

The Impact of Biofuels on Land Markets and Production

Methodological Issues and Results from LEITAP

Martin Banse, LEI (The Hague, NL)

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Outline of Presentation

- Introduction
- Methodology
- Modelling results of enhanced biofuel production in the EU
 - Impact at Global level
 - Impact at European level
 - Primary agricultural production
 - Trade
 - Land use
- Summary and conclusion

Methodology (I)

- Instruments applied at LEI to analyse policy options in the area of biofuels
 - General equilibrium model: LEITAP
 - Extended version of the GTAP model
 - Global focus
 - Multi-sectoral approach (not only agri-food sectors)
 - Partial equilibrium model: ESIM
 - World model
 - However with strong EU focus
 - Focus on agri-food sectors

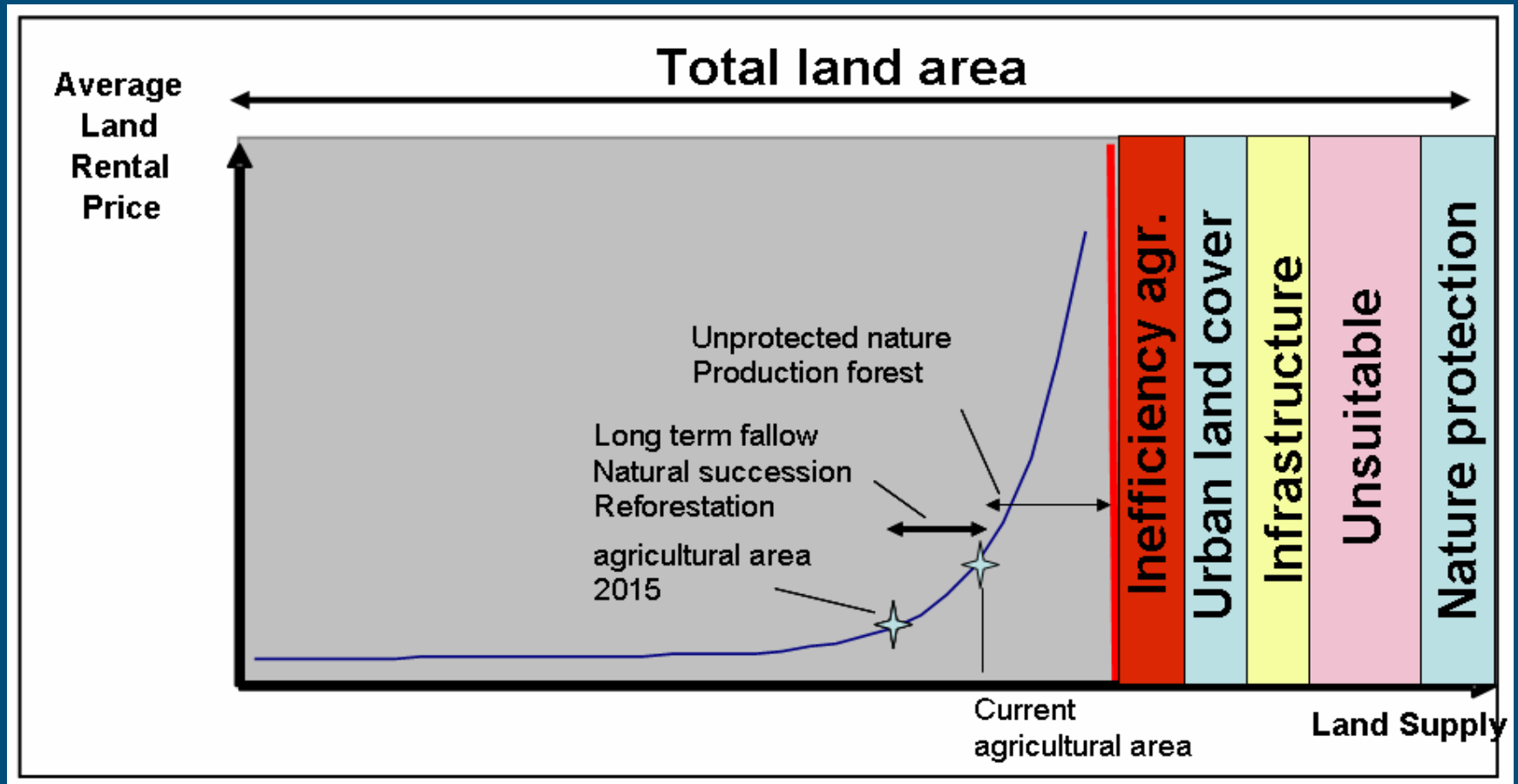
Methodology (II)

- Economic model with global and economy wide coverage (GTAP)
 - Database (base year 2001):
 - 88 regions (including individual EU27, Croatia and Turkey)
 - 57 sectors (14 primary agriculture and 7 food processing)
 - input-output data covering intersectoral linkages
 - bilateral trade data, transport data, protection data
 - Features
 - global trade (Doha-WTO) and agricultural policies
 - economy wide
 - structural change (long run)
 - factor markets (e.g. labour and land)

Methodology (III)

- Elaborate standard model from GTAP
 - Segmentation of factor markets
 - Agricultural policies
 - Land allocation structure
 - Land supply curve: $S = a - b/p$
 - $p = 1$ (base year 2000)
 - a = Asymptote value: Total available surface for agriculture
 - b = Total available area (a) – surface used by Agriculture (S)

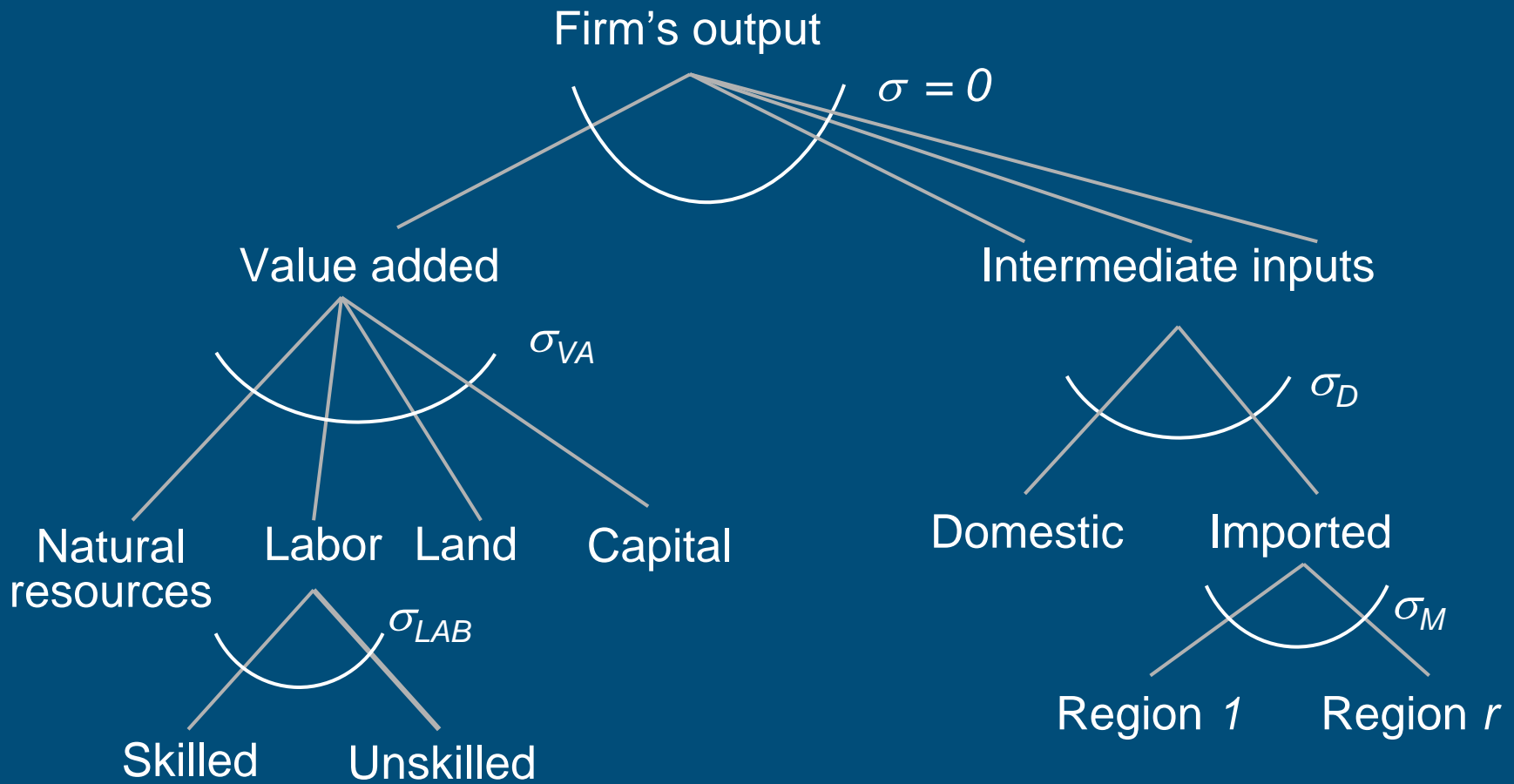
Methodology (IV)



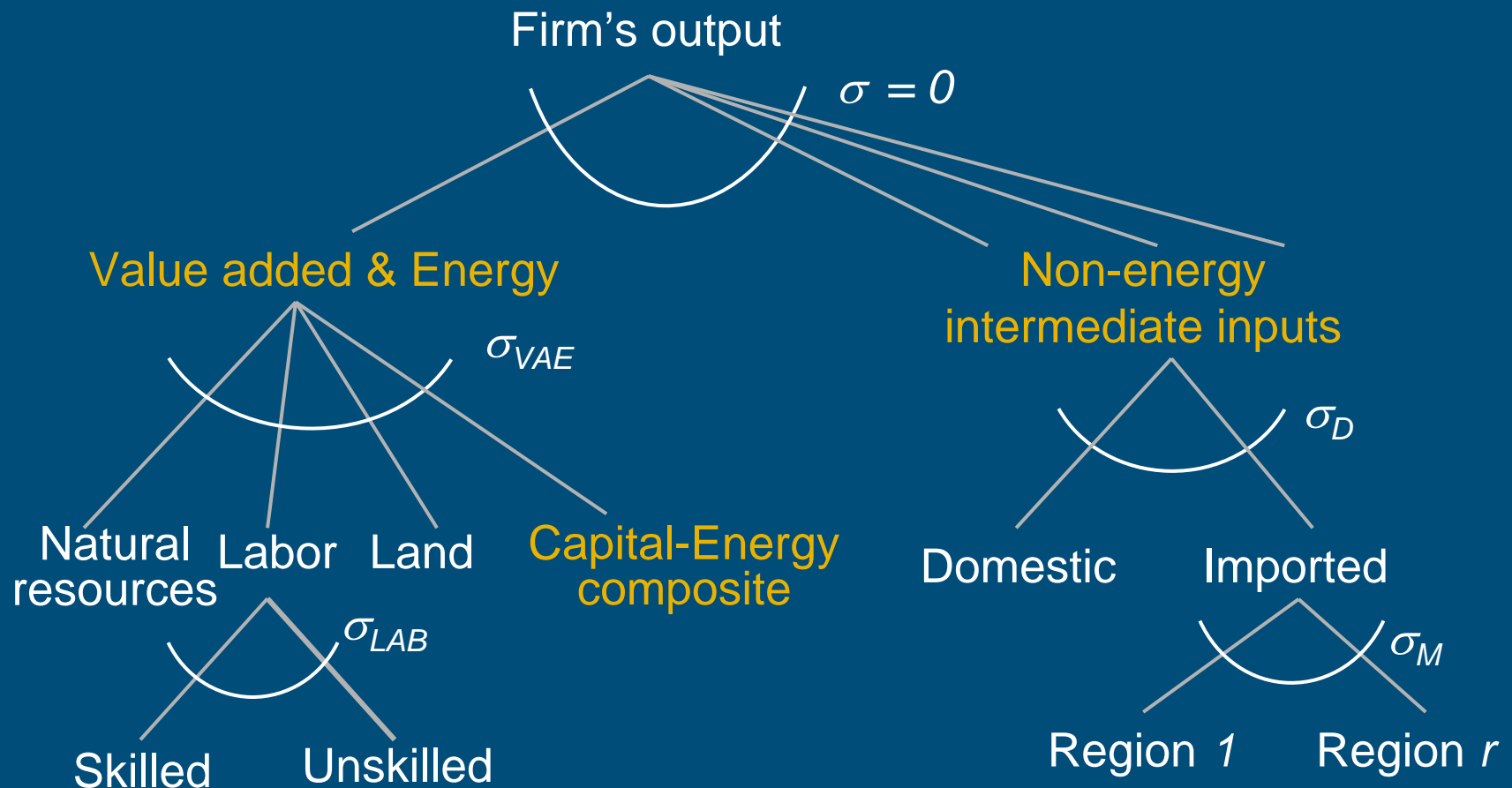
Extensions towards Modelling Biofuels

- Energy in Standard GTAP
 - GTAP has a 'top-down' structure for energy production
 - No energy substitution in production
- Similar approach as in GTAP-E (Burniaux, Truong, 2002)
 - Introduces energy substitution into production
 - Allows for energy and capital to be either substitutes or complements

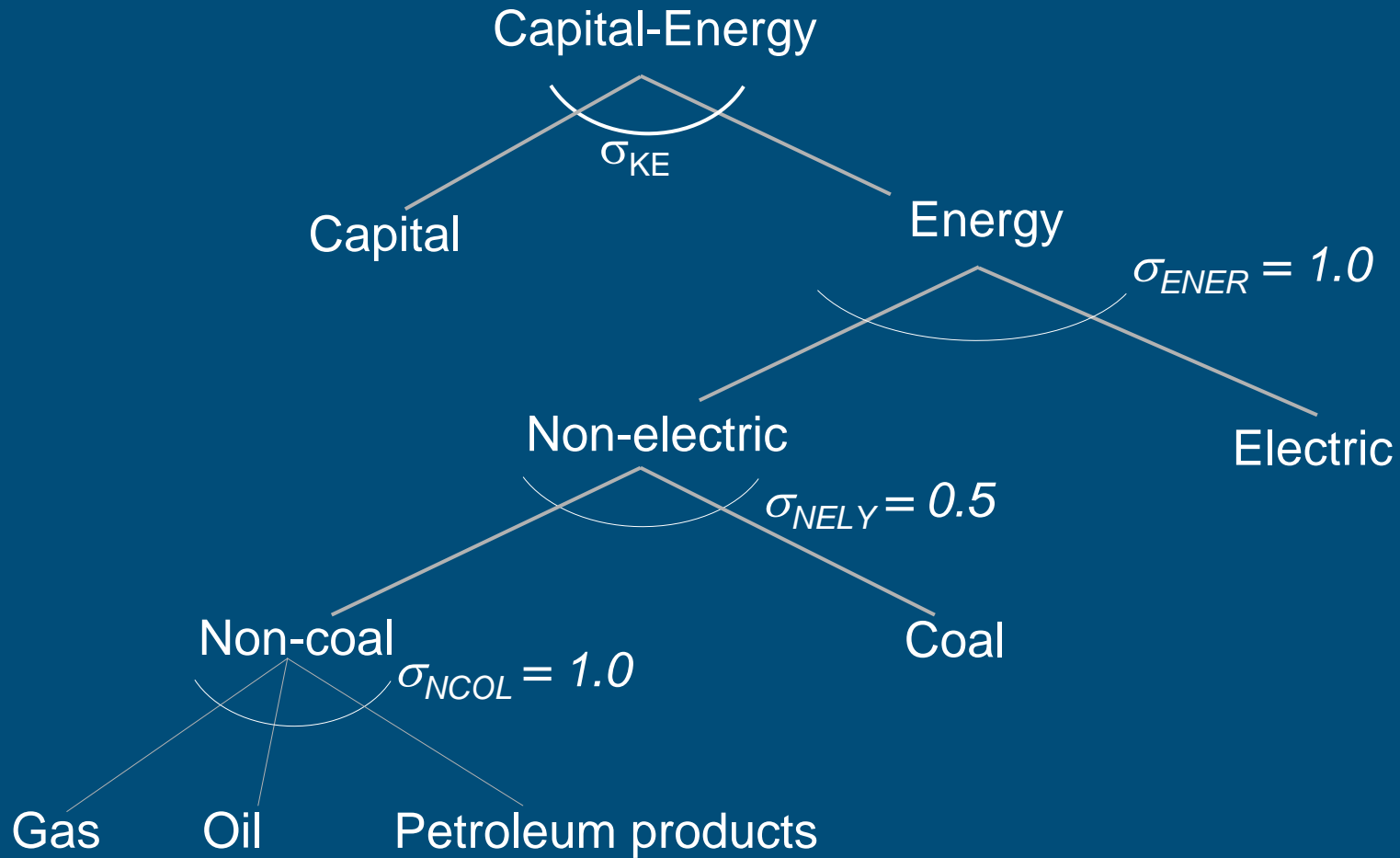
Standard GTAP: Production Structure



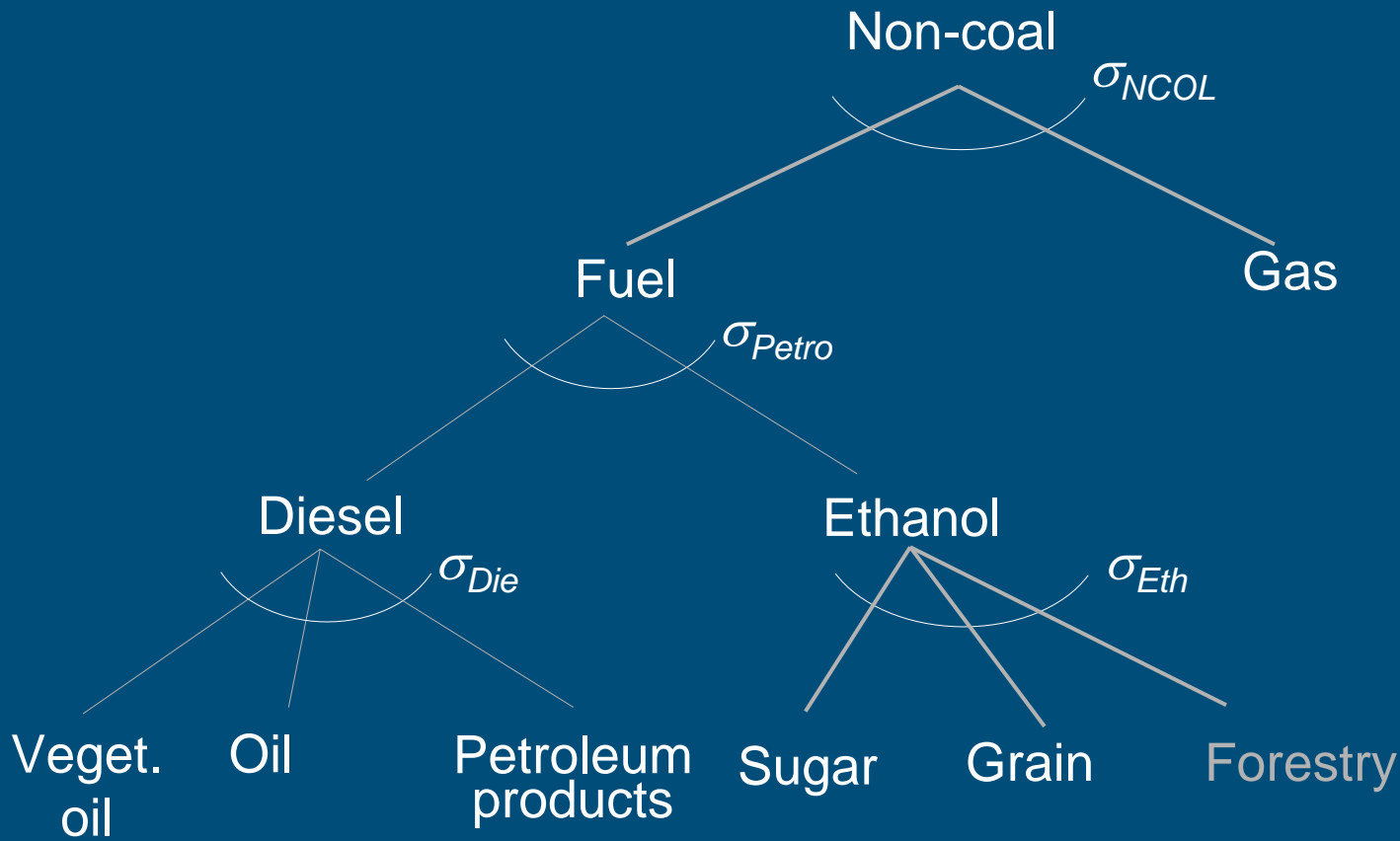
GTAP-E Production Structure



GTAP-E: Capital-Energy Composite



Where is the Bio-fuel?



Implementing the Biofuel Policies

- Fixing of blending target impossible
- Price incentive (subsidy or tax exempt) to use bio fuel crops
 - Problem: With subsidy input costs will decline and consequently consumer prices
 - Not realistic: With higher bio-fuel shares: higher consumer prices
- ‘Neutral subsidy’: Additional (endogenous) sales tax on petrol finances the prices incentive to use bio-fuel crops

Projects with Focus on Biofuels

- Scenar2020
- Eururalis – discussion support
 - Four narratives: world views play out differently
 - Policy options lead to scenario-dependent consequences (CAP, biofuels, LFA)
 - Link agro-economy & other sectors (nature, peri-urban)
 - Bio-energy: linking food – feed – fuel
 - Multi-scale approach: global context via countries & regions

global

Global economy

Open markets

Competitiveness development

No CAP

Global co-operation

Global solidarity

Government intervention

CAP: Multifunctional agriculture

low regulation

high regulation

Continental Markets

Divided regions

Security

CAP: no change

Regional communities

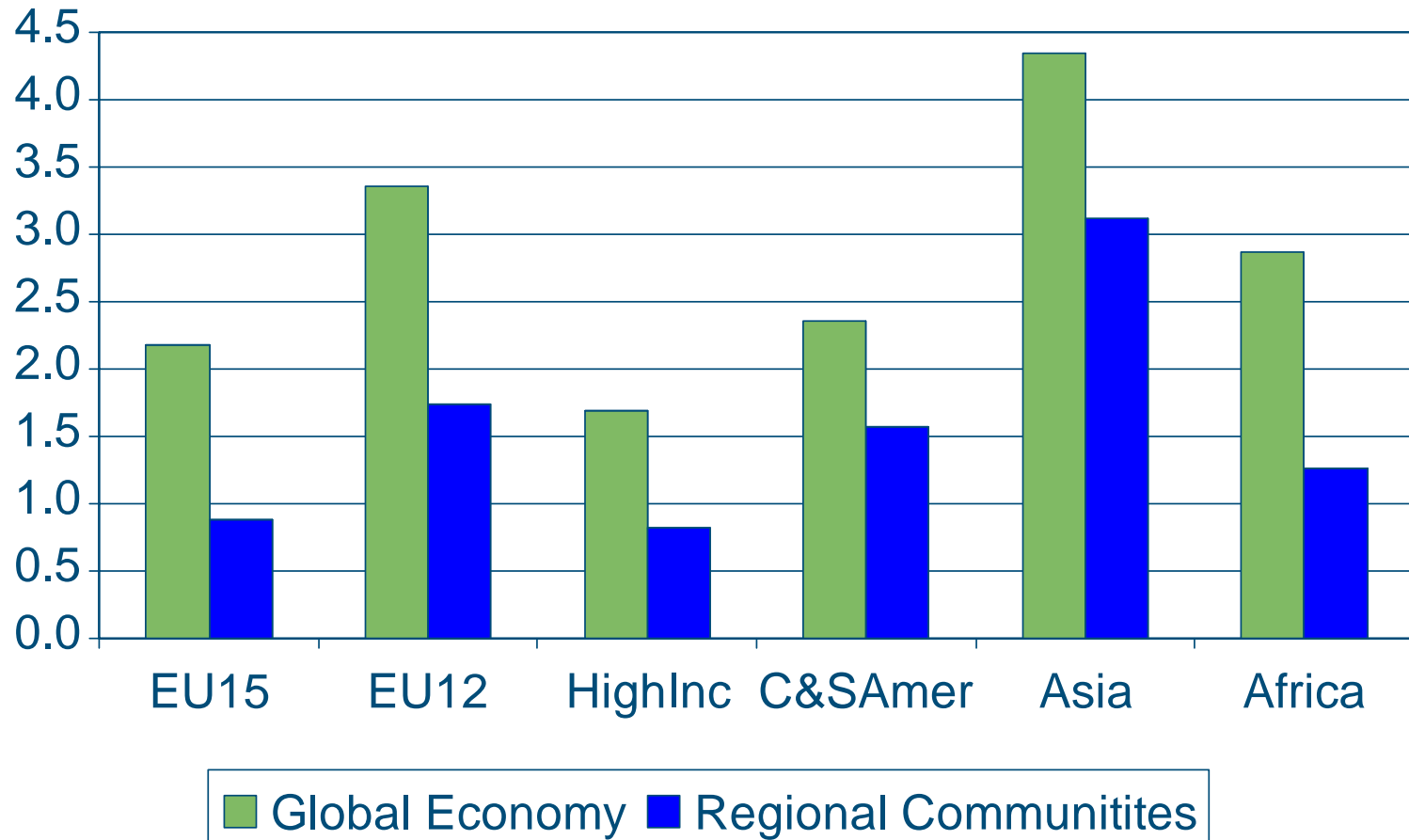
Regional identity

Behavioral change

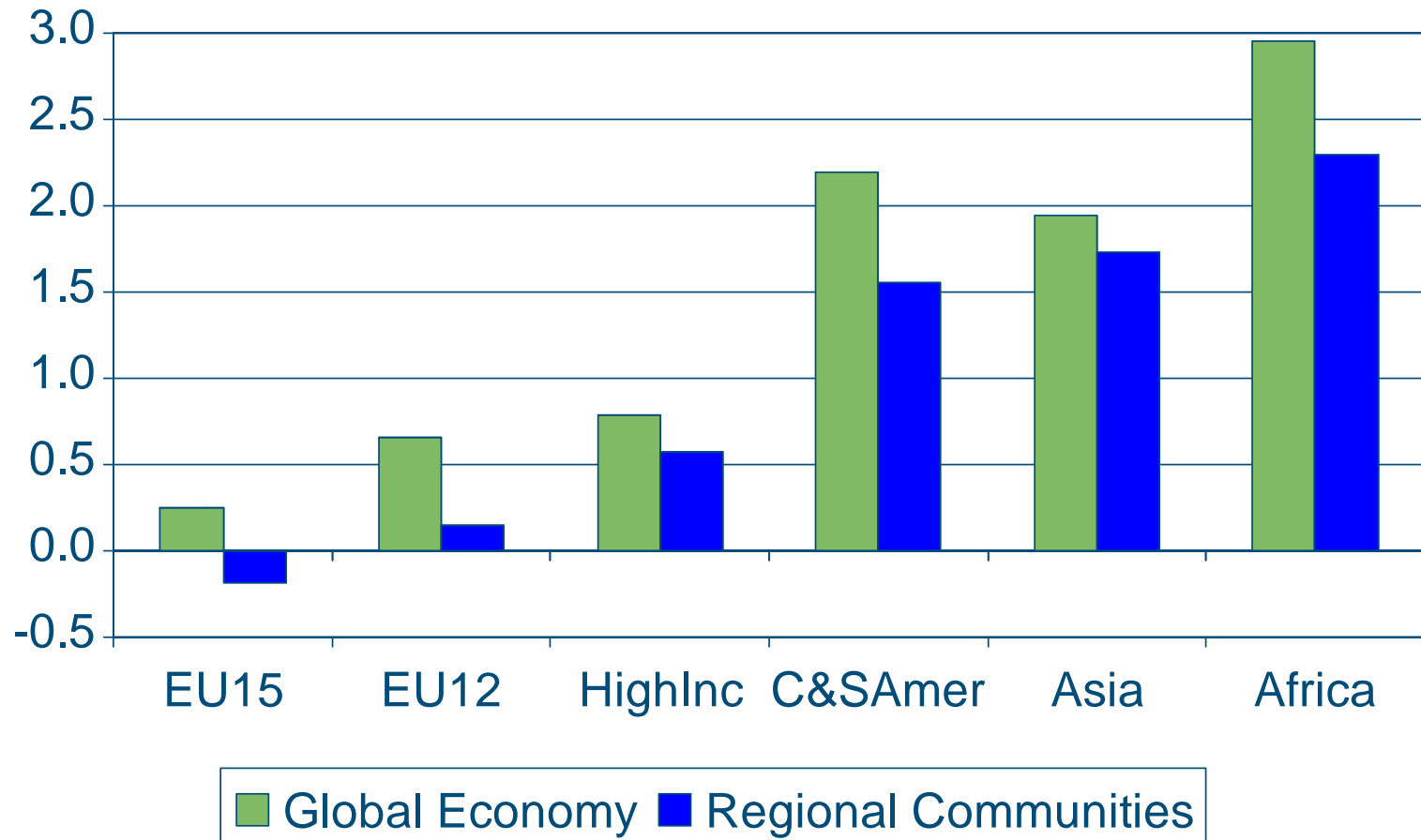
Export subsidies abolished

regional

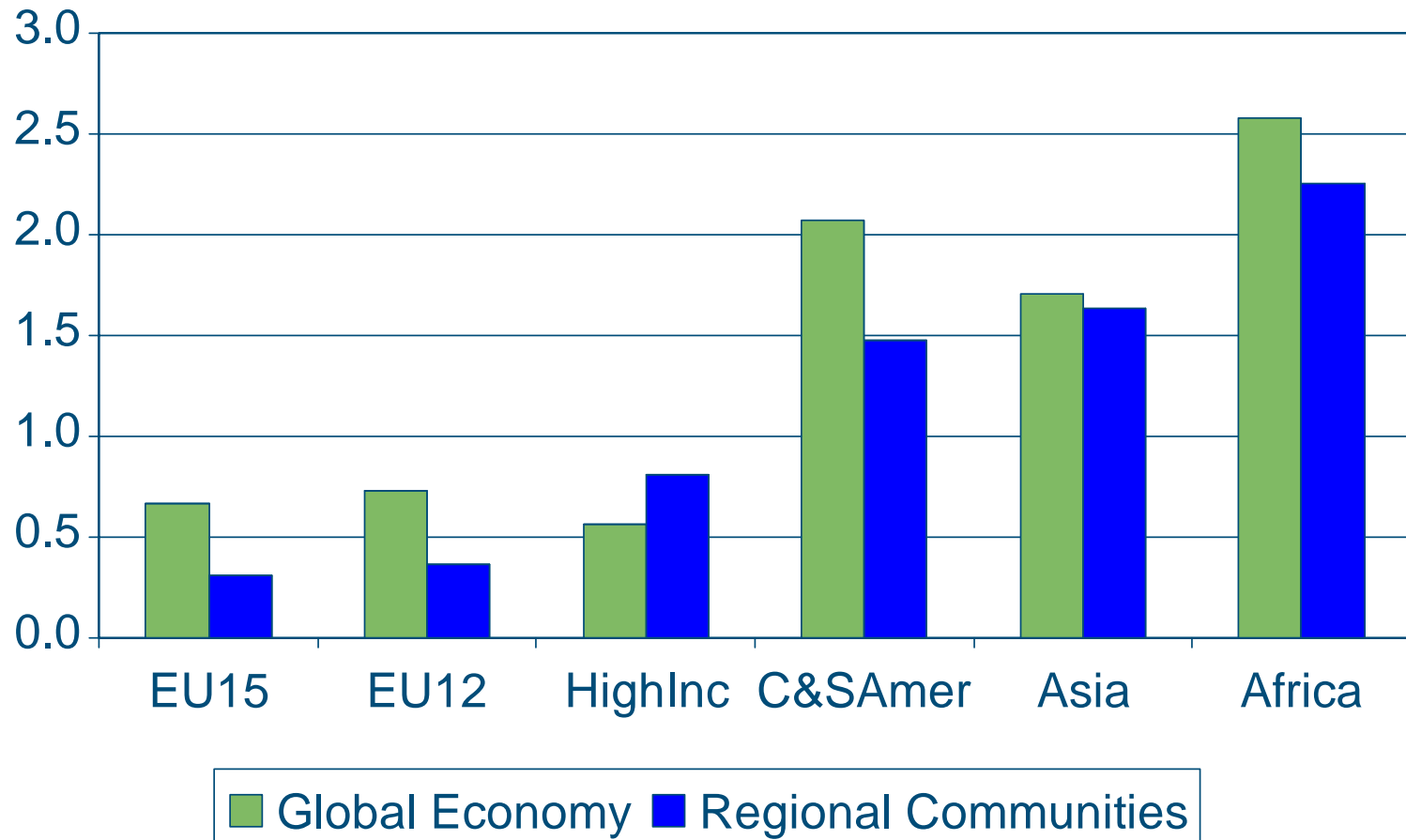
Change in GDP per capita, annual growth rates in %



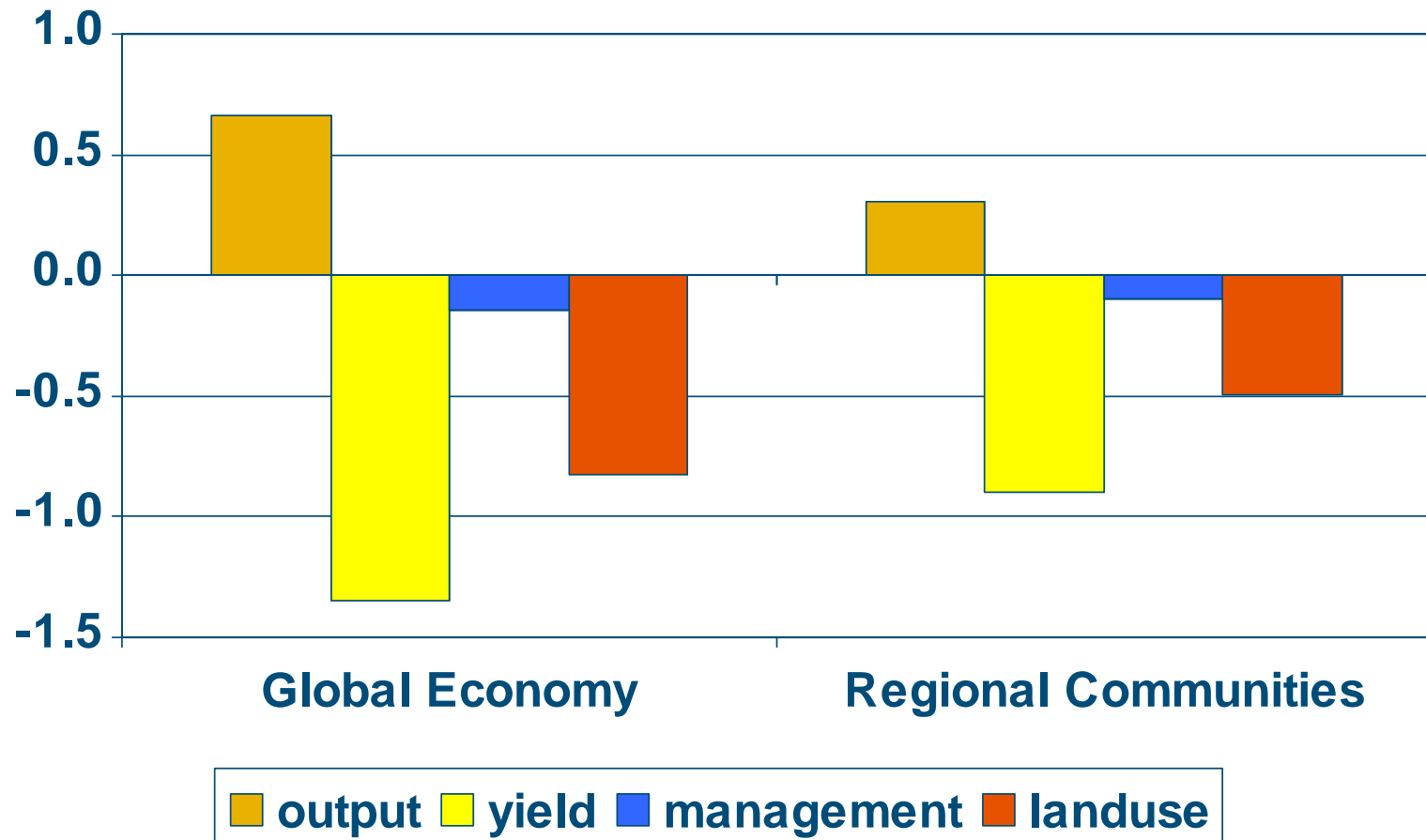
Growth in Total Agricultural Production, annual growth rates, 2001-2030



Growth in Arable Crop Production, annual growth rates, 2001-2030

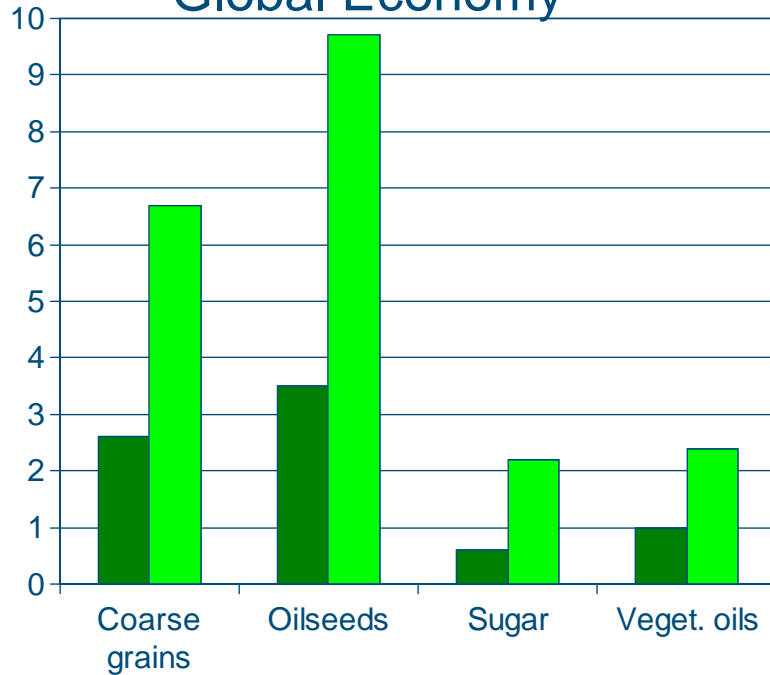


Driving Forces of Arable Land Use in EU-15, annual growth rates, 2001-2030



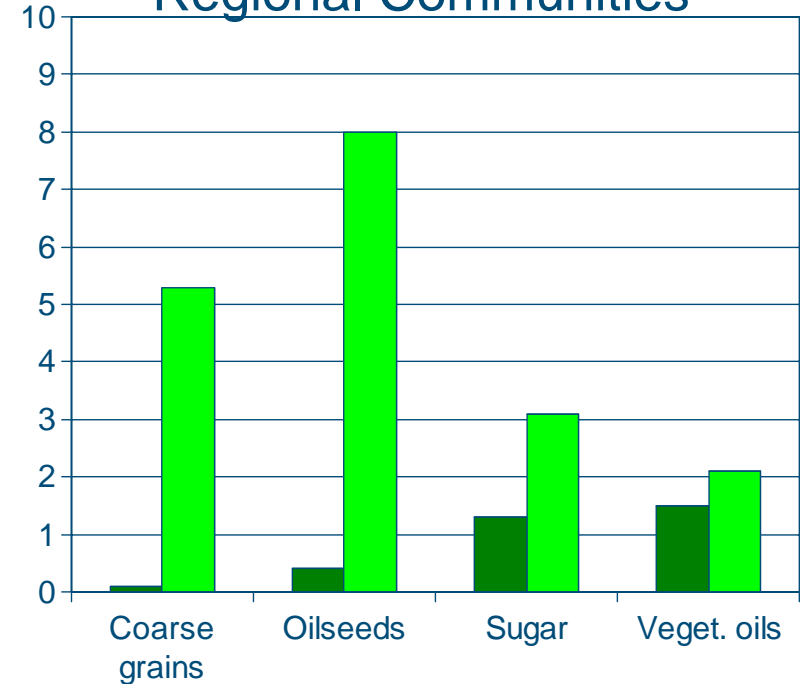
Impact of EU-Biofuel Directive on World Price Level, Change in %, relative to Reference, 2010

Global Economy



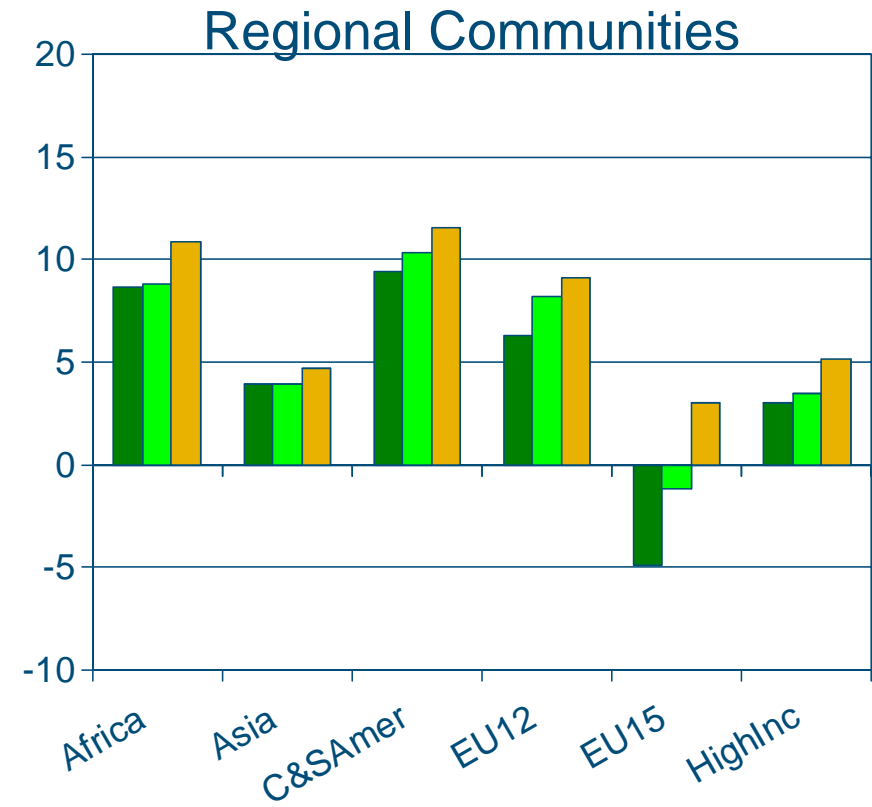
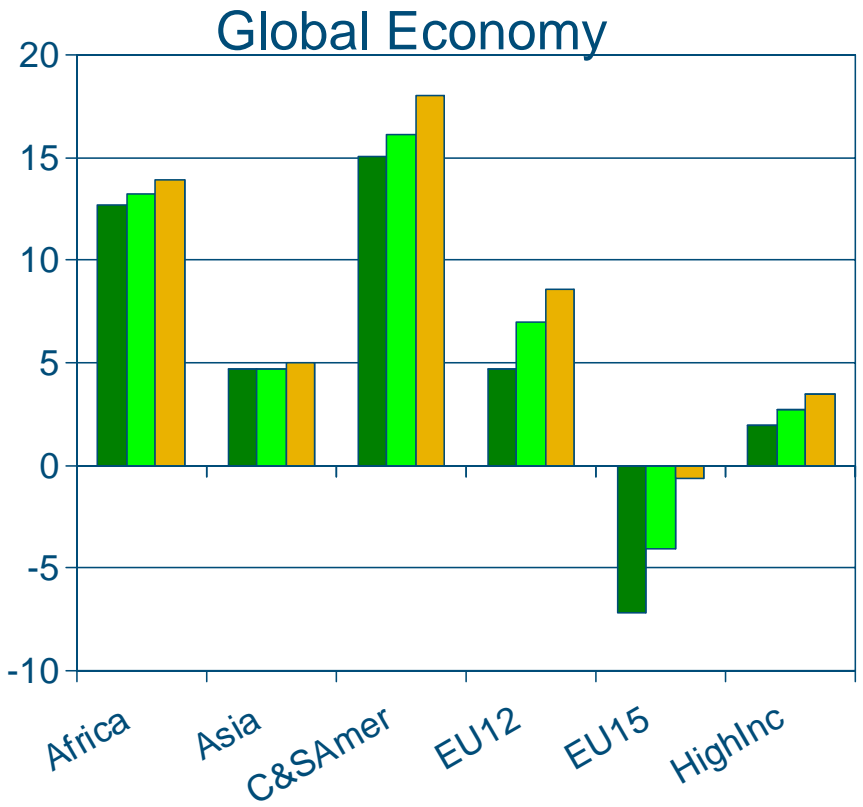
■ Biofuel Directive, 5.75% ■ Biofuel Directive, 11.5%

Regional Communities



■ Biofuel Directive, 5.75% ■ Biofuel Directive, 11.5%

Impact of EU-Biofuel Directive on Agricultural Land Use, change in %, 2010

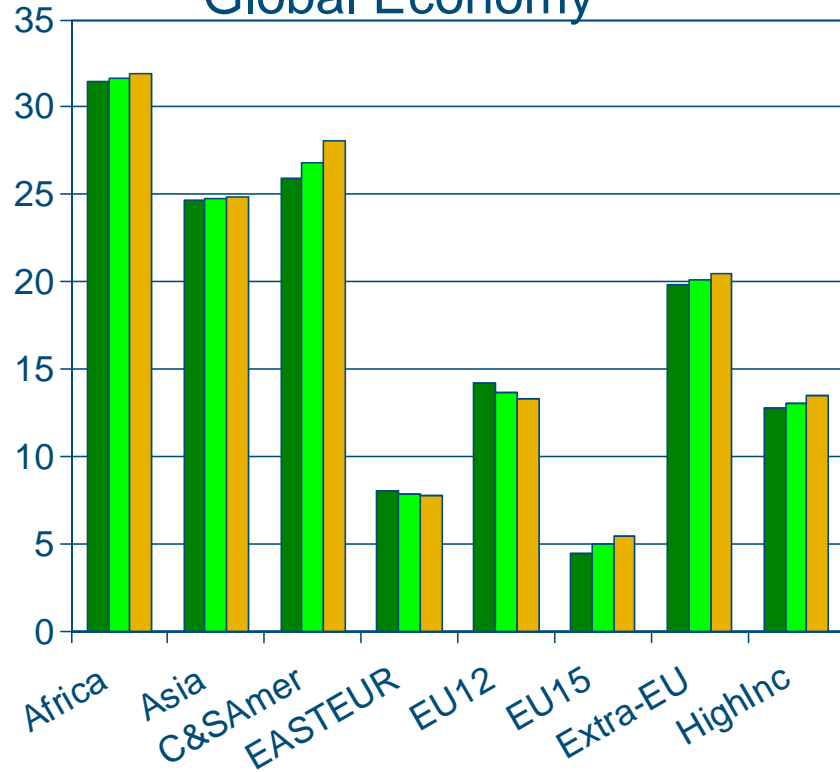


■ Reference
 ■ Target: 5.75%
 ■ Target: 11.5%

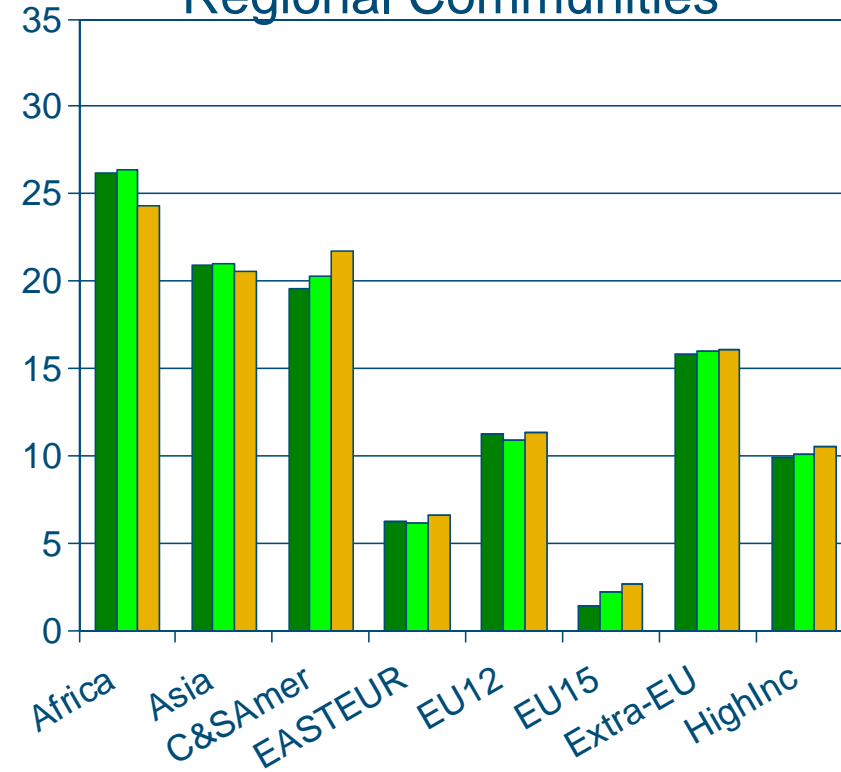
■ Reference
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Impact of EU-Biofuel Directive on Agricultural Production, change in %, 2010

Global Economy



Regional Communities

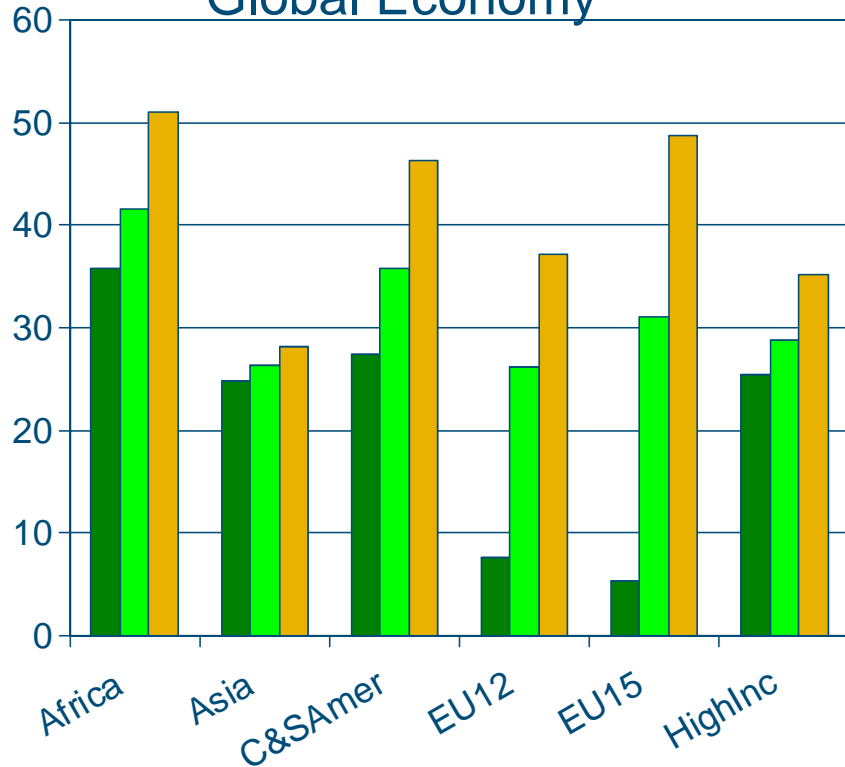


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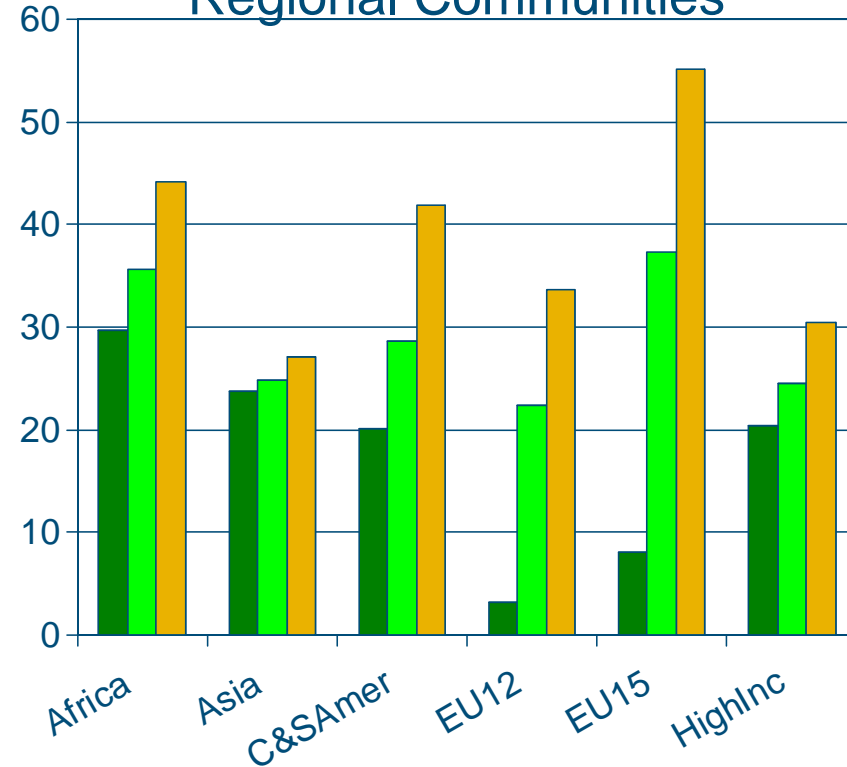
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Impact of EU-Biofuel Directive on Oilseed Production, change in %, 2010

Global Economy



Regional Communities



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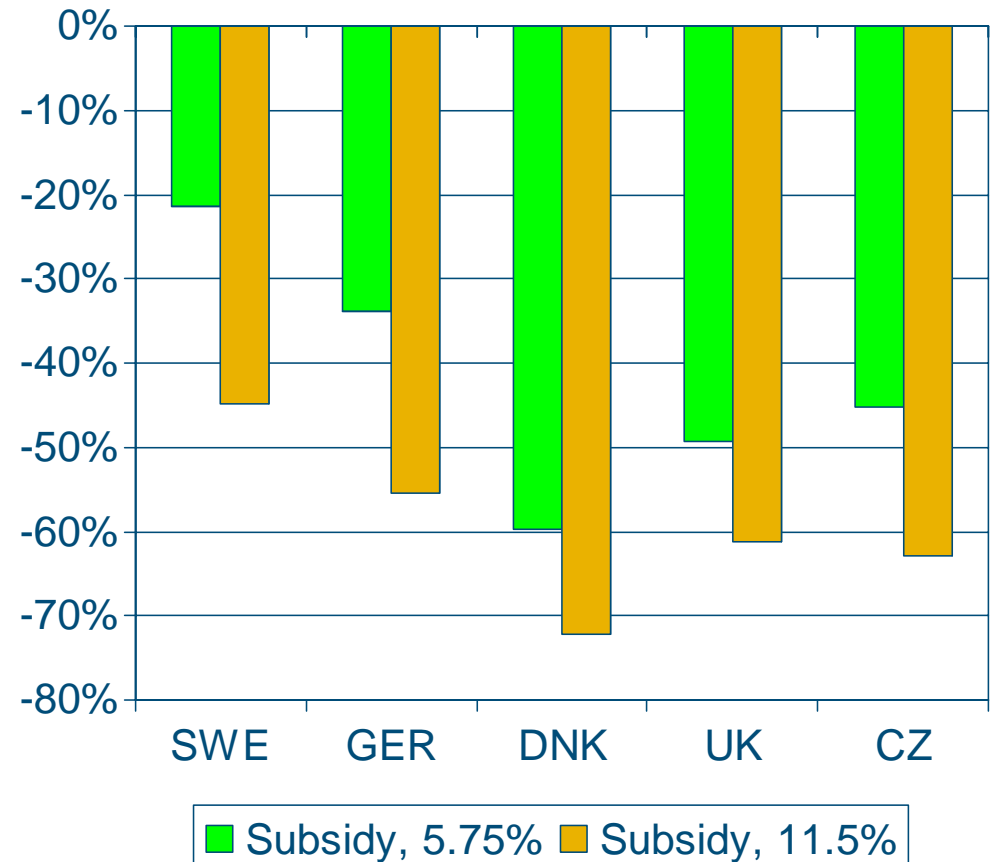
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Initial Share of Biofuel Use and Subsidies on Inputs in Petroleum Industries, 2010

Initial Biofuel Shares:

Sweden	2.9%
Germany	1.9%
Denmark	0.3%
UK	0.3%
Czech Rep.	1.2%

Subsidy on Biofuel Crops in Petro.



Summary and Conclusions

- Analysis of EU biofuel directive (BFD) based on extended GTAP model
 - Empirical agricultural land supply curve derived from detailed biophysical data
 - Substitutability between different energy inputs in the petroleum industries
- Empirical results
 - EU biofuel directive only small impact on total agric. output
 - Strong impact on some markets affected by BFD
 - Land demand increases at world level
 - Without strong incentives (subsidies) EU will never reach the targets of the BFD