Utility under the Dark Tetrad

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Abstract

Purpose – Literature on psychology highlights four traits that shape an amoral and antisocial personality: Machiavellianism, narcissism, psychopathy and sadism. Together, these personality traits form the Dark Tetrad. In this study, the standard intertemporal utility maximization model is reassessed from the point of view of a representative economic agent endowed with the Dark Tetrad personality traits.

Design/methodology/approach – The approach followed in this paper consists of identifying how each of the Dark Tetrad traits might be logically associated with the dynamic utility problem, as well as exploring, in the context of the model, the implications, for consumption and utility, of admitting the presence of such traits in individuals' personalities.

Findings – It is found that, typically, dark personalities penalize consumption growth, even when such traits are interpreted directly and positively contributing to the utility of the agent. It is also found that in economies with two or more interacting agents, the dark traits might have a mutually destructive nature.

Originality/value – Economics is going through a smooth revolution in the direction of becoming an eminently behavioral science. Most of the traditional economic models, based on the idea of the hyper-rational agent, are being replaced or complemented by a different view of the homo-economicus, in which, among other things, personality matters. This paper offers a novel contribution in this direction.

Keywords Dark tetrad, Machiavellianism, Narcissism, Psychopathy, Sadism, Utility, Economic dynamics

Paper type Research paper

1. Introduction

In psychology, the set of traits that shape amoral and antisocial personalities is typically referred to as the Dark Tetrad. Originally designated the Dark Triad, the notion was first advanced by Paulhus and Williams (2002), who elected psychopathy, narcissism and Machiavellianism as the foundational dark personality traits. Later, sadism was added to the list (Chabrol *et al.*, 2009; Buckels *et al.*, 2013), thus completing the Dark Tetrad.

An abundant body of literature on the social implications of dark personalities has been brought to light in the last few years. Applications range from the characterization of social interactions among high school students (Chabrol *et al.*, 2015) and coworkers (Thibault, 2016) to the study of the impact of dark personalities on political orientation and adoption of extremist views and attitudes (Duspara and Greitemeyer, 2017).

Part of this empirical research highlights the points in common across the elements of the Dark Tetrad. Dark traits partially overlap because they all involve a low degree of honesty and humility, and they are all associated with a deficit in empathy (Wai and Tiliopoulos, 2012; Lee *et al.*, 2013; Book *et al.*, 2016). Notwithstanding, most of the studies also emphasize the independent nature of the dark traits. Examples include:

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(1) Studies on individual risk-taking and financial behavior, where the most evident distinction is the one between psychopaths – risk-lovers who disregard financial and legal consequences – and Machiavellians – cautious players who misbehave only if a direct gain is on their horizon (Jones, 2013, 2014; Malesza and Ostaszewski, 2016; Stanwix and Walker, 2021).

(2) Contributions to academic dishonesty, for which views differ: Brunell *et al.* (2011) emphasize the role of narcissism, while Williams *et al.* (2010) attach cheating behavior predominantly to psychopathy.

(3) Research on infidelity in relationships, in which the main finding is that although dark personalities are a propeller for infidelity, different traits have a distinct impact on relationships: Machiavellianism preserves them, while psychopathy leads to their erosion (Jones and Weiser, 2014; Brewer *et al.*, 2015).

Despite its uncontestable relevance, the above-mentioned literature is mostly empirically oriented, offering no systematic theoretical underpinnings to frame how dark personalities might influence behavior regarding sociological, political or economic interactions. At this level, there are also insightful contributions, which primarily discuss the role of the Dark Tetrad in organizational contexts (Jones and Mueller, 2021). However, there are still gaps to fill in the literature, namely concerning the association between the Dark Tetrad and economic theory.

This study approaches the implications of Dark Tetrad personality traits from a theoretical perspective and has a background scenario of a trivial dynamic economic model of household consumption choices, i.e. the type of workhorse utility maximization model one easily finds in any dynamic economics textbook (see, e.g. Alogoskoufis, 2019 or Gomes, 2022). In its orthodox form, the basic assumption underlying the model is rationality (i.e. no biases influence behavior). In this paper, we depart from such conjecture by inquiring how dark personality traits might disturb the model's trivial outcomes.

Different dark traits play different roles in the model. Narcissism and sadism will be directly associated with the utility function, while Machiavellianism and psychopathy emerge as a disturbing effect on the distribution of resources across agents. Specifically, narcissism is modeled as an additional utility from own consumption; sadism is included in the utility function as a diminishing utility from the consumption of other agents; Machiavellianism and psychopathy will both be reflected in the purposive behavior of an agent in acting to deviate resources from others to increase her own resource endowment [1].

The inclusion of the Dark Tetrad in the intertemporal utility maximization model allows for uncovering how personality biases change growth rates of consumption, asset accumulation and utility levels for agents holding such traits and for those who interact with them. New patterns of growth and intertemporal utility are revealed – patterns that might assist in explaining deviations relative to the rationality benchmark.

The principal contribution offered by the explored model is the possibility of making an integrated analysis of the Dark Tetrad in the context of a standard representative agent economic model. Other studies exist on the role of dark personality traits in influencing preferences, attitudes and behaviors of economic agents (see the next section); typically, however, these tend to focus on isolated traits and not on the Dark Tetrad in its entirety.

The remainder of the manuscript is organized as follows. Section 2 undertakes a brief literature review aimed at identifying how dark traits have previously emerged in economic theory. Section 3 revisits the key features of the prototypical intertemporal utility maximization model. Section 4 proceeds with the fundamental part of the study, which

consists of the insertion of the dark traits into the optimization framework and also the discussion of the respective implications. Section 5 further explores the results of the model, debating theoretical and managerial implications, and clues for further research are also addressed. Finally, Section 6 concludes.

2. Literature review

A slow but steady paradigm shift is taking place in economics. The most salient feature of this change is associated with the increasing attention placed on behavioral biases (see, e.g. Alcocer *et al.*, 2019; Isidore and Christie, 2019; Bouteska and Regaieg, 2020). The following remark by Thaler (2000, p. 133) is enlightening about the direction that economic science is taking:

> In responding to a request for predictions about the future of economics, I predict that Homo Economicus will evolve into Homo Sapiens, or, more simply put, economics will become more related to human behavior.

Part of the behavioral revolution in economics requires focusing attention on individuals' personalities (Saeed, 2020). Despite hypothetically sharing the same endowments, having the same preferences and facing the same constraints, economic agents holding distinct personalities will certainly behave in different ways. Psychological analysis has developed a rich set of taxonomies regarding the classification of personality traits (being the most popular categorization of the big five personality traits) – openness to experience, conscientiousness, extraversion, agreeableness and neuroticism – originally proposed by Digman (1990) and Goldberg (1990). When focusing exclusively on traits that may lead to antisocial and destructive behavior, the Dark Tetrad classification, already briefly characterized in the introduction, apparently is an adequate starting point to approach the link between personality and behavior.

Despite its multiple applications to socioeconomic realities (mentioned in the introduction), the notion of the Dark Tetrad is not absolutely uncontroversial. The main criticism typically pointed out in the classification of dark personality traits is that they overlap, i.e. in some sense, they signify the same proclivity for socially censurable, dishonest and manipulative behavior (Međedović and Petrović, 2015; Book *et al.*, 2016; Dinić *et al.*, 2020). However, regardless of their proximity and correlation, the elements of the Dark Tetrad should not be interpreted as redundant; they have different meanings and stimulate distinct potentially malevolent behavioral conducts (Jones and Paulhus, 2010, 2017).

Brief definitions of each of the Dark Tetrad traits and their distinctive features can be enunciated as follows:

(1) *Machiavellianism* is mainly associated with a cynical world view, pragmatism, self-interest and the manipulation of others for personal gain;

(2) *Narcissism* reflects egocentrism, grandiosity, the need for admiration and a sense of entitlement;

(3) *Psychopathy* is attached to impulsiveness, callousness, a lack of empathy and antisocial behavior and

(4) *Sadism* is a personality trait one can associate with the enjoyment of cruelty.

These short definitions suffice to contextualize the economic analysis of the Dark Tetrad proposed in this study. A deeper characterization of the Dark Tetrad traits can be found in Paulhus (2014) and in the collection of works cited thus far.

In the economic literature, the dark traits emerge intermittently, disparately and often just implicitly. For instance, in Gomes and Frade (2019), it is highlighted that some agents in market transactions reveal a proclivity to adopt deceiving attitudes. At least partially, this deceiving behavior might be justified by dark personalities. Other studies explicitly mention some elements of the Dark Tetrad, but they appear in isolation in different contexts. A brief review of this literature follows below.

Starting with narcissism, available studies dealing directly with this personality trait are mostly concerned with issues pertaining to managerial activities. More specifically, narcissism has been studied as a driver of entrepreneurial behavior and of the willingness to finance new businesses (Baldegger *et al.*, 2017; Liu *et al.*, 2019; Leung *et al.*, 2021). Also, the behavior of chief executive officers and other top and middle managers has been scrutinized in light of narcissistic personalities (Oesterle *et al.*, 2016; Al-Shammari *et al.*, 2019; Lin *et al.*, 2020). In these and other economic contexts, narcissism is perceived as a catalyst of contradictory attitudes: narcissistic agents might be grandiose and magnanimous or, conversely, petty and dishonest; they can even be both and frequently do (Back *et al.*, 2013; Schroder-Abé and Fatfouta, 2019).

In what respects utility analysis, narcissism is not commonly approached in its strict sense, but there are notions with similar meanings that emerge in studies contemplating static or dynamic utility analysis. The most prominent of these notions is the concept of conspicuous consumption (Friedman and Ostrov, 2008; Zhang, 2016). Because conspicuous consumption reflects egocentrism and a sense of entitlement, it is directly linked with narcissism.

The notion of sadism is almost absent from economic literature, especially when not directly linked with the psychological processes underlying individual behavior. Such a concept is episodically used in a euphemistic way, for instance, to refer to certain economic and fiscal scenarios and associated policies (e.g. Polychroniou, 2013), but in a rather inconsequential way. Being defined as the practice of cruelty and the enjoyment it brings, in the model, it will be attached to the utility from which third party low levels of consumption may originate.

Regarding Machiavellianism, this trait is mentioned in economic analysis mostly in the context of working relations, management and leadership (Sendjaya *et al.*, 2016; Dugan *et al.*, 2019). Machiavellianism in the workplace raises interesting discussions mostly about ethics and morality and how these impact productivity and efficiency. A sensible balance between pursuing self-interest by any means and the need to preserve human relations emerges as a fundamental part of the equation when addressing potentially Machiavellian managerial behavior.

Manipulative behavior in economics has been equated as well in the context of theoretically oriented settings. For instance, Clempner (2017) makes a game-theoretical assessment of social interactions when the actions of players are determined by what the author designates as moral heuristics. The unfolding of the game determines how the agents act and the extent to which their actions can be classified as more or less Machiavellian. Strategic interaction analysis, in the form of a bargaining game, is also the modeling apparatus chosen by Gunnthorsdottir *et al.* (2002) to establish a bridge between trustworthiness and Machiavellianism.

Finally, psychopathy also has its own modest place in economics. Durand (2018) undertakes an empirical assessment of the relationship between psychopathy and happiness and finds that they are negatively correlated. Under our framework, this would signify that psychopathy makes the agent's utility fall. Again, the bulk of the discussion about this dark trait in the context of economics and business is associated with work relations and management (Eisenbarth *et al.*, 2018; Shank, 2018; Boddy and Taplin, 2021).

3. Method: the utility framework in economics

In this section, the intertemporal planning problem of the representative household, as it is commonly characterized in the literature, is revisited. The goal is to set the stage for the subsequent introduction of the Dark Tetrad personality traits.

3.1 Research design/model

Typically, to represent the preferences of an economic agent, a felicity or utility function is modeled. In its simplest form, the utility function involves a single argument, namely, a composite measure of the goods and services that are consumed during the specified time period. Let $c(t)$ represent consumption at date t. Function $u[c(t)]$: $\mathbb{R}_+ \to \mathbb{R}$ will then obey a few general properties, pervasively pointed out in the literature. These properties include continuity, differentiability and concavity. The utility function is simultaneously increasing, $u' > 0$, and concave, $u'' < 0$, implying that the marginal utility of consumption is positive but diminishing.

A positive marginal utility is synonymous with nonsatiation, while the notion of decreasing marginal utility is attached to the agent's desire to smooth consumption over time: splitting consumption between two time periods is, under this specification, preferable to concentrating consumption in a single period. The most popular explicit functional form adopted for the felicity function is the constant elasticity of intertemporal substitution (CEIS) utility function. Its general representation is the one depicted in equation (1),

$$u[c(t)] = \frac{c(t)^{1-\theta} - 1}{1-\theta},\ \theta \in (0, +\infty)\backslash\{1\} \tag{1}$$

A particular case, for $\theta = 1$, should be accounted for. Applying L'Hopital's rule to the defined function, utility becomes logarithmic, i.e.

$$u[c(t)] = \ln c(t),\ \theta = 1 \tag{2}$$

Observe that both versions of the utility function fulfill the required requisites regarding marginal utility, i.e. $u' = c(t)^{-\theta} > 0$ and $u'' = -\theta c(t)^{-(1+\theta)} < 0, \forall \theta > 0$.

The elasticity of intertemporal substitution is the inverse of the function's parameter, which, in fact, is a constant value. The higher the value of θ, the lower will be the elasticity of substitution, meaning that increases in consumption provoke relatively stronger declines in marginal utility (stronger concavity of the utility function). A low θ, near zero, and, thus, a high elasticity of intertemporal substitution, will imply a quasi-linear utility function where diminishing marginal utility almost vanishes.

The CEIS property is useful to analytically approach simple and standard intertemporal optimization problems, and the meaning of parameter θ is better understood in such an environment. Thus, let us present the typical utility maximization optimal control problem of a representative household. In its simplest form,

$$\begin{aligned} &Max_{c(t)} \int_0^{\infty} u[c(t)]e^{-\rho t}dt \\ &\text{subject to}: \dot{k}(t) = rk(t) - c(t) \\ &k(0) = k_0 \text{ given} \end{aligned} \tag{3}$$

Problem (3) indicates that the agent chooses the trajectory of consumption over an infinite horizon to maximize intertemporal utility. Future utility is discounted to the present at a constant rate $\rho > 0$, which might be interpreted as a measure of the individual's impatience or, what is the same, as the rate of time preference. The agent holds a portfolio of assets or a capital stock, represented by $k(t)$; this is the state variable of the optimal control problem. The capital stock increases with the respective return, at rate r and decreases with consumption.

3.2 Analytical solution

To solve the optimality problem, we write the corresponding current-value Hamiltonian function,

$$H[c(t), k(t), p(t)] = u[c(t)] + p(t)[rk(t) - c(t)] \tag{4}$$

with $p(t)$ the shadow-price of capital, a co-state variable that is required to calculate first-order optimality conditions. These conditions are:

$$\frac{\partial H}{\partial c} = 0 \Rightarrow c(t)^{-\theta} = p(t) \tag{5}$$

$$\dot{p}(t) = \rho p(t) - \frac{\partial H}{\partial k} \Rightarrow \dot{p}(t) = (\rho - r)p(t) \tag{6}$$

and the transversality condition,

$$\lim_{t \to \infty} k(t) e^{-\rho t} p(t) = 0 \tag{7}$$

Differentiating Equation (5) with respect to time,

$$-\theta \frac{\dot{c}(t)}{c(t)} = \frac{\dot{p}(t)}{p(t)} \tag{8}$$

Replacing Equation (8) into (6), one arrives at the equation of motion for optimal consumption, which represents a constant growth trajectory that is determined by three parameters: the rate of time preference, the rate of return on assets' accumulation and the elasticity of intertemporal substitution,

$$\frac{\dot{c}(t)}{c(t)} = \frac{1}{\theta}(r - \rho) \tag{9}$$

3.3 Optimal consumption growth rate

Interpreting Equation (9), it is straightforward to understand that it is basically the relation between r and ρ that determines the temporal path of consumption, namely if consumption falls, rises or remains constant over time. Nevertheless, the shape of the utility function, molded by parameter θ, is also relevant. First, note that the reason why the growth rate of consumption is constant is because we have assumed a CEIS class of utility functions; if the elasticity of intertemporal substitution were not constant, then the growth rate in Equation (9) could not be constant as well. Second, note that the value of parameter θ is decisive in determining the responsiveness of the consumption growth rate to the difference between the rate of return and the intertemporal discount rate: a stronger concavity of the utility function (a higher value of θ), which represents a lower willingness to substitute intertemporally, will imply a smaller reaction of the growth rate to the gap between r and ρ.

Is it indispensable for utility analysis to assume a constant elasticity of intertemporal substitution? This issue is addressed by Bliss (2004), who finds evidence and discusses the implications of a variable elasticity. A variable EIS signifies that the extent to which the agent substitutes the future for present consumption may vary with the level of consumption; as a corollary, in the simple environment we have addressed so far, there is the inexistence of a constant growth rate of consumption.

The aforementioned author relies on the work by Attanasio and Browning (1995) to make his point: there is evidence that those with higher levels of consumption have higher

elasticities of substitution; therefore, the higher the level of consumption, the lower will be the value of θ, which implies not a constant but an increasing consumption growth rate. In a different context, namely concerning the presence of narcissism as a feature of the individual agent personality, the next section exemplifies how the CEIS hypothesis might be broken.

In what follows, the intertemporal utility model is modified to account for each of the Dark Tetrad traits. Results of this analysis will reveal that transient utility and long-term consumption growth suffer relevant changes when people have personalities, namely, in this case, when they have, a weaker or stronger extent, a dark personality.

4. Results: dark traits and their implications

4.1 Narcissism in the utility function

Narcissistic individuals are egocentrics and experience a sense of entitlement. In our simple framework, this will translate into a utility surplus for every consumed unit; the utility surplus is as much higher, for a given amount of consumption, as the higher is the degree of narcissism.

Analytically, in order to contemplate the possibility of narcissism, we modify the standard CEIS utility function and write it under the form

$$u[c(t)] = \frac{\left[c(t)e^{\eta c(t)}\right]^{1-\theta} - 1}{1-\theta}, \theta \in (0, +\infty)\backslash\{1\} \tag{10}$$

$$u[c(t)] = \ln c(t) + \eta c(t), \theta = 1 \tag{11}$$

In equations (10) and (11), $\eta \geq 0$ measures the degree of narcissism. If $\eta = 0$ then we are back at the prototypical utility example with no narcissism. The stronger the degree of narcissism, i.e. the higher the value of η, then the higher is the level of utility the agent draws from consumption. The first obvious question to ask is whether narcissism, as formalized, implies that diminishing marginal utility no longer holds. The answer is not obvious, and it will depend on the degree of narcissism and on the level of consumption.

First, look at the simplest case of logarithmic utility. In this case, under the current formulation, $u' = c(t)^{-1} + \eta > 0$ and $u'' = -c(t)^{-2} < 0$. Thus, marginal utility continues to be positive and diminishing. For the general case, the obtained expressions are not as straightforward,

$$u' = [1 + \eta c(t)]c(t)^{-\theta}\left[e^{\eta c(t)}\right]^{1-\theta} \tag{12}$$

$$u'' = \frac{(1-\theta)[1+\eta c(t)]^2 - 1}{[1+\eta c(t)]c(t)}u' \tag{13}$$

Expression (12) undoubtedly corresponds to a positive value. Expression (13) might or might not be negative; clearly, if $\theta \geq 1$ then $u'' < 0$, but this condition does not necessarily hold for $\theta < 1$; if $\theta < 1 - \frac{1}{[1+\eta c(t)]^2}$, then we will be in the presence of increasing marginal utility, what eventually occurs for high narcissism and high consumption level. Hence, our first result is that narcissism might transform the utility function from a concave into a convex function, but this occurs only for specific circumstances associated with the original utility configuration.

Next, we verify that the elasticity of intertemporal substitution is no longer constant. It will depend on the level of consumption, turning the consumption growth rate into a non-constant value. The elasticity of intertemporal substitution is now

$$EIS = -\frac{u'}{u'' \times c(t)} = \frac{1+\eta c(t)}{1+(\theta-1)[1+\eta c(t)]^2}, \forall \theta > 0 \tag{14}$$

Regarding equation (14), observe that for $\eta = 0$ we recover the original case in which the elasticity of intertemporal substitution is the inverse of the value of the concavity parameter. Furthermore, if $\theta = 1$ (log utility), then the elasticity value reduces to $1 + \eta c(t)$. In any case, for positive narcissism, we no longer have a constant elasticity of intertemporal substitution, which now depends on the value of the consumption variable.

To further explore the implications of narcissism in utility, we again solve problem (3). Under the novel utility specification, the first-order optimality condition (5) is now presentable in a more general form,

$$\frac{\partial H}{\partial c} = 0 \Rightarrow [1+\eta c(t)]c(t)^{-\theta}\left[e^{\eta c(t)}\right]^{1-\theta} = p(t) \tag{15}$$

Differentiating (15) with respect to time yields:

$$-\frac{1+(\theta-1)[1+\eta c(t)]^2}{1+\eta c(t)}\frac{\dot{c}(t)}{c(t)} = \frac{\dot{p}(t)}{p(t)} \tag{16}$$

and, therefore,

$$\frac{\dot{c}(t)}{c(t)} = \frac{1+\eta c(t)}{1+(\theta-1)[1+\eta c(t)]^2}(r-\rho) \tag{17}$$

Equation (17) indicates that the optimal growth rate of consumption continues to be the difference between the rate of return on asset accumulation and the discount rate, multiplied by the elasticity of intertemporal substitution. The difference is that this last term is no longer a constant value. Consequently, the growth rate of consumption will no longer be constant as well.

Moreover, notice that

$$\lim_{c(t)\to\infty} \frac{1+\eta c(t)}{1+(\theta-1)[1+\eta c(t)]^2} = 0, \quad \forall \theta, \eta > 0 \tag{18}$$

The limit in expression (18) suggests that the growth rate of consumption will asymptotically fall to zero with a progressive increase in consumption. Therefore, the fundamental implication of introducing narcissism into the utility function, in the proposed terms, is to transform a positive consumption growth result into a long-term outcome in which the growth rate declines towards zero.

The highlighted result is illustrated below, for a specific numerical example. Let $\theta = 1.25$, $r - \rho = 0.05$, and consider five different possible values of the narcissism parameter: (1) $\eta = 0$; (2) $\eta = 0.25$; (3) $\eta = 0.5$; (4) $\eta = 0.75$; (5) $\eta = 1$. Figure 1 depicts the growth rate of consumption, revealing that for any positive level of narcissism, the growth of consumption is no longer constant, converging to zero as the level of consumption rises. Note, as well, that the higher the level of narcissism, the faster will be the fall of the consumption growth rate along the transient path. Narcissism also allows for higher-than-average growth in the short-term, with a peak reached sooner for higher levels of narcissism.

For the same set of parameter values, Figure 2 displays the time trajectories of utility, taking into consideration identical alternative values for the narcissism parameter as above.

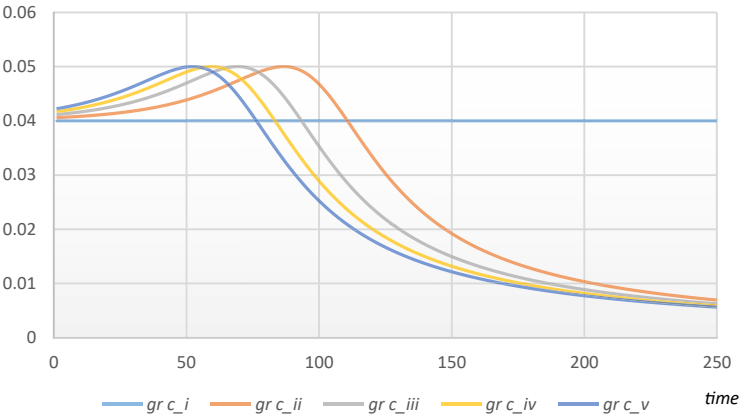

Figure 1.
Consumption growth rate under narcissism

Source(s): Figure by author

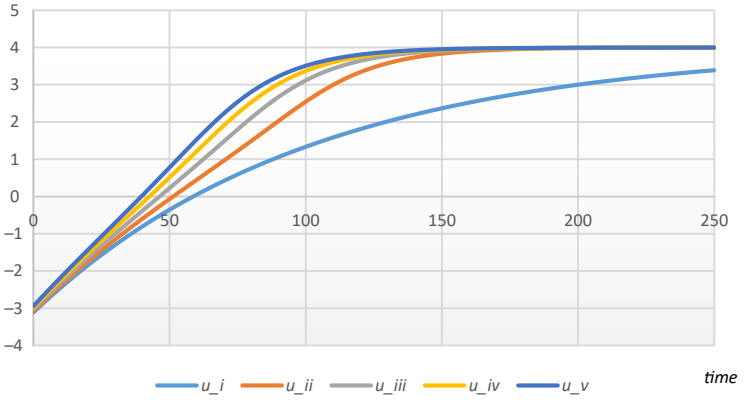

Figure 2.
Utility trajectories under narcissism

Source(s): Figure by author

One observes that stronger narcissism implies higher utility in the short-run, but in the long-run all the utility levels converge to the same value, which corresponds to $\frac{-1}{1-\theta}$.

Explicit general analytical results cannot be determined, except for particular case $\theta = 1$. In this case, the growth rate of consumption becomes

$$\frac{\dot{c}(t)}{c(t)} = [1 + \eta c(t)](r - \rho) \tag{19}$$

Ordinary differential equation (19) has a straightforward closed-form solution,

$$c(t) = \frac{c_0 e^{(r-\rho)t}}{1 + \eta c_0 [1 - e^{(r-\rho)t}]} \tag{20}$$

with c_0 the initial consumption level. For $\eta = 0$, equation (20) reduces to $c(t) = c_0 e^{(r-\rho)t}$, i.e. consumption grows at constant rate $r - \rho$. For any other value of η, growth will fall to zero as t

goes to infinity. To confirm this last assertion, note that, under (20), $\lim_{t\to\infty} c(t) = -\frac{1}{\eta}$ and, therefore, under expression (19), $\lim_{t\to\infty} \frac{\dot{c}(t)}{c(t)} = 0$.

Narcissism has been modeled as an increment in utility for every level of consumption. As such, we have verified that it can transform decreasing marginal utility into increasing marginal utility, although this is not a general outcome; in fact, it applies only to a relatively restricted range of values that determine the concavity of the utility function. The most outstanding result offered by the modified utility function is that, under narcissism, the elasticity of intertemporal substitution is no longer constant, implying that in the long run the growth rate of consumption will fall to zero. Numerical and graphical inspection allowed us to visualize that the more narcissistic the individual is, the faster the growth rate of consumption will increase in the short-run but also the faster it falls towards the long-run state of asymptotic zero growth.

4.2 Sadism in the utility function

Recover the original utility function (without narcissism) and consider another dark trait: sadism. Sadism is defined as the enjoyment of cruelty, what, in our context, might be interpreted as the satisfaction drawn from observing others enjoying low levels of utility, emanating from low levels of consumption. Therefore, in this case, we need to introduce a second agent, an agent with no associated dark personality, who consumes a good $b(t)$ and solves a trivial intertemporal utility maximization problem, such that

$$\frac{\dot{b}(t)}{b(t)} = \frac{1}{\theta}(r - \rho) \tag{21}$$

To simplify the discussion, consider identical rate of return, discount rate, and utility concavity for both agents.

The utility function of the sadistic individual will include two arguments: her own consumption and the consumption of the second individual, i.e. $u[c(t), b(t)]$: $\mathbb{R}_+ \times \mathbb{R}_+ \to \mathbb{R}$. The explicit form of the utility function must consider that the lower the consumption of the second agent, the higher will be the utility of the sadistic individual, i.e. $\frac{\partial u[c(t),b(t)]}{\partial b(t)} < 0$. A feasible functional form is the following,

$$u[c(t), b(t)] = \frac{\left[c(t)e^{\sigma b(t)^{-1}}\right]^{1-\theta} - 1}{1-\theta}, \theta \in (0, +\infty)\backslash\{1\}, \sigma \geq 0 \tag{22}$$

Equation (22) fulfills the intended requisites: it takes a sadism parameter, σ, which is equal to zero in the absence of sadism. For a positive value of σ, the higher the level of consumption of the non-sadistic individual the lower will be the utility of the sadist, for any given amount of own consumption. The higher the value of the parameter σ (i.e. the stronger the level of sadism), other things equal, the higher is the utility level of the agent holding the dark personality trait. By multiplying the sadistic term by the consumption of the individual, one is saying that the enjoyment of cruelty is associated with the own wellbeing (i.e. if $c(t) = 0$, then utility will be zero independently of the level of consumption of the other individual).

The particular case of log-utility might be approached as well. In this case,

$$u[c(t), b(t)] = \ln c(t) + \sigma b(t)^{-1} \tag{23}$$

Positive and diminishing utility of own consumption is maintained, in this scenario, as in the original formulation in the absence of dark personality traits. Also, no change occurs with

regard to the elasticity of intertemporal substitution, which is constant and equal to $1/\theta$. Nevertheless, the dynamics of consumption growth are not identical with and without sadism. In this case, the first-order optimality condition (5) is transformed into

$$\frac{\partial H}{\partial c} = 0 \Rightarrow c(t)^{-\theta}\left[e^{\sigma b(t)^{-1}}\right]^{1-\theta} = p(t) \tag{24}$$

Differentiating (24) with respect to time:

$$\frac{\dot{c}(t)}{c(t)} = \frac{1}{\theta}\left[(\theta-1)\sigma b(t)^{-1}\frac{\dot{b}(t)}{b(t)} - \frac{\dot{p}(t)}{p(t)}\right] \tag{25}$$

Replacing (6) and (21) in (25), one gets,

$$\frac{\dot{c}(t)}{c(t)} = \frac{1}{\theta}(r-\rho)\left[1 + \frac{\theta-1}{\theta}\sigma b(t)^{-1}\right] \tag{26}$$

The consumption growth rate is no longer necessarily constant; the original growth rate comes multiplied by a term that is different from 1 in the presence of sadism. This term vanishes under logarithmic utility, and it makes consumption to grow faster for $\theta > 1$ and slower for $\theta < 1$. Under $\theta > 1$, consumption growth increases with the degree of sadism and declines with the increase in the other agent's utility. Because $b(t)$ grows at a constant rate, $\lim_{b(t)\to\infty}\left[1 + \frac{\theta-1}{\theta}\sigma b(t)^{-1}\right] = 1$ and, consequently, the long-term growth rate of the consumption of the sadistic agent will be the trivial difference between rate of return and discount rate, duly multiplied by the elasticity of intertemporal substitution.

Independently of variables $c(t)$ and $b(t)$ growing, in the long-term, at the same benchmark rate, (9) or (21), sadism influences the utility of the sadistic agent. One might rewrite equation (22) under form

$$u[c(t), b(t)] = \frac{\left\{c_0 e^{\frac{1}{\theta}(r-\rho)t} e^{\sigma\left[b_0 e^{\frac{1}{\theta}(r-\rho)t}\right]^{-1}}\right\}^{1-\theta} - 1}{1-\theta} \tag{27}$$

and equation (23) such that

$$u[c(t), b(t)] = (r-\rho)\ln c_0 t + \sigma b_0{}^{-1} e^{-(r-\rho)t} \tag{28}$$

With consumption depending only on time, one might numerically investigate how utility evolves in the long run. Figure 3 undertakes this exercise for $c_0 = b_0 = 1$, $\theta = 1.25$, $r-\rho = 0.05$, and five different values of the sadism parameter: (1) $\sigma = 0$; (2) $\sigma = 0.25$; (3) $\sigma = 0.5$; (4) $\sigma = 0.75$; (5) $\sigma = 1$. The graphic indicates that sadism implies different initial levels of utility, with higher utility for stronger sadism. However, rapidly all trajectories converge to the same path, which conducts utility to its ultimate long-term value, $\frac{-1}{1-\theta}$

Because own consumption and other's consumption grow at the same constant positive rate, the sadism component will progressively lose strength (the agent draws progressively less utility from observing the other individual's consumption, since this will increase), and the own consumption component will gain weight and become completely dominant. Therefore, in a growing economy, with sadism associated with the absolute value of consumption of a third party, sadism can only have a transient effect on utility. This eventually changes if no systematic growth of consumption of the other agent is observed.

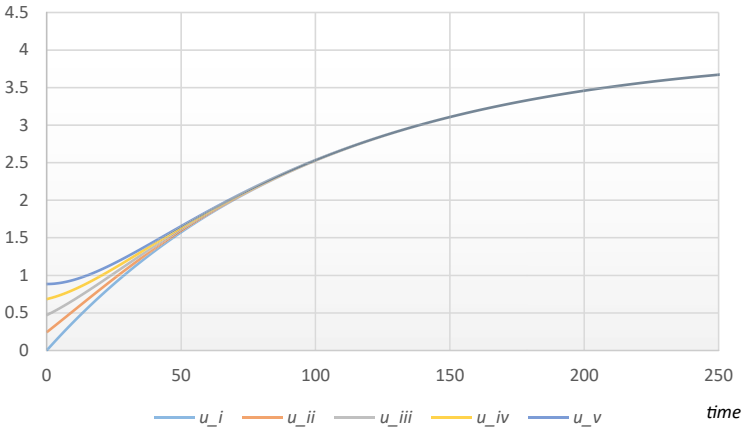

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Figure 3. Long-term utility trajectories under sadism

To complement the previous analysis, consider now a scenario where two dark personalities interact. The agent under scrutiny, whose consumption is $c(t)$, is sadistic, and interacts with another agent, who consumes $b(t)$, who is narcissist. Taking equation (25), combined with (6) and a version of (17) associated with the behavior of the second agent, the growth rate of consumption of the sadistic agent comes:

$$\frac{\dot{c}(t)}{c(t)} = \frac{1}{\theta}(r-\rho)\left[1 + \frac{(\theta-1)[1+\eta b(t)]}{1+(\theta-1)[1+\eta b(t)]^2}\sigma b(t)^{-1}\right] \tag{29}$$

The growth rate of consumption of the narcissist agent is similar to equation (17), i.e.

$$\frac{\dot{b}(t)}{b(t)} = \frac{1+\eta b(t)}{1+(\theta-1)[1+\eta b(t)]^2}(r-\rho) \tag{30}$$

Because, as $b(t)$ increases, its growth rate falls to zero, then we should expect consumption of the sadistic individual to converge once again to the standard growth rate of equation (9). Thus, the narcissism of the agent who consumes good b will not affect the long-run growth of consumption of the sadistic individual. To explore further the pattern of growth, recover the numerical example, with $r-\rho = 0.05$ and $\theta = 1.25$, and assume three different cases: (1) no sadism ($\sigma = 0$); (2) sadism but no narcissism from the other party ($\sigma = 0.5$; $\eta = 0$); (3) sadism with narcissism of the other agent ($\sigma = 0.5$; $\eta = 0.5$). Figure 4 exposes what happens in this scenario. In the long-run, in every case, the growth rate is the same, but in the short-run sadism brings stronger growth, which is even higher in the first phase, if the second agent is narcissist.

In the particular case of logarithmic utility, sadism does not impact consumption growth, and therefore, the narcissism of the second individual is irrelevant.

Two pieces of our puzzle are now identified. To proceed with the analysis of the Dark Tetrad in the intertemporal utility maximization setting, the next sub-section will approach Machiavellianism and psychopathy.

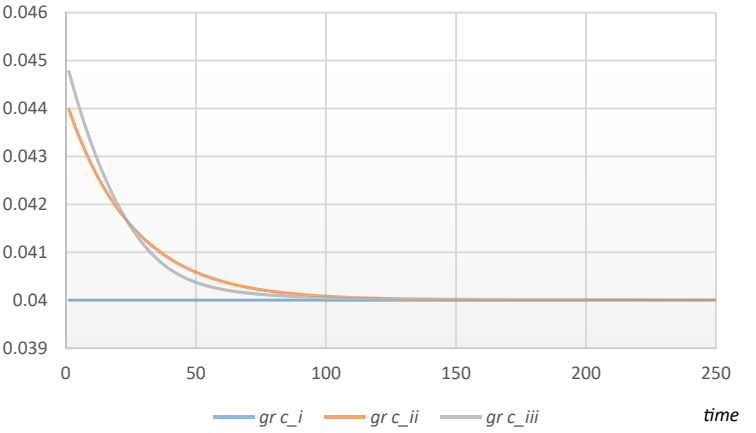

Figure 4.
Consumption growth rate under sadism (and eventual narcissism of the second individual)

Source(s): Figure by author

4.3 Machiavellianism and psychopathy: reaping other Person's returns

Machiavellianism was characterized as manipulative and exploitative behavior, while psychopathy was attached to selfishness, impulsiveness and remorselessness. In the proposed framework, these dark personality traits will be associated with reaping other agents' returns from capital or asset accumulation. If this exploitative behavior directly triggers a personal gain, we classify this as Machiavellianism; otherwise, if diverting resources from others does not generate any gain, then we call it psychopathy.

To proceed, we consider the agents for whom consumption levels have been defined by $c(t)$ and $b(t)$, who will accumulate, respectively, capital $k(t)$ and $h(t)$. Their resource constraints without the influence of any dark trait might be written as $\dot{k}(t) = rk(t) - c(t)$, $k(0) = k_0$ given; and $\dot{h}(t) = rh(t) - b(t), h(0) = h_0$ given. In this stage, we abstract from dark influences over utility, as discussed in previous sub-sections, and take standard CEIS utility functions with concavity parameter θ.

To introduce Machiavellianism/psychopathy, we consider that agent k diverts a share $\mu \in [0, 1]$ of her resources, which amount to $rk(t)$, from capital accumulation to reap part of the return of the other agent to herself, in a portion equal to $e^{-\zeta/\mu}$, $\zeta > 0$. In such a setting, the two resource accumulation constraints come

$$\dot{k}(t) = (1-\mu)\left(1 + e^{-\zeta/\mu}\right)rk(t) - c(t) \tag{31}$$

$$\dot{h}(t) = \left(1 - e^{-\zeta/\mu}\right)rh(t) - b(t) \tag{32}$$

Note that if $\mu = 0$, then Machiavellianism/psychopathy is absent. In the other extreme, $\mu = 1$, agent k has used all her resources for malevolent actions, being incapable of accumulating any wealth; in this case, a maximum share $e^{-\zeta} < 1$ of return is diverted from the other agent.

In this scenario, consumption growth rates are constant and amount to

$$\frac{\dot{c}(t)}{c(t)} = \frac{1}{\theta}\left[(1-\mu)\left(1 + e^{-\zeta/\mu}\right)r - \rho\right] \tag{33}$$

$$\frac{\dot{b}(t)}{b(t)} = \frac{1}{\theta}\left[\left(1 - e^{-\zeta/\mu}\right)r - \rho\right] \tag{34}$$

Clearly, agent h loses with the predatory behavior of agent k; growth rate in equation (34) is lower than the benchmark growth rate without Machiavellianism/psychopathy; and the higher the value of parameter μ, the lower is the growth rate. Equation (33) does not deliver an unequivocal result: the growth rate rises with returns diverted from the other agent, but there is a cost associated with the resources that are no longer employed to accumulate additional assets. Whether condition $(1-\mu)\left(1 + e^{-\zeta/\mu}\right) > 1$ holds or not will determine if there is a benefit in terms of consumption growth. The graphical illustration below reveals that for intermediate values of parameter μ, neither too high or too low, consumption will grow faster under exploitation, and the attitude of the agent can be classified as Machiavellian and not plain psychopathy.

Figure 5 represents the growth rates in equations (33) and (34), for parameter μ in the range 0–1. The other assumed parameter values are $r = 0.08, \rho = 0.03$, $\theta = 1.25$, and $\zeta = 0.25$. The graphic reveals that the growth rate of consumption variable $b(t)$ progressively falls with the increase in the value of μ. Relatively to $c(t)$, a region of values of μ ($0.1339 < \mu < 0.3069$) allows for a growth rate of consumption higher than in case $\mu = 0$. We can identify this as the Machiavellianism region; for other values of the parameter both agents lose, relatively to the $\mu = 0$ scenario, what we associate with plain psychotic behavior.

Under the above example, independently of the rate of growth of consumption, as long as it remains positive, long-term utility of the Machiavellian/psychopathic agent converges to $\frac{-1}{1-\theta} = 4$. The difference resides in the transient phase. Figure 6 draws the trajectory of the utility of the agent for three distinct scenarios: (*1*) $\eta = 0.05$; (*2*) $\eta = 0.25$; (*3*) $\eta = 0.5$. The intermediate case, for which the growth rate of consumption is higher, is the one allowing for superior transient utility.

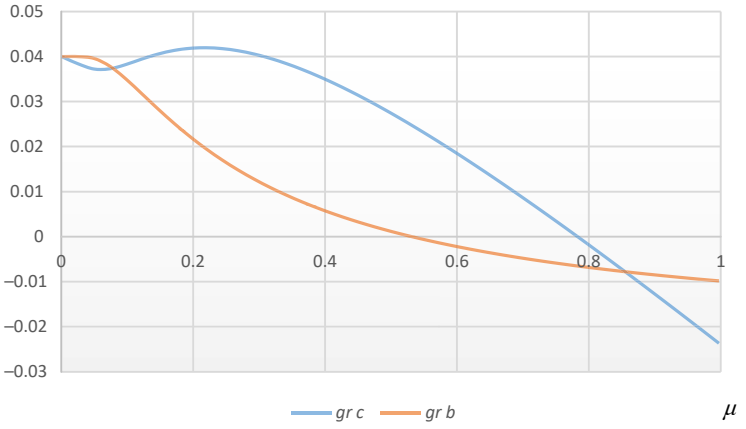

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Figure 5.
Growth rate under Machiavellianism/psychopathy

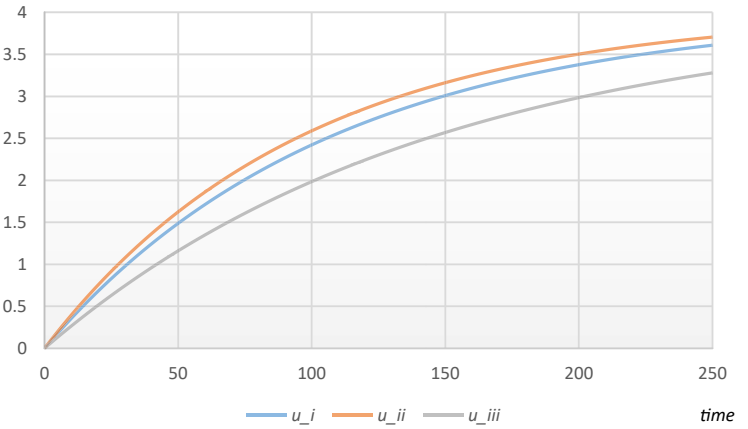

Figure 6.
Utility under Machiavellianism/ psychopathy

Source(s): Figure by author

5. Discussion

5.1 Theoretical implications

The analysis brought about some interesting theoretical results: first, as formalized, narcissism overturns the basic result of the benchmark model, which is the constant rate of return of consumption; with narcissism, the growth rate falls to zero as consumption increases. Second, sadism implies nonlinear growth of consumption that culminates in a steady state of positive and constant growth, not changing long-term results regarding utility. Third, Machiavellianism/psychopathy is presented in such a way that reaping others' resources might be beneficial for an intermediate level of exploitation. This intermediate level of exploitation that brings gains when harming others receives the designation of Machiavellianism, while psychopathy emerges in the analysis as exploitation that does not benefit the agent and hurts others.

The analysis suggests that behavioral biases are prone to influence consumption and utility. Because agents are not purely rational and are subject in a larger or smaller extent to dark personality traits, the analysis claims that a variety of outcomes emerges, even in a very simple framework, when we consider these traits and how they influence preferences, behavior and actions.

5.2 Managerial and policy implications

Because the modeling exercise suggests that personality traits have a relevant effect upon intertemporal consumption decisions, firms' managers might find it beneficial to collect data on the personalities of their customers and prospective clients. Information on the psychological profile of consumers may help firms with their production and marketing decisions. Such data, which can be collected indirectly through the observation of consumption patterns, is relevant not only for firms, but for policy decision-makers as well. Obviously, data gathering must be weighed against privacy concerns.

Dealing with customers exhibiting strong Dark Tetrad traits is challenging, given the deceitful and insidious nature of their actions. Notwithstanding, Dark Tetrad personalities can be used to the advantage of businesses, if managers are capable of subverting them: the lack of humility that is pervasive across dark traits might be instrumental in manipulating customers to increase conspicuous consumption and other ego-feeding expenditures.

Nonetheless, as the characterization of the model made clear, the prevalence of dark personalities is likely to be essentially damaging for businesses and for the economy as a whole: the silver lining associated with the exploitation of personality flaws cannot typically compensate the harm that comes from egotistical, selfish, callous, impulsive, and destructive behavior (from consumers, but also from business owners and managers).

5.3 Limitations and future research agenda

The growing interplay between economics and behavioral science makes it increasingly relevant to approach baseline economic models under two interconnected assumptions: first, that agents have personality and, second, that different agents exhibit different traits of personality (darker or lighter). This is an understudied subject in economics, and there is a lot that can be explored around the topic. The current study has taken a first step in the mentioned direction, although the chosen benchmark model is, admittedly, an overly simplified one, offering just a first glimpse on an extraordinarily complex subject that can and should be approached under much more sophisticated economic settings.

Personality traits can be associated with any conceivable decision-making problem in economics: they may determine the behavior of workers in the search and matching model of the labor market; they can be decisive in shaping preferences in economic growth models, thus determining the pace of growth; and they are important in assessing decisions with relevant impact on the environment (e.g. concerning recycling). These are some of the prospective avenues that might eventually be explored in future work on the interplay between personality and economics.

6. Conclusion

This study proposed a theoretical framework to address the impact of dark personality traits on consumption and utility of a given individual agent. The Dark Tetrad of personality traits, involving Machiavellianism, psychopathy, narcissism and sadism, has been considered and each of these personality elements has been associated with a particular feature of the behavior of the agent.

Given the definition of each of the dark traits, they were attached in different ways to the setup via agent's behavior and agent's preferences: Machiavellianism/psychopathy was associated with exploitative behavior. Narcissism and sadism were directly linked with utility. Results revealed that dark personalities penalize consumption growth, even when the dark traits are interpreted as directly and positively contributing to the utility of the agent.

Note

1. The concept of utility is directly linked to the perception of value, i.e. to the gratification people draw, in this case, from their own consumption and from the consumption of others. The sense of entitlement of narcissists makes them value more their own consumption; the cruelty of sadistic individuals makes them value the lack of access others have to consumption opportunities. Under this interpretation, it is reasonable to assume a direct link between the mentioned elements of the Dark Tetrad and utility. On the other hand, Machiavellianism and psychopathy have a more instrumental nature. Either due to strategic manipulation (Machiavellianism) or erratic antisociality (psychopathy), agents may act with the purpose of distorting the market efficient allocation of resources, thus deviating income for their own benefit or for the disadvantage of others, regardless of the change in utility such resource relocation generates. These arguments justify the role of each dark trait in the utility maximization model.

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