The Effects of Drug Use on Capital Accumulation

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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 per capita 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

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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](image)

Where $W_D < 0$ and $W_{DD} < 0$. Let $\epsilon = \frac{\partial W}{\partial D} \frac{D}{W} < 0$ be the willingness to work-drug use elasticity. Note that when $D = 0$, the willingness to work is maximum and $|\epsilon|$ approaches 0. Inversely, when $D$ approaches the maximum value, $|\epsilon|$ 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, $\frac{\partial d}{\partial t} = \frac{\partial D}{\partial WN} - \frac{\epsilon (\partial D / \partial t)}{WN} - \frac{nD}{WN}$.

\(^2\) 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

\[
\frac{\partial K}{\partial t} / WN = \frac{\partial k}{\partial t} + nk\left(\frac{\varepsilon}{1-\varepsilon}\right) + nk .
\]

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

\[
\frac{\partial K}{\partial t} / WN = F\left(\frac{K}{WN}, 1\right) - \frac{D}{WN} = f(k) - d .
\]

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

\[
\frac{\partial k}{\partial t} = f(k) - nk\left(\frac{1}{1-\varepsilon}\right) - d .
\]

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:

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

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

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

\[
H = \left\{ u(d) + \lambda \left[ f(k) - nk\left(\frac{1}{1-\varepsilon}\right) - d \right] \right\} \quad (3)
\]
First-order conditions for maximization are:

\[ u'(d) = \lambda \]  \hspace{1cm} (4)

\[
\frac{d\lambda}{dt} - \Theta \lambda = -\lambda \left( f_k - \frac{n}{1 - \varepsilon} \right) \]  \hspace{1cm} (5)

\[ \lim_{t \to \infty} \lambda_t k_t e^{-\Theta t} = 0 \]  \hspace{1cm} (6)

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

\[ f_k (k^*) = \Theta + \frac{n}{1 - \varepsilon} \]  \hspace{1cm} (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.

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References


