THE U.S. BIOFUEL INDUSTRY: PRESENT & FUTURE

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INTRODUCTION

- In the United States and many countries in the world, ethanol is used as a gasoline additive not as a fuel.The only exception is Brazil.
- Prices of ethanol, crude oil, and petroleum refined products such as gasoline and MTBE are subsidized.
- Gasoline and MTBE prices are not reflecting the external costs of burning fuel such as health and environmental effects.

Overview

- Biofuel Industry
- Ethanol Production Costs
- Economic Impacts of Ethanol Production
- Federal and State Policies and Regulations
- Conclusions

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Renewable Energy

- Biofuel:

  Ethanol (grains; corn, sorghum, wheat, etc., sugar crops; sugarcane, Sugar beets, tubers, molasses, waste starch and sugar, and biomass)

  Biodiesel (oilseeds; soybean oil, rape seed oil, etc., yellow grease, and animal fats)

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Agricultural Commodities Surplus

- Biofuel is mostly produced in countries that have surplus of agricultural commodities, have excess natural resources, or want to reduce green house gas emissions (GHG)
- Examples are grains and oilseeds in the United States; sugarcane and oilseeds in Brazil; grains, oilseeds, sugar beets, and wine in European Unions; sugar cane in India; and grains in China

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Value-Added Benefits (US unit)

- Corn to ethanol:
- Corn 1 bushel -$2.11
- Ethanol 2.8 gallons +$3.85
- Byproducts,DDGS +$1.20
- CO2 +
- Value of ethanol & byproducts +$5.05

  Value-added +2.94

- Soybean oil to biodiesel:
- Soybeans 1 bushel -$7.53
- Biodiesel 1.5 gallons +$2.94
- Byproducts, soymeal +$6.11
- Cost of methanol = Glycerin credit
- Value of biodiesel & byproducts +$9.05

  Value-added +$1.52

Value-Added Benefits (European Unit)

- Corn to ethanol:
- Corn (1 T) - 70 € *
- Ethanol (426 l) + 128 €
- Byproducts,DDGS + 40 €
- CO2 +
- Value of ethanol & byproducts + 168 €

  Value-added/T + 98 €

- Soybean oil to biodiesel:
- Soybeans (1 T) - 250 €
- Biodiesel (228 l) + 98 €
- Byproducts, soymeal + 204 €
- Cost of methanol = Glycerin credit
- Value of biodiesel & byproducts + 302 €

  Value-added/T + 52 €

*With 1 Euro = 1.2 $

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Industry at Glance

- Number of operating ethanol plants, 73
- Plants under construction or expansion, 16
- Current production capacity, about 3,000 million gallons per year (MGPY) (or 114 Mhl/year)
- Projected production capacity, 3,500 MGPY (133 Mhl / year) by late 2004
- Size, less than 1 to over 300 MGPY (11 Mhl)
- Location, 20 states
- Process, wet and dry
- Feedstock %:

Corn	93
Sorghum	5
Wheat	1
Waste	1

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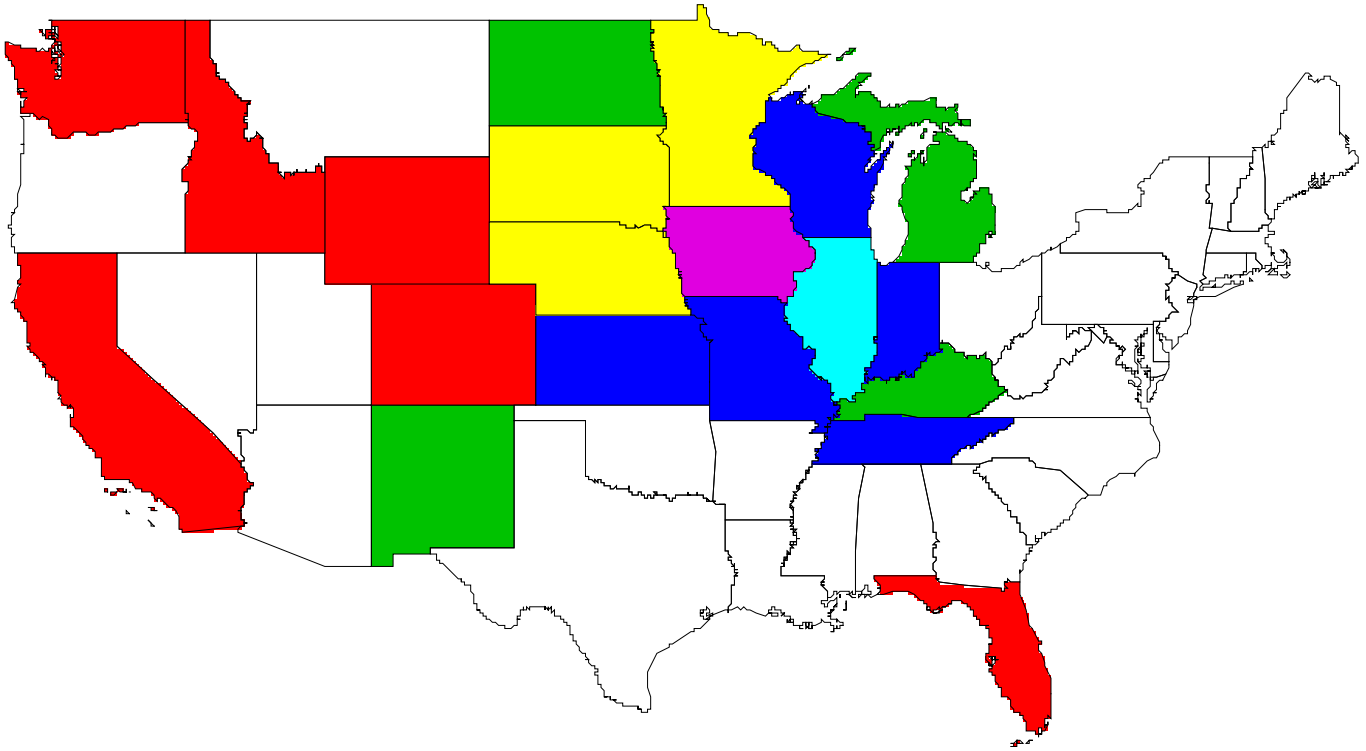
U.S. Ethanol Production Capacity
Million Gallons per Year, 2003



100 million gallons = 3.8 Mhl

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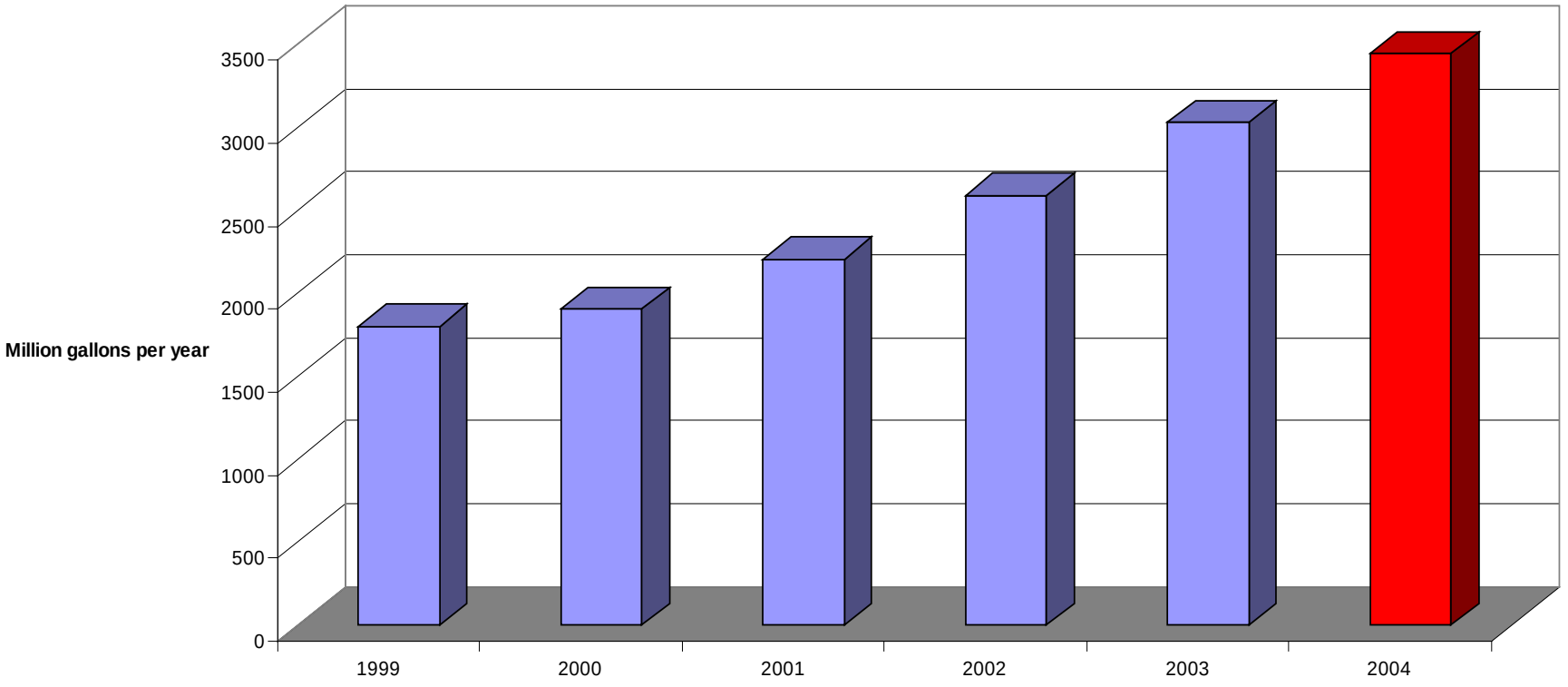
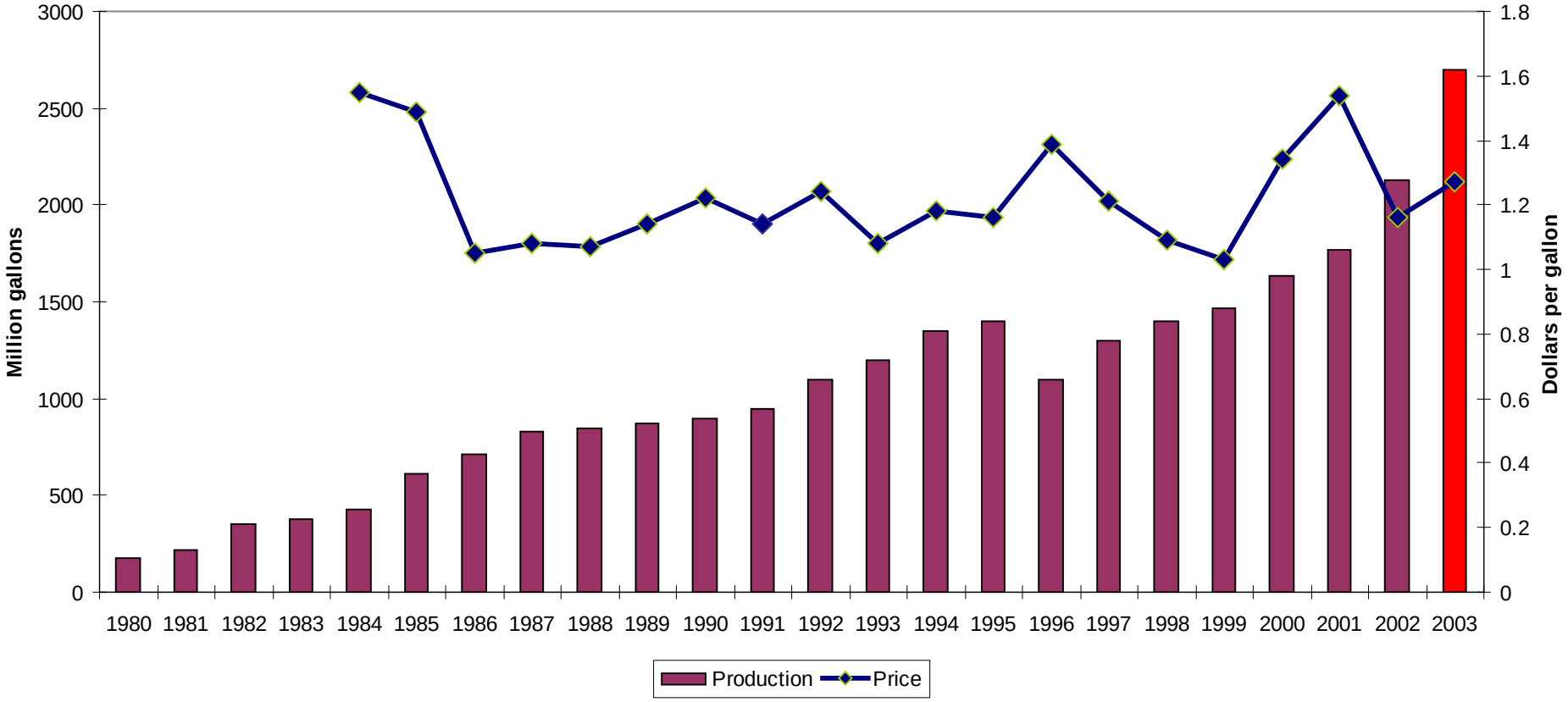
U.S. Ethanol Production Capacity



1000 million gallons = 38 Mhl

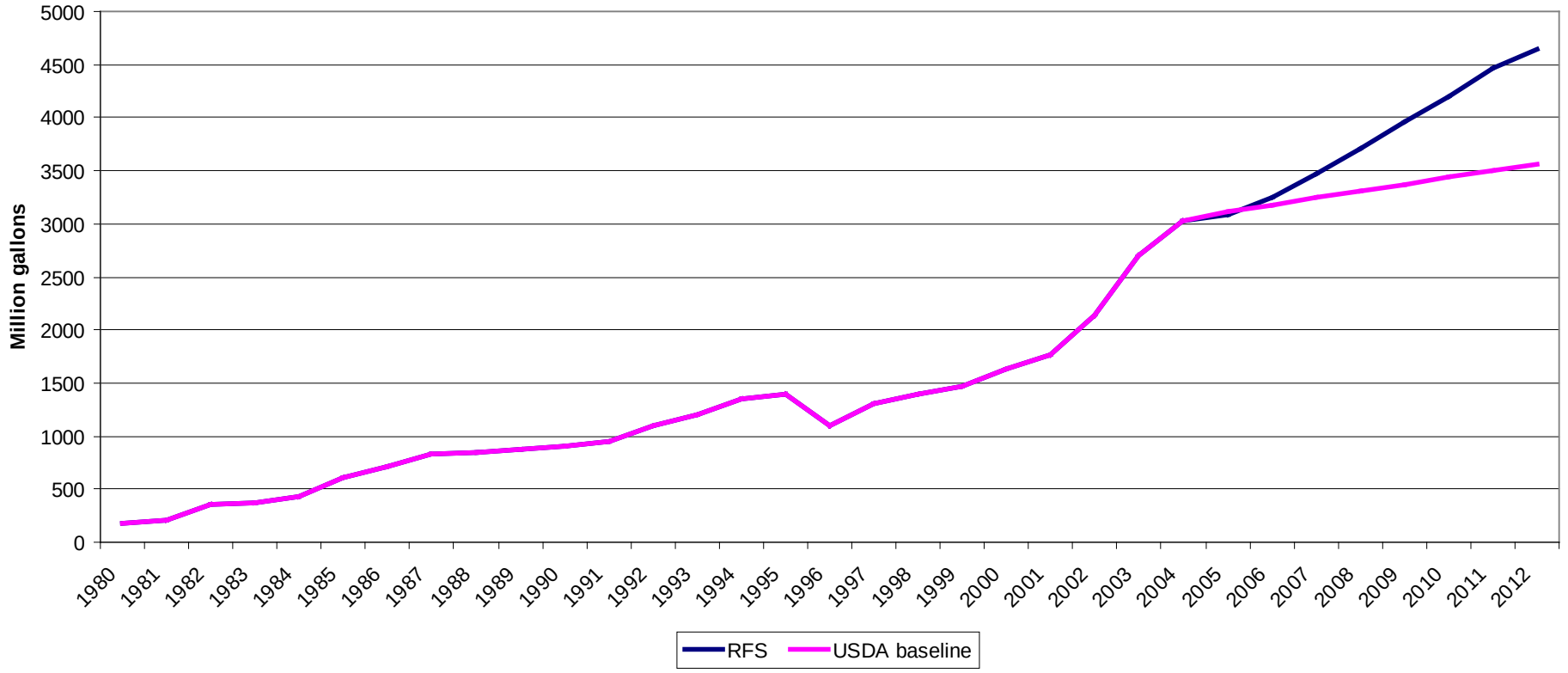
Ethanol: Historical Production and Prices



1000 million gallons = 38 Mhl

$/gallon = 0.22 Euros / l (1Euro = 1.2 $)

Projected Ethanol Production: USDA Baseline and RFS



1000 million gallons = 38 Mhl

Biofuel Production in the United States: Biodiesel

- There are 12 biodiesel plants with 90 MGPY (3 Mhl) total production capacity. There are 7 biodiesel plants under planning and construction
- More than 90 percent of biodiesel is made from soybean oil and the rest from animal fats and restaurant grease
- Biodiesel could be used as a neat fuel (B100) or could be blended with petroleum diesel fuel from 1 to 20 percent (B1-B20)

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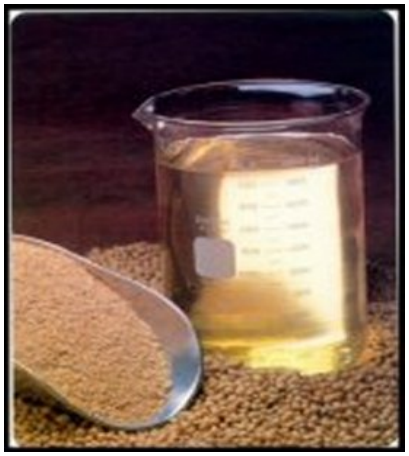


Biodiesel

(Catalyst)

100 pounds + 10 pounds = 100 pounds + 10 pounds

Soy Oil Methanol Biodiesel Glycerine

or

Animal Fats

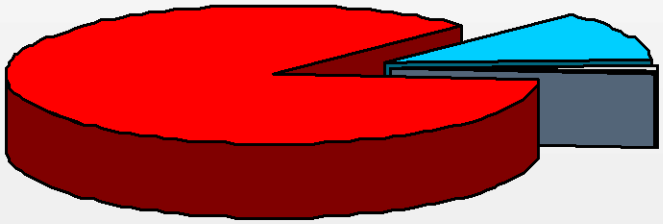
B100 = Biodiesel

Specified by ASTM D 6751

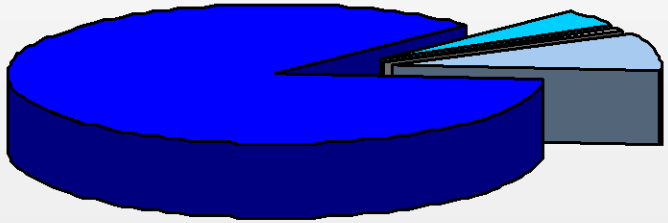
B20 = 20 % B100 blended with 80% petrodiesel

Production Process Transesterification

Process Input Levels = Process Output Levels



- Methanol 12%
- Catalyst 1%
- Neutralizing Agent 1%
- Oil 86%



- Methanol 4%
- Fertilizer 1%
- Glycerine 9%
- Methyl Ester 86%

Nothing is wasted

Biofuel Production in the United States: Biodiesel--Continued

- Blended biodiesel with diesel fuel reduces particulate matter (PM) and increases lubricity of diesel fuel
- More than 100 major fleets have implemented biodiesel programs across the country, including Federal fleets such as US Postal Service, the U.S. Air Force, the US Army, New Jersey city buses, Cincinnati Metro, Bi-State in St. Louis, Florida Power, Georgia Power, Duke Energy, Alabama Power, and others

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Forces Shaping Demand for Ethanol

- Clean Air Act Amendment of 1990
- Federal and State ethanol policies and regulations
- MTBE ban in California, New York, Connecticut, and other States
- USDA /CCC Bioenergy Program in FY 2001 and FY 2002
- 2002 Farm Bill, Title IX, Energy
- Energy Bill, Renewable Fuel Standards

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Fuel Ethanol Production Costs

The USDA's 1998 Ethanol Cost-of-Production Survey:

1. Data collection was based on personal interview by BBI international
2. Ethanol production cost data was collected for both wet- and dry-mill processing plants
3. Included 28 plants with about 1.1 billion gallons (42 Mhl) of ethanol production
4. Included plant sizes over 1 million gallons (38 000 hl) production per year
5. Estimated ethanol production costs for cash-operating expenses, feedstock costs, and credit for byproducts

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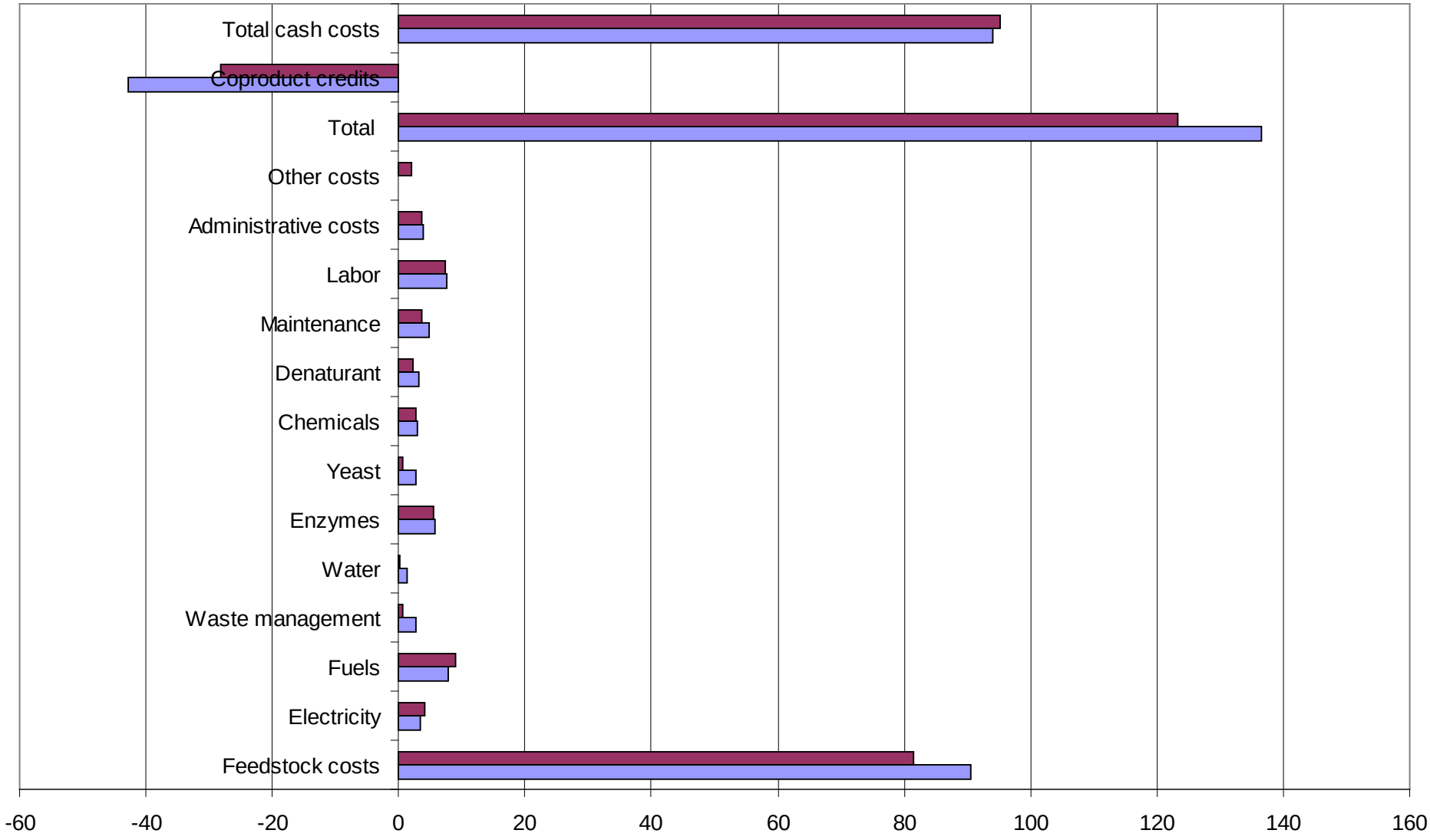
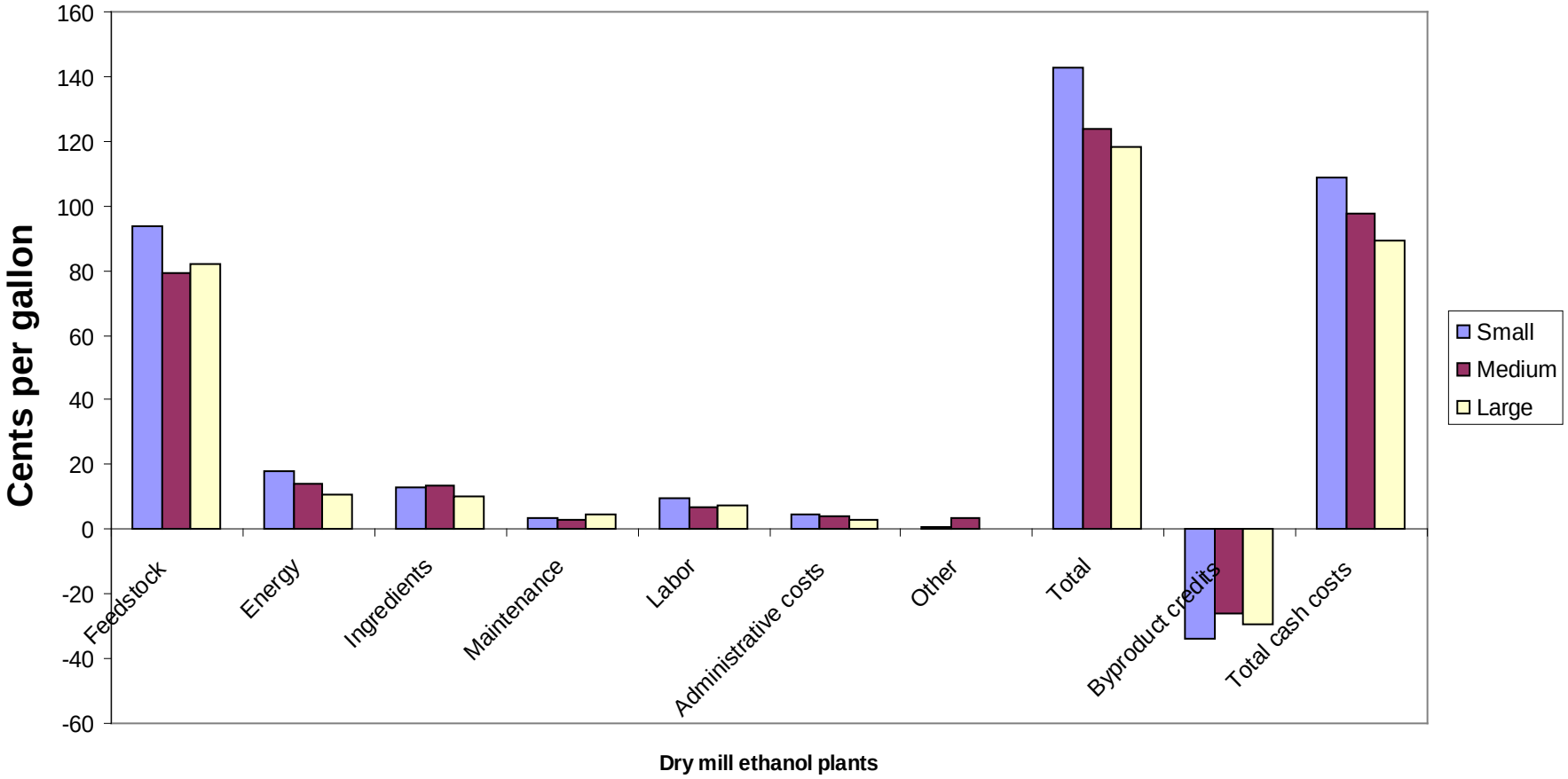
Ethanol Production Costs,1998



Ethanol Cash Costs and Net Feedstock Costs, 1998



10 cents/gallon = about 2 cents of Euros/l

Factors Affecting Ethanol Production Costs

- Prices of corn and ethanol co-products (DDGS, CGF, CGM, and corn oil)
- Energy prices (natural gas and electricity)
- Cost-saving technologies in corn production and ethanol production

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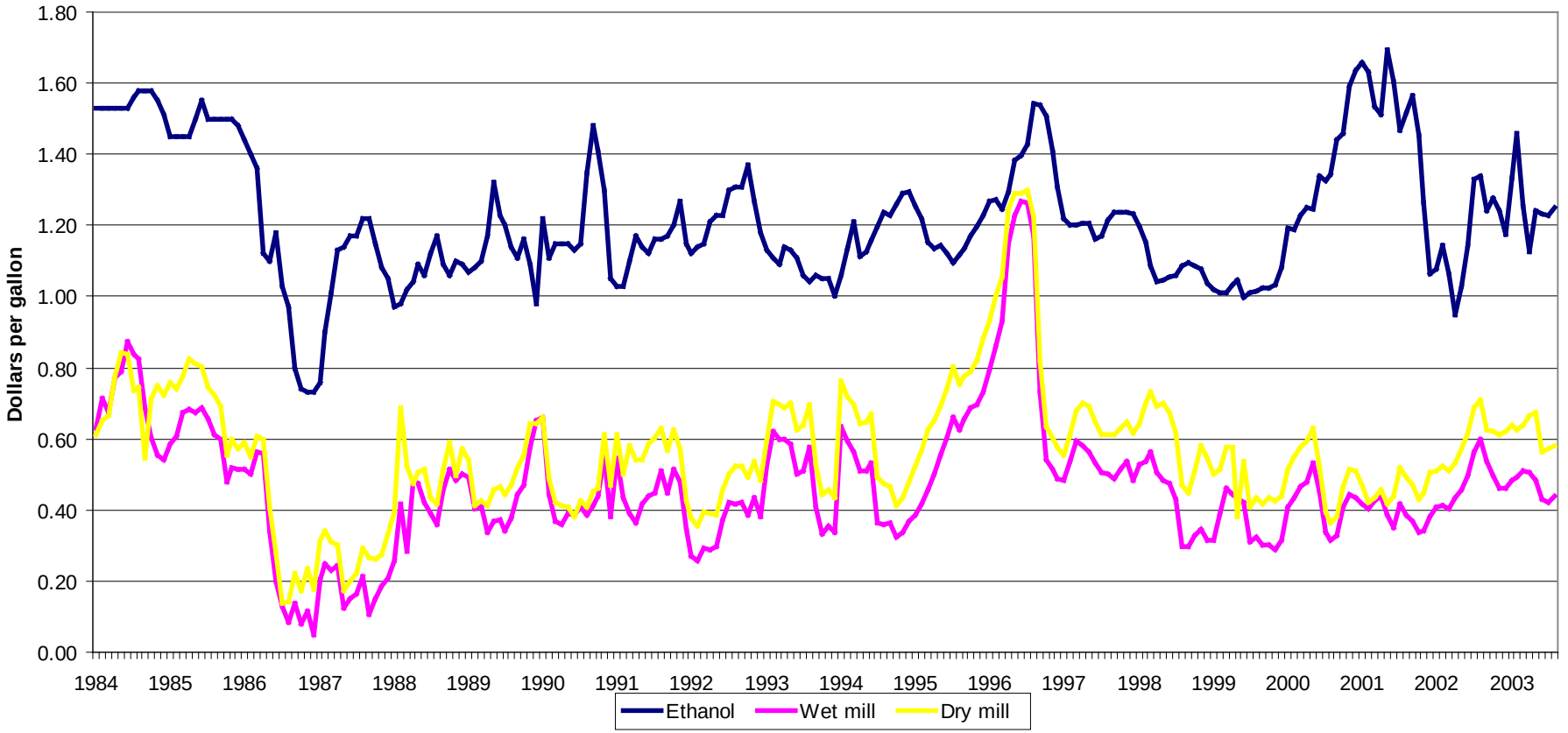
Ethanol Prices and Net Corn Costs, 1984-2003



1 US $/gallon = about 22 cents of Euros/l

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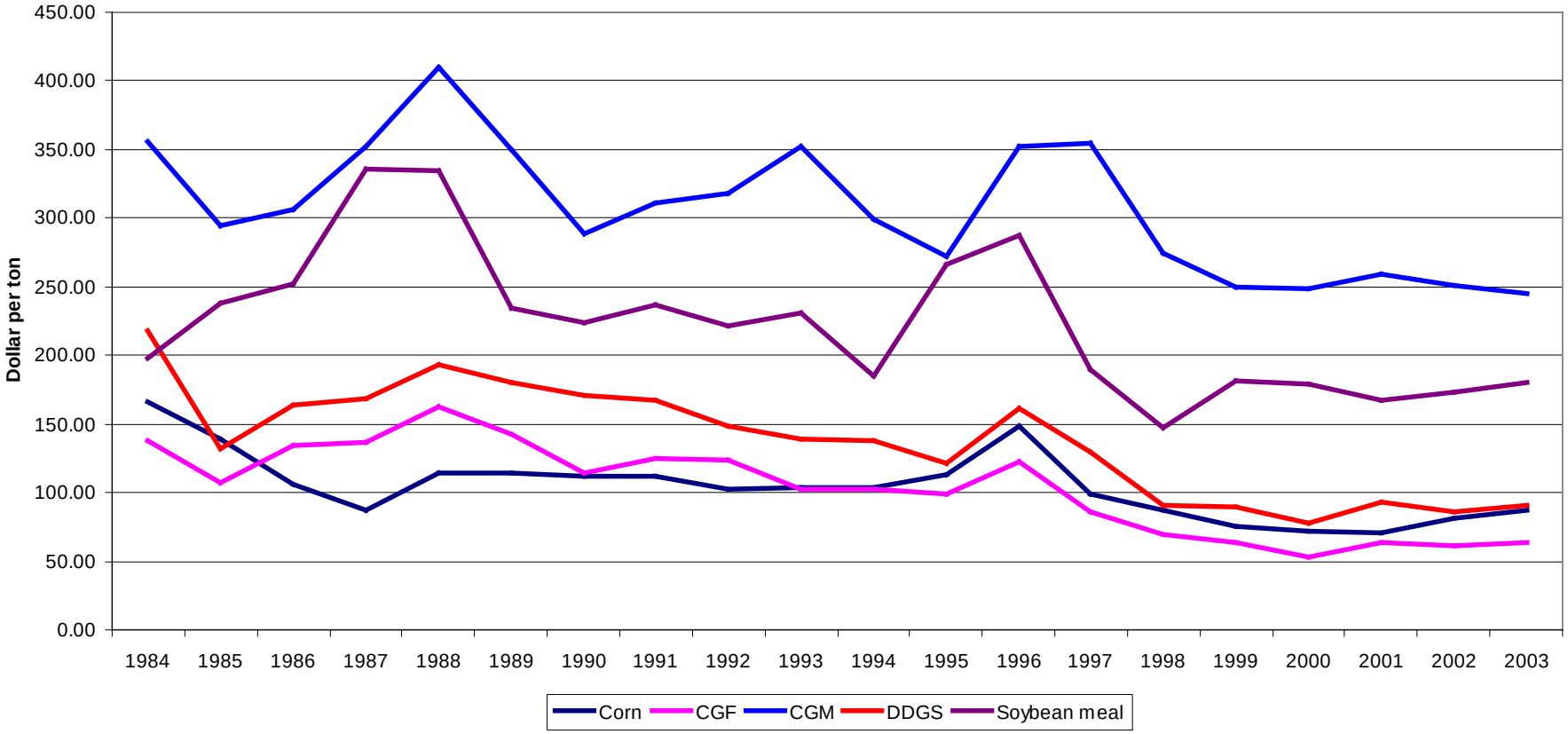
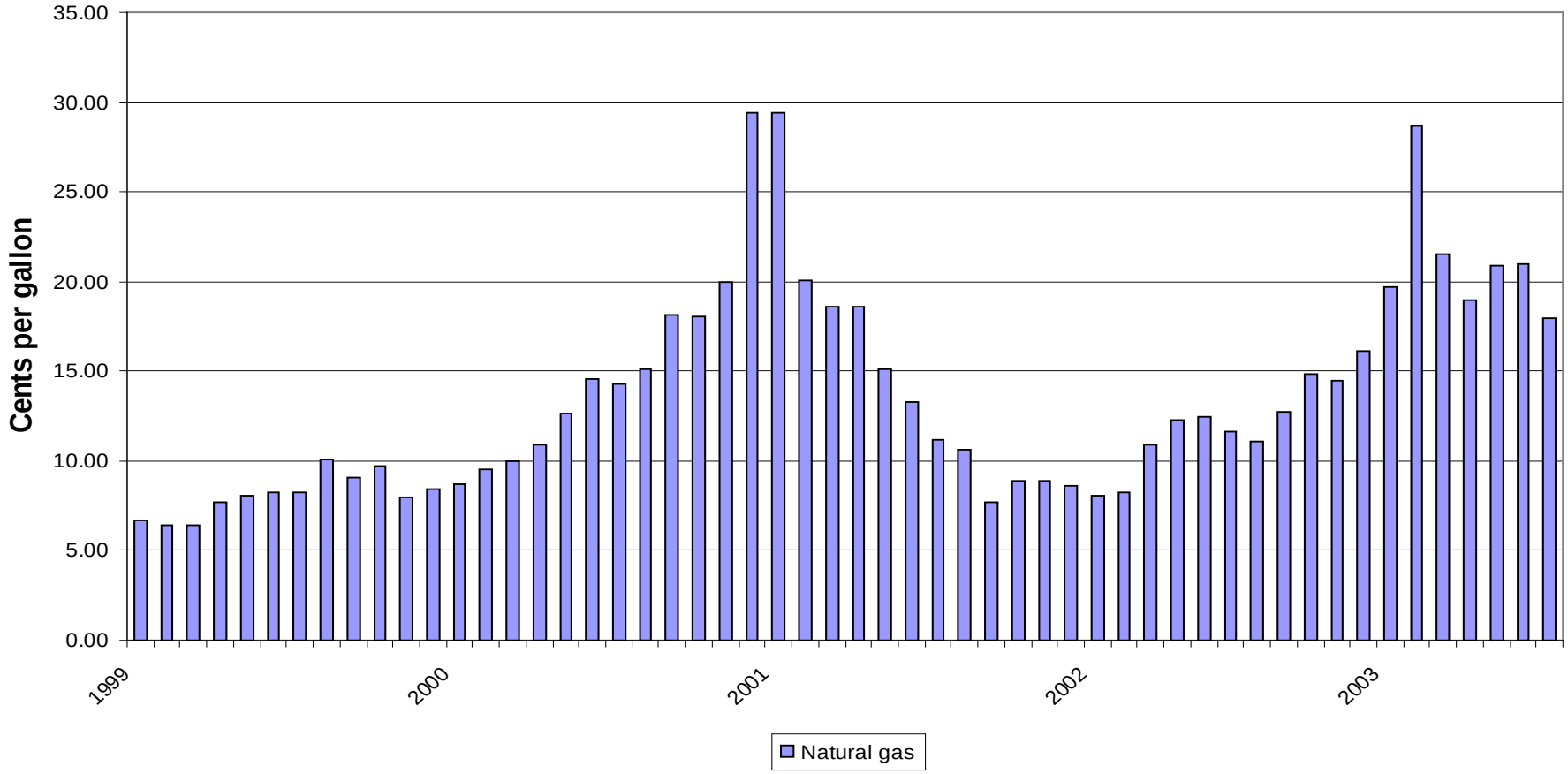
Prices: Soybean Meal, Corn, and Corn-Ethanol Byproducts, 2003=100



Dry Mill: Fuel Cost per Gallon of Ethanol



10 cents/gallon is about 2 cents of Euros/l

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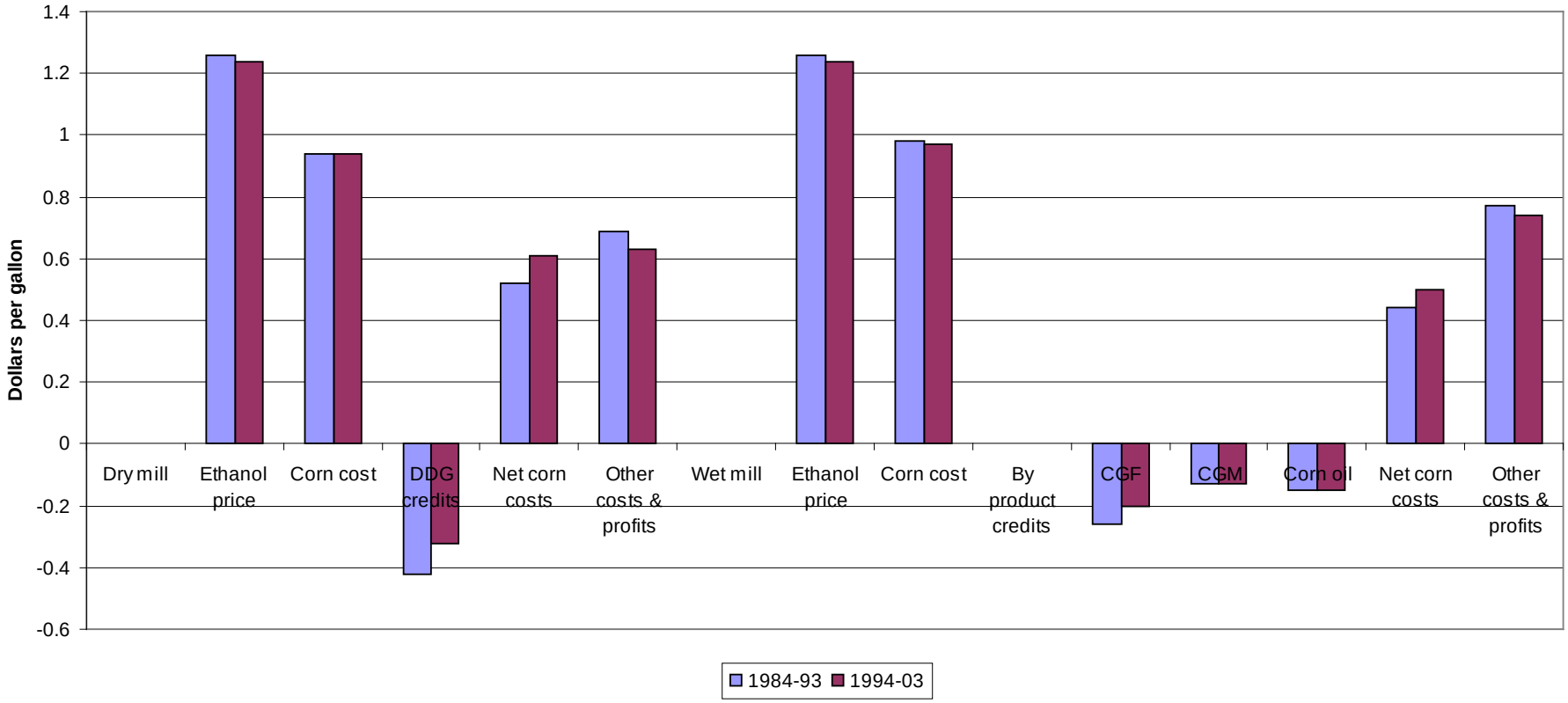
Ethanol: Prices, Net Corn Costs, other Costs and Profits per Gallon: 1984-93 and 1994-2003



1 $/gallon = about 22 cents of Euros/l

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Comparison of Fuel Ethanol and Gasoline and MTBE Prices

- In general, fuel ethanol and other biofuel production prices are higher than prices of petroleum products
- Ethanol plants are small relative to petroleum refineries, therefore, they are price takers and practically have no influence on ethanol prices

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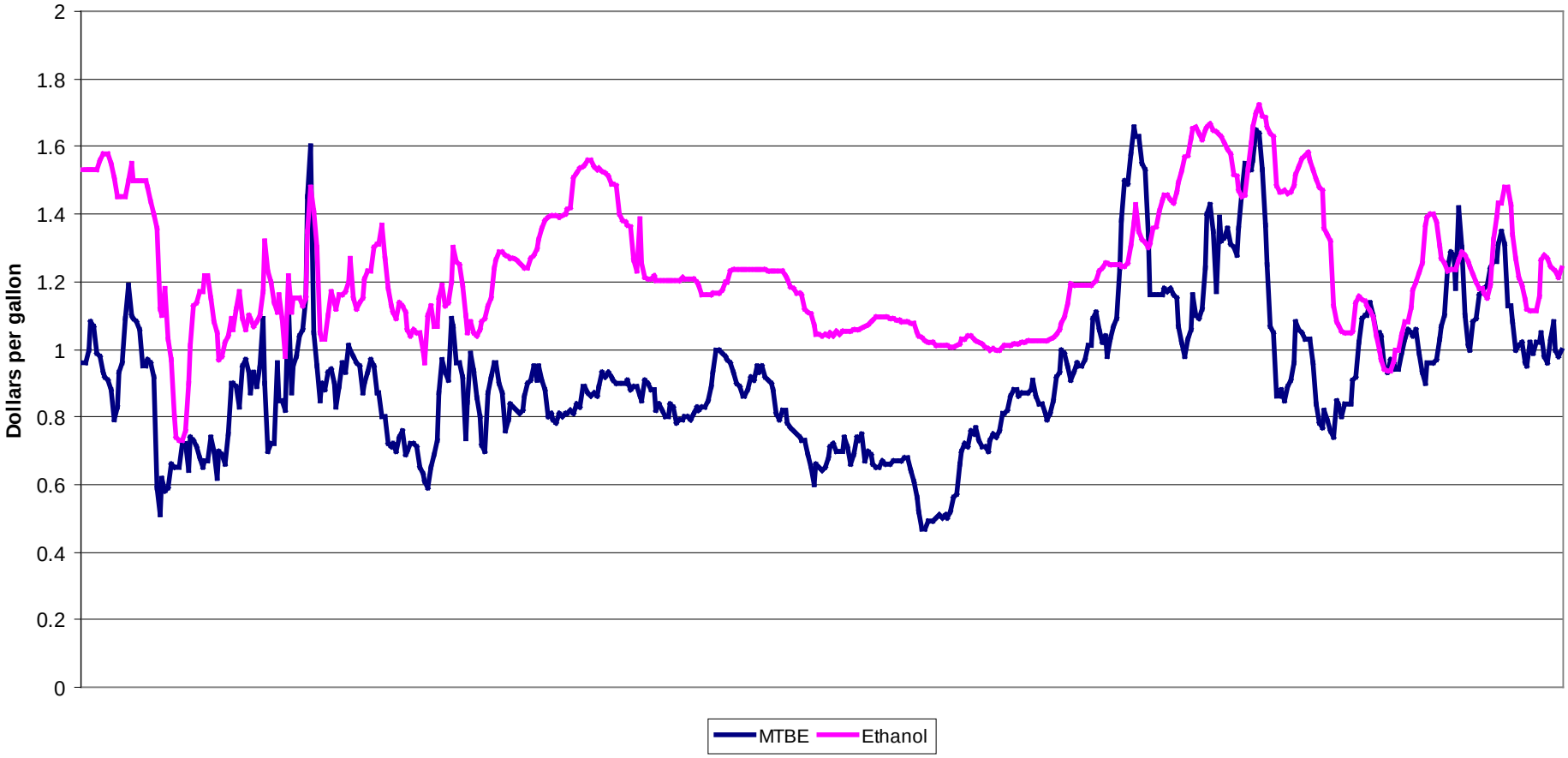
Ethanol and MTBE Prices, 1984-2003



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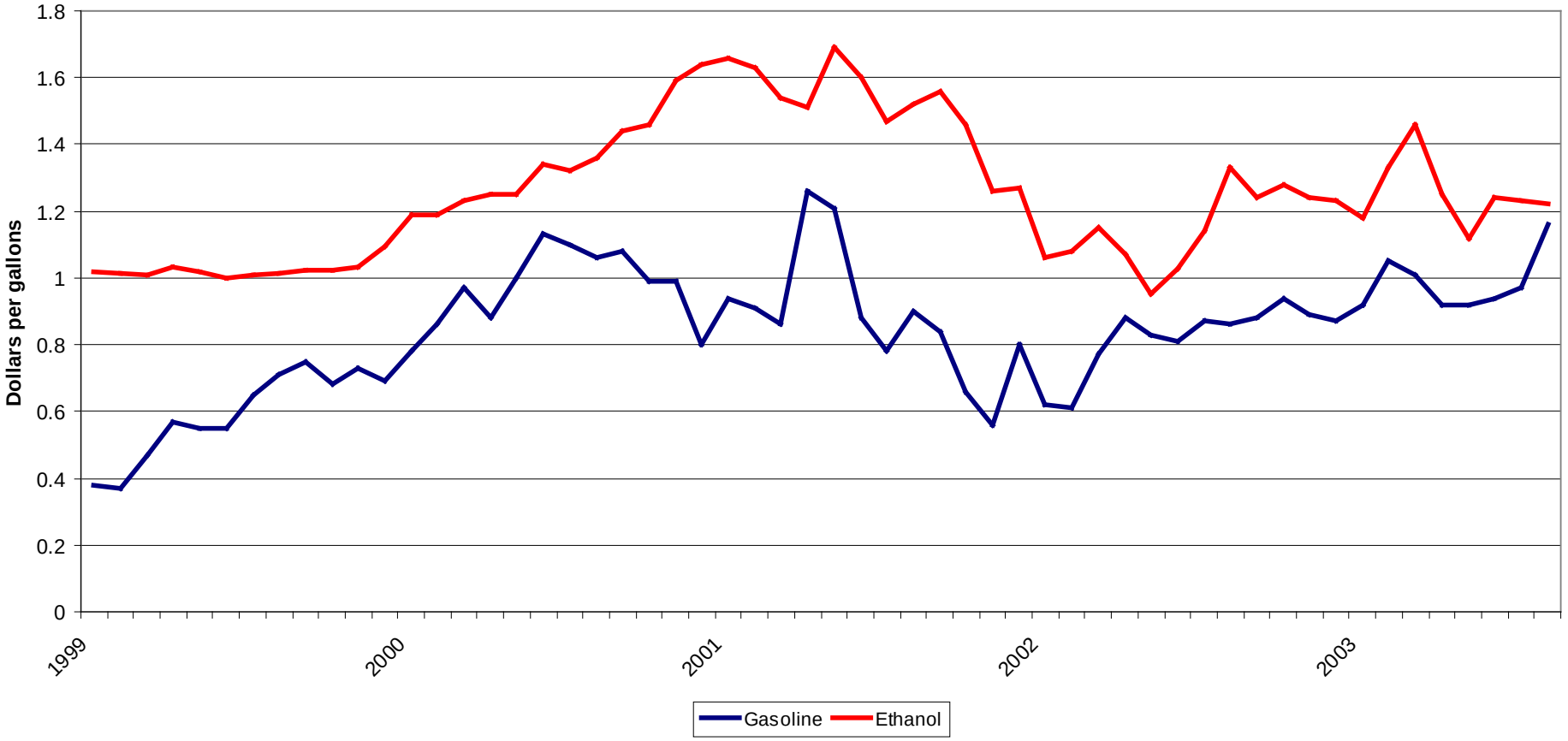
Monthly Ethanol and Gasoline Prices, 1999-2003



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Economic Impacts of Ethanol Production

- Reduces agricultural surplus and increases commodity prices
- Creates job opportunities in rural areas
- Increases farm income
- Reduces Government payments
- Improves air quality and reduces greenhouse gas (GHG) emissions
- Improves trade deficit
- Reduces dependency on foreign oil

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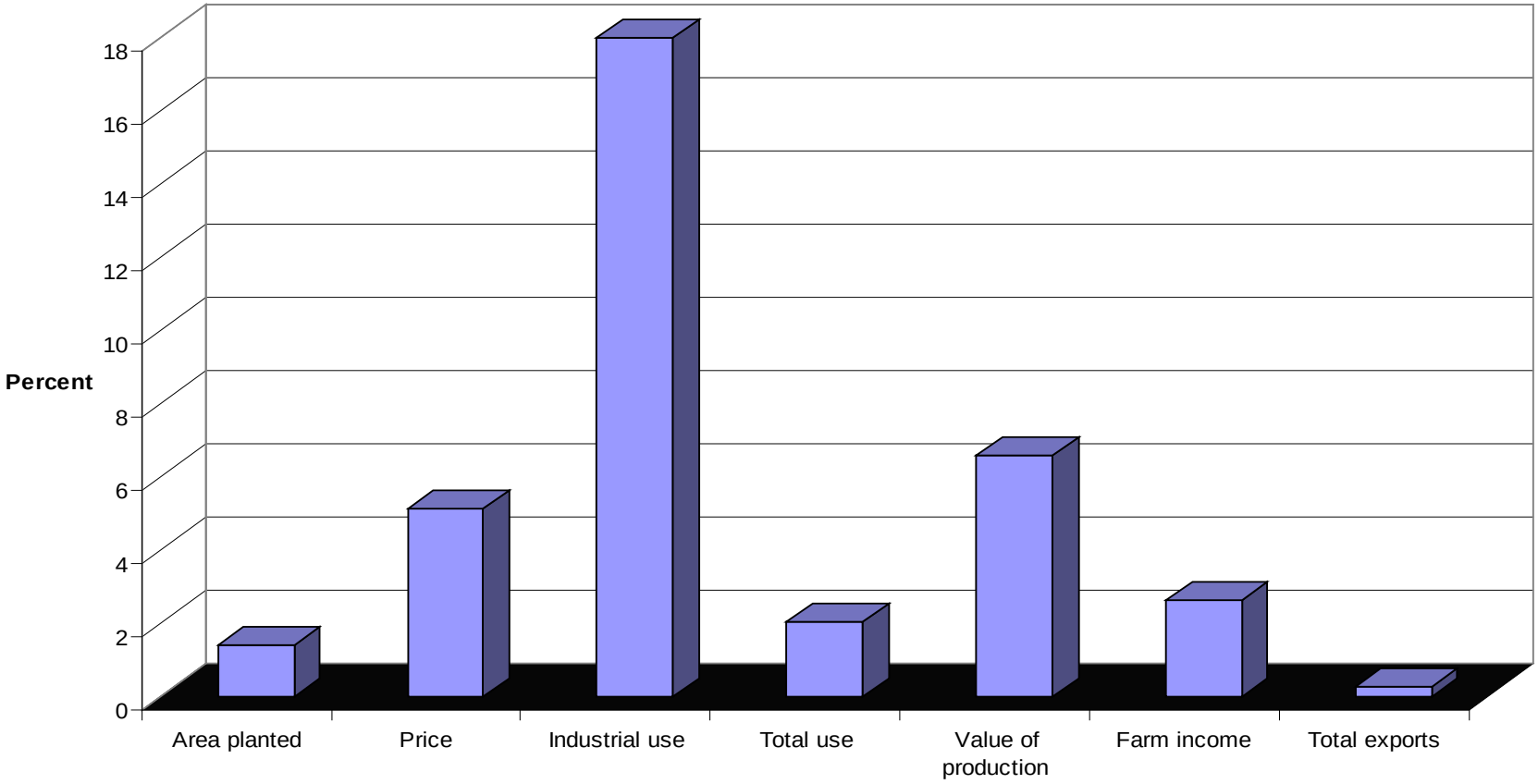
Economic Impacts of Increasing Corn-Ethanol Production by 1.4 Billion Gallons (54 Mhl) in 2012



Federal & State Policies and Regulations

- The Clean Air Act Amendments of 1990
- Federal tax incentives
- State incentives
- Farm Security and Rural Investment Act of 2002
- Energy Bill: Renewable Fuel Standard (RFS), and Income Tax Credit for biodiesel

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Federal & State Policies and Regulations--Continued

- The Clean Air Act Amendments of 1990
  - The Oxygenated Fuel Program, 1992
  - The Reformulated Gasoline Program, 1996
- Federal tax incentives: Alcohol-blended credit, straight alcohol credit, and small ethanol producer's credit
- Current ethanol tax credit is $0.52 per gallon (0.114 Euros/l) and is scheduled to drop to $0.51 (0.112 Euros/l) by 2005. Under the current law, the Federal exemption expires on December 31, 2007

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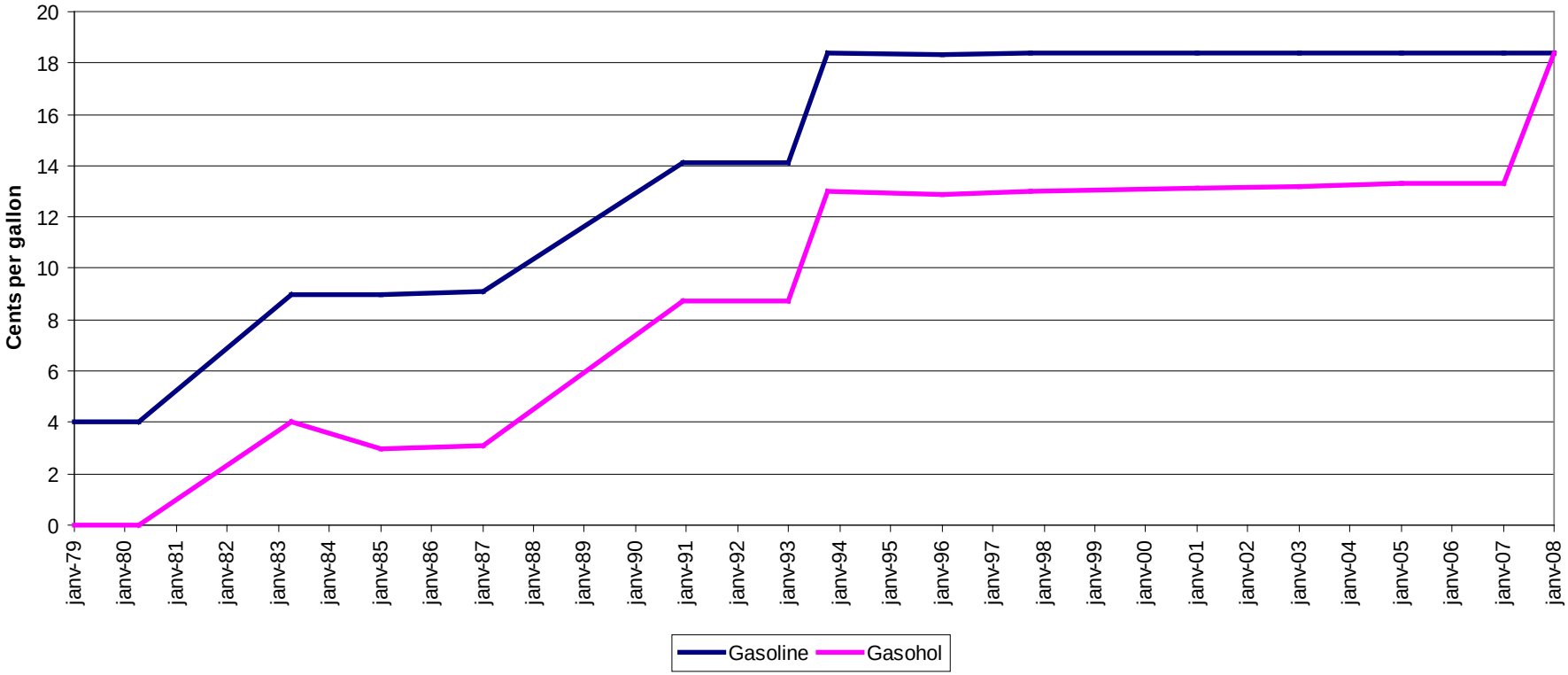
Federal Excise Taxes on Gasoline and Gasohol (10% blend)



10 cents/gallon = about 2 cents of Euros/l

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Federal & State Policies and Regulations--Continued

- Energy Policy Act of 1992 (EPAC) requires Government and State motor fleets to purchase alternative-fueled vehicles (75% of new purchases). Alternative fuel providers must also comply (90% of new purchases). DOE has the authority to implement a private and local government program if necessary
- The Energy Conservation Reauthorization Act of 1998 amended EPAC to include biodiesel fuel use credits. The rule, effective January 2001, gives fleet operators one auto flexible fuel (AFV) credit for using 450 gallons (about 1700 l) of biodiesel
- Auto industry receives Corporate Average Fuel Economy credits to manufacture flexible-fueled vehicles

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Federal & State Policies and Regulations--Continued

- Banning MTBE has stimulated ethanol demand. (MTBE has been Ban in California begins in 2004, 16 other States also have plans to ban MTBE and there is proposal in the Congress that calls for national ban)
- At least 13 States have some kind of ethanol incentives, ranging from $0.01-per-gallon (0.3 cents of Euros/l)-excise exemption in Connecticut to $0.40-per-gallon- (12 cents of Euros/l) producers payment in Wyoming
- 16 States have grant programs, personal and corporate income tax credits for constructing biofuel facilities, conducing research on renewable fuel technologies, developing renewable energy systems, and investing in alternative energy development

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Federal & State Policies and Regulations--Continued

- 2002 Farm Bill, Energy Title IX
- Section 9002: Federal Procurement of Biobased Products, $1 million per year, FY 2002-07
- Section 9003: Biorefinery Grants, no funds
- Section 9004: Biodiesel Fuel Education Program, $1 million per year, FY 2003-07
- Section 9006: Renewable Energy Systems and Energy Efficiency Improvements, $23 million per year, FY 2003-07
- Section 9008: Biomass Research & Development, $5 million in FY 2002 and $14 million, FY2003-07

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Federal & State Policies and Regulations--Continued

Section 9010, continuation of the Bioenergy Program, up to $115.5 million, FY 2003 and up to $150 million per year, FY 2004-06

CCC Bioenergy Program Results

- Ethanol producers received $32.7 million for 141.3 million additional gallons of ethanol (5.4 Mhl) in FY 2001 and $66.1 million for 219.3 million additional gallons (8.3 Mhl) in FY 2002
- Biodiesel producers received $7.9 million for 6.4 million additional gallons (0.24 Mhl) in FY 2001 and $12.6 million for 8.9 million additional gallons (0.48 Mhl) in FY 2002.

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Federal & State Policies and Regulations--Continued

- Energy Bill

  Energy Bill, Renewable Fuel Standard (RFS)

  Income tax credit for biodiesel.

Challenges and Opportunities

- Biofuel transportation and handling
- Distillers dried grains with soluble
- Biofuel imports from CBI countries and Brazil
- Biomass-ethanol
- New Technologies in corn production and corn processing

Conclusions

- Ethanol is renewable fuel produced from domestically grown feedstock at higher cost than gasoline
- gasoline prices are lower than market prices due to direct and indirect subsidies
- Gasoline prices are not reflecting the external costs of burning fuel such as health and environmental effects
- In the absence of a well-functioning market for transportation fuels, ethanol industry may require both Federal and state incentives to survive
- Ethanol production received a major boost from Federal and States policies and regulations

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