Overlapping generations with a public good

The economy

1. Each generation 0 has 100 members: 50 of them ("the poor") with endowment $(1, 0)$ [meaning that they have one unit of the good when young and zero units when old] and the other 50 ("the rich") with endowment $(4, 1)$.

2. There is no capital nor production: people spend their endowments in consumption c, loans l, and contributions e to a public good.

3. The public good only benefits the young individuals. Consequently, the old make no contribution to the public good. The utility function of each young individual i is $u_t^i = c_t^i(t) \cdot c_t^i(t+1) \cdot [1 + g(\sum_{j \in N(t)} e^j)]$, where e^j is the contribution by young individual j. It is assumed that e^j cannot be negative nor higher that j's endowment when young.

4. For simplicity, suppose $g(\sum_{j \in N(t)} e^j) = \sum_{j \in N(t)} e^j$. This can be viewed as the production function of the public good: the total amount of contributions $\sum_{j \in N(t)} e^j$ generate the amount $g(\sum_{j \in N(t)} e^j)$ of public good.

5. The intuition is that each unit of public good reinforces the utility of private consumption: the public good makes the consumption of the good more useful.

6. Question: what is the amount of contribution to the public good made, in equilibrium, by a poor individual (call this contribution e^P) and what the amount by a rich individual (call it e^R)?