universitätbonn

Assessment of the impact of avian influenza-related regulatory policies on poultry meat trade and welfare

Christine Wieck, Simon W. Schlüter and Wolfgang Britz

Institute for Food and Resource Economics (ILR)

University of Bonn

Presentation at the IATRC annual meeting

11.-13. December 2011

St. Petersburg, Florida

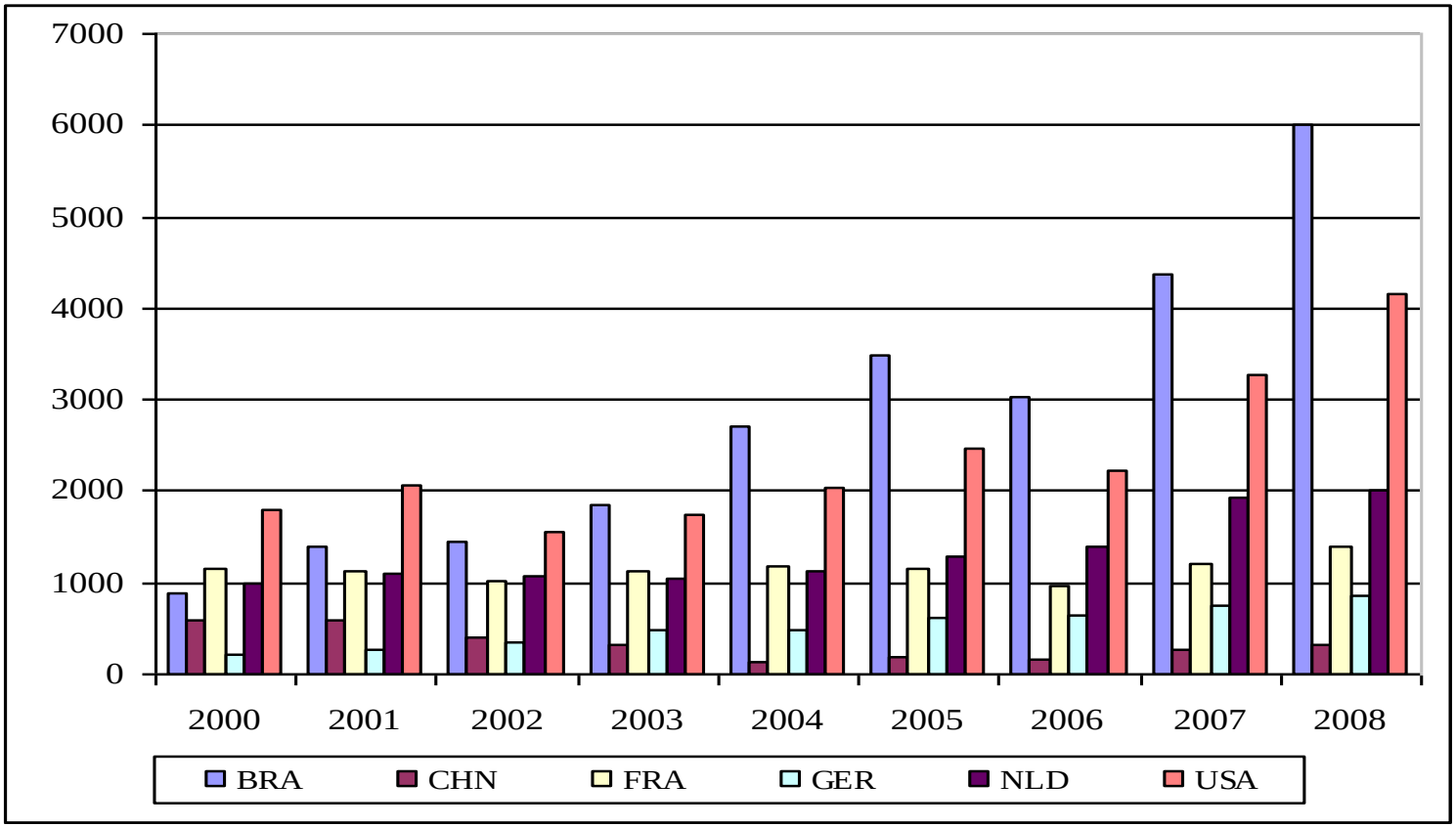
Roadmap

- Motivation
- Research question
- Trade flow analysis: Econometric model
  - Model structure and data
  - Results
- Welfare analysis
  - Model structure and data
  - Policy scenarios
  - Results
- Conclusion

Motivation

Global exports of poultry meat

- millions of US $



Source: Authors' calculation based on UNCTAD (2011).

Motivation

Specific trade concerns regarding poultry raised in the SPS Committee

- time period: 1995 - 2010

Specific trade concerns	Number	Percentage
Avian influenza	12	57
Microbial contamination	3	14
Other infectious diseases	3	14
Antimicrobial treatment	1	5
Maximum residue limits	1	5
Other	1	5
SUM	21	100

Source: Authors' calculation based on WTO (2011).

Motivation

- Exporters complain about imposition of AI-related NTMs being disproportional to associated risk
- Two examples
  - CHN vs EU/US (2007): Import ban for CHN cooked poultry meat due to AI

    But OIE guidelines: Heat-tratment deactivates the AI virus, trade-restricting measures should not be applied to cooked poultry meat
  - EU vs India (2004): Import ban for EU poultry products/meat due to LPAI or AI in wild birds

    But OIE guidelines: AI in wild birds or LPAI should not lead to import bans

Research Objective

- Analyze country trade and welfare effects of changes in importers' regulatory AI policies for important poultry meat exporters and importers
  - Account for AI infection status of meat importer and exporter
  - Account for difference between cooked and uncooked poultry meat

- Two steps
  - Evaluate past AI-related policies in terms of trade impact
    → Method: Sample selection gravity model approach
  - Calculate welfare effects arising from different policy scenarios
    → Method: Spatial simulation model

Trade flow analysis

Model structure and data

- Heckman-type econometric model based on Helpman et al. (2008) extended to a SUR systems approach

→ SUR system because of differentiation between cooked and uncooked poultry meat

Trade flow analysis

Model structure and data

- First: Selection equation

$$\rho_{ijk} = \Pr\left(h_{ijk} = 1 \mid x_{1k}\right) = G\left(x_{1k}, \beta_{1k}\right)$$

  - ρ_{ijk} : Probability of non-zero trade flow
  - h_{ijk} : Binary variable
  - x_{1k} : Vector of observed variables
  - $G(.)$: Cdf of the bivariate normal distribution
  - β_{1k} : Estimated vector of coefficients

- Selection equation is estimated seperately for both poultry meat categories k.

Trade flow analysis

Model structure and data

- Second: Trade flow equation conditional on non-zero trade

$$E\left[m_{ijk} \mid h_{ijk}=1\right] = x_{2k}\beta_{2k} + \sigma_{12k}\lambda_{ijk} + \omega_{ijk} + u_{ijk}$$

  - m_{ijk} : Logarithmic observed trade flow
  - x_{2k} : Vector of explanatory variables
  - σ_{12k} : Covariance matrix of unobserved errors
  - λ : Heckmans lambda controlling for sample selection
  - ω_{ijk} : Controls for the fraction of firms that export

Trade flow analysis

Model structure and data

- Time periode: 2000 to 2007
- Exporters: BRA, CHN, FRA, GER, NLD, USA, ROW
- Importers: JPN, RUS, ROW
- Trade data in value terms: UNCTAD Comtrade
- n = 288 trade flow observations in selection equation (87.5% are non-zero)
- Bilateral policy measures: Japanese AQS and Russian Ministry of Agriculture (assumption: ROW implements policy measures in line with OIE requirements)
- Production and consumption quantities: FAO, UN, ZMP
- Tariffs: UNCTAD
- Other bilateral data: CEPII

Trade flow analysis

Results: Trade flow equation

	Cooked meat		Uncooked meat	
Control variable	**OLS**	**NLS**	**OLS**	**NLS**
Prod_ex	13.573***	14.060***	6.931*	4.420
	(5.121)	(4.440)	(3.724)	(6.541)
Cons_im	37.094***	27.912***	12.861**	11.909
	(9.887)	(8.889)	(5.059)	(7.530)
Distance	-7.283***	-4.139***	-1.404**	-2.625**
	(0.814)	(0.856)	(0.640)	(1.286)
Ban	-0.054	1.692***	-5.000***	-6.046***
	(0.722)	(0.623)	(0.667)	(1.710)
Regionalization	0.127	-0.551	4.226***	3.109*
	(0.649)	(0.532)	(0.720)	(1.736)
Tariff	0.704	0.393	0.129	-1.439
	(1.015)	(0.720)	(0.875)	(0.906)
Omega (Firm heterogeneity)		1.127***		0.872
		(0.396)		(0.656)
Lambda (Sample selection)		-3.988***		-7.652***
		(0.910)		(2.030)
n = 126				

Welfare analysis

Model structure and data

- Spatial multi-commodity model for homogenous products based on the Takayama-Judge approach
- Commodity is differentiated by processing stage and by the origin's country disease status
- Six meat categories

Welfare analysis

Model structure and data

- Demand side
  - Consumers are indifferent regarding the meat‘s AI status
  - Welfare changes for consumers are based on Varian’s money metric concept
- Supply side
  - Perfectly competitive industry within each region
  - Normalized quadratic profit function is used
  - Supply is influenced by infection risk
- Per unit transport costs are a linear function of transported quantities

Welfare analysis

Model structure and data

- Infection risk
  - Infectinon risk is detemined by share of infected uncooked poultry products imported or sold domestically
- Country classification according to AI status
  - Each region is characterized by a share of infected products

	Free of AI	Low pathogenic incidence of AI	High pathogenic incidence of AI
	Brazil, the Netherlands	Japan, the US, ROW	China, France, Germany, Russia
Assumption about share of affected products	100%	2%	5%

Welfare analysis

Model structure and data

- Data
  - Shares as far as possible the data with the gravity estimation
  - Transport costs: Maritime transport cost database of OECD
  - Import tariffs: CAPRI global multi-commodity model
  - Country classification according to the AI status: WHO

Welfare analysis

Policy scenarios

- Drastic scenario
  - Global ban of poultry imports from infected countries: Introduction of import ban for cooked/uncooked meat by FAI countries for imports from HPAI and LPAI countries and by LPAI countries for imports from HPAI countries

- Realistic scenario
  - Global ban of uncooked meat from HPAI countries: Introduction of import ban for uncooked meat from HPAI countries only by FAI and LPAI countries

Welfare analysis

Results

	Realistic scenario				AI status
	Sum	Money Metric	Transport costs	Profits	
World	-267.17	-276.84	79.43	-69.76	
Germany	-12.71	9.53	5.88	-28.12	*HPAI*
Netherlands	-2.52	0.56	-0.66	-2.42	*FAI*
France	-7.14	18.38	-1.74	-23.78	*HPAI*
USA	14.49	7.84	-1.77	8.42	*LPAI*
Brazil	-3.51	16.79	-0.19	-20.11	*FAI*
Japan	9.88	-6.53	-6.66	23.07	*LPAI*
China	-45.73	131.09	8.63	-185.45	*HPAI*
Russia	3.40	23.03	26.23	-45.86	*HPAI*
ROW	-223.33	-477.52	49.72	204.48	*LPAI*

	Drastic scenario				AI status
	Sum	Money Metric	Transport costs	Profits	
World	-330.45	-349.52	85.92	-66.84	
Germany	-14.69	43.06	-1.28	-56.47	*HPAI*
Netherlands	-1.52	0.07	-1.09	-0.50	*FAI*
France	-15.56	44.29	-6.02	-53.83	*HPAI*
USA	17.68	-16.69	-2.60	36.97	*LPAI*
Brazil	-2.48	12.63	-0.05	-15.06	*FAI*
Japan	20.79	-13.33	6.60	27.52	*LPAI*
China	-44.83	161.96	16.12	-222.92	*HPAI*
Russia	-4.82	32.80	15.29	-52.91	*HPAI*
ROW	-285.01	-614.32	58.96	270.35	*LPAI*

Conclusion

- Policy measures' impacts differ for uncooked and cooked meat
  - For uncooked meat results are as expected
  - For cooked meat results are inconclusive
- Simulation model
  - Important trade diversion effects take place depending very much on infection status of involved countries
  - Banned exporting countries redirect much of their exports towards their own market
  - Banned countries start to trade among each other's, crowding out imports from countries which were not directly targeted by the ban

Conclusion

- Disease transmission modeled via import of infected poultry meat (in line with guidelines and assumptions made by OIE)
  - However, scientific evidence may indicate that risk potentially resulting from imports of uncooked meat may be negligible (Phaor 2003, Zepeda and Salman 2007)
  - In addition, most transmission occurs through migration of wild birds