug; 31.4 percent have been treated for alcohol or drug use in the past year; and 40.3 percent have engaged in binge drinking in the past year.

Baggett et al.’s (2010: 1328) study of 966 homeless people, drawn from 79 clinic sites that serve the homeless nationwide, also seems to suggest lower substance-abuse prevalence. In the past year, 25.1 percent used illicit drugs only; nine percent had “problem

alcohol use” only; and 30.7 percent used illicit drugs and had “problem alcohol use.” Then again, Kushel et al.’s (2003: 2494) study of 1,952 homeless people in San Francisco suggests that substance abuse is more prevalent: 24.2 percent report having problematic alcohol use in the past year, while 59.7 percent report having used illicit drugs during that period.

Amidst this sea of widely varying prevalence estimates, there is, however, something approaching a constant: substance abuse—it would seem no matter how that is defined—is more prevalent among the homeless than in the general population (see, for instance, Baumohl and Huebner 1991: 838; Fischer and Breakey 1991: 1118). To get a sense of this, consider that in the US as a whole, an estimated 5.5 percent of the population suffered from a “drug or alcohol disorder” in the past year—2.1 percent from an alcohol disorder and 3.3 percent from a drug disorder (Ritchie and Roser 2018a). Precisely how much more prevalent substance may be among the homeless, however, it is much harder to say. We may perhaps say “a lot,” but this does not tell us, for instance, whether most of the homeless are substance abusers or most of them are not.

And what about panhandlers? It’s tempting to reason that since the typical panhandler is homeless, whatever the (relatively high) rate of substance abuse among the homeless may be, it applies also to panhandlers. This reasoning is potentially dangerous, however, since, as Section 2 reviewed, while we know that panhandlers are typically homeless, we also know that in several important respects they are not the “typical homeless.” Thus, evidence from studies of the homeless in general furnish, at best, indirect evidence for panhandlers.

We can, however, do slightly better, for two studies examine substance-abuse prevalence among the homeless that consider panhandlers and non-panhandlers separately. Zlotnick and Robertson (1996) survey a nationwide probability sample of 564 homeless adults, 82 of whom panhandle. On the basis of respondents' replies to Diagnostic Interview Schedule questions about their substance use and mental health in the past 12 months, Zlotnick and Robertson (1996: 148) assign them to "four mutually exclusive current diagnostic groups: major mental disorders only (schizophrenia or major affective disorders), substance use disorders only (alcohol or other drug use disorders), dual disorders (both major mental and substance use disorders) and no current disorder." In this sample, 37.8 percent of panhandlers have substance disorders only, compared to 34.9 percent of the non-panhandling homeless, and 17.1 percent of panhandlers have both substance and mental disorders, compared to 8.5 percent of the non-panhandling homeless (we consider the results for mental illness by itself below).

Lee and Farrell's (2003: 307, 310) study of the *National Survey of Homeless Assistance Providers and Clients*, which contains 2,876 homeless people, 372 of whom panhandle, also presents data on the prevalence of substance abuse in these populations separately. They record the percentage of each group that had "alcohol problems" in the past month, based on "indicators [that] include frequency and volume of consumption, amount spent on alcohol, adverse effects (craving, seizures, etc.), and importance and recency of treatment," and the percentage of each group that had "drug problems" in the past month, based on similar indicators (Lee and Farrell 2003: 310). Lee and Farrell find that 61 percent of panhandlers experienced alcohol problems, compared to 34 percent of

the non-panhandling homeless, and 37.8 percent of panhandlers experienced drug problems, compared to 24.3 percent of the non-panhandling homeless.

Comparing these results to Zlotnick and Robertson's (1996) is problematic, since (typical of the literature that considers substance abuse among the homeless) the studies measure substance abuse in different ways; not even the timeframes considered are comparable (the past 12 months vs. the past 30 days). In qualitative terms, however, they paint a similar picture: substance abuse is more prevalent among panhandlers than among the homeless in general (the latter being more prevalent than in the general population). Although this evidence is direct, it is based on only two studies and, moreover, carries all the interpretive difficulties inherent in attempting to measure substance-abuse prevalence among the homeless in general. Thus, it seems reasonable to conclude only that we "think we know" that substance abuse is especially prevalent among panhandlers.

4.2 Mental Illness

Our "knowledge" about mental-illness prevalence among panhandlers is analogous to our "knowledge" about substance-abuse prevalence among them. Save two studies, what evidence we have is indirect, coming from research on mental illness among the homeless in general. Studies are methodologically inconsistent, yielding widely varying estimates that are often incomparable. What should "count" as mental illness is a matter of opinion, there being no single or "correct" answer. And, all this considered, mental-illness prevalence among panhandlers is, we think, higher than among the homeless in general, which, we are confident, is in turn higher than in the general population.

Fazel et al.'s (2008: 1675) meta-analysis of 10 studies that consider mental illness among the American homeless yields prevalence estimates for "psychosis" in the past six months, ranging from three percent to 30. In Koegel et al.'s (1999: 311) sample of homeless people, five percent suffered from schizophrenia in the past six months, 16 percent from major depression, and four percent from mania (seven percent, 22 percent, and six percent in their lifetimes, respectively). In Haugland et al.'s (1997: 507) interviews with 201 homeless people in Westchester County, NY, 21.4 percent are mentally ill. Nearly half the sample in Baggett et al.'s (2010: 1328) study have been treated for mental illness. And in Edens et al.'s (2011: 386) national sample of 714 homeless people, 76.2 percent report having mental health problems.

Kushel et al. (2003: 2494) find that 22.4 percent of homeless people in their sample have a history of psychiatric hospitalization. Levitt et al. (2009: 980) find that a third of their sample has a history of hospitalization or treatment for mental illness. Roth and Bean (1986: 715) also find that about a third of their sample has such a history.

Lehman and Cordray's (1993: 370) meta-analysis of 24 studies of mental illness among the homeless reports a weighted average prevalence of "any mental health problem" of 47 percent. In a study of 90 homeless people admitted to the psychiatric emergency service at Bellevue Hospital in New York City, Lipton et al. (1983: 819) find that 96.7 percent have been psychiatrically hospitalized previously. And in a study of 911 homeless people in Austin, Snow et al. (1986: 413) estimate that at most 16 percent are mentally ill. Wright (1988: 188) argues that this estimate misses individuals due to "under-diagnosis" at first contact and thus is too low. The opposite possibility—that estimates of mental-

illness prevalence among the homeless might be too high because of overly inclusive definitions—does not occur to him.

As this sampling of the literature suggests, depending on what one counts as “mental illness,” research has narrowed down the rate of such illness in the homeless population to something between three and 97 percent. Still, as with substance abuse, there is consensus on at least one thing: mental health problems are more prevalent among the homeless than in the general population. According to Ritchie and Roser (2018b), in the US, approximately six percent suffer anxiety disorders, 5.2 percent from depression, 0.8 percent from bipolar disorder, and 0.3 percent from schizophrenia. Regardless of how one defines “mental illness,” it seems that such illness affects the homeless at a higher rate.

The same two studies that separately consider substance-abuse prevalence among the panhandling and non-panhandling homeless also consider mental-illness prevalence in these two groups, again providing precious, albeit limited, insight into how it may differ between them. Zlotnick and Robertson (1996: 150) find that 37.8 percent of panhandlers have no current substance or mental disorder, compared to 48.8 percent of the non-panhandling homeless; 7.3 percent of panhandlers have mental disorders only, compared to 7.9 percent of the non-panhandling homeless; and 17.1 percent of panhandlers have both disorders, compared to 8.5 percent of the non-panhandling homeless. Thus, approximately 62 percent of panhandlers and 51 percent of the non-panhandling homeless have a substance or mental health disorder. To (perhaps) put these figures in better context, according to Ritchie and Roser (2018b), approximately 22 percent of the US population in general has a substance or mental health disorder.

Lee and Farrell (2003: 310) find that 50.2 percent of panhandlers experienced mental health problems in the past month, compared to 37.2 percent of the non-panhandling homeless, where “mental health problems” are based on “indicators [that] include types of symptoms (depression, anxiety, hallucinations, suicidal thoughts, etc.) and types and recency of treatment.” Comparing these results to Zlotnick and Robertson’s (1996) is again problematic but, qualitatively, they suggest the same ordering: mental illness is more prevalent among panhandlers than among the homeless in general, which in turn is more prevalent than in the general population. Bearing in mind that, as for substance abuse, the direct evidence we have regarding mental-illness prevalence among panhandlers is limited to two studies—the remaining evidence being based on results for the homeless in general—it therefore seems reasonable to “think we know” that mental illness is especially prevalent among panhandlers.

4.3 Irrationality

The three categories of panhandler “knowledge” reviewed above do not exist in isolation from one another; they interact. For instance, as just seen, the fact that we know most panhandlers are homeless forms much of the basis for thinking that we know panhandlers are likely to be substance abusers and mentally ill, since research suggests that the homeless in general are relatively likely to be substance abusers and mentally ill.

There is, however, another interaction—one more significant for policymaking: the tendency, given what we do not know about panhandlers, to use that which we think we know about panhandlers to suppose the nature of panhandler behavior. Specifically, in the absence of research on the determinants of panhandler behavior that could counsel

otherwise, it is natural to infer from the “fact” that panhandlers are substance abusers and mentally ill to the supposition that panhandlers behave irrationally—i.e., that their behavior unresponsive, or not predictably responsive, to incentives.

According to Conroy (2001: 300), for instance, “the whole subject of rationality is difficult with homeless populations,” such as panhandlers, “because such a high proportion of the sample are substance abusers and/or mentally ill.” Goldstein (1993: 313) warns against “the assumption that the panhandlers” are “rational...individuals, seeking to maximize either their income, or some broader utility function.” And Lee and Farrell (2003: 300) reason that because “some panhandlers exhibit diminished capacity due to alcohol, drugs, or mental illness,” this “call[s] into question the predictability of their actions.” Given such views of panhandler (ir)rationality, it’s not surprising that the determinants of panhandler behavior have not been studied. After all, if panhandlers behave unpredictably, what could researchers expect to find from painstaking data collection on and analysis of their behavior? Statistical noise.

While inference from panhandler substance abuse/mental illness to irrational panhandler behavior is natural, it is also invalid. Not because we are uncertain about just how prevalent substance abuse and mental illness are among panhandlers, though that is also true. Rather, it is invalid because minds diminished by substance abuse and psychological disorders do not imply irrational behavior. Stated differently, even if we were certain that all panhandlers were addicted to substances and mentally ill, it would not follow that their behavior does not respond predictably to incentives.

Responding (predictably) to incentives entails only doing less (more) of something when its relative cost rises (falls) and doing more (less) when its relative benefit rises (falls). This requires neither mental health nor a clear state of mind. Indeed, it does not even require a human mind: the behavior of insects and animals has been shown to respond predictably to incentives (see, for instance, Tullock 1971, 1994; Roth 1986; Kagel 1987). Still more important for our purpose, policy is concerned with *aggregate* behavior—responses of the group, not responses of its individual members. And even when individual responses are “irrational,” aggregate responses tend to exhibit “rationality”—they comport predictably with changes in incentives—as they forced to do by changes in relative constraints (Alchian 1950; Becker 1962, 1976; McKenzie 2009). Thus, supposing, or even knowing, that panhandlers are mentally ill or are addicted to substances does not relieve policymakers of taking account of their incentives.

5. Panhandlers and Public Policy

5.1 Interventions

Public policy that address panhandling in the United States is overwhelmingly created and applied at the municipal level.⁵ It reflects two kinds of interventions: laws that ban panhandling and laws that regulate panhandling, directly or indirectly. As these interventions suggest, panhandling policy is concerned with the welfare of the non-panhandling public—minimizing the nuisance that panhandling presents passersby and businesses—rather than with the welfare of panhandlers.

⁵ Though, this has not always been so. Prior to the 1970s/80s, laws that address panhandling tended to be created and applied by state governments (Smith 2005).

According to a study by the National Law Center on Homelessness and Poverty (NLCHP) that examines the municipal codes of 187 US cities nationwide, an estimated 26.7 percent of US cities ban panhandling. Relative to less-comprehensive panhandling interventions, panhandling bans have proved more susceptible to legal challenge on constitutional grounds. Nevertheless they've grown rapidly in popularity; since 2006, the frequency of this intervention has increased 43 percent (NLCHP 2017: 25).

Substantially more cities regulate panhandling directly—limiting how panhandlers may solicit, most notably, proscribing solicitation activities associated with “aggressive panhandling” and/or limiting where panhandlers may solicit—however, the growth of such interventions has been much slower than the growth panhandling bans. For example, an estimated 61 percent of US cities regulate where panhandlers may solicit—a “mere” seven percent increase since 2006 (NLCHP 2017: 25). Smith (2005) explores the propensity of municipalities to adopt panhandling regulations (as of 1994) in a sample of 71 US cities and finds that more densely populated cities, those with higher crime rates, higher proportions of disabled citizens, and higher proportions of college-educated citizens are more likely to regulate begging; cities with higher welfare benefits are less likely to do so.

To get a sense of municipal interventions that regulate panhandling directly, consider the Code of the District of Columbia, which restricts both panhandling solicitation activities and locations. That code prohibits “aggressive” panhandling, defined as (Code of the District of Columbia, Chap. 23):

Approaching, speaking to, or following a person in a manner as would cause a reasonable person to fear bodily harm or the commission of a criminal act upon the person, or upon property in the person's immediate possession; Touching another person without that person's consent in the course of asking for alms; Continuously asking, begging, or soliciting alms from a person after the person has made a negative response; or Intentionally blocking or interfering with the safe or free passage of a person by any means, including unreasonably causing a person to take evasive action to avoid physical contact.

While not deemed "aggressive," the following solicitation activities are also proscribed:

solicit[ing] alms from any operator or occupant of a motor vehicle on a public street in exchange for blocking, occupying, or reserving a public parking space, or directing the operator or occupant to a public parking space; solicit[ing] alms in exchange for cleaning motor vehicle windows while the vehicle is in traffic on a public street; [and] solicit[ing] alms in exchange for protecting, watching, washing, cleaning, repairing, or painting a motor vehicle or bicycle while it is parked on a public street.

The same code bars panhandling at the following locations:

in any public transportation vehicle; or at any bus, train, or subway station or stop...within 10 feet of any automatic teller machine (ATM)...from any operator or occupant of a motor vehicle that is in traffic on a public street...[and] on private property or residential property, without permission from the owner or occupant.

Many cities' codes also contain interventions that regulate panhandlers or panhandling indirectly. For example, in 2016 an estimated 18 percent of US cities prohibit sleeping in public spaces; 33 percent prohibit camping in public spaces; 32 percent prohibit public loitering/loafing/vagrancy; and 47 percent prohibit sitting or lying in certain public places (NLCHP 2017: 71; see also, Mitchell 1998; Olson et al. 2015).

Penalties for violating municipal laws that prohibit or restrict panhandling include fines, community service, and imprisonment. While citations are easy enough to dispense—and in some cities, dispensed frequently—it is uncertain how often associated penalties are, or even in principle could be, enforced. But it cannot be often. Most panhandlers do not have the resources to pay fines, and it would not be profitable for city governments to expend resources attempting to collect them. More panhandlers would be capable of performing community service, but since panhandlers are often transient, it is also hard to see how this penalty could be enforced—and highly questionable that it would be worthwhile. Imprisonment is the most feasible penalty to enforce and, in extreme cases, may be used. In general, though, it is doubtful that many cities would be willing to, or do, incarcerate panhandlers for any length of time, relying on short-term detention instead.

Given the difficulties of enforcing legal penalties for infractions related to panhandling, what is the purpose of laws that ban or regulate it? To grant municipal officials legal authority to physically remove panhandlers from certain public spaces at their discretion or when a business or passerby complains (arresting and briefly detaining them if necessary). Current panhandling policy is, in effect, “weed-control” policy. It does not seek to account for and, as we describe below, does not account for, panhandler

incentives. Although, in practice, current policy deters some panhandling, it primarily serves as a legal framework for removing (at least temporarily) some or all panhandlers from an area, managing the nuisance they present in the manner that one would manage the nuisance presented by invasive plants.

But what if panhandlers are not like weeds?⁶ What if one does not suppose they lack rational agency? What if, as we have suggested, panhandlers respond (predictably) to incentives?

Below, we evaluate policy interventions that address panhandling from the perspective that they do. However, we appreciate that until the lines of research reviewed in Section 2 have been explored, and thus concrete evidence of determinants of panhandler behavior consistent with rationality are forthcoming, some readers will remain skeptical of the idea that panhandlers respond to incentives. The following analysis nevertheless offers them as much as it does readers who are inclined to agree with us that panhandlers respond to incentives. For the former, it identifies unconsidered, potential consequences of current panhandling policy—consequences worth pondering should it turn out that panhandlers respond to incentives. For the latter, it identifies unconsidered consequences of panhandling policy manifested currently.

5.2 Unconsidered Consequences

Even evaluated myopically from the perspective of promoting the non-panhandling public's welfare, existing policy that addresses panhandling leaves much to be desired.

⁶ Though, even plants have been shown to respond predictably to incentives (see, for instance, Khalil 2010).

While the ability to physically remove/detain panhandlers does not require accounting for their incentives—only the legal authority to do so—that ability is not sufficient to mitigate panhandling nuisance. Purposeful panhandlers are not “weeds.” They respond—rationally and predictably—to interventions that, wittingly or unwittingly, affect the relative costs and benefits of panhandling versus alternative forms of work and of alternative panhandling solicitation activities. Those responses can partially or totally mute policy efforts to reduce the nuisance that panhandling presents the non-panhandling public and even lead to the opposite result, increasing that nuisance.

We begin by considering panhandling bans. The first-order effect of laws that blanketly prohibit panhandling is to raise the relative cost or, what is the same, reduce the relative returns of panhandling compared to alternative forms of work. This reduces the incentive to panhandle, which reduces the amount of panhandling—an effect consistent with policy’s goal. But that does not exhaust the effects of a panhandling ban on panhandlers’ incentives.

When the relative returns to panhandling fall, the relative returns to non-panhandling employments rise. This includes both the returns to traditional work and the returns to alternative shadow-work employments, such as scavenging, selling blood plasma, and theft. Efforts formerly devoted to panhandling do not evaporate into the ether after panhandling is prohibited; they are substituted into these non-panhandling employments.

If panhandlers were not constrained by human capital, such as their formal education, or the by the difficulties of satisfying the requirements of traditional work, such

as their access to facilities to maintain good hygiene, a ban on panhandling would lead panhandlers to substitute a significant part of the time they formerly spent panhandling with traditional work. However, what we know about panhandlers, reviewed in Section 2, suggests that many are constrained both of these things. Substitution from panhandling to such work is thus likely to be relatively small.

Substitution from panhandling to alternative forms of shadow work, in contrast, is likely to be relatively large. Scavenging, selling plasma, and theft are low human-capital intensive activities and do not require, for instance, clean clothes. In terms of shifting their efforts into these employments, panhandlers are less constrained. Whether this substitution reduces or increases the nuisance faced by the non-panhandling public depends on the particular alternative shadow-work activities that become more common as a result.

Greater reliance on selling blood plasma by panhandlers is unlikely to bother the non-panhandling public. However, as Section 2 described, panhandlers are limited in how much income they can earn this way, since plasma cannot be given continuously. Some shadow-work substitution must therefore occur in other areas, such as scavenging and theft. An increase in scavenging has an ambiguous effect on the non-panhandling public's welfare. It is unclear whether the nuisance the public faces rises or falls as a result of encountering fewer street people soliciting donations but more street people rummaging through public garbage bins for recyclables. An increase in theft, however, unambiguously harms the non-panhandling public's welfare: street people who steal are a greater nuisance than those who solicit donations.

The relative magnitudes of these shadow-work substitutions—and thus their contributions to the net effect of banning panhandling on the non-panhandling public’s welfare—is an empirical question. Answering it requires investigating the determinants of panhandler behavior, underscoring the policy importance of learning what we don’t know about panhandlers, reviewed in Section 3.

The degree to which a panhandling ban reduces the quantity of panhandling depends on the elasticity of panhandlers’ demand for panhandling. If that demand is elastic, the reduction will be substantial; if it is inelastic, the reduction will be modest. In either case, it is certain that prohibiting panhandling will not, and indeed does not, cease entirely after it is banned. At least some (and possibly much) panhandling continues. Because of this, a panhandling ban affects not only the incentive to panhandle but also, for those who continue to panhandle, *how* to panhandle—i.e., the choice of solicitation activities. The amount of panhandling changes, as well as its composition.

Under a panhandling ban, the more passersby a panhandler solicits, the greater his chances of being reported and running afoul of police. A ban thus incentivizes panhandlers to substitute away from activities that yield less revenue per passerby solicited, toward activities that yield more revenue per passerby solicited—presumably, more aggressive activities. There is less panhandling overall, but that which remains (perhaps be most it) is more “potent”—the kind of panhandling most objected to by the non-panhandling public. The net effect of this compositional change on overall panhandling nuisance depends again on relative elasticities: how much of a reduction in panhandling is achieved by prohibiting it, and how much of the panhandling that is left becomes more aggressive in consequence.

If the latter rises more than the former falls, panhandling nuisance may be exacerbated, not mitigated, by prohibiting panhandling.

A blanket ban on panhandling also incentivizes more aggressive panhandling through a second channel. Because such a ban does not distinguish between different solicitation activities, it imposes the same additional cost on all of them. In doing so, it reduces the *relative* cost of solicitation activities that were more costly for panhandlers to engage in to begin with—namely, those requiring greater panhandler activeness, such as aggressive panhandling—resulting in substitution toward those activities.

And there is a third channel: a blanket ban on panhandling prevents “marginal deterrence.” Consider a panhandler who would like to solicit aggressively. If panhandling is permitted but aggressive solicitation activities are proscribed, the panhandler’s marginal cost of panhandling aggressively is positive. Thus, he may decide it’s not worth it and choose to panhandle passively instead. However, if panhandling is blanketly banned, and thus all solicitation is sanctioned the same, the panhandler’s incentive to forego aggressive panhandling disappears. Conditional on panhandling at all, his marginal cost of panhandling aggressively is zero. If he chooses to panhandle, he is likely to do so aggressively.

Policy interventions that regulate panhandling can also create panhandler incentives that lead to the opposite effect of that intended by policymakers. However, unlike panhandling bans, some regulatory interventions do not set in motion self-defeating panhandler behavioral responses. Chief among these are interventions that restrict panhandling locationally.

In certain public spaces, for instance on subway trains or public buses, the nuisance that panhandling presents the non-panhandling public is especially severe. By itself, at least, a law that permits panhandling in general but prohibits it in such spaces will raise the relative cost of panhandling where it's least desired but, critically, do so without increasing the relative cost of panhandling in general—thus avoiding incentivizing panhandlers to substitute into other, still less desirable, forms of shadow work, or incentivizing them to substitute more aggressive panhandling activities for the less objectionable sort. Such regulation will, of course, incentivize panhandlers to substitute soliciting in certain spaces for soliciting in others. However, from a nuisance-mitigation perspective, this substitution is desirable: more panhandling in spaces where panhandling poses less of a nuisance and less in areas where it poses more of one. Locational restrictions can, in effect, channel panhandling nuisance to those spaces where it bothers the non-panhandling public least.

This happens, however, only if (at least) two conditions are satisfied. First, there must be a surfeit of “good” panhandling locations. If panhandling returns are especially high at the public library but low everywhere else, prohibiting panhandling at the library will affect panhandler incentives in ways besides those described above—and less positively from the perspective of the non-panhandling public's welfare. In contrast, if the library is one of numerous public spaces that offer similarly high panhandling returns, a simple nuisance-reducing, locational “shift” will occur. As Section 3 discussed, Dordick et al. (2017) find that, in Manhattan at least, there are plenty of “good” panhandling locations available to panhandlers. Prohibiting panhandling at one, or a handful, of such locations is

thus likely to lead to locational “shifting” without instigating countervailing, undesirable panhandler behavioral responses.

The second condition that must be satisfied for locational regulation to be productive is a function of panhandling policy itself: interventions that restrict panhandling locationally must not be rendered such that, in practice, they operate as panhandling bans. For example, a city code that restricts panhandling to “public spaces not frequented by large numbers of people” in effect prohibits panhandling. “Location-regulating” interventions of this nature are subject to the counterproductive consequences attendant to explicit panhandling bans described earlier.

Unfortunately, many municipal codes that regulate panhandling locations violate this condition. According to the NLCHP’s (2017: 25) study of such codes, “Even where cities have chosen to limit their prohibition of panhandling to particular places,” they typically proscribe panhandling in “commercial and tourist districts,” which “are often the only places where homeless people have regular access to passersby and potential donors.”

In principle, regulatory interventions that restrict panhandling solicitation activities are also less likely to be counterproductive to the nuisance-reducing goal of policy. In practice, however, they, too, are often problematic. Among the least potentially problematic are laws that proscribe “aggressive” panhandling. By raising the relative cost of aggressive panhandling solicitation activities but otherwise permitting panhandling—and thus generally avoiding the undesirable incentive effects attendant to blanket panhandling bans discussed above—such interventions, by themselves at least, *may* affect

panhandlers' incentives in productive way: panhandlers are encouraged to substitute less "intense" solicitation activities for more "intense" ones, which are more objectionable.

Even this incentive effect, however, may be perverse. Because they tend to involve more panhandler activeness, more aggressive panhandling solicitation activities tend to be more time consuming. A panhandler who "chases down" each passerby he solicits, for example, can solicit fewer passersby than a one who simply lays stationary on the ground. A regulation that proscribes "aggressive" panhandling therefore trades the solicitation of fewer passerby, each with higher "intensity," for the solicitation of a larger number of passersby, each with lower "intensity." The net effect of proscribing aggressive panhandling solicitation activities on the non-panhandling public's welfare depends on the magnitudes of these effects and relative weights attached by the non-panhandling public to solicitation frequency and solicitation aggressiveness in contributing to panhandling nuisance.

That said, it is reasonable to think that laws which proscribe aggressive solicitation activities would in fact raise the non-panhandling public's welfare—provided that they are not rendered so as to, in effect, ban panhandling. In that case, the counterproductive panhandler incentives discussed above would again become operative. Unfortunately, much as with laws that regulate where panhandling may occur, which, in principle, are also productive toward policy's goal, in practice, at least some city codes that proscribe "aggressive" panhandling solicitation activities serve to proscribe panhandling in general. "In Mobile, Alabama, for example, a person would be in violation of the municipal code for 'aggressive panhandling' if he or she simply requests a donation from a person standing

in line to enter a commercial establishment—no matter how mildly the request was made” (NLCHP 2017: 25).

More problematic, even in principle, are interventions that regulate panhandling indirectly. Consider, for instance, laws that ban sitting or lying down in public places. Sitting/lying is an “input” into certain panhandling solicitation activities. The solicitation activities that use these panhandling inputs tend to be the more passive varieties—such as simply sitting/lying down with a sign. Whether “aggressive” panhandling is also prohibited or not, raising the relative cost of passive-solicitation inputs reduces the relative cost of using more aggressive-solicitation inputs, such as following passersby. The result is again an incentive for panhandlers who continue to panhandle to substitute from less aggressive to more aggressive methods of solicitation.

Bans on sleeping/camping in public also create perverse incentives; paradoxically, they may even lead to a greater amount of panhandling. These bans raise the relative cost of street living in general, which reduce the number of people living on the street, hence, indirectly, the amount of panhandling. However, if street people’s demand for street dwelling is inelastic (as it probably is), this effect will be small.

Acting oppositely to this effect, criminalizing street living reduces the relative cost of panhandling for those who choose to remain on the street. If you’re going to risk running afoul of authorities by being on the street, why not panhandle? Not only will those remaining on the street who already panhandled now have an incentive to spend more time doing so, but those remaining the street who did not already panhandle will now have an incentive to spend some time doing so. In conjunction with sufficiently inelastic street-

person demand for street dwelling, these incentives lead to a higher quantity of panhandling than if there were no ban on sleeping/camping in public.

The foregoing analysis of current policy that addresses panhandling leads to the following conclusions: (1) that policy, whose goal is to minimize the nuisance that panhandling presents the non-panhandling public, ignores panhandler incentives in favor of a “weed-control” approach based on legally empowering public officials to physically remove/detain panhandlers at their discretion; (2) blanket panhandling bans, which are increasingly popular, reduce the amount of panhandling but simultaneously incentivize panhandler behaviors that are contrary to policy’s goal; (3) interventions that regulate panhandling activities/locations directly are in principle productive toward policy’s goal but, in practice, often incentivize panhandler behaviors that undermine it; (4) interventions that regulate panhandling indirectly produce perverse panhandler incentives similar to blanket panhandling bans.

5.3 Panhandling Policy and Panhandler Welfare

Although our focus has been on current panhandling policy, which is concerned with the welfare of the non-panhandling public, it is strange—and we would suggest, inhumane—to ignore the question of panhandling policy from the perspective of panhandlers’ welfare. Panhandlers, after all, are people—and the people most directly affected by panhandling policy. While any legal restriction on panhandling must harm some panhandlers individually, perhaps surprisingly, it’s possible for some such restrictions to increase panhandler welfare collectively. The most salient example based on current policy is regulatory interventions that proscribe “aggressive” panhandling. Panhandlers who solicit

in one another's proximity may create externalities for those nearby. Some of these "spillover" effects may be positive. For instance, a popular instrumental performer may attract a large crowd of passersby, generating additional passerby traffic for other panhandlers in his region.

Other spillovers, however, may be negative. For example, a loud and angry panhandler who shouts obscenities at passersby who do not give to him may drive passersby approaching the area in which he's soliciting to an alternative route, reducing passerby traffic for the passive panhandlers in his area. In this case, especially if the number of "well-behaved" panhandlers is large relative to the number of "ill-behaved" ones, it's possible for a regulation that proscribes aggressive panhandling—which incentivizes the ill-behaved panhandlers to behave better—may increase collective panhandler receipts and thus welfare.

Of course, this possibility is limited by aggressive-panhandling "regulation" that operates in practice as a panhandling ban, which is virtually guaranteed to reduce panhandlers' collective welfare, and also by public officials' willingness to enforce the regulation even if it is properly rendered. Statistics from cities like Dallas, TX, where approximately 2,000 citations were dispensed by official for panhandling infractions in 2015 alone (NLCHP 2017: 29), easily create the impression that municipalities are more than willing to enforce panhandling codes. But what such statistics don't tell us is how many panhandling infractions occurred that went uncited, which could be far more. For many cities, it's doubtful that enforcing panhandling laws is a priority.

There is, however, perhaps a more reliable way to enforce panhandling rules that stand to benefit most panhandlers, and that is to delegate the creation and enforcement of those rules to private organizations concerned with, and that care for, the homeless. In Washington, DC, for example, a private non-profit organization called Street Sense Media offers panhandlers the opportunity to distribute a bi-weekly newspaper, *Street Sense* (which contains stories about issues relating to and written by local homeless people), as their panhandling solicitation activity. To gain access to this solicitation activity, panhandlers must agree to a “code of conduct” that regulates their solicitation behavior. Among the regulations such panhandler agrees to follow (Street Sense Media 2018):

I will refrain from threatening others, pressuring customers into making a donation, or in engaging in behavior that condones racism, sexism, classism, or other prejudices....I agree not to distribute copies of Street Sense on metro trains and buses or on private property....[and] I will not distribute Street Sense under the influence of drugs or alcohol.

Street Sense Media has arrived at a panhandling regulatory regime that embraces the most sensible and effective elements of panhandling public policy—locational restrictions and restrictions on objectionable solicitation activities—but has done so privately. The importance of the latter should not be overlooked. Panhandlers who distribute *Street Sense* agree to these rules voluntarily, giving them “buy-in” to the regulatory regime, which aids in enforcement. Moreover, Street Sense Media is operated by organizers for whom aiding street people, including the enforcement of the foregoing code of conduct, is a priority—one they have chosen to dedicate their work to. Under this

regulatory regime, panhandlers who “misbehave” are not only much more likely to be brought to the organization’s attention, their fellow-Street Sense distributors having an interest in reporting such misbehavior, but the organization has a ready means of carrying out enforcement to incentivize appropriate behavior: it can refuse to continue to supply *Street Sense* to non-compliant panhandlers.

Street Sense Media is not the only private non-profit organization that can, or has, performed such a function. *Street News* previously did so in New York City. And *StreetWise* currently does so in Chicago. Unlike the panhandling policy imposed by municipal codes, panhandling policy as developed and enforced by such organizations benefits panhandlers in another way: by “credentialing” them. To the extent that passersby contribute less, or less often, to panhandlers out of concern that they’re subsidizing undesirable behavior, panhandlers’ affiliation of with organizations like Street Sense Media, which certifies their status as “deserving” solicitors, routes panhandling policy through such organizations lead to higher panhandling revenues. Delegating panhandling policy to non-profit organizations is not a panacea for the problems that panhandlers—or the non-panhandling public—face, of course. But it may be an important step in the right direction.

6. Conclusion

Our survey of the literature that considers American panhandlers and corresponding analysis of public policy that addresses panhandling has four central findings: (1) We know about panhandlers’ demographics, housing, and sources of income: panhandlers are typically homeless, but they are not the “typical homeless.” (2) We know little about

panhandlers' behavior: determinants of the decision to panhandle and of panhandling activities have not been studied. (3) We think we know that many panhandlers abuse substances and are mentally ill: these phenomena are relatively prevalent among the homeless and appear to be still more prevalent among the homeless who panhandle. (4) This stock of "knowledge" about panhandlers leads easily but incorrectly to the supposition that panhandler behavior is "irrational." Public policy reflects this supposition: it ignores how interventions affect panhandler incentives, undermining its effectiveness.

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HOBO ECONOMICUS

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.

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.⁷ Despite their ubiquity, little is known about these people, whose behavior literally begs for explanation.

⁷ "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.

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

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).

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.

Studies of American panhandlers are rare.⁸ 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. 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). 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.

⁸ 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).

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 “psychological discomfort...in pedestrians,” such as guilt, awkwardness, shame, even fear (Ellickson 1996: 1181; Skogan 1990; Burns 1992).⁹ 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).

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

⁹ 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 shames him publicly, “calling him out” to other passersby.

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.

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

threatens passersby with more discomfort. For example, passersby feel guiltier declining a panhandler who makes an impassioned vocal plea for help than one who stands silently in their view. The panhandler therefore extracts larger payments from passersby when he solicits more actively: inframarginal passersby, who pay him a positive amount even if he solicits less actively, pay him more; marginal passersby, who don't pay him anything if he solicits less actively, pay him a positive amount. Andreoni et al. (2017), for instance, find that Salvation Army bell-ringers who solicit passersby vocally collect larger donations than their non-vocal counterparts.

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 .

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

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

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's 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 : $\Pi_{m_1} > \Pi_{m_2}$. 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 can't be enforced, side payments between them aren't possible. The panhandlers play the location game in Panel B of Figure 1.

This game has two subgame-perfect Nash equilibria. If $\Pi_{m_1} \geq 4\Pi_{m_2}$, both panhandlers choose to solicit at m_1 . If $\Pi_{m_1} < 4\Pi_{m_2}$, 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 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 isn’t 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 extract the largest payment possible from passersby, such a panhandler would like to communicate to them 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.¹⁰ Metrorail (Metro) is the public rapid-transit system that serves the Washington metropolitan area.¹¹ 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).¹²

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.¹³ 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

¹⁰ These months are, in 2016: October, November, and December; in 2017: February, March, April, May, June, October, and November.

¹¹ Also known as the "National Capital Region."

¹² Behind the NYC Subway and Chicago "L."

¹³ Provided that solicitation isn't physically coercive ("aggressive"). See Chapter 23 of the Code of the District of Columbia.

observed no panhandlers being interfered with by police or Metro authorities. Lawful or simply ignored, panhandling in the Metro spaces we study proceeds unmolested.

Appendix Figure 1 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. Appendix Table 1 reports the average number of riders who exited each sample station per sample month.¹⁴ 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.¹⁵

At each visit we canvassed a one square-block area around the station exit(s) for panhandlers.¹⁶ 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.¹⁷ It excludes vendors selling merchandise, such as flowers or umbrellas, for which payment is required. “Street people” were identified

¹⁴ 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.

¹⁵ For convenience of exposition, we refer to Georgetown as a “station” throughout.

¹⁶ In Georgetown, a one square-block area around the intersection of Wisconsin Avenue and M Street.

¹⁷ *Street Sense* contains stories written by, and highlighting the plights of, Washington-area street people.

by appearance: the “disheveled, [and] 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 department” (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.¹⁸ Table 1 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).¹⁹ Table 1 reports the frequency with which the unique

¹⁸ Category 1 includes four panhandlers who were sitting in wheelchairs; all other “sitters” were on the ground.

¹⁹ “Hit” is a slang reference to a person whom a panhandler “hits up” for a donation, i.e., a passerby he solicits.

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?

[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 1 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.²⁰

We could not observe panhandlers' ages or revenues. However, 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 1 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

²⁰ 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.

average we visited each station to collect data on passersby approximately four times total, in two different months.

Any adult observed exiting a Metro station escalator was considered a passerby.²¹ 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.²² Our data contain 701 passersby.

Appendix 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 1 reports the frequency with which the passersby in our data respond to solicitation with these reactions. Approximately 23 percent ignore solicitation; 15 percent

²¹ In Georgetown, anyone walking through the northwest intersection of Wisconsin Avenue and M Street.

²² In Georgetown, for 15 minutes—the approximate time it takes for three train arrivals at a Metro station.

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.

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. 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. Appendix Table 2 presents summary statistics for all variables.

4 Empirical Analysis

Table 2 explores predictors of how actively panhandlers solicit. Each observation is a unique panhandler. We estimate ordered probit and OLS models that use the benchmark version of our panhandler activeness, panhandler human capital, and passerby responsiveness 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.

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. We find similar results using the additive versions of our variables in Appendix Table 3.

Table 3 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 version of our passerby responsiveness variable. All regressions calculate

robust standard errors clustered by Metro station and include hour and date fixed effects.²³ Station fixed effects are not possible in Table 3, since (with the exception of number of passersby) all regressors are measured at the station level.

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.

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. We find similar results using the additive version of our passerby responsiveness variable in Appendix Table 4.

We don't observe panhandler profit directly, precluding a direct test of spatial equilibrium: equalization of potential-profit per panhandler across Metro stations. However, it's 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

²³ Since panhandlers at a station-visit were sometimes observed over a period that overlapped two hours, in Table 3, 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).

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.²⁴ Spatial equilibrium implies that predicted potential-profit per panhandler will be equal across stations.

²⁴ 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).

Table 4 finds that it nearly is. The sole exception is Vienna/Fairfax-GMU, a station that lies at the remote western edge of the Metro system (see Appendix Figure 1), 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 1, 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 their higher input cost to passersby, and since the sum is fixed by Street Sense Media—printed on the paper’s masthead—permits them to do so credibly.

Fixed pricing is profit-maximizing for *Street Sense*-distributing panhandlers only if it’s 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 can’t observe whether any panhandler in our sample declined a donation, so we can’t rule this possibility out. 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—belies rational maximization (see, for instance, Schwartz, Baxter, and Ryan 1984; Suchman 1989; Iannaccone 1992; Leeson 2007, 2013a,b, 2014a,b; Piano 2017, 2018; Skarbek 2011, 2016; Leeson and Russ 2018).²⁵ 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.

²⁵ Gordon Tullock and Gary Becker pioneered this approach. See, for instance, McKenzie and Tullock (1975) and Becker (1976).

APPENDIX

Table 1. Panhandler and Passerby Characteristics

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

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

Table 3. Determinants of the Number of Panhandlers at a Metro Station

Dependent variable: Number of panhandlers	Poisson			OLS
	(1)	(2)	(3)	(4)
Homeless shuttle-stop	0.534 (0.306)	0.313 (0.129)	0.413 (0.117)	0.806 (0.170)
Homeless service	0.272 (0.285)	0.411 (0.115)	0.639 (0.187)	0.559 (0.255)
Number of passersby		0.004 (0.000)	0.004 (0.001)	0.005 (0.001)
Passerby responsiveness			1.453 (0.693)	1.782 (0.770)
Hour fixed effects	X	X	X	X
Date fixed effects	X	X	X	X
Adjusted R^2				0.42
Observations	222	222	222	222

Notes: Observations are Metro-station visits. Columns 1-3 present Poisson estimates; column 4 presents OLS estimates. Robust standard errors clustered by Metro station in parentheses. See Appendix Table 5 for variable descriptions.

Table 4. Predicted Potential-Profit per Panhandler by Metro Station

	[Passersby*Respon- siveness]/ Panhandlers	[Passersby ^{1/2} *Respon- siveness]/ Panhandlers	[ln(Passersby)*Respon- siveness]/ 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
Georgetow n	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
Smithsonia n	652.105	10.586	33.694
Vienna/Fai rfax-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.

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BIOGRAPHY

Robert Augustus Hardy graduated from John Handley High School, Winchester, Virginia, in 2009. He received his Bachelor of Arts from the University of Virginia in 2012. He received his Master of Arts in Economics from George Mason University in 2015.