Cox regression framework with explanatory variables under control

- **Approach** → Optimal generic conditional design for any possible time of debut.

**Procedure:**

- Unit $i$ → Random arrival $I_i \equiv U[0, T]$ → Maximum time in study $c_i \equiv U[0, T]$
- Explanatory controllable variable → $z \in \{0, 1\}$
- Failure times → $t \equiv \mathcal{E}(\alpha + \beta z)$
- Censored times

Observed time $x_i \in [0, c_i]$ ↔ Failure time $x_i = t_i$

Censored time $x_i = c_i$

$\tilde{\xi}_1(c)$ given marginal design  ⇒  $I(c, z) = w(c, z)^2 \left( \frac{1}{z} \frac{z}{z^2} \right)$

$\xi_{2|1}(z|c) = \begin{cases} 
0 & \text{if } 1 - p(c) \\ 1 - p(c) & \text{if } p(c) \end{cases}$ conditional design  ⇒  $M(\xi) = \int_{[0,T] \times \{0,1\}} I(c, z) \xi(dc, dz)$

**Aim:** A function $0 \leq p(c) \leq 1$ optimizing the D-criterion

- $\tilde{\xi}_1$ discrete with finite support  ⇒  Algorithm
- $\tilde{\xi}_1$ continuous  ⇒  $p(c)$ is modeled as a polynomial of degree $l$