The Effects of Drug Use on Capital Accumulation

Tito Belchior S. Moreira[*]
Adolfo Sachsida[**]
Paulo Roberto A. Loureiro[***]

Abstract: This paper analyzes the effects of drug use on capital accumulation in a modified version of the Ramsey's model. We show that the equilibrium per capita stock of capital is smaller than in the original model, which implies that drug use has a negative impact on capital accumulation.

Keywords: Drug use. Willingness to work.

JEL classification: K42; K49

Resumo: Este artigo analisa os efeitos do uso de drogas sobre a acumulação de capital em uma versão modificada do modelo de Ramsey. Nós mostramos que o equilíbrio do estoque de capital *percapita* é menor do que no modelo original, implicando que o consumo de drogas tem um impacto negativo sobre a acumulação de capital.

Palavras-chave: Consumo de drogas. Disposição para trabalhar.

Classificação JEL: K42; K49

[*] Universidade Católica de Brasília: tito@pos.ucb.br
[**] Universidade Católica de Brasília: sachsida@hotmail.com
[***] Universidade de Brasília: loureiro77@hotmai.l.com

1. Introduction

The evidence of a strong connection between illicit drug use and a wide range of criminal activities seems to be overwhelming for many economists (ROTTENBERG, 1968; HOLAHAN, 1972; MOORE, 1973; MICHAELS, 1987; REUTER, MACCOUN e MURPHY,1990; LEE, 1993; ENTORF e WINKER, 2001; JOFRE-BONET e SINDELAR, 2002; ARAUJO e MOREIRA, 2004). Illegal drugs, such as marijuana and cocaine, and legal ones, like alcohol, are frequently associated with criminality, car accidents, and misconduct. However, drug use may also affect economic other economic activities.

Kaestner (1998), for example, have studied the effects of drug use on poverty, focusing on its impact on consumption, capital and wealth. From an empirical analysis of two national samples[1] for young adults, he concluded that drug use is associated with an increased poverty.

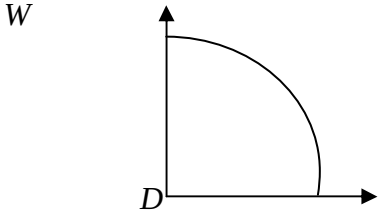
Marwick (1999) have shown that the belief that most people who use illicit drugs are unemployment and concentrated in impoverished parts of inner cities is a myth. In 1997, 70% of the 6.3 million persons between the ages of 18 and 49 years who admitted using illicit drugs were full-time employees.

In this paper we investigate the effects of drug use on capital accumulation by using a modified Ramsey's model (1928), which allows for the consumption of drugs. In the next section, we present the basic model and, in section 3, the conclusions.

[1] One sample is drawn from the National Household Survey of Drug Abuse (NHSDA), and the other from the National Longitudinal Survey of Youth (NLSY).

2. The Model

Let us assume that the willingness to work, *W*, is a function of the amount of drugs used, that is $W = W(D)$. We admit that the higher the consumption of drugs, the smaller the willingness to work[2]. In Graph 1, we represent a possible relation between drug use and willingness to work:



Graph 1- Relation between drug use and willingness to work

Where $W_D < 0$ and $W_{DD} < 0$. Let $\varepsilon = \frac{\partial W}{\partial D}\frac{D}{W} < 0$ be the willingness to work-drug use elasticity. Note that when $D = 0$, the willingness to work is maximum and $|\varepsilon|$ approaches 0. Inversely, when D approaches the maximum value, $|\varepsilon|$ approaches infinity, a situation in which the willingness to work is null.

Let $d = \frac{D}{WN}$, where N is the population, and WN is referred to as effective labor. Hence, $\frac{\partial d}{\partial t} = \frac{\partial D/\partial t}{WN} - \frac{\varepsilon(\partial D/\partial t)}{WN} - \frac{nD}{WN}$,

[2] For tractability reasons, we assume that even small quantities of drugs have a negative impact on willingness to work. Some could say that small quantities of drugs may increase this willingness but the effect of drug use on work-loss disability days may offset this positive effect since.

where $\frac{\partial N / \partial t}{N} = n$. Let $Y = F(K, WN)$ be a production function with a constant return to scale in two arguments, capital (*K*), and effective labor (*WN*), to be combined to produce output (*Y*), where $F_K > 0, F_{KK} < 0, F_{WN} > 0, F_{WN,WN} < 0$. Let $k = \frac{K}{WN}$, then $\frac{\partial K / \partial t}{WN} = \frac{\partial k}{\partial t} + nk(\frac{\varepsilon}{1-\varepsilon}) + nk$.

The household's budget constraint is given by (ignoring the time index)

$$\frac{\partial K}{\partial t} = F(K, WN) - D,$$

so by dividing both sides by *WN* yields $\frac{\partial K / \partial t}{WN} = F(\frac{K}{WN}, 1) - \frac{D}{WN} = f(k) - d$.

Since $\frac{\partial K / \partial t}{WN} = \frac{\partial k}{\partial t} + nk(\frac{\varepsilon}{1-\varepsilon}) + nk$,

then $\frac{\partial k}{\partial t} = f(k) - nk(\frac{1}{1-\varepsilon}) - d$.

The economy is populated by infinitely living individuals, with the population growing at rate *n*. Each consumer is a potential drug user, and solves the following maximization problem:

$$\text{Max } V_s = \int_0^{\infty} u(d) e^{-\Theta t} dt \quad (1)$$

$$\text{s.t. } \frac{\partial k}{\partial t} = f(k) - nk(\frac{1}{1-\varepsilon}) - d \quad (2)$$

$u_d > 0, U_{dd} < 0$. The Hamiltonian associated with the maximization problem is

$$H = \left\{ u(d) + \lambda \left[f(k) - nk(\frac{1}{1-\varepsilon}) - d \right] \right\} \quad (3)$$

First-order conditions for maximization are:

$$u'(d) = \lambda \quad (4)$$

$$\frac{d\lambda}{dt} - \Theta\lambda = -\lambda(f_k - \frac{n}{1-\varepsilon}) \qquad (5)$$

$$\lim_{t \to \infty} \lambda_t k_t e^{-\Theta t} = 0 \quad (6)$$

From (5) evaluated in the steady state, the capital stock of equilibrium is given by:

$$f_k(k^*) = \Theta + \frac{n}{1-\varepsilon} \quad (7)$$

By comparing this expression with the modified golden rule in the original Ramsey's model, $f_k(k^*) = \Theta + n$, allows us to conclude that the stock of capital in the present model is in general lower than the stock of capital in the Ramsey model. In other words, the use of drugs affects negatively the per capita stock of capital and income.

3. Conclusion

In this paper we analyze the effects of drug use on capital accumulation in a modified version of the Ramsey's (1928) model. We have shown that in equilibrium the per capita stock of capital is smaller than in the original model, which implies that drug use has a negative impact on capital accumulation.

Acknowledgments
The authors wish to thank Jaime Orrillo and Emilson Silva for his comments. The usual disclaimer applies.

References

ARAUJO, R.; MOREIRA, T. A dynamic model of production and traffic of drugs. **Economics Letters**, 82, 371 – 376. 2004.

ENTORF, H.; WINKER, P. **The Economics of Crime**: Investigating the Drugs-Crime Channel Empirical Evidence from Panel Data of the German States. Wurzburg Economic papers, n.29. University of Wurzburd, Mannheim, Germany, 2001.

HOLAHAN, J. **The Economics of Heroin**. In: Dealing with Drug Abuse: A Report to the Ford Foundation. Praeger, New York, 1972.

JOFRE-BONET, M.; SINDELAR, J. **Drug Treatment as a Crime Fighting Tool**. NBER, Working Paper 9038, 2002.

KAESTNER, R. **Does Drug Cause Poverty?** NBER Working Paper N° W6406, 1998.

LEE, L. Would Harassing Drug Users Work. **Journal of Political Economy**, 101, 939 – 959, 1993.

MARWICK, C. Illicit drug uses not idle; report says 70% go to work. **The Journal of the American Medical Association**, v.282, issue: 14: 1320–1321, 1999.

MICHAELS, R. **The Market for heroin before and after legalization**. In: Dealing with Drugs: Consequences of Governmental Control, edited by Ronald Hamowy. Lexington, Mass.: Heath, 1987.

MOORE, M. **Policies to Achieve Discrimination on the Effective Price of Heroin**. A.E.R. Papers and Proc. 63 (May): 270 – 277, 1973.

RAMSEY, F. A Mathematical Theory of Saving. **Economic Journal,** 38, n.152(Dec.),543-559, 1928.

REUTER, P.; MACCOUN, R.; MURPHY, P. **Money from Crime**: A study of the Economics of Drug Dealing in Washington, D.C. Santa Monica, Calif.:RAND Corp., Drug Policy Res.Center, 1990.

ROTTENBERG, S. The Clandestine Distribution of Heroin, Its Discovery and Suppression. **Journal of Political Economy**, n.76, (January/February): 78-90, 1968.