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## **Demand lotteries, abandonment options and the decision to start R&D and process innovation\*\***

We study different determinants of real-life R&D decisions within a net present value framework. Besides entry threat, Bertrand competition and multi-stage R&D with an abandonment option, our model includes demand uncertainty, modelled as a lottery. A lottery becomes more divergent when the difference between the outcomes of the lottery increases. We derive under which lottery probabilities more divergent demand lotteries positively or negatively affect the decision to start R&D. Using CIS IV data for about 2600 German firms, we find that for firms facing lotteries where the good state is more likely to prevail a 10% increase in the degree of divergence of the demand lottery increases the likelihood of undertaking R&D by 1.2 percentage points. For firms facing a demand lottery where the bad state is most likely to prevail, a 10% increase in the degree of divergence of the demand lottery decreases the likelihood of undertaking R&D by 4.6 percentage points. Having the option to abandon R&D projects significantly increases the likelihood of undertaking R&D.

**Key words:** multi-stage R&D, demand uncertainty, entry threat, abandonment option (JEL: D21, D81, L12, O31)

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