In the presence of amortization payments, the incentive compatibility constraint is given by

$$(1 + a_i)\, p_i \geq (1 + a_{i+1})\, p_{i+1} + (1 + b_i)\, w_i \tag{8}$$

or

$$p_i \geq \frac{1}{1 + a_i} \sum_{k=i}^{N} (1 + b_k)\, w_k \tag{9}$$

The optimal contract solves for $\{p_i\}$ and $\{a_i\}$ that maximize the surplus from the production chain subject to the incentive compatibility (IC) and participation (IR) constraints of all upstream firms. Our model has the feature that the IC and IR constraints are linked. If the IR constraint is slack, it is possible to relax the IC constraint by raising a_i - that is, by allowing the accumulation of larger accounts receivable. The economic intuition is that the accounts receivable of firm i constitutes a stake held by firm i in the project as a whole, thereby binding the interests of the firm to the production chain as a whole. By choosing a high enough stake, the incentive compatibility constraint can be relaxed as long as there is slack in the participation constraint. The introduction of accounts receivable and payable reduces total rents along the production chain enabling longer production chains to be feasible.

The participation constraint for firm i requires that it breaks even in expected terms. Since there is positive probability that the project fails before cash flows materialize, the underlying sale prices $\{p_i\}$ incorporate a premium to compensate for the possible loss.

To state the participation constraint more formally, consider the net present value of firm i's cash flows viewed from the first date that it incurs cost of production. Firm i's cash flows are the combination of three risky perpetuities.