

# **THE ENDOGENEITY OF TIME PREFERENCE AND ANALYSIS OF COLLECTIVE BEHAVIOR: INSIGHTS FROM THE STUDY OF RECOVERING DRUG ADDICTS, PRISONERS AND STUDENTS**

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***Abstract:** This essay proposes that time preference is an essential component of analysis of collective behavior and provision of public goods. It addresses the validity of the assumption that time preference, as a parameter in individual utility functions, is exogenous and fixed. While individual time discounting is used to predict many social phenomena, it is quite often applied in a fixed form where the possibility of change is rarely discussed. The mechanism of change in individual time discounting is explored in different social contexts, using student, inmate and drug addict populations. This study establishes that certain parameters, such as the length of exposure to new environment and new social connections, are of extreme importance in determining the degree of change in time discounting.*

***Key words:** public good, individual time discounting, social connections, change, collective action.*

It has been 50 years since Mancur Olson posited an interesting dilemma while describing organizations and large groups: members of the group might understand their common interest, yet when they pursue their individual goals a suboptimal outcome is often achieved instead. This observation is true when we are discussing competitive market place and the behavior of individual firms, the provision of such public goods like bridges and roads and individual indirect contributions to public goods provision via paying taxes. If people are left to their own individual self-interest in the context of voluntary participation the results are often quite dismal and less than what would have been accomplished had there been a system of compulsory action with certain reinforcements to increase motivation. Olson

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defines “public good” in a classic tradition as “any good such that, if any person  $X_i$  in a group  $X_1, \dots, X_i, \dots, X_n$  consumes it, it cannot feasibly be withheld from others in that group” (Olson, 1965: 14). He stresses that “large or latent groups have no tendency voluntarily to act to further their common interests” (Olson, 1965: 165), noting that the behavioral reinforcement would be especially difficult in these large groups. Take, for example, corruption: most people agree that it is bad for society. However, when you ask those who live in rather corrupt societies, like Ukraine, whether they would do anything about it (e.g. refuse the bribe or file a complaint about the corrupt official), most of the people prefer not to do anything, thus contributing to the existence of such suboptimal equilibrium. We can therefore conceptualize non-corrupt environment as a public good, thus potentially enriching an understanding of the public good provision dilemma. Under what conditions would members of a society or large organization shift from a suboptimal social equilibrium lamented by Olson to a more beneficial one?

Olson’s initial treatment of the problem of collective action focused on the specific problem of group size and how an increase in the number of people needed to coordinate to achieve an efficient outcome exacerbated that problem. The solutions he cited thereafter focused on the implementation of private incentives for collective action (e.g., insurance programs offered by labor unions) or a hierarchical organizational structure that, from each individual’s perspective, had the effect of decreasing the size of the relevant group (e.g., Lenin’s hierarchical structure for the Communist Party). Once the lessons of Olson’s analysis had been absorbed by other social scientists and a full connection made to game theory and the Prisoners’ Dilemma in particular, other alternative solutions were proposed and explored, both theoretically and empirically. One “solution” that gained special traction was repeated play of the PD as a mechanism for inducing cooperation as an equilibrium (Axelrod 1984). This, in turn, brought to the fore the relevance of another parameter in people’s valuation of outcomes – the discount they applied to the future, with the conclusion that the lower that discount, the easier it is, *ceteris paribus*, to have efficient collective action be an equilibrium (Aumann 1959, Friedman 1971).

An *individual time discounting* or time preference, a core concept of economic theory, refers to the relative value placed by people on benefits or costs in the immediate as opposed to a more distant future. Among numerous other applications of time discounting as a critical behavioral parameter, there are corruption (Klochko and Ordeshook 2005), cooperative action and coalition formation (Axelrod 1984), and the establishment of stable social institutions (Elster 1992). Clearly, the individual time discounting is an important element of understanding a variety of social phenomena and to the analysis of collective action. Generally and largely as a matter of convenience, the parameter denoting *time preference* (discount rate) in the

usual conceptualization of individual preferences is assumed to be a constant. This is done not because researchers necessarily believe this to be a valid assumption but rather because it is unclear how to make time preference endogenous to their models.

The issue this essay addresses specifically, then, is the validity of the assumption that time preference as a parameter in individual utility functions is exogenous and fixed and seeks to show empirically that it varies and is endogenous to situations in a coherent way. With this as our focus, we consider here survey data drawn from three distinct populations – drug addicts attending Cocaine Anonymous meetings, the comparison of Ukrainian students studying in the West as opposed to in Ukraine, and prisoners in Ukrainian prisons – in which we argue that individual time discounting changes in a coherent and understandable way. The reader, of course, might balk at placing students, drug addicts and prisoners together in a single study, but we argue that these populations have at least one thing in common: their environment changes in a way that allows us to offer a reasonable hypothesis about how that change impacts the way they perceive and value the future. Indeed, there are assumptions in the literature about all of these populations that suggest the dynamic nature of time preferences within them and what we attempt here is to bring these populations together in order to unify an approach that to date is largely disjointed and specialized. In this way we hope to emphasize the necessity for studying the dynamics of time preferences in a general way as a factor pertinent to many social phenomena.

**Data collection:** To study all of the above-mentioned populations, simple mostly paper-based questionnaires have been administered using convenience sampling combined with a snowball method, when applicable. Ukrainian student population included a sample of Ukrainian college enrolled students and high school students (seniors) living in Ukraine (324 respondents) and students from Ukraine (and some other countries of former Soviet Union) who moved to the West to study (172 respondents) – specifically, the US, UK, France, Germany and Australia. The respondents have been identified using fellowship programs for Ukrainian student populations like USA/USA, Muskie exchange program, Freedom Support Act exchange program (USAID program). Drug addiction and recovery respondents were recruited at the multiple Cocaine Anonymous meetings in the Los Angeles area (141 attendees). The prison population was selected in Eastern Ukrainian prisons at the medium and low security levels (206 respondents). The questionnaires included multiple questions measuring the typical socio-demographic categories such as age, gender, marriage status, education, as well as questions pertaining to a specific population sample, like the self-reported length of the sobriety or prison term. The questionnaires have been administered in English (when approaching US population) or Ukrainian (when approaching Ukrainian population). Ukrainian students living in the Western countries were given a choice of the language catering to their cultural preferences.

**Measuring time discounting:** Among the questions included in the questionnaires, the most direct one pertaining to the issue of time discounting was “*Would you prefer \$200 today or \$500 in 6 months?*” (with an appropriate currency and amount adjustment in value for the Ukrainian samples). This question served as an indicator of individual time discounting: if the subject picks the former option, their time discounting is estimated as ‘high’; if they pick latter option they were said to have a ‘low’ time discount. The questionnaire administered in Ukrainian prisons provides more than one measure of time discounting, which includes questions about prison lottery (with a reward being a dinner) and the length of time one chooses to wait for a monetary reward (Klochko, 2008: 195-196). Admittedly, these are crude and imperfect measures, but the formulation of these questions comes from years of experimental work in economics. The decision to measure the individual time discounting in such a manner stems from the desire to establish continuity with intellectual tradition of behavioral economics and experimental psychology, which used very similar if not the same questions to study the time discounting parameter. For other attempts of measuring time discounts and discussion of these rates see Benzion, Rapoport and Yagil (1989), Horowitz (1991), Holcomb and Nelson (1992), Lowenstein and Prelec (1993), Green et al (1994), Chapman and Winquist (1998) and Frederick et al. (2002). To augment these questions student population respondents were also asked how much interest they would charge on money lent to an acquaintance (further discussion of this questionnaire and the details on student population can be found in Klochko 2006).

**College Education and Emigration:** Let us begin with the Ukrainian student population. Generally, the assumptions about student population are straightforward: when young adults go to college their perceptions and beliefs change in fundamental ways. They learn new subjects, they make new friends, and their political and social views change and, potentially, solidify. Usually a college-educated population differs from a non-college educated population on many parameters, including that of mean salaries, values, political participation and so on. What happens though when roughly half of the group leaves their country of origin and goes to another geographic location to obtain their advanced education? Specifically, although we might expect a person’s time preference to change as they age, will this change be impacted as well by their immediate environment? Will a college age population experience a different change when moved from a political-economic context that arguably punishes placing much weight on the future to one that rewards long term perspectives? And if so, how much of the change can be explained by selection processes versus the evolution of time preferences themselves? That is, although we can assume that those who choose to leave home for higher education differ in some fundamental way from those who do not, are these differences subject to continued evolution over time?

Turning now to a brief review of some descriptive differences between the two subpopulations, consider Table 1. Note a dramatic difference between the student population that had never studied in the West (both high school students and college students) and the one that did. It seems that, disproportionately, those who studied in the West exhibit a strong preference for discounting the future less (the relationship is in anticipated direction and significant at .000 level,  $\chi^2=79.196$ ).

**Table 1**  
*\$200 now versus \$500 later*

	Never studied in the West	Studied in the West
<b>\$200 now</b>	198 (58.6%)	27 (16.5%)
<b>\$500 later</b>	140 (41.4%)	137 (84%)

One can argue, of course, that the most motivated individuals left the former Soviet Union to study elsewhere and that by definition, only those with a long-term planning horizon (and low discounting time preference) would make such a choice. Table 2, then, reports logit regressions for a subsample of the college students, specifically, the group that chose to stay in their respective Western countries (from now on called ‘immigrants’). Higher coefficients mean higher estimated probability of low discounting.

**Table 2**  
*Logit regressions, Question 1, ‘immigrants’ only, \$200 now versus \$500 later*

	model 1	model 2	model 3	model 4	model 5	model 6	model 7
<i>intercept</i>	2.221 (1.491)	1.421** (.53)	2.202 (1.631)	1.782** (.500)	1.538 (1.672)	1.825** (.492)	2.363 (1.500)
<i>years in West</i>	-	-	.169** (.071)	.154** (.065)	-	-	-
<i>years in West %</i>	-	-	-	-	.042** (.017)	.036** (.015)	-
<i>years in college</i>	.341* (.135)	.340** (.130)	-	-	-	-	-
<i>career</i>	.119 (.297)	-	.066 (.320)	-	.061 (.320)	-	.106 (.295)
<i>religion</i>	-.004 (.175)	-	.003 (.183)	-	.007 (.183)	-	-.122 (.164)
<i>Gender (female)</i>	-1.454** (.469)	-1.466** (.456)	-1.522** (.509)	-1.570** (.501)	-1.513** (.509)	-1.579** (.501)	-1.27** (.449)
<i>marriage</i>	.218 (.514)	-	.114 (.517)	-	.129 (.513)	-	-.011 (.488)
<i>comm.</i>	-.439 (.442)	-	-.572 (.487)	-	-.588 (.492)	-	-.465 (.425)
<i>age</i>	-.027 (.047)	-	-.006 (.047)	-	-.020 (.047)	-	.012 (.045)
<i>adj R<sup>2</sup></i>	.179	.170	.196	.182	.202	.183	.11

This analysis suggests that the years spent in the West and years spent in college in general have positive relationship with a propensity of having a low time discount rate. At the time of this research (2004) the West was definitely more politically and economically stable than the successor states of the former Soviet Union: minimally, financial institutions functioned smoothly instilling consumer confidence and promoting opening both checking and saving accounts. At the same time, a new country of residence offers new sets of friends and acquaintances whose time preference can reasonably be expected to influence a newcomers' preference as well. Once an individual from the former Soviet Union enters a country that is more socially and economically stable with well-developed and stable financial and legal institutions he/she starts to exhibit behaviors that match their new surroundings. The longer the individual stays in the West, as this case illustrates, the more the change of the time discounting occurs.

Another interesting finding is that the level of education is also positively coordinated with the extension of the time horizon: by committing oneself to higher education the person already expresses the preference for low time discounting. But by continuing one's study a student apparently reinforces the values of delayed gratification. Interestingly, the study of delaying gratification in children noted that preschool measurement of delayed gratification significantly correlates with academic abilities (SAT) as well as other types of competence, like ability to cope with a variety of problems (Mischel et al 1992: 158). This finding suggests that the level of time discounting has long ranging consequences (in this case the preschool test of delayed gratification was significantly correlated with subsequent high school achievements or lack thereof). Of course, a higher level of education is commonly associated with higher income, and one consequence of higher income is the ability to postpone immediate gratification relative to those with lower incomes. Putting the Ukrainian-to-West transition aside, then, we can speculate that attending college with American middle class youth is a way to reinforce and/or acquire that same orientation to the future. We can assume a sort of memetic transformation, where memes of low time discounting spread from one individual to another through interaction (Dawkins 1976).

**Drug Addiction:** Moving to our second population sample – attendees at Cocaine Anonymous meetings -- one can say that immediate surroundings (similar to the student population discussed earlier) also play a crucial role in a person's descent into and recovery from self-destructive behavior, be it drug or alcohol addiction. Friends, acquaintances and significant others serve as role models and provide support and encouragement for patterns of behavior, good or bad. However, the substance use patterns can be changed and potentially disrupted by switching to another group of peers, which serves as the constant reinforcement of initial change or desire to

change as is quite often witnessed in members of groups like Alcoholics Anonymous or Narcotics Anonymous (McAuliffe et al 1991:1155).

It is well understood, of course, that the difficult problem is sustaining the recovery process even after an asserted commitment to sobriety has been made. Too often people relapse back to self-destructive choices, and here we must acknowledge the success of support programs that effectively help people overcome their addictions – Alcoholics Anonymous (AA), Cocaine Anonymous (CA), Narcotics Anonymous, and so on (Kalett 1996). It is reasonable to suggest that programs such as AA and CA do more than merely communicate costs and benefits when immersing a recovering addict in a sober peer group using a variety of social activities – picnics, camping trips, and so on. Indeed, the literature on addiction presents us with a specific hypothesis identifying the individual time discounting as a significant parameter. Quite often the studies of addiction refer to ‘common impatience’ of addicts and their propensity to engage in instant gratification as opposite to non-addicted individuals (Becker and Murphy 1988: 682). It has also been derived that addictions induce people to “discount future more heavily” (Becker and Mulligan 1997: 744; see also Ainslie 1992; Skog 1997; and Bretteville-Jensen 1999. For a potential source of contrary evidence see Ainslie and Haendel’s 1982 study of myopic discounting). The data support the notion that the greater temporal discounting is exhibited by the problem drinkers, opioid dependent participants, subjects with a past history of drug dependence, heroin addicts, needle sharers compared to light drinkers, and not addicted populations (Vuchinich and Simpson 1998, Madden et al 1997, Allen et al 1998, Kirby et al 1999, Giordano et al 2002). A parallel literature exists with respect to delinquency and crime, wherein a similar relationship is established between time discounting and the propensity to delinquency and gang membership as well as the importance of peer group associations. (See, for example, Gottfredson and Hirshi 1990, Wilson and Hernstein 1985, Nagin and Pogarsky 2001, and Johnstone 1983).

The specific hypothesis here is that the time discount addicts apply to the future is influenced by their regular participation in a 12-step recovery program. That is, regular participation in a voluntary recovery program extends people’s horizons such that they give future outcomes greater weight and more immediate outcomes less weight in day-to-day decisions. The data we report is also consistent with the argument that sustained participation in a program is crucial in the sense that the critical change in time discounting occurs sometime after five years of regular participation. One might infer the formal recognition of this effect on time discounting in the very philosophy of a ‘12-step program’. Defined so they require years to complete, such programs seem to proceed in accordance with Bickel and Johnson’s (2003: 435) recommendation that “individuals with sufficient experience in pursuing and accomplishing relatively long-term goals may be less susceptible to allowing the brief, intense reinforcing effects

of drugs to command a large portion of their behavior,” and that “an environment rich with such temporally extended activities may serve to condition lower rates of delay discounting.” If one completes step 3, there is a degree of instant gratification, but *at the same time* one is encouraged to anticipate the rewards of accomplishing steps 4 through 12. In a similar vein, 12-step approaches, and other similar addiction recovery strategies, tend to provide “immediate social reinforcement for abstinence, and withhold praise during periods of relapse” (Giordano *et al* 2002: 181).

Consider the data in Table 3 that divides our sample approximately in quarters according to the reported length of sobriety. The data are striking and the imputed relationship statistically significant at the .01 level of significance ( $\text{Chi}^2 = 6.69$ ). Specifically, we observe a nearly inverse relationship between length of sobriety and one’s choice of an immediate reward of \$200 over the more distant \$500. A somewhat finer breakdown of the data is more revealing. Table 3 also divides those who claim being sober less than five years into two categories – sober less than a year and sober for more than a year but less than 5. With a relationship significant at the .035 ( $\text{Chi}^2 = 6.71$ ), the data here are consistent with hypothesis that the critical change in individual discount rates occurs sometime after five years -- with the hypothesis that during first few years of involvement, recovery may be slow, at least as measured by time discounting. It is only after a full (even lifetime) commitment to the program that the fruits of participation are fully realized. We use the word ‘commitment’ meaningfully. If we consider question about the regularity of participation, of those indicating regular attendance, 43 (40.6%) chose \$200 while 63 (59.4%) chose \$500, whereas irregular attendees divide nearly equally between \$200 and \$500 (although only 35 (24.8%) respondents reported less than regular attendance and a bare majority chose \$200, the relationship is in the anticipated direction and significant at the .032 level ( $\text{Chi}^2 = 4.61$ ).

**Table 3**  
*Choice and Length of Sobriety*

	<i>prefer \$200 today</i>	<i>prefer \$500 in 6 months</i>
<i>Sober less than a year</i>	31 (53.4%)	27 (46.6%)
<i>1 &lt; sober &lt; 5 years</i>	13 (52%)	12 (48%)
<i>Sober &lt; 5 years</i>	44 (52%)	39 (47%)
<i>Sober greater than 5 years</i>	18 (31%)	40 (69%)

As a final assessment of the relationship in our data between sobriety and attendance on time preference, we note that respondents were also asked their gender, age, and religious conviction. Hence, the logical issue to explore is whether these more traditionally sociological variables account for some of the apparent impact



of sobriety and attendance. Table 4, then, reports the results of two logit regressions that differ only in the coding of length of sobriety. In the first measure, the variable “sobriety length” is coded according to the categories of the questionnaire whereas in the second it is dichotomous (less than 5 years versus greater than 5). The important thing to notice, now, is that none of these three demographic variables is statistically significant in either regression and that the regularity of attendance is marginally significant (at .05) only in the second. However, in both cases, the coefficient for length of sobriety is strongly significant (at .005). Insofar as gender, age and religious convictions are concerned, males and those 40 and over seem less likely to choose \$500 tomorrow over \$200 today, although no coefficient here is statistically significant, and religious conviction has no discernable impact whatsoever.<sup>1</sup> Note again, that being a female indicates the choice of immediate reward. This result is similar to the result in student population described earlier.

**Table 4**  
*Logit Regressions on Choice (standard errors in parenthesis)*

<i>variables</i>	<i>Model 1</i>	<i>Model 2</i>
Constant	-.261 (.821)	-.302 (.815)
Gender (f)	-.580 (.385)*	-.493 (.379)
Age	-.607 (.402)*	-.556 (.396)
Attendance	.317 (.240)	.403(.236)*
Sobriety length	.315 (.116)***	-
Sobriety (0, 1)	-	1.04 (.384)***
Religion	.062 (.139)	.065 (.139)
<i>R</i> <sup>2</sup>	.109	.110

Certainly it would be valuable to apply similar questions to addicts whose participation in CA failed to yield the desired sobriety or to those who, for one reason or another, ceased participation in the program, since, as we suggest earlier, this study leaves several important questions unanswered. For example, although there are good reasons for believing that programs such as CA are designed to operate directly on an addict’s time preference, it may also be the case that for biological reasons alone recovery requires an initially longer time horizon and less impatience. More critically, the bimodal distribution in our data in the duration of reported sobriety (i.e., the relatively fewer respondents indicating participation between 1 and 5 years in Table 3) suggests selection bias whereby those who sustain participation beyond a year in a recovery program are those with low discounts initially. That is, our data are also consistent with the hypothesis that rather than impact time preference, a 12-step

<sup>1</sup> Males are coded 0 and females 1; respondents 39 and under are coded 1, those 40 and over are coded 2). Religion coding is as follows: 0 – none; 1 – few if any in a formal sense; 2 – weak convictions; 3 – strong but irregular church attendance; 4 – strong and regular church attendance.

program merely filters on that preference so that those with high discounts relapse before five years. There has been some evidence to the latter discussed in a controlled study of smoking cessation participants where the high level of time discounting was associated with greater probability of relapse or poorer smoking cessation treatment response (MacKillop and Kahler 2009).

As always, of course, correlation cannot imply cause, especially in a cross-sectional study where self-selection can impact our sample of respondents. Indeed, it is especially dangerous to infer cause since our data does not allow us to test various hypotheses as to the specific mechanisms whereby participation in a CA program impacts time preference. If there is indeed a direct impact on time preference, is it, for instance, through a process of socialization via a new and different peer group, through the program's educational objectives of teaching persons the full consequences of their addiction, the attention given to long term goals set by a 12-step program, or simply that recovering addicts physiologically require less immediate gratification in the form of drugs as length of sobriety increases. Nevertheless, our data do lend weight, tentative as it might be, to the idea that not only is the discount people apply to the future subject to endogenous change, but that that change can be potentially effected by a drug recovery program. This study, then, is consistent with the findings of Bickel, Odum and Madden (1999) and Odum, Madden and Bickel (2002) that delay discounting is impacted by treatment experience. Moreover, our finding that the inferred impact of a 12-step program becomes evident only after a sustained period of participation is consistent with the logical view that "addiction does not immediately diminish in strength when drug use stops, but addiction declines incrementally with sustained nonuse" (McAuliffe et al 1990-1: 1153), to which we would only add that the period of nonuse should not be measured in weeks or months, but in years and until the basic parameters of individual choice that correlate with addiction are changed.

Moreover, "addiction arises as the result of voluntary choices; once established, it undermines the capacity to choose or at least to make rational choices... Cravings can be overcome by setting up appropriate incentive systems" (Elster 1999: 190-191). It seems that given the complexity of addictive behavior Cocaine Anonymous groups try to do just that, to introduce the incentive systems and new motivators which are placed in a future and thus by definition tend to extend one's time horizon. Again, it is important to note that one of the major parameters that change the preference is a presence of social constraints. As Herrnstein and Prelec note, "without the social supplements, many of us might work less and eat more cake that is optimal

for society as a whole” (1992: 352). Ultimately, then, the organizations like CA and AA try to provide their members with ever present or, at least, ever-available social reinforcements that help people to maintain the healthiest preference possible.

**Prisoners:** Finally, the third group which comes into our focus on time discounting is that of a prison population and specifically inmates of a Ukrainian prison. Again, one rationale for incarceration, in addition to simple punishment, is to ‘rehabilitate’ prisoners and prepare them for a return to the ‘normal’ population. Our research here asks if this change in fact occurs in the Ukrainian penal system. It is assumed that rehabilitation entails a change in time discounting since the criminology literature suggests that criminals tend to have an immediate gratification orientation as compared to the regular population (Gottfredson and Hirshi, 1990:89). Thus the change in time discounting might indicate successful rehabilitation.

Looking then at the results reported in Table 5, it seems that the more time one spends in a Ukrainian prison the less likely a person is to extend their time horizons (variable ‘time spent vs. left’). This finding, albeit insignificant in the regression, quite possibly highlights the problems of a penal system in which the primary aim is incarceration as opposed to rehabilitation. Indeed, time preferences change, but not in a direction we might prefer if rehabilitation is the primary objective: the more time you spend in prison the more ‘criminal’ or ‘deviant’ you become (as measured by time preference). This finding goes along with some well-established ideas of prisonization (Clemmer, 1940) and the idea of learning to be criminal while in prison (Kolstad, 1996). Also note the direction of influence of gender: here it follows the direction predicted in the time discounting literature: being a woman corresponds to having a lower level of individual time discounting (Davids and Falkof 1975), yet takes the opposite sign comparing to the two previously analyzed populations; in a study of Ukrainian students, the relationship of gender has an opposite effect (Klochko 2006). Unsurprisingly, it seems that a prison’s environment in Ukraine creates quite different set of circumstances compared to that of a student population. One possibility here is that a female’s longing for her children is amplified by her limited contact with the family (Klochko 2008:199-200), which leads to her over compensation by thinking of her future and being reunited with her children/family again. Another possibility involves disproportionate incarceration of men (vs. women), where men are more likely to commit crimes requiring long term planning and criminal skills whereas women are more likely to go to prison for crimes of passion and self-defense (e.g. battered women syndrome).

**Table 5**  
*Dependent variable: 100 HRN today vs. 500 HRN in 6 months: prison population*

	Model 1 (n=99)	Model 2 (n=98)	Model 3 (n=95)	Model 4 (n=70)
<i>Intercept</i>	-1.812 (2.216)	-2.188(1.286)*	-3.178(2.369)*	4.037 (5.087)
<i>Age</i>	.043 (.026)*	.034 (.028)	.069 (.035)**	.102 (047)**
<i>Education</i>	.004 (.203)	.003 (.213)	-.015 (.241)	.037 (.357)
<i>Family status</i>	.263 (.181)	.357 (.206)*	.363 (.236)*	.508 (.394)*
<i>Hours Rehab</i>	-.025 (.018)	-.025 (.019)	-.015 (.022)	-.010 (.030)
<i>Children</i>	---	.191 (.231)	-.029 (.250)	.384 (.419)
<i>Months spent</i>	---	-.003 (.007)	---	---
<i>Months left</i>	---	.011 (.009)	---	---
<i>Time spent vs. left</i>	---	---	-.297 (1.165)	-.363 (1.657)
<i>Gender (female)</i>	---	---	1.410 (.621)**	1.691 (.867)**
<i>Second time</i>	---	---	-.674 (.870)	-.918 (1.260)
<i>Living arrangement</i>	---	---	.284 (.504)	-.288 (.884)
<i>Meet at the release</i>	---	---	.127 (.602)	-.228 (1.108)
<i>Help Finding job</i>	---	---	-1.251(.545)**	-1.568 (.721)**
<i>Borrow money</i>	---	---	.290 (.424)	.554 (.582)
<i>Enough money</i>	---	---	.249 (.221)	.347 (.306)
<i>Family visits</i>	---	---	---	-1.130 (.565)**
<i>All visits</i>	---	---	---	.410 (.462)
<i>Rcvd. family letters</i>	---	---	---	.416 (.445)
<i>Letters sent</i>	---	---	---	-.696 (.457)*
<i>Visit frequency</i>	---	---	---	-1.060 (.759)*
<i>Seriousness of crime</i>	---	---	---	-.443 (.307)*
<i>R<sup>2</sup></i>	.068	.097	.26	.448

## DISCUSSION

Comparing these three populations deepens our understanding of time preference, its likelihood of change, and its relationship to a variety of social phenomena, like public good provision and collective behavior dynamics. More importantly, this study establishes that certain parameters, such as the length of exposure to new environment and new social connections, are of extreme importance. Although the studies reported here are cross-sectional in nature, employ convenience sampling and do not necessarily allow us to report with 100% confidence on the evidence of endogeneity of individual time discounting, they tend to be compatible with other research done in different fields of socio-behavioral inquiry. Additionally, this work allows us to raise important questions and hopefully facilitate the multidisciplinary treatment of the time discounting. Granted, our findings about Ukraine’s prison population run contrary to popular public policy assumptions; yet is it hardly surprising that a longer term in prison does not necessarily lead to rehabilitation. What we observe is still a change, although not the change we might prefer in the context of public policy. Ultimately, the longer this exposure to a new environment the more profound the change: Cocaine Anonymous members become more

oriented to the future and, hopefully, less addicted; students become more mature and future oriented; and prisoners become more like the rest of their inmates: more criminal. These changes (in the way people discount the future) can also give us hope for countries that undergo social and economic transitions. It might indeed be possible to approach the transition to a less corrupt equilibrium from a more corrupt equilibrium if we have an understanding of what social parameters we need to target and how we should approach this targeting. More research is needed, of course, in identifying other mechanisms of behavioral change in different populations, using representative sampling techniques and longitudinal methods.

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Citations referring to this article should include the following information:

Klochko, Marianna. (2015). The endogeneity of time preference and analysis of collective behavior. In: *Decyzje* 24 (December), pp. 107-121, Kaminski Marek M., ed., Warsaw: Kozminski Academy.