

Re.: **Essays on Philanthropy** by Katarina Svitkova

I have read Katarina's thesis and find it to be generally very good. Her work is original and displays sufficient technical rigor for a PhD level thesis. The first chapter is already well polished and I have no particular comments about it, other than to say that she now needs to think about having it published. I don't have any particular expertise to assess the content of the third chapter, which is empirical, but it seems competently done also. I have no objections to these two chapters. However, I find that the second chapter of her thesis is weaker and that the analysis she presents there is not entirely correct. Therefore, I would ask her to improve it before the thesis is accepted.

The model in chapter 2 seeks to shed some light on whether the presence of a certifier would influence the decision of a nonprofit entrepreneur to operate a genuine nonprofit firm (hereby called GNP) rather than a for-profit in disguise (hereby called FPID). The model makes many simplifying assumptions that do limit its generality, but I don't find that to be a problem, as she is tackling a complex question. The model has two strategic players: a donor who chooses to give some amount to a nonprofit firm, and a manager who receives the donation on behalf of the firm and chooses how to use it. A third player, the certifier, does not play strategically. If the firm is a GNP, it will use the donation to produce a public good consumed by both the donor and the charity manager. On the other hand, if the firm is a FPID, it will use it to buy a private good consumed only by the charity manager. The manager's inclination to found either a GNP or a FPID is given by a random variable, and the donor does not know whether the manager has founded a GNP or a FPID. However, the donor has some beliefs about the probability that the firm is a GNP, and the amount of his donation is positively related to this probability. The manager can influence the donor's beliefs by seeking certification. In the certification process, the firm pays a fee to the certifier who investigates the firm using an imperfect detection technology and issues or not a seal of approval depending on the results of the investigation. By assumption, the certifier is more likely to grant certification to a GNP than to a FPID, even though type 1 and 2 errors are possible (i.e., rejecting a GNP by mistake or certifying a FPID by mistake). Upon seeing the certifier's verdict, the donor updates his beliefs about the probability that the firm is a GNP, and gives accordingly. I find all of this to be very well done. Katarina made appropriate simplifications where needed to keep the model tractable, and has set up a consistent model that yields results.

To answer the question posed at the start of this paragraph, Katarina identifies the set of entrepreneurs who would found a GNP when a certifier is not available, and compares this to the outcome when a certifier is available. This outcome depends on the precision of the detection technology and on the certification fee. She finds that in most cases the set of entrepreneurs who would found a GNP is larger when certification is available. In other words, entrepreneurs who would have founded a FPID in the absence of a certification would be prompted to found a GNP instead when certification is available. There are no cases where certification reduces the set of entrepreneurs who would found a GNP. As expected, if the fee is too high and/or the detection technology too imprecise, entrepreneurs may find that certification signals too little information to be worth the cost, in which case the presence of a potential certifier has no impact.

While I think that these results may be correct, I think that Katarina presents them incorrectly, or at least awkwardly. The model she has set up is a sequential game of incomplete information. Equilibria for such games are sets of rational beliefs updated using Bayes' rule at each stage, and strategies that are optimal against each other given the players' rational beliefs. Here, the entrepreneur has complete information, but the donor does not know the entrepreneur's type, so only the donor's beliefs need to be specified. Beliefs here are about the type of the entrepreneur (the value of α , using her notation). Rational beliefs at the beginning of the game can be discovered as follows: By solving the entrepreneur's problem, the donor can predict what the behavior of any entrepreneur would be, i.e., whether an entrepreneur of type α would found a GNP or a FPID. Since α is known by the donor to be uniformly distributed over $[0,1]$, the donor can then calculate the cumulative probability that the entrepreneur has an $\alpha > \alpha_i$ (which is the value of α for which an entrepreneur is just indifferent between founding a GNP or a FPID) and therefore the probability that the firm he manages is a GNP. The donor would then make a donation consistent with these beliefs.

The presence of a certifier complicates the model a lot, because it allows the entrepreneur to send a signal to the donor. Since the entrepreneur plays first, he must choose whether to found a GNP or FPID, and whether to seek certification or not, taking into account its cost and the probability of obtaining it, as well as the impact this will have on the donor's beliefs. In making this calculation, the entrepreneur must solve the game's last stage from the donor's point of view, i.e., forecast how a rational donor would update his beliefs conditional on each possible signal received, and calculate what donation levels are consistent with these updated beliefs. He then chooses his optimal strategy, and in equilibrium the donor follows by playing exactly as predicted by the entrepreneur. The entrepreneur has 4 possible strategies: found a GNP and seek certification; found a GNP and don't seek certification; found a FPID and seek certification; and found a FPID and don't seek certification. The donor's strategy is a donation function given his rational beliefs about the entrepreneur's type, conditional on the signals received. I think this is how Katarina should present the results of her model.

In chapter 1 of her thesis, Katarina uses jargon about pooling and separating equilibria in the analysis of her model. A pooling equilibrium occurs when many players play the same strategy despite being of different types, so their behavior does not reveal that they are different. This is appropriate in chapter 1 because her model there has many firms competing with each other. But the model in chapter 2 has only one firm, so whatever the entrepreneur does can never be pooled or separated in that sense. What I understand Katarina to be trying to say when she talks about a pooling equilibrium in chapter 2 is that in some cases, e.g., when the fee for applying for certification is low enough, all types of entrepreneurs would apply for certification, and therefore the donor cannot infer anything from learning that a firm has applied for certification. I suggest that Katarina use instead language that labels signals as being "informative" if it allows the donor to update his beliefs, or "uninformative" if it leaves the donor's beliefs unchanged.

This misunderstanding about how to derive and update rational beliefs in games of incomplete information leads Katarina to a serious mistake in section 2.3.4 where she discusses whether also revealing that a firm has applied for but been denied certification would yield different results compared to only revealing whether or not the firm has received certification. The question is interesting, but I

think the analysis presented is incorrect. In particular, Katarina claims that if this extra information is revealed, all FPID would also apply for certification because donors believe that all firms who apply for certification are GNP. However, I cannot think of a way to update rational beliefs after receiving the information that a firm has been denied certification, that would lead the donor to conclude that this firm is a GNP. As an example, suppose that the detection technology is both sufficiently costly and very accurate, so that almost all FPID applications would be denied, and almost all GNP applications would be granted. How would a rational donor update his beliefs if he learns that the firm applied for but did not receive certification? It seems logical that the donor would believe that the firm is a lot less likely than previously believed to be a GNP since there is a small probability that the firm is a GNP who was inaccurately denied, but a much larger probability that the firm is a FPID who as accurately denied. Believing that the firm is most likely a FPID, the donor would reduce his donation significantly. I have not attempted to solve the model, but considering the high cost of applying for certification and the low probability of receiving it, it seems likely that in these circumstances an FPID would not apply for certification, just as in the case where the certifier does not reveal who has applied and failed.

In summary, I would accept as is both chapters 1 and 3 of the thesis. The model in chapter 2 is also well done, and most of her results, except for section 2.3.4, also seem correct. However, the analysis of the model in chapter 2 needs to be improved. In my opinion, the changes that would make that part of the thesis acceptable should not take very long to make, maybe a couple of weeks at most.

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