Agri-food projections
AG-MEMOD
for EU member states

First Results of an Econometric Based Agricultural Sector Model for Germany

- Work in progress -

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Outline

- Introduction
- Aims, structure and features of AGMEMOD
- Estimation
- Simulations
  - Baseline
  - Mid Term Review
- Results
- Concluding remarks and summary

AGMEMOD

- **Aims**
  - Development of ag models for member states with one partner responsible for one country,
  - Extension to new member states,
  - Focus on projections and analysis of policy impacts,
  - Explicit and detailed modelling of policies and markets with regard of regional specialities,
  - Results consistent across markets,
  - Integration of model builders & users, and results for public use

AGMEMOD

- **Aims**
- **Approach**

  – Partial Equilibrium models for single member states based on a model template (GOLD model by FAPRI)
  – Econometric estimation of the behavioural parameters including variables for policy instruments,
  – Combination of country models to a ‘combined EU model’
  – Initially on spreadsheet, later transferred into GAMS code
  – Guidance from Advisory Groups

AGMEMOD

- **Aims**
- **Approach**
- **Model structure**
  - Commodity market models
    - Recursive dynamic
    - Multi-product
    - Partial equilibrium
  - Markets linked and solved in prices & trade
  - Key market assumption - price transmission equations
  - Policy variables explicitly included

AGMEMOD - product coverage

grains and oilseeds..

..livestock and dairy

sugar beet..

..potatoes

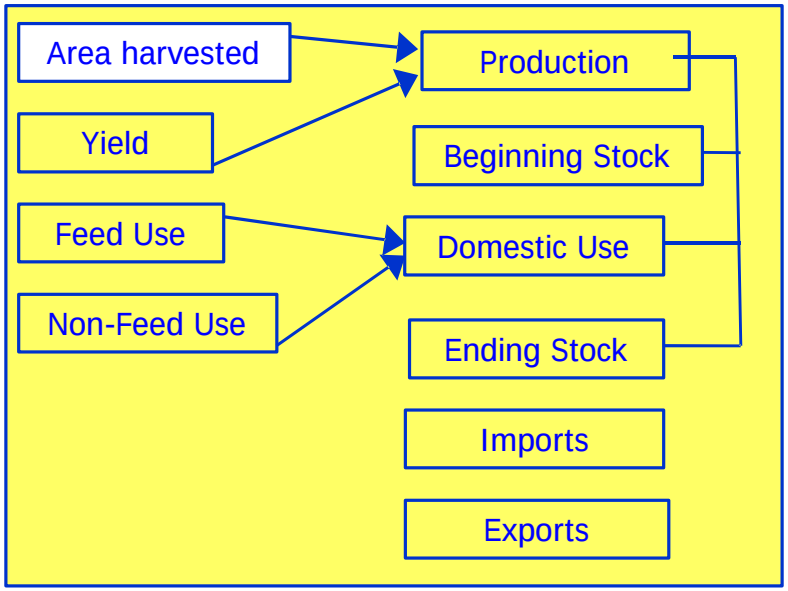
oranges..

..olive oil

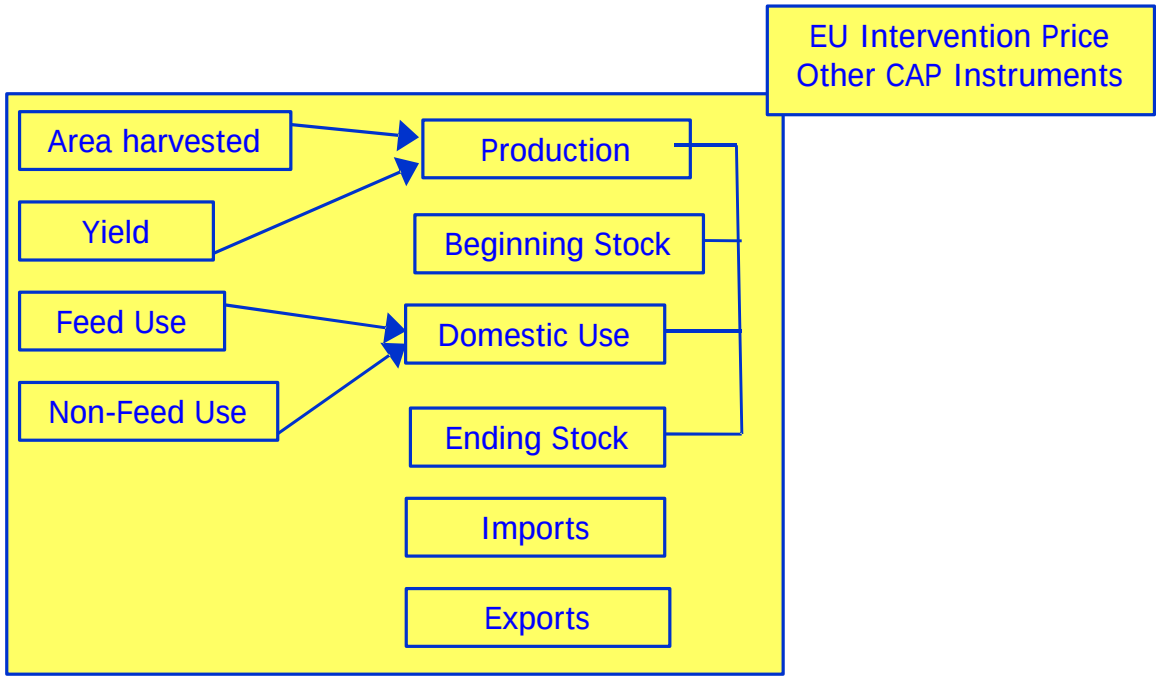
tomato paste..

..tobacco

AGMEMOD - model structure



AGMEMOD - model structure



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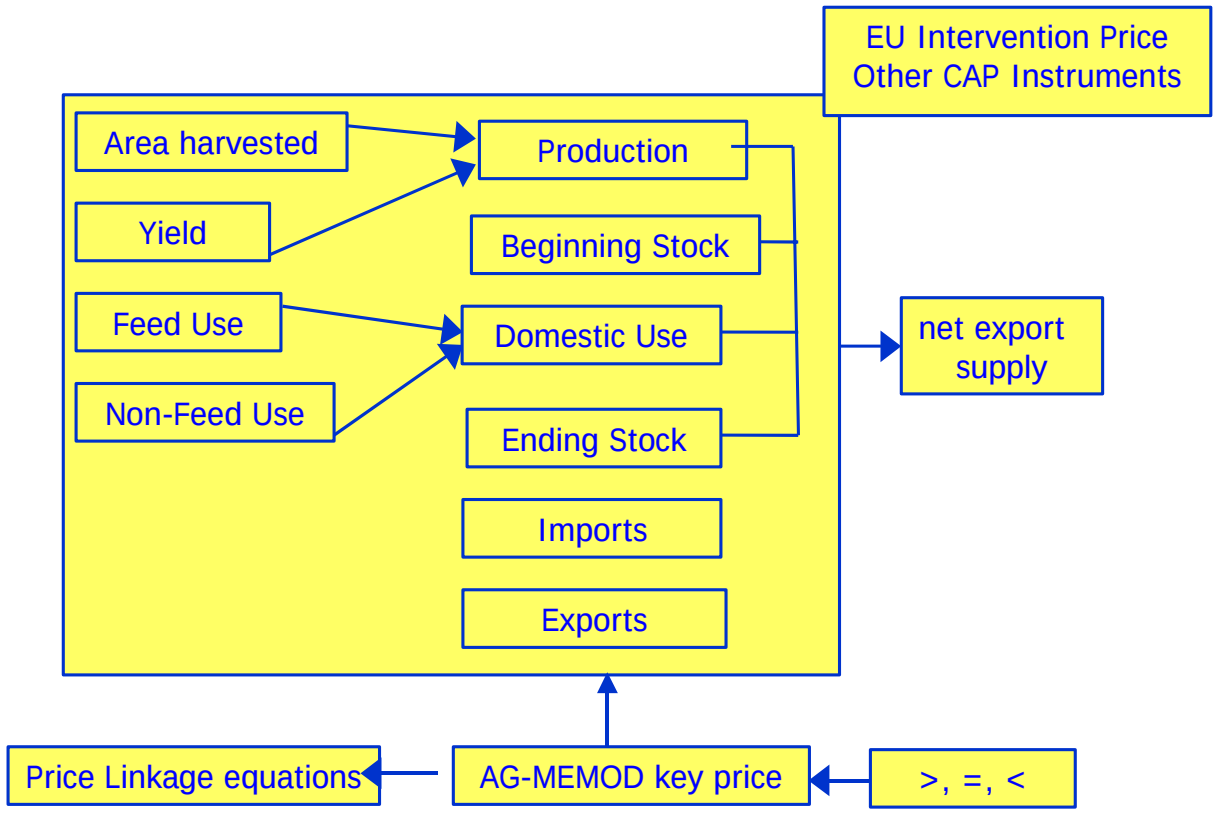

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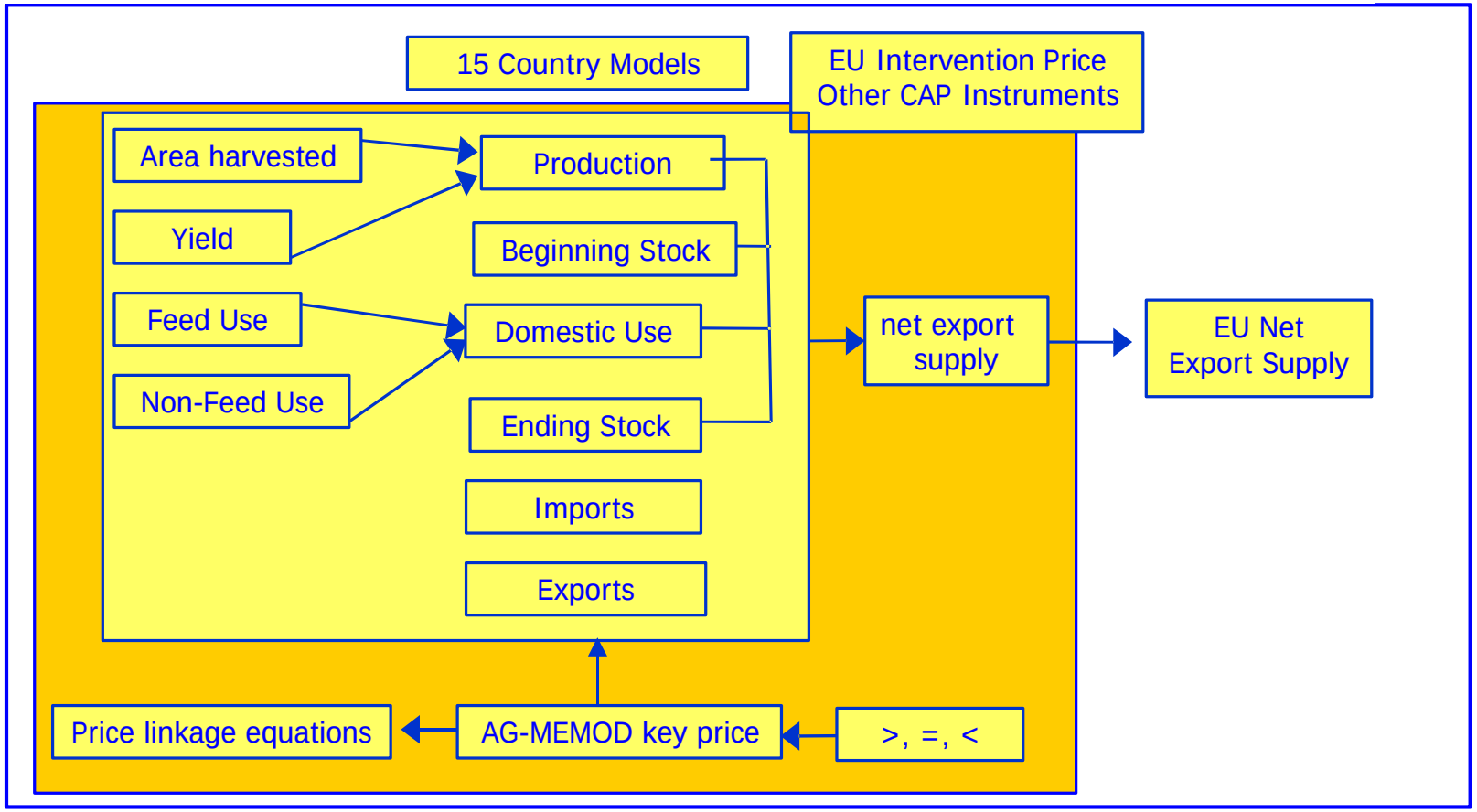
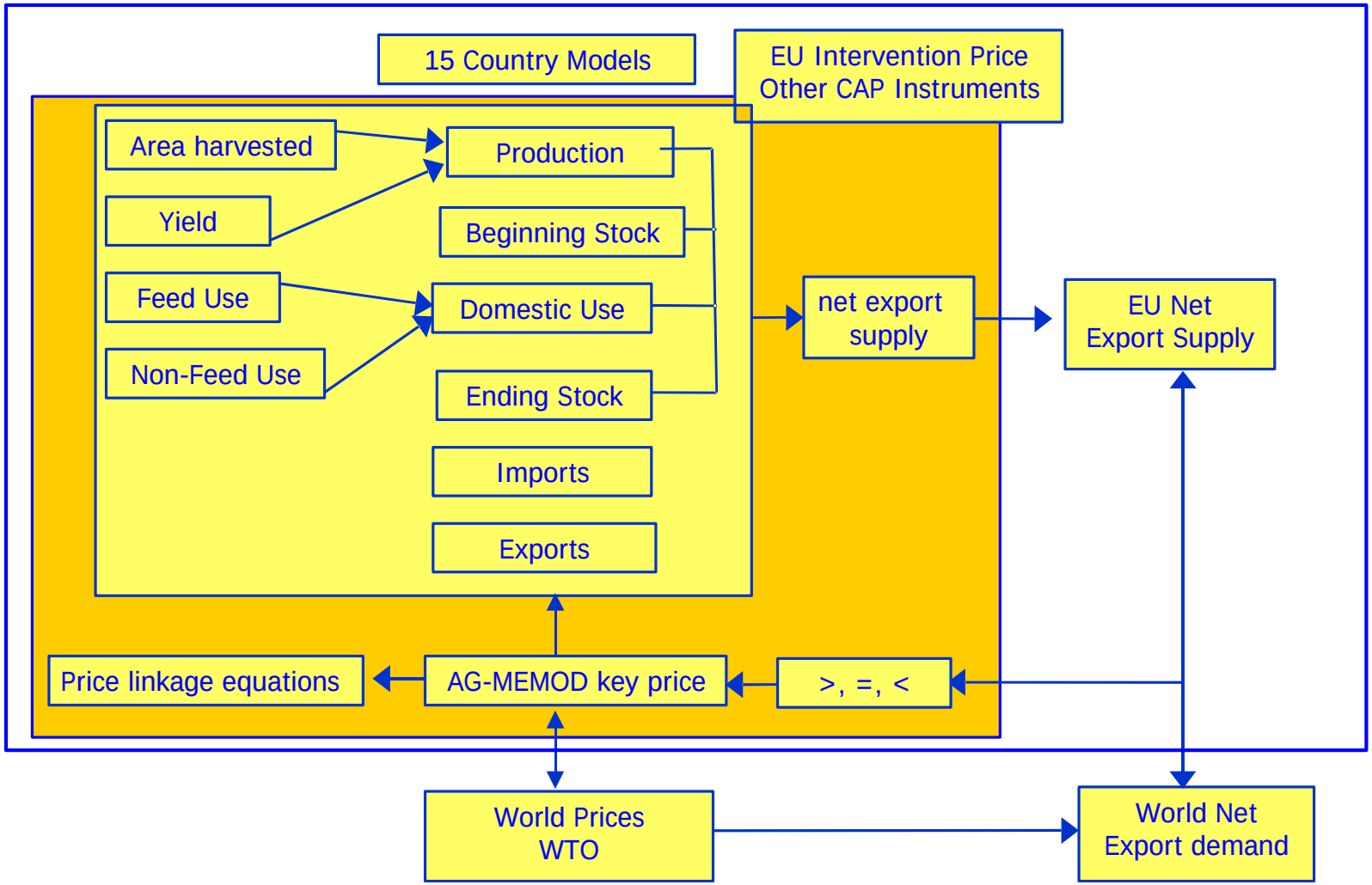


AGMEMOD - model structure



AGMEMOD - model structure

Behavioural equations of the grains, oilseeds and root crops sub-models

Equations	**Total Grains** Total oilseeds Total root crops	**Soft wheat** **Durum wheat** **Barley** **Maize**	**Rapeseed** **Sunseed** **Soybean**	**Rape oil** **Sun oil** **Soy oil**	**Rape meal** **Sun meal** **Soy meal**	**Potatoes**	**Sugarbeet**	**Sugar**
Area harvested	X	X	X			X	X	
Share of area		X				X	X	
Yield		X	X			X	X	
Production		X	X	X	X	X	X	X
Feed use		X				X		
Food use per capita		X		X		X		X
Food use		X				X		X
Domestic use		X	X	X	X	X	X	X
Industrial use			X				X	
Stocks Change		X	X	X	X	X	X	X
Imports		X	X	X	X	X		X
Exports		X	X	X	X	X		X
Feed and seed use								
Crush demand			X					

X Only available for Soy oil

AGMEMOD - model structure

Behavioural equations of livestock sub-models

Equations	Cattle	Beef and veal	Pig	Pig meat	Sheep	Sheep meat	Poultry
Ending numbers	X		X		X		
Crop	X		X		X		
Exports	X	X	X	X	X	X	X
Imports	X	X	X	X	X	X	X
Slaughter	X		X		X		
Slaughter weight	X		X		X		
Production		X		X		X	X
Stocks	X	X	X	X	X		
Consumption per capita		X		X		X	X
Domestic consumption		X		X		X	X
Piglets per sow			X				

AGMEMOD - model structure

Behavioural equations of the dairy sub-model

Equations	Milk	Skin milk powder	Whole milk powder	Cheese	Butter
Dairy cows ending number	X				
Yield per cow	X				
Production	X	X	X	X	X
Stocks		X	X	X	X
Exports		X	X	X	X
Imports		X	X	X	X
Factory use	X				
Food consumption per capita		X	X	X	X
Food consumption		X	X	X	X
Animal feed use	X	X			
Protein in collected milk	X				
Protein in fluid milk use	X				
Fat in fluid milk use	X				
Fat in collected milk	X				
Fat in whole milk powder	X				
Fat in cheese	X				
Fat in other use	X				
Fat in butter	X				
Protein in cheese					
Protein in other use	X				
Protein in skim milk powder	X				
Protein in whole milk powder	X				

AGMEMOD - model structure

- All AGMEMOD commodities have been covered
- GRAINS
  - Soft Wheat is the most important cereal in the country.

'Adding-up': In the majority of implemented country models 3-grains area harvested is allocated across the 3 grains using 2 area share allocation equations (ASH) and an identify.

WSASHDE = 1-BAASHDE-COASHDE

- OILSEEDS
  - Rape seed is the most important oilseed in Germany - production/crushing and trade (meal)
  - Sunflower and especially soybeans are marginally produced
  - Soybeans and soymeal are imported in large amounts

AGMEMOD - model structure

- LIVESTOCK AND DAIRY
  - For beef and veal, pork, lamb and poultry, the German model follows the structure of the GOLD model – imports of live animals were not modeled (exogenous).
  - The dairy model depicts raw milk production, feed use, the factory use of contents (fat & protein) as well as the markets of butter, cheese, skimmed (SMP) and whole (WMP) milk powder and other dairy products.
  - the German markets for **cattle meat, pig meat, poultry meat,** and **butter** are key markets for the price formation within the composite model - these prices are linked to world market prices (and related to the external trade of the Community)

AGMEMOD - model structure

Market	Policy instrument
Grains	♦ Set-aside rate ♦ Compensation ♦ Compensation reference yield ♦ Intervention price (in Interv. price comparison ratios)
Oilseeds	♦ Set-aside rate ♦ Compensation ♦ Compensation reference yield
Sugar	♦ A-Quota Sugar Levy ♦ Price of B-Quota sugar (sugar beets) ♦ Price of A-Quota sugar (sugar beets) ♦ A-Quota Sugar (sugar beets) ♦ B quota sugar (sugar beets) ♦ B-Quota Sugar Levy ♦ Intervention price
Potatoes	♦ *starch quota not included*

AGMEMOD - model structure

Trade	Policy instrument
♦ Wheat ♦ Coarse grains ♦ Sugar ♦ Beef ♦ Pig meat ♦ Poultry ♦ Sheep meat ♦ Cheese ♦ Butter ♦ SMP	**TRQs** **(Tariff rate quotas)**
♦ Wheat ♦ Coarse grains ♦ Sugar ♦ Beef ♦ Pig meat ♦ Poultry ♦ Cheese ♦ Butter ♦ SMP	**WTO Limits for subsidized exports**

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AGMEMOD

- **Aims**
- **Approach**
- **Model structure**
- **AGMEMOD Partnership**

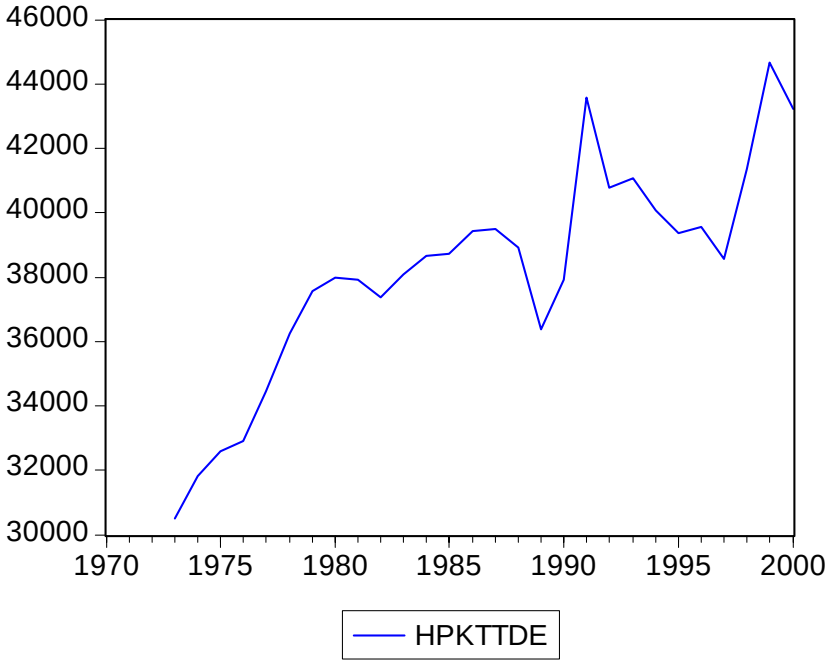
  - more than 27 single commodity models estimated
  - with 14 “old” EU member states partners with country models to be combined
  - +10 partners from “new” EU member states as single country models

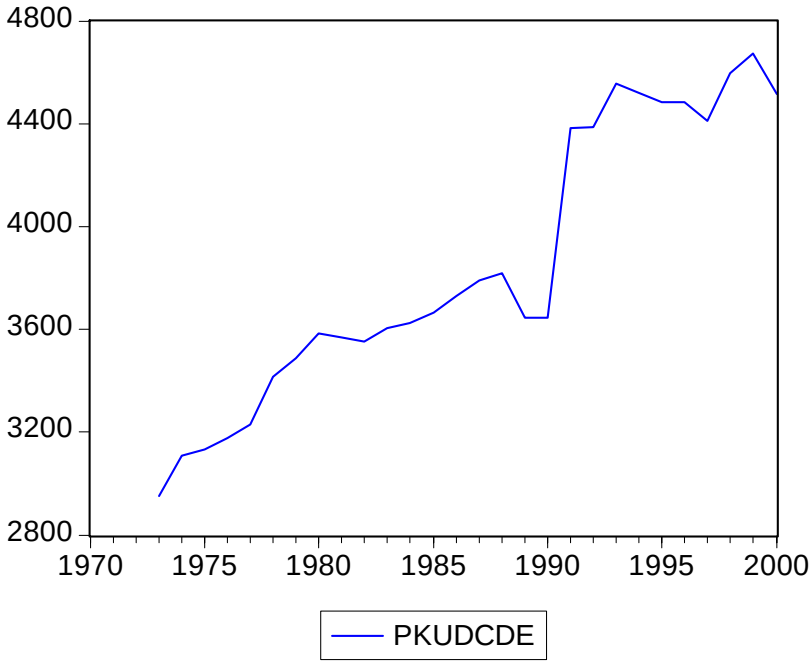
Estimation

- In general, the econometric estimations covered the period from 1973 to 2000
- Estimations were based on OLS estimators and estimated with EViews 4.0
- Data were generated from NEW CRONOS and national sources
- When necessary, equations were modeled with dummy-variables or trends that take into account the re-unification effects (unique, recurring or declining effect) or long run consecutively adjustments (technical progress) as trends
- Additional dummy-variables were implemented to capture the impact of BSE outbreaks within the estimation period

Estimation

- Important issue for the German team was to obtain historical parameters taking into account the re-unification





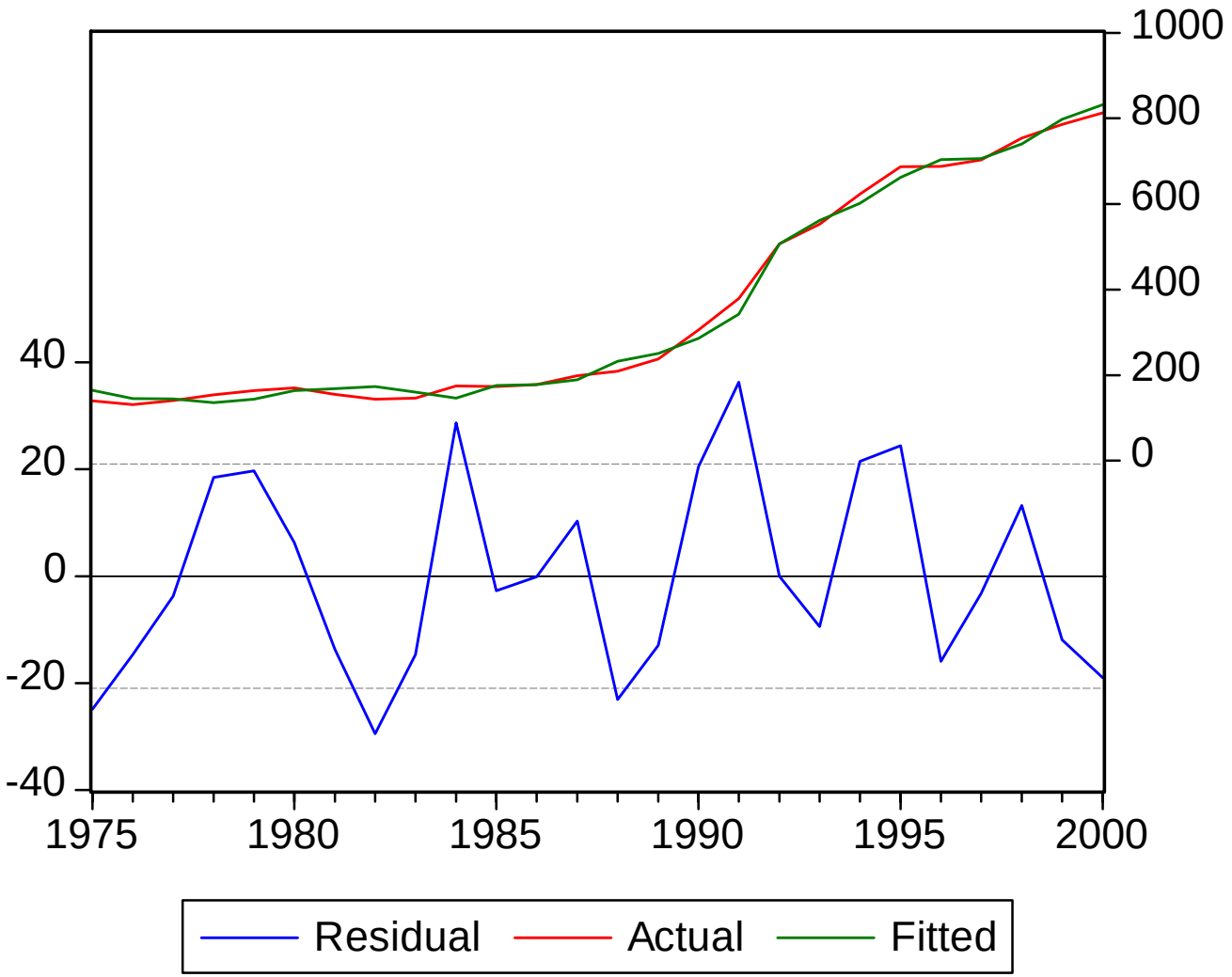
Estimation: Stocks of suckler cows

Dependent Variable: BCCCTDE
Method: Least Squares
Date: 05/25/04 Time: 15:41
Sample(adjusted): 1975 2000
Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	337.3113	229.0202	1.472845	0.1572
BCCCTDE(-1)	0.831464	0.132981	6.252511	0.0000
DCCCTDE(-1)	-0.074387	0.034153	-2.178027	0.0422
(CCPRMDE+((BCSCPE5*EXRE DE)/(BCCCTDE/CCSLWDE)))/ GDPDDE	0.101738	0.049728	2.045883	0.0549
BCQSCDE	0.136994	0.088628	1.545711	0.1387
XX1992	162.9841	44.57405	3.656480	0.0017
CCPRMDE/LMPRMDE	17.31594	14.76546	1.172732	0.2554

R-squared	0.994692	Mean dependent var	358.4028
Adjusted R-squared	0.993016	S.D. dependent var	250.6546
S.E. of regression	20.94676	Akaike info criterion	9.146649
Sum squared resid	8336.565	Schwarz criterion	9.485367
Log likelihood	-111.9064	F-statistic	593.4655
Durbin-Watson stat	1.491078	Prob(F-statistic)	0.000000

Estimation: Stocks of suckler cows



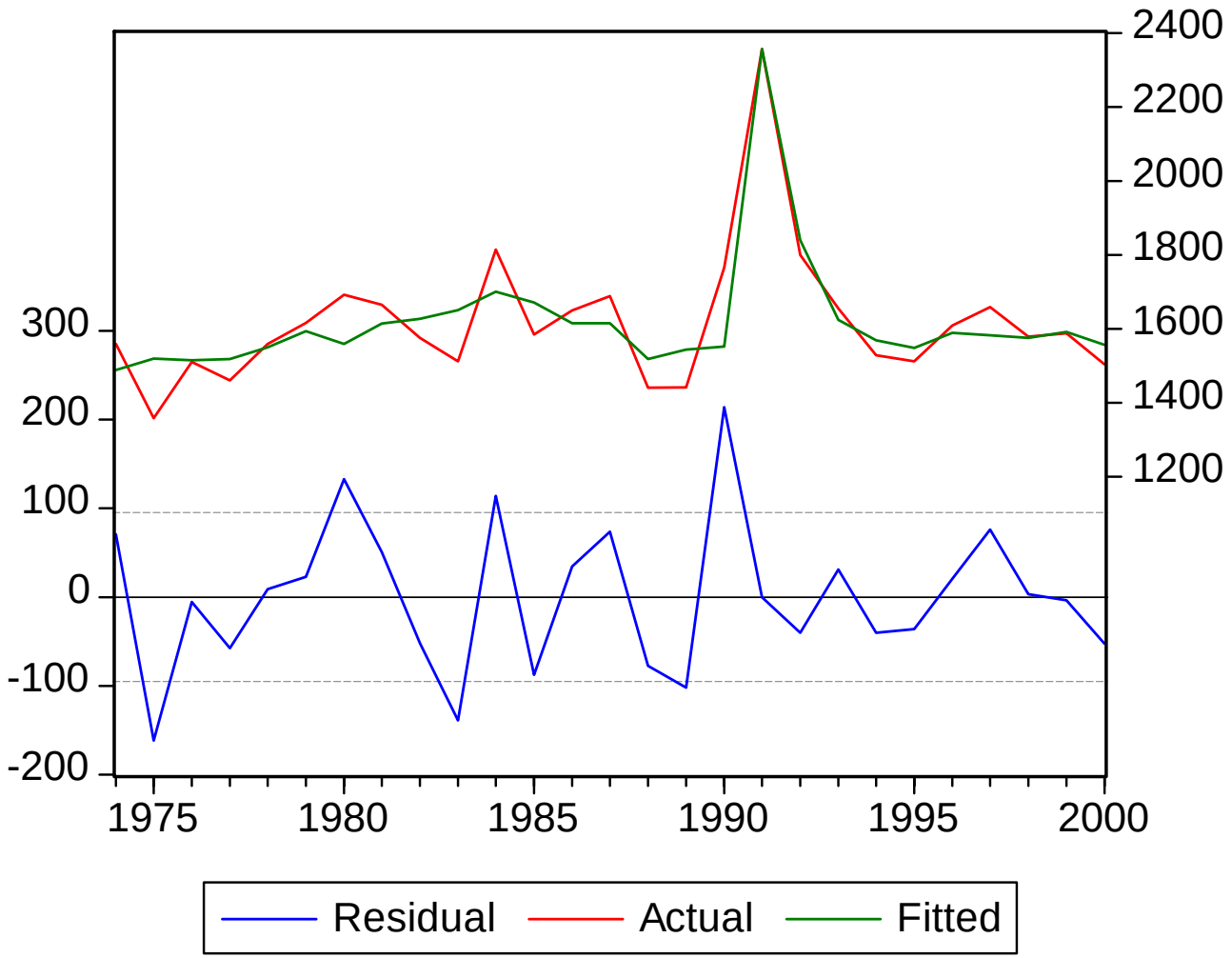
Estimation: Slaughterings of total cows

Dependent Variable: BCKTTDE
Method: Least Squares
Date: 05/23/04 Time: 18:44
Sample(adjusted): 1974 2000
Included observations: 27 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-341.2048	592.0427	-0.576318	0.5708
BCCCTDE(-1)	1.477377	0.711837	2.075443	0.0511
DCCCTDE(-1)	0.242611	0.104935	2.312012	0.0316
(CCPRMDE+((BCSCPE5*EXREDE)/BCCCTDE(-1))/CCSLWDE)/GDPDDE	0.789245	0.359694	2.194214	0.0402
(BCSCPE5*EXREDE)/GDPDDE	-1.749487	1.418314	-1.233497	0.2317
BCQSCDE	-0.409267	0.221404	-1.848508	0.0794
XX1991	802.3294	119.5033	6.713870	0.0000

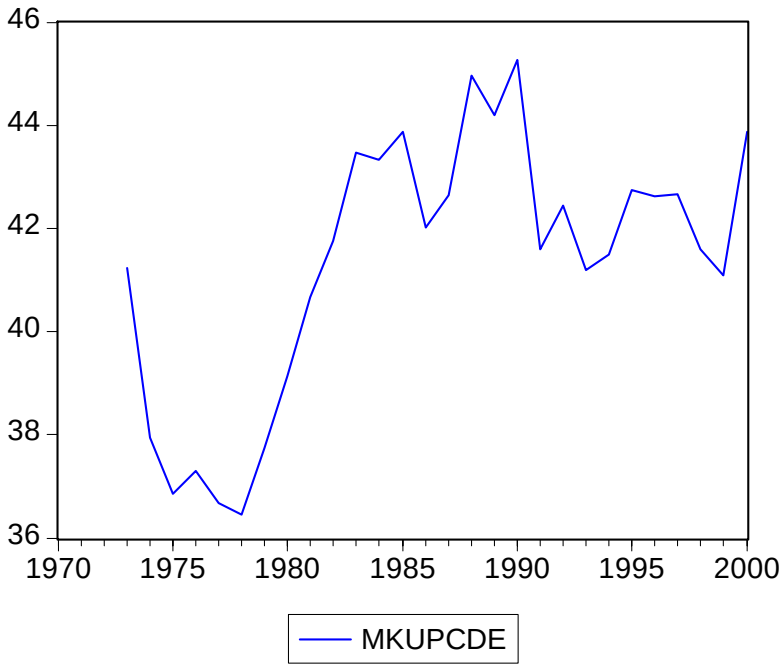
R-squared	0.793501	Mean dependent var	1618.251
Adjusted R-squared	0.731552	S.D. dependent var	183.6570
S.E. of regression	95.15633	Akaike info criterion	12.16733
Sum squared resid	181094.6	Schwarz criterion	12.50329
Log likelihood	-157.2590	F-statistic	12.80883
Durbin-Watson stat	2.421563	Prob(F-statistic)	0.000006

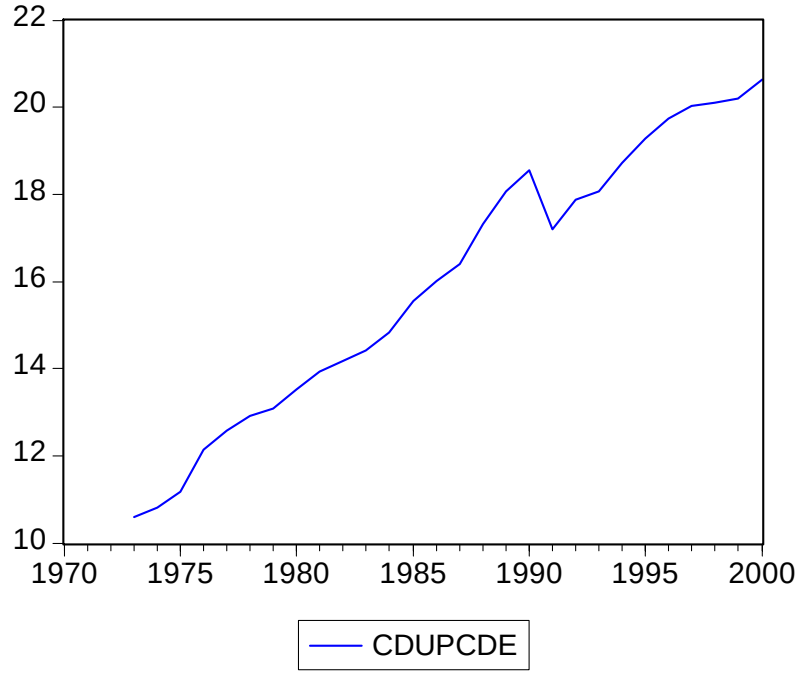
Estimation: Slaughterings of total cows



Estimation

- Main issue for the German team was obtain historical parameters taking the re-unification into account





Policy simulations

- Baseline projection: Agenda 2000
- MTR: Decoupling

Main assumptions – baseline (AG 2000)

- For crops: maintenance of policy variables
- For livestock: levels of policy variables in € or 1000 t

	2002	2010
Beef intervention price	278.0	243.3
Butter intervention price	328.2	279.0
SMP intervention price	205.5	174.7
Suckler cow premium	200.0	200.0
Male bovine premium	210.0	210.0
Butter consumption subsidy	39.7	15.9
SMP feed subsidy	75.0	30.0
Ewe premium	19.3	20.8
German milk quota (applied)	*27 953*	*28 375*
German suckler cow quota	*639.5*	*639.5*
Animal density threshold	2.0	1.8

Main assumptions – policy sim (MTR)

- For crops: policy variables levels according MTR proposal
- For livestock: maintenance of baseline levels
- decoupling of payments by 0.7

		2002	from 2005 decoup.
Cereal compensation	€/t	63.00	18.90
Oilseeds compensation	€/t	63.00	18.90
Suckler cow premium	€/head	200.00	60.00
Male bovine premium	€/head	210.00	63.00
Ewe premium	€/head	19.24	6.25

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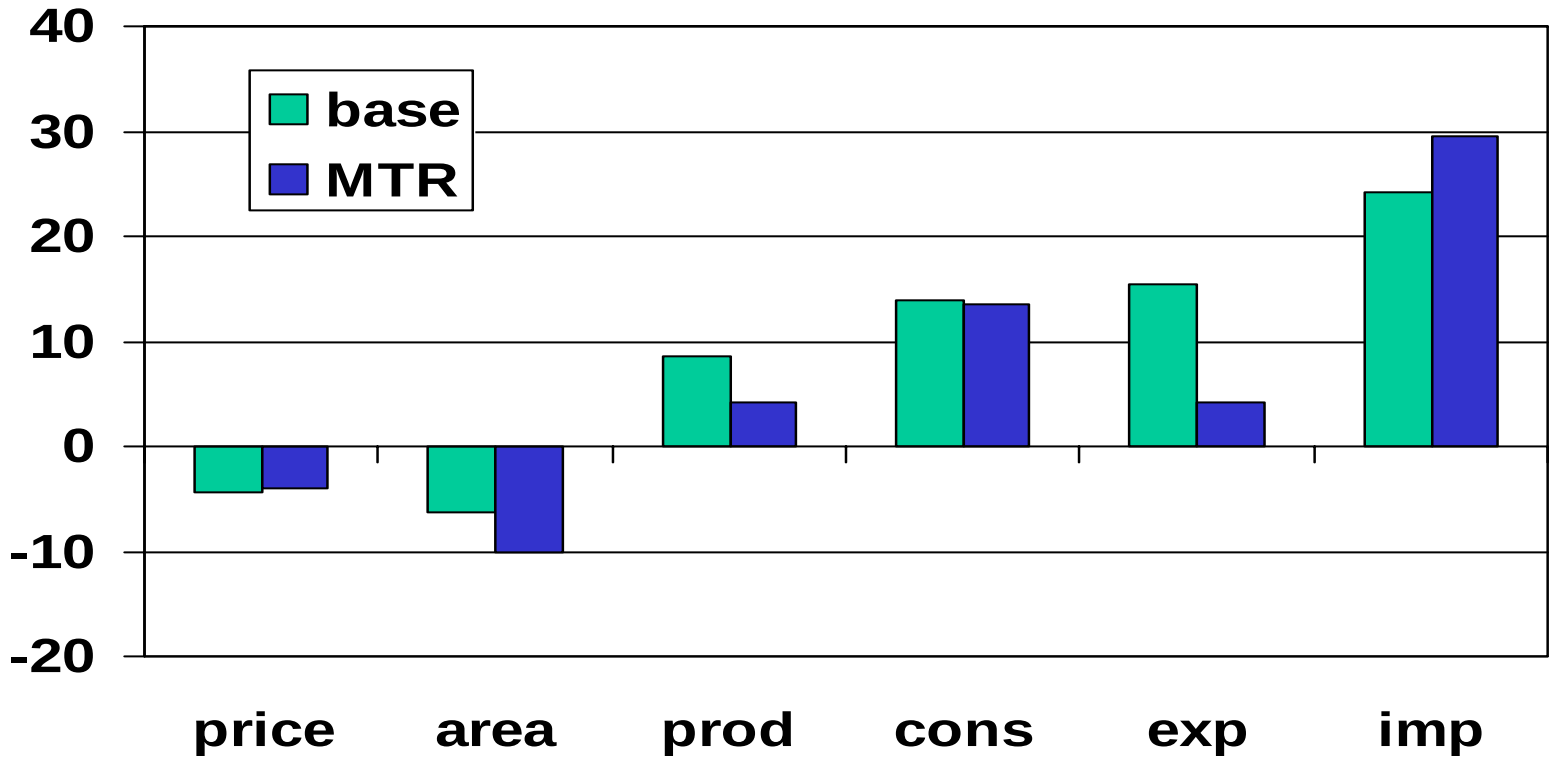
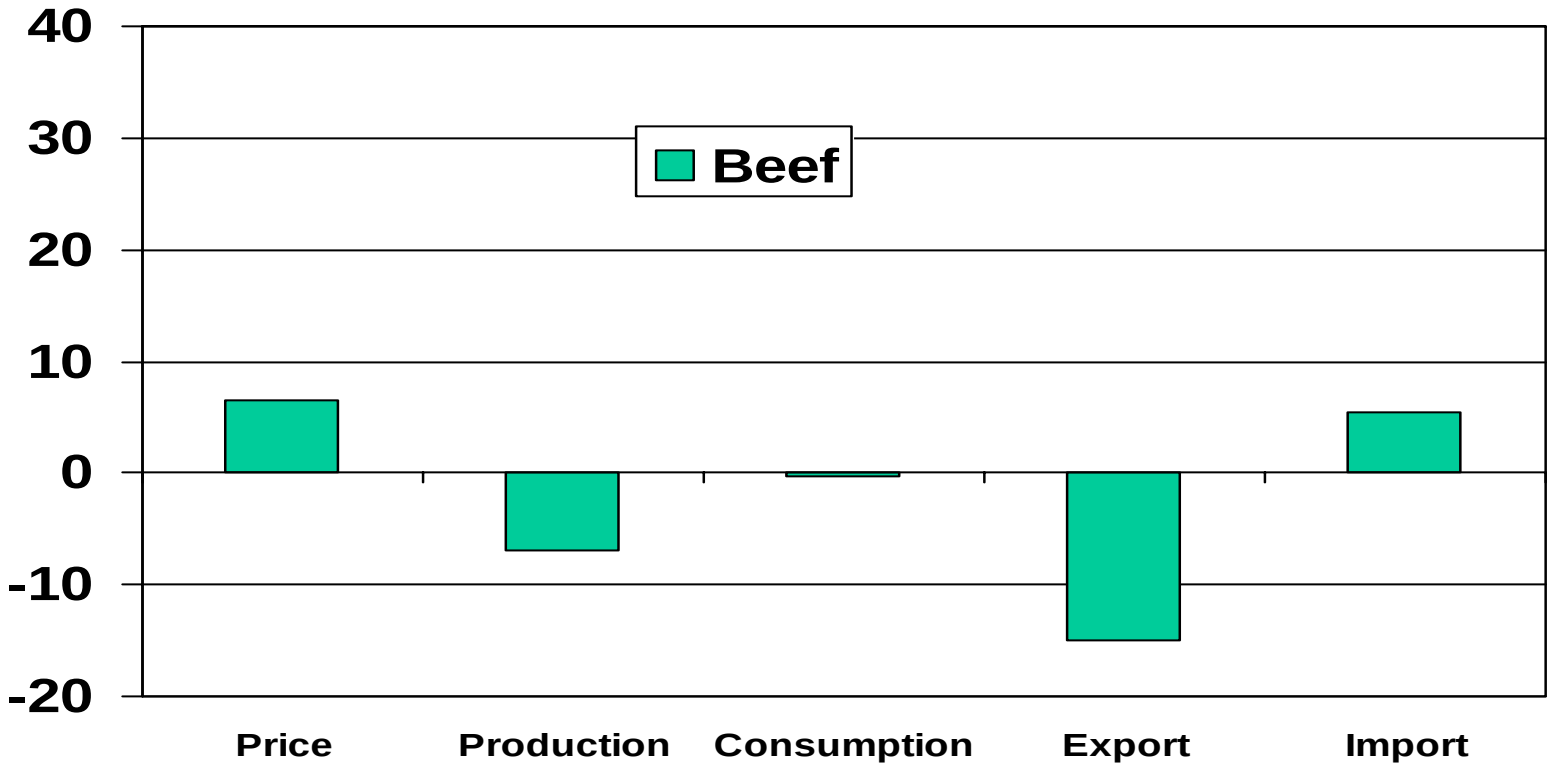
Some results - wheat market in Germany

- changes in % compared to 2000

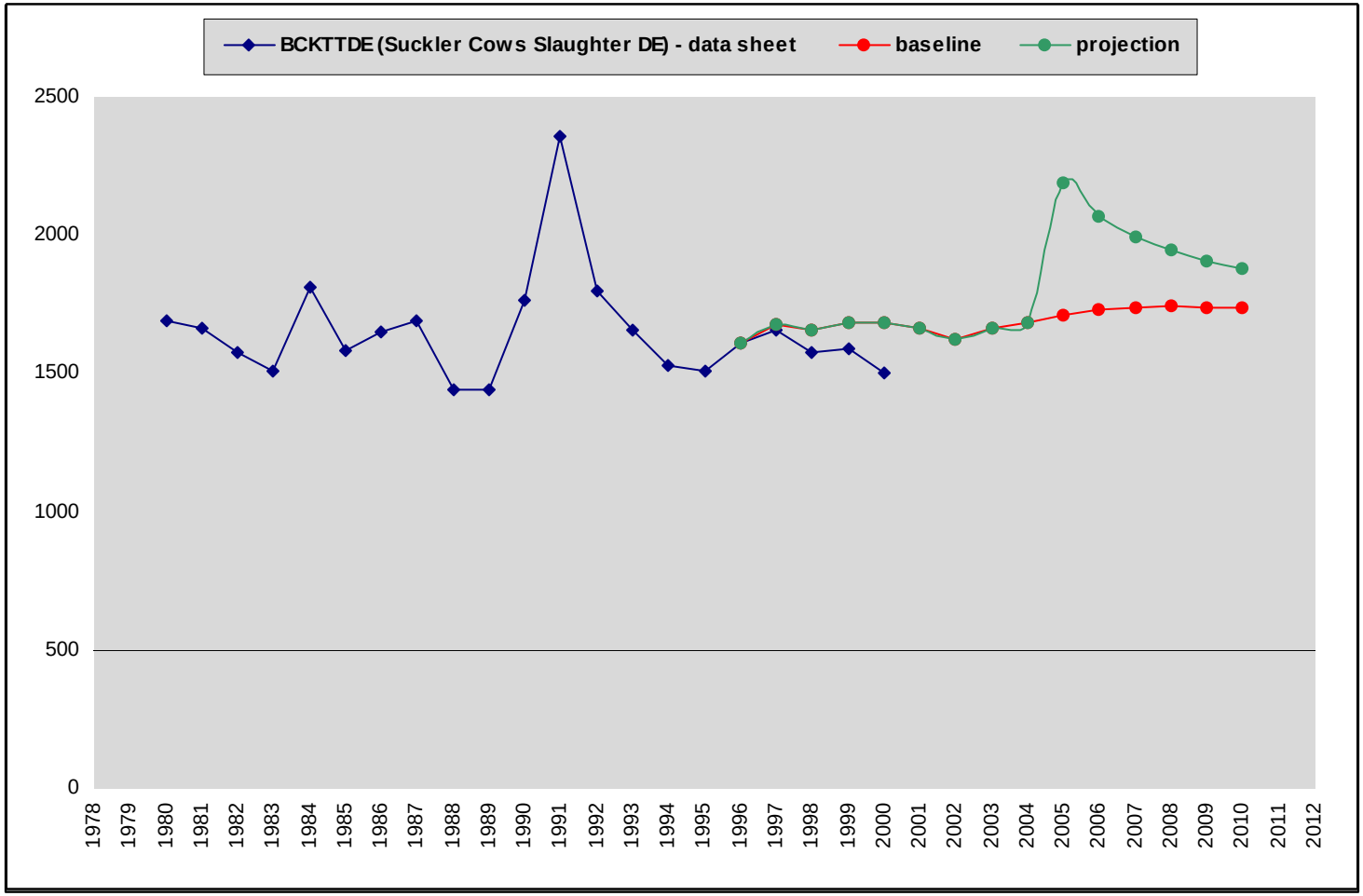


Some results - beef market in Germany

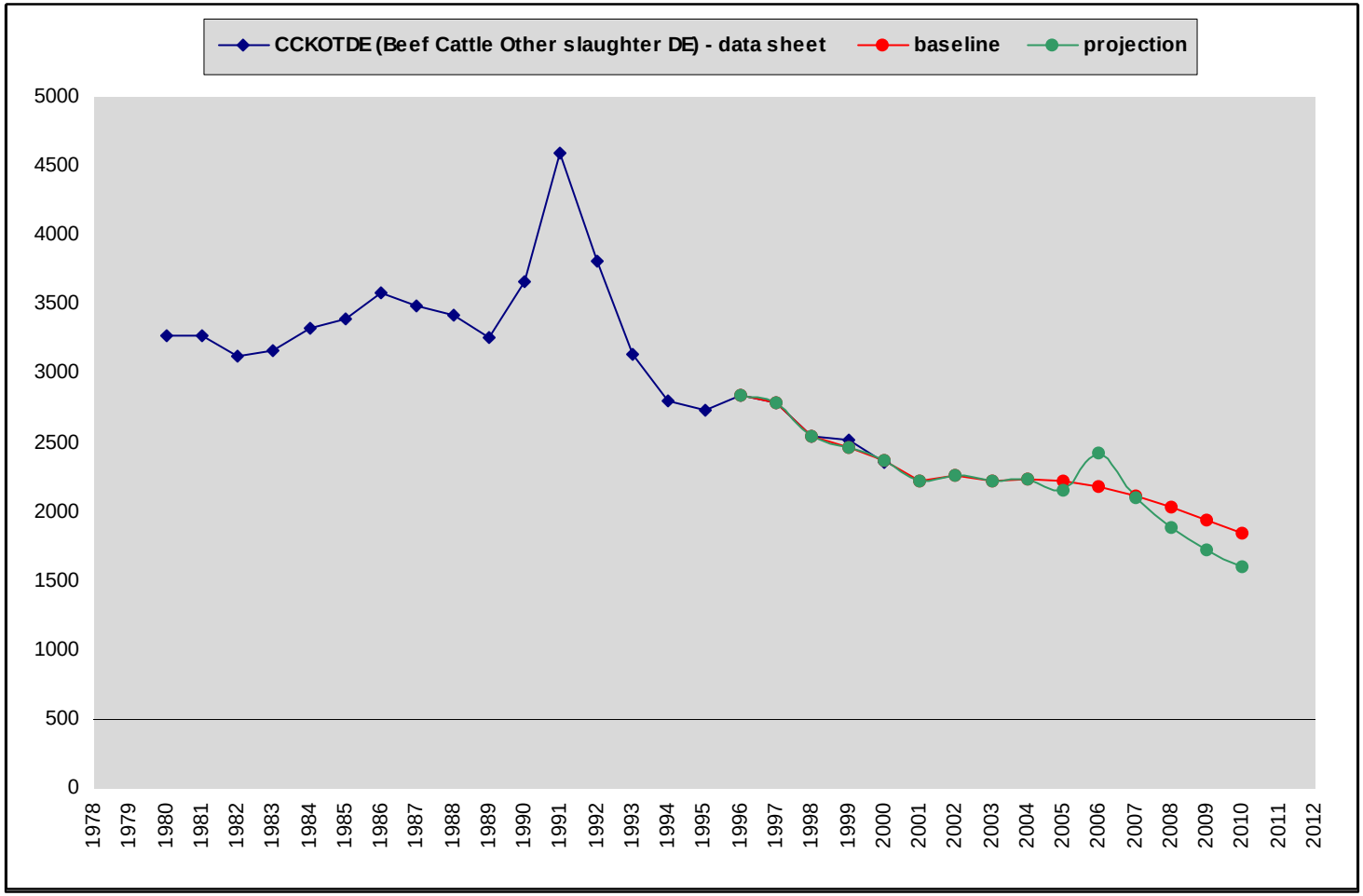
- change compared to baseline



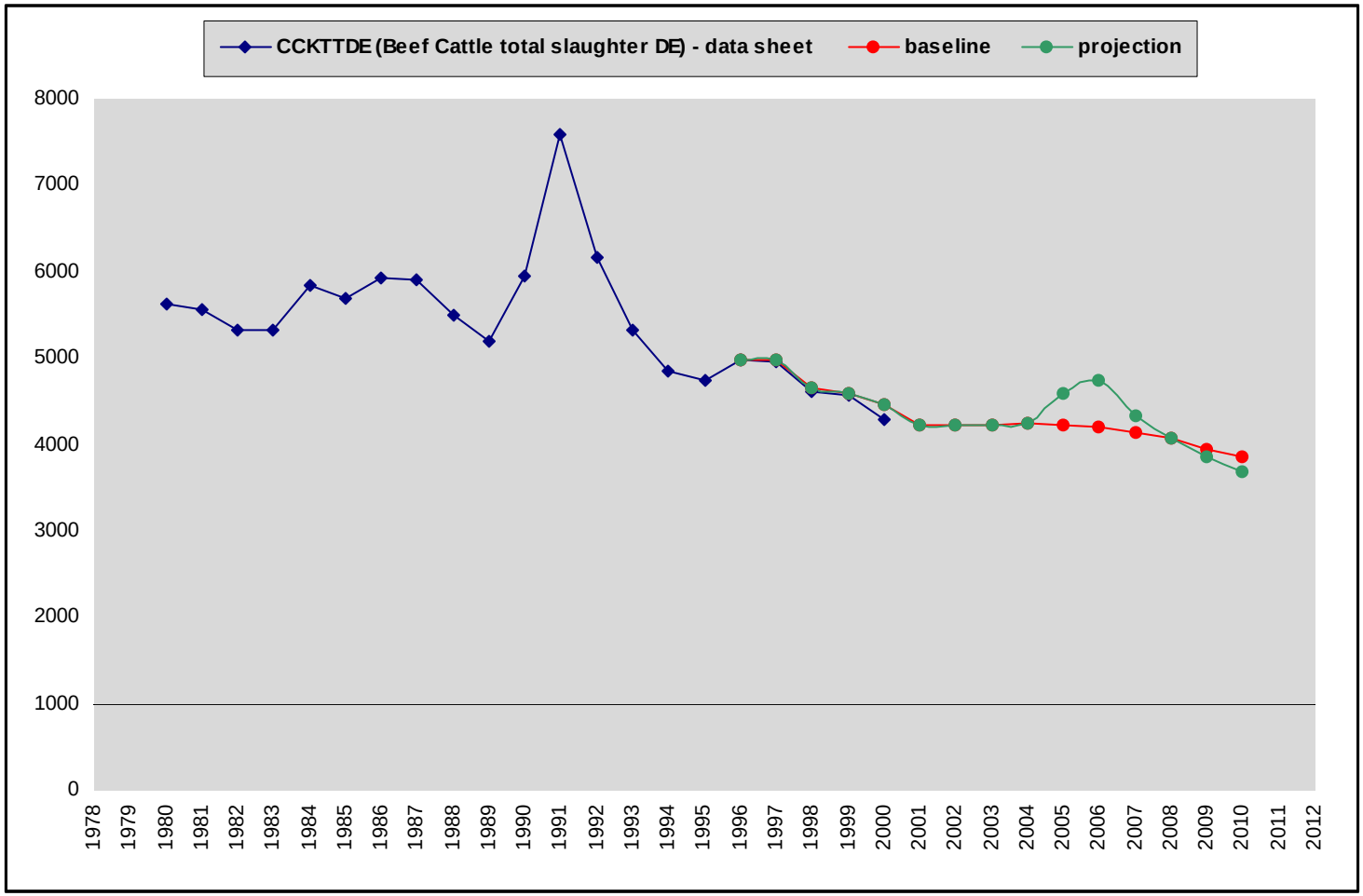
Results DE – slaughter cows



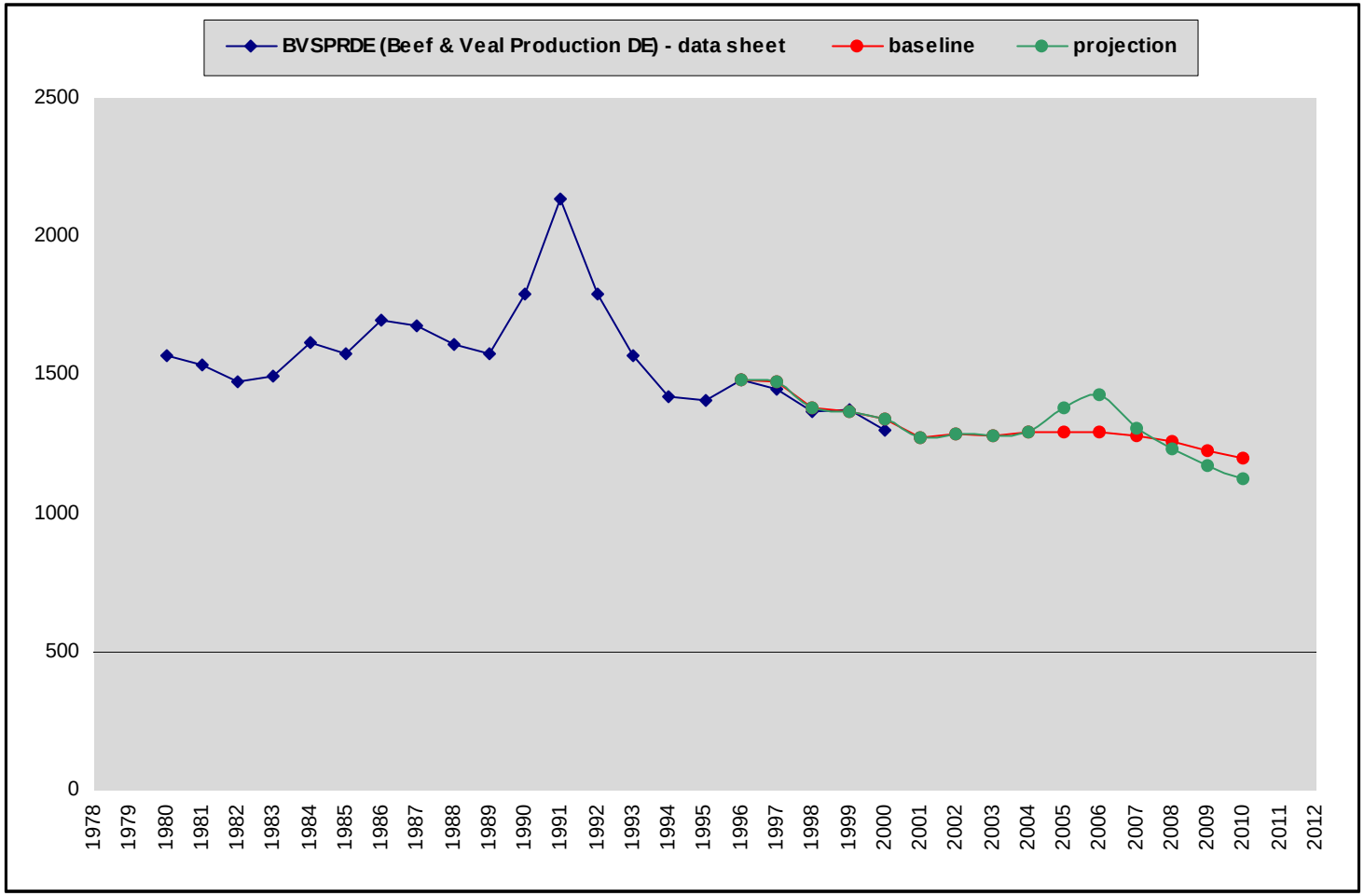
Results DE – slaughter other cattle



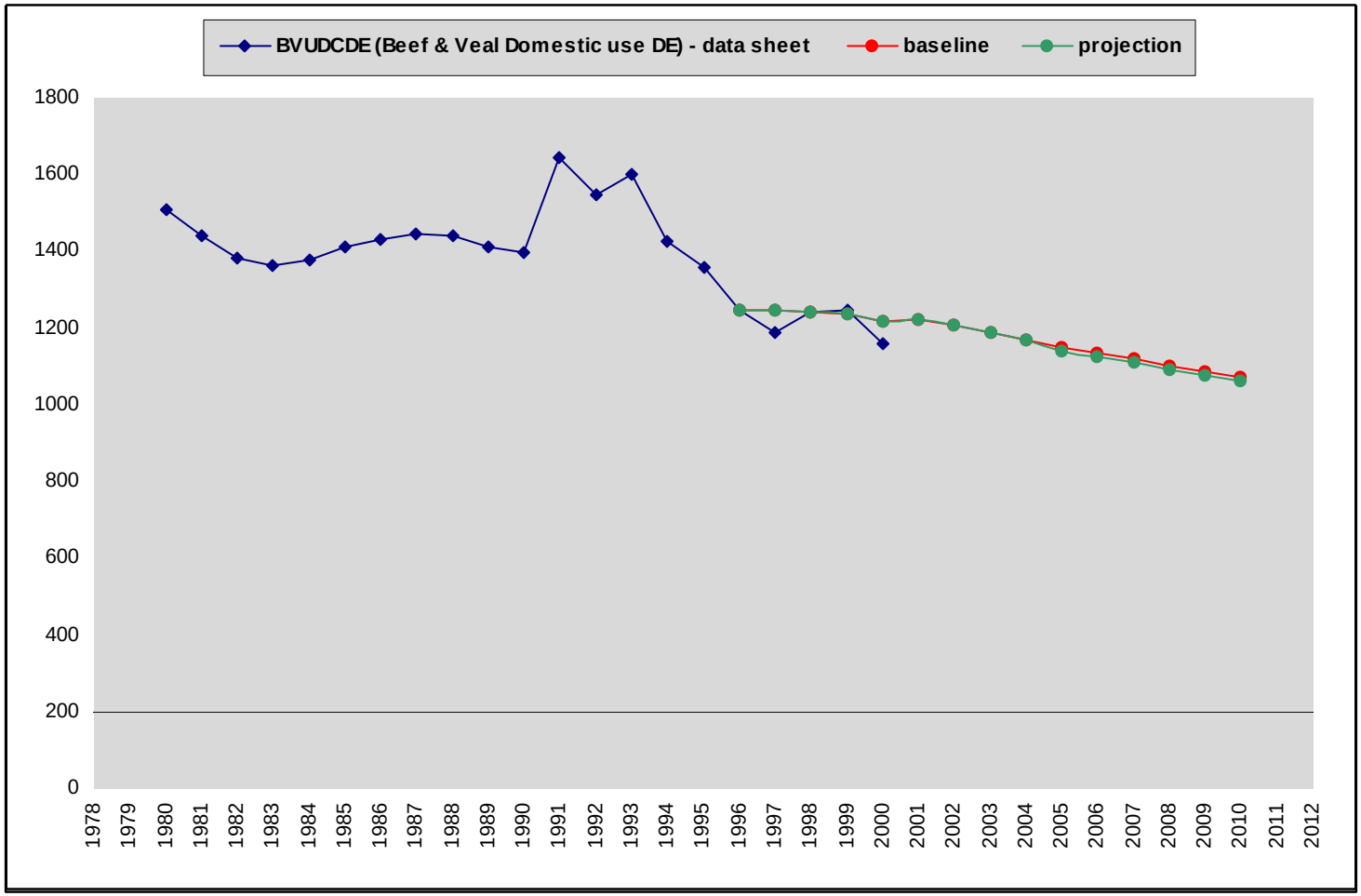
Results DE – slaughter cattle



Results DE - beef & veal production



Results DE - beef & veal domestic use



Concluding remarks

- **Work in progress - fine tuning**
- **Econometrically estimated model**
  → German re-unification (structural break)
  → policy variables
  → defined set of exogenous variables
  → wrong signs of parameters
- **Baseline and policy simulations in period 2002-2010**
  → by large the direction of the effects seemed to be correct
  → improving feedback effects concerning net trade: change in results possible when all models (at the moment: 9) are combined
  → some unexpected results: improvement necessary

Thank you for your attention

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