Eviction threat and resource extraction

A single firm exploits a non-renewable mineral deposit. The unit selling price p of the resource is constant through time and given for the firm. Per-period total cost of extraction is $C(R_t)$ and displays increasing marginal costs of extraction, i.e. $C'(R_t) > 0$ and $C''(R_t) > 0$. The initial stock of the resource is S_0 and the firm's time *discount factor* is $\beta < 1$.

Due to political instability in the country, the firm faces a threat of eviction at every period. To simplify, suppose that this means that for every period t, the firm assigns a probability π of not being around to exploit the resource at the next period t + 1 and thereafter. This applies to all period t = 0, 1, 2, ..., T.

- a) Solve the T-period non-renewable resource extraction problem of the present-value maximizing firm. (NB T is fixed and we assume that the resource constraint is binding.)
- b) What happens to the extraction rate when the threat of eviction π increases? Interpret your results.

THE INTRODUCTION OF A PROBABILITY OF EVICTION SIMPLY RE-DUCES THE "EFFECTIVE" DISCOUNT FACTOR FROM β to $(1 - \pi)\beta$. THIS MEANS THAT THE "EFFECTIVE" INTEREST RATE INCREASES From $r = \frac{1}{\beta} - 1$ to $r' = \frac{1}{(1-\pi)\beta} - 1$. The problem is solved EXACTLY AS DONE IN CLASS, EXCEPT THAT THE NEW EFFECTIVE DISCOUNT RATE IS NOW r'. A HIGHER DISCOUNT RATE IMPLIES THAT THE RESOURCE WILL BE EXTRACTED AT A FASTER RATE. IF THE PROBABILITY OF EVICTION INCREASES, THEN THE EFFECTIVE DISCOUNT RATE INCREASES. THE RESOURCE GETS EXTRACTED AT AN EVEN FASTER RATE. THE INTUITION FOR THIS RESULT IS THAT BY LOWERING THE PROBABILITY OF BEING ABLE TO EXTRACT THE RESOURCE LATER, THE OWNER WILL PREFER TO EXTRACT MORE TODAY IN ORDER TO SECURE MORE INCOME FROM THE RESOURCE. NOTE THAT HE DOES NOT EXTRACT ALL THE RESOURCE TODAY BECAUSE OF THE INCREASING MARGINAL COST OF WITHIN-PERIOD EXTRACTION. HE MUST WEIGH THAT INCREASING COST WITH THE PROBABILITY OF NOT BEING THERE LATER TO EXTRACT THE RE-SOURCE. WHEN THE PROBABILITY OF EVICTION GOES UP, THE WEIGHT OF FUTURE EXTRACTION GAINS DECREASES; THIS PRO-VIDES AN INCENTIVE TO EXTRACT EVEN MORE TODAY.