Dynamic problem.

- Dynamic problem of firm (choice of R&D spending : x)
  - The start-of-period value of an incumbent firm $V(\Gamma, z, a)$ solves:

$$V(\Gamma, z, a) = \pi(z, a, \varphi) + R\,a + (1-\delta)a + \max\left\{0\,;\ \tilde{V}(\Gamma, z, a) - \chi\right\} \tag{7}$$

  - where:

$$\begin{aligned} \tilde{V}(\Gamma, z, a) \quad = \quad & \max_{x} -x - g(x, \varphi) + \beta \int V(\Gamma', z', a')\, dH(z'|z)\, J(\Gamma'|\Gamma) && (8) \\ & \text{s.t.} \quad \varphi' = (1-\delta_\varphi)\varphi + f(x) \\ & \qquad\ \ a' = \pi(z, a, \varphi) + R\,a + (1-\delta)a - x && (9) \end{aligned}$$

  - δ_φ: depreciation rate of abatement tech.
  - f: transform final good to abatement tech. ($f' > 0$, $f'' < 0$)
  - g: abatement techn. adjustment cost
  - β: discount factor.
  - χ: fixed cost of operation.