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Crime and Punishment with Habit Formation

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Abstract

Moral concepts affect crime supply. This idea is modelled assuming that illegal activities is habit forming. We introduce habits in a intertemporal general equilibrium framework to illegal activities and compare its outcomes with a model without habit formation. The findings are that habit (i) reduces the crime level; (ii) reduces the marginal effect of illegal activities return on crime; (iii) reduces the efficacy of punishment.

Key-Words: Crime, Habit formation, Punishment.

JEL Class: K42, K14.

1 Introduction

In the seminal paper of Becker and Murphy (1988) habit was included in the utility function to describe consumption behavior of harmful goods, notably drugs. In the present paper we merge the Becker and Murphy insight about this link between illegal behavior and habit with the traditional crime and punishment approach due to Becker (1968) in a general equilibrium framework.

The existence of habit formation due to factors such as social interactions may affect the behavior of agents in crime supply. Factors such as culture or religion provide social incentives that may induce habits in illegal activities. For example, surveys in Britain and the United States have indicated that at least a third of the citizens in both countries believe that religion provides a sociocultural and/or spiritual foundation for curtailing criminal behavior (Banks, Maloney and Wittrock, 1975; Jensen, 1981). Ellis and Peterson (1996) find that more religious countries have lower crime rates than less religious countries, at least regarding property crimes, using data from 13 industrial nations.

On the other hand Gaviria (2000) demonstrates, using a myriad empirical evidence — both statistical and anecdotal — that the daily contact of youth with criminal adults

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and criminal peers results in the erosion of morals and hence in a greater predisposition toward crime.

The insight that through the process of habit formation, one's own past decisions might influence the utility yielded by current decisions is hardly new; see, for example, Marshall (1989) and Pareto (1901).

In fact the habit formation hypothesis has been applied in many issues such as endogenous growth models (Carroll et al, 2000), cyclical consumption (Dockner and Feichtinger, 1993), aggregate savings (Alessie and Lusardi, 1997), money and growth (Faria, 2001), environment (Ono, 2002), fiscal policy (Burnside et al, 2004) and monetary policy (McCallum and Nelson, 1999, Amato and Laubach, 2004), to mention a few. All these papers introduce habit in consumption. Nonetheless, Faria and León-Ledesma (2004) uses habits in number of hours worked to study labor supply. In fact, it is not only in consumption that habits may occur. Becker and Murphy (1988, p. 695), for example, explain that: "Not only cigarettes, alcoholic beverages, and cocaine are obviously addictive, but many other goods and *activities* have addictive aspects".

In this paper we assume that social incentives create an ethic that affects the number of hours allocated to criminal activities by a representative agent. This is modelled by assuming that crime is habit forming. The idea is quite intuitive: past crime forms a stock of habits that affect agents' disposition towards present crime.

This paper is organized as follows. Section 2 develops the model, characterizes equilibrium and shows the main result. Section 3 provides concluding remarks.

2 The Model

While agents are stimulated to engage in criminal activities according to the expected positive returns, they are also subject to the effects of crime, with loss in income. According to this idea, we may argue that the total expected income (Y) of a representative agent of this economy will be given by (1).

$$\pi P + (1 - \pi)[f(k, o)(1 + \phi(o, \bar{o}))] \quad (1)$$

where

$$\phi(o, \bar{o}) \begin{cases} = 0, & \text{if } o = \bar{o} \\ > 0, & \text{if } o > \bar{o} \\ < 0, & \text{if } o < \bar{o} \end{cases}$$

Thus, $f(k, o)$ represents the production function, where k is the capital stock and o the number of hours spent on criminal activity. On the other hand, $\phi(o, \bar{o})$ represents the net income function of the criminal activity, where the agent chooses the number of hours that will be dedicated to crime, when faced with the average number of hours of the other agents, $\bar{o}$. This type of function is commonly used in illicit activity models

such as in Ehrlich and Lui (1999) and Teles (2004). Complementarily, π is the probability of punishment, and P is the payoff of the punishment. In fact, P may represent the consumption supplied for criminals by the society in prisons, for example. (see Fender, 1999).

The production function may be represented by,

$$f(k, o) = Ak^\beta (1 - o)^{1-\beta} \quad (2)$$

where agents devotes the fraction $(1 - o)$ of his non-leisure time to current production, A is the level of technology, and β is the capital-share.

If we consider that criminal activity (o) directly affects the well-being of an agent, and if we incorporate this in his utility function, and that the individual cares not only about consumption (c) and the instantaneous flow of offenses (o), but also takes into account his past criminal activities, captured by his stock of habits (h), then the instantaneous isoelastic utility function proposed by Abel (1990) is adapted to introduce o :

$$U(c, o, h) = \frac{[(o/h^\gamma)^\alpha c^{1-\alpha}]^{1-\sigma} - 1}{1 - \sigma} \quad (3)$$

where α is a positive parameter that lies in the unitary interval, σ is the coefficient of relative risk aversion, and $\gamma \in [0, 1)$ indexes the importance of habits. If $\gamma = 0$, then habit stock has no relevance, and the utility function reduces to the traditional case. While if $\gamma = 1$, crime relative to habit stock is very important.

Following Carroll et al. (2000) it is assumed that the stock of habits is a weighted average of past offenses. The stock of habits evolves according to:

$$\dot{h} = v(o - h) \quad (4)$$

where v is a positive parameter determining the relative weights of offenses at different times. The smaller is v , the less important is offenses in the recent past.

The individual maximizes a discounted, infinite stream of utility:

$$\begin{aligned} \text{Max}_{c,o} \int_0^\infty U(c, o, h) e^{-\rho t} dt \\ \dot{k} &= Y - c - P \\ \dot{h} &= v(o - h) \end{aligned} \quad (5)$$

By substituting (1) and (3) in (5) and solving the problem, and applying the equilibrium condition $o = \bar{o}$, the following first-order conditions are obtained,

$$\lambda_k = \left[\left(\frac{o}{h^\gamma} \right)^\alpha c^{1-\alpha} \right]^{-\sigma} \left[\left(\frac{o}{h^\gamma} \right)^\alpha (1 - \alpha) c^{1-\alpha} \right] \quad (6)$$

$$-v \lambda_h = \left[\left(\frac{o}{h^\gamma} \right)^\alpha c^{1-\alpha} \right]^{-\sigma} \left[\alpha \frac{o^{\alpha-1}}{h^{\gamma\alpha}} c^{1-\alpha} \right] + \lambda_k \{ (1 - \pi) f_o + f \phi_o \} \quad (7)$$

$$\frac{\dot{\lambda}_k}{\lambda_k} = \rho - \{(1 - \pi) f_k\} \quad (8)$$

$$\dot{\lambda}_h = \rho \lambda_h - \left[\left(\frac{o}{h^\gamma} \right)^\alpha c^{1-\alpha} \right]^{-\sigma} \left[-\gamma \alpha \left(\frac{o^\alpha}{h^{\alpha\gamma-1}} \right) c^{1-\alpha} \right] + \lambda_h v \quad (9)$$

where λ_k and λ_h are the co-state variables of k and h respectively.

By substituting (6) in (7), and then this result in (9) and considering that in this model's steady-state the per capita variables remain constant, meaning that the shadow-price of capital and habits remains constant, we will have that the following equations establishes the steady-state condition.

$$\rho = \{(1 - \pi) f_k\} \quad (10)$$

$$\rho = \frac{h\gamma\alpha}{\left(\frac{\alpha}{o} \right) + (1 - \alpha) [(1 - \pi) f_o + f\phi_o]} \quad (11)$$

$$\pi P + (1 - \pi) f = c + P \quad (12)$$

$$o = h \quad (13)$$

Using the production function (3) in this system it is possible to study the effects of habit formation on crime, according to what is listed in propositions 1 to 3.

Proposition 1 *The importance of habit to the agent has a negative impact on his decision in crime practice if $\phi_o > 0$ and $\phi_{oo} < 0$.*

Proof: Solving the system (10)-(13), using (3) and applying the implicit function theorem to result we obtain that,

$$\frac{do}{d\gamma} = \frac{o\alpha}{\rho \left\{ [(1 - o) \phi_{oo} - \phi_o] (1 - \alpha) A \left(\frac{(1-\pi)\beta A}{\rho} \right)^{\frac{\beta}{1-\beta}} - \frac{\alpha}{\sigma^2} - \frac{\gamma\alpha}{\rho} \right\}} \quad (14)$$

Since $\phi_o > 0$ and $\phi_{oo} < 0$ the relation $\frac{do}{d\gamma}$ is negative.

Proposition 2 *The importance of habit to the agent reduces the effect of crime return on his decision in crime practice.*

Proof: The proof follows immediately from equation (14), where the marginal return of crime (ϕ_o) has a negative relationship with $|do/d\gamma|$.

Proposition 3 *The importance of habit reduces the efficacy of punishment*

Proof: Solving the system (10)-(13), using (3) and applying the implicit function theorem to result we obtain that,

$$\frac{do}{d\pi} = \frac{\left\{ (1 - \alpha) A \left[\frac{(1-\pi)\beta A}{\rho} \right]^{\frac{\beta}{1-\beta}} \right\} \left\{ \frac{A\beta^2}{(1-\beta)\rho} \left[\frac{(1-\pi)\beta A}{\rho} \right]^{-1} [(1 - o)\phi_o - (1 - \pi)(1 - \beta)] + (1 - \beta) \right\}}{\left\{ \frac{\gamma\alpha}{\rho} + \frac{\alpha}{o^2} + (1 - \alpha) A \left[\frac{(1-\pi)\beta A}{\rho} \right]^{\frac{\beta}{1-\beta}} [\phi_o - (1 - o)\phi_{oo}] \right\}} \quad (15)$$

where the importance of habit (γ) has a negative relationship with $|do/d\pi|$.

3 Conclusion

The tradition of the models addressing the economics of crime defines the decision of an agent participating in an illicit activity as a rational one, since it is an economic decision in which the benefits and costs of crime are weighed along with the alternatives. (Fender, 1999). From this perspective, this study has introduced habit in an intertemporal general equilibrium framework and demonstrates that habit reduces the rationality of crime, since both the returns to crime and punishment play a less important role in the agent's decision to engage in crime.

Propositions 1 and 2 state that when habit has a strong weight in the utility function the agent will practice less crime and the returns to crime become less important in his decision, respectively. These propositions are important because they lay the foundation to better understanding the lack of rationality which is frequently involved in criminality even in those cases in which the agent chooses not to engage in illicit activities, in spite of being more rational to do so.

Proposition 3 shows that an agent that attributes a strong weight to habit formation in his or her utility function cares less about the chances of being punished. This proposition corroborates that habit formation reduces the rationality of crime behavior and punishment loses its efficacy. This result is fundamental in the analysis of policies aimed at combating crime, since it becomes clear that under certain conditions investment in punishment may not be the most effective form of deterring crime.

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