# Evaluating Targeted Subsidies

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## Abstract

This note dicusses the value of targeting in the context of technology adoption subsidies. Whenever agents are heterogeneous in their impact on others, targeting subsidies to those who have the greatest externality will improve the impact of subsidies. However, the relevant information needed for efficient targeting may sometimes be private. We describe incentive compatible methods to target subsidies on such private information. Drawing on the existing literature, we clarify what type of private information may be extracted, and how it may be useful for targeting.

## ➤ 1. Heterogeneity of externalities and targeted subsidies

Interventions beyond simple marketing are often necessary for the adoption of a new technology. The most common intervention is a subsidy, or discount, for the new technology. These may be provided by the inventor of a technology, or some other group interested in the technology's adoption. Subsidies for technology adoption are generally motivated by one of three rationales: differing beliefs, information externalities, or direct externalities.

- In the first case, a subsidy is motivated by different beliefs, or preferences over outcomes, between the (potentially) adopting population and the subsidy provider. This may even occur if the subsidy recipient(s) can afford the technology, and the benefits of the technology accrue entirely to the adopter.

- However, in many cases, the benefits of the technology may accrue, in part, to others. This benefit may be due to the information generated by early adopters on the costs of operating the technology and its returns. For many technologies, the rate of return depends on local conditions. For example, in agriculture, climate, soil conditions, prices, and so on, matter for the returns to fertilizer, seeds, and irrigation. Therefore, local experimentation is needed for farmers to make technology adoption decisions (Besley and Case, 1993; Conley and Udry, 2010). However, as the information arising from a local experiment is a public good—farmers in similar conditions benefit from an experimenter's labors—it will be under-provided (Foster and Rosenzweig, 1995; ATAI, 2011). As such, many programs subsidize experimentation: directly through discounting new technologies, or indirectly through extension workers whose demonstrations

can effectively substitute for some local experimentation.

- The above information externalities are a special case of more direct externalities. That is, the subsidy provider may also want to promote a technology, for instance, pest and disease control innovations can help both adopters and their neighbors.

This note is interested in the targeting of subsidies driven by a technology with heterogeneous externalities. For example, the externality of information generated by an early adopter of a new varietal will depend on the density of her social network, and the externality due to pest control will depend on the number of neighbors. In these situations, the cost-efficiency of technology subsidy programs can be enhanced by targeting recipients with the greatest externalities.

There are many potential sources of heterogeneity in externalities. There can be variation in

- the subsidy recipients' position within the local social network;
- her willingness to use the technology;
- her skill in doing so;
- her willingness to share information with, or help others;
- how representative she is of the community;
- the specific use she has for the technology.

If there is a lot of heterogeneity across individuals, then targeting subsidies to those who have the greatest externalities promotes information creation and diffusion, as well as increasing the social returns to technology adoption.

## ➤ 2. Targeting based on private information

In many cases, it may be interesting to target subsidy recipients based on their private information. For instance, one may want to target a recipient based on how eager he or she is to

experiment, or what is his or her position in the social network.

As Chassang, Padro i Miquel, and Snowberg (2012) highlight, such private information must be elicited in an *incentive compatible way*. For example, when thinking about subsidies that depend on an individual's position in a social network, community members may exaggerate their own centrality, and downplay that of rivals, in order to gain a subsidy.

Incentive compatibility disciplines the range of targeting mechanisms that can be implemented. Broadly, the following principles must be respected:

1. participants must be aware of the rules of the mechanism they are participating in; i.e., be aware of how their response affects targeting;

2. deciding which information to elicit from participants is equivalent to deciding on a choice problem to offer them;

3. targeting schemes must 'respect participants' preferences', that is, although allocations may be random, allocations that participants prefer must be more likely.

We illustrate the above principles through three examples of information elicitation, and targeting based on that information.

**Private cash value for the technology.** By giving potential recipients a choice between obtaining the subsidy at no cost for a relatively low probability, or obtaining the subsidy at some cost with a higher probability, it is possible to elicit the participant's cash value for the technology. At one extreme, take-it-or-leave-it prices deliver a 0-1 assignment as a function of willingness to pay in cash.

**Private effort value for the technology.** Instead of offering participants a trade-off between a higher probability of getting a subsidy and cash, one can offer the participant trade-offs between obtaining the subsidy and physical effort—for example, performing basic tasks such as plowing a field—or even between ob-

taining the technology and time/attention—by attending additional information sessions on the relevant technology.

**Preferences over other recipients.** Basing subsidy assignment on private information that relevant stakeholders have on potential recipients may be particularly attractive. Voting schemes provide one way to do so. Importantly, the outcome of a vote need not by deterministic, that is, plurality candidates need not be given a subsidy. It is sufficient for the likelihood of receiving the subsidy to be monotonically increasing in the number of votes.

▶ **3. Existing findings**

The existing literature provides useful guidance on what private information may be usefully elicited from participants.

**Willingness to pay cash.** The fear that subsidized technologies will be left unused and poorly maintained is widespread. If people who are willing to pay for a technology are more eager to use it, higher willingness to pay may signal a greater externality on others.

As a result, many groups are opposed to heavy subsidization of new technologies—including NGOs that focus on technology adoption. With only small subsidies, a new technology is assigned only on the basis of willingness to pay cash.

Recent evidence from the health sector shows that technologies that are easy to use, such as insecticidal bednets, are well used even if they are heavily subsidized (Cohen and Dupas, 2011; Dupas, 2009; Tarozzi *et al.* 2013). For such technologies, targeting based on willingness to pay cash may not be very useful. For complicated agricultural technologies that require significant experimentation effort, selection of who to target may be much more important in terms of information generation and learning.

**Willingness to pay with effort.** As argued in

Cohen and Dupas (2011), willingness to pay cash may be a very noisy signal of intended usage when participants are credit constrained, or face large liquidity risks. If this is the case, non-monetary choice problems may reveal more useful information. Findings from Atalas *et al.* (2013) and Dupas *et al.* (2016), who study the effectiveness of mechanisms that depend on physical effort or time for targeting cash transfer programs and health subsidies, respectively, suggest that time and effort may be useful in targeting participants with liquidity constraints. These mechanisms serve to target poor recipients. It is unclear whether they can be used to select different types of subsidy targets.

**Social information.** Several studies show that targeting based on social information may be useful. Beaman *et al.* (2015) show how allocating technologies to more central participants may affect adoption. Banerjee *et al.* (2014) show how both network information and direct elicitation may generate useful information about community members best able to diffuse new information.

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