INCENTIVES VERSUS RISK OF INNOVATION ACTIVITIES IN THE AGRO-FOOD SECTOR *THEORETICAL PREMISES*

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Outline

- Examine the notion of innovation and related definitions
- Discuss briefly exogenous and endogenous incentives to innovate in the context of innovation risk
- Analyze market incentives to innovate and discuss social and market value of innovation
- Define single company incentives to introduce product innovation
- Describe the nature and specificity of innovation risk
- Supply and demand sides of the product innovation risk
- Highlight some managerial aspects of innovation risk
- Implications for the agro-food sector

What is an innovation?

- Schumpeter's "disruptive change"?
- Technological innovation? (product vs. process innovation, drastic or major vs. nondrastic or minor); [Tirole, 1988];
- OECD – Oslo Manual (i.e. an innovation must contain a degree of novelty).
- Three types of novelty:
  - ➤ an innovation can be new to the firm, and in fact covers the diffusion of an existing innovation;
  - ➤ new to the market, i.e. the firm is the first to introduce the innovation on its market;
  - ➤ or new to the world when the firm is the first to introduce the innovation for all markets and industries.

Exogenous and endogenous incentives for a firm to innovate

Exogenous incentives are related to institutional settings and government actions such as:

- patenting system;
- intellectual property rights and trade marks protection;
- governments transfers awards and grants;
- existence of venture capital sharing innovation risks.

Endogenous incentives are related to such factors as:

- market structure;
- patent licensing;
- innovation adoption process (supply & demand).

Market incentives to innovate and value of innovation

Incentives to innovate are related value of an innovation, which differs depending on the considered perspective: monopolist's, a competitive market, or social.

cb – marginal cost before innovation

ca – marginal cost after innovation

r – interest rate

Discounted present values of a drastic innovation:

V^M – monopolist's value

V^C – a competitive market firm's value

V^S – social value

$$V^M = \frac{1}{r}\int_{ca}^{cb} D(p^m(c))dc < V^C = \frac{1}{r}\int_{ca}^{cb} D(c^c)dc < V^S = \frac{1}{r}\int_{ca}^{cb} D(c)dc$$

Hypothetical Prisoners' Dilemma of a Firm in the Monopolistically Competitive Market

The rest of the market firm's decisions	Decision of a firm in a monopolistic competition market	
	Introduce innovation	Abstain from innovation
Introduce innovation	$\pi_2^{rm}; \pi_2^{f}$	$\pi_1^{rm}; \pi_3^{f}$
Abstain from innovation	$\pi_3^{rm}; \pi_1^{f}$	$\pi_0^{rm}; \pi_0^{f}$

π^f – a firm profit;

π^{rm} – the rest of the market profits

$\pi_3^{rm} < \pi_2^{rm} < \pi_1^{rm} < \pi_0^{rm}$ and $\pi_3^f < \pi_2^f < \pi_1^f < \pi_0^f$
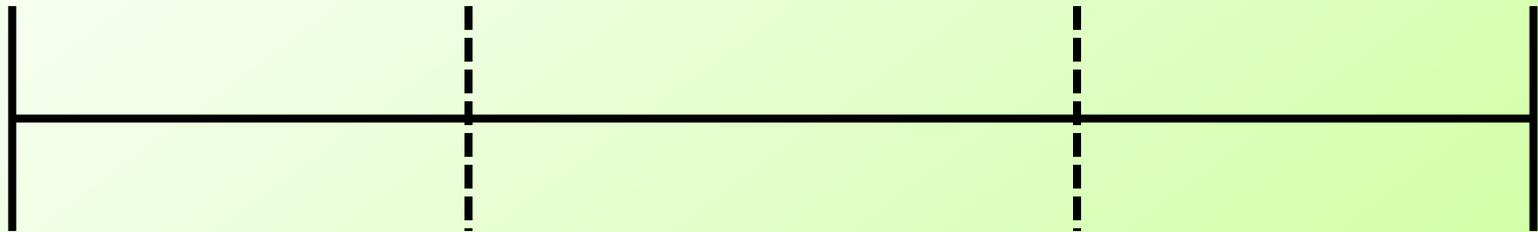
Market structure and innovation incentive

Monopoly

Monopolistic competition

Perfect competition
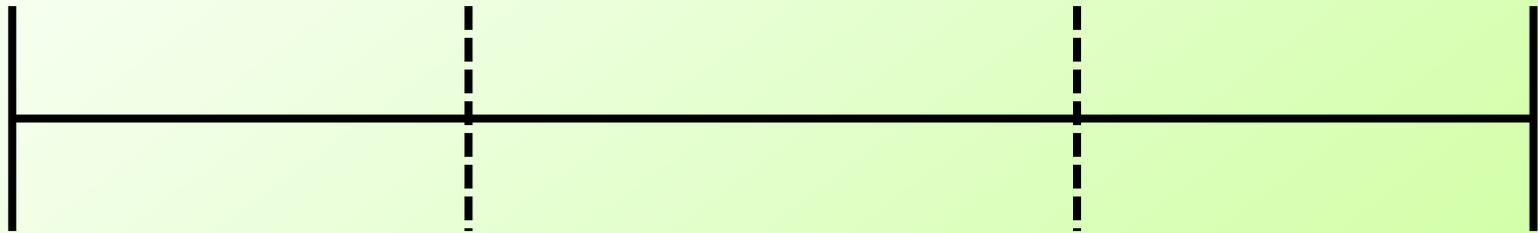
Increasing incentive

Decreasing capability to innovate

Types of novelty and innovation incentive

Drastic innovations   **Nondrastic innovations**   **Imitations**

Increasing incentive

Increasing capability to innovate and innovation diffusion

Specificity of a product innovation project

2015 - 2019

1. Longer implementation time horizon.
2. Dynamically changing environment when working on the project.
3. High level of uncertainty regarding final outcome.
4. Relatively long period of return.
5. Often lack of empirical data allowing to assess feasibility of the project.

Product innovation risk exposure and value of an innovation project

Product innovation risk exposure (*PIRE*) can be expressed as the following function:

$$PIRE = f(SC, P(F), T)$$

SC – potentially sunk costs,
$P(F)$ – probability of failure,
T – project duration.
Product innovation as in investment project:

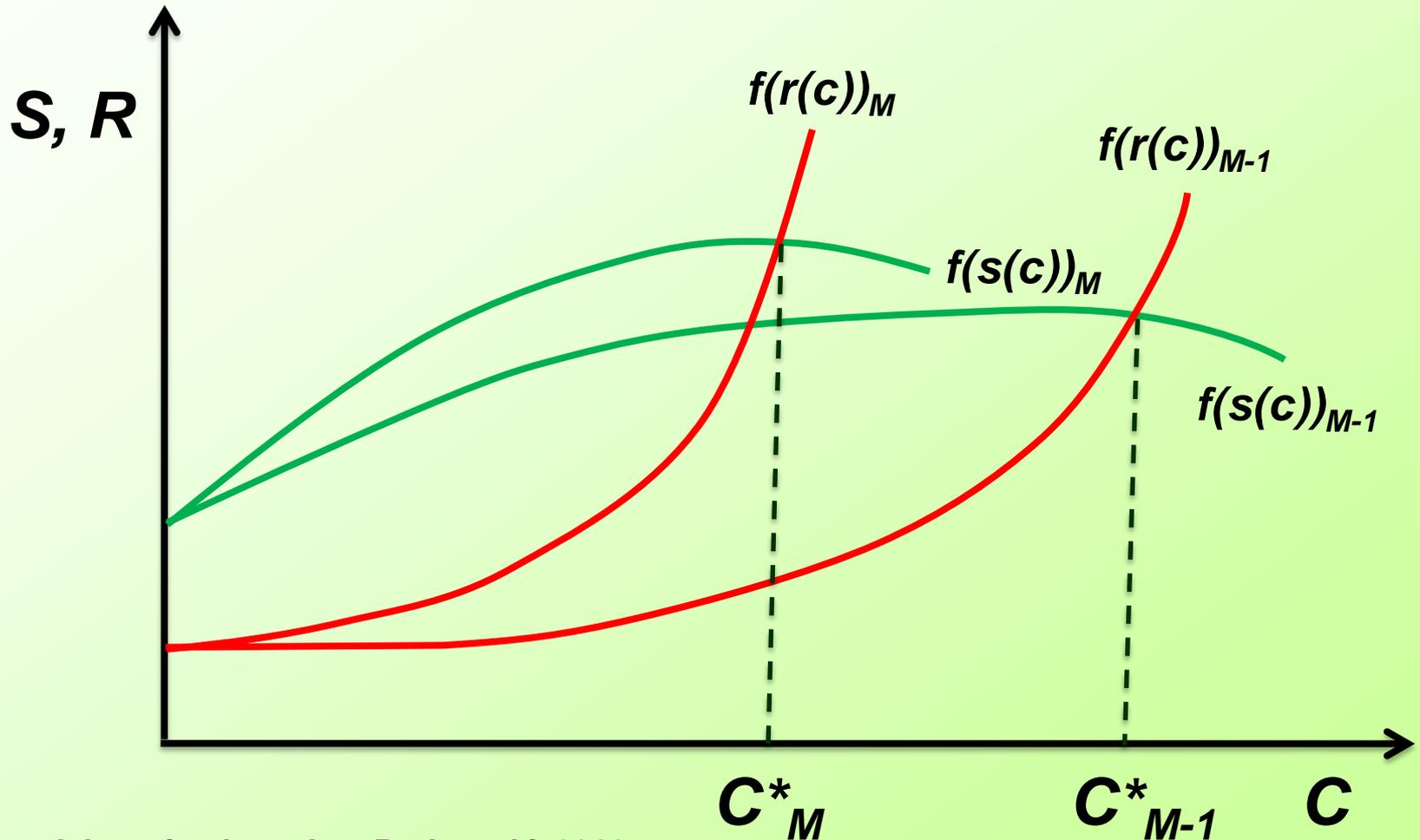$$EMV_{PI} = \frac{1}{r} \sum_{t=1}^{k} \pi_t p_t$$

EMV_{PI} – expected monetary value of the innovation;
π_t, p_t – profit and related probabilty.
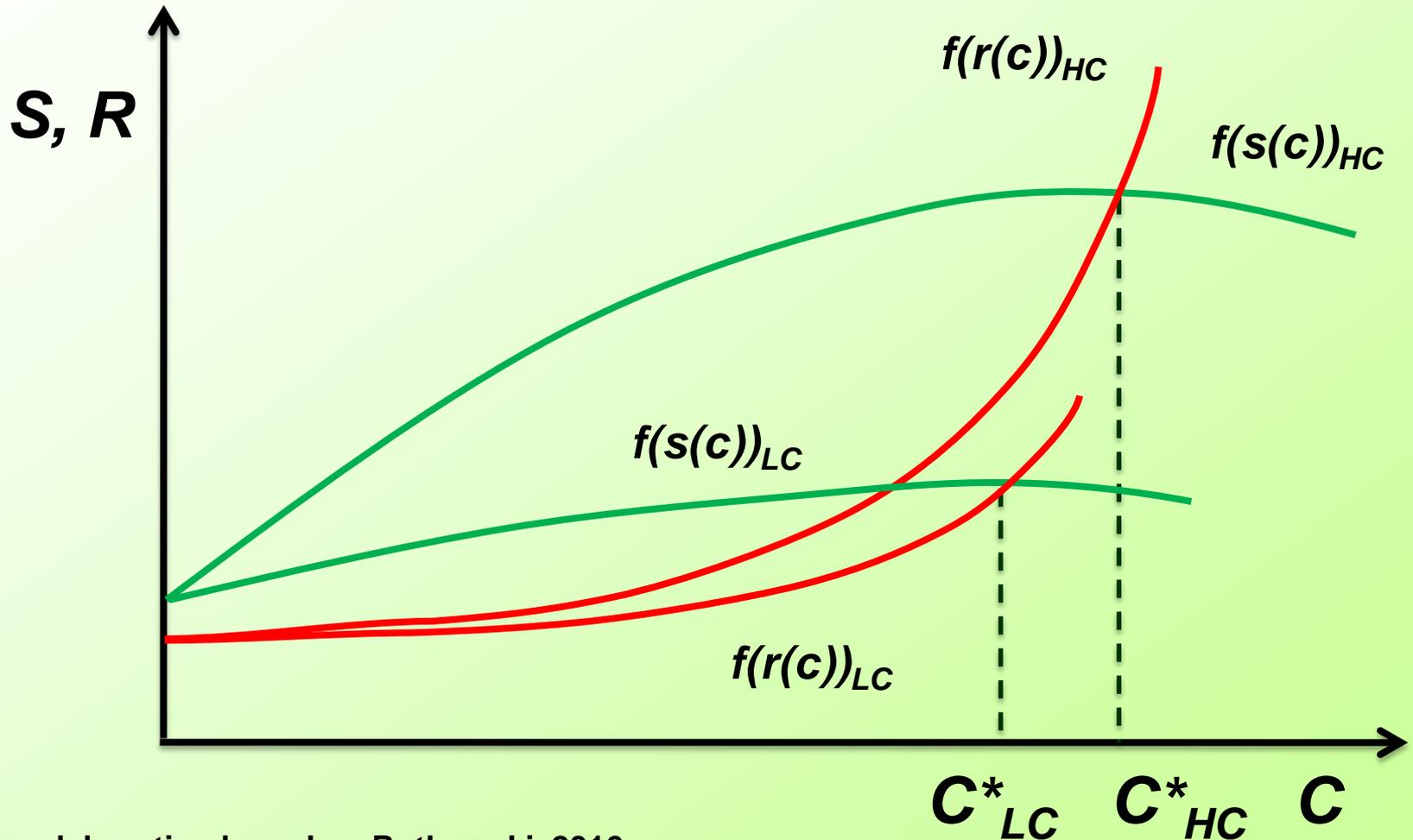
Safety and risk of innovations against the process maturity

Source: own elaboration based on Rutkowski, 2016

Safety and risk of innovations against the process complexity

Supply and demand sides of the product innovation risk

Product innovation risks are related not only with their successful development (supply side) but also with their market adoption and diffusion (demand side).

Stages of customer adoption: awareness, interest evaluation, trial, and adoption or rejection.

Diffusion within customer population:

- Innovators (2%),
- Early adopters (14%),
- Early majority (34%),
- Late majority (34%)
- Laggards (16%)

Critical elements of innovation risk – Managerial perspective

Five basic rules (a recent HBR article):
1. Recognize that a model exists and needs to be developed for judging risk and return.
2. Every innovation model has its own set of limitations.
3. Expect the unknowns.
4. Obtain intimate knowledge and understanding of the user.
5. Consider the infrastructure the innovation will be placed in.

Final Remarks & Conclusions (I)

- Incentives to innovate are related value of an innovation, which differs depending on the considered perspective: monopolist's, a competitive market, or social.

- Innovations are not the ultimate business goal – not to innovate not always has to be a wrong decision, especially if a company can compete successfully using other measures.

- Value of a product innovation is inevitably confronted with other investment projects, which can represent higher payoff.

Final Remarks & Conclusions (II)

- Risk of a drastic innovation in the agro-food sector is very high, therefore, breakthrough innovations are less likely to happen (imitations are easier).

- Intrinsic sector constraints:
  - ➢ relatively low entry barriers and innovations,
  - ➢ risk averse attitudes, especially in agriculture,
  - ➢ difficulties with patenting and patent protection,
  - ➢ products, even ones, are often close substitutes,
  - ➢ brand recognition, but low brand loyalty (variety is valued).

Final Remarks & Conclusions (III)

- Food safety expectations increase the risk of introducing innovative agricultural and food products (e.g. GMO).

- Strongly positive consumer attitudes to traditional food products reduce incentives to develop new food products – a fear from new.

- Product innovations to be successful are supposed to be a part of regularly planned firm's activities and should be managed as investment projects portfolio.

- From the range of innovations marketing innovations are the easiest.

Thank you for your attention
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