

Cost for the  $i$ -th push\_back

$$c_i = \begin{cases} 1 + 2^k & \text{if } i - 1 = 2^k \text{ for some } k \\ 1 & \text{otherwise} \end{cases}$$

Thus,  $n$  push\_back operations cost

$$T(n) = \sum_{i=1}^n c_i \leq n + \sum_{i=0}^{\lfloor \lg n \rfloor} 2^i = n + 2n - 1 = 3n - 1.$$

Amortized costs:  $T(n)/n = (3n - 1)/n < 3$ .