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Title:

*"A Study of the Macro Economic
Effects on the Cocaine Market in
New York"*

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RESEARCH

A Study of the Macro Economic Effects on the Cocaine Market in New York

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Abstract

This paper examines the impact of macroeconomic variables and other factors that influence the price of cocaine in New York using the Drug Enforcement Agency's System to Retrieve Information on Drug Evidence (STRIDE) dataset. Results suggest macroeconomic factors have varying effects on price and offer support for the "Expected Purity Hypothesis" proposed by past researchers.

Introduction

Economists have studied the impact of macroeconomic factors on substance abuse with most of the research focusing on alcohol – a legal and widely available depressant. Although most of the research has been done on alcohol, there is still an insightful body of evidence highlighting the effects of illicit drug use on macroeconomic factors.

For instance, Bassols and Castello, in their research on the effects of the recession on Spanish illicit drug consumption, posit two theoretical frameworks for thinking about illicit drugs and the macroeconomy. The first theory focuses on how illicit drugs follow a pro-cyclical pattern. Assuming illicit drugs are normal goods, their consumption will fall as income decreases. If illicit drugs follow a counter-cyclical pattern, then macroeconomic downturns could be leading people to be depressed and consume drugs as a result [20].

Furthermore, in a meta-analysis of 28 studies by Nagelhout et. al, researchers found the majority of the literature suggests, "[The] counter-cyclical mechanism [of] recessions and unemployment increase psychological distress, which increases drug use" [17].

The goal of this research is to test the counter-cyclical hypothesis on cocaine use in the state of New York by studying the following variables: unemployment, sale arrests, possession arrests, real median household income, graduation rate, and net grams.

Data

The Drug Enforcement Agency (DEA's) System to Retrieve Information from Drug Evidence (STRIDE) provides information on drug seizures and purchases for heroin, cocaine, and methamphetamines, detailing relevant variables such as quantity, potency, price, date (month and year), and location (state). This data is collected through the use of undercover agents via purchases or seizures. If undercover agents

are able to purchase the drugs, the purchase price is entered into the dataset. Otherwise, drugs acquired through seizure have a price entered as zero; therefore, this analysis only uses data from purchased drugs.

The use of the STRIDE data has been heavily discussed [13] [5] [14]. Horowitz notes that undercover agents would not purchase at prices that differ too greatly from the true market price since sellers would become suspicious of customers who are willing to pay too high of a price; therefore, the sellers would find the risk of engaging with such clientele far outweighed by the potential profits [12]. However, even if undercover agents consistently paid prices greater than the market value, a reliable metric to measure changes in drug price would still exist.

There are many observations present in the dataset that state that the purity of the substance is zero, or close to zero. I have allowed these observations to remain in the dataset based on the beliefs held by past researchers that these observations are representative of “rip-offs” that occur in the market [5].

Table 1 Summary statistics

| Variable | Mean | Std. Dev. | Min. | Max. |
|----------|--------|-----------|--------|--------|
| Price | 73.881 | 39.216 | 24.194 | 223.18 |
| purity | 45.27 | 22.465 | 0 | 90 |
| N | | 74 | | |

Table1 lists the summary statistics of relevant variables from the data. Price is measured as dollars per gram, and purity is measured as a percentage.

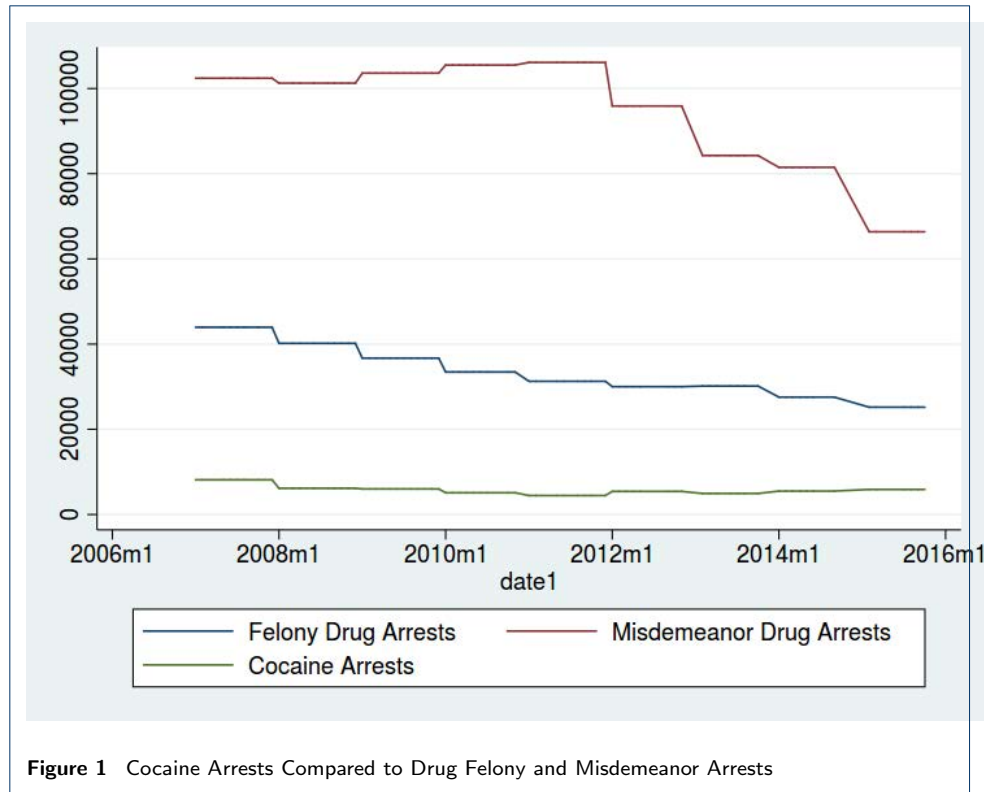
Macroeconomic variables include real median household income, unemployment rate and high school graduation rate. I also examined possession arrests (arrests for possessing cocaine) and sales arrests (arrests for distributing or attempting to distribute cocaine) to test the effect they had on price.

When looking at the arrest data retrieved from the state of New York, I compared misdemeanor drug and felony arrests to total cocaine arrests. Both of the former variables have declined in recent years, while cocaine arrests have remained steady. (Figure 1).

The farming of coca leaves has not been factored into the analyses because farming costs account for less than one percent of cocaine’s final price [10]. Tom Wainwright, journalist and author of popular book, “Narconomics,” states that increasing the cost of farming coca leaves would have a similar effect on price that increasing the price of da Vinci’s paint supplies would have on the cost of the Mona Lisa [23]. Essentially, the effect of cocaine’s raw inputs on its final price is negligible.

Methodology and Results

The model is composed of monthly data, beginning in January 2007 and concluding in October 2015. I estimate Equation 1 using the Prais-Winston estimator to correct for detected first-order serial correlation. I took the natural log of the following variables: price, possession arrests, sales arrests, real median household income, and netgrams. This approach allows normalization of the data I have obtained, while also offering ease of interpretation of the coefficients since they can be read as percentages.



Evidence suggests that unemployment is positively correlated with cocaine use [27]. Other possible measures of drug abuse and labor market outcomes include wages and cocaine use. Research suggests that cocaine abuse and wages are primarily correlated over long horizons[3]. In order to test the competing hypotheses that cocaine price is countercyclical or procyclical, unemployment and real median household income are both necessary variables.

Sale arrests intuitively lead to lower supply and, therefore, higher prices. Sellers may demand a premium if they incur increased risks due to their work. Also, an increase in enforcement rates entails more arrests of buyers and sellers.

The criminality of cocaine in New York remained constant over the course of data I have compiled [19] which suggests that the overall enforcement level across the state has not changed. Therefore, increases in the following factors are possible explanations for the increases in sale and possession arrests: number of sellers, number of sales, number of buyers, or number of purchases.

The high school graduation rate is another relevant variable for understanding cocaine price. Cocaine use among differing education strata has changed over the years with use declining among high school and college graduates most recently; at the same time, cocaine use is highest among non-high school graduates [26].

Quantity discounts are evident in the data: lower per gram prices are paid at higher ends of the supply chain. The data includes both large scale purchases from distributors as well as low quantity purchases at the “street level.”

The estimation was as follows:

$$\begin{aligned}
 CocainePrice = & \alpha + \beta_1 unemployment + \beta_2 salearrests + \beta_3 possessionarrests \\
 & + \beta_4 realmedianhouseholdincome + \beta_5 graduationrate + \beta_6 netgrams + \varepsilon
 \end{aligned}
 \tag{1}$$

| VARIABLES | (1) CocainePrice |
|---------------------------|-----------------------|
| unemployment | 0.0317 (0.0573) |
| SaleArrests | 0.280 (0.414) |
| PossessionArrests | -0.0745 (0.277) |
| RealMedianHouseholdIncome | -7.624*** (2.676) |
| graduationrate | -8.530** (3.832) |
| NetGrams | -0.198*** (0.0259) |
| Constant | 94.74*** (29.48) |
| Observations | 74 |
| R-squared | 0.599 |

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

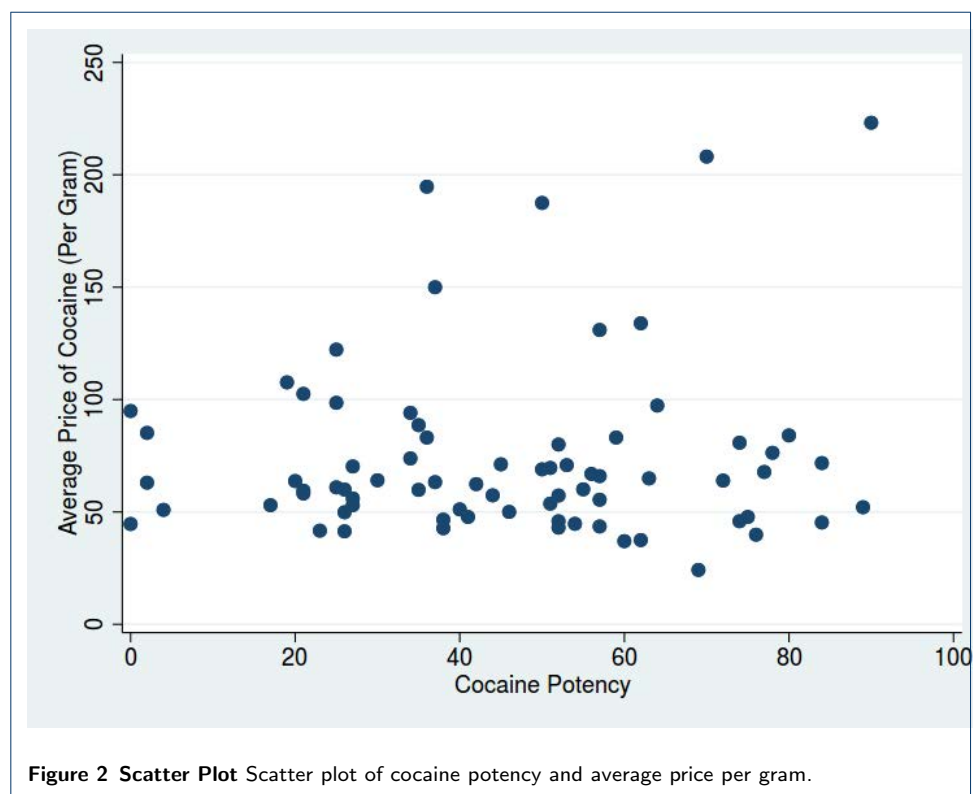
STRIDE does not differentiate between the two types of cocaine which is consistent with research that found differentiating the two to be unnecessary. Popular opinion maintains that “crack” cocaine is cheaper than powdered cocaine. Caulkins states, “Crack has been widely believed to be cheaper than powder cocaine, and this ‘fact’ has been used to help explain why US drug problems worsened in the 1980s. However, crack is not, in fact, cheaper per pure unit than powder cocaine” [7]. Therefore, the inclusion of all cocaine purchases (this includes cocaine derivatives such as “crack”) by DEA agents as one good is nonproblematic since the variable of interest is price.

Estimates of both sale and possession arrests are not statistically significant. For example, Caulkins and Reuter find that enforcement policies only have an effect up to a certain point and beyond that there are diminishing, marginal returns; they claim that current enforcement efforts could be reduced with minimal effect on drug price or use [6].

Perhaps the most surprising finding is the lack of association between price and purity (Figure 2). Caulkins notes, “...because quality control is difficult for illicit

products, price is governed more by the expected purity than by the actual purity of the product” [11]. This claim has developed into what is called the “expected purity hypothesis” – customers pay the purity they expect and not the purity they actually receive. Caulkins claims that this phenomenon is the result of cocaine’s status as an “experience good”; essentially, both buyers and sellers are unaware of the quality of the good they are purchasing at the point of sale [11].

To further this point, clinical studies that show that experienced cocaine users often struggle to distinguish between low purity cocaine and lidocaine [14]. Analysis of drug samples show that street drugs are often cut with many differing substances [8]. The lack of inclusion of low potency samples within the observations is problematic. Furthermore, questions are raised as to why sellers who do not dilute their product are willing to miss out on the financial advantages of doing so. The best explanation is that this experience good should be classified as a “double experience good” since knowledge of the true quality is sparse among buyers and sellers alike [9]. In short, there are asymmetric information problems, all the way down the supply chain.



In the model, there is a statistically significant negative coefficient between real median household income and the price of cocaine. This supports the countercyclical hypothesis. It has been shown that stress among existing drug users leads to greater use and dependency [1]. In fact, Arkes has found that weaker economies lead to greater drug and alcohol use among teenagers [4]. Illicit drug use is often

funded by other illicit activities [2]. Buchmueller and Zuvekas discovered a negative relationship between price and income among prime-age men who engage in “problematic drug use” [24]. Considering these “problematic” users make up the large portion of the consumers, the strongly negative relationship between income and price fits with past research.

In addition, the variable netgrams is significant. It has been observed that large quantity discounts exist in the cocaine market, as they do in other markets [2].

Concluding Remarks

In conclusion, the findings of this paper support the conclusion that cocaine prices in New York are countercyclical. Both the real median household income and graduation rate illustrate how a decrease in education as well as a decrease in salary are correlated with an increase in the price of cocaine.

Admittedly, more research is needed on income effects on cocaine price. While numerous factors were evaluated with the construction of this paper, more in-depth consideration of real median household incomes and graduation rates is needed. Following the work of Buchmueller and Zuvekas, greater research should be performed on income at deeper levels of analysis, taking into account demographics and income levels.

References

1. Amy Young, Carol Boyd, and Amy Hubbell Prostitution, Drug Use, and Coping with Psychological Distress *Journal of Drug Issues* October 2010
2. Anne Line Bretteville-Jensen Illegal drug use and the economic recession—What can we learn from the existing research? *International Journal of Drug Policy* September 2011
3. Denise Kandel, Kevin Chen, and Andrew Gill The Impact of Drug Use on Earnings: A Life-Span Perspective *Social Forces* 1995
4. Jeremy Arkes Does the economy affect teenage substance use? *Journal of Health Economics* 2007
5. Jeremy Arkes, Rosalie Liccardo Pacula, Susan M. Paddock, Jonathon Caulkins and Peter Reuter “Why the DEA STRIDE Data are Still Useful for Understanding Drug Markets” *NBER Working Paper Series* August 2008
6. Jonathon Caulkins and Peter Reuter How Drug Enforcement Effects Drug Prices *Crime and Justice* 2010
7. Jonathon Caulkins Is crack cheaper than (powder) cocaine? *Addiction* November 1997
8. Jonathon Caulkins and Peter Reuter Illegal Lemons: Price Dispersion in Cocaine and Heroin Markets *Bulletin on Narcotics* 2004
9. Jonathon Caulkins Price and Purity Analysis for Illicit Drugs: Data and Conceptual Issues *Heinz College Research* May 2005
10. Jonathon Caulkins and Peter Reuter What Price Data Tell Us About Drug Markets *Journal of Drug Issues* July 1998
11. Jonathon Caulkins Developing Price Series for Cocaine *RAND* 1994
12. Jonathon Caulkins Domestic Geographic Variation in Illicit Drug Prices *Journal of Urban Economics* 1995
13. Joel L. Horowitz Should the DEA’s STRIDE Data be Used for Economic Analysis of the Market for Illicit Drugs? *Journal of the American Statistical Association* December 2001
14. Joel L. Horowitz Should the DEA’s STRIDE Data be Used for Economic Analysis of the Market for Illicit Drugs? Rejoinder *Journal of the American Statistical Association* December 2001
15. Manolis Galenianos, Rosalie Liccardo Pacula, and Nicola Persico A Search-Theoretic Model for the Retail Market for Illicit Drugs *Review of Economic Studies* July 2012
16. Manolis Galeniano and Alessandro Gavazza A Structural Model of the Retail Market for Illicit Drugs *American Economic Review* March 2017
17. Gera E. Nagelhout, Karin Hummel, Moniek C.M. de Goeij, Hein de Vries, Eileen Kaner, and Paul Lemmens How economic recessions and unemployment affect illegal drug use: A systematic realist literature review *The International Journal of Drug Policy* June 2017
18. National Institute on Drug Abuse What is the scope of cocaine use in the United States? May 2016
19. New York State Penal Law Article 220
20. Nicolau Martin Bassols and Judit Vall Castello Effects of the great recession on drugs consumption in Spain *Economics and Human Biology* 2016
21. U.S. Department of Justice Drug Enforcement Administration Drugs of Abuse: A DEA Resource Guide 2017 edition
22. Simon Burgess and Carol Propper Early Health-Related Behaviours and Their Impact on Later Life Chances: Evidence from the US *Health Economics* 1998
23. Tom Wainwright Narconomics: How to Run a Drug Cartel *Public Affairs* 2016
24. Thomas Buchmueller and Samuel Zuvekas Drug use, Drug abuse, and Labour Market Outcomes *Health Economics* 1998

25. Peter Reuter and Mark A.R. Kleiman Risks and Prices: An Economic Analysis of Drug Enforcement *Crime and Justice* 1986
26. Valerie Harder and Howard Chilcoat Cocaine Use and Educational Achievement: Understanding a Changing Association Over the Past Two Decades *American Journal of Public Health* 2011
27. Ziggy Mac Donald and Stephen Pudney Illicit Drug Use, Unemployment, and Occupational Attainment *Health Economics* 2000

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