

Cost Trends Associated with the Production and Delivery of Wood-Based Composites in North America

Presented by

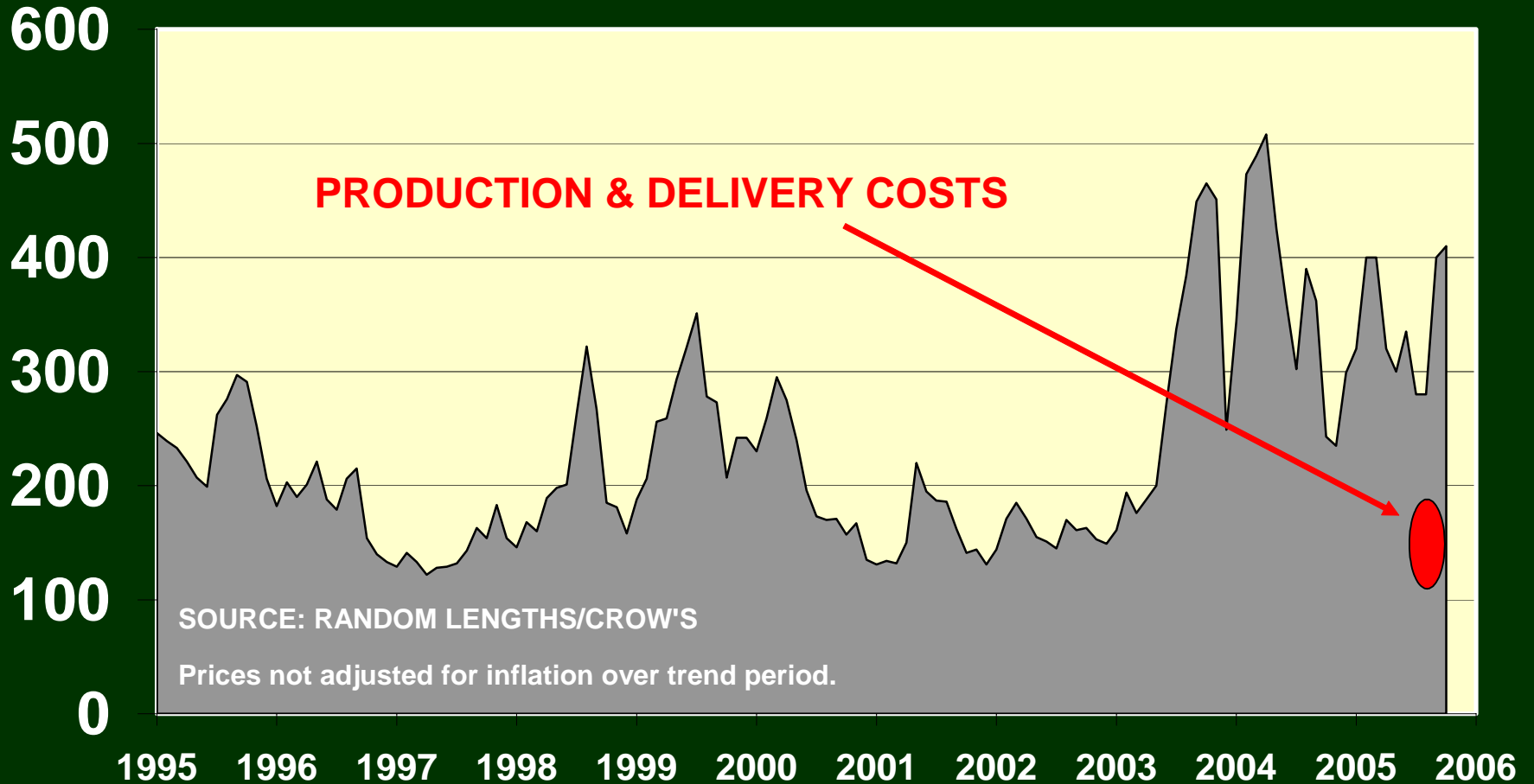
Jack G. Winterowd

Weyerhaeuser

Prepared for the “**WOOD ADHESIVES 2005**” meeting in San Diego, CA on November 2-4, 2005

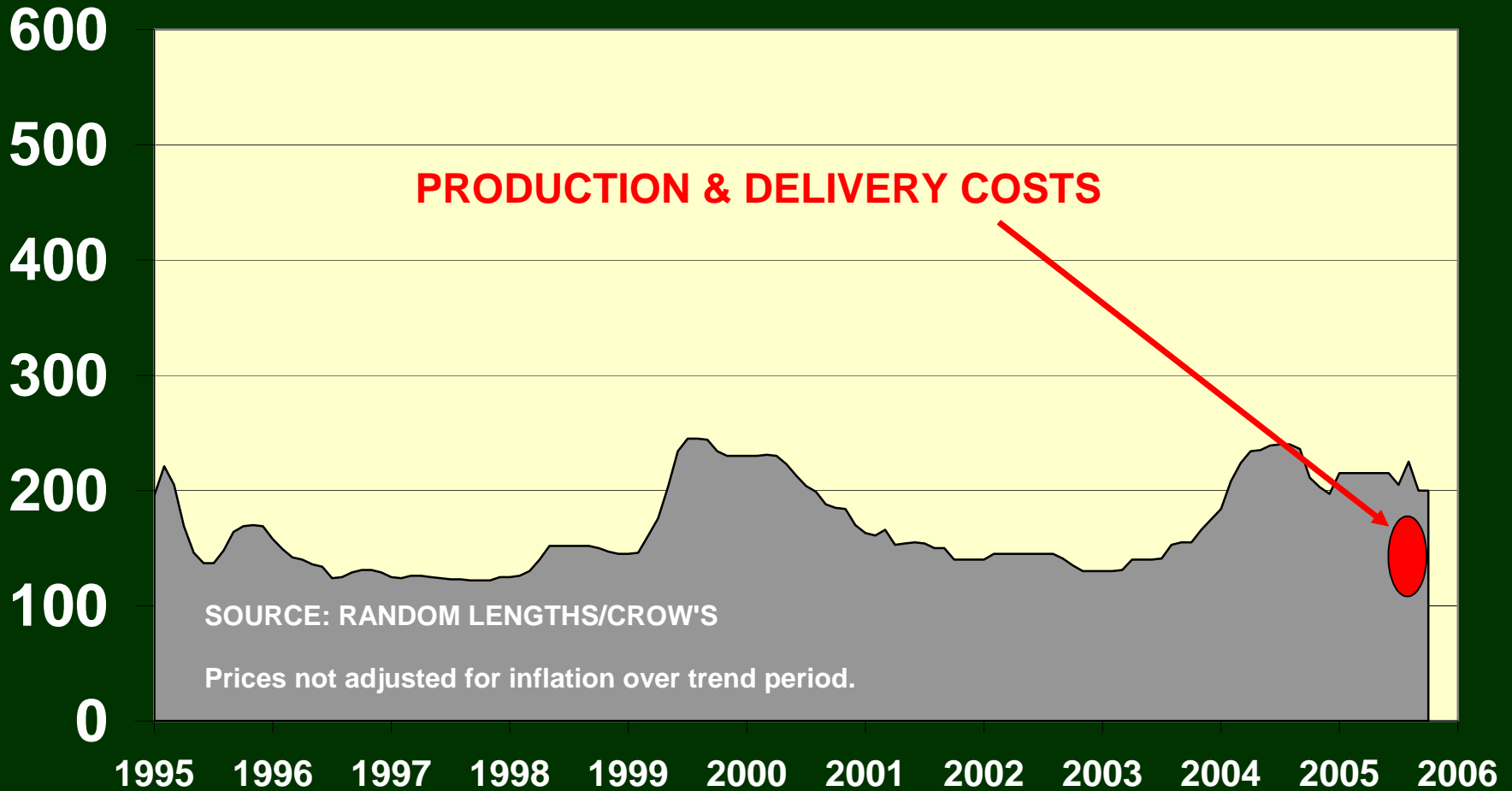
HISTORIC OSB PRICES

(NORTH CENTRAL PRICES FOR 7/16" SHEATHING, F.O.B. MILL)



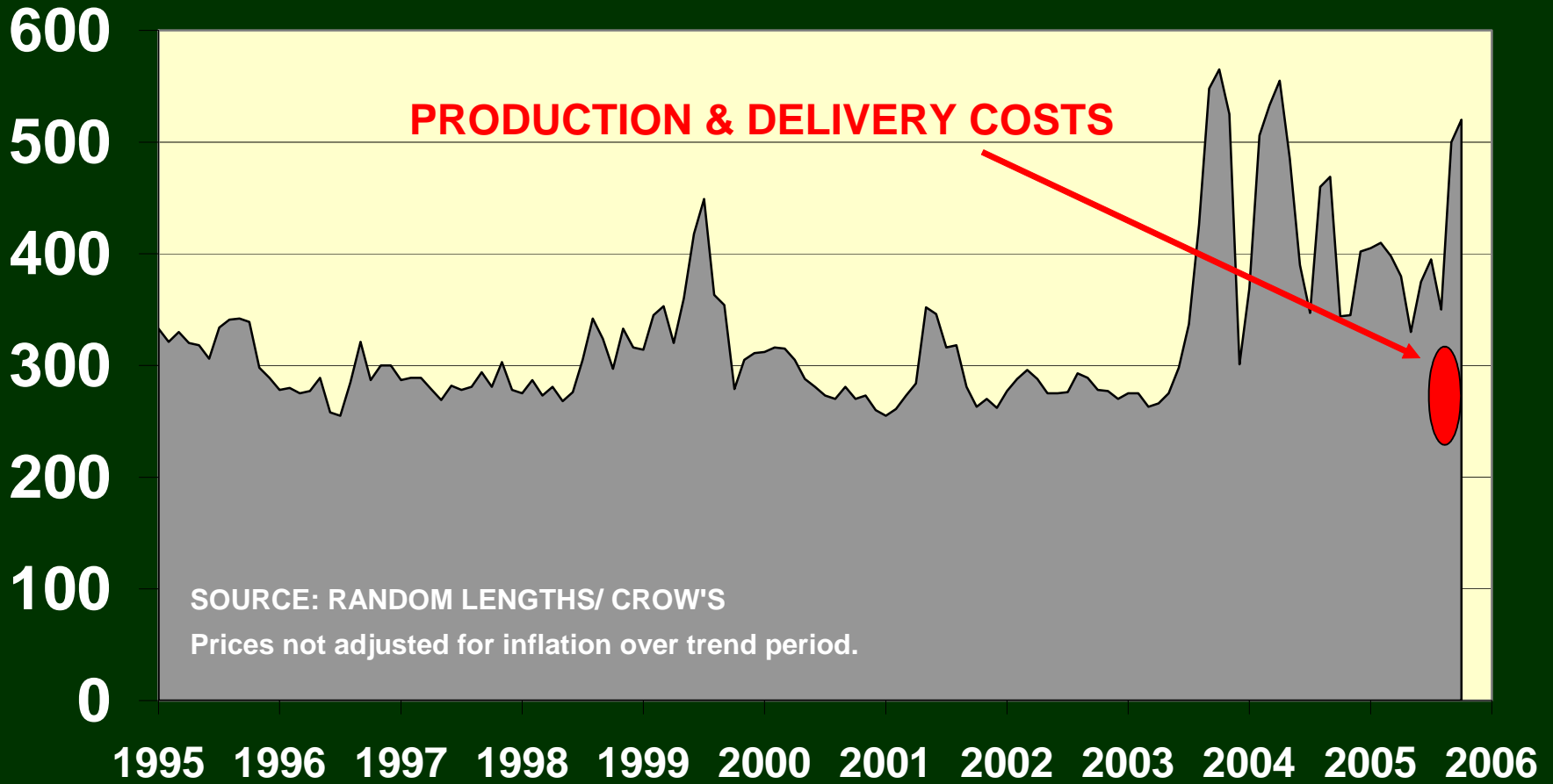
HISTORIC PARTICLEBOARD PRICES

(WESTERN PRICES FOR 3/8" UNDERLAYMENT, F.O.B. MILL)



HISTORIC PLYWOOD PRICES

(EASTERN PRICES FOR SYP 15/32", CD, EXTERIOR, 4-PLY, F.O.B. MILL)



SURVIVAL STRATEGIES

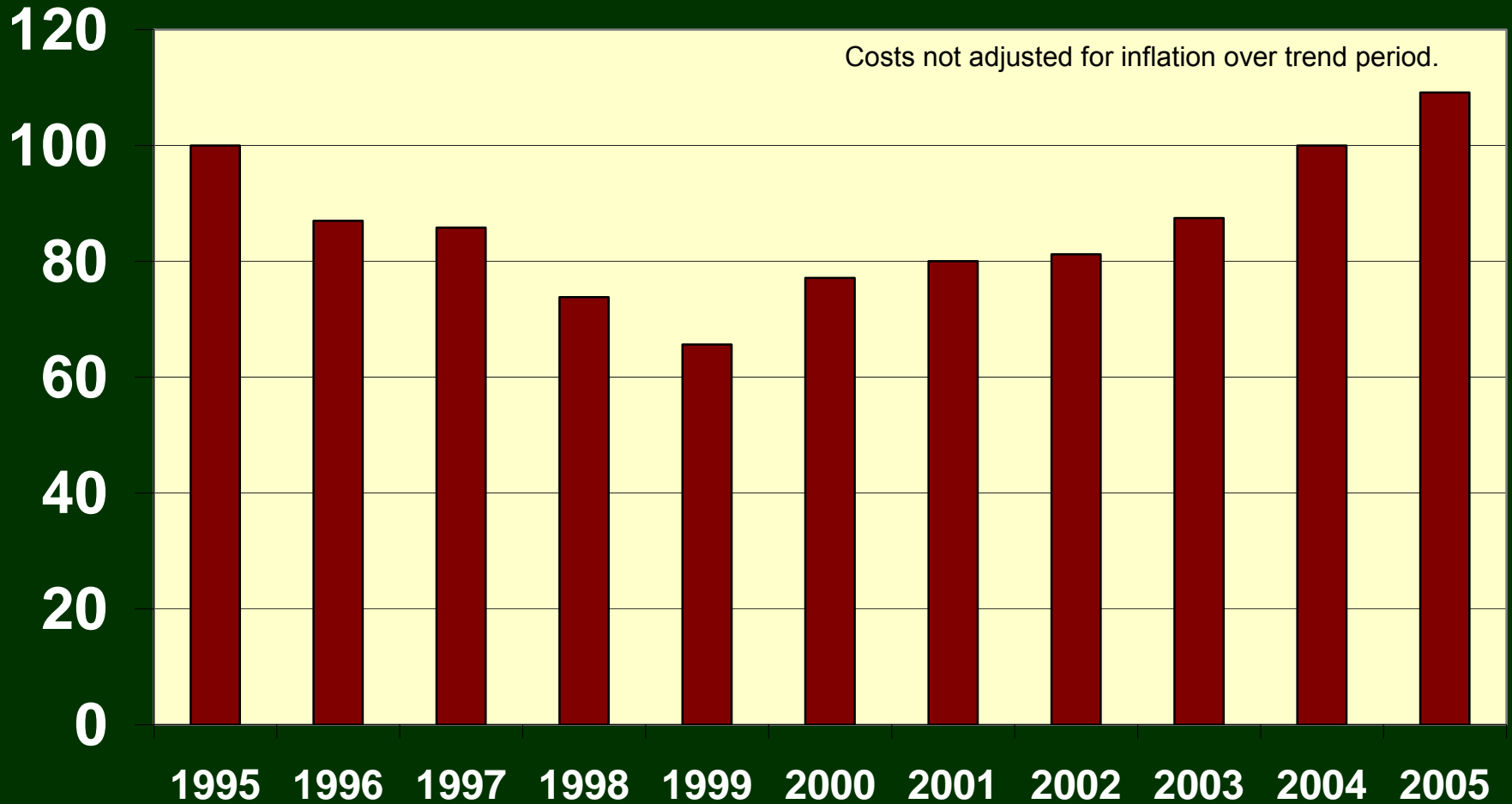
- **PRODUCT VALUE ENHANCEMENT**
- **COST MINIMIZATION**
 - ADHESIVE
 - WOOD
 - WAX
 - LABOR
 - ENERGY
 - POLLUTION CONTROL
 - TRANSPORTATION TO MARKET

ADHESIVES USED FOR WOOD-BASED COMPOSITES

- UF
- PF
- PMDI
- PRF
- RF
- MUF
- MF
- POLYURETHANES (1 & 2-COMPONENT)

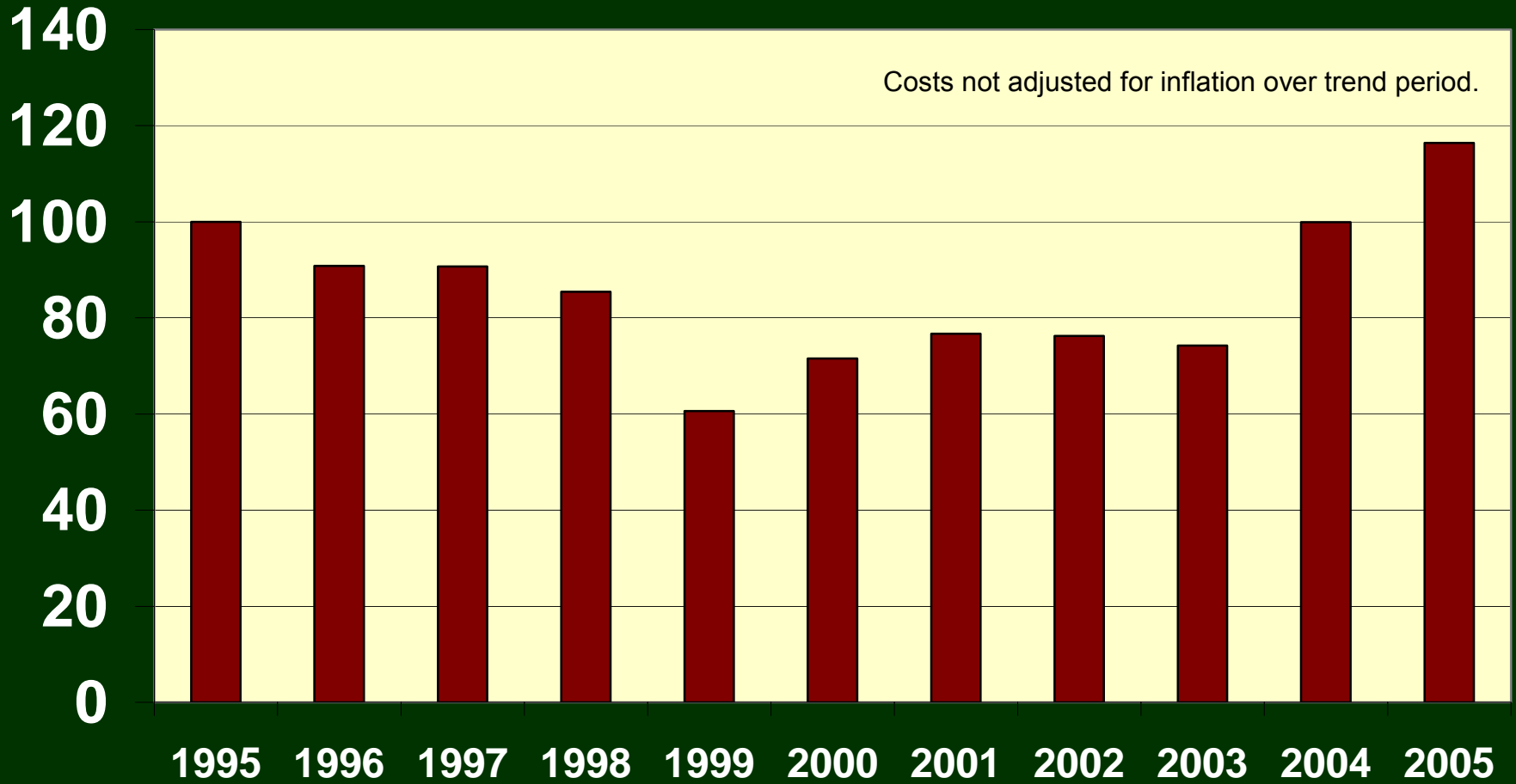
HISTORIC COST OF UF RESINS

(RELATIVE TO COST IN 1995)



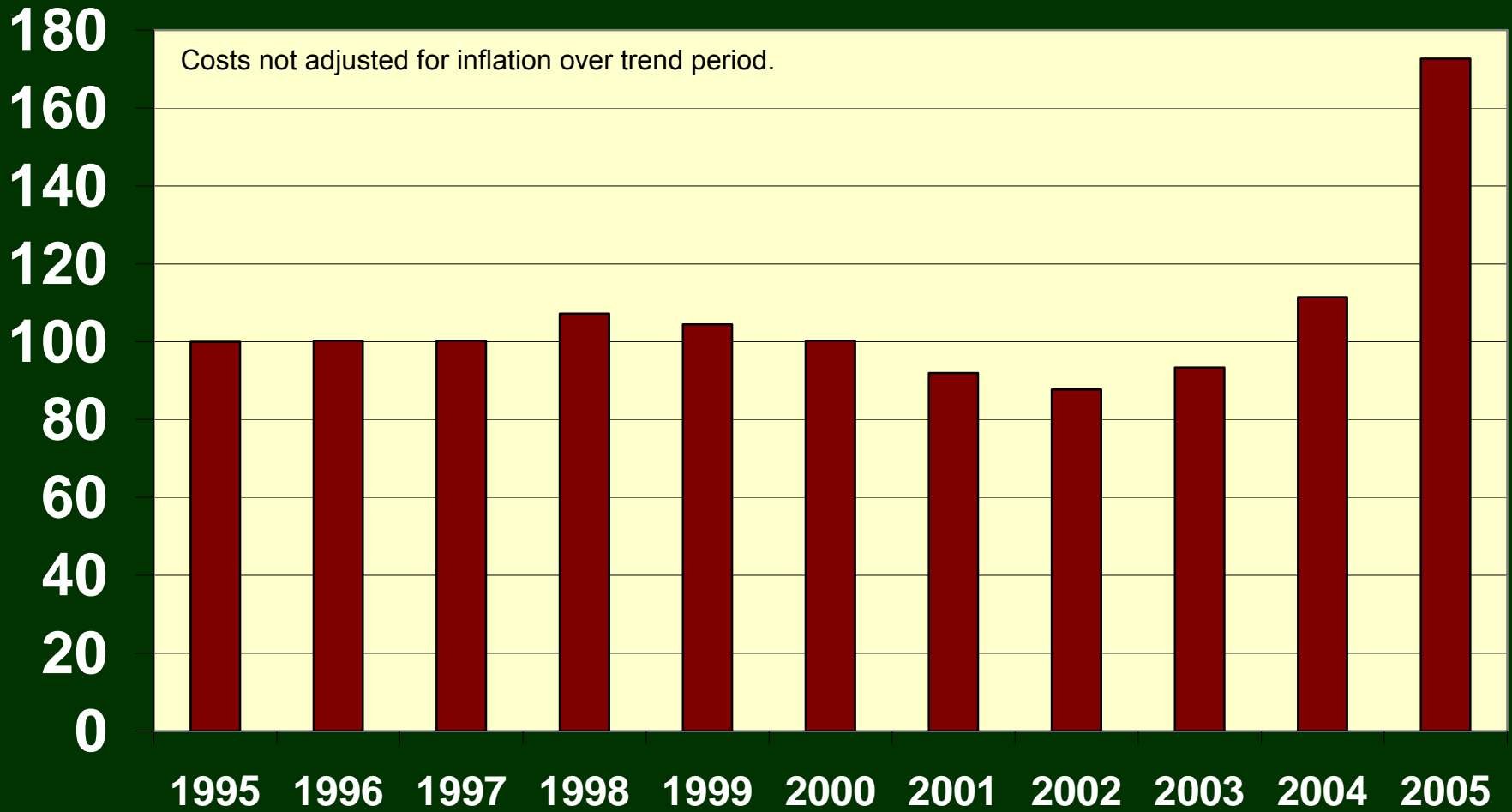
HISTORIC COST OF PF RESINS

(RELATIVE TO COST IN 1995)

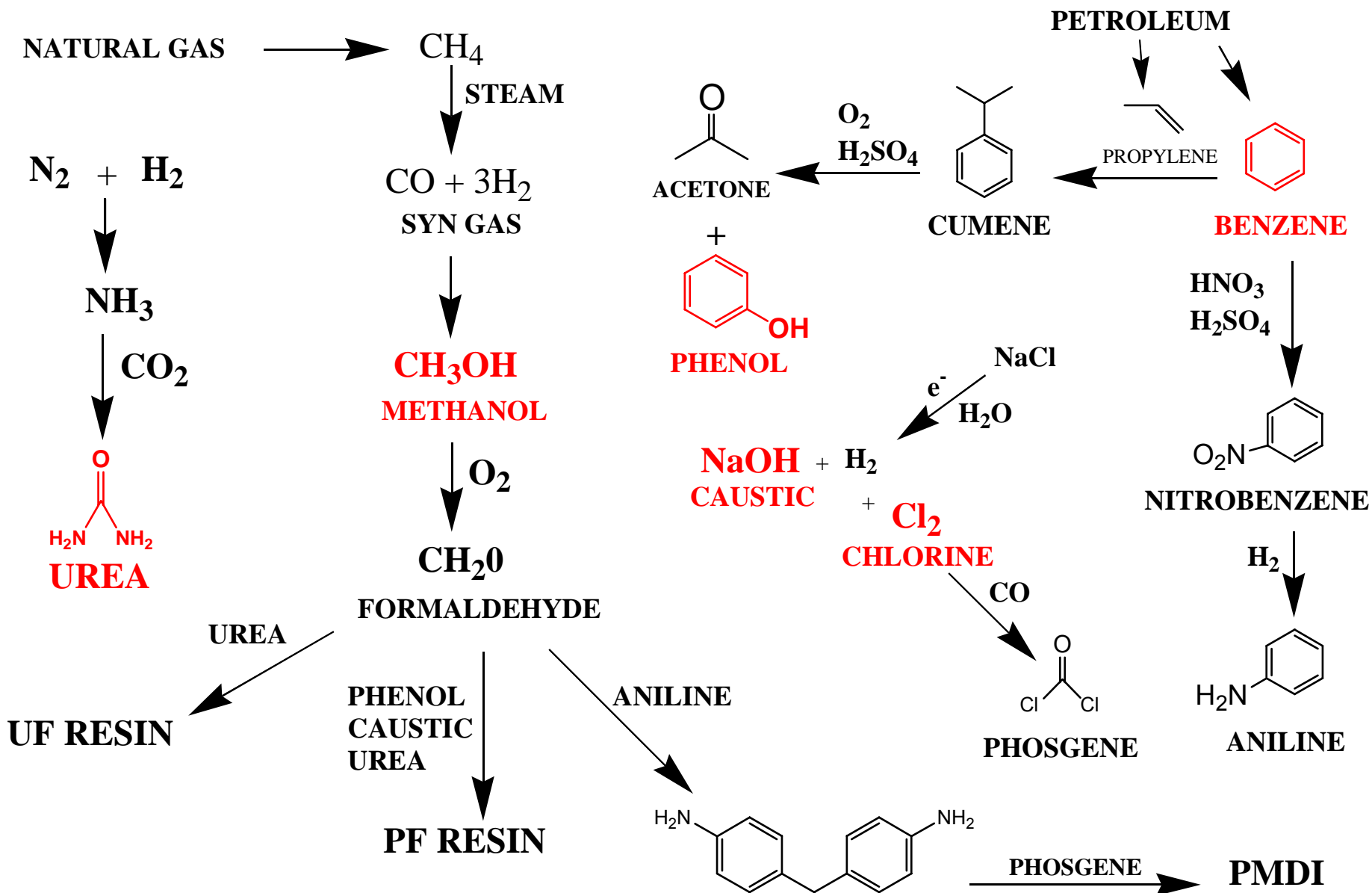


HISTORIC COST OF PMDI

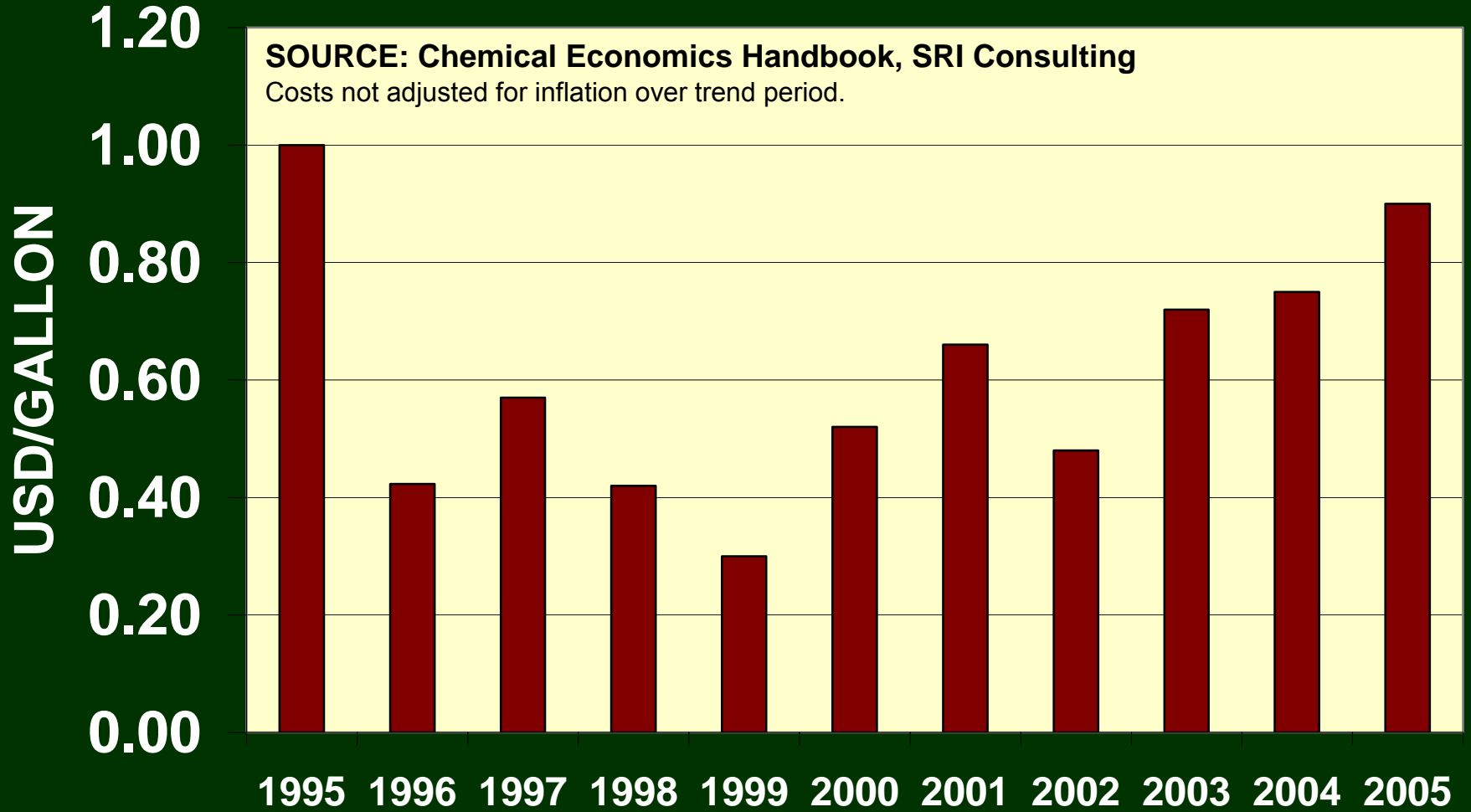
(RELATIVE TO COST IN 1995)



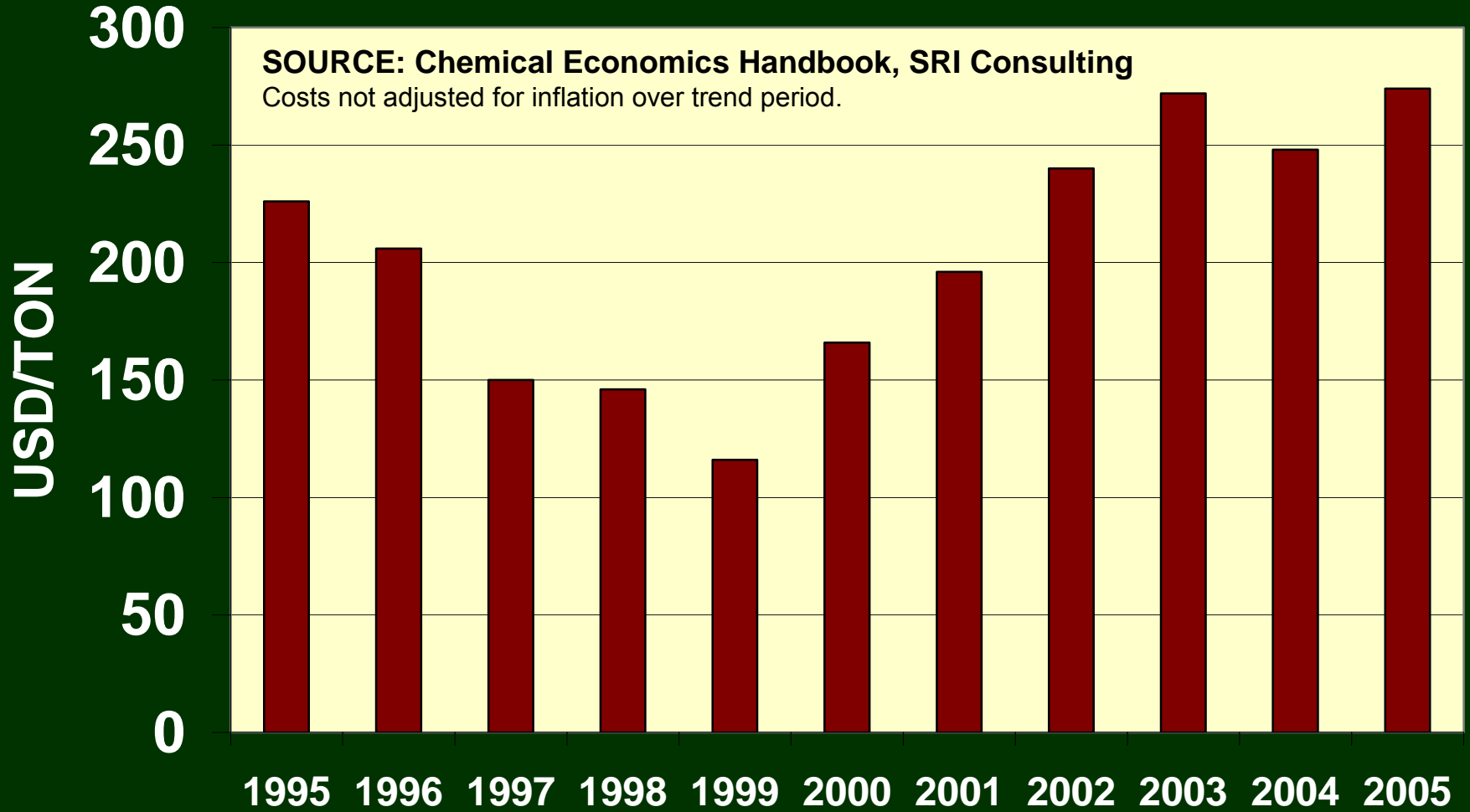
SYNTHETIC PATHWAY FOR UF, PF & PMDI



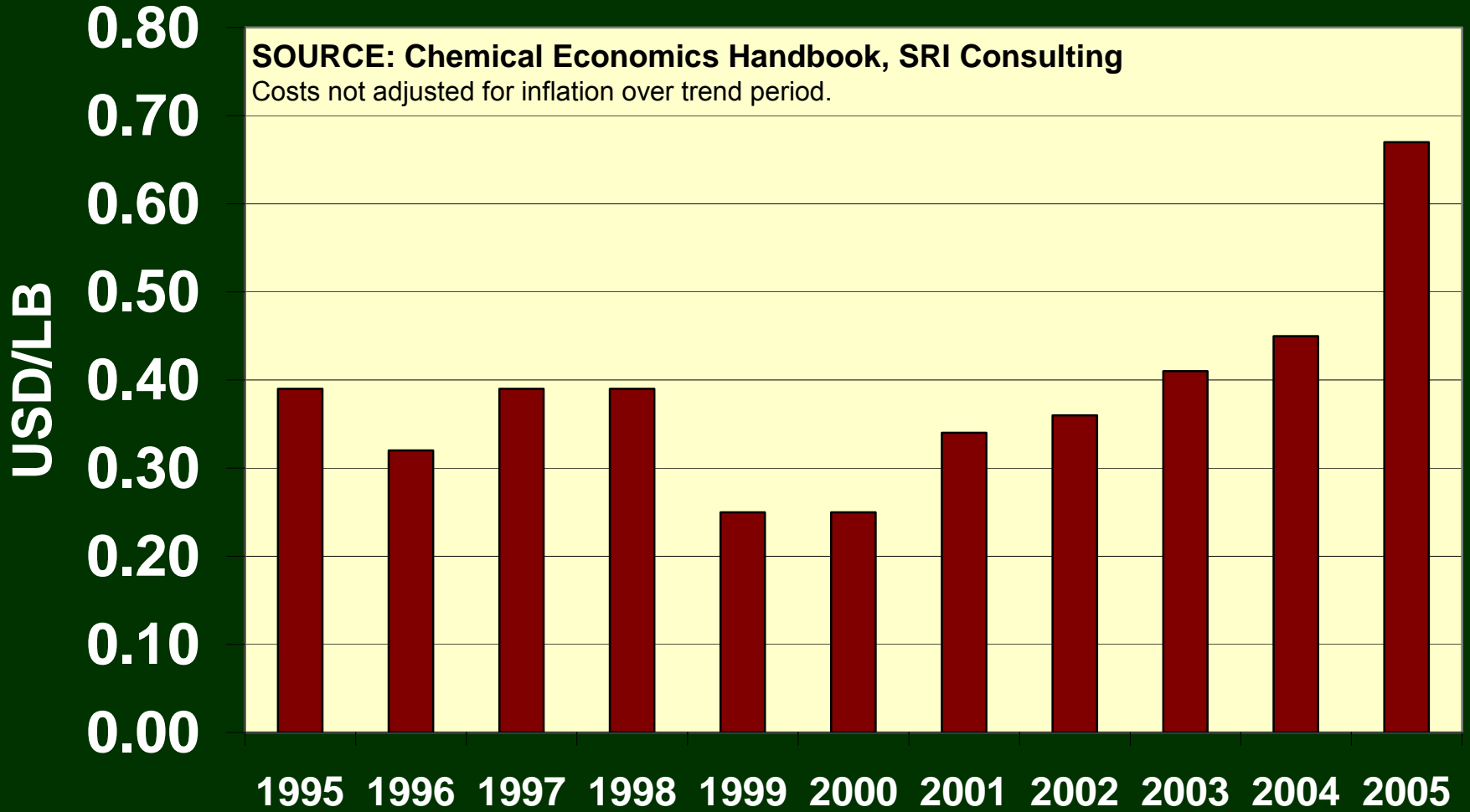
HISTORIC COST OF METHANOL



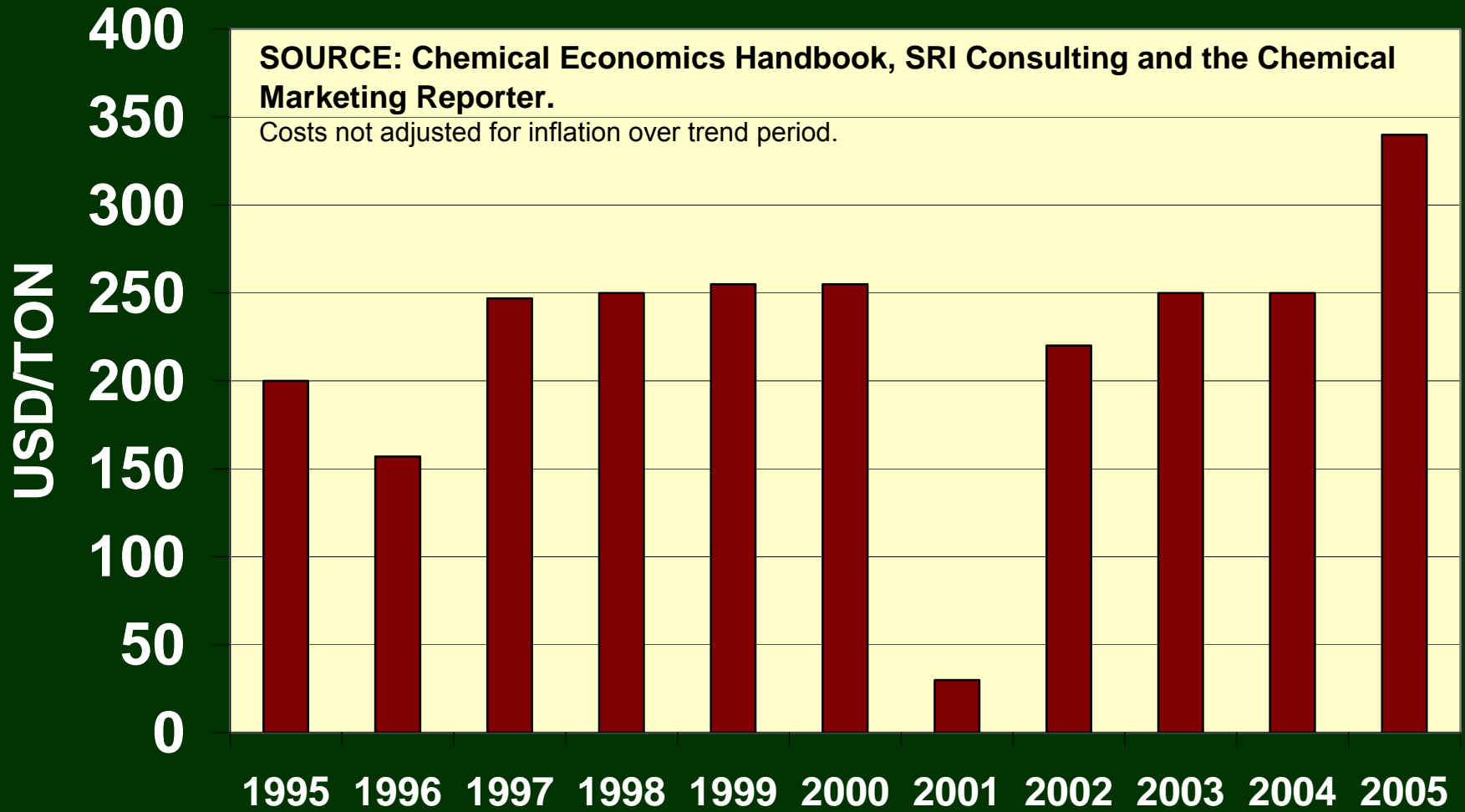
HISTORIC COST OF UREA



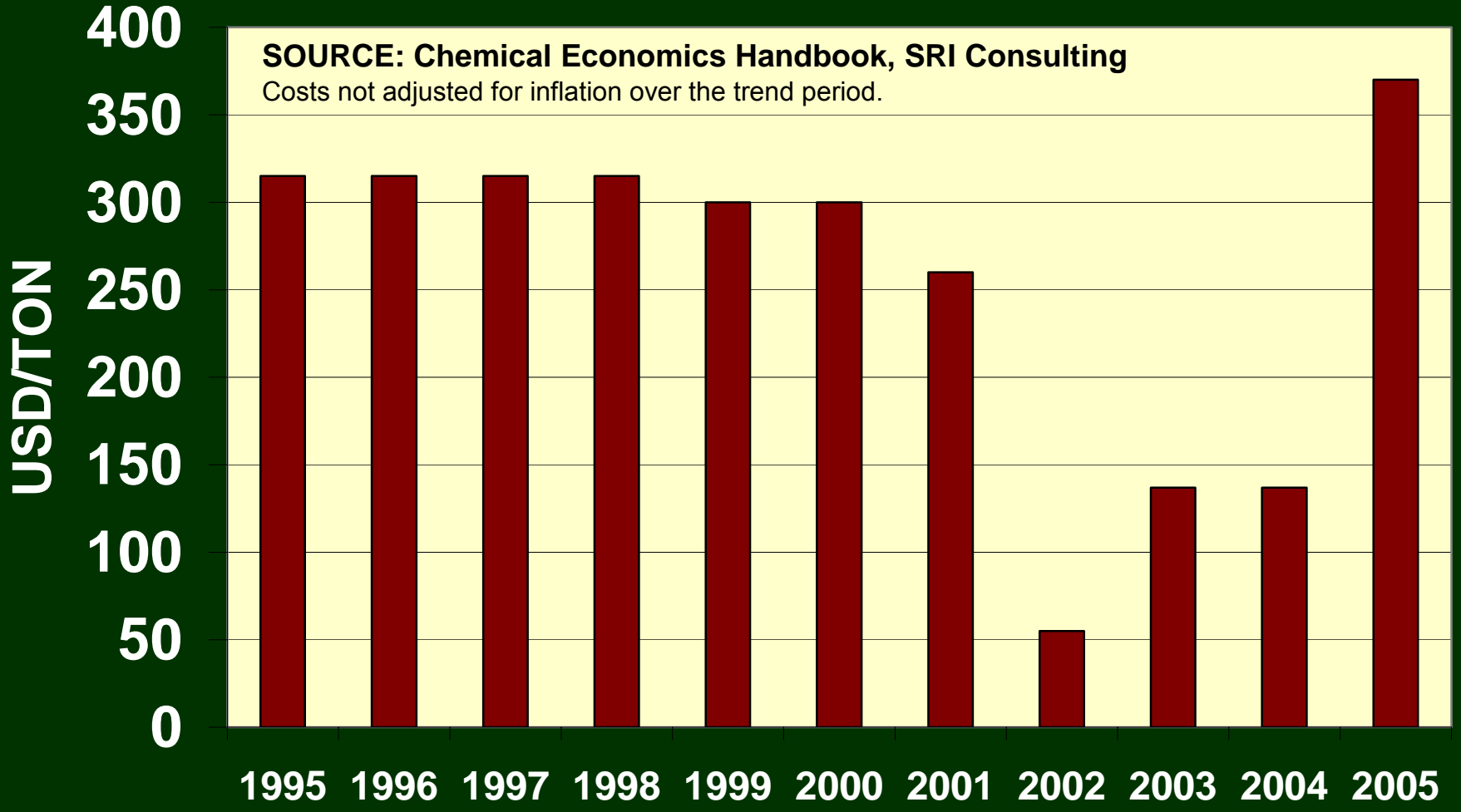
HISTORIC COST OF PHENOL



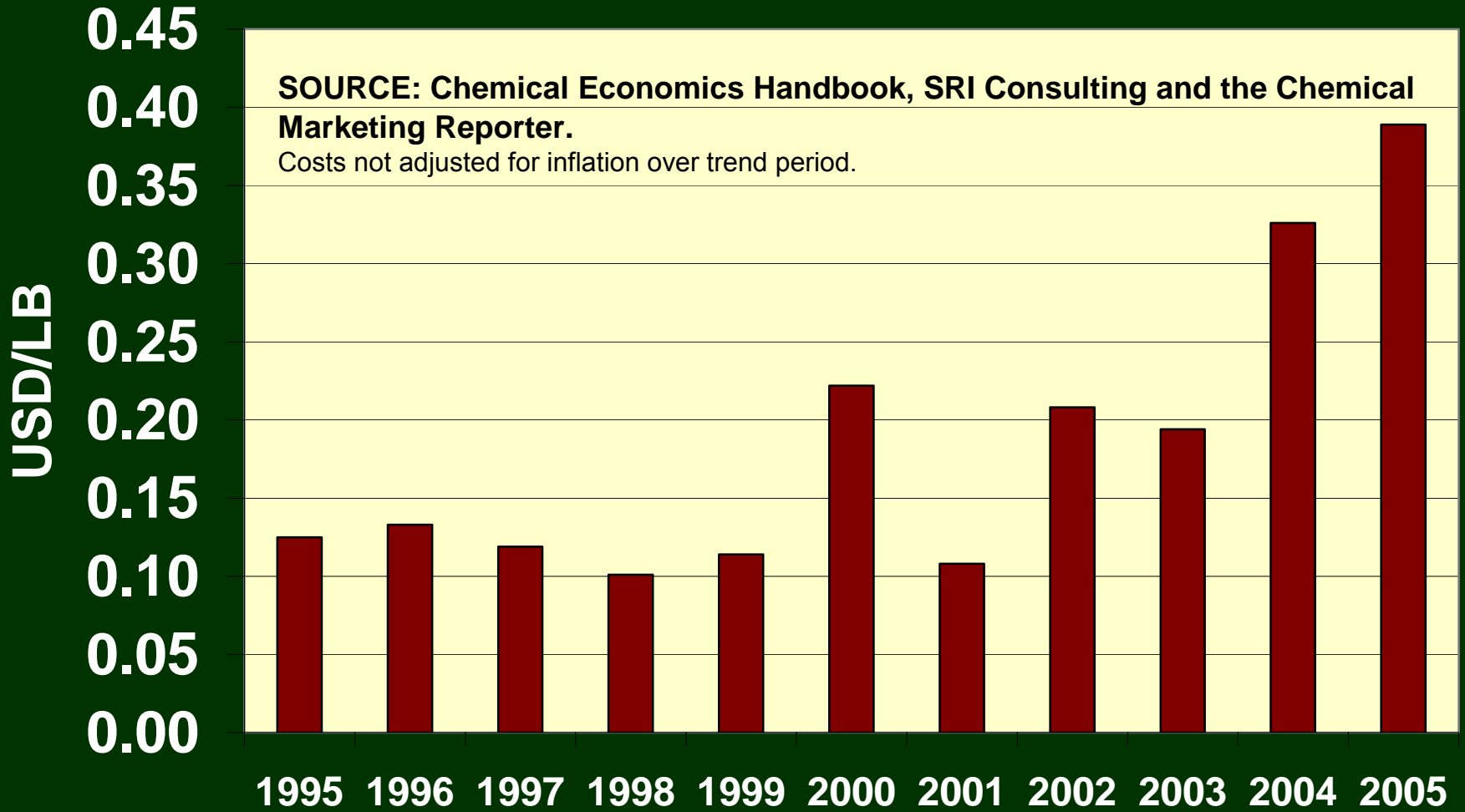
HISTORIC COST OF CHLORINE



HISTORIC COST OF CAUSTIC



HISTORIC COST OF BENZENE



WAX USED FOR WOOD-BASED COMPOSITES

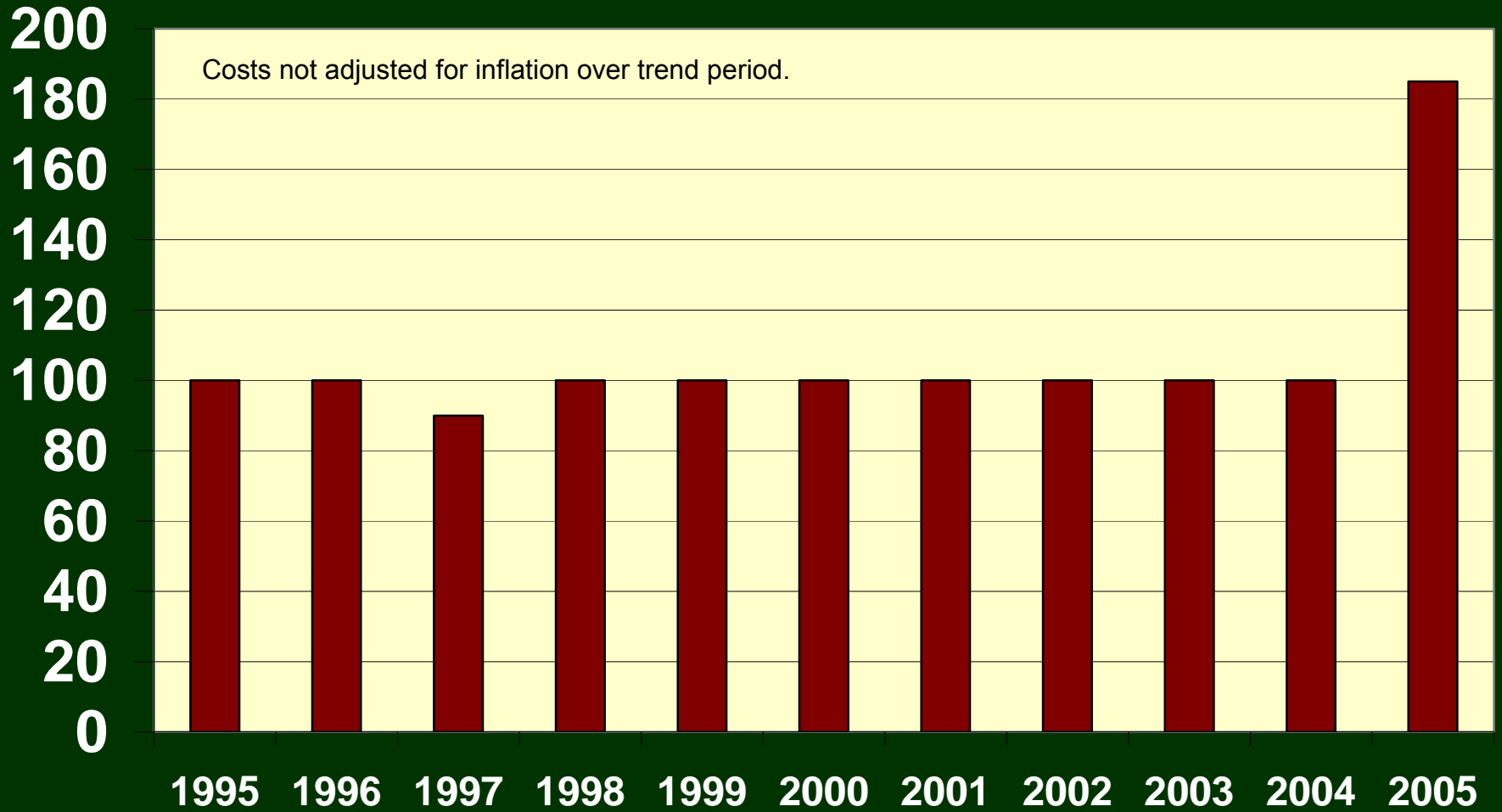
- **EMULSIFIED WAX**
- **SLACK WAX**

HISTORIC COST OF EMULSIFIED WAX (RELATIVE TO COST IN 2000)



HISTORIC COST OF SLACK WAX

(RELATIVE TO COST IN 1995)

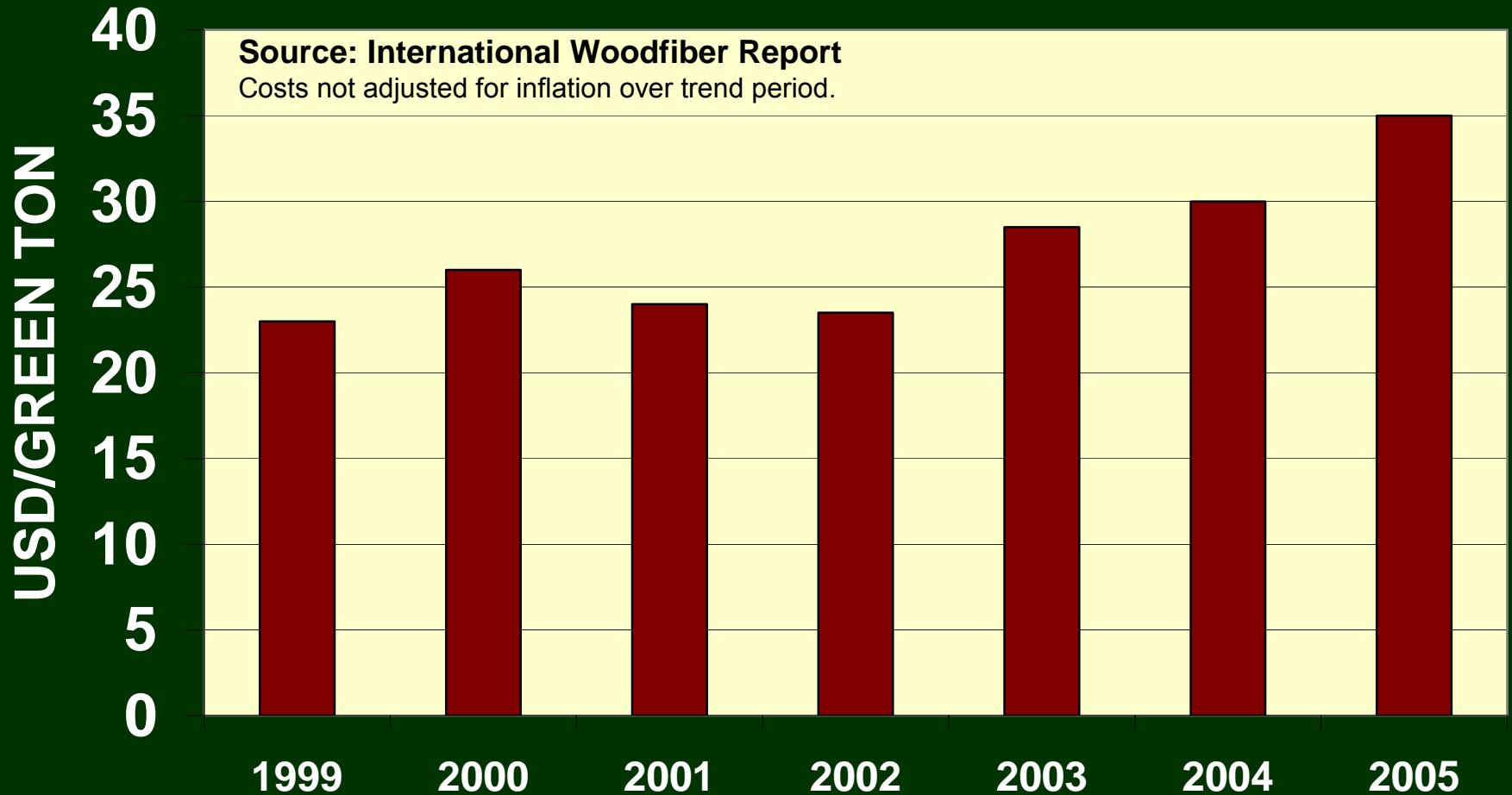


WOOD USED FOR WOOD-BASED COMPOSITES

- **HARDWOOD ROUNDWOOD**
- **SOFTWOOD ROUNDWOOD**
- **VENEER**
- **WOOD RESIDUALS (PLANAR SHAVINGS, TRIM & SAW DUST)**
- **LUMBER**

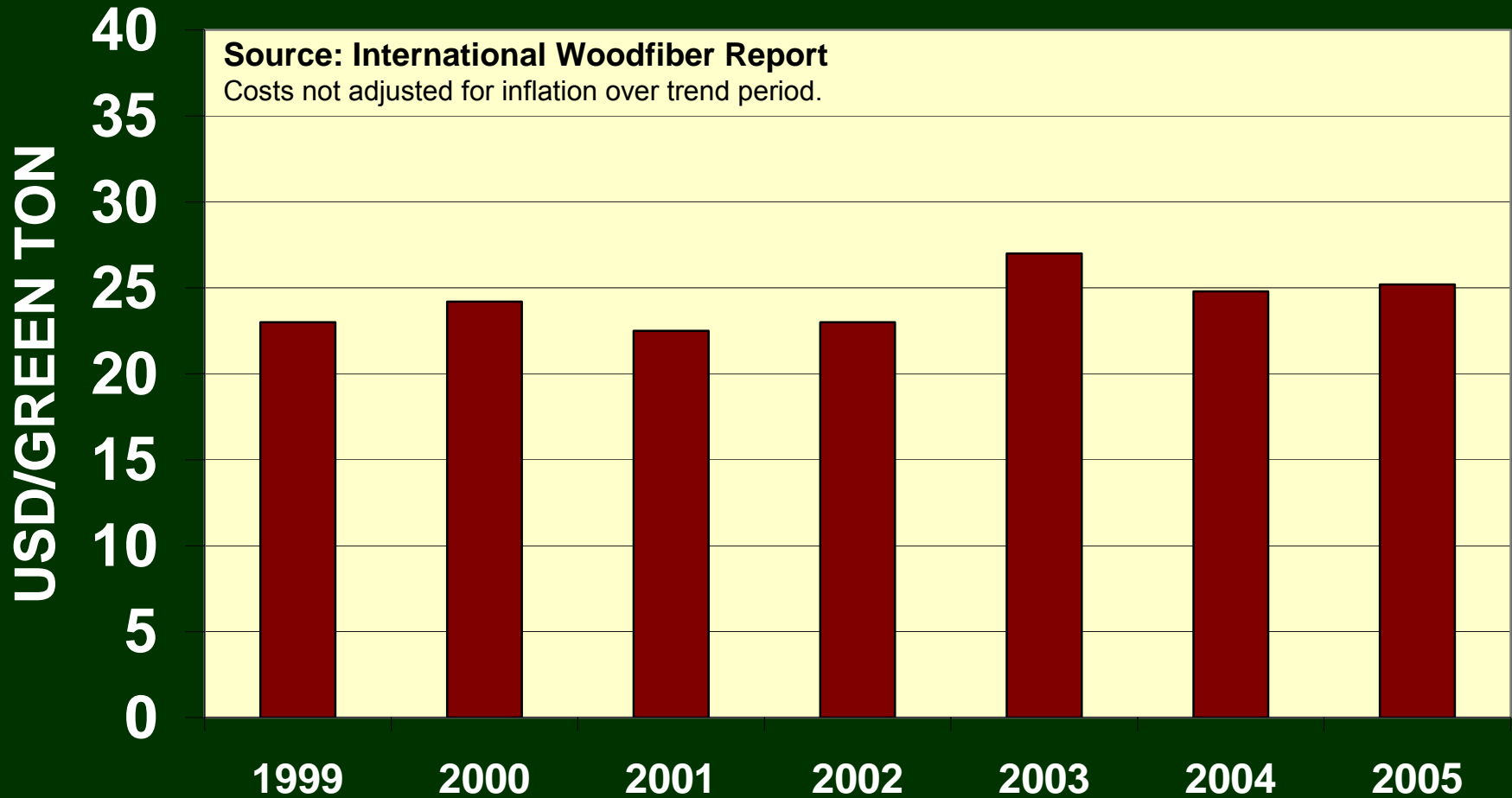
HISTORIC COST OF HARDWOOD

(NORTHEAST PRICES FOR ROUNDWOOD)



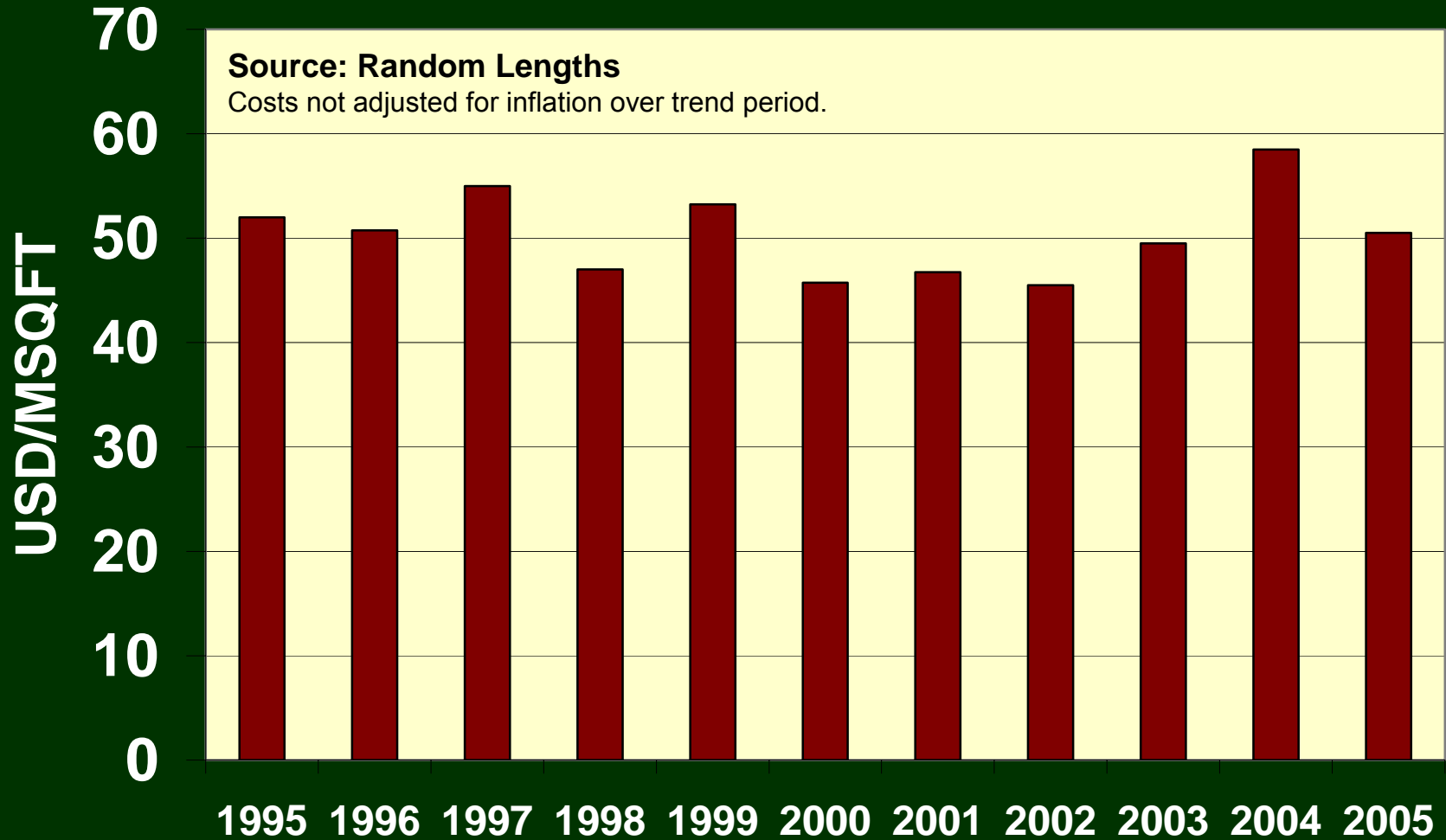
HISTORIC COST FOR SOFTWOOD

(EASTERN PRICES FOR ROUNDWOOD)



HISTORIC COST FOR VENEER

(WESTERN PRICES FOR DOUGLAS-FIR VENEER 1/10", CD, 54", 8', F.O.B. MILL)

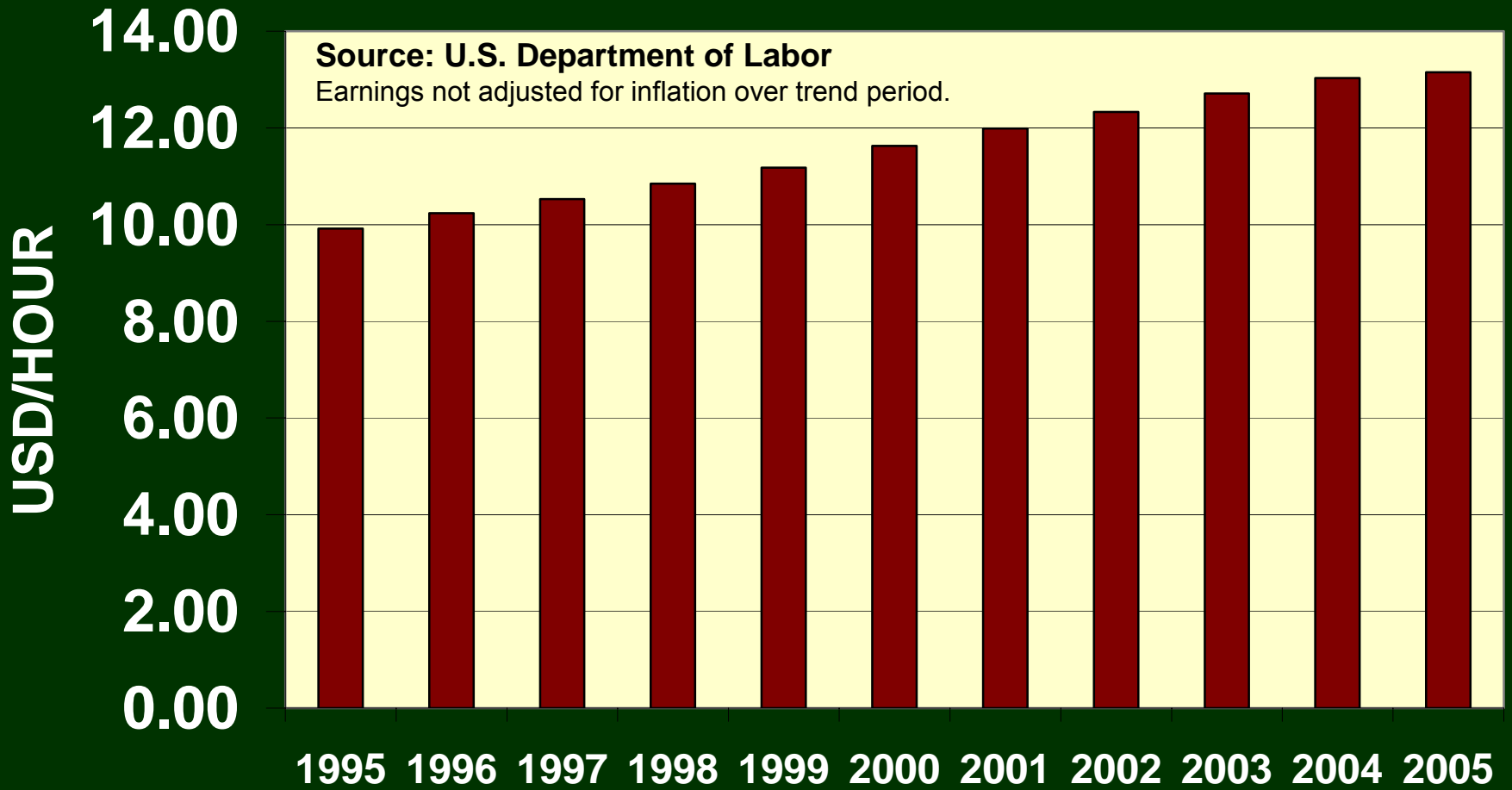


LABOR COSTS FOR THE PRODUCTION OF WOOD-BASED COMPOSITES

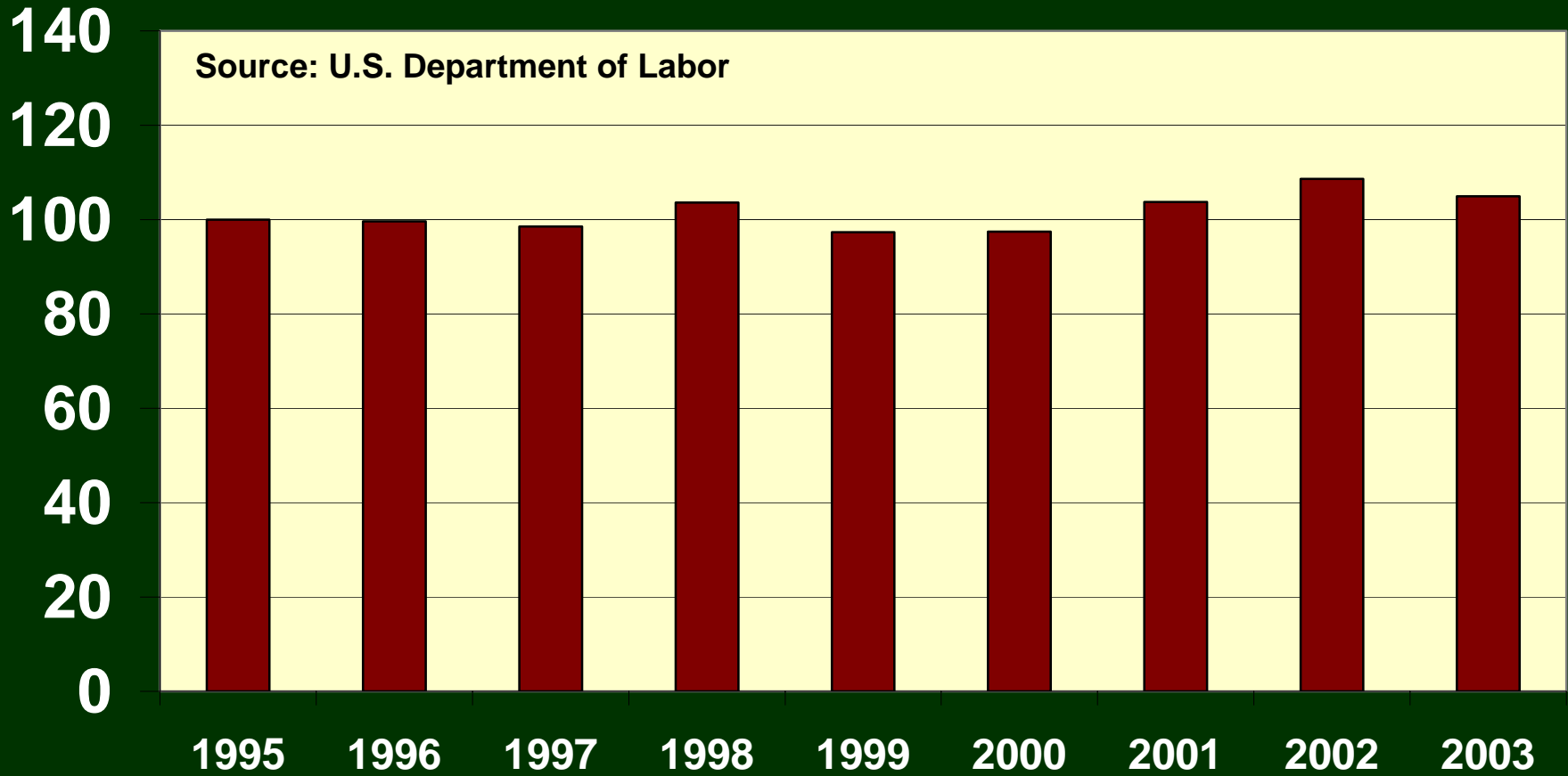
- **HOURLY EARNINGS**
- **OUTPUT PER HOUR**

HISTORIC HOURLY EARNINGS

(VENEER, PLYWOOD & E.W.P. MANUFACTURING)



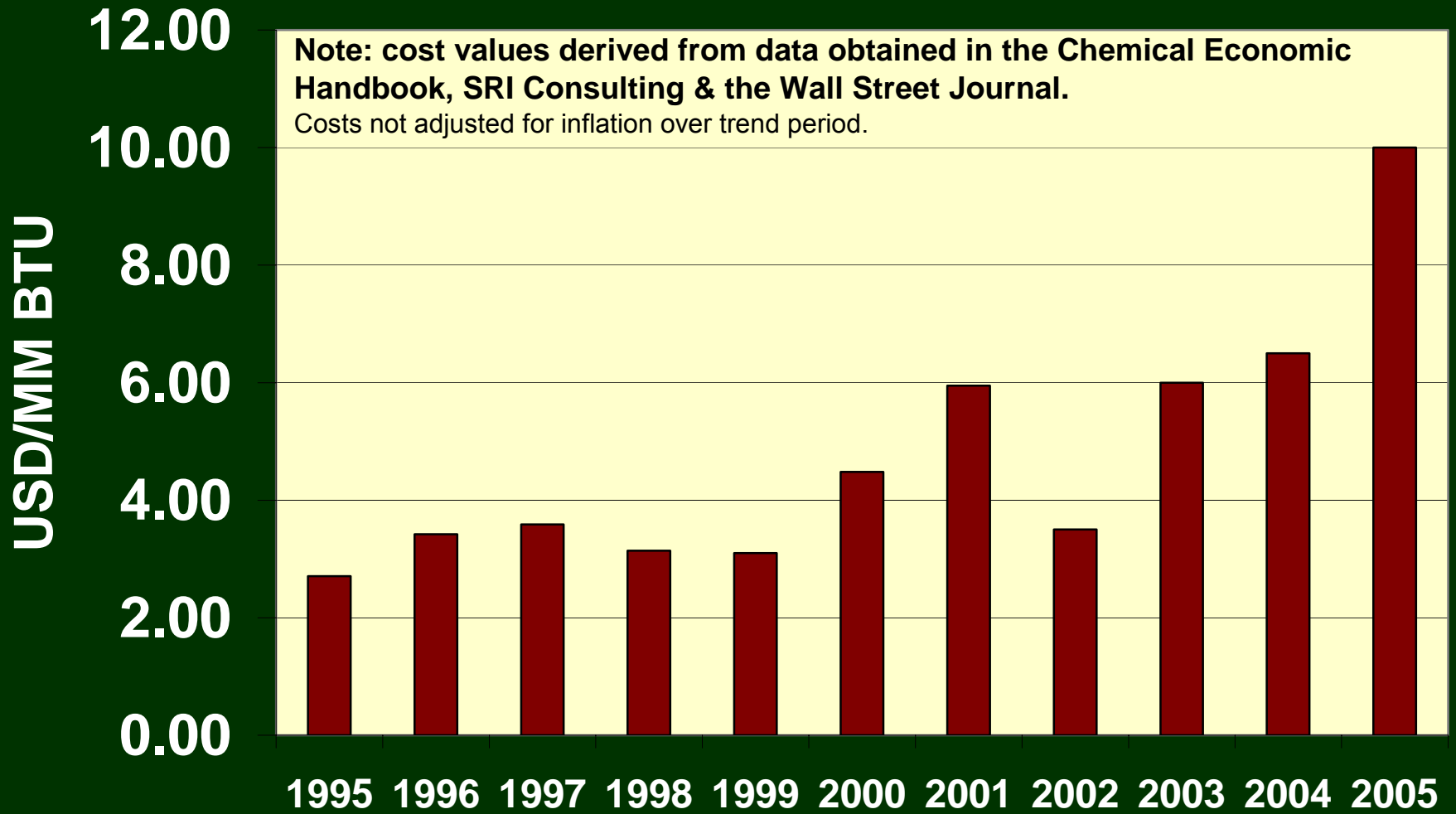
HISTORIC OUTPUT/HOUR (VENEER, PLYWOOD & E.W.P. MANUFACTURING) (RELATIVE TO 1995 OUTPUT)



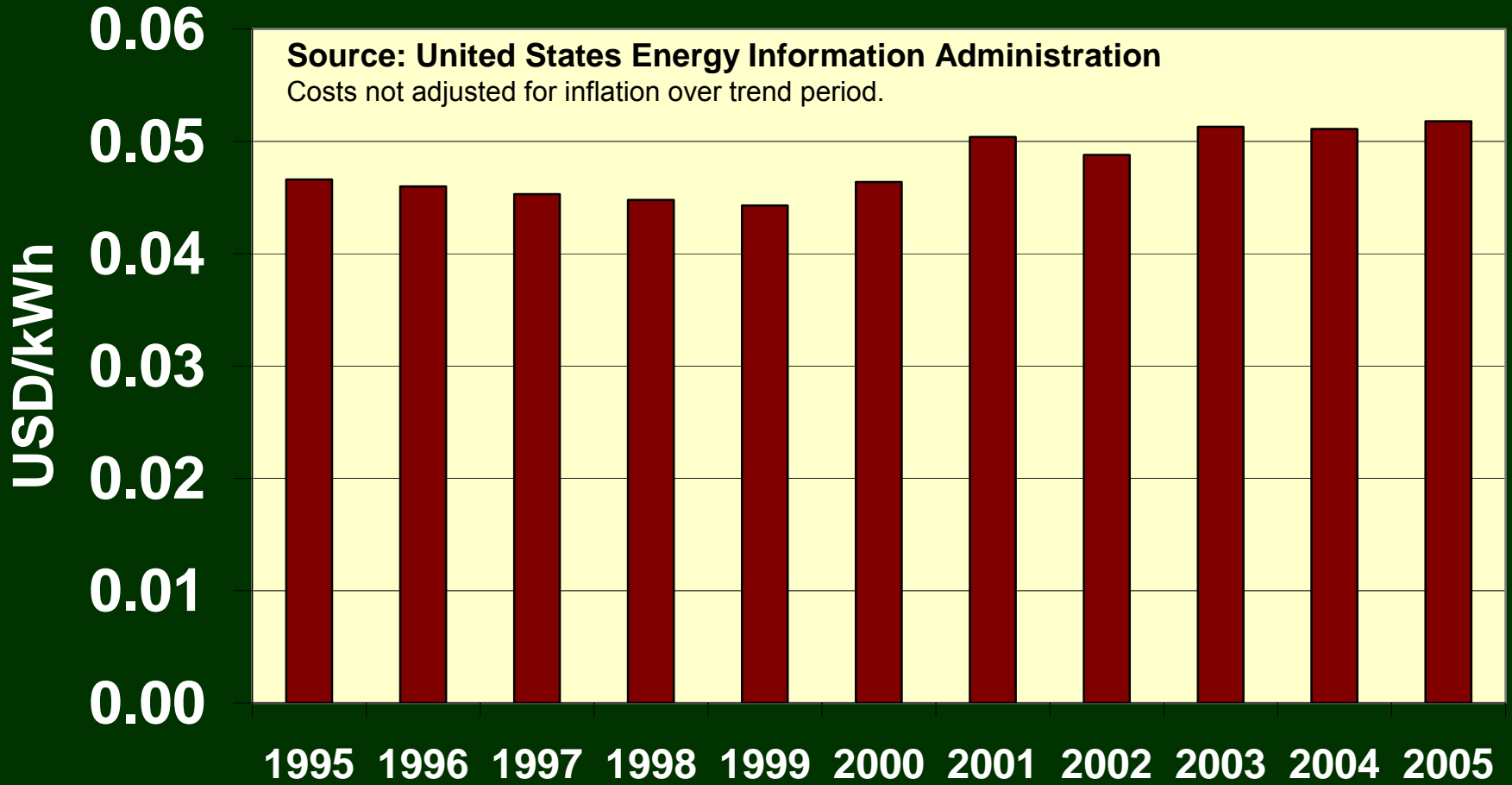
ENERGY COSTS FOR THE PRODUCTION OF WOOD-BASED COMPOSITES

- ENERGY-INTENSIVE PROCESSING CENTERS:
 - REFINERS
 - DRYERS
 - PRESSES
 - CONVEYORS, LIGHTING, CONTROL EQUIPMENT, SAWS, FANS
 - POLLUTION CONTROL DEVICES
- ENERGY SOURCES:
 - WOOD RESIDUALS
 - NATURAL GAS
 - ELECTRICITY

HISTORIC COST OF NATURAL GAS



HISTORIC RETAIL COST FOR ELECTRICITY IN THE U.S. INDUSTRIAL SECTOR



POLLUTION CONTROL FOR WOOD-BASED COMPOSITES

- NEW REGULATION (40 CFR, Part 63, Subpart DDDD, 9 69 FR 45944)
- **Air Toxics** (formaldehyde, methanol, acrolein, acetaldehyde, propionaldehyde, phenol, & more)
- Plants that emit 25 tons/yr of any combination of air toxics must use **M.A.C.T.**
- M.A.C.T. devices include **RTO's, RCO's, WESP's & biofilters.**
- E.P.A. predicts that about **half** of all wood-based composite mills will be required to use M.A.C.T.

COST ESTIMATE FOR M.A.C.T. TECHNOLOGY

(ANNUALIZED CAPITAL, INSTALLATION, OPERATION & MAINTENANCE)

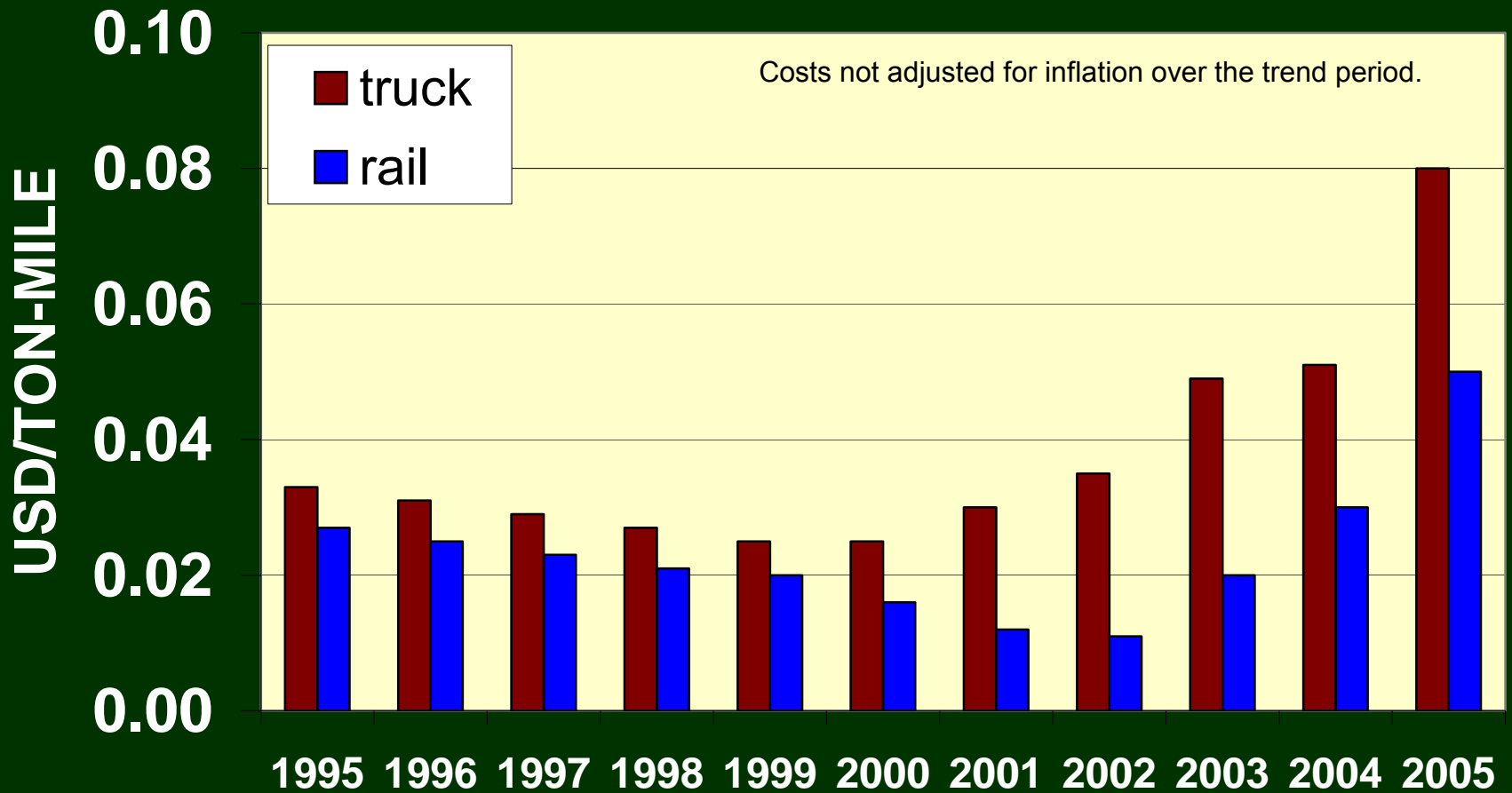
<u>MILL TYPE</u>	<u>ANNUAL COST (U.S.D.)</u>
OSB	0.5-3.0 MILLION
MDF	0.5-3.0 MILLION
PARTICLEBOARD	0.5-3.0 MILLION
PLYWOOD	0.3-1.5 MILLION
VENEER	0.3-1.5 MILLION

COST OF TRANSPORTING WOOD-BASED COMPOSITE PRODUCTS TO THE MARKETPLACE

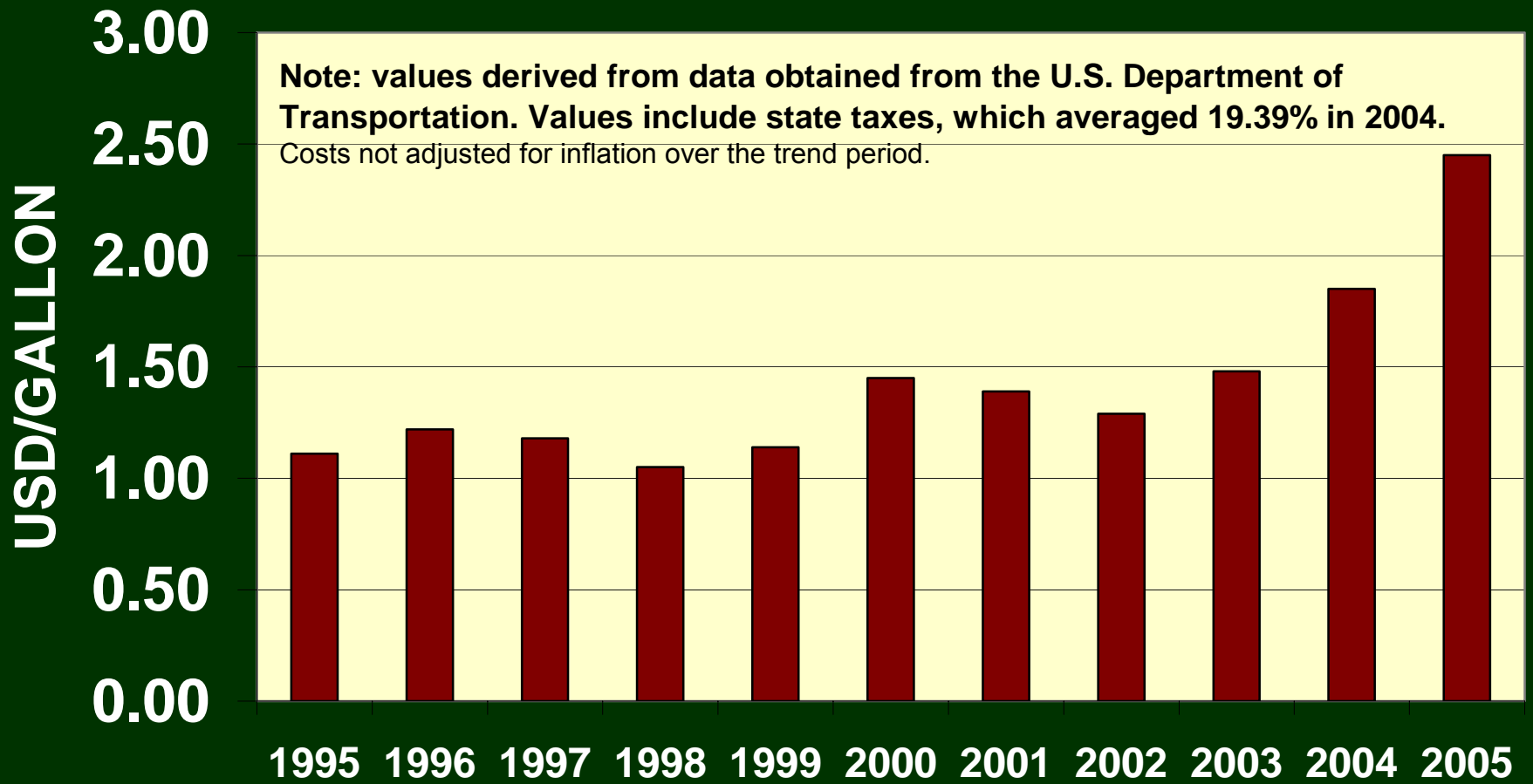
- **MAJOR TRANSPORTATION MODES:**
 - **RAIL** (superior fuel efficiency, infrastructure capacity, & safety record)
 - **TRUCK** (preferred mode due to speed, mobility & reliability advantages)

- **FACTORS AFFECTING TRANSPORTATION COSTS**
 - DECREASED DRIVER AVAILABILITY
 - INCREASED DRIVER COMPENSATION
 - HOURS-OF SERVICE REGULATIONS: 49 CFR, Part 395
 - INCREASED DIESEL FUEL COSTS

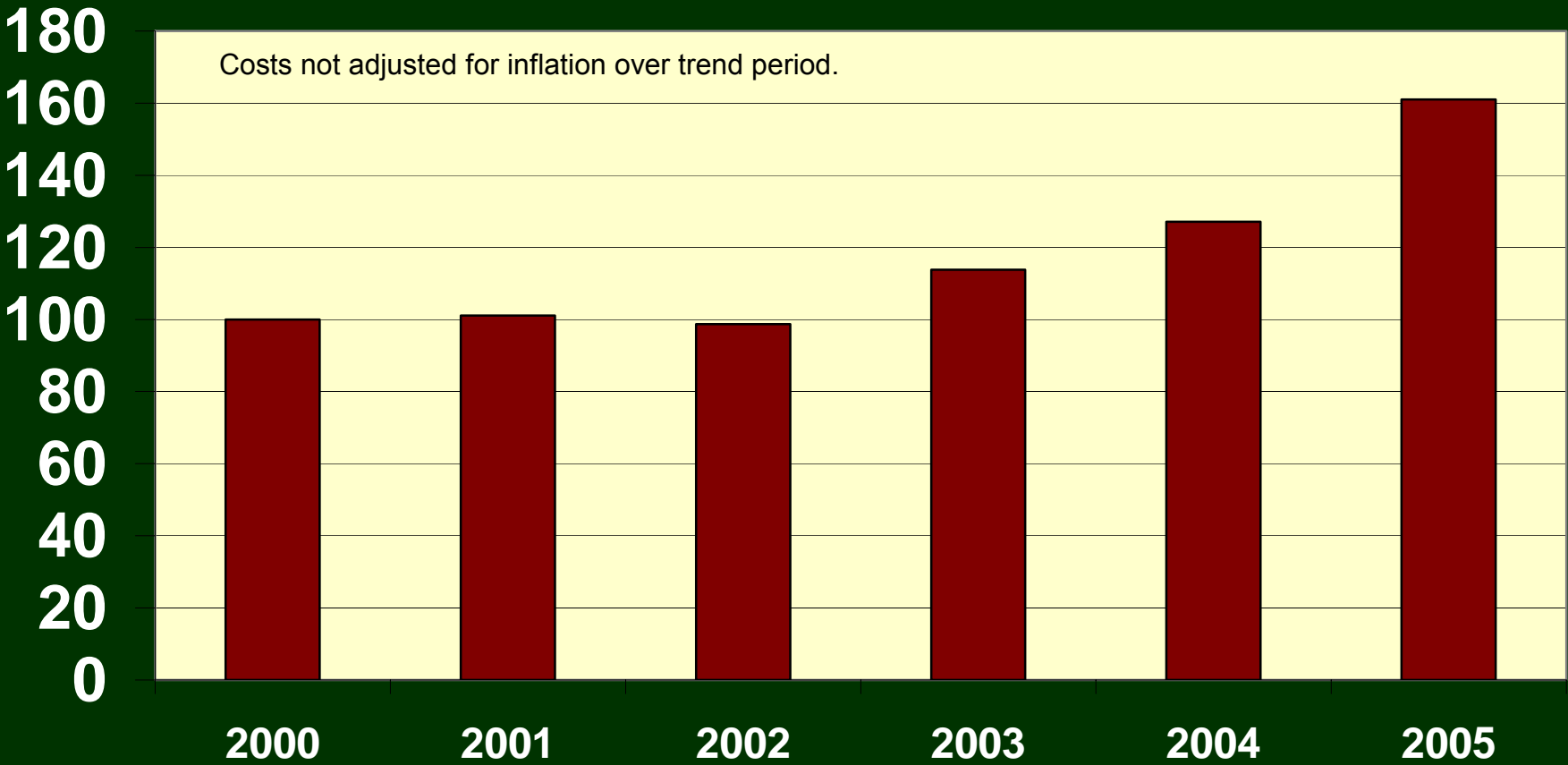
HISTORIC TRANSPORTATION COSTS FOR WOOD-BASED COMPOSITES



HISTORIC RETAIL PRICE OF NO. 2 DIESEL FUEL IN THE UNITED STATES



TOTAL COST TO PRODUCE & DELIVER A WOOD-BASED COMPOSITE PANEL (RELATIVE TO COST IN 2000)



SUMMARY

- The cost to manufacture & deliver wood-based composites in North America has increased substantially during the past three years.
- The cost increase is predominantly due to cost increases for:
 - ADHESIVES
 - HARDWOOD ROUNDWOOD
 - NATURAL GAS
 - POLLUTION CONTROL
 - TRANSPORTATION
- High prices for wood-based composites during the past two years have preserved a profit margin for most manufacturers.