Then

$$h_n(x) \equiv f_n(x)\, g_n(x) \longrightarrow h(x)$$

Notice that

$$h_n(x) = \sum_{j=0}^{2n} a_j x^j \sum_{k=0}^{n} b_k x^k$$

$$= \sum_{r=0}^{2n} \left(\sum_{j=0}^{r} a_j b_{r-j} \right) x^r$$

$$+ \sum_{\{0 \le j,k \le 2n \,:\, j+k > 2n\}} a_j b_k\, x^{j+k}$$

$$\equiv \tilde{h}_n(x) + \gamma_n(x)$$