

Septiembre 2020

ART2_A1_2020_2

N° de serie

Artículo Científico

The daily grind: Cash needs and labor supply

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ALIANZA EFI
Economía Formal e Inclusiva

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Journal of Economic Behavior and Organization

journal homepage: www.elsevier.com/locate/jeboThe daily grind: Cash needs and labor supply[☆]Pascaline Dupas^a, Jonathan Robinson^{b,*}, Santiago Saavedra^c^aCEPR and NBER, Stanford University, United States^bSanta Cruz and NBER, University of California, United States^cUniversidad del Rosario, Colombia

ARTICLE INFO

Article history:

Received 11 September 2019

Revised 11 June 2020

Accepted 15 June 2020

Available online 10 July 2020

JEL classification:

C93

D12

J22

Keywords:

Intertemporal labor supply

Reference-dependence

Income targeting,

ABSTRACT

The majority of people in developing countries are self-employed and can therefore set their own work hours. How do self-employed individuals motivate themselves to work hard day after day? We document four facts about the labor supply of Kenyan bicycle-taxi drivers: (1) drivers work more on days with higher cash needs; and (2) the quitting hazard increases once the driver earns enough to meet his day's need; but (3) the needs are not binding subsistence requirements; and (4) randomized cash payouts have no meaningful effect on labor supply. These results are consistent with models in which workers have reference-dependent preferences over earning targets.

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1. Introduction

The majority of people in developing countries are self-employed and can therefore set their own work hours. Self-employment offers the advantage that hours can easily adjust to changing economic conditions, for example as a response to unexpected shocks (Kochar, 1995; 1999; Frankenberg et al., 2003; Jayachandran, 2006). However, the freedom to choose one's own hours also has the fundamental disadvantage of being susceptible to self-control issues: without a fixed hours schedule, it may be tempting for a worker to quit earlier in the day than he had planned—especially in a physically demanding or monotonous occupation. Recent research shows that workers with time-inconsistent preferences over effort demand external constraints to help them meet work targets.¹ However, such external commitment devices are not typically

[☆] The research protocol was approved by the IRBs of UCLA, UCSC, and IPA Kenya. Funding for the data collection was provided by UCLA and UCSC. For extremely helpful discussions, we thank Ned Augenblick, Stefano DellaVigna, Supreet Kaur, Muriel Niederle, Devin Pope, Matthew Rabin and Adam Szeidl. We are also grateful to Richard Akresh, Sandro Ambuehl, Jeffrey Carpenter, Jishnu Das, Elwyn Davies, Jonathan de Quidt, Christine Exley, Erick Gong, Tim Halliday, John Hoddinott, Clement Joubert, Emir Kamenica, Ethan Ligon, Jeremy Magruder, John Maluccio, Sendhil Mullainathan, Anant Nyshadham, Alan Spearot, Eric Verhoogen, Andrew Zeitlin and participants at various seminars for helpful comments. We are grateful to IPA Kenya for administrative assistance coordinating the project, to Moses Barasa and Sarah Walker for coordinating field activities, and to Sindy Li for research assistance. All errors are our own.

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¹ Kaur et al. (2015) show that data entry operators voluntarily enter into employment contracts which penalize them for not meeting daily work targets while Augenblick et al. (2015) show that university students demand costless commitment for repetitive effort tasks.

available outside of formal work arrangements or a laboratory setting. How do self-employed individuals working in low-skill, physically demanding, repetitive occupations motivate themselves to work hard day after day?

This paper studies the labor supply decisions of one specific group of workers: Kenyan bicycle taxi drivers. These workers (all of whom are men) carry passengers or goods on the back of their fixed-gear single-speed bicycles in a tropical climate, and so this is a very strenuous occupation. We study the intertemporal labor supply decisions of these workers, using a novel observational dataset combined with experimental variation in windfall cash payouts. The dataset is constructed from daily passenger-level logbooks kept by 259 drivers over approximately 2 months. Critically, these logbooks included a question on whether respondents had particular cash needs on a given day and, if so, how much money was required to deal with these needs. On random days, we gave out experimental cash payouts (in the form of lottery wins) to workers.

We use the logbook data and the experiment to document four key stylized facts. First, we find that needs and labor supply are strongly positively correlated. While it may not be surprising that workers work more in response to *unexpected* shocks, we also find a strong correlation even for *expected* cash needs such as a savings club payment coming due. Second, we find that the hazard of quitting increases once workers earn enough to meet their cash need. Third, we find no evidence that the needs are binding subsistence requirements – while workers report needs on 90% of days, they only make enough to meet these needs on 41% of days. And fourth, we find no effect of the randomized lottery payouts on labor supply:² even workers whose day's need was fully covered by the lottery prize exhibit a jump in the likelihood of quitting after *earning* enough to meet the need. They do not quit immediately after receiving the lottery payment itself.

As discussed in more detail below, these facts are inconsistent with both a neoclassical labor supply model (even with other constraints added in) and with a model of reference-dependent labor supply in which workers set a target based on consumption. Instead, our results suggest a model in which drivers have reference-dependent preferences around a daily *earned* income target.

Without any frictions, the neoclassical model is clearly rejected since the model would not predict a change in the probability of quitting at the need. Adding credit or savings constraints alone (with the extreme case being that people must consume whatever they earn in a given day) would also not explain the results, since the need would not enter the utility function and so there would be no reason to observe a change in quitting behavior at the need: on high-wage but low-need days people may choose to earn beyond the subsistence need and consume more. While the results *would* be consistent with a model with binding subsistence constraints and effort costs high enough that consumption above the subsistence need is never desirable, this does not seem plausible for our sample since people so often don't meet their needs, suggesting needs are not binding subsistence constraints.

A model which predicts our combined set of results must therefore have the need in the utility function in some form, but the penalty for failing to meet the need must be limited (since people so often fail to meet their needs). We argue that the most likely model to fit these facts is one of reference-dependent labor supply. However, the results are inconsistent with workers having a target over total income or consumption (Camerer et al., 1997; Köszegi and Rabin, 2006). If workers were targeting on total income or consumption, they should be more likely to quit after receiving the large lottery payment.

Our results suggest instead a model in which drivers have reference-dependent preferences around a daily *earned* income target (rather than a daily target on total consumption). The reference dependence term can be thought of as a “boost” in utility at the target or as a reduction in effort costs until the target is reached. Under the latter interpretation, reference-dependence helps to “numb the pain” of a physically demanding job, which allows workers to work longer and incur higher effort costs than they otherwise would. We sketch such a model and calibrate it to estimate earnings under alternative labor supply models, holding constant effort costs and time preferences. The simulation exercise suggests that neoclassical workers would earn about 19.1% less income than earned income targeters.

Our paper adds to an active economics literature (starting with Camerer et al., 1997) which tests for reference-dependent labor supply among workers who are free to set their own hours. A number of papers find evidence in support of reference dependence, especially for inexperienced drivers (Chou, 2002, Crawford and Meng, 2011, Agarwal et al., 2015 and Sheldon, 2016 for taxi drivers; Chang and Gross, 2014 for fruit packers; Giné et al. 2017 and Hammarlund, 2018 for fishermen).^{3,4} A key challenge in these studies is that the reference point itself is unobserved and so must be estimated, or reference dependence must be inferred indirectly through an observed negative correlation between labor supply and earnings opportunities. By contrast, our paper uses a survey measure of need which does not require inferring targets from previous quitting decisions. A second challenge is that earning opportunities are endogenous. Two prior studies overcome this by randomly varying wage rates (Fehr and Goette 2008 and Andersen et al., 2018), something we were unable to do. However, we did experimentally vary unearned income. The only other paper we are aware of to do this is Andersen et al. (2018), who

² This result is similar to Andersen et al. (2018), who find no effect of windfall payments by mystery shoppers on the labor supply choices of vendors in India.

³ In different contexts, See Pope and Schweitzer (2011) for evidence that professional golfers target a goal of par for a hole while Allen et al. (2016) find evidence that marathon runners are loss averse around targets of salient finishing times.

⁴ Other studies find evidence in line with a neoclassical model of labor supply, including the extensive margin studies of Oettinger (1999) in the US and Goldberg (2016) in Malawi. See Farber (2005; 2008; 2015) for a set of papers on the labor supply of New York City cabdrivers which show mixed evidence of income targeting. In a recent paper, Thakral and Tô (2019) reanalyze the data in Farber (2015) and find evidence of adaptive expectations, a rejection of the neoclassical model.

also implemented randomized cash windfalls, but in the form of overpayment by naive foreigners (played by confederates). Like this paper, [Andersen et al. \(2018\)](#) find no effect of windfalls on labor supply.⁵

The layout of the paper is as follows. [Section 2](#) presents the sample and data. [Section 3](#) presents the empirical findings of interest. [Section 4](#) estimates the economic significance of the labor supply patterns we describe, and calibrates a target-earning model that rationalizes the findings. [Section 5](#) concludes.

2. Sample and Data

2.1. Bike-Taxi Driving

During the time period of this study, bike-taxis (known as "boda-bodas") were ubiquitous in rural and semi-urban areas of Western Kenya and other parts of East Africa. Boda-bodas are similar to rickshaws, but bicycles are designed to carry passengers or goods on the back rack of their bicycles, rather than in a trolley. Since the time we finished data collection, boda-bodas have been largely replaced by motorcycles, but bicycles were the dominant form of taxi at the time of this study. This occupation is quite physically demanding, especially with single-gear bicycles in an equatorial climate: even in the US, an hour of bicycling is estimated to burn 500–700 calories (i.e. [Harvard Medical School, 2020](#)), so this will be twice as high in this setting in which boda-bodas are carrying adult passengers.

Bike-taxis are members of an association that set and enforces rules of conduct as well as fares. They are organized in "stages" (at local market centers) (we have 22 stages in our dataset).⁶ A given ride (say from market A to market B) has a pre-set fare (and a preset premium for night rides), and those pre-set fares are well known from customers (exclusively local community members). There is typically no bargaining and no tipping. According to our data, on an average day a bike-taxi driver starts work at about 9 am and ends at about 4 pm.

2.2. Sampling Frame

The project took place in the Busia district of Western Kenya in Summer and Fall 2009. The sample was drawn in August, and the labor supply logs were collected between September and December.⁷ To draw the sample, enumerators conducted a census of all bicycle-taxi drivers in market places scattered around the district. Individuals were included in the sample only if their primary occupation was as a bicycle taxi driver.

The only sample restriction was that the respondent had to be able to read and fill out the logs. We therefore excluded individuals who could neither read nor write or who had fewer than three years of schooling (24% of those in the census), leaving 303 eligible individuals. We were able to successfully enroll 259 (85%) of these in the study. The remainder could not be enrolled for one of three reasons: they had moved out of the area, had quit boda work, or did not consent to the relatively heavy data collection requirements.

2.3. Data

2.3.1. Baseline Survey

Each individual who was enrolled in the study was administered a baseline survey.⁸ In addition to basic household demographic information, the survey included a number of measures to inform possible subgroup analysis. These include a financial module, a health module, and a module to construct measures of time preferences, risk preferences, and loss aversion.⁹

[Table 1](#) presents baseline characteristics for our study sample. All study participants are male, since bicycle-taxi driving is an exclusively male occupation. Nearly all are married and the average respondent has been working as a bike taxi drivers for 6.2 years. Respondents are poor but do own assets: the average respondent has 1.4 acres of land and approximately 18,000 Ksh (US \$240) in household assets (durables + animals), and 57% own cell phones. 75% of respondents participate in Rotating Savings and Credit Associations (ROSCAs) and 31% have bank accounts. Health status appears relatively poor among bodas. Even though the average age is only 33 years, 39% of bodas in the sample missed at least one day of work in the month prior to the baseline due to sickness.

Reference-dependence requires that individuals be loss averse around a target. Consistent with this, [Fehr and Goette \(2007\)](#) find that lab experimental measures of loss aversion predict behavior in their experiment among bicycle

⁵ [Andersen et al. \(2018\)](#) argue that their results reject earned income targeting, because the windfalls were designed to be perceived as entering "earned income": they were paid out by naive foreigners (rather than via a lottery, as in this paper). However, it is also possible that vendors perceived these payments as similar to a lottery, since overpayment by naive foreigners is rare.

⁶ A driver typically waits for rides at his stage, accepts any ride there and returns to the stage unless he gets a ride on the way back.

⁷ The logs were introduced on a rolling basis because the fixed cost of training a respondent to keep the log was large so it took some time to train respondents.

⁸ This survey, as well as the daily and weekly logs described below, can be found on the authors' websites.

⁹ The baseline was conducted in parallel with the beginning of the data collection process. Baseline data is missing for 13 of the workers in our sample.