The inclusion of a social preference parameter in credit models: an attempt to explain the behavior of micro lending institutions.

"How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it, except the pleasure of seeing it."

-Adam Smith, The Theory of Moral Sentiments

1. Introduction

One of the major critiques of neoclassical economics is its creation of and reliance on the perfectly rational individual, *Homo economicus*. The theories of this school of thought are based on the concept of an individual who is focused exclusively on achieving the maximum profit for the least amount of labor, who acts on complete knowledge, and is focused only on their own well-being. Contrary to what the neoclassical school of thought would have us believe, profit and selfishness are not the only factors motivating human behavior. As illustrated by the above quote, even as early as Adam Smith there are other motivating desires at play in man’s behavior than “selfishness”.

In this paper I will attempt to model the inclusion of social awareness into a lender/borrower credit model. I will do so by modifying the credit model found in Samuel Bowles' *Microeconomics* to include a social preference parameter. By doing so I hope to be able to illustrate situations where the motivations of the lender can range from profit-driven to altruistic. Through the inclusion of this parameter I will also be able to examine the response by borrower and lender to changes in social preference, risk, and the interest factor.
2. Background

In many parts of the developing world, social and economic progress is impeded by an absence of access to credit for the many individuals lacking collateral. These credit constrained individuals are typically limited to one outlet for funds, the village money lender, who's exorbitant interest rates often erase any surplus that may have accrued to the borrower. Nowhere is the figure of *Homo economicus* better portrayed than in the village money lender who takes advantage of the absence of perfect competition to extract as much of the consumer surplus as possible. However, in the past several decades an answer to this stereotypical figure has emerged in the many non-profit and non-governmental organizations that have been attempting to remedy this situation. They do so by offering small loans at reasonable interest rates, without the stipulation of collateral. These microloans are providing startup funds for individuals and groups at rates that allow them to retain a portion of the surplus they create.

The rise of micro financing is most deservedly attributed to Bangladeshi banker Muhammad Yunus and his Grameen Bank. This institution has provided start up loans for thousands of women, who would otherwise not have access to credit. The main attributed of the program include no collateral, small loans, and a practice of group lending which aids in holding borrows accountable for their repayments. This model has been implemented in multiple countries by numerous NGOs, who have recently been joined by for-profit versions of micro lending institutions. In both cases it seems that micro financers are attempting to balance the need to be profitable and self-sufficient with the desire to preserve the surpluses of consumers above the reservation point needed to ensure sufficient demand and maintain the goal of providing access to credit for a large number of persons (Dehejia et al).
3. Construction of the model

As in the model constructed by Bowles, define the level of risk taken by the borrower as $f$, the return to the borrower as $r = \mu f (1 - f)$, where $\mu$ is a positive constant representing project quality. To include the social preference parameter, let $\alpha \in (0, 1)$ represent the social preference of the lender, where $\alpha = 1$ represents complete altruism. Then let $\delta$ represent the interest factor, the amount borrowed plus the interest charged. The profit function of the lender then becomes

$$\pi = \delta (1 - \alpha) (1 - f),$$

where the borrower receives the interest factor $\delta$, less the amount given up by their social preference $(1 - \alpha)$, with the probability that the project succeeds $(1 - f)$. With the modified profit function, we can now construct the return function for the borrower. Representing the agent's return $y$ as the difference between their return on the project, less the repayment to the lender, we get

$$y = \mu f (1 - f) - \delta (1 - \alpha) (1 - f).$$

To find the best response function of the borrower, we differentiate the agent's return function with respect to the risk level, $f$. This gives us the result

$$\frac{dy}{df} = \mu - 2\mu f + \delta - \alpha \delta = 0.$$

If we solve this equation for $f$, the result is the agent's best response function,

$$f = \frac{1}{2} + \frac{\delta (1 - \alpha)}{2\mu}.$$

We can interpret this response function as saying the amount of risk taken by the borrower is decreasing in the social preference parameter. In fact, should the lender be perfectly altruistic, the second term on the right hand side will collapse and we will be left with the social planner outcome for
the borrower of \( f = \frac{1}{2} \). The assumption of complete altruism would also reduce the profit function to \( \pi = 0 \). However, it is an easy assumption that most lenders are not entirely altruistic, otherwise the credit market would not even exist, people would simply give money to anyone starting a project. Under this assumption we continue onward to see how the profit function is maximized by varying the interest factor. By differentiating the profit function with respect to \( \delta \) and rearranging the terms we come up with the expression \( f'(\delta) = \frac{1-f(\delta)}{\delta} \). If we look back to the agent’s best response function we can substitute the appropriate expressions in for \( f(\delta) \) and \( f'(\delta) \). In order to find the profit maximizing interest factor, we solve the equation for \( \delta \), which results in the expression

\[
\delta^* = \frac{\mu}{2(1-\alpha)}.
\]

Finally, we substitute this result back into the agent’s best response function we can solve for the optimal level of risk, \( f \). The end result provides us with the optimal level of risk for the borrower in the presence of a profit maximizing lender being \( f^* = \frac{3}{4} \). When substituted back into the profit and return functions, the payoffs under this model are \( (\frac{\mu}{8}, \frac{\mu}{16}) \), which are the same expected payoffs as the non-contractible risk, single period model.

4. Interpretation of the results

Having attempted to insert a measure of social preference into the credit decision model, I will now examine the results. I feel that some aspects worked well, while others provide less satisfactory explanations for the behavior I am trying to model. The agent’s best response function provides an equation that is both meaningful and intuitive to describing the issue presented. The level of risk taken decreases as the level of social preference rises. This makes sense because if there is a lower amount to be paid back the borrower does not need to engage in as risky a venture. The reaction of this function to
different variables also makes intuitive sense. An increase in the project quality or social preference will decrease the level of risk taken, while an increase in the interest factor will increase risk taken.

In looking at the expression determining the optimal interest factor, I understand that in order to maximize profit, if social preference increases, the lender must simultaneously increase the interest factor on the portion that is being repaid. However, I do not find it to be a satisfactory explanation within the context of the situation I am attempting to model.

Compared to the different versions of this model examined by Bowles, I inadvertently created a model that is very similar to the one he examines titled *Noncontractable risk with borrower’s equity*. Even though the lender’s profit function and borrower’s return function are different, both models achieve the same equilibrium result. Going on from his static equilibrium, Bowles inserts his result into a competitive general equilibrium model by setting the lender’s profit function equal to zero, the zero-profit condition. It would be interesting to examine a situation similar with this model, however the assumption of perfect competition and zero profit are inappropriate for this situation. It is precisely a lack of competition that inspired the creation of micro lending institutions. They hope to spur economic growth and increase social welfare both by increasing competition to diminish the monopoly power of moneylenders and by providing opportunities for individuals to start new ventures that do not need to take unreasonable amounts of risk in order to stay afloat.

5. Conclusions

In attempting to modify Bowles’ credit model to show how social preference plays into the lending decision of micro financiers I feel mixed results were achieved. The borrower best response function seems successful, but the model seems less so in regards to the lender’s behavior. It is clear that modeling behavior is more an art than a science. Often an author will create a model with the intent of explaining a particular situation. It may not be possible to modify a particular model to portray
a situation not considered by the original creator. A better model to utilize may be one where the interest factor $\delta$ is broken down into its respective pieces. Being able to have the social preference parameter only impact the interest rate, rather than the entire amount to be repaid, may result in a more satisfying model.

References
