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**Rewarding my Self.**  
**The role of Self Esteem and Self Determination in Motivation Crowding Theory**

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**Abstract**

The paper aims to reconcile different explanations (and consequences) of the motivation crowding theory in a unique theoretical framework where the locus of control is introduced in a one period maximisation problem and the intrinsic motivation is assumed as an exogenous psychological attitude. The analysis is based on the distinction among different types of objectives of the intrinsic motivation. For each type of objective, the different role of self esteem and self determination mechanisms determine different conditions for crowding out of intrinsic motivation, depending on the self determination sensitivity, its impact on the motivated good and the individual belief about one's own self.

**Keywords:** intrinsic motivation, crowding out, self esteem, self determination.

**JEL:** D11, D64, J22.

## 1. Introduction

In psychology the motivation is defined as a dynamic factor that directs behaviour toward an objective. According to Geen (1994), motivation refers to the initiation, direction, intensity and persistence of human behaviour. The extrinsic motivation operates when someone engages in a particular behaviour for purposes that are extrinsic to the behaviour itself, such as to receive praises, awards, good reviews or to avoid unpleasant situations, such as a punishment. In Deci et al. 2008 (p. 13) the behaviour motivated by extrinsic motivation “entails doing an activity because it leads to some outcome that is operationally separable from the activity itself. That is, extrinsic motivation concerns activities enacted because they are instrumental rather than because one finds the actions satisfying in their own right”. The intrinsic motivation, instead, operates when someone engages in behaviour because he finds the activity challenging and rewarding in itself, and he gets satisfaction in enhancing his competence in that specific task.

Two points have to be stressed. First, the distinction between intrinsic and extrinsic motivations is based on relation between the activity performed, the individual and the motivation. Second, the motivation is a factor that pushes the individual to perform a specific activity.

Economic theory of human behaviour is based on the hypothesis that individuals behave according to the aim of maximising utility by means of the available income. In the logical sequence of economic thinking, individual's behaviour (the choice of a specific combination of variables) is the outcome resulting by utilizing available means (income) to reach an objective (maximisation of utility function). The arguments of the utility function are a list of objective. Which role for motivation? Economic literature has devoted some attention to the effect of intrinsic motivation on performances of workers and students, to study the crowding out effect of pecuniary incentives (extrinsic motivations) but the weight of motivations in economic behaviour could be relevant for many other situations<sup>1</sup>. Frey and Jegen have formalised the crowding out effect in the Motivation crowding theory, but they didn't explain why derivatives representing crowding effects could differ from one person to another and from one situation to another (Harvey, 2005). Much empirical evidence on the perverse effects of rewards is available: crowding out effects have been detected in supplying working effort (Barkema, 1995), in reciprocating behaviour (Fehr, Gächter, 2000; Bruni et al., 2009), and in situation where trust (Bohnet, Frey, Huck, 2001) or other regarding feelings are involved (Frohlich, Oppenheimer, 1998)<sup>2</sup>.

Many authors have stressed the relation between the crowding effect of rewards and the perceived control effect. Frey and Jegen (cit.) identify two psychological processes that affect intrinsic motivations: impaired self determination and impaired self esteem. Benabou and Tirole (2003) use the “looking glass self” (Cooley, 1902) to show that agent takes the principal's perspective in order to learn about himself. For the authors, the incentives enhance engaging an activity only if they reveal hidden information to the agent, about the task or the agent's talent, enhancing his confidence about himself. They stress that “before worrying about the negative impact of rewards, one should first check that the reward provider has private information about the task or the agent's talent” (Benabou, Tirole, 2003, p.505). An asymmetric information framework is also in Sliwka model (2007), where explanation of crowding out is explicitly “distinct from those proposed by psychologist”, and is based on the learning of the prevailing social norm, emerging from the incentive scheme proposed by the principal.

In this general framework, the paper aims to reconcile different explanations (and consequences) of the motivation crowding theory in a unique theoretical framework, based on the distinction of four categories of objectives of intrinsic motivation. Within each category, the self determination process has different effects on behaviour, and different conditions are needed to observe motivation crowding out, depending on the kind of motivated good the individual considers. The differences become more evident if the self esteem mechanism is also considered.

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<sup>1</sup> See Frey and Jegen (2001) for a discussion about economic issues that could be covered by this topic.

<sup>2</sup> See again Frey and Jegen (2001) for a review of empirical studies on crowding out effects.

To explicitly model the self esteem and self determination mechanisms in motivation crowding, the locus of control is introduced in a one period maximisation problem. Throughout the model the intrinsic motivation is assumed as an exogenous psychological attitude that can be more or less highlighted in economic behaviour. Differently from some previous models, that will be discussed all through the paper, the intrinsic motivation is not a matter of economic choice where individuals choose to behave as intrinsic (altruistic) or extrinsic (selfish), according to the best payoff they can afford.

The paper is organised as follows. In the following section the economic approach to intrinsic motivation and the four categories of intrinsic motivation will be discussed. In section 3, the role of self esteem, self determination and locus of control in motivation crowding out are examined. Sections 4, 5, 6 and 7 show the hypotheses and the results of the model for the different categories of intrinsic motivation. Some concluding remarks are reported in section 8.

## 2. Motivations and the economic theory

Starting from the idea that motivation is a factor that activates and directs human behaviour, one can easily classify economic incentives in the category of extrinsic motivations because they act as exogenous factors that modify basic individual behaviour. Incentives are exogenous both with respect to the activity, both with respect to the reward provider: a principal, differently informed, can induce the agent to better performances through the appropriate design of incentives. Other motivations are extrinsic if they are provided by someone different from the individual (they are extrinsic with respect to the individual), are not a natural output of the activity (they are extrinsic with respect to the activity), have an explicit formalisation other than a feeling, which is in turn an intrinsic matter of the individual. These characteristics should be present to make a motivation extrinsic.

On the opposite, any motivation that is endogenous to the individual and/or to her behaviour is intrinsic. The effect of the intrinsic motivation is easy to recognize when economic theory predicts a very different behaviour: volunteering with a zero wage is an example<sup>3</sup>. Nevertheless, in many other cases it is difficult to “differentiate between different source of motivation, which in the economic view are just manifestations of underlying preferences (for the task itself, or for the reward that is associated with performing the task)” (Frey, Jegen, 2001, p.591).

As suggested by Frey and Jegen (2001), it could be useful to consider the two polar cases of purely extrinsically and purely intrinsically induced individuals, with a continuous of combination of the two motivations in the between. The first type of individual corresponds to the standard agent of the economic theory. He gives up time only if is compensated with a pay and he gives up goods only if a price is reimbursed. If no intrinsic motivation is at work, only extrinsic motivation directs behaviour and a principal can use incentives to modify the agent’s choices because incentives supply more means (more income or material goods) to reach the extrinsic goal of getting more goods.

Purely intrinsically motivated people gives up his time only if he finds the activity pleasant per se and gives up goods for donation. He spontaneously reduces the available means needed for getting more goods but the emotional welfare has a positive relation with the amount of goods and time one uses for this purposes. From this point of view, intrinsic and extrinsic objectives exclude each other.

Basically, for the intrinsically motivated individual the logical sequence underlying her behaviour is the same as the extrinsically motivated one: behaviour (the choice of a specific combination of variables) is the outcome resulting from utilizing available means (income) to reach an objective (maximisation of an emotional welfare function). The arguments of the emotional welfare function are a list of objective which may include pleasure to engage in an activity, desire to succeed in doing it, to perceive a warm glow or to increase the others welfare.

In the middle of the two polar cases, both intrinsic and extrinsic motivation impact on the same variables (goods and leisure) with directions that could be opposing or alike.

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<sup>3</sup> See Bruno and Fiorillo (2009) for a theoretical model and an empirical investigation of intrinsic motivation role in volunteering.

Meier and Stutzer (2008) have identified three kinds of intrinsic motivation. Their classification is here extended with a fourth kind of intrinsic motivation to better include the Benabou and Tirole framework. Furthermore, a different graduation of the relation between individual satisfaction and the other's involvement is highlighted.

- 1) Pleasure to perform the task. Strictly following the Deci definition<sup>4</sup>, the intrinsic motivation is the pleasure to do something and the opportunity to let own competence grow. Being linked to individual preferences and to the activity, the motivation is intrinsic both to the individual and to the activity. No other is involved.
- 2) Desire to succeed in performing the task. From the Benabou and Tirole perspective, "agent will undertake the task only if he has sufficient confidence in his own ability to succeed" (Benabou, Tirole, 2003, p. 491). Intrinsic motivation is identified with the probability to succeed, which in turn depends on the self-confidence of the agent, his ability and the difficulty of the task. It is intrinsic both to the individual and to the activity. Through the "looking glass self", probability to succeed could be reinforced or crowded out by a principal that, supplying an extrinsic motivation, provides information on personal ability and/or the difficulty of the task. The extrinsic motivation may be an explicit reward or by a public acknowledgement.
- 3) The warm glow. An impure form of altruism is what Andreoni (1990) defined the warm glow, to point out that people are often "motivated by a desire to win prestige, respect, friendship, and other social and psychological objectives" (Olson, 1965). In this respect, motivation is individually generated, but needs an ex post social approval to be reinforced. Though warm glow is provided by the surrounding society, it has not an explicit formalisation other than a feeling, and it is intrinsic to the activity if a specific activity is preferred to others, also if the activity is exerted to obtain the warm glow.
- 4) Social preferences. Social preferences can be interpreted as a category of intrinsic motivation if an individual has as objective not only his welfare but the other's welfare too (Fehr, Fishbacker, 2002). Individual choices are directed by an internal emotional objective that regards others welfare. In economic terms, the human behaviour is motivated both by his material wellness and by the others' welfare. Motivation is intrinsic to the individual, for it is embedded in his preferences. It could be not intrinsic to the activity.

Moving from category 1 to 4, one can observe an increasing social involvement of the individual, from the pure individual gratification, to the need of being accepted at social level, to the other regarding preferences. Moreover, in the first category the intrinsic motivation is not related to the output dimension of the activity, and the intrinsic motivation is *input oriented*. In the last three categories the objective of intrinsic motivation is the output of the activity, instead that the activity itself and the intrinsic motivation is *output oriented*.

### 3. Self esteem, self determination and locus of control

The two psychological processes that are supposed to affect intrinsic motivations are impaired self determination and impaired self esteem.

The first psychological process is well described by the Self determination theory (SDT) by Deci and Ryan (2000, 2007). Cognitive evaluation theory (CET) was presented by Deci and Ryan (1985) as a sub theory within SDT that had the aim of specifying factors that explain variability in intrinsic motivation and focus on the fundamental needs for competence and autonomy. According to CET, people must not only experience competence or efficacy, they must also experience their behaviour as self determined for intrinsic motivation to be in evidence. Motivation crowding out occurs when a reward affects perceived self determination, while the feeling of competence will not affect intrinsic motivation unless accompanied by a sense of autonomy (Deci, Ryan, 2000, p. 70). When individuals perceive an external intervention as reducing their self determination, intrinsic motivation is substituted by external control. Following Rotter (1966) the locus of control shifts from inside to outside (Frey, Jegen, cit., p.

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<sup>4</sup> "To be intrinsically motivated means to engage in an activity because the activity itself is interesting and enjoyable" (Deci et al. 2007, p. 12).

594). Locus of control is a term in psychology that refers to individual beliefs about what causes the good or bad results in their life, either in general or in a specific area. It can either be internal (meaning the persons believe that they control themselves and their life) or external (meaning they believe that their environment, some higher power, or other people control their decisions and their life). Internals tend to attribute outcomes of events to their own control. Externals attribute outcomes of events to external circumstances. Weiner's early work (1974) suggested that, orthogonal to the internality-externality dimension, we should also consider differences between those who attribute to stable causes, and those who attribute to unstable causes: ability (an internal stable cause), effort (an internal unstable cause), task difficulty (an external stable cause) or luck (an external, unstable cause). The self determination process is relevant in every category of intrinsic motivation objectives previously discussed.

The second psychological process acts when outside intervention carries some information about personal competence or the difficulty of the task and it could be either supportive or discouraging. In the BT framework the direction of the self esteem mechanism relies on the private information of the performer, but also in a symmetric information framework, the self esteem mechanism has relevant implication for crowding out.

Self esteem, considered in a specific dimension, reflects a person's evaluation of his or her own worth in that activity, which in the definition of Branden (1969) derives from "the experience of being competent ... and being worthy of happiness". In the older definition of James (1890) self esteem is higher when there is coincidence between real self and ideal self. While self determination is always undermined by an external intervention, the self esteem mechanism can be supportive or discouraging, depending on the individual evaluation of his worth in that activity. Therefore, also self esteem is associated to the cognitive process where an individual claims his beliefs about what causes the good or bad results in their life, that is the locus of control. Self esteem can be reduced by the attribution of the results to external causes if individual experiences lower competence and worthiness, or supported when internal causes are highlighted. In more detail, if individuals experience results under their expectations feel low self esteem because their real self is smaller than their ideal self. In this situation, a reward shifting the locus from inside to outside, by reducing the role of competence, will increase their expectation. The reaction to a higher feeling of incompetence is a lower effort. The self esteem mechanism is then discouraging. On the other hand, individuals experimenting results over their expectations feel higher self esteem because the real self appears to be greater than their ideal self. A reward shifting the locus from inside to outside will decrease their expectation, but feeling very competent to the task and with a good self esteem, they will put more effort to counterbalance lower power against external factors. The self esteem mechanism is then supportive.

The self esteem process is relevant in agent choice if the intrinsic motivation is performance related, because correspondence between ideal and real self has a role only when performance have to be measured. This happens in motivation categories 2, 3 and 4 above. The pleasure to perform the task should not be interested by this mechanism, simply because individual is not interested in his own performance.

#### **4. Model**

Discussion about intrinsic and extrinsic motivations shows that they concern the shape of the utility function and that they give a specific direction to human behaviour. Basically, depending on the different weight that intrinsic and extrinsic motivations have in the preferences system, motivations direct behaviour toward different variables combination. Because we can observe only the resulting behaviour, not the decision-making process leading to it, it is difficult to discern how the overlapping motivations act on the same variables. If different motivations address to different objectives, it could be useful to distinguish in the utility function between intrinsic motivated goods and extrinsic motivated goods. Take as arguments of the utility function the amount of time one spends for intrinsic motivation and the amount performed for an extrinsic one. The same can be done for market expenditures (goods). The preferences are characterised by the weight that motivations have in

individual behaviour. The utility function arguments are consumption goods ( $C$ ), which contribute to higher material welfare (I feel good because I've got many assets) and the correspondent amount ( $D$ ) that impacts on the emotional well being (I feel good because I've given many gifts, donations and so on). At the same way, time can be used to reach a material purpose (by consuming pure leisure  $T$ ) or an intrinsically motivated objective ( $Y$ ) which provides an output without any other explicit formalisation than a feeling, like the pleasure to perform a task, the desire to succeed in performing a task, the warm glow deriving from an activity or the others' satisfaction deriving from an activity. In the present terminology, if an external intervention undermines self determination (shifts the locus from internal to external), intrinsic motivation is less in evidence and has a weaker impact in directing behaviour (the intrinsic motivated good has a lower weight among objectives). The crowding out of intrinsic motivation emerges, if with growing external intervention (i.e. with higher rewards) individual reduces his effort in pursuing intrinsic objectives.

In order to consider the most general framework where all the four categories can be embedded, leisure time used for intrinsic motivation is considered as an input to produce a generic motivated output, like the pleasure to perform a task, the desire to succeed in performing a task, the warm glow deriving from an activity or the others' satisfaction deriving from an activity. Therefore, to produce the motivated output  $Y$ , individual spends time  $A$  in the activity.

Denote  $\gamma$  the weight intrinsic motivation has in directing individual behaviour and  $1-\gamma$  the corresponding weight of extrinsic motivation, parameters describing the individual preferences. A Cobb Douglas utility function is summarised in (1).

$$U = [CT]^{-\gamma} [Y(A, K(h, k))D]^{\gamma} \quad (1)$$

s.t.

$$T_x = T + A + L$$

$$D + C = wL + X + hwA$$

where  $L$  is labour time,  $w$  is wage,  $X$  is non labour income.

According to the locus of control theory, each individual has an external-internal belief on what influences his performance  $Y$ . Let denote  $K$  the individual belief that internal variables influence  $Y$  (locus of control). CET Theory states that intrinsic motivation is much in evidence if individual can experience some autonomy. When individuals perceive an external intervention as reducing their self determination, intrinsic motivation is substituted by external control. To include the effect on locus of control of an external intervention represented by a reward, consider  $K$  as a function of two distinct factors: the individual inclination for internal locus  $k$  and the *control effect on self determination* represented by a reward, so that  $Y(A, K(h, k))$ , where  $0 < b < 1$  is the ratio of the reward with respect to wage. Given an individual locus  $k$ , when  $b$  increases, its effect on self determination reduces  $K$ , and the locus of control moves from inside to outside. This reward effect makes intrinsic motivation less evident in its effect on human behaviour. Assume that in the individual belief  $K$  the control effect is represented by the mark up of wage on reward.

**Assumption 1:**  $K = \beta(1-h)^{\alpha}$ ,  $\frac{\partial K(h, k)}{\partial k} > 0$

The Assumption states that the *control effect* of increasing rewards has a negative impact on self determination and that the external intervention is always perceived as reducing self determination. This could be not always true, but it is useful to show how motivation could be crowded in, also in the worst hypothesis. Moreover, the marginal effect of  $b$  on  $K$  depends on the coefficient  $a$ . With  $a=1$  every reward increase reduces internal belief at the same way. If  $a > 1$  growing rewards undermine the internal locus more than proportionally. Decreasing reductions of locus appear if  $a < 1$ . All these alternatives seem reasonable in different ways and will be discussed. These alternatives can be discussed as different degrees of *self determination sensitivity* to rewards. Finally, the individual inclination for internal locus has a positive effect on self determination.

**Assumption 2:**  $\frac{\partial Y(A, K(h, k))}{\partial A} > 0$ ,  $\frac{\partial Y(A, K(h, k))}{\partial K} > 0$

The Assumption states that the individual belief that internal variables influence  $Y$ , i.e. self determination, has a positive impact on the motivated object  $Y$ . Consequently, from assumption 1 derives that the individual inclination for internal locus has a positive effect on the motivated object: individuals with higher internal locus of control tend to attribute outcomes of events to their own control and feel higher self determination; this enhances the satisfaction coming from intrinsic motivated activity. On the other hand, if the *control effect* of increasing rewards has a negative impact on self determination, higher rewards will correspond to lower levels of the motivated object  $Y$ . Finally, more time spent in the activity increases the production of the motivated good.

#### 4.1. General framework

The implicit form for the motivated output can be itemized for the conceptual categories expressed above. Nevertheless, it could be useful as first step to disentangle the implications of the most general form. Denote  $\varepsilon_{YA}$  the elasticity of the motivated good with respect to time spent in the motivated activity.

**Proposition 1:** When a motivated good is produced through time spent in the activity, the optimal amount of time spent in the activity is lower than a standard leisure time.

**Proof:** The optimal value for  $\mathcal{A}$  is given in (2)

$$A^* = \frac{(wT_x + X)}{2w(1-h)} \frac{\gamma\varepsilon_{YA}}{2 - \gamma + \gamma\varepsilon_{YA}} \quad (2)$$

while if  $\mathcal{A}$  would be directly the motivated output the optimal value would be as in the special case, where  $\varepsilon_{YA} = 1$ ,

$$A^* = \bar{A} = \frac{\gamma(wT_x + X)}{2w(1-h)} \quad (2)$$

that is greater than (2) for any positive elasticity.

In a standard Cobb Douglas function, the exponent represents the fraction of income devoted to each good. If the motivated good is produced through  $\mathcal{A}$ , the weight of the motivated object will be  $\gamma\varepsilon_{YA}$  and the amount of income used for  $\mathcal{A}$  will be the second fraction in (2). It is worthwhile to note that this ratio represents how motivation works as a factor that pushes the individual to perform a specific activity. The motivation, taken as a dynamic factor that directs behaviour, has an individual component (the exponent) and an objective component (the elasticity) depending on the kind of motivated object and on the functional form of the motivated object production. Consequently, the intensity and the direction of motivation depend on the role of self-determination and locus in the motivated object production. If  $\mathcal{A}$  increases  $Y$  of the same proportion the motivated output, it quite coincides with the motivated time spent to produce it. Time spent in the motivated activity is determined as fixed amount of potential income divided by its price, where the proportion is  $\gamma/2$ . In this case, the agent sets the amount of time to devote to the motivated good production just as leisure time.

**Proposition 2:**

- a) If  $\varepsilon_{YA}$  is constant both with respect to the reward and the time spent in the activity, the optimal value of time spent in the production of the motivated object is a fixed amount of potential income. The control effect does not crowd out time spent in the motivated activity.
- b) If  $\varepsilon_{YA}$  is constant with respect to the time spent into the activity, but it varies with reward, crowding out could emerge if the percentage variation of  $\mathcal{A}$  weight in individual utility is negative and greater than the percentage variation of the cost of the motivated activity.

If the marginal effect of self determination on the motivated good is constant, the relative price effect described by Frey and Goette (1999) gives a proportional variation in  $\mathcal{A}$ . If the elasticity of the motivated object is constant to reward variations, for every reward increase the positive price effect acts increasing  $\mathcal{A}$ . Being the marginal production of the motivated object invariant to reward, the control effect acts directly on the pleasure deriving from  $Y$ : the individual will be less happy when the control



effect is at work, but he is not induced to reduce effort in the motivated good because  $A$  reductions has no benefit in terms of greater productivity.  $A$  increases at the same percent variation of price effect and the reduction of satisfaction deriving from the control effect cannot be offset by  $A$  variations

If the control effect has a positive influence on the elasticity of the motivated object,  $A$  increases both by price effect and control effect. If the control effect reduces the marginal production of the motivated object, but the percentage variation is in absolute value smaller than the corresponding variation of the price effect, the crowding in still emerges.

From the general framework analysis it appears that the crowding out basically depends on the elasticity of the motivated output and on the effect of self determination on it. In more details, if self determination does not influence the productivity of  $A$  and its elasticity is constant, individual could be less happy but he is not induced to lower effort, because  $A$  reductions has no benefit in terms of greater productivity. If the elasticity of the motivated object is constant with respect to the time spent into the activity, but decreases with reward, the self determination process weakens the efficacy of time spent in the motivated activity and crowding out could emerge. When the general framework is detailed for the different categories of intrinsically motivated goods, additional distinctions can be highlighted.

Taking into account different mechanism of self-determination, it can be shown that the intrinsic motivation *input oriented* produces very different path from intrinsic motivation *output oriented* because of the different role of self-esteem mechanism.

## 5. Pleasure to do

When intrinsic motivation concerns the pleasure to do something and the opportunity to let own competence grow, individual is interested only in doing the activity and learning by it. His satisfaction, and then the motivated object, does not depend on the difficulty of the task or on her ability to perform it, as would happen if he was interested in the good result of his activity. As previously discussed, the self esteem mechanism, being supportive or discouraging, has no role in the pleasure resulting from the activity, as would be for making jogging in the morning, reading a book, listening music or having sex.

The self determination process could imply crowding out of effort spent in the motivated activity, depending on how the pleasure to do something varies with different degree of self determination sensitivity. Two situations can be distinguished:

- a) **Self determination of pleasure.** If self determination directly supports the pleasure to do something, individual feels autonomy as a part of his pleasure (I'm pleased in doing that by myself);
- b) **Self determination of competence.** If self determination supports the efficacy of his action (the productivity in terms of pleasure of his effort), individual experiences competence or efficacy as self determined and they grow with growing self determination (I'm pleased in doing that and I'm able to do it by myself).

Though it seems that the second definition is closer to CET theory, both alternatives will be discussed. Moreover, a different sensitivity of self determination to rewards can be analysed in these alternative situations.

### a) *Self determination of pleasure*

If self determination undermines the pleasure deriving from the time spent in the motivated activity, but for any reward and any level of effort the same percent increase of pleasure occurs (the elasticity described in Proposition 2.a), then the price effect always determines a proportional increase in  $A$  and the control effect reduces the pleasure deriving from  $A$ , but variations of effort cannot offset it.  $A$  proportional relation between the individual belief  $K$  and the motivated output would be the case, as for  $Y = KA^\alpha$ , for any value of  $\alpha$ . In other words, it does not matter how much self determination is sensible to reward variations. This happens because the marginal impact of self determination on pleasure is independent from self determination itself. Because it is irrelevant if self determination is high or low, any reward variation gives a proportional variation of pleasure.

When self determination proportionally reduces the pleasure to do something, the intrinsic motivation is not crowded out by a reward increase because the price effect makes effort cheaper and control effect undermine pleasure but does not makes effort less productive. Consider as motivated output reading books. My father gives me a reward for any hour spent in reading books. I feel my self-determination threatened, because I'd be happier reading without reward, but the marginal pleasure deriving from reading is always the same. As a whole, taking into account that with higher reward I can purchase more books, I'll spend more time reading books.

**b) Self determination of competence**

An exponential form gives different results. Consider that pleasure to do is given by  $Y = A^k$ . The elasticity has the characteristic described in Proposition 2 and then crowding out could emerge depending on the sensitivity of self determination to reward variations (that is the  $a$  value). It easy to show that for any  $a < 1$  or equal, the crowding in still emerges. While low sensitivity to reward does not crowd out effort, with higher self determination sensitivity, i.e. for  $a=1/k$ , the intrinsic motivation can be crowded out depending on the values of  $b$ ,  $k$ , and  $\gamma$ . If  $a=1/k$ , for any  $k < 1/2$  agent will be always crowded out, while for higher internal inclinations there will be increasing effort in the activity with low rewards that will disappear when too higher rewards are proposed. The threshold reward increases with higher motivation as shown in Figure 1.

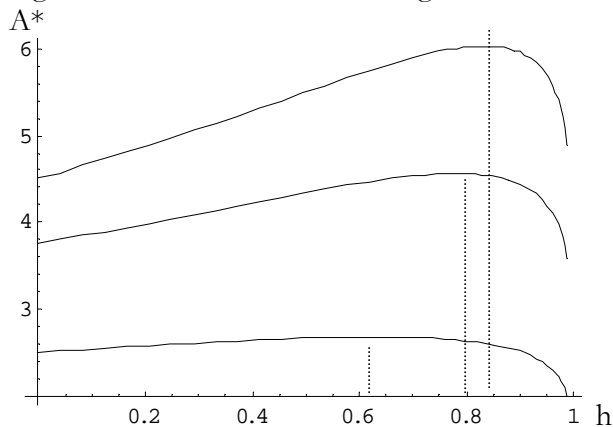


Figure 1 – Motivation crowding of self determination of competence

If self determination reduces the marginal pleasure to do something, and the self determination process is highly sensitive to reward variation, the intrinsic motivation could be crowded out by a reward increase because the price effect makes effort cheaper but, at the same time, the control effect make it less productive and the two effects conflict. Consider as motivated output having sex with someone. Which effect will have a payment for every appointment? If I feel that my self-determination is threatened, it is reasonable that my marginal pleasure in each appointment is lessened because I feel that my efficacy is not self determined. Than, it could happen that I'll reduce my appointments when she offers very high reward.

An additive relation like  $Y=K+A$  would imply that the pleasure to do something would be positive also if I do nothing at all. Seemingly unreasonable, it will not be considered.

Above discussion has shown that when an individual is intrinsically motivated to do something because the activity itself is interesting and enjoyable, he could be crowded in/out depending on how self determination is linked to the pleasure to do and on its sensitivity to rewards.

**6. Probability to succeed**

If individual is intrinsically motivated to succeed in performing a task, the motivated object is the desire to succeed. In this situation the intrinsic motivation is *output oriented*.

When the motivated good is the probability to succeed, one must take into account the locus of control role because the probability to succeed is an expectation about  $Y$ , based on the personal belief about

the functional relation determining  $Y$ .  $Y$  is a function of internal variables if it depends on ability ( $S$ ), an internal stable cause, and time devoted to the activity ( $A$ ), an internal unstable cause. On the other side, the variables determining  $Y$  are external if the functional relation is  $Y(\theta, \sigma)$ , where  $\theta$  represents task simplicity (stable) and  $\sigma$  good luck (unstable). Each variable has a positive effect on  $Y$ . Rotter (1975) cautioned that internality and externality represent two ends of a continuum, not an either/or typology. When the motivated good is the probability to succeed, the motivated good is an expected value  $E(Y)$ , based on the individual belief  $K$  that internal variables influence  $Y$ .

$$E(Y) = KAS + (1 - K)\sigma\theta \quad (3)$$

where to simplify algebra  $Y(\theta, \sigma) = \theta\sigma$  and  $Y(S, A) = SA$ . Note that the inverse relation between locus of control and reward does not always imply a reduction of  $E(Y)$ , depending on the contribution of internal and external causes to the production<sup>5</sup>. Moreover, when the motivated object is the probability to succeed,  $\epsilon_{YA}$  varies both with time spent in the activity and with reward, so that Proposition 2 is no more applicable. Finally, the proportional relation between the self determination parameter  $K$  and the contribution of internal variables  $AS$  is equivalent to the self determination of pleasure framework of the previous paragraph, where sensitivity to reward ( $\alpha$ ) is not influential for crowding direction and crowding in always appears.

As previously discussed the self esteem mechanism comes into evidence in shaping utility, when motivation is *output oriented*. Because the derivative of  $E(Y)$  with respect to  $K$  is positive if  $AS > \sigma\theta$ , satisfaction grows with the probability to succeed if internal variables are (perceived) more relevant than the external ones. With a given amount of effort, a growing reward will shift the locus from inside to outside (the self determination process), giving more weight to the external variables, but the probability to succeed will grow if the internal variables weight is greater than that of the external ones. The relation between equilibrium value of internal and external variables gives evidence to the self esteem mechanism. Individuals feel high self esteem if experience a real self greater than their ideal self. In analytical terms, this implies that in equilibrium they choose a level of effort corresponding to an ideal self (their belief about the probability to succeed) smaller than the result really affordable by exerting that level of effort, that is simply  $A^*S$ .

$$KA^*S + (1 - K)\sigma\theta < A^*S \rightarrow A^*S > \sigma\theta \rightarrow \frac{\partial E(Y)}{\partial K} > 0 \quad (5)$$

For any level of self determination, a reward that shifts the locus from inside to outside will decrease their expectation, making more evident the positive experience of self esteem. The self esteem mechanism is then supportive and enhances to exert more effort.

On the other hand, the probability to succeed will decrease if the self esteem mechanism is discouraging, when the internal variables weight is lower than that of the external ones.

$$KA^*S + (1 - K)\sigma\theta > A^*S \rightarrow A^*S < \sigma\theta \rightarrow \frac{\partial E(Y)}{\partial K} < 0 \quad (6)$$

Individuals, who have an ideal self greater than their real self, experiment decreasing self esteem. A reward, shifting the locus from inside to outside, will increase their expectation, confirming that their competence is not so important in determining results. The self esteem mechanism is then discouraging. The optimal value for  $A$  is

$$A^* = \frac{\gamma(wT_x + X)}{2w(1-h)} - \frac{2 - \gamma}{2} \frac{\sigma\theta}{S} \frac{1 - K}{K} \quad \text{if} \quad (7)$$

=0 otherwise

where the first addend is the standard leisure time in (2) and the second addend represents the perceived weight of external variables in the production of the motivated good. The derivative of  $A^*$  with respect to the reward is:

$$\frac{\partial A^*}{\partial h} = \frac{\gamma(wT_x + X)}{2w(1-h)^2} + \frac{\sigma\theta}{S} \frac{K'}{K^2} \left[ 1 - \frac{\gamma}{2} \right] \quad (8)$$

<sup>5</sup> The derivative of  $E(y)$  with respect to  $K$  is positive if  $\sigma\theta < AS$ .

$A^*$  is increasing in  $h$ , through substitution and income effects<sup>6</sup> (in the first addend, the *price effect*) and decreasing through the *external effect* (second addend), representing the perceived weight of exogenous factors ( $\theta$  and  $\delta$ ) in the production of the motivated good. A growing reward reduces the opportunity cost of intrinsic goods with respect to the extrinsic ones, increasing  $A$ , through price effect, and increases the weight (reduces autonomy) of exogenous factors, reducing  $A$ , through external effect. Note that the external effect modifies  $A$  through two channels: a negative *direct external effect*, due to the share of motivated good production that is independent from  $A$  and exogenously determined by task difficulty and luck; and a positive *indirect external effect*, capturing how exogenous “endowment” of  $Y$  is redistributed between goods. The total external effect is always negative on  $A$ , because redistribution of exogenous “endowment” is spread over all intrinsic and extrinsic goods and only a part ( $\gamma/2$ ) of exogenous contribution to  $Y$  is redistributed on  $A$ . While internal locus reduces total external effect, the intrinsic motivation has a positive effect both on the indirect part of external effect (the positive one) and on the price effect. Therefore, a more intensive motivation, by increasing the positive impact of external factors, reduces the overall negative impact of external effect. Intuition behind this result relies on the different role of intrinsic motivation and locus of control. Locus determines if the effect of external variables on intrinsic activity is strong or weak, while the absolute weight of intrinsic activity depends on motivation.

The crowding in condition is shown in (9).

$$\frac{\gamma}{(2-\gamma)} \frac{(wT_x + X)}{w} \frac{S}{\sigma\theta} > \frac{\alpha}{\beta} (1-h)^{1-\alpha} \quad (9)$$

where the lhs is the ratio between the contribution of internal and external variables to the probability to succeed, when time spent in the activity is set as a standard leisure time. The relative contribution of internal/external variables is a key factor in determining crowding direction because it describes the proportion between the agent’s contribution to the probability (the time he would spend in the activity without locus and productivity implications) and the contribution of external variables: a strongly motivated individual, with high competence in the task and higher potential income, would resist to the undermining effect of rewards better than someone with low levels of competence, motivation and income; at the same time the same individual, facing different kind of activities, could be crowded out more easily in a simpler task or in a lucky situation than when the activity is very difficult or unlucky conditions occur. The rationale for this is in the self esteem mechanism. In a difficult task, the agent chooses a higher effort because has a lower expectation of success. A greater increase of self esteem will come back by comparing expectations and results. Consequently, in an unlucky or difficult task, the reward appears as a support to self esteem because, by shifting the locus from inside to outside, further reduces the expectation in a situation where individual has experienced competence. The reaction is higher effort.

A reward offered in a very simple task, instead, is perceived as discouraging for it is not proportional to the task; where agent expects easy situations puts lower effort and has higher expectations. The results are more frequently under his expectations. The reward further decreases the role of competence he perceives and effort is reduced. In this perspective the Benabou and Tyrole framework gives further implications if two conditions for crowding out occur, that is when “the agent is less knowledgeable in some dimensions than the principal” and “the principal must be more inclined to offer a reward when the agent has limited ability or the task is unattractive” (Benabou and Tyrole, p.492). In the present framework, also with symmetric information crowding out may occur, nor specific preferences of the principal have to be modelled. The uncertainty works through the individual locus of control and the crowding out emerges if the locus decreases with external intervention.

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<sup>6</sup> Substitution and income effect have the same sign. If  $A$  is a secondary activity with respect to labour, the opportunity cost of  $A$  is the difference between wage and reward. With increasing rewards, the opportunity cost decreases and the substitution effect has a positive sign

## 6.1. Different degrees of self determination sensitivity

Just as for the hypothesis of the pleasure to do, also when the probability to succeed is the motivated good, the self determination sensitivity plays an important role while describing the effect of rewards.

Denote  $A_0 = \frac{\gamma(wT_x + X)}{2w}$  the standard leisure time in (3) for  $h=0$  and  $B = \frac{\sigma\theta}{S} \left(1 - \frac{\gamma}{2}\right)$ . The crowding

in condition (9) is simplified in:

$$\frac{A_0}{B} > \frac{\alpha}{\beta} (1-h)^{1-\alpha}$$

Consider the simplest form of  $K$ , with  $a \leq 1$  and  $\beta=1$ . The right hand side of crowding condition is decreasing in  $h$  or independent from it. The  $a=1$  hypothesis in Assumption 1 implies that any reward increase reduces (increases) internal (external) belief at the same way. The  $a < 1$  hypothesis implies a reduction of locus less than proportional. Therefore, the crowding direction strictly depends on the value of  $A_0$  (the effort without reward) and the relation between internal and external factors, that is on the self esteem mechanism. The exogenous variables (psychological and economic) univocally determine the crowding direction and the size of reward is irrelevant. If  $a=1$  the condition in (9) with the equality sign could be rewritten as  $A_0 = B$ . In this situation,  $A$  does not vary with growing rewards: the agent always exerts the level of effort corresponding to no reward, because the self esteem support exactly counterbalances the undermined self determination. For  $A_0 > B$ , individual will be always crowded in, because a more supportive self esteem always offsets a lower self determination, while the crowding out will occur if the opposite is verified, because self esteem and self determination have the same direction. For  $a < 1$  lower levels of  $A_0$  are needed to obtain the same results. It should be noted that, in the pleasure to do framework, the agent would have been always crowded in, both with proportional and decreasing self determination sensitivity, both in the self determination of pleasure and in the self determination of competence hypothesis, because the self esteem mechanism is ruled out when the motivated good is *input oriented*.

For the same self determination sensitivity ( $a=1$ ), but with  $\beta=k$ , the right hand side of crowding condition in becomes equal to  $1/k$  and the crowding condition is still independent of  $h$ . This combination of hypothesis allows us to deeply discuss the influence of psychological attitudes on motivation crowding. Consider the combinations of locus of control and intrinsic motivation that allow respectively the crowding out or the crowding in situations. Couples of  $\gamma$  and  $k$  that ensure a stable value of  $A$  are described by the following equation.

$$k = \frac{w(2-\gamma)\sigma\theta}{\gamma(wT_x + X)S} \quad (10)$$

that is decreasing in  $\gamma$ , as in Figure 2. With increasing rewards, individuals with high intrinsic motivation could reduce time in intrinsic motivated activity if their natural locus of control  $k$  is relatively low. They easily perceive that reward attempt to their autonomy, because they are not self determined and they attribute outcomes of events to external circumstances: a growing reward, that is external, intensifies this attribution. At the opposite, internals will intensify effort in the activity with increasing rewards, also with lower intrinsic motivation, because they are highly confident in their own ability and they perceive growing rewards as an assessment of it.

On the other hand, individuals highly motivated will be crowded in, unless of a low locus of control. They give much weight to intrinsic motivated production, independently from the factors determining it. The strongly motivated individual faces an increasing reward as an enlargement of his income possibility to consume it, through the price effect and through the indirect external effect, intensifying effort in production.

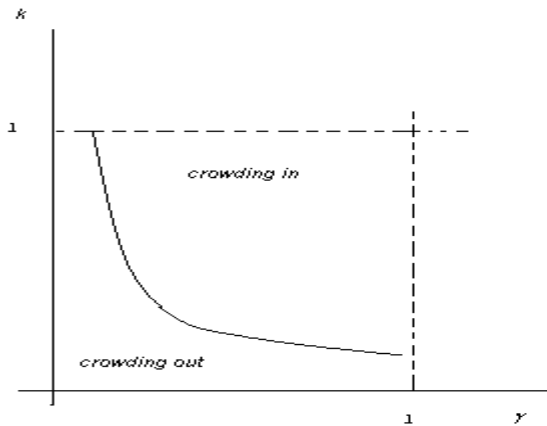


Figure 2 – Psychological characteristics and crowding effects

Wage and non-wage income will determine different situations for agents with same psychological characteristic. Graphically, a higher wage will shift the curve upward, while higher non-labour income downward. Individuals with higher non-labour income, due the income effect, will experiment crowding in, while individuals with lower non-labour income are crowded out.

Finally, the hypothesis that self determination sensitivity implies growing reduction of locus can be discussed ( $a > 1$ ). Consider  $a = 1/k$  and  $\beta = 1$ . The crowding condition is expressed by

$$\frac{A_0}{B} > \frac{1}{k} \left( \frac{1}{1-h} \right)^{\frac{1-k}{k}} \quad (11)$$

When the self determination sensitivity implies growing reduction of locus, the appearance of crowding out depends both on the size of the reward and on the ratio between internal and external variables, reflecting the self esteem mechanism. Higher individual inclination for internal locus will make individual more resistant to the undermining effects of rewards, higher intrinsic motivation will do the same. The crowding out would occur, when lower rewards are offered, also for low potential income individuals or when activity entails easy task, depending on the relative strength of locus and intrinsic motivation

## 7. The principal's profit as object of intrinsic motivation

As discussed above, psychological literature suggests that motivation crowding out occurs when a reward affects perceived self determination. The perception of external intervention ( $K$ ) has been expressed as a function of the size of reward, while the individual psychological characteristic is represented by the individual locus of control ( $k$ ). Other conditions may alter the perception intensity of external intervention. Harvey (cit) has showed that extrinsic rewards might be perceived as controlling if two conditions occur: a large size of the reward and the coincidence between the object of an agent's intrinsic motivation and the source of his rewards. The first condition has been discussed above, while the second needs a slight modification of the objective of intrinsic motivation.

In the proposed classification of intrinsic motivations, social preferences can be interpreted as a category of intrinsic motivation if an individual has as objective not only his welfare but the other's welfare too. If a social preference is the source of intrinsic motivation, utility will be a direct function of other's utility.

$$U = (CT)^{1-\gamma} (U_o D)^\gamma$$

where  $U_o$  is the other's utility. The condition described by Harvey is a special case of intrinsic motivation induced by social preferences, where  $U_o$  is the principal's profit. The social preferences framework has been modelled by Sliwka (2007), with selfish agents compared with fair agents, who care for the principal's payoff, and conformist agents, who behave alternatively as selfish or fair, depending on how the largest fraction of population behave. Asymmetric information is assumed about the type of the agent and the distribution of types in the population. A social preferences hypothesis is also in Bolle and Otto (2010), where a linear relation between individual utility and others' utility is assumed. The intrinsic motivation to other's welfare depends on the value of the good the other receives and not on the good itself: because the individual estimation of this value is assumed higher than the signal he learns from the reward, the crowding out could occur if the signal is too low.

Just as for the probability to succeed, the intrinsic motivation is directed toward the result of the activity. The agent has an expectation about his performance based on the personal belief about the functional relation determining his principal's payoff.  $U_o$  is a function of internal variables if it depends on ability and time devoted to the activity, minus the reward the agent perceives. On the other side, the variables determining  $U_o$  are external if the principal's profit depends on task simplicity and good luck.

The principal's payoff is described in (12)

$$U_o = K(AS - hwA) + (1 - K)\sigma\theta \quad (12)$$

Consider again the simplest form of  $K$ , with  $a=1$  and  $\beta=1$ . The optimal value for  $A$  is

$$A^* = \frac{\gamma(wT_m + X)}{2w(1-h)} - \left[ \frac{h}{(1-h)(S-hw)} \right] \frac{(2-\gamma)\theta\sigma}{2} \quad (13)$$

where time devoted to the activity is increasing in  $h$  if

$$\frac{\gamma(wT_m + X)S}{w(2-\gamma)\sigma\theta} > \frac{(S-h^2w)S}{[S-wh]^2} \quad (14)$$

The above condition for crowding in has the same left hand side of the corresponding condition for the probability to succeed. Compared with the probability to succeed hypothesis, with a constant self determination sensitivity, an internal highly motivated, that in that hypothesis would be crowded in for any reward, will be still crowded in with very low rewards. With growing control, the agent who has a stake in principal's payoff will be crowded out. The explanation for an easier crowding out relies again on the self esteem mechanism. Also where the reward is perceived as supportive, because the agent experiments results over his expectations, an additional effect of reward must be taken into account. By reducing the principal's payoff, the reward acts directly on the internal variables contribution: it reduces their perceived weight, through undermined self determination, but reduces also their real weight, through a higher cost for principal. While the expectation is reduced proportionally to the self determination parameter, the real self is reduced of the whole higher cost. Consequently, the real self (the principal's payoff) decreases with growing rewards, faster than the ideal self, because of the imperfect psychological perception. An individual experiencing high self esteem with low rewards, can experiment low self esteem with higher rewards because he underestimates the role of costs in profit function.

This result is quite similar to the results reported in Harvey (cit), where a higher reward is a condition for crowding out, but with a different explanation. The perfect substitutability between intrinsic and extrinsic objectives, in Harvey framework, shifts choices from intrinsic to extrinsic behaviour, because individuals choose to behave "as if" being intrinsic or extrinsic motivated according to the situation that gives a higher welfare. The size of the reward is determinant for the shift from one objective to another. In the Sliwka (2007) signalling game, the trust/control strategy of the principal is not related to the reward size and the conformist agent choose to behave "as if" being selfish or fair by learning the prevailing social norm. Bolle and Otto (2010) find that the reward size is relevant for crowding out because the individual estimation of the value of goods is substituted by the (lower) market signal when a reward is offered. The subjective psychological attitude toward the other is replaced by a market evaluation.

Here, individual intrinsic motivation can be more or less enlightened by the simultaneous work of self determination and self esteem mechanism, but the motivation is not ruled out by an opportunity evaluation of benefits deriving from the motivated action. In other words, intrinsic motivation is considered as a psychological attitude of the individual, exogenous to the economic behaviour, where it can become more or less evident.

## **8. Concluding remarks**

Taking into account that intrinsic motivation is a psychological issue whose relevance in economics has already been addressed, the paper presents a model where some relevant psychological mechanism are explicitly modelled in order to explain how the self esteem and the self determination mechanisms affect the intrinsic motivation. The analysis is based on the distinction among different kind of objectives of the intrinsic motivation. If an activity is engaged just for the pleasure to perform the activity itself, with low self determination sensitivity to the reward, the agent will be always crowded in. With higher sensitivity, the crowding out would not still emerge, unless the self determination process is relevant for the marginal productivity of pleasure, that is when the self determination enlightens the role of intrinsic motivation by putting in evidence individual competence.

When the agent is motivated to succeed in performing a task, the self esteem effect of good or bad performance must be taken into account. Also with low degrees of self determination sensitivity a constant crowding out could emerge if individual experience very low self esteem. Finally, when individual is motivated to pursue the principal's payoff, more occasions for crowding out of intrinsic motivation may occur because of the imperfect estimation of the cost effect on principal's profit, that progressively undermines his self esteem.

Throughout the model, the intrinsic motivation is assumed as an exogenous psychological attitude that can be more or less highlighted in economic behaviour. Differently from some previous models, intrinsic motivation is not a matter of economic choice where individuals choose to behave as intrinsic (altruistic) or extrinsic (selfish), according to the best payoff they can afford.

Further research is needed to define the variability of self determination sensitivity or its better functional form, but the distinction among different kind of motivated objectives can be useful to distinguish the effects of rewards, with a given sensitivity. The theoretical framework here proposed can be tested in experiments that should take into account the above distinction.



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