Federal Agricultural
Research Centre

Institute for Market Analysis and
Agricultural Trade Policy

Renewable energies – new forces in Brazilian trade with the EU?

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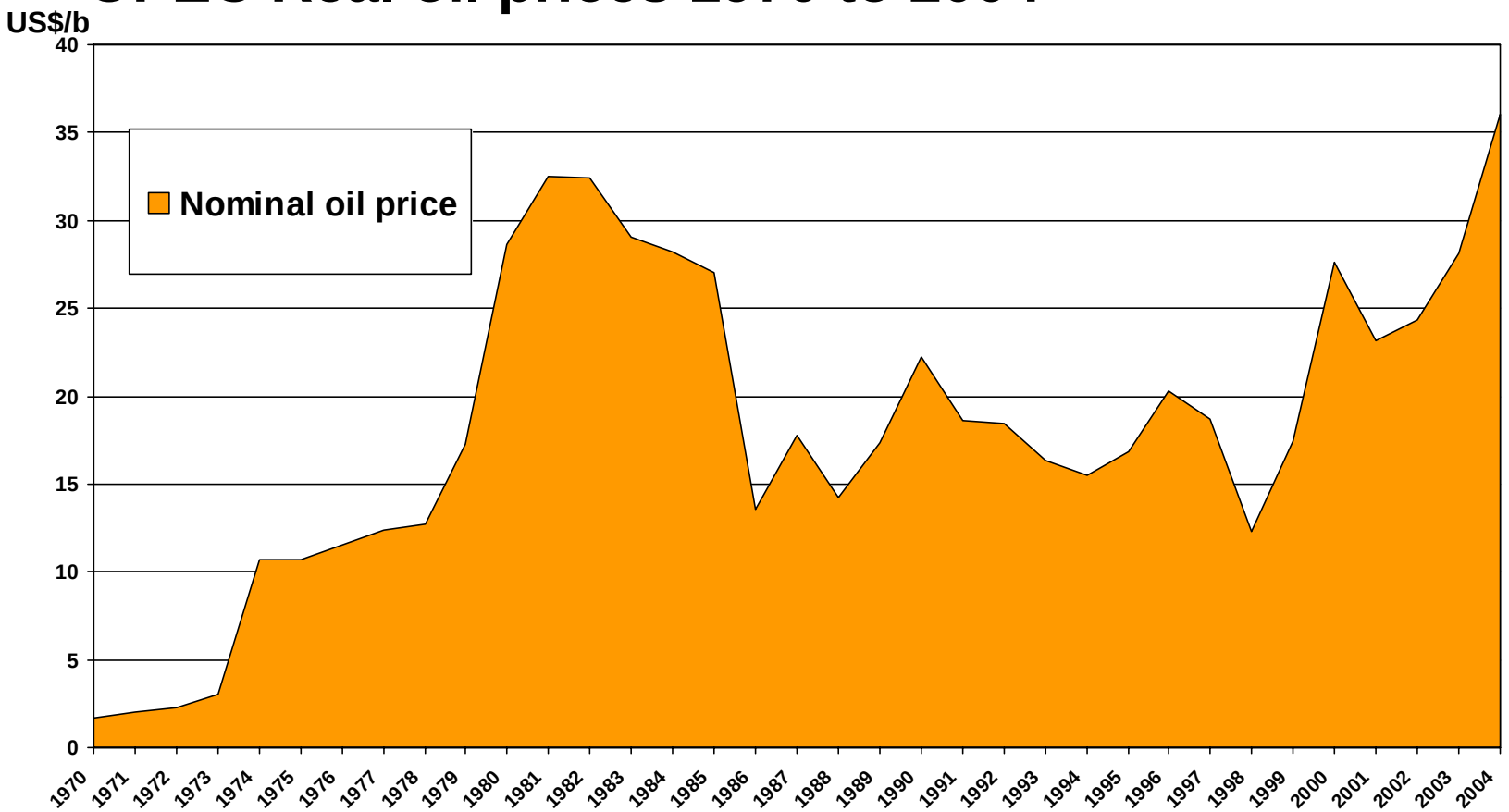
Structure

- Introduction
- Ethanol - production
  - trade
- Trade flow analysis
  - the gravity model
- Results and conclusion

Background I – increasing energy costs

OPEC Real oil prices 1970 to 2004



From 1970 to 1981, the Arab Light official price. As of 1982, the OPEC spot Reference Basket price.

Annual Statistical Bulletin 2004, OPEC (2005)

Background I – increasing energy costs

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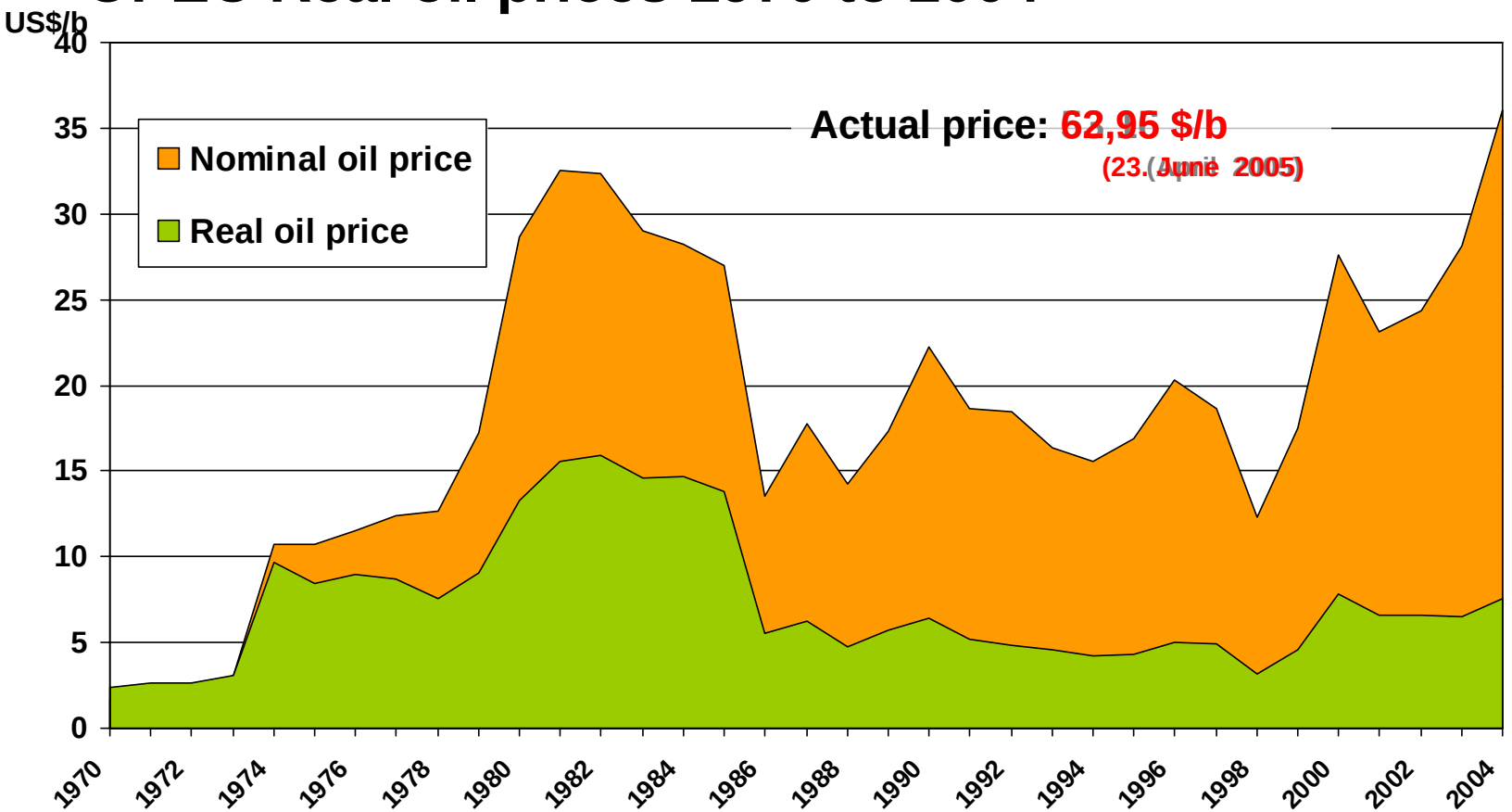
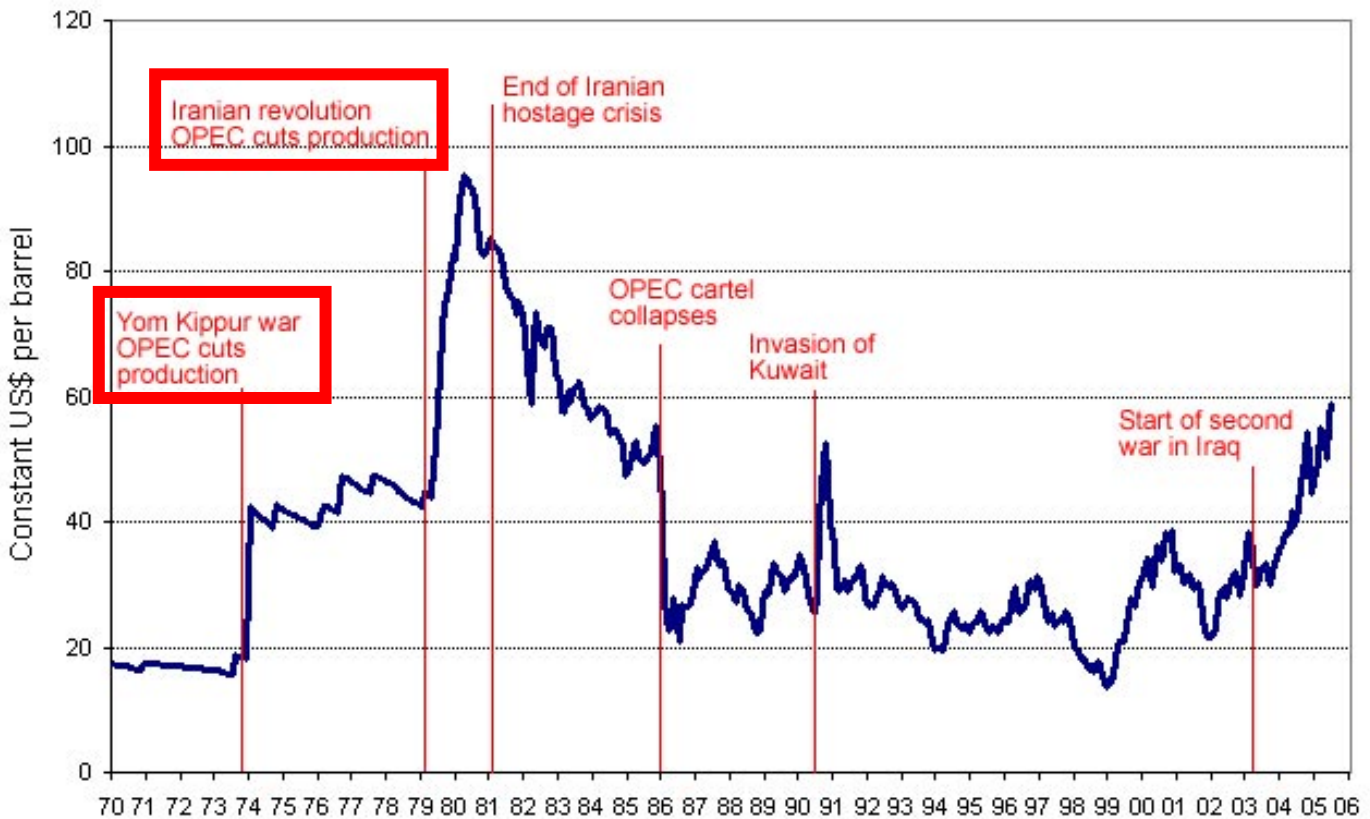


From 1970 to 1981, the Arab Light official price. As of 1982, the OPEC spot Reference Basket price.

Annual Statistical Bulletin 2004, OPEC (2005)

Background II – increasing energy costs

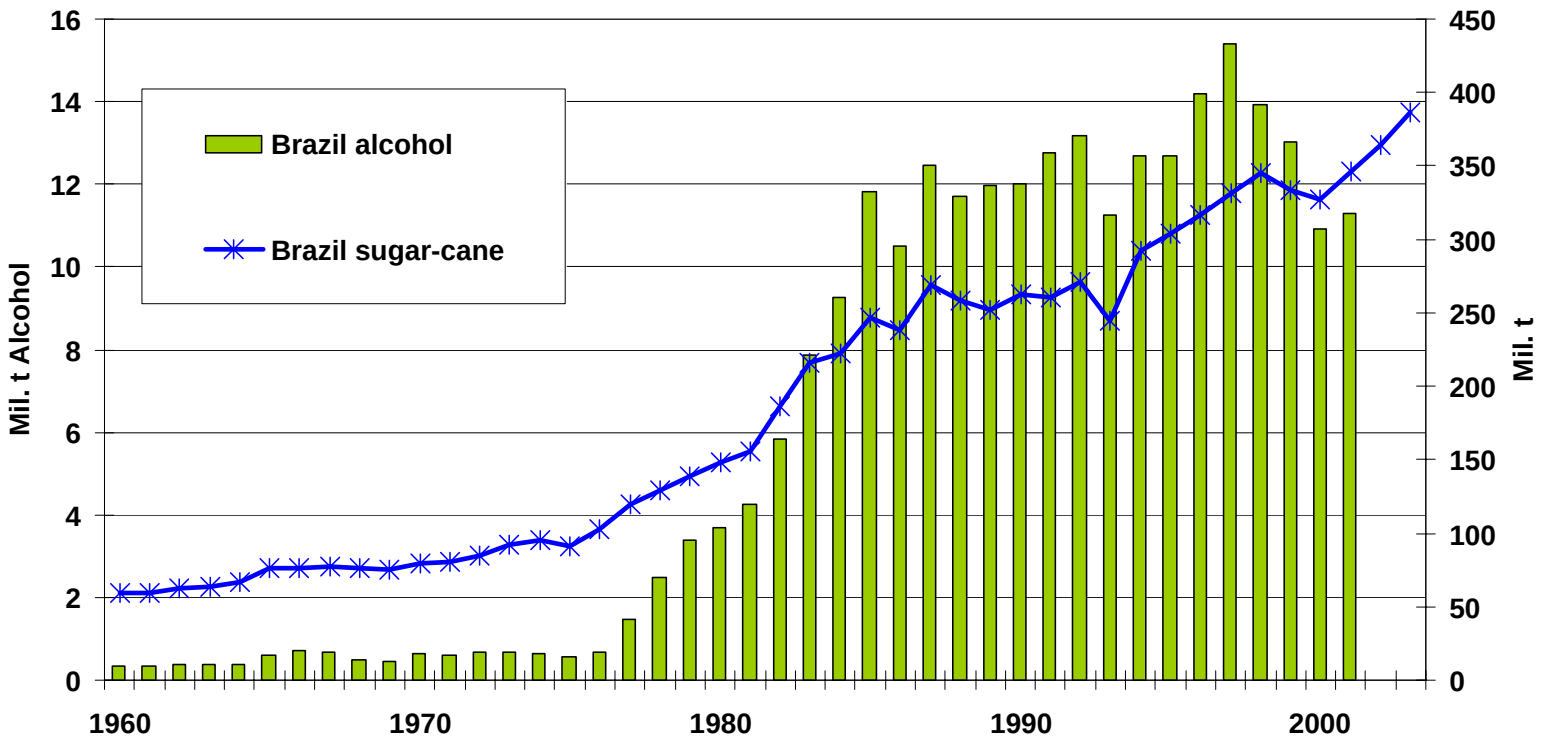
Real crude prices* January 1970 to July 2005



* West Texas Intermediate in constant (July, 2005) U.S. dollars

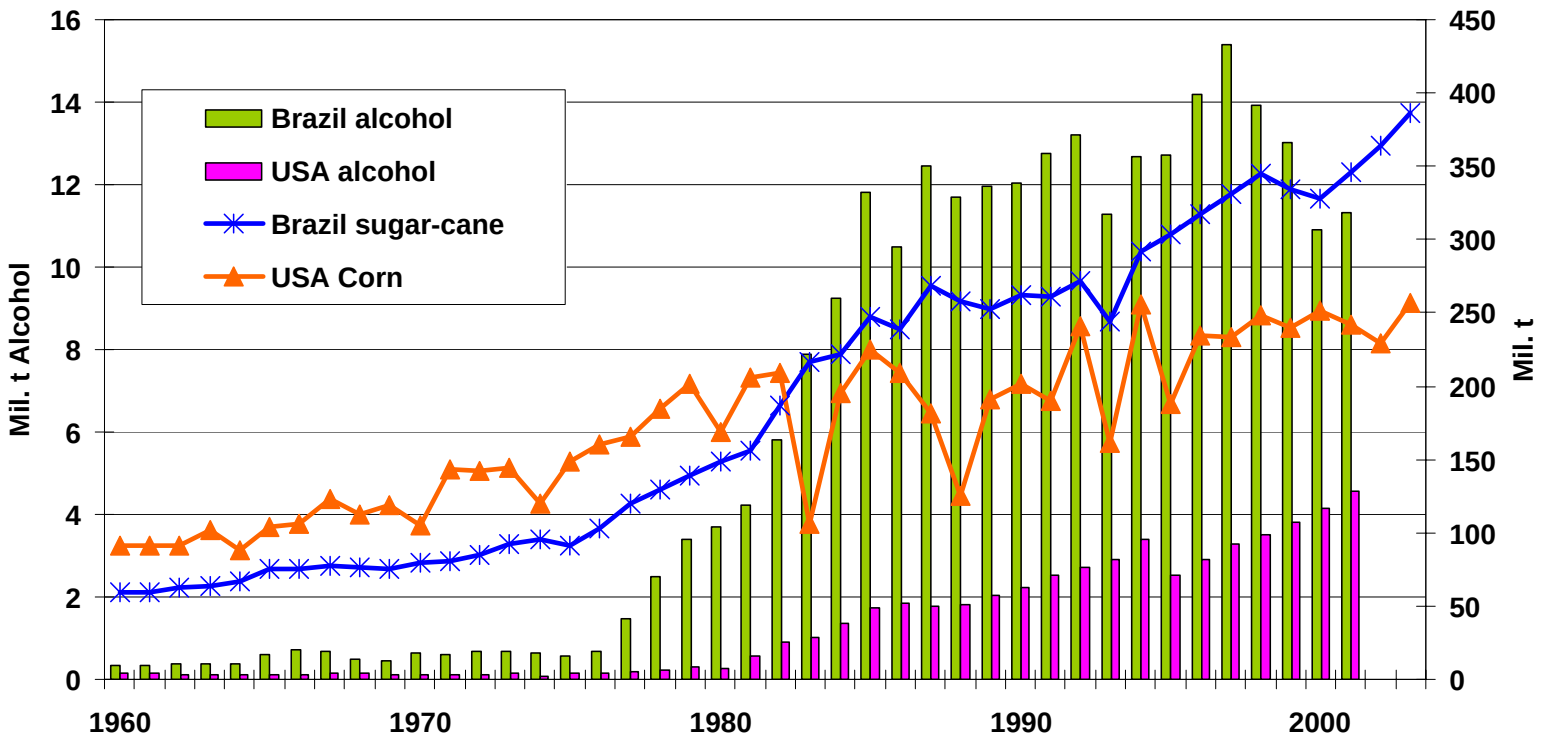
SOURCE: Federal Reserve Bank of St. Louis, and Bureau of Labor Statistics in LEMIEUX (2006)

Agricultural energetic option - ethanol



Own calculations based on USDA, FAOStat (2004/5)

Agr. energetic option - ethanol



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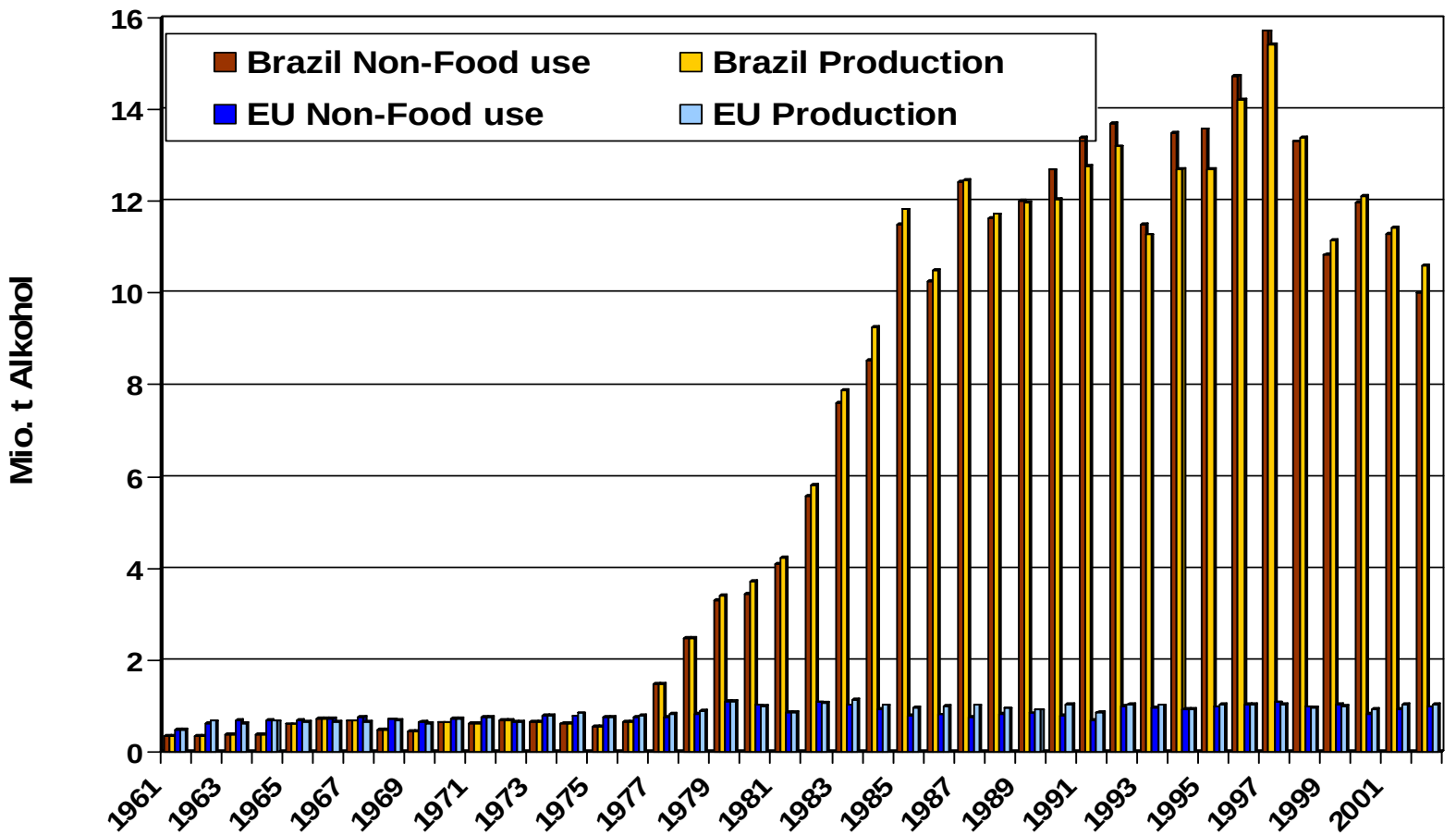
Ethanol: still an agr. energetic option?



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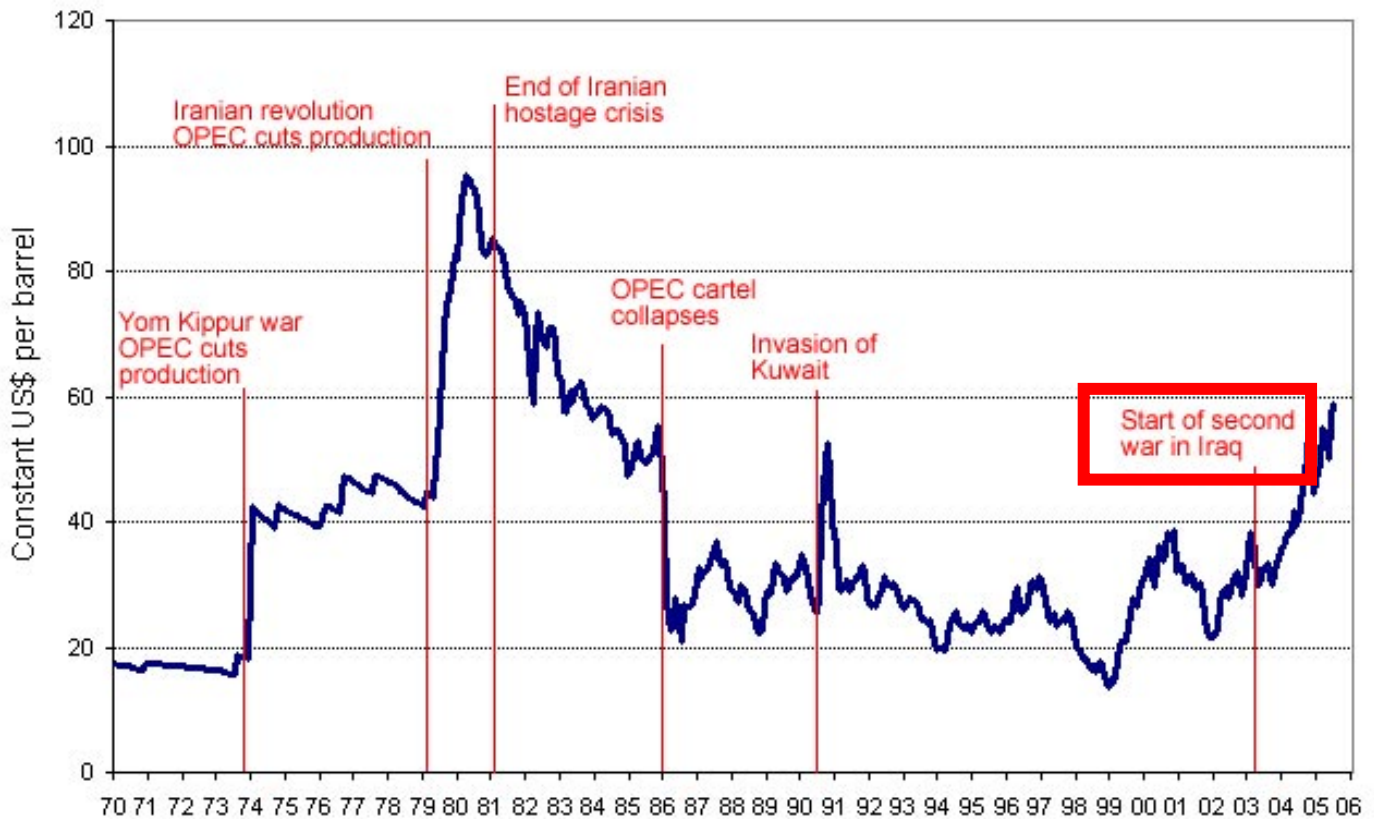
Background III – increasing energy costs

Real crude prices* January 1970 to July 2005



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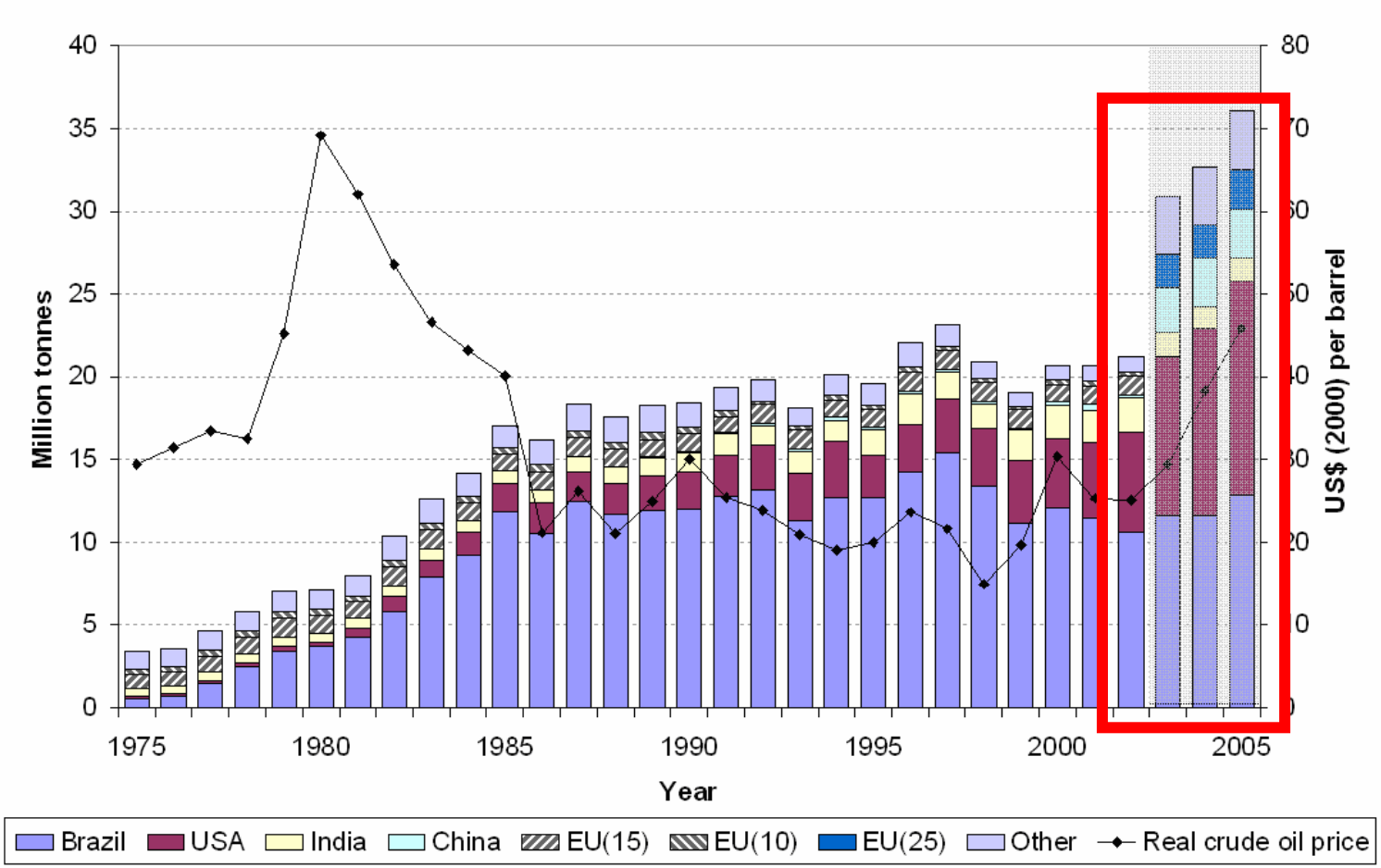
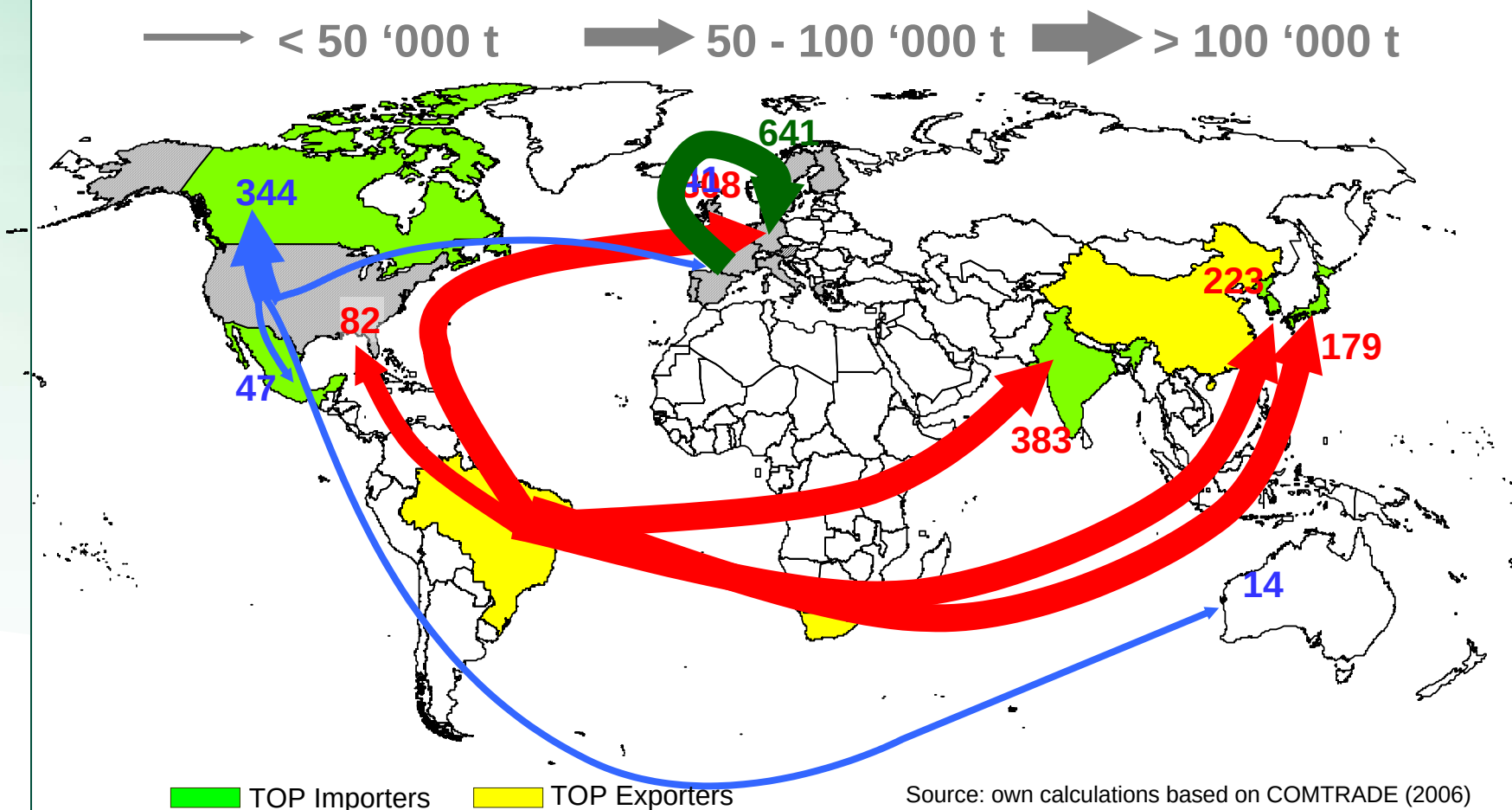
SOURCE: Federal Reserve Bank of St. Louis, and Bureau of Labor Statistics in LEMIEUX (2006)

Ethanol production



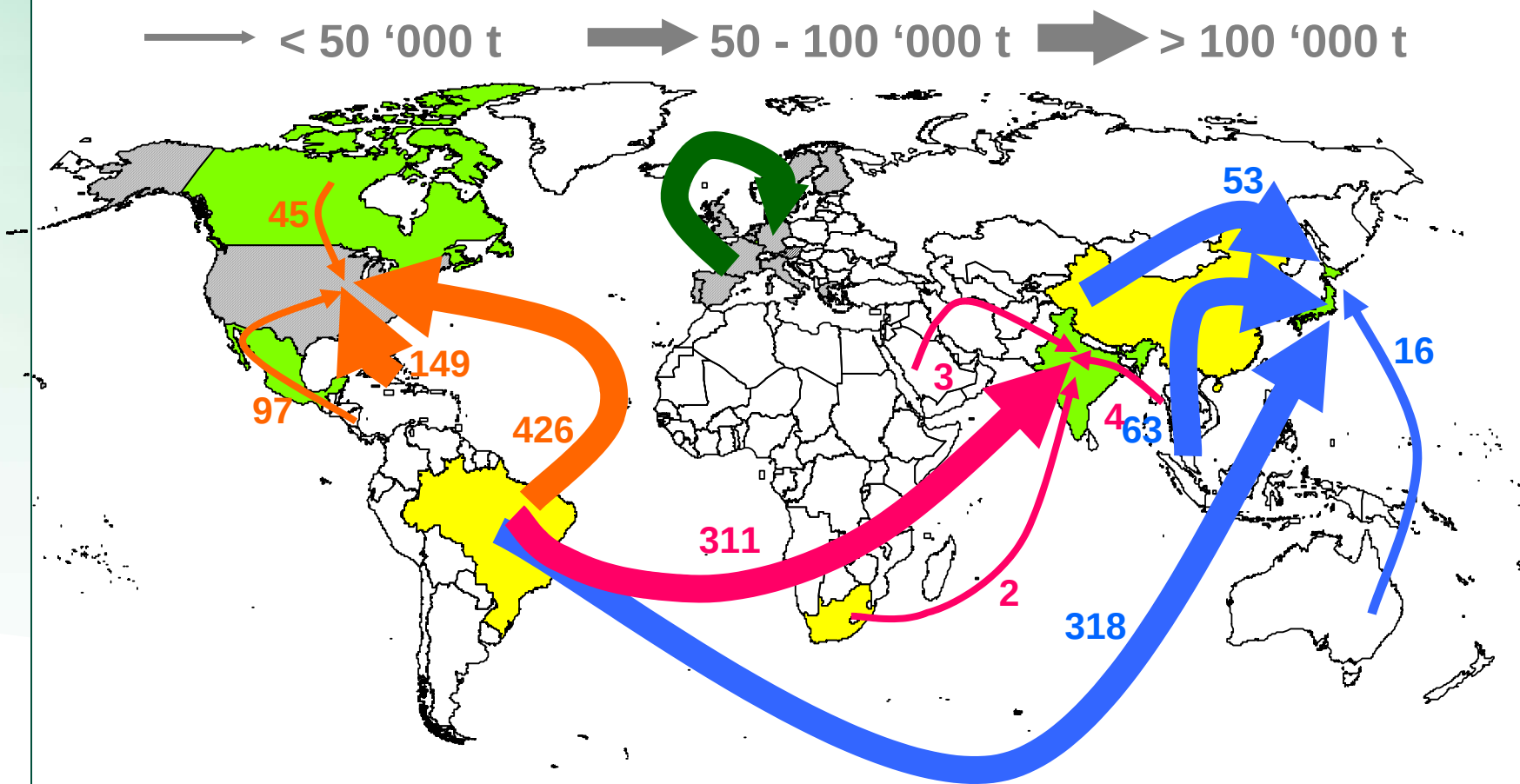
Source: OECD (2006), based on FAOSTAT and F.O. Licht.

Ethanol export flows, 2004



Source: own calculations based on COMTRADE (2006)

Ethanol import flows, 2004



Source: own calculations based on COMTRADE (2006)

Trade flow analysis: the gravity equation

$$X_{ij} = \alpha_0 GDP_i^{\alpha_1} \left(\frac{GDP_i}{POP_i} \right)^{\alpha_3} GDP_j^{\alpha_2} \left(\frac{GDP_j}{POP_j} \right)^{\alpha_4} DIST_{ij}^{\alpha_5}$$

$$\begin{aligned} \ln X_{ij} = \ln \alpha_0 &+ (\alpha_1 + \alpha_3) \ln GDP_i - \alpha_3 \ln POP_i \\ &+ (\alpha_2 + \alpha_4) \ln GDP_j - \alpha_4 \ln POP_j + \alpha_5 \ln DIST_{ij} \end{aligned}$$

Trade flow analysis: the gravity equation

$$\ln X_{ij} = \alpha_0 + \alpha_1 \ln GDP_i + \alpha_3 \ln\left(\frac{GDP_i}{POP_i}\right)$$
$$+ \alpha_2 \ln GDP_j + \alpha_4 \ln\left(\frac{GDP_j}{POP_j}\right)$$
$$+ \alpha_5 \ln DIST_{ij}$$
$$+ \alpha_6 \ln(Area_i) + \alpha_7 \ln(Area_j) + \alpha_8 (ID)$$
$$+ \alpha_{10} (JD_T) + \ldots + \alpha_{T+n} (JD_{T+n})$$

Specification and results

logX = f (logGDP, logGDP_E, logDistance,
log_GDP/POP, log_GDP_E/POP_E,
dummy_inEU15, dummy_exEU15,
dummy_inNAFTA, dummy_NAFTA_,
dummy_inMSUL, dummy_MSUL_,
logAREA_E)

Trade Creation dummy: 1 if countries i and j belong to the same RTA

Trade diversion dummy: 1 if an RTA member imports from a third country

And additional dummies and variables to capture influence of:
- **annual events**
- **price/quality variation**
- **energy prices**
- **substitutes (sugar)**

Specification and results

basic gravity equation specifications for the ethanol trade, 1975-2004

	Model 1	***Model 2***
Intercept	-1.50191**	-13.78432**
logGDP	0.43016**	0.46238**
logGDP_e	-0.15383**	-0.1131**
logDistance	-0.19773**	-0.17721**
Log_(GDP/POP)	0.03586**	0.01712**
Log_(GDPe/POP_e)	-0.0793**	-0.04606**
dummy_inNAFTA	0.83964*	0.54269**
dummy_exEU	-0.28247**	0.01969**
logUnitVal		-0.69685**
logOILPR		0.22686**
logAREA_e	0.05602**	0.01978**
dummy_EU15	1.05025**	
$R^2 / \overline{R}^2$	0.2312/0.2306	0.3943/0.3941

** significant at a level of 1%,
* significant at a level of 10%
11 290 observations in Model 1, 20 696 observations in Model 2
Own calculations.

Specification and results

Ethanol global gravity equation, period pooled data

	Model 04-00	***Model 99-95***	***Model 94-90***	***Model 89-85***	***Model 84-80***	***Model 79-75***
Intercept	-13.78	-15.10	-13.732	-14.875	-22.140	-16.47
logGDP	0.462	0.333	0.484	0.491	0.402	0.498
logGDP_E	-0.113	-0.101	-0.093	-0.174	-0.089	-0.030
logDistance	-0.177	-0.025	-0.218	-0.19	-0.156	-0.091
log_(GDP/POP)	0.017	0.030	0.006	0.055	0.026	0.030
log_(GDP_E/POP_E)	-0.046	-0.021	-0.025	-0.005	-0.060	-0.030
dummy_inNAFTA	0.542	0.646	0.322	0.851	1.781	1.164
dummy_exEU	0.019	0.556	-0.397	-0.599	-0.449	-0.435
logUnitVal	-0.696	-0.86	-0.886	-0.886	-0.826	-0.571
logOILPR	0.226	0.339	-0.838	-0.187	2.462	0.679
logAREA_E	0.019	0.015	-0.008	-0.023	-0.078	-0.153
$R^2 / \overline{R}^2$	0.38/0.38	0.40/0.40	0.43/0.43	0.50/0.50	0.40/0.39	0.31/0.30
Observations	7072	5055	3465	2307	1730	846

Own calculations.

Qualification

- Estimation results display relatively low significations
- Some commonly used dummy variables have been excluded due to correlation
- Non-existing trade flows had to be excluded from analysis
- The use of the Poisson Pseudo Maximum Likelihood Estimator (PPMLE) might overcome the problems and will be tested
- Preliminary results including tariffs – here only applied tariffs – indicated insufficient results, therefore bound tariffs will be required for further analysis

Summary

- Pooled estimates of variables (size, income, distance) for ethanol trade are significant with expected signs
- Impact on exporter's income is more pronounced than that of importers
- From the supply side agricultural land is relevant
- Formation of EU and NAFTA have had a positive impact on intra-regional ethanol trade – but not for the MERCOSUR
- EU decoupled domestic ethanol market from the world market - but effect is decreasing
- Variations of oil price have had an influence on ethanol trade

Conclusions

- The gravity model approach explains the trade flows as expected but only at a low level of determination - thus refinement is needed to enable estimation of potential developments
- The markets of renewable agricultural energy sources are complex as several goals are to be achieved inducing 'erratic market movements'
- The market will remain policy driven and will depend on tensions in the energy markets as well as on the technological development

E.g. the flex-fuel-engine boosted the demand for ethanol in Brazil, allowing the consumer to choose between the cheapest and most convenient fuel

Thank you for your attention