



# Nature of human capital, technology and ownership of public goods<sup>☆</sup>

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## ABSTRACT

Besley and Ghatak (2001) show that a public good should be owned by the agent who values the public good the most – irrespective of technological factors. In this paper we relax their assumptions in a natural way by allowing the agents to be indispensable, and we show that the relative valuations are not the sole determinant of an optimal ownership structure but also the nature of human capital and technology matter.

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## 1. Introduction

Besley and Ghatak (2001) extend the property rights theory of Grossman and Hart (1986) and Hart and Moore (1990) to analyze the ownership of public goods. Their main result is that the agent who has the highest valuation for the public good should be the owner, irrespective of who is the key investor or other technological factors. We relax their assumptions in a natural way by allowing the agents to be indispensable and we show that although the valuation for a public good is an important determinant of the optimal ownership structure, technology – and in particular the nature of human capital – matter too.

In property rights theory, ownership affects incentives via default payoffs in bargaining. With private goods, ownership increases the default payoff and investment incentives.<sup>1</sup> Therefore, the key investor should be the owner in order to guarantee the best incentives for him. With public goods – analyzed by Besley and Ghatak (2001) – the default payoffs work differently because public goods are non-excludable and non-rival

and all the agents benefit from the public good, even if bargaining breaks down. This is why the default payoffs depend on an agent's valuation of the public good. Besley and Ghatak (2001) (henceforth, BG) show that ownership of the high-valuation agent is optimal, even if the low-valuation agent is the key investor.

Their framework applies, for example, in collaboration of a government agency<sup>2</sup> and an NGO to provide public goods such as health care, education, environmental protection, and agricultural extension. In a developing economy context, the NGO can be more in tune with the beneficiaries of the project and, therefore, have a higher valuation for the public good than has the government agency (henceforth, the government). The BG result then implies that the NGO should own the public good. However, embedded in their Assumption 1 are certain properties of human capital. In particular, their assumption implies that the agents are relatively dispensable, so that the government's investment would not be adversely affected if the NGO were to leave the project. However, many NGOs are indispensable because they pioneer new technologies specific to their beneficiaries. For example, Partners in Health were responsible for the innovation of an effective community-based treatment for multi-drug-resistant tuberculosis in Haiti<sup>3</sup> and Friends in Village Development pioneered an improvement of duck-rearing practices in Bangladesh.<sup>4</sup> Alternatively, the NGO can be indispensable because it has

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<sup>1</sup> However, removing ownership can motivate higher investment when a different bargaining solution is applied (Chiu, 1998; De Meza and Lockwood, 1998), when investment affects the agent's outside opportunities (Rajan and Zingales, 1998), or when asymmetric information is introduced (Schmitz, 2006).

<sup>2</sup> We assume that the government agency is represented by a single bureaucrat.

<sup>3</sup> <http://www.pih.org/>.

<sup>4</sup> Farrington and Lewis (1993), p. 52.

developed trusting relationships with the beneficiaries and is familiar with the local conditions.<sup>5</sup> In such situations, the value of the government's investment would be adversely affected if the NGO were to leave the project, as other NGOs may not have the specialist technology or local networks. Further, the government may be indispensable, for example, to an NGO that needs access to all of the schools for their vaccination program. These cases arise naturally, but they violate BG's Assumption 1.

We take up an example from BG to demonstrate the contribution of our paper. A government agency is choosing how much to invest in improving the quality of a school and can choose either low or high investment at costs 0 or 2, respectively. The payoff to the government is 0 or 1. An educational NGO values the well-being of the children highly, and obtains a payoff 0 or 5. The NGO does not make an investment. Further, the absence of the NGO does not lower the payoffs from the project to either agent. In the terminology of our paper, the NGO is dispensable. This is the case when, for example, there are many similar NGOs with which the government could contract.

Suppose that the government owns the school and makes the high investment. The NGO gets a payoff of 5, even if it leaves the project. This is, firstly, due to the public-good nature of the project. The NGO values the education of the children, even if it cannot participate in educating them. Secondly, since the NGO is dispensable, the payoffs are not affected by the NGO's absence from the project. Therefore, the NGO is not willing to make any transfer to the government in Nash bargaining and the payoff for the government is equal to 1. Therefore, the government does not invest if it owns the school ( $1 < 2$ ).

If the NGO owns the school, the default payoffs for both parties are zero, as BG assume (in their example) that the participation of the government is needed to generate any surplus.<sup>6</sup> Now the NGO is willing to make a transfer to the government so that the project continues. In Nash bargaining the agents split the ex post surplus, each receiving a payoff of 3. Therefore, the government invests under the NGO ownership ( $3 > 2$ ). This is the main result of BG. Even when the government is the only investor, ownership by the high-valuation NGO is optimal. Under the BG assumption, NGO ownership is optimal because the default payoffs are not responsive to the investment and the government obtains an equal bargaining position. Under government ownership, the investment increases the default payoff of the high-valuation NGO relatively more; this puts the government in a weak bargaining position. In this paper we show that this result depends on the assumption that the NGO is dispensable.

Now, suppose that the NGO is indispensable due to its specialist technology. Therefore, the project does not generate any surplus without the NGO. Further, we assume that part of the government's investment is embodied in the physical capital and remains in the project, even if the government leaves. Suppose that due to this spillover the payoffs from the high investment to the government and the NGO are 0.6 and 3, respectively, when the government leaves the project.

If the government owns the project, the agents split the ex post surplus in bargaining, since without the indispensable NGO the project generates no surplus. The government's payoff of 3 covers the investment cost of 2. Therefore, contrary to BG, the government will invest when it owns the school.

If the NGO owns the school, it can guarantee itself a payoff of 3 even in the absence of the government, due to the spillover. Therefore, the NGO is not willing to make a large transfer to the government. In Nash bargaining, the government gets its default payoff plus half of the gains from trade (as the payoffs increase to 1 and 5 when the government is present)  $0.6 + 0.5 \cdot (0.4 + 2) = 1.8 < 2$ . The government will not invest. The NGO has a strong bargaining position

due to its high valuation for the public good and the spillover from the investment.

Ownership by the low-valuation government is now the best way to make the default payoffs least responsive to the investment – and protect the bargaining position of the government – because the investment has no value without the indispensable NGO. This demonstrates that the results of BG depend on their Assumption 1, which requires that the default payoff is more responsive to the investment when the investor is the owner. In this example, there is a 60% spillover from the government's investment. To satisfy BG's Assumption 1, the NGO would have to be so dispensable that the government can realize more than 60% of the value of its investment without the NGO. Alternatively, the spillovers can be small, for example when the government's leadership is necessary, so that the investment has no value without the presence of the government. In that case, the NGO can be relatively indispensable and still satisfy BG's Assumption 1. However, there is no natural link between the spillovers from the government's investment and the dispensability of the NGO; assuming such is restrictive.

We further demonstrate that technology plays a role in determining the optimal ownership structure of public goods. This is the case when both of the agents invest but have asymmetric roles, for example the NGO is indispensable and the government is dispensable. Then there is a trade off in providing incentives and the ownership structure should be chosen to maximize the key investor's incentives.

We have established how introducing indispensability changes the BG results. Interestingly, the results further depend on which agent is indispensable. When we compare ownership by the high-valuation agent, ownership by the low-valuation agent, and joint ownership, we find that joint ownership is weakly dominated when the high-valuation agent is indispensable and the low-valuation agent is dispensable. However, if the roles are the opposite, so that it is the low-valuation agent who is indispensable, then joint ownership weakly dominates ownership by the high-valuation agent. We can apply our analysis to public–private partnerships where the government is indispensable because it is the only purchaser of the public good. Our results indicate that the governance structure appropriate for a developing economy (where a pro-poor NGO is likely to be the high-valuation party) should differ from that of a developed economy (where government typically is the high-valuation party).

Relatively few papers have directly explored the model by Besley and Ghatak (2001). Rasul (2006) applies their model to child custody, introduces the endogenous probability of marital breakdown and explores joint custody. It has been shown that ownership by the low-valuation agent can emerge when maintenance costs (paid by the owner) are introduced (Grosjean, 2010), when public goods are impure (Francesconi and Muthoo, 2011), or when the relationship is repeated (Halonen-Akatwijuka and Pafilis, 2009). None of these papers allow the agents to be indispensable.

In a related paper, Hart et al. (1997) show that a private supplier of a public service has strong incentives for cost reduction, which can have an adverse effect on the quality of the service when contracts are incomplete. Public ownership with its weak incentives is then optimal if the adverse quality effect of privatization is large. For such a trade off to exist, it is important that the private supplier does not care directly about the benefits of the project. In the BG framework – which abstracts from cost-reducing investments – also the private supplier cares about the service and therefore would internalize at least part of the quality-reducing effect of cost-cutting. Hoppe and Schmitz (2010) building on Hart et al. (1997) rely on ex post renegotiation (induced by contracting on inefficiently low quantity) to get the private supplier to internalize the adverse quality effect of cost-cutting.

Incomplete contracting literature on public–private partnerships is also related.<sup>7</sup> Hart (2003) and Bennett and Iossa (2006) show

<sup>5</sup> Werker and Ahmed (2008), p.80.

<sup>6</sup> In their main model, BG assume that the default payoff is more responsive to the investment when the investor is the owner.

<sup>7</sup> See also Martimort and Pouyet (2008) and Chen and Chiu (2010) who take a more complete contracting approach.

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