RANEPA
THE RUSSIAN PRESIDENTIAL ACADEMY OF NATIONAL ECONOMY AND PUBLIC ADMINISTRATION

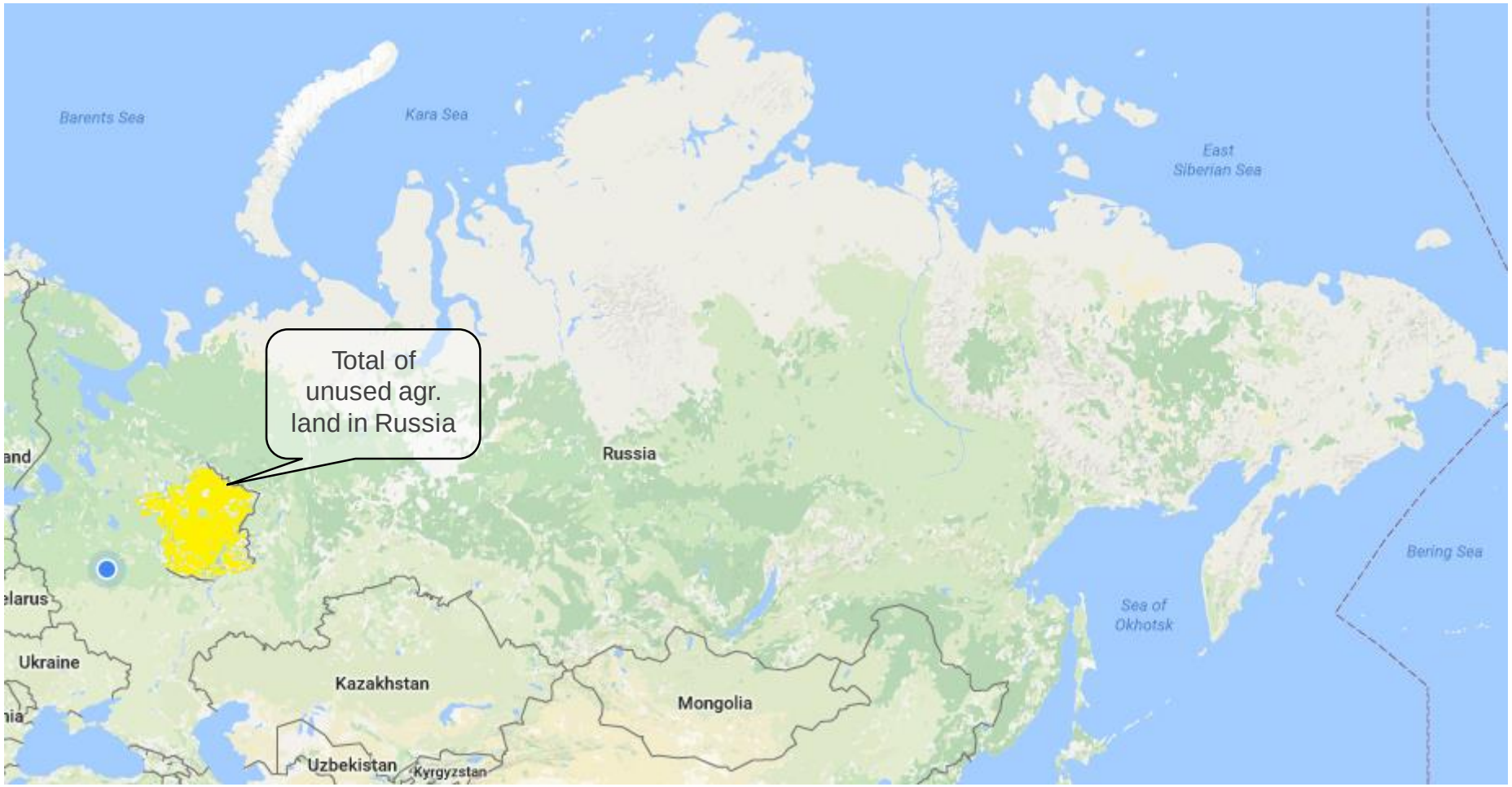
The Centre for Agricultural and Food Policy

Land use projections for Southern Non-Black-Earth regions of Russia: **coping with uncertainty**

Prof. Dr. Nikolai M. Svetlov
E-mail: svetlov-nm@ranepa.ru

The study is conducted in the framework of year 2017 State assignment to RANEPA

MOTIVATION


Barents Sea
Kara Sea
East Siberian Sea
Total of unused agr. land in Russia
Russia
Bering Sea
Sea of Okhotsk
Ukraine
Kazakhstan
Mongolia
Uzbekistan
Kyrgyzstan

MOTIVATION

International dimension

- Schierhorn et al. (2014): how much grain from abandoned agricultural land in Russia can flood world markets?
  - There are 56 million hectares of unused agricultural land in Russia (Shagaida, 2016)
- How soon (if ever) will this happen?

National dimension

- Can Russia gain from its unused agricultural land?

Methodological angle

- The questions above depend on many uncertain factors
  - Can we give certain answers in the presence of unavoidable uncertainty?

This study focuses only on circa 0,25 million hectares of that 56 million

- Located, however, at the edge of export-producing area

RESEARCH QUESTIONS

Practical:

- Can land abundancy in South Non-Black-Earth regions of Russia favour their expansion in agricultural markets?
  - If yes, how to launch this expansion?
  - If yes, can this expansion be harmful?

Methodological:

- How (if possible) to achieve certainty answering the questions above?
- What should be learned to make answers more precise?
- Relevance to this section:
  - In particular, does the uncertainty about climate change matters?
    - Not yet addressed empirically

LITERATURE (please drop more to nikolai.svetlov@gmail.com)

Land abundancy in Russia

Estimates and causes of abundance

Bokusheva & Hockmann (2006); Svetlov & Gataulin (2013); Shagaida (2016)

Projections

Schierhorn et al. (2014); Saraikin, Uzun & Yanbykh (2014)

Partial equilibrium

Conforti & Londero (2001), Fock et al. (2000)

Behaviour of DMU

Moiseev (1981)

Policy priorities

Promoting R&D

Gulyayeva et al. (2016)

Improving the institutions

Liefert et al. (2003); Svetlov (2009); Liefert & Liefert (2012)

Risk management

Bokusheva & Hockmann (2006)

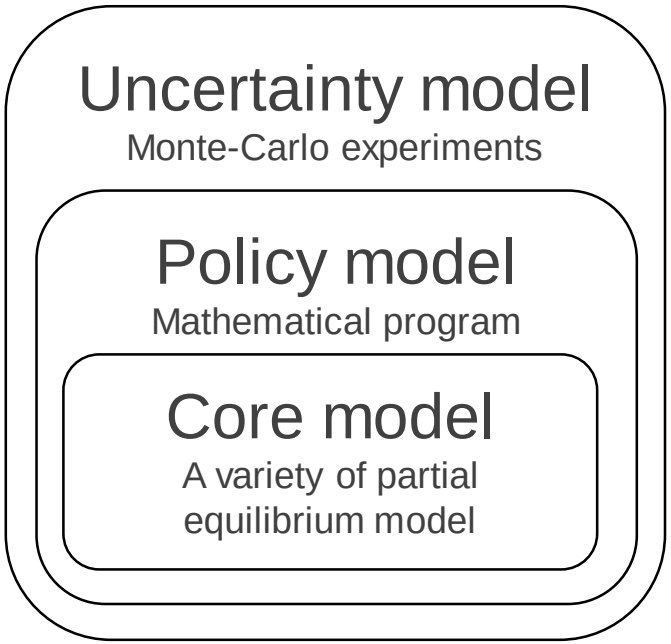
Import tariffs

Liefert & Liefert (2012)

Stochastic simulation

Hardaker et al. (2004), ch. 8

METHODOLOGY AT THE GLANCE



CORE MODEL

Uncertainty model

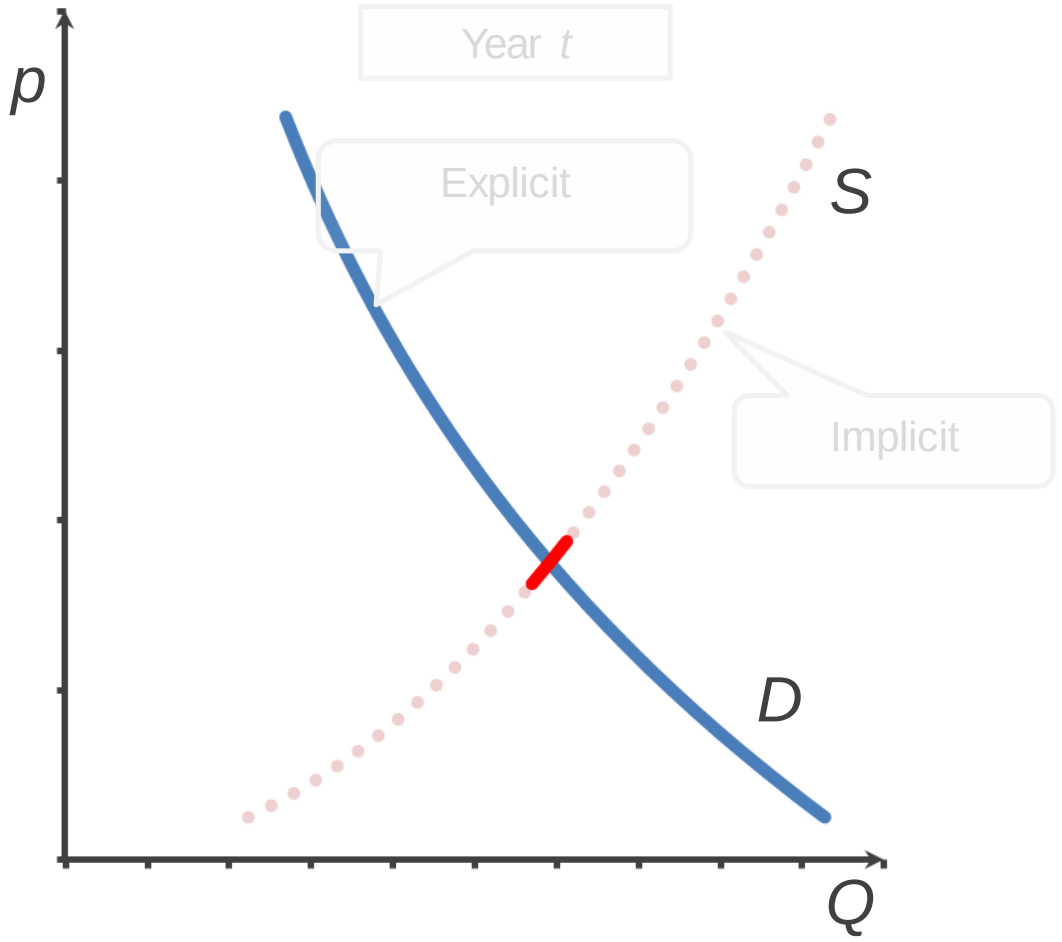
Monte-Carlo experiments

Policy model

Mathematical program

Core model

A variety of partial equilibrium model



CORE MODEL

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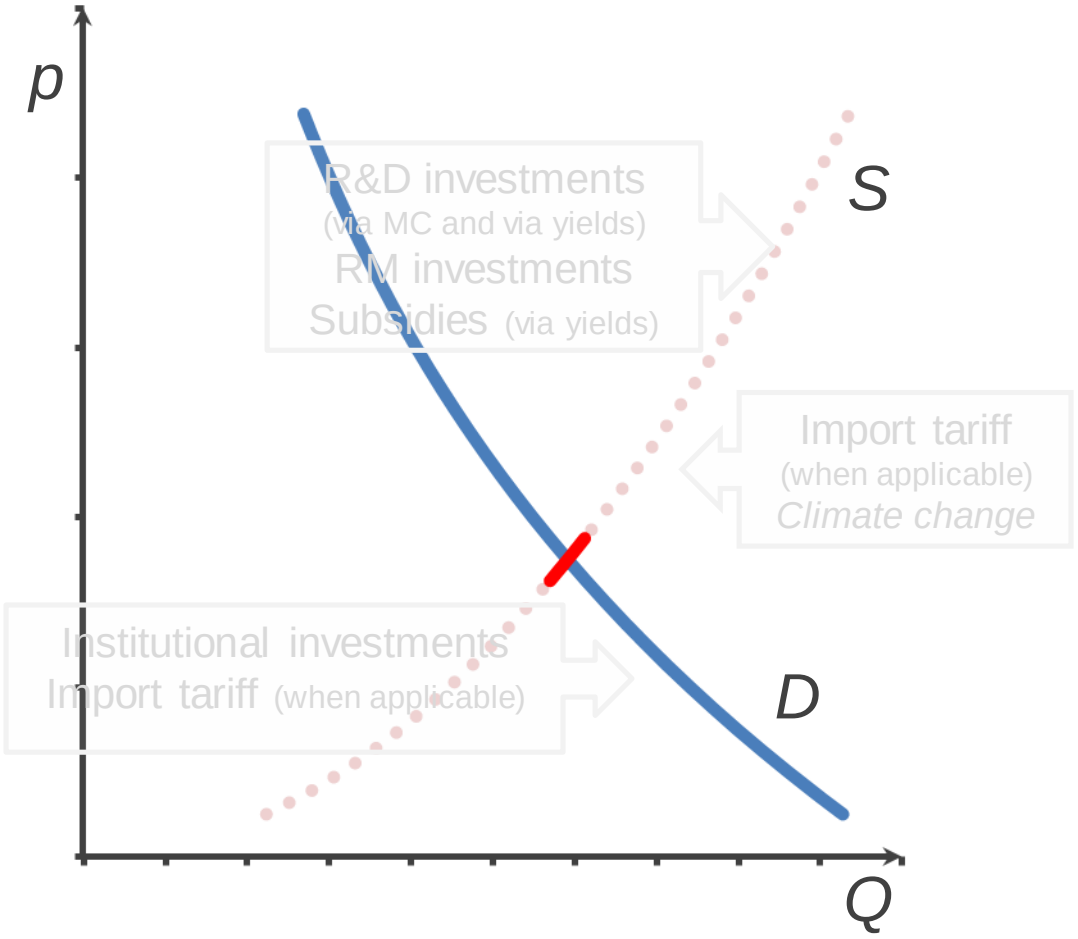
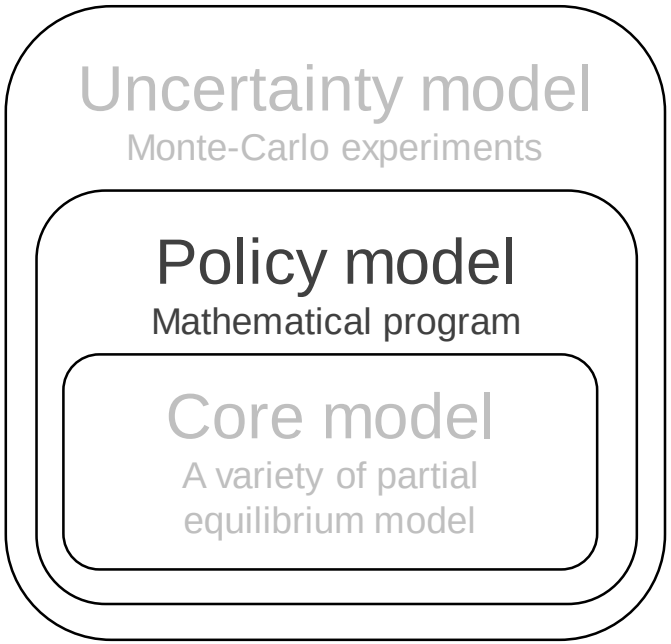
A variety of partial equilibrium model

Markets:
cereals, potatoes, remaining crops



POLICY MODEL



Maximize

Gross sales of crop production

varying

investments in R&D, RM, institutions

subsidies

import tariffs

subject to

lump sum of investments and subsidies

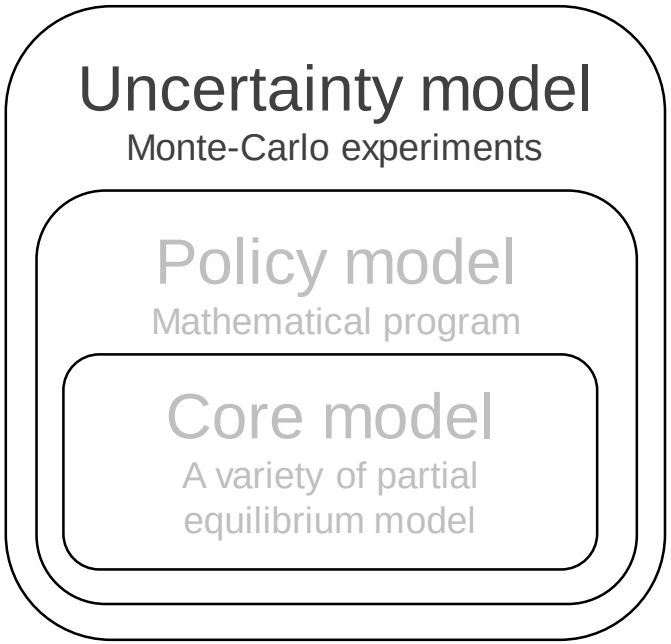
maximum import tariff

equilibrium conditions from the core model

Model time: 50 years

The year of projection is 20th (i.e. 2035)

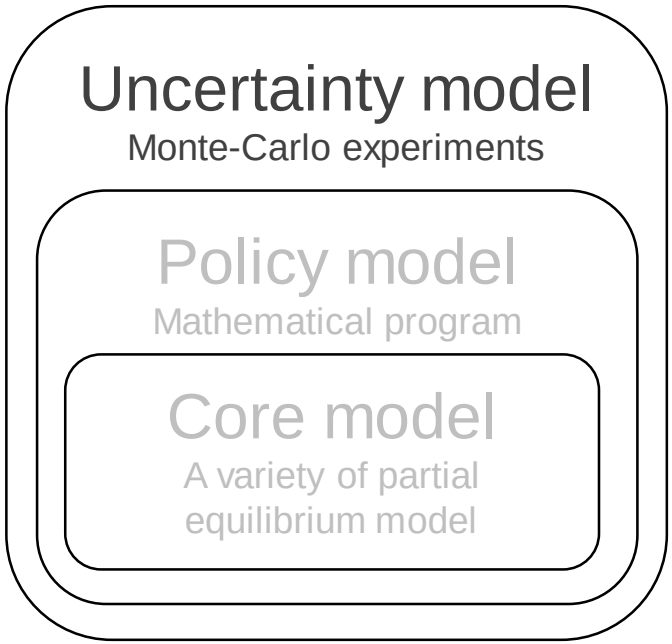
UNCERTAINTY MODEL



Uncertain parameters

- Influence of R&D inv. on crop productivity
- Influence of R&D inv. on MC
- Influence of subsidies on crop productivity
- Influence of RM inv. on MC
- Influence of inv. in institutions on demand
- Influence of tariffs on demand
- Influence of tariffs on MC
- Influence of price on demand (price=MC)
- A share of production costs that depend on area
- Influence of cultivated area on MC (via rent)
- Total of investments and subsidies

UNCERTAINTY MODEL



Bounds of the uncertain parameters

Preliminary: zero to 1/variable mulitplier (rounded upwards to order)

The median is one order less than the upper bound

Distribution

Beta with $a + b = 10$ (arbitrary)

Tightening the bounds

Identifying the cases of obviously unrealistic dynamics of sales, yields and areas

Tightening the most influential parameter

Proceeding until

(a) cannot identify a single parameter causing the unrealistic dynamics

(b) the number of cases of unreal dynamics is small

Finally, 1000 Monte-Carlo runs in GAMS

DATA

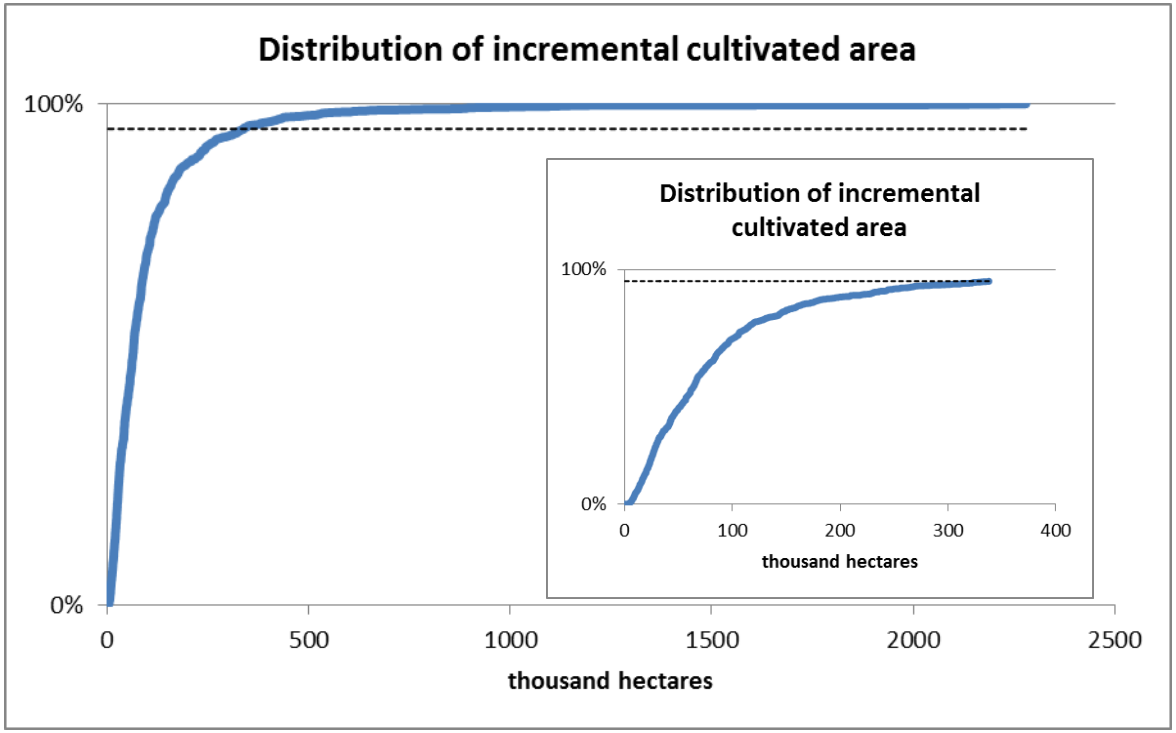
Kaluga, Tula and Ryazan oblasts (the edge of the Black Earth area)

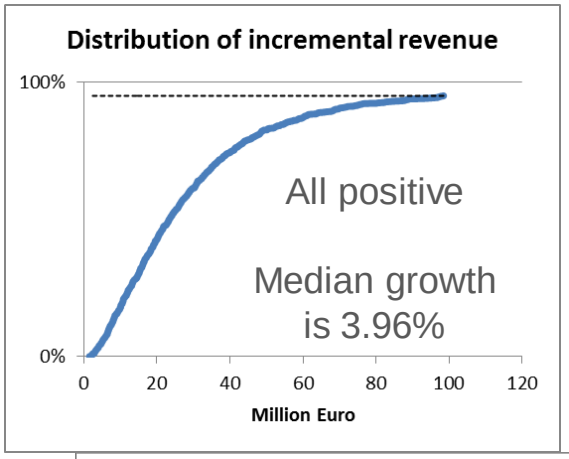
Year 2015 oblast level data

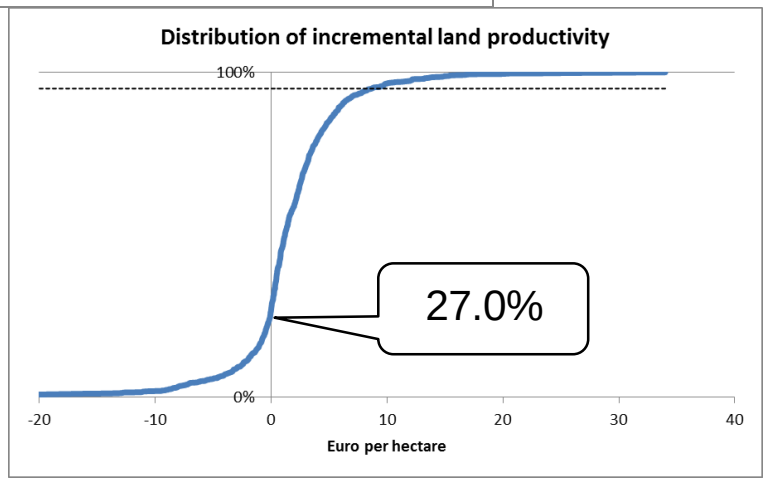
The source is the open access EMISS database

- initial cultivated area
- initial yields per hecatre (except remaining production)
- revenue per unit of production (a proxy for initial price and MC, except r.p.)

RESULTS: PROJECTIONS





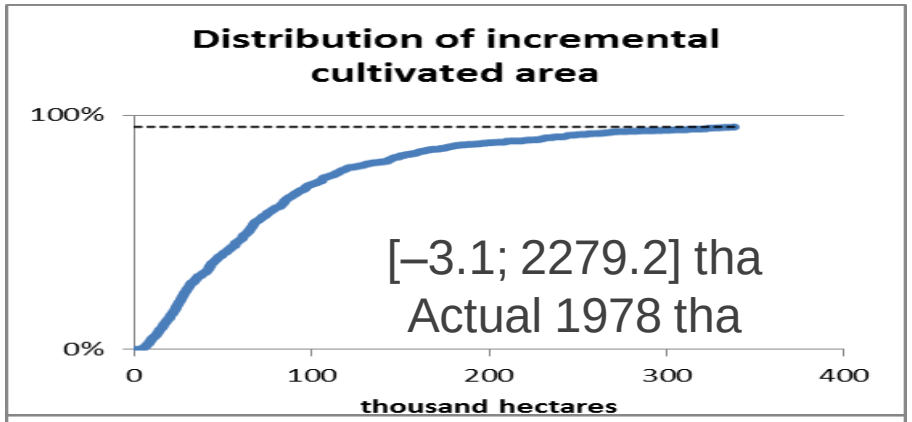


Year 2035

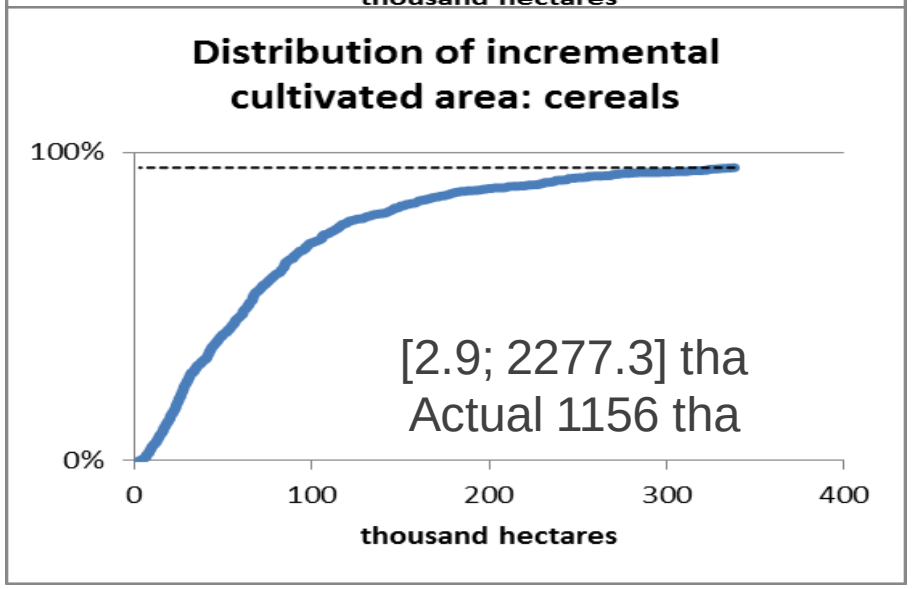
95% below 338 tha
17.1% to actual area
Median 64 tha (3.2%)

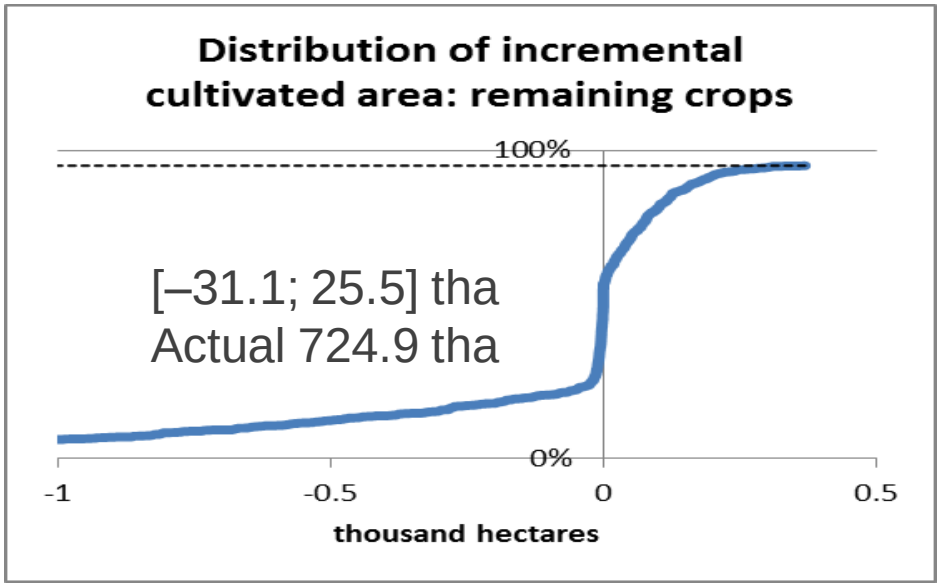
1 case negative
0.1% of total

RESULTS: PROJECTIONS

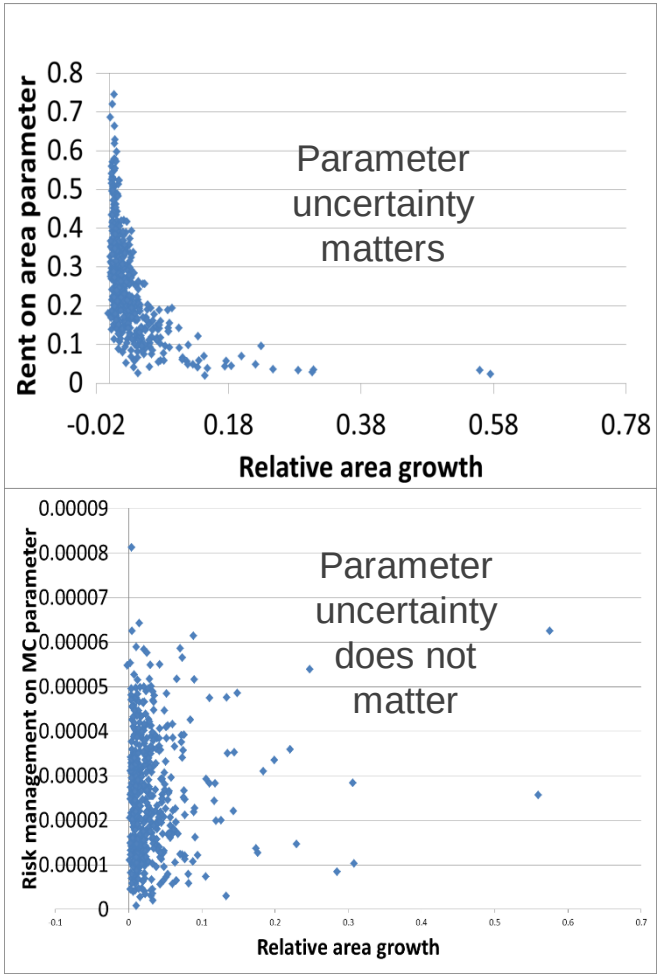


Potatoes: neither area (97.1 tha) nor revenue change





RESULTS: ROLE OF UNCERTAINTY



Pearson linear pairwise correlation coefficients between the parameters and variables at 20th year of the modelled period

Parameter	Correlation with total incremental land use	Correlation with total revenue growth
α_S influence of investments in R&D on crop productivity	0.026	**0.179***
α_C **influence of investments in R&D on marginal costs**	**0.272***	**0.258***
α_A influence of 'amber box' subsidies on crop productivity	0.018	0.022
α_R influence of investments in improving the risk management on marginal costs	0.001	–0.010
α_I **influence of investments in improving institutions on the demand**	**0.063***	0.060
α_Q influence of import tariff on the effective demand at the farm gate	0.008	0.011
α_T influence of import tariff on marginal costs	–0.027	–0.034
α_M **influence of marginal cost on the demand**	**0.071***	**0.092***
α_Z **influence of an incremental cultivated area on marginal costs**	**–0.470***	**–0.439***
m_0 annual financial inflow	**0.309***	**0.423***
r opportunity cost of capital	0.029	0.025

* The difference from zero is significant at α = 0.05

CONCLUSIONS

1. The cultivated land area at the edge of Black Earths will grow
2. The grow is likely to be slow
3. The growth is almost due to cereals
4. Although worse lands are involved, the land productivity is more likely to grow than to decrease
5. The conclusions are robust to a very high degree of uncertainty
6. The uncertainty of the results can be diminished primarily by better knowledge about land rent change while changing area and impact of R&D on MC

   Better knowledge of more than a half of highly uncertain parameters would not improve the certainty of the results

THANK YOU FOR YOUR ATTENTION! QUESTIONS ARE WELCOME. **PLEASE SPEAK SLOW!**