

I N E N R P S D S M U N P M E R P R O N E

Working Paper No. 18-09

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I. Introduction

officers

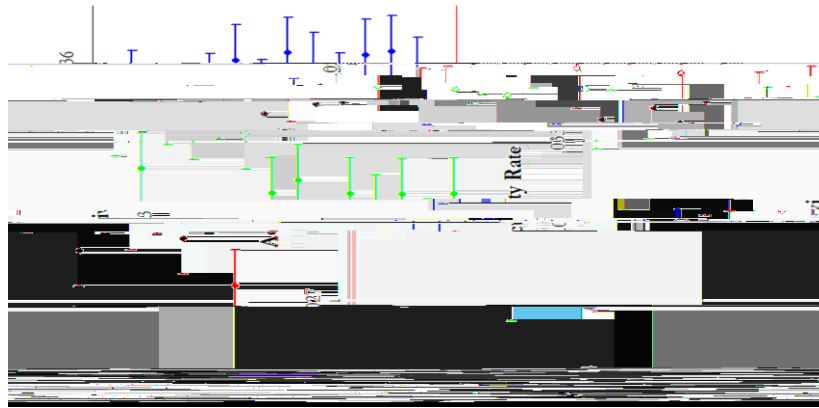
do it to bring your numbers up, but I would have to massively write summonses and

officers, who themselves derive less value from meeting these objectives, they exert less effort so as to minimize the subjective costs of work.

To resolve this dilemma, given that only the agents perfectly observe their true effort, the NYPD management maintains what it sees as an appropriate compensation schedule for their subordinates. In addition to standard wages, the schedule includes a return corresponding to the level of output relative to monthly performance goals or requirements imposed by a quota performance

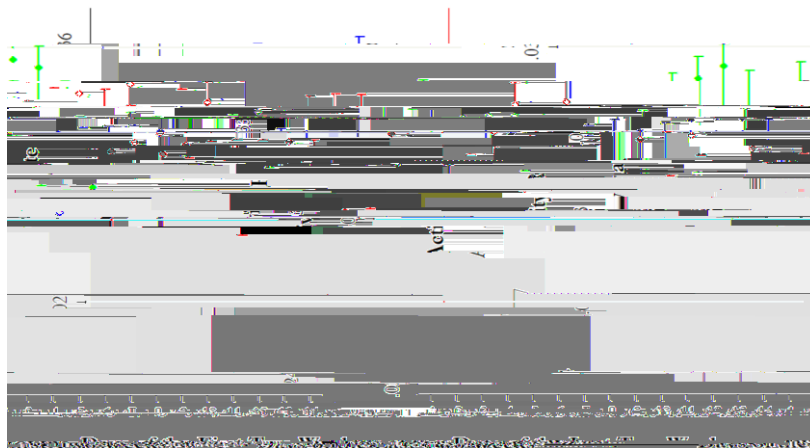
FIGURE 1. POLICE ACTIVITY RATES OVER THE COURSE OF THE MONTH

Panel A. Daily Fraction of Monthly Arrests



Panel B. Daily Fraction of Monthly Summonses

Panel C. Daily Fraction of Monthly Non-Criminal Stops



Notes: Daily shares of monthly activity based on SQF data for 2016 (New York City). Panels A, B, and C display the daily shares of monthly arrests, summonses, and stops resulting in neither an arrest nor a summons, respectively. Blue bars indicate 90% confidence intervals. Vertical red bar indicates a division between the first two weeks and two weeks of the month. The mean daily share of monthly activity is normally distributed and equal for each calendar month.

FIGURE 2. POLICE

immediate gratification and postponement work in various real world contexts (Solomon and Rothblum, 1984; Schouwenburg and Groenewoud, 2001; Royen, Steel, and Ferrari, 2013).

Similar behavior of procrastination is observed within the literature on sales and compensation that focuses on the dynamic allocation of efforts as a response to different compensation for workers, which, similar to those of the NYPD, are characterized by nonlinearity. To elicit additional efforts from workers, many firms adopt plans that include nonlinear compensation characterized by lump sum returns for completion of assignments such as reaching a sales quota (Joseph and Kalwar, 1998). These nonlinear remuneration schedules in fact induce the strategic manipulation of work effort. For workers who discount future costs and benefits, efforts are increasingly allocated closer to the period as they capture any rewards from meeting the quota (Asch, 1990; 1998; Misra and Nair, 2011). If an unpredictable shock leads to a worker meeting the quota earlier, efforts are scaled down in settings - and b exist (Jain, 2012; Ghore et al., 2013). This last reaction could

its own, whose use is positively correlated with the commission of other types of crimes. Several works have connected increased drug consumption (measured by the recorded numbers of overdose hospitalizations and related deaths) to the arrival of welfare recipients (Riddell, 2006; Dobkin and Puller, 2007; Cotti et al., 2016; Hsu, 2017). Furthermore, welfare recipients are more vulnerable to substance abuse than the general population, further increasing the risk (Grant and Dawson, 1996; Black and Reuter, 2006).

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differences in types of arrests and summonses, suggesting that welfare time is limited

A. Formal evalu

is no specific target number that we go for. There are no quotes from the commissioner

on a monthly basis can detract from the quality of policing in pursuit of a qualitative outcome. These concerns are only exacerbated by the additional presence of a quota. And, although the existence of a quota system has officially been denied, many believe that the NYPD surreptitiously operates an evaluative process that considers both average performance and quotas.

B.

officers. In 2006, arbitrator ruled that the NYPD maintained a traffic citation quota in violation of state labor law (Case #A106904, 2006). In 2015, an NYPD officer was awarded a \$280,000 settlement.

FIGURE 3. WELFARE DISBURSEMENT SCHEDULE

officers are more likely to view these efforts as a sequence, as opposed to independent of each other. Matching this view, police officers might choose to work less as a month progresses, corresponding to a sequence of increasing leisure and a reduction in the costs incurred by efforts. As police officers stay on this trajectory, they reduce the ~~direction of~~ ^{direction of} their performance goal, which

provide a careful examination of these possibilities that the frisking efforts as a precautionary measure persists even when considering these other factors.

IV. Data and Primary Methodology

The primary data used in this paper comes from the NYPD Stop, Question, and Frisk (SQF) data which documents daily interactions between NYPD officers and the community.²⁵ The SQF collects

²⁶The

SQF program was aggressively used to expand community policing by increasing focus on lower

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2013, 2014, ..., 2016 the years in the sample; and $i, \dots, 77$ denotes each of police precincts. The spatial unit of analysis is the precinct being the unit at which enforcement policies are set. Errors are likely to correlate over time within precincts, and thus standard errors are clustered at the precinct level.

The dependent variable is constructed using the following formula:

TABLE 2. SUMMARY STATISTICS

Variables	Mean	SD	Min	Max	Number of instances
Dependent variables					
Arrest rate	0.0328	0.076	0	1	282,211
Summons rate	0.0328	0.0846	0	1	285,156
Stop rate (noncriminal outcome)	0.0328	0.0444	0	1	4,105,451
Financially motivated crime	0.0327	0.124	0	1	49,944
Violent crime rate	0.0328	0.139	0	1	23,996
Controlled substance crime rate	0.0329	0.114	0	1	67,903
Explanatory variables					
Last two weeks	0.5	0.5	0	1	
Each day of week	0.142	0.349	0	1	
Holiday	0.117	0.322	0	1	
Temperature (in °F)	55.19	17.33	4	94	
Rainfall (in inches)	0.144	0.407	0	7.57	
Snowfall (in inches)	0.102	0.903	0	27.3	
Lunar luminosity	0.5	0.351	0	1	
Daylight (in minutes)	731.87	120.23	555	906	

Notes: Financially motivated crime includes robbery, burglary, and all types of larceny. Violent crimes include sexual assault, kidnapping, menacing, and harassment. Controlled substance crimes include possession and distribution of all narcotics prohibited in New York City. Number of instances is the total count of activities in rate. The total number of unique prey observations is 358,708.

(see footnote 5) and can similarly influence the amount of interactions. The data on rain, snowfall, and temp /P <</MCID 114>> BDC q 0.0Tm 0 g 0 G [(betw)6(ee)-5(n)-9(a

number of days in the first and the second half of each month. The mean of 0.117 on the dummy indicates that over 11 percent of all days are considered celebratory. The inclusion of the adjacent weekend in addition to the actual day of the holiday is responsible for the large magnitude of the coefficient (see footnote 32).

The rightmost column of Table 2 provides total counts of each of the activities used in the activity rate calculation. Stops leading to arrests (232,215) or summons (285,150) comprise only 5.97% and 6% of stops respectively. Most (4,105,454) result in neither of these outcomes.³⁵ A quarter of all arrests made over controlled substances, representing the largest category of crime committed. Within this category, 39% of arrests involve marijuana (not in Table 2).

V. Main Results

This section estimates the model in equation (1) which considers the variation of labor productivity throughout a month. If there exists an unequal display of performance throughout a month, it will be captured by the coefficient on the variable separating a month into two halves. This unequal performance could be a product of unequal distributions of

TABLE 3. OLS ESTIMATES OF STOP OUTCOMES

Explanatory variables	(1) Arrests	(2) Arrests	(1) Summonses	(2) Summonses	(1) Non-criminal Stops	(2) Non-criminal Stops
Last two weeks	-0.00344*** (0.000261)	-0.00348** (0.000321)	-0.00231*** (0.000308)	-0.00234*** (0.000314)	-0.00109*** (0.000148)	-0.00111*** (0.000175)
Holiday		-0.00376** (0.000459)		-0.00226*** (0.000461)		-0.0026*** (0.000278)
Tuesday		0.0153*** (0.000628)		0.00742*** (0.00077)		0.011*** (0.000467)
Wednesday		0.0191*** (0.000674)		0.00995*** (0.000737)		0.0143*** (0.000564)
Thursday		0.0173*** (0.000642)		0.00997*** (0.000701)		0.0129*** (0.000478)
Friday		0.0169*** (0.000648)		0.0141*** (0.000676)		0.015*** (0.000542)
Saturday		0.012*** (0.000788)		0.0149*** (0.000892)		0.0113*** (0.00063)
Sunday		0.00114* (0.000644)		0.00631*** (0.000866)		0.0017*** (0.00054)
Temperature		0.000064*		0.000067**		

channels, for instance, the reduction of the number of potential victims, aversion to precipitous criminals, or similar aversion by police officers who might view inclement weather as an inconvenience

The first row in Table 3 summarizes the main results of interest. The coefficients presented across columns in Table 3 depict the differences in arrests, summonses, and criminal stops between the first and the last week of a typical month. All three coefficients are statistically significant at the 1% level, negative, and sizable in their magnitudes. These results translate to 10.1% fewer arrests, 6.9% fewer summonses, and 8.3% fewer criminal stops during the last week of a month relative to its first two weeks. These results suggest that officers make more arrests, summonses, and conduct more unproductive stops early in the month, consistent with the standard front-loading efforts.

Arrests and summonses are likely to be valued more highly than simple stops due to the successful apprehension of criminals, which could lead to safer streets and additional revenue primarily driven by achieving these outcomes. This might explain larger cyclical effects for arrests and summonses in contrast with the attenuated cycle of criminal stops.

It is worth noting the unequal number of observations between the dependent variables in equation (1). During some months, some of the precincts did not record any instances of the associated activities (arrests, summonses, or criminal stops), and therefore, these precinct observations cannot be included (as the value of the dependent variable for such observations is equal to zero). Such precinct observations with zero instances of a particular activity being recorded constitute 5.5%, and 9% of the full sample for arrests, summonses, and non-criminal stops, respectively. Of these observations with zero recorded activities within a month, around 90% fall in the interval of time between July 2013 and December 2016. The overabundance of zero-valued observations in this period can be attributed to reforms in response to a series of accusations against the city and the department over its excessive use of Stop, Question, and Frisk (Mummolo, 2017), and an ensuing reduction in interactions with the young SQF. Figure 4 illustrates this decline in the number of monthly stops following the changes, with a vertical line (July, 2013) representing a stabilized new trend. To address this break in the data, equation (1) was estimated excluding this period lower monthly activities. Re-estimating the sample in such a way preserves statistical significance and does not substantially change the magnitude of the main results (not formally presented).

³⁸When equation (1) is estimated excluding years post

FIGURE 4. TOTAL NUMBER OF STOPS PER MONTH

Notes: Number of stops per month reprocessed data, 2000-2016 (New York City). The vertical line indicates July, 2013.

The next table explores whether specific types of crime are responsible for the observed patterns. Table 4 presents results of equation (1) using dependent variables that disaggregate into three categories of financially driven, violent, or controlled substance related.³⁹ All coefficients on the variables are again statistically significant and negative. Estimates are 4.9%, 3.9%, and 1.6% lower for financial, violent, and controlled substance respectively during the second half of a month. These results suggest that there is less overall activity in the weeks irrespective of crime composition.

These findings suggest the existence of both a monthly cyclical nature of crime and discretionary adjustments of labor efforts on the part of police officers, which exists independent of the form. The largest intra-month cycle in arrests is found in the illicit narcotics category. This discovery is consistent with the literature reflecting surges in arrests to illegal substance use. A liquidity constrained individual is financially enabled to purchase on receiving a welfare check, leading

³⁹Similar to the explanation provided with regard to Table 3, the difference in observations is due to precincts making zero arrests for particular crimes during some months. Analyses were again performed for each of the three categories. The results were qualitatively unchanged, with similar statistical significance and magnitudes for financially motivated and substance related crimes but not for violent crimes (0.18).

TABLE 4. OLS ESTIMATES OF DISAGGREGATED A

The intra-month cycle in arrests for violent crimes follows a similar trajectory of the substance-related arrests by exhibiting a month-long decline. It is hard to conclude what drives this result. It could reflect the effort adjustment by police officers, or it could be complementary to the drug-related cycle where substance consumption is positively correlated with behavior leading to violent crime. Another plausible channel for this is the increased competition between dealers over ephemerally larger markets. The methods with which such conflicts are settled are notoriously violent due to the unavailability of formal property rights or dispute settlement mechanisms for conflict resolution (Goldstein, 1985).

The final result on the declining-month cycle of financially motivated crimes is inconsistent with the previous literature connecting crime to the welfare distribution schedule. The end-of-month scarcity of resources owing to the exhaustion of welfare and the resulting higher marginal utility of consumption due to lower levels of consumption⁴⁰ This provides an incentive for some to obtain resources through crime. More arrests would therefore be expected during the first days of a month, but in fact are fewer. The declining number of arrests nonetheless parallels the decline in the number of arrests for other crimes. This is strong evidence for the idea that individuals undertake a lower effort level as a month progresses, and further, that the nature of the type of crimes that officers deal with.

VI. Exogeneity

TABLE 6. OLS ESTIMATES OF STOPS INVOLVING INDIVIDUALS WITH ADVERSE PHYSIQUES

Explanatory variables	Heavy		Tall		Large	
	Weight 1 SD above	Weight 2 SD above	Height 1 SD above	Height 2 SD above	Body type	Weight, height, and body type
Last two weeks	-0.00152*** (0.000363)	-0.000975*** (0.000191)	-0.000523 (0.000338)	-0.000294** (0.000125)	-0.00126*** (0.000293)	-0.00044*** (0.000138)
Holiday	-0.00151** (0.000593)	-0.000603** (0.00029)	-0.00183** (0.000756)	-0.000299 (0.000218)	-0.00137* (0.00045)	-0.000784*** (0.000238)
Constant	0.146*** (0.00592)	0.0303*** (0.00339)	0.195*** (0.00709)	0.00832*** (0.00154)	0.081*** (0.00528)	0.0229*** (0.0028)
Observations	4,627,886	4,627,886	4,657,513	4,657,513	4,656,386	4,562,656

Notes: Other included controls temperature, lunar luminosity, rainfall, snowfall, daylight, dummies for days of the week, and fixed effects. Standard errors are clustered at the precinct level. $^* p < 0.05$, $^{\dagger} p < 0.1$, $^{\dagger\dagger} p < 0.01$, $^{\dagger\dagger\dagger} p < 0.001$.

B. The Possibility of Discretion

If voluntary discretion to exert less effort is one of the mechanisms behind lower rates of apprehension later in the month, then the tasks possessing less leeway in the potential range level should exhibit an attenuated cycle.

In the SOF data, the decision to initiate a stop can come from two different sources. The first source occurs when a police officer conducts a self-initiated stop during his patrol. The second source of a stop occurs when a police officer responds to calls from the public. These calls for service are communicated to a police officer via police radio, are assigned a job number, and are generally considered more urgent due to the immediacy of the assistance request. Logically,

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Nonetheless, calls for service do not have to be equal in their severity and immediacy. Some calls could involve minor public infractions or delayed reports. These calls, due to their lesser importance, allow for a greater degree of effort adjustment. One way to narrow down the list of tasks which further deprive police officers of the latitude to shirk is to consider the outcome of service calls resulting in arrests are, on average, an indication of their importance and immediacy. Therefore, to estimate this effect, model (3) is estimated, which takes as its unit of analysis a stop involving arrest:

(3)

The dependent variable is Y_{it} , which equals one if an arrest was made due a service call and zero if it was made due to a self-initiated stop by an officer. Given the binary nature of the dependent variable, equation (3) is a linear probability model.

Given that β_1 is the coefficient on the variable X_{it} , the adjusted R-squared is 0.00000912.

scaling down on the first⁴⁹. This conclusion relies on the assumption that the fraction of crimes discovered through patrolling in the second half is lower than in the first half⁵⁰ and that the fraction of crimes reported by the public does not increase in the second half. This assumption is not necessarily true. It is possible that during the earlier days of the month different types of crimes are committed. These types might differ in their discovery and reporting rates from the rest of crimes. Certain substances related offenses are prime examples of this in February welfare disbursements

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(4)

This specification is identical to equation (1), with the only difference arising from the inclusion of an interaction variable δ_{it} . Each of the six dependent variables from equation (1) are considered.

The standalone indicator variable for high income is not included in equation (4) as it is perfectly collinear with the month fixed effects. In this specification, the coefficient on δ_{it} captures the difference in activities between the second and first halves of a month for all precincts, while

The third column, which considers stops as the dependent variable, offers a somewhat different story. Lower welfare precincts have an attenuated cycle compared to higher welfare precincts experience an additional decrease of 0.00065 in the number of stops during the last two weeks of the month. This drop is 76.5 percent of the one experienced by the higher welfare precincts. Although the percentage difference appears large, it is important to note that these unproductive stops exhibited the weakest cycle, with a difference of only one-half of a month. Notwithstanding this smaller variation, it appears that unproductive stops in lower welfare precincts undergo a larger decline in the later days of the month. This could potentially be explained by additional aversion toward officers during these times of disorder, once the numbers are met.

The fourth and fifth columns differentiate arrest rates across financially driven crimes, respectively. The coefficients are larger (12.7% and 14.4%) for lower welfare precincts. However, the absence of statistical significance on the interaction term precludes any definite conclusion. The absence of a significant difference between low and high welfare precincts for financially driven crimes is of particular importance given the previously mentioned literature linking the incidence of such crimes to the

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The sixth and final column considers arrests for controlled substances. In lower welfare precincts, a cycle pattern persists, albeit with a smaller magnitude compared with higher welfare precincts. Table 4 results in this column suggest a significant difference between the results derived using SSI versus public assistance. Using public assistance with higher welfare participation

intra-month relationships who fail to account for their potential being influenced by the intertemporality of effort allocation. This pattern is of researchers investigating police or criminal behavior.

Furthermore, this research reveals potentially concerning implications of the existence of public policies that mandate or expect a minimum level of enforcement. Such policies induce behavioral responses not consistent with police activities over time. Such might engender suboptimal police protection later days of the month and/or excessive policing in the earlier days. The focus on by savvy criminals who strategically allocate their criminal activities to predictably lower police presence, whereas the latter might delegitimize law in the eyes of the public. A full consideration of such effects is essential in implementing policies concerning performance standards for effective police procedures.

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