1077-49-365 **Jannett Highfill** (highfill@bradley.edu), Department of Economics, Bradley University, and **Michael McAsey*** (mcasey@bradley.edu), Department of Mathematics, Bradley University, Peoria, IL 61625. *Optimal R & D Spending and Competition Between Firms.* Preliminary report.

The goal is for a firm to determine the optimal expenditure of research and development (R&D) funding that increases the quality of their product so as to maximize the integral representing total discounted profit. The integrand in the optimal control problem is constructed from a distribution of reservation prices which results in a function that is quadratic in the state variable $x(t)$ (the quality level of the product) and linear in the control $E(t)$ (the R&D expenditure). The quality is regarded as a number between 0 and 1 so that $1 - x(t)$ is the failure rate of the product. The state equation is $dx/dt = k(1 - x)E^{1/2}$, so that quality gets more difficult to increase as the product has higher quality and the R&D funding has diminishing returns. In an initial model a competitor is another firm that is either "complacent" (doing no R&D) or "lockstep" (matching improvements to the product instantaneously). Extensions of the basic model include changes in the planning period, introducing trade costs, and considering intermediate competitive scenarios. In another extension, the behavior of the two firms are characterized in a dynamic game setting. (Received August 26, 2011)