optimal; but if so, (2.9) and (2.25) are too strict, and inspections that are even less effective (in some sense) can deter all states. Nonetheless the main justification for these models is their simple form, and the clear and intuitive conclusions that they imply.

Problem 3

This problem addresses the distribution of inspection resources within a state. It assumes that a state which intends to violate may choose exactly how it will violate — and also that the most effective type of inspection depends on the type of violation.

Consider a model focusing on the behaviour of a state, that has a declared and an undeclared site for handling nuclear material. Assume that the state behaves illegally — in the sense of the NPT — in *at most* one of the two sites.

The IAEA, spends inspection effort ε_1 at site 1, the declared site, and $\varepsilon_2 = \varepsilon - \varepsilon_1$ at site 2, the undeclared site, where ε is its total available inspection effort. Let $1 - \beta_i(\varepsilon)$ be the probability of detecting an illegal action at site i, if it is inspected with effort ε_i $(i = 1, 2)$. Here $1 - \beta_1(\cdot)$ and $1 - \beta_2(\cdot)$ are detection probability functions as illustrated in Figure A1. The payoffs to (IAEA, state) are

$$\begin{aligned} &(0, 0) \text{ for legal behaviour of the state} \\ &(-a_i, -b_i) \text{ for detected illegal action at site } i \\ &(-c_i, d_i) \text{ for undetected illegal action at site } i. \end{aligned} \tag{3.1}$$

In this case, we assume

$$0 < a_i < c_i, \quad 0 < b_i, \quad 0 < d_i \text{ for } i = 1, 2. \tag{3.2}$$

The IAEA chooses its inspection effort at site 1, ε_1, according to a cumulative probability distribution $F(\cdot)$, with support in $[0, \varepsilon]$. The state behaves illegally with probability q_1 at the first site, and q_2 at the second, where

$$q_1 + q_2 \le 1. \tag{3.3}$$

Thus $q_1 = q_2 = 0$ means legal behaviour at both sites. The unconditional expected payoff to the IAEA is