

Crifo, Patricia; Rullière, Jean-Louis

Working Paper

Incentives and anonymity principle : crowding out toward users

CESifo Working Paper, No. 1316

Provided in Cooperation with:

Ifo Institute – Leibniz Institute for Economic Research at the University of Munich

Suggested Citation: Crifo, Patricia; Rullière, Jean-Louis (2004) : Incentives and anonymity principle : crowding out toward users, CESifo Working Paper, No. 1316, Center for Economic Studies and ifo Institute (CESifo), Munich

This Version is available at:

<https://hdl.handle.net/10419/18681>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

INCENTIVES AND ANONYMITY PRINCIPLE: CROWDING OUT TOWARD USERS

PATRICIA CRIFO
JEAN-LOUIS RULLIÈRE

CESIFO WORKING PAPER NO. 1316
CATEGORY 4: LABOUR MARKETS
OCTOBER 2004

PRESENTED AT CESIFO VENICE SUMMER INSTITUTE, WORKSHOP ON
BEHAVIORAL PUBLIC ECONOMICS, JULY 2004

An electronic version of the paper may be downloaded

- *from the SSRN website:* www.SSRN.com
- *from the CESifo website:* www.CESifo.de

INCENTIVES AND ANONYMITY PRINCIPLE: CROWDING OUT TOWARD USERS

Abstract

In our model, an agent produces an outcome by a costly effort and then distributes it among heterogeneous users. The agent's payoff is the weighted sum of the users' shares and the coefficient reflecting their heterogeneity. When the agent neglects users' heterogeneity the game leads to an anonymous allocation. Otherwise, the equilibrium distribution is non-egalitarian but more efficient. Low performing agents reduce inequality among users by delivering an egalitarian service, while intermediate or high performing agents tend to prefer (but not always) delivering an unequal service, thereby breaking the anonymity principle. Incentives do matter regarding the crowding effect toward users.

JEL Code: C9, J33, J45, L32, M5.

Keywords: incentives, anonymity principle, egalitarian tasks allocation, principal agent user relationship, crowding-out effect.

Patricia Crifo
GATE
University of Lyon
93, chemin des Mouilles BP 167
69131 Ecully Cedex
France
crifo@gate.cnrs.fr

Jean-Louis Rullière
GATE
University of Lyon
93, chemin des Mouilles BP 167
69131 Ecully Cedex
France
rulliere@gate.cnrs.fr

1. Introduction.

In any classroom, each teacher or professor is bound to wonder whether she should make more effort toward the most able, more effort toward the least able, or to teach without any consideration about the specific characteristics of her pupils. In the first case, the teacher wishes to value at best her individual effort (the most able, the most valuable). At the opposite, the teacher wishes to reduce unequal abilities among pupils. In the last case, the teacher delivers a anonymous course to pupils (the course is not based on the distribution of ability among pupils).

Such a concern is more generally inherent to any form of public service, since each user must be equal (i.e. anonymous) in front of the civil servant. Apart from the example of the teacher (civil servant) and her pupils (users), regarding other public services, users' heterogeneity may lie in any other individual characteristics interfering in the co-production of the service.

The way by which the teacher delivers a course deeply depends on the level of the costly effort oriented toward pupils. It is doubtful that the teacher will choose her effort level independently of her opinion regarding the anonymity principle. As the effort also depends on the compensation scheme including or not incentives, this paper deals with the reliability of the anonymity principle to the power of incentives.

For Laffont (1999), the French public service system is characterized by the absence of monetary incentives and sanctions, a permanent relying on the benevolence of civil servants and an independence between wage variability and performance. In particular, with an almost fixed wage, there are no incentives to take into account users' heterogeneity, especially if there little or no concern about joint production maximization between users and civil servants.

However, introducing incentives into any form of organization is not always the best way to induce the highest effort from agent or to maximize the value of the outcome. The motivation crowding theory explores the psychological effects of monetary rewards and effort. Deci and Ryan (1985) showed that where individuals perceive an external intervention to be controlling, their intrinsic motivation to perform the task diminish. Introducing such kind of considerations within principal-agent models then induces a classical perverse effect of incentives on motivation, highlighted as a motivation crowding-out effect (see among others Gneezy and Rustichini, 2004; Frey and Jegen, 2001; Frey and Oberholzer-Gee, 1997). This hidden costs of incentives induces a trade-off between motivation and incentives but as pointed out by Akerlof and Kranton (2003), a source of motivation is missing from current models of organization. Akerlof and Kranton characterize this missing source as identity, that is a person's self image. And interestingly, they indicate that *"In the Army as well as in civilian*

organizations, such identification – or lack of it – plays a critical role in the determination of work effort, incentive schemes, and organizational design”.

Besides, as highlighted by Dixit (2002), it is conventional wisdom to attribute many perceived ills of public sector services, like high costs for poor quality of products or lack of attention to users, to the absence of competition and consequent weakness of incentives. In such a context, civil servants are usually assimilated to pencil pushers who deliver an equally low service toward anonymous users.

However, in the public as well as in the private sector, the power of incentives and competition cannot be considered in isolation to ethical considerations. In particular, using the examples of "excessive" executive pay, corporate earnings manipulation, and commercial activities by universities, Shleifer (2004) shows that when unethical behavior cuts costs, competition drives down prices and entrepreneurs' incomes, and thereby reduces their willingness to pay for ethical conduct. Competition then induces a crowding-out effect on the ethical behavioral of agents. In the long run however, competition may induce crowding in effects on ethical behaviors because it promotes growth and raises incomes, and higher incomes raise the willingness to pay for ethical behavior, but may also change what people believe to be ethical for the better.

Our paper contributes to this debate on crowding effects and incentives by considering a principal agent user model in which if the agent makes a high level of effort and selects or ranks users, we can establish that incentives induce a crowding out effect on users.

More precisely, we consider a principal agent user model in which agents make a two-step decision: the production of an outcome by a costly effort and the distribution of this outcome among heterogeneous individual users. In the first step, we allow for two possibilities : the principal can reward the agent either by a fixed wage or by a performance based compensation. In the second step, the agent allocates the outcome among users in order to co produce with them. The reward of the agent depends positively on the global value of this joint production and negatively on the dispersion of the distribution of the outcome among users.

The larger the size of the outcome obtained by an individual performance based compensation, the greater the level of inequality among users. By contrast, the low outcome resulting from a fixed wage incites the agent to offer an anonymous allocation among users; that is behave like a pencil pusher. We therefore obtain an endogenous relationship between incentives for the agents and crowding effects toward users, thereby departing from the classical trade-off between incentives *versus* motivation crowding-out for the agents.

This paper is organized as follows. Section 2 develops the theoretical model of the Pencil-Pusher Game. Section 3 presents the main results of the model. Section 4 develops some calibration exercises carried out to illustrate the results and discusses the relationship between incentives and crowding effects. Section 5 concludes the paper.

2. The Pencil-Pusher Game

Our game-theoretic model involves three kinds of players: a principal, a group of agents $i = 1, \dots, n$ who make decisions either independently from one another or within a team, and a group of users $j = 1, \dots, m$, where $n > 1$, $m > 1$. The game is a two-stage game : a first stage between the principal and each agent or the team of agents; and a second stage between each agent and the users.

The payoff of each agent corresponds to the sum of the payment obtained in each stage of the game, w_i^1 in the first stage and w_i^2 in the second stage. Hence, the overall reward of each agent i is given by: $w_i = w_i^1 + w_i^2$.

2.1. The first stage of the game

During the first stage, we consider a simple agency relationship between a principal and n identical agents (with the same utility function). In the most simplified form, each agent performs an unobservable effort e_i , ($e_i \in \{0, 1\}$), at the expense of a disutility $v(e_i)$, where $v'(\cdot) \geq 0$ and $v''(\cdot) \geq 0$. The effort of each agent i generates an observable individual outcome a_i , ($a_i \in \mathbb{R}^+$, indexed by h). Let $p^h(e_i)$ denote the

conditional probability of observing the outcome a_i^h , $p^h(e_i)$ is defined as follows:

$$p^h(e_i) = p(a_i = a_i^h | e_i), \quad \forall h, p^h(e_i) > 0 \quad \text{and} \quad \sum_h p^h(e_i) = 1$$

The agent's utility function is of the form $u(w_i^1) - v(e_i)$, where $u'(\cdot) \geq 0$ and $u''(\cdot) \leq 0$. The principal is risk neutral and is interested only in his expected outcome

$$\sum_{i=1}^n (a_i - w_i^1)$$

- If the principal demands the low effort to agent i ($e_i = 0$), it is enough to pay her a fixed amount equivalent to the amount she would be paid under the assumption of verifiable effort. The principal then offers the agent a compensation based on the agent's reservation utility and on the disutility of the low effort. In this case, $w_i^1 = u^{-1}(\underline{U} + v(e_i))$, with $e_i = 0$. If we assume $v(0) = 0$ then $w_i^1 = u^{-1}(\underline{U}) = F$.
- If the principal wishes to obtain from the agent the high level of effort ($e_i = 1$), and if we assume that $p(a_i | e_i = 1) > p(a_i | e_i = 0)$, then the principal offers a compensation w_i^1 such that $w_i^1 > F = u^{-1}(\underline{U})$.

2.2. The second stage of the game

The objective of the second stage consists in a co-production between each agent and the group of users. Each user j is characterized by a level of productivity ρ_j . The agent has to choose a distribution of her outcome a_i for

the users $(a_{ij})_{j=1 \dots m}$ (so that $\sum_{j=1}^m a_{ij} \leq a_i$).

The output q_i of this co-production between the agent i and the users is

given as follows: $q_i = \sum_{j=1}^m \rho_j \cdot a_{ij}$. The individual payoff w_i^2 at the end of the

second stage depends positively on q_i and negatively on the dispersion σ_i of the distribution chosen by the agent defined by $\sigma_i = \sum_{j=1}^m (a_{ij} - \bar{a}_i)^2$ where $\bar{a}_i = \frac{1}{m} \left(\sum_{j=1}^m a_{ij} \right)$. Hence we have:

$$w_i^2 = q_i - \sigma_i = \sum_{j=1}^m \rho_j \cdot a_{ij} - \sum_{j=1}^m (a_{ij} - \bar{a}_i)^2 \quad (1)$$

Such a measure of the dispersion of the distribution represents the agent's disutility of choosing a distribution $(a_{ij})_{j=1\dots m}$. Intuitively, what is costly for the agent in the second stage is to allocate the first-stage outcome a_i among the users, and the disutility of this allocation is given by the measure of its dispersion. In fact, the agent is committed by the labor contract to deliver a collective service as in any public organization.

The definition of w_i^2 captures the following trade-off. Either the agent chooses to deliver an anonymous service (without taking into account the users' heterogeneity in terms of productivity), or she searches to maximize the output of the co-production on the basis of the users' heterogeneity in order to counter-balance the negative effect associated with the dispersion of $(a_{ij})_{j=1\dots m}$.

In turn, the agent determines the equilibrium distribution of the first stage outcome $(a_{ij})_{j=1\dots m}$ according to the following program:

$$\begin{aligned} \max_{(a_{ij})_{j=1\dots m}} \quad & w_i^2 = \sum_{j=1}^m \rho_j \cdot a_{ij} - \sum_{j=1}^m (a_{ij} - \bar{a}_i)^2 \\ \text{s.t.} \quad & \sum_{j=1}^m a_{ij} \leq a_i \end{aligned} \quad (2)$$

The first order conditions of this program with respect to a_{ij} , $j = 1 \dots m$ and λ , the Lagrange multiplier associated with the constraint write ¹ :

$$\begin{cases} \rho_j - 2 \cdot (a_{ij} - \bar{a}_i) - \lambda = 0, & j = 1 \dots m \\ \sum_{j=1}^m a_{ij} = a_i \end{cases}$$

We have a system of $m+1$ equations, with $m+1$ unknown variables: λ and $(a_{ij})_{j=1 \dots m}$. After some simple algebra, we finally obtain:

$$a_{ij} = \frac{a_i}{m} + \frac{1}{2m} \sum_{k=1}^m (\rho_j - \rho_k), \quad j = 1 \dots m \quad (3)$$

2.3. The no-corner condition

Two assumptions are made with respect to the equilibrium distribution chosen by the agent.

Assumption 1: The service allocated to users must be positive

$$a_{ij} \geq 0, \quad \forall j = 1 \dots m \quad (A1)$$

Substituting for (2) into (A1) implies in turn the following condition:

$$a_i \geq \frac{1}{2} \sum_{k=1}^m (\rho_k - \rho_j), \quad j = 1 \dots m \quad (C1)$$

Condition (C1) is standard since it simply assumes that public services cannot be strictly null for any user.

¹ There are two ways to solve the program : either the agent considers \bar{a}_i as given when choosing her allocation distribution among users, or she takes into account the cross-effects among users, that is , she does not take \bar{a}_i as given. Both methods yields to the same analytical results. The former is the simplest to present, therefore it is the one detailed in the paper.

Assumption 2. When the outcome of the first stage of the game a_i is very high, the agent should not allocate the entire outcome to the highest productive user.

Let $\hat{\rho}$ denote the highest level of productivity among users, $\hat{\rho} = \max_j(\rho_j)$, and let \hat{a}_i denote the public service provided by the agent to the highest productivity user, $\hat{a}_i = a_i$ for $\hat{\rho} = \max_j(\rho_j)$. A degenerate distribution such that $\hat{a}_i = a_i$ and $a_{ij} = 0 \quad \forall j = 1 \dots m$ such that $\rho_j \neq \hat{\rho}$ is ruled out when the outcome of the agent is negative or null. Using equation (1), such an assumption writes:

$$w_i^2(\hat{a}_i = a_i, 0, \dots, 0) \leq 0 \Leftrightarrow \hat{\rho} \cdot a_i - (a_i - \bar{a}_i)^2 - (m-1) \cdot (\bar{a}_i)^2 \leq 0 \quad (\text{A2})$$

Assumption (A2) is more restrictive than (A1) since it imposes another restriction on the equilibrium allocation of public service, according to which inequality of treatment (allocating the entire public service to one user only - the highest productive one) is ruled out.

Using the fact that in this case $\bar{a}_i = \frac{1}{m} \left(\sum_{j=1}^m a_{ij} \right) = \frac{a_i}{m}$, and substituting it into assumption (A2), leads to the following condition on the first stage outcome:

$$a_i > \hat{a} \equiv \frac{m}{m-1} \cdot \hat{\rho} \quad (\text{C2})$$

3. Anonymity Principle within Public Services

Given the equilibrium distribution (equations (3)) and provided that condition (C1) holds, the theoretical model leads to the following results, depending on whether condition (C2) holds or not.

3.1. Public Service when condition (C2) is satisfied

In this case, the first-stage outcome of the Pencil-Pusher Game is high enough for the agent to face a trade-off between the anonymity principle and the efficiency of the co-production. We therefore have the following result.

Result 1. Anonymous versus efficient public services.

When condition (C2) is fulfilled and under (C1), the Pencil-Pusher Game leads to a unique equilibrium distribution which is egalitarian when the minimizing dispersion effect compensates the co-production's equilibrium efficiency effect, that is when:

$$\underbrace{\frac{1}{m} \cdot \sum_{j=1}^m \left(\frac{m-1}{m} \cdot \left\{ a_i^* + \sum_{k=1}^m \frac{\rho_j - \rho_k}{2} \right\} \right)^2}_{\text{Dispersion Effect}} > \underbrace{\sum_{j=1}^m \left\{ \rho_j \cdot \sum_{k=1}^m \frac{\rho_j - \rho_k}{2} \right\}}_{\text{Efficiency Effect}} \quad (4)$$

Proof.

When (C2) holds, the agent's payoffs when the distribution of public service among users by the agent is either the equilibrium one (equations (3)) or the egalitarian one $\left(a_{ij} = \frac{a_i}{m}, \quad \forall j = 1 \dots m\right)$ are given by:

$$w_i^2\left(\frac{a_i}{m}, \dots, \frac{a_i}{m}\right) = \frac{a_i}{m} \cdot \sum_{j=1}^m \rho_j, \text{ and}$$

$$w_i^2(a_{i1}, \dots, a_{im}) = \sum_{j=1}^m \rho_j \cdot \left\{ \frac{a_i}{m} + \frac{1}{2m} \cdot \sum_{k=1}^m (\rho_j - \rho_k) \right\} - \sum_{j=1}^m \left(\frac{a_i}{m} + \frac{1}{2m} \cdot \sum_{k=1}^m (\rho_j - \rho_k) - \frac{1}{m} \cdot \left\{ \frac{a_i}{m} + \frac{1}{2m} \cdot \sum_{k=1}^m (\rho_j - \rho_k) \right\} \right)^2$$

Result 1 then is obtained after some simple algebra.

□

Result 1 exhibits a trade-off for the agent between two kind of effects:

- on the one hand, a **minimizing dispersion effect in favor of the anonymity principle**, that is independently of the nature of the co-production relationship between the agent and the users, since the dispersion is minimized (and null) when users are treated equally, that is when the distribution is egalitarian: $a_{ij} = \frac{a_i}{m}, \quad \forall j = 1 \dots m$;

- and on the other hand, a **co-production efficiency effect inducing the agent to take into account users' productive heterogeneity**, since maximizing the output of the co-production relationship between the agent and the users leads to the maximum efficient outcome, as in any standard concave optimization program.

In other words, when the minimizing dispersion effect dominates the co-production efficiency one, the agent's behavior is driven by the anonymity

principle. Otherwise, the equilibrium allocation is driven by the users' heterogeneity.

Let consider now the situation when condition (C2) is not fulfilled, that is, when the first-stage outcome is below the threshold level \hat{a} .

3.2. Public Service when condition (C2) is violated

When condition (C2) is violated, we have

$$a_i \leq \hat{a} \equiv \frac{m}{m-1} \cdot \hat{\rho}.$$

In other words, the agent has to allocate a “small service” (which we will call a “minimum public service”) a_i toward users. Besides, we cannot apply the standard optimization program to determine the agent's equilibrium distribution's decision. Indeed, condition (C2) is required for equations (3) to be considered as equilibrium distributions.

However, since condition (C2) is violated, the agent may in this case allocate the entire outcome to the highest productive user. We therefore have to determine whether there exists a unique distribution in this case, or whether distributions other than the most unequal one (allocating the entire first-stage outcome to the most productive user) exist or not.

In particular, we will compare the unequal distribution with the egalitarian one $a_{ij} = \frac{a_i}{m}$, $\forall j = 1 \dots m$, since it is the distribution that minimizes the agent's disutility (dispersion).

Result 2. Anonymity but minimum public service.

When condition (C2) does not hold and under (C1), the Pencil-Pusher Game leads to a unique equilibrium allocation which is always anonymous:

$$w_i^2\left(\frac{a_i}{m}, \dots, \frac{a_i}{m}\right) > w_i^2\left(\hat{a}_i = a_i, 0, \dots, 0\right) \quad (4)$$

$$\Leftrightarrow \underbrace{\sum_{k=1}^m \rho_k}_{\text{Egalitarian productive effect}} > \underbrace{-\frac{m-1}{m} \cdot a_i^* \cdot (a_i^* + \hat{\rho})}_{\text{Inequitable dispersion effect}}$$

Proof.

When (C2) does not hold, the agent's second-stage rewards when the distribution of public service among users is either the unequal one, or the egalitarian one ($a_{ij} = \frac{a_i}{m}$, $\forall j=1\dots m$) are such that:

$$w_i^2\left(\frac{a_i}{m}, \dots, \frac{a_i}{m}\right) = \sum_{j=1}^m \rho_j \cdot \frac{a_i}{m} - \sum_{j=1}^m \left(\frac{a_i}{m} - \frac{1}{m} \sum_{j=1}^m \frac{a_i}{m}\right)^2 = \frac{a_i}{m} \cdot \sum_{j=1}^m \rho_j = \frac{a_i}{m} \cdot \hat{\rho} + \sum_{k=1}^m \rho_k, \quad \forall \rho_k \neq \hat{\rho}$$

$$w_i^2\left(\hat{a}_i = a_i, 0, \dots, 0\right) = \hat{\rho} \cdot a_i - \sum_{j=1}^m \left(a_{ij} - \frac{1}{m} \sum_{j=1}^m a_{ij}\right)^2 = \hat{\rho} \cdot a_i - \left(a_i - \frac{a_i}{m}\right)^2 - (m-1) \cdot \left(\frac{a_i}{m}\right)^2$$

Therefore, comparing both rewards, results 2 is easily obtained. \square

Result 2 establishes that when condition (C2) does not hold, the agent faces a trade-off exhibiting two kinds of effects:

- on the one hand, a **minimizing dispersion effect in favor of an equality of treatment independently of users' heterogeneity**, that is independently of the nature of the co-production relationship between the agent and the users, since the dispersion is minimized (and null) when users are treated equally, that is when the distribution is egalitarian:

$$a_{ij}^* = \frac{a_i}{m}, \quad \forall j=1\dots m;$$

- and on the other hand, **a co-production efficiency effect between the agent and the most productive user only, in favor of the most inequitable distribution**, since violating condition (C2) implies delivering a null service to all users except the highest productive one.

When condition (C2) does not hold, the first-stage outcome is so low (below the threshold value \hat{a}) that the minimizing dispersion effect is always dominating, the Pencil-Pusher game then leads to an anonymous allocation. In other words, whatever the heterogeneity among users, that is whatever the nature of the co-production relationship between the agent and the users (even though it may be high), the agent always prefers to deliver an anonymous (i.e. egalitarian) public service and does not take into account the productivity differentials that may exist within the group of users when she has to allocate low levels of service.

4. Incentives for agents with crowding-out toward users

An important result in our model is that the larger the size of the outcome obtained by an individual performance based compensation, the greater the level of inequality among users. By contrast, the small outcome resulting from a fixed wage incites the agent to deliver an anonymous service to users. We therefore obtain an endogenous relationship between incentives for the agents and crowding effects toward users.

In this section, we provide some calibration exercises to illustrate these links between incentives and crowding effects.

4.1. Calibration and simulation results

To calibrate the model, we restrict the number of users to $m=3$. In this case,

the equilibrium distribution then writes: $a_{ij}^* = \frac{a_i^*}{3} + \frac{2\rho_j - \sum_{k=2}^3 \rho_k}{6}$, $j=1,2,3$

Condition (C2) is also given by: $a_i^* > \frac{3}{2} \cdot \hat{\rho}$

The model is calibrated and simulated ² considering two alternative cases: a low and high heterogeneity among users. The parameter values are set as follows.

	Low heterogeneity	High heterogeneity
Users' ability levels	$\rho_1 = 18, \rho_2 = 24, \rho_3 = 30$	$\rho_1 = 6, \rho_2 = 18, \rho_3 = 24$
Condition (C2) holds	$a_i^* \in [45, 100]$	$a_i^* \in [36, 100]$
Condition (C2) does not hold	$a_i^* \in [1, 44]$	$a_i^* \in [1, 35]$

In the four cases considered (low and high heterogeneity among users and (C2) holds or does not hold), the *dashed line* represents the *equilibrium dispersion function* whereas the *solid line* represents the *equilibrium co-production function*.

² The model has been calibrated using the Mathematica 4.0 software. Programs are available upon request.

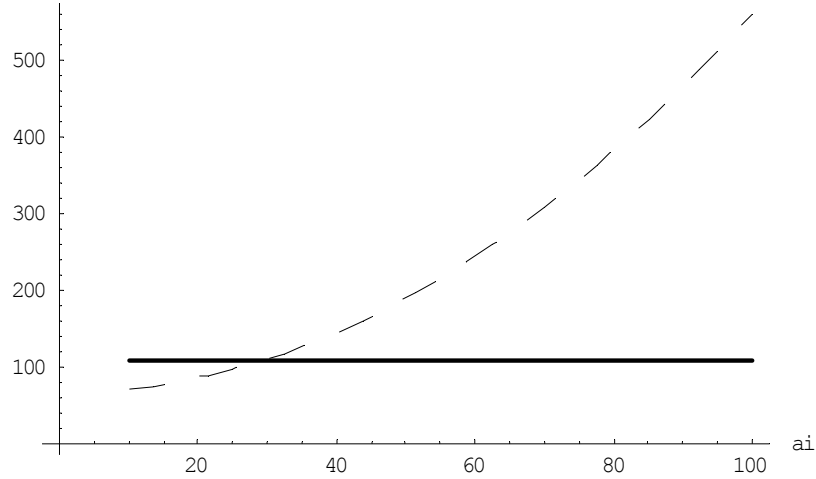


Figure 1: Low heterogeneity among users, (C2) holds

Figure 1 illustrates that when heterogeneity among users is low, the dispersion function is increasing in a_i and always above the co-production function. Hence, for low levels of heterogeneity among users, result 1 holds, that is, the agent prefers to treat users anonymously, that is without taking into account their heterogeneity in terms of productivity, whatever the value of a_i .

In other words, when users are weakly heterogeneous, the minimizing dispersion effect in favor of an equality of treatment independently of users' heterogeneity dominates the co-production efficiency effect (which would induce the agent to take into account users' productive heterogeneity).

This suggests that when (C2) holds, low levels of heterogeneity among users, independently of the level of a_i (but below \hat{a}), always favors the anonymity principle.

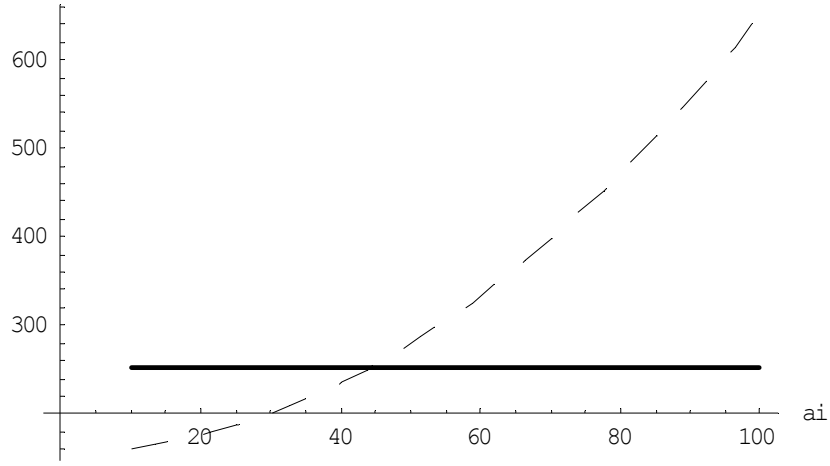


Figure 2: High heterogeneity among users, (C2) holds

Figure 2 illustrates the trade-off between the minimizing dispersion effect in favor of an equality of treatment independently of users' heterogeneity and the co-production efficiency effect inducing the agent to take into account users' productive heterogeneity depends on the level of a_i .

Figures 1 and 2 also illustrate result 2, that is the anonymous minimum public service effect. Indeed, when condition (C2) is violated, this effect always holds whatever the level of heterogeneity among users, a result indeed exhibited by our simulations when a_i is low ($a_i^* \leq \hat{a} = 45$ for low heterogeneity among users and $a_i^* \leq \hat{a} = 36$ for a high heterogeneity among users), the most inequitable distribution (delivering all the public service to the highest productive user) is never an equilibrium outcome: the equilibrium dispersion function is always below the equilibrium co-production function.

4.2. At which level does the crowding-out effect occurs?

We have shown that the nature of incentives offered to agents (fixed versus performance based pay) influences their egalitarian behavior toward users.

This effect induces a positive link between incentives at the agents' level and motivation crowding-out effects toward users.

Hence, where the standard literature finds crowding-out effects among agents, we provide a theoretical model with a three-layer hierarchy (principal agent user) where incentives are associated with crowding-out effects among users.

In other words, what we show is that incentives-based pay induces a second order incentive to break users' anonymity. When users' heterogeneity is taken into account, crowding-out indeed increases : the agent's performance affects positively differences among users.

A low performing agent, like a Pencil-Pusher, in the first stage of the game chooses to reduce inequality among users by delivering an egalitarian service. On the contrary, an intermediate or a high performing agent tends to prefer but not always, delivering an unequal service.

5. Conclusion.

The principal-agents-users model considered in this paper, the Pencil-Pusher Game, shows that compensation schemes affects agents' egalitarian behaviors within public organizations. We show that there exists a trade-off for the agent between the anonymity principle and the efficiency of the co-production. When the former dominates the latter, the Pencil-Pusher game

leads to an egalitarian outcome. Otherwise, the equilibrium distribution contradicts the anonymity principle, thereby inducing crowding out effects from agents toward users.

The agent's performance in the first stage affects inequality in the distribution of users' ability. A low performing agent, like a Pencil-Pusher, chooses to reduce inequality among users by delivering an egalitarian service. On the contrary, an intermediate or a high performing agent tends to prefer but not always, delivering an unequal service. In other words, incentives do matter not only regarding the agents behavior but also regarding the egalitarian nature, of the public service delivered. Therefore we characterize an endogenous link between incentives and crowding effect toward users.

Since the power of incentives and competition cannot be considered in isolation to ethical considerations, as pointed out by Shleifer (2004), our model suggests a more general interpretation of the relationship between incentives and crowding effects. Indeed, in our model, the relationship between the agent and the users can be viewed as specific dictator game with two variants : first, the agent –the dictator- chooses an allocation of a pie between heterogeneous responders – the users; and second, the dictator's payoff is defined as the weighted sum of the individual shares among users by the coefficient reflecting the heterogeneity of the responders. The literature on dictator games and their experimental

applications constitute a fruitful area of application for our theoretical model.

We will therefore test our theoretical predictions by running experiments, in particular to determine to which extent the link between incentives for the agents and an crowding effects toward users suggest that incentive labor contracts within public organizations need a preliminary sorting among users in order to induce performance and reduce crowding-out effects on users.

References

- [1] **Akerlof G.A. and R.E. Kranton.** (2003), “Identity and the Economics of Organizationsarison”, *Univerrsty of California, Mimeo*.
- [2] **Barr, A., Lindelöw, M. and Serneels, P.** (2004), “To Serve the Community or Oneself: The Public Servant’s Dilemma”, *World Bank Policy Research Working Paper* No. 3187.
- [3] **Borjas, G.J.** (2002), “The Wage Structure and the Sorting of Workers Into the Public Sector”, *NBER Working Paper* No. 9313
- [4] **Bull, C. Schotter, A. and Weigelt, K.** (1987), “Tournaments and Piece Rates: An Experimental Study”, *Journal of Political Economy*, 95(1), 1-33.
- [5] **Croxson, B., Propper, C. and Merkins A.** (1998), “Are Public Sector Workers Influenced by Financial Incentives?”, University of Bristol, *CMPO Working Paper* No. 98/001.
- [6] **Dixit, A.** (2002),“ Incentives and organizations in the public sector: An interpretative review”, *Journal of Human Resources*, 37(4), 696-727.
- [7] **Fehr, E. and Gächter S.** (2002), “Do Incentive Contracts Crowd-out Voluntary Cooperation?”, University of Zurich, *Institute for Empirical Research in Economics Working Paper* No. 34.
- [8] **Frey, B.S. and Jegen, R.** (2001), “Motivation Crowding Theory: A Survey of Empirical Evidence”, *Journal of Economic Surveys*, 15 (5), 589-611.
- [9] **Frey, B.S. and Oberholzer-Gee, F.** (1997), “The Cost of Price Incentives: An Empirical Analysis of Motivation Crowding-out, *American Economic Review*, 87, 746-755.
- [10] **Gneezy, U. and A. Rustichini.** (2004), “Gender and Competition at a Young Age ”, *American Economic Review* , 94(2) , 377-381.
- [11] **Koford, K. and Penno, M.** (1992), “Accounting, Principal-agent Theory, and Self-interested Behavior”, in Bowie N.E. and Freeman R.E. (eds.), *Ethics and Agency Theory*, New York, Oxford University Press, 127-142.
- [12] **Kreps, J.** (1997), “Intrinsic Motivation and Extrinsic”, *American Economic Review*, 87(2), 359–364.

- [13] **Laffont, J.J.** (2000), “Etapas vers un Etat moderne, une analyse Economique”, in Conseil d’analyse économique, *Etat et gestion publique*, Report No. 24, 117-149.
- [14] **Lazear, E.** (1998), *Personnel Economics for Managers*, New York: John Wiley and Sons.
- [15] **Montmarquette, C. Rulhière, J-L., Villeval M-C. and Zeiliger R.** (2003), “Redesigning Teams and Incentives: A Real Effort Experiment with Managers of a Merged Company”, GATE Working Paper No. 2002/12, under revision in *Management Science*.
- [16] **Shearer, B.** (2004), “Piece rates, Fixed wages and Incentives : Evidence from a Field Experiment”, *Review of Economic Studies*, 71, 513-534.
- [17] **Shleifer, A.** (2004), “Does Competition Destroy Ethical Behavior?”, *American Economic Review*, 94(2) , 414-418.
- [18] **Slivinski, A.** (2002), “Team Incentives and Organizational Form”, *Journal of Public Economic Theory*, 4(2), 185-206.
- [19] **Sliwka, D.** (2003), “On the Hidden Costs of Incentive Schemes”, *IZA Discussion Paper* No. 844.

CESifo Working Paper Series

(for full list see www.cesifo.de)

- 1253 Ngo Van Long and Gerhard Sorger, Insecure Property Rights and Growth: The Roles of Appropriation Costs, Wealth Effects, and Heterogeneity, August 2004
- 1254 Klaus Wälde and Pia Weiß, International Competition, Slim Firms and Wage Inequality, August 2004
- 1255 Jeremy S. S. Edwards and Alfons J. Weichenrieder, How Weak is the Weakest-Link Principle? On the Measurement of Firm Owners' Control Rights, August 2004
- 1256 Guido Tabellini, The Role of the State in Economic Development, August 2004
- 1257 François Larmande and Jean-Pierre Ponssard, EVA and the Controllability-congruence Trade-off: An Empirical Investigation, August 2004
- 1258 Vesa Kanninen and Jenni Pääkkönen, Anonymous Money, Moral Sentiments and Welfare, August 2004
- 1259 Panu Poutvaara and Andreas Wagener, Why is the Public Sector More Labor-Intensive? A Distortionary Tax Argument, August 2004
- 1260 Lars P. Feld and Stefan Voigt, Making Judges Independent – Some Proposals Regarding the Judiciary, August 2004
- 1261 Joop Hartog, Hans van Ophem, and Simona Maria Bajdechi, How Risky is Investment in Human Capital?, August 2004
- 1262 Thomas Eichner and Rüdiger Pethig, Efficient Nonanthropocentric Nature Protection, August 2004
- 1263 David-Jan Jansen and Jakob de Haan, Look Who's Talking: ECB Communication during the First Years of EMU, August 2004
- 1264 David F. Bradford, The X Tax in the World Economy, August 2004
- 1265 Hans-Werner Sinn, Migration, Social Standards and Replacement Incomes. How to Protect Low-income Workers in the Industrialized Countries against the Forces of Globalization and Market Integration, August 2004
- 1266 Wolfgang Leininger, Fending off one Means Fending off all: Evolutionary Stability in Submodular Games, August 2004
- 1267 Antoine Bommier and Bertrand Villeneuve, Risk Aversion and the Value of Risk to Life, September 2004

- 1268 Harrie A. A. Verbon and Lex Meijdam, Too Many Migrants, Too Few Services: A Model of Decision-making on Immigration and Integration with Cultural Distance, September 2004
- 1269 Thomas Eichner and Rüdiger Pethig, Economic Land Use, Ecosystem Services and Microfounded Species Dynamics, September 2004
- 1270 Federico Revelli, Performance Rating and Yardstick Competition in Social Service Provision, September 2004
- 1271 Gerhard O. Orosel and Klaus G. Zauner, Vertical Product Differentiation When Quality is Unobservable to Buyers, September 2004
- 1272 Christoph Böhringer, Stefan Boeters, and Michael Feil, Taxation and Unemployment: An Applied General Equilibrium Approach, September 2004
- 1273 Assaf Razin and Efraim Sadka, Welfare Migration: Is the Net Fiscal Burden a Good Measure of its Economics Impact on the Welfare of the Native-Born Population?, September 2004
- 1274 Tomer Blumkin and Volker Grossmann, Ideological Polarization, Sticky Information, and Policy Reforms, September 2004
- 1275 Katherine Baicker and Nora Gordon, The Effect of Mandated State Education Spending on Total Local Resources, September 2004
- 1276 Gabriel J. Felbermayr and Wilhelm Kohler, Exploring the Intensive and Extensive Margins of World Trade, September 2004
- 1277 John Burbidge, Katherine Cuff and John Leach, Capital Tax Competition with Heterogeneous Firms and Agglomeration Effects, September 2004
- 1278 Joern-Steffen Pischke, Labor Market Institutions, Wages and Investment, September 2004
- 1279 Josef Falkinger and Volker Grossmann, Institutions and Development: The Interaction between Trade Regime and Political System, September 2004
- 1280 Paolo Surico, Inflation Targeting and Nonlinear Policy Rules: The Case of Asymmetric Preferences, September 2004
- 1281 Ayal Kimhi, Growth, Inequality and Labor Markets in LDCs: A Survey, September 2004
- 1282 Robert Dur and Amihai Glazer, Optimal Incentive Contracts for a Worker who Envy his Boss, September 2004
- 1283 Klaus Abberger, Nonparametric Regression and the Detection of Turning Points in the Ifo Business Climate, September 2004

- 1284 Werner Güth and Rupert Sausgruber, Tax Morale and Optimal Taxation, September 2004
- 1285 Luis H. R. Alvarez and Erkki Koskela, Does Risk Aversion Accelerate Optimal Forest Rotation under Uncertainty?, September 2004
- 1286 Giorgio Brunello and Maria De Paola, Market Failures and the Under-Provision of Training, September 2004
- 1287 Sanjeev Goyal, Marco van der Leij and José Luis Moraga-González, Economics: An Emerging Small World?, September 2004
- 1288 Sandro Maffei, Nikolai Raabe and Heinrich W. Ursprung, Political Repression and Child Labor: Theory and Empirical Evidence, September 2004
- 1289 Georg Götz and Klaus Gugler, Market Concentration and Product Variety under Spatial Competition: Evidence from Retail Gasoline, September 2004
- 1290 Jonathan Temple and Ludger Wößmann, Dualism and Cross-Country Growth Regressions, September 2004
- 1291 Ravi Kanbur, Jukka Pirttilä and Matti Tuomala, Non-Welfarist Optimal Taxation and Behavioral Public Economics, October 2004
- 1292 Maarten C. W. Janssen, José Luis Moraga-González and Matthijs R. Wildenbeest, Consumer Search and Oligopolistic Pricing: An Empirical Investigation, October 2004
- 1293 Kira Börner and Christa Hainz, The Political Economy of Corruption and the Role of Financial Institutions, October 2004
- 1294 Christoph A. Schaltegger and Lars P. Feld, Do Large Cabinets Favor Large Governments? Evidence from Swiss Sub-Federal Jurisdictions, October 2004
- 1295 Marc-Andreas Mündler, The Existence of Informationally Efficient Markets When Individuals Are Rational, October 2004
- 1296 Hendrik Jürges, Wolfram F. Richter and Kerstin Schneider, Teacher Quality and Incentives: Theoretical and Empirical Effects of Standards on Teacher Quality, October 2004
- 1297 David S. Evans and Michael Salinger, An Empirical Analysis of Bundling and Tying: Over-the-Counter Pain Relief and Cold Medicines, October 2004
- 1298 Gershon Ben-Shakhar, Gary Bornstein, Astrid Hopfensitz and Frans van Winden, Reciprocity and Emotions: Arousal, Self-Reports, and Expectations, October 2004
- 1299 B. Zorina Khan and Kenneth L. Sokoloff, Institutions and Technological Innovation During Early Economic Growth: Evidence from the Great Inventors of the United States, 1790 – 1930, October 2004

- 1300 Piero Gottardi and Roberto Serrano, Market Power and Information Revelation in Dynamic Trading, October 2004
- 1301 Alan V. Deardorff, Who Makes the Rules of Globalization?, October 2004
- 1302 Sheilagh Ogilvie, The Use and Abuse of Trust: Social Capital and its Deployment by Early Modern Guilds, October 2004
- 1303 Mario Jametti and Thomas von Ungern-Sternberg, Disaster Insurance or a Disastrous Insurance – Natural Disaster Insurance in France, October 2004
- 1304 Pieter A. Gautier and José Luis Moraga-González, Strategic Wage Setting and Coordination Frictions with Multiple Applications, October 2004
- 1305 Julia Darby, Anton Muscatelli and Graeme Roy, Fiscal Federalism, Fiscal Consolidations and Cuts in Central Government Grants: Evidence from an Event Study, October 2004
- 1306 Michael Waldman, Antitrust Perspectives for Durable-Goods Markets, October 2004
- 1307 Josef Honerkamp, Stefan Moog and Bernd Raffelhüschen, Earlier or Later: A General Equilibrium Analysis of Bringing Forward an Already Announced Tax Reform, October 2004
- 1308 M. Hashem Pesaran, A Pair-Wise Approach to Testing for Output and Growth Convergence, October 2004
- 1309 John Bishop and Ferran Mane, Educational Reform and Disadvantaged Students: Are They Better Off or Worse Off?, October 2004
- 1310 Alfredo Schclarek, Consumption and Keynesian Fiscal Policy, October 2004
- 1311 Wolfram F. Richter, Efficiency Effects of Tax Deductions for Work-Related Expenses, October 2004
- 1312 Franco Mariuzzo, Patrick Paul Walsh and Ciara Whelan, EU Merger Control in Differentiated Product Industries, October 2004
- 1313 Kurt Schmidheiny, Income Segregation and Local Progressive Taxation: Empirical Evidence from Switzerland, October 2004
- 1314 David S. Evans, Andrei Hagiu and Richard Schmalensee, A Survey of the Economic Role of Software Platforms in Computer-Based Industries, October 2004
- 1315 Frank Riedel and Elmar Wolfstetter, Immediate Demand Reduction in Simultaneous Ascending Bid Auctions, October 2004
- 1316 Patricia Crifo and Jean-Louis Rullière, Incentives and Anonymity Principle: Crowding Out Toward Users, October 2004