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# INDUSTRY TRADE AND TECHNOLOGY REVIEW

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# PREFACE

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## *LISTING OF PUBLISHED ARTICLES*

**(February 1994 - October 1996)**

### February 1994

Recent trade treaties likely to stimulate continuing changes in global sourcing of apparel
Implications of beverage container legislation for industry, technology, and trade
Computer software and the U.S. copyright regime: Setting limits for intellectual property protection
U.S.-Japanese construction trade relations
NAFTA and Mexico's Maquiladora industry
U.S.-Canadian dispute on swine and pork trade

### May 1994

Microprocessor industry: Developments influencing global competition
U.S. bicycle industry creates innovative products using metal matrix composites
Aluminum product development and the automotive industry
Electric utility industry compliance with "acid rain" clean air standards portends favorable U.S. air pollution control equipment market

### August 1994

Computer outsourcing services: Telecommunication regulation affects global competitive position of U.S. firms
Systems integration services enhance U.S. global competitiveness
Economics and innovation spur shift from mechanical fasteners to adhesives and sealants in certain automotive applications
R&D consortia in the U.S. and Japanese automobile industry
India and Pakistan resist commitments to greater market access in the textiles and apparel sector

### October 1994

Bovine somatotropin (bst): An application of genetic engineering to increase milk production
Impact of environmental disposal laws on packaging worldwide
Titanium industry seeks new markets which could bring competitive benefits to end users
Regulatory environment impacts emerging personal communications industry
Emerging focus on quality systems registration enhances market prospects for the U.S. instruments industry

### March 1995

NAFTA update: Steady U.S. bilateral trade growth with Mexico faces mixed prospects in 1995
New manufacturing processes for materials: Government policies and programs towards commercialization
Globalization and growth herald new markets for passenger rail suppliers
Forces behind restructuring in U.S. apparel retailing and its effect on the U.S. apparel industry
Steel in residential construction: A potentially significant developing market

## *LISTING OF PUBLISHED ARTICLES--Continued*

### May 1995

Section 22: Uruguay Round Agreement changes U.S. operation of agricultural program
Telecommunication services: Bell companies act to join global network alliances
The information superhighway: Global implications from current test projects
Direct ironmaking: A case study in government and industry cooperation to commercialize new manufacturing processes for materials

### September 1995

Structural changes and competitive strategies of the U.S. footwear industry in the 1990s
U.S./EU toy safety standards and the implications for APEC harmonization
Comparison of production-sharing operations in the Caribbean Basin with those in Mexico and in selected East Asian countries
Free-trade zones: Global overview and future prospects

### December 1995

Financial services: An overview of the World Trade Organization's negotiations
Sol-gel: Industry seeks to commercialize energy-saving technology for existing and emerging markets
China's evolving grain trade opens new marketing opportunities for U.S. exporters
NAFTA update: Early signs confirm benefits

### April 1996

Approaching the next frontier for trade in services: Liberalization of international investment
The impact of Cubas's new foreign investment law
The development of information technology in the Arab world

### July 1996

Computer services: Examination of commitments scheduled under the General Agreement on Trade in Services
The global positioning system advances toward universal acceptance
Reformulated gasoline program achieves smooth transition

### October 1996

World textile and apparel trade: A new era
World shipbuilding and the status of the OECD Agreement to eliminate subsidies
Thin-slab casting/flat-rolling: New technology to benefit U.S. steel industry

# CONTENTS

# WORLD TEXTILE AND APPAREL TRADE: A NEW ERA

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*The Agreement on Textiles and Clothing (ATC) negotiated during the Uruguay Round of trade negotiations provides for the phaseout of import quotas established under the Multifiber Arrangement (MFA).*[1] *Given the prominent use of textile and apparel quotas by the United States, this new agreement likely will have a significant impact on trade in these products. This article highlights U.S. actions taken thus far to implement the quota phaseout and provides insight on implications for sector trade through 2005, at which time all quotas will be eliminated.*

World textile and apparel trade entered a new era in 1995 with the establishment of the new World Trade Organization (WTO)[2] and the entering into force of the ATC. Under the MFA, importing countries--including the United States, Canada, and many of those in Western Europe--limited the flow of imports from lower cost, developing countries largely by negotiated bilateral agreements that set import quota levels and annual quota growth rates.[3]

The main purpose of the ATC is to provide a systematic and gradual means of integrating world textile and apparel trade back into the trade norms set by the GATT. The ATC requires WTO members to phase out all MFA quotas in three stages over a 10-year period, ending January 1, 2005. Table 1 shows how quotas will be affected by two concurrent actions: (1) integration of products, involving removal of textile and apparel products from quota coverage, and (2) acceleration of growth rates for annual quotas on textile and apparel products still under quota during the transition period. For the most part, WTO members may choose which products to include in each integration stage. The accelerated growth of annual quotas, however, is inherently automatic. It is based on quota levels and growth rates existing prior to the entry into force of the ATC.

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[1] The Multifiber Arrangement (MFA) is a multilateral import quota program under which much of world trade in textiles and apparel has been conducted for more than two decades. In 1990 textile and apparel exports from MFA members to all destinations accounted for 80 percent of total world textile and apparel exports. There were 44 signatories to the MFA--including the European Economic Community as one--in 1992. General Agreement on Tariffs and Trade (GATT), *Multifibre Arrangement Extended for One Year* (press release), Dec. 9, 1993.

[2] The WTO is designed to operate in much the same manner as the GATT institutional arrangement that it replaced, that is, as a permanent forum for member governments to address their multilateral trade relations as well as to facilitate the implementation of the trade agreements negotiated during the Uruguay Round.

[3] The MFA was established under the auspices of the GATT in 1974 to deal with the occurrence of market disruption in importing developed countries, while allowing exporting developing countries to expand their share of world trade in these products. The MFA was an exception to established GATT rules in that it permitted actions at odds with two of the key GATT objectives: (1) the promotion of nondiscrimination among members and (2) the elimination of nontariff barriers.

**Table 1**
**Uruguay Round Agreement on Textiles and Clothing: Staging for product integration and accelerated growth of annual quotas**

| Stage (implementing date) | Minimum percent of trade to be integrated[1] | Minimum percentage increase to be applied to annual quota growth rates[2] |
|---|---|---|
| 1 (January 1, 1995) | 16 | 16 |
| 2 (January 1, 1998) | 17 | 25 |
| 3 (January 1, 2002) | 18 | 27 |

[1] Products to be integrated at each stage are to make up not less than the required minimum percentage share of 1990 imports of products listed in the annex to the ATC and are to include selections from each of the four product groups--tops and yarns, fabric, made-up textile products, and apparel.

[2] Article 2.18 of the Uruguay Round Agreement on Textiles and Clothing provides for the advancement by one stage of the acceleration of annual quota growth for countries qualifying as "small suppliers"--i.e., those that accounted for 1.2 percent or less of an importing country's total quotas, as of December 31, 1991.

Source: Compiled from the "Agreement on Textiles and Clothing" (articles 2.6, 2.8, 2.13, and 2.14), *Final Act Embodying the Results of the Uruguay Round of Multilateral Trade Negotiations.*

In 1995, the United States had quota agreements with 42 countries, covering approximately 40 percent of total U.S. textile imports ($18 billion) and 50 percent of U.S. apparel imports ($15.4 billion). The United States maintains quotas on textile and apparel imports from all of its significant foreign suppliers except the EU, Canada, Mexico,[4] and Japan. On January 1, 1995, U.S. bilateral quota agreements with WTO suppliers were superseded by the ATC. Bilateral agreements with non-WTO suppliers remained in place, for extension or renegotiation as their terms expire.[5] China and Taiwan are the largest non-WTO suppliers to the United States, accounting for 14 percent and 6 percent, respectively, of total U.S. textile and apparel imports in 1995.

## *U.S. Implementation of ATC Quota Phaseout*

As required under the Uruguay Round Agreements Act (URAA), the Committee for the Implementation of Textile Agreements (CITA) began implementing the provisions of ATC on January 1, 1995. Sixteen percent of U.S. textile and apparel trade was immediately integrated into the GATT, thus removing such products from quota eligibility. On May 1, 1995, CITA published the schedule of products to be integrated in the second, third, and final stages (table 2).[6]

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[4] Quotas on imports from Mexico are being phased out under the North American Free-Trade Agreement.

[5] The United States extended or renegotiated expiring bilateral agreements with Fiji, Laos, Oman, Qatar, Romania, Taiwan, and the United Arab Emirates in 1995 and with Bulgaria in 1996. The bilateral agreement with China, scheduled to expire at the end of 1996, also is expected to be renegotiated or extended. United States Trade Representative, *1996 Trade Policy Agenda and 1995 Annual Report of the President of the United States on the Trade Agreements Program*, 1996, p. 42.

[6] The ATC requires WTO members to provide a list of products to be integrated at least 12 months prior to the beginning of the respective integration stage. The United States provided its integration schedule for the full 10 years in an effort to provide certainty for planning purposes for all affected parties, including U.S. producers, U.S. importers, and

(continued...)

Table 2
**U.S. staged integration of textile and apparel products into the GATT**

| Stages (integration date) | Percent of 1990 imports[1] | Major products to be integrated |
|---|---|---|
| 1 (January 1, 1995) | 16.21 | Silk yarns, fabrics, and made-up textile products; certified hand-loomed fabrics; jute/bast fiber textiles and textile products; monofilament yarn; certified hand-loomed and -knotted rugs; certain coated fabrics; rubberized belts and hoses; plastic and rubber coated apparel and accessories; certain down-filled apparel; certain tents, tarpaulins, and sails; worn clothing; umbrellas; seat belts; and parachutes. |
| 2 (January 1, 1998) | 17.03 | Babies' garments; wool and manmade fiber hosiery; down-filled coats; silk apparel; special purpose fabrics; carpets and rugs; certain cordage and twine; manmade staple fiber prepared for yarn spinning; parts of footwear; and cotton brassieres. |
| 3 (January 1, 2002) | 18.11 | Cotton and manmade fiber robes; hats and scarves; certain neckties; silk blend and non-cotton vegetable fiber textile and apparel products; manmade fiber brassieres; certain gloves; manmade filament yarn and tow; glass fabric; curtains and drapes; knit fabrics; nonwoven fabrics; textile handbags and luggage; certain kitchen and table linens; certain blankets; bar mops; and surgical towels. |
| Final (January 1, 2005) | 48.65 | Most cotton, manmade fiber, and wool apparel; diapers; wool yarns and fabrics; most cotton and manmade fiber fabrics; bed linens; cotton pile towels; and cotton and manmade staple fiber yarns. |

[1] Based on 1990 U.S. imports of products listed in the annex to the Uruguay Round Agreement on Textiles and Clothing totaling 17.03 billion square meter equivalents (SMEs).

Source: Compiled from data in 59 F.R. 51942-51944 and 60 F.R. 21075-21130.

As required by the U.S. Uruguay Round legislation, quotas on the most import-sensitive products largely were scheduled to be eliminated during the final stage of integration. Products scheduled for integration in the first three stages involved largely those that were never subject to quotas, had no quotas in place, or had quotas that were underutilized (figure 1).[7] In contrast, 94 percent of the products to be integrated on January 1, 2005 are former MFA products currently under restrictive quotas.[8] Products in the final stage include mainly cotton and manmade-fiber textile and apparel products--the staples of the U.S. industry--and highly import-sensitive wool textile and apparel products.

Most of the less import-sensitive yarns and made-up textile products were scheduled for integration in the first three stages whereas most of the more import-sensitive apparel items and fabrics were scheduled for integration on January 1, 2005.[9] U.S. quota restraints are heaviest in the apparel categories, of which many involve quotas

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[6] (...continued)
U.S. trading partners. As of June 1996, no other importing country had provided product integration schedules past the first stage.

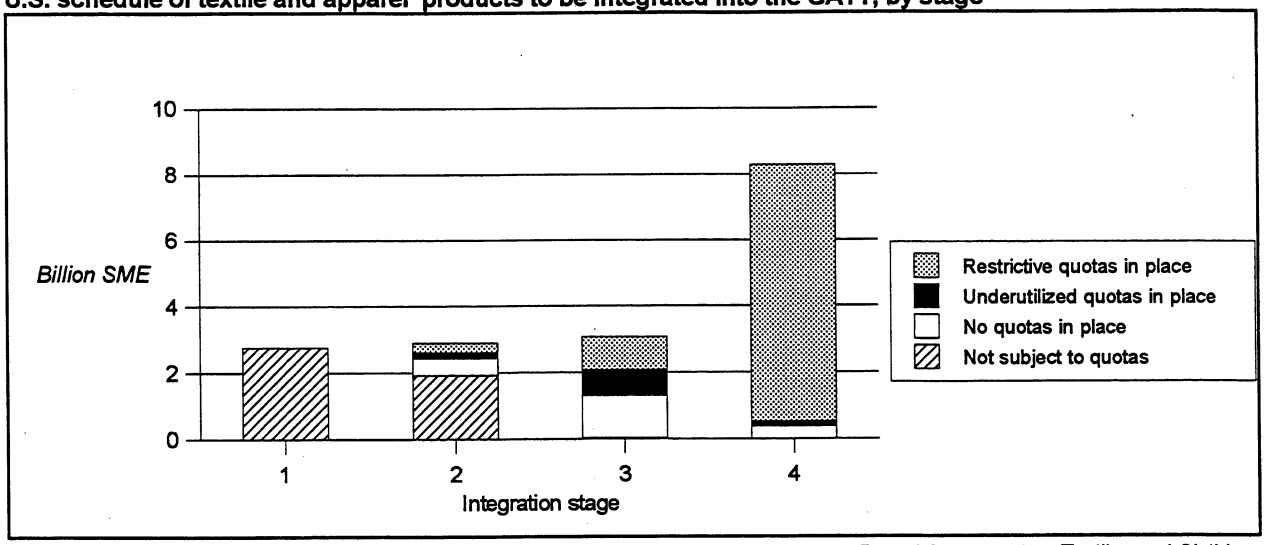
[7] Of the 1990 import trade in products listed in the annex to the ATC, 28 percent was never subject to quota. An additional 19 percent either had no U.S. quotas in place on WTO members or had quotas that were underutilized. For the purpose of this analysis, underutilized quotas include those with one or more WTO members where the quantitative limit was filled by 85 percent or less in 1994.

[8] Silk garments, which accounted for almost one-fourth of the apparel products in the second stage, involved quotas only on China, which is not a WTO member.

[9] Twenty-two percent of total apparel imports in 1990 and 42 percent of total fabric imports were scheduled for integration in the first three stages. In contrast, 87 percent of yarn imports in 1990 and 88 percent of made-up textile

(continued...)

**Figure 1**
**U.S. schedule of textile and apparel products to be integrated into the GATT, by stage [1]**




[1] Based on U.S. imports of textile and apparel products listed in the annex to the Uruguay Round Agreement on Textiles and Clothing equivalent to 17.03 billion square meter equivalents (SME) in 1990. The following guidelines were used for the purposes of this analysis: (1) products not subject to MFA quotas are those that were not assigned to a U.S. quota category, (2) products with no quotas in place are those assigned to a quota category, but had no restraints in place on WTO members in 1994, (3) products with underutilized quotas in place–i.e., those involving one or more WTO members with restraints that were less than 85 percent filled in 1994, and (4) products with restrictive quotas in place–i.e., those involving one or more WTO members with restraints that were 85 percent or more filled in 1994.

Source: Compiled from data in 59 F.R. 51942-51944 and 60 F.R. 21075-21130.

on 15 or more countries. For example, quotas in place on men's and boys' cotton and manmade fiber shirts involve more than 30 countries. Other heavily restricted products include cotton and manmade fiber coats, skirts, trousers and slacks, and nightwear.

Domestic producers attending the CITA hearing on product integration generally supported a schedule that kept quotas in place on import-sensitive items until the end of the transition period. Importers and retailers, however, requested that CITA implement a schedule that included more "meaningful" trade. A spokesperson for the retail sector recommended that CITA consider the following for early integration: (1) products of key concern to American families, such as children's wear, (2) products where U.S. producers are already competitive, such as cotton knit shirts and underwear and cotton and manmade fiber brassieres, and (3) products that are not available from U.S. producers at competitive prices, such as, textile luggage and hand bags, manmade fiber sweaters, silk-blend apparel, and men's and boys' cotton woven shirts.[10]

Exporting countries have also voiced their disappointment with the U.S. integration schedule. Pakistan submitted a paper to the WTO Council on Trade in Goods stating that although the United States and other importing

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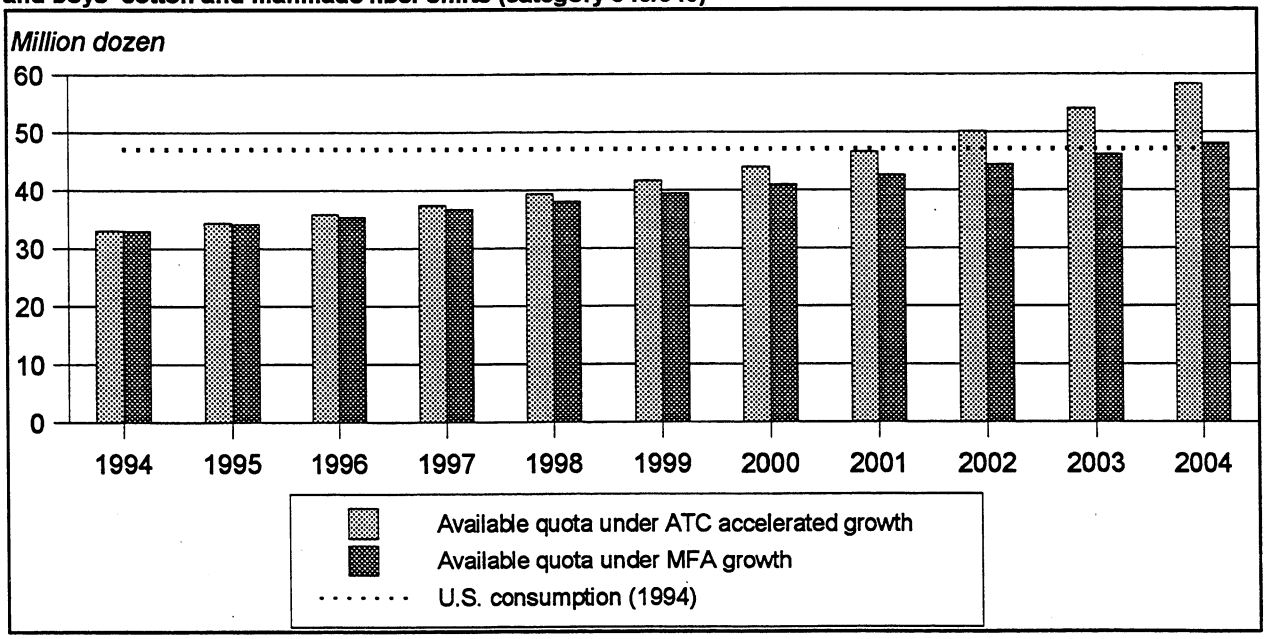
[9] (...continued)
product imports were scheduled for early integration.

[10] Robert P. Hall III, Vice President, Government Affairs Counsel, National Retail Federation before the Committee for the Implementation of Textile Agreement Hearing on Product Integration Under the Uruguay Round Agreement on Textiles and Clothing, Washington, DC, Mar. 20, 1995.

countries had met the 16-percent integration requirement for the first stage, the products that were chosen for early integration were not consistent with the overall objective of the ATC.[11]

To some extent, the accelerated growth in quotas will mitigate the effect of quota restrictions that are maintained on many former MFA textile and apparel products over the 10-year transition period. Reportedly, quota availability will likely exceed market demand for several product categories before the end of the transition period in 2005.[12] For example, as shown in figure 2, total quota availability in men's and boys' cotton and manmade fiber woven shirts (category 340/640) under the ATC accelerated growth will exceed 1994 U.S. consumption by 2002 whereas quota availability under the MFA would not have exceeded 1994 market demand until 2004. By 2004, the total quota available for these shirts will increase by 77 percent under the ATC compared to the 46-percent increase that would have been available under the MFA during the 10-year period. Overall, quota availability for WTO members will rise by 90 percent in the period, representing an increase of 151 percent for small suppliers and 71 percent for other WTO members. In contrast, non-WTO members, which are not eligible for accelerated growth, will experience quota growth of 23 percent during the period.

**Figure 2**
**Accelerated growth of annual quotas under the Uruguay Round Agreement on Textiles and Clothing: Men's and boys' cotton and manmade fiber shirts (category 340/640)**




Note.–Of a total of 52 countries supplying the U.S. market for men's and boys' cotton and manmade fiber woven shirts in 1994, 32 were subject to quotas. In 1994, imports accounted for 70 percent of the domestic market.

Source: Compiled from official statistics of the U.S. Department of Commerce, International Trade Administration, Office of Textiles and Apparel, *Summary of Agreements*, 1995 and *U.S. Imports, Production, Markets, Import Production Ratios and Domestic Market Shares for Textile and Apparel Categories*, 1995.

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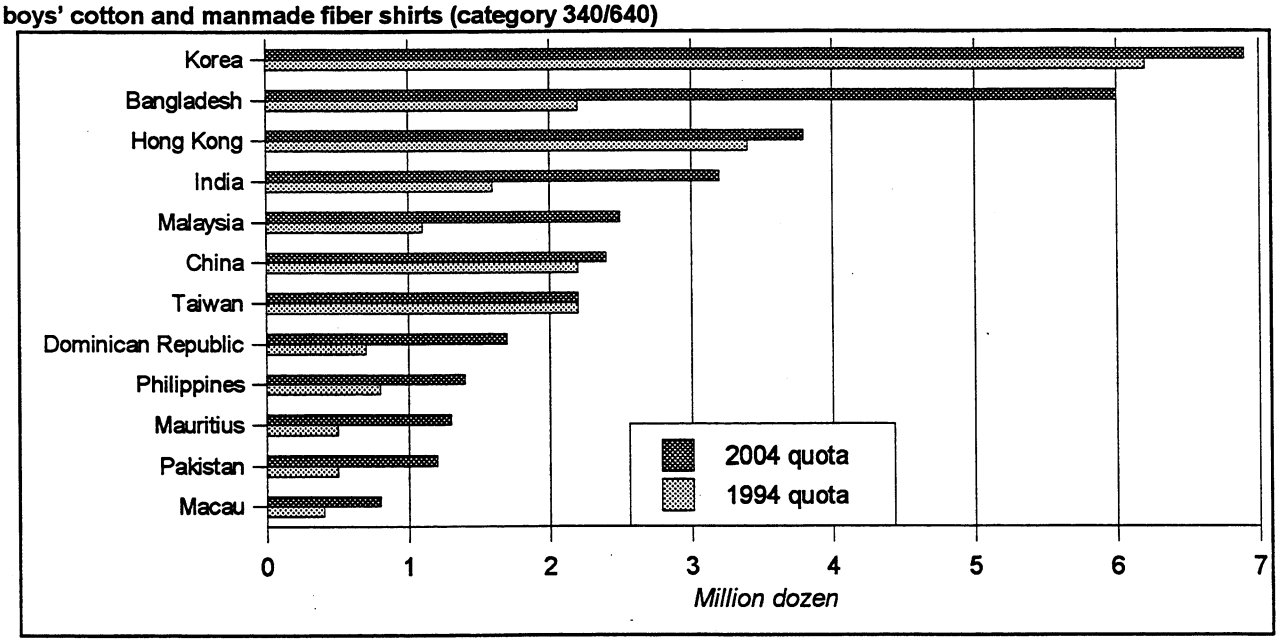
[11] U.S. Department of State telegram, "May 25 CTG Meeting on Textiles," prepared by U.S. Mission, Geneva, July 31, 1996.

[12] Testimony provided by Robert Antoshak of Trade Resources, Inc., a private consulting firm, before the Committee for the Implementation of Textile Agreements at the Hearing on Product Integration Under the Uruguay Round Agreement on Textiles and Clothing in Washington, DC, on Mar. 20, 1995; testimony included an analysis of the major textile and apparel quota categories comparing projected quota growth with 1993 consumption.

Countries that will experience some of the largest quota increases under the accelerated growth mechanism include Bangladesh, India, and Pakistan, which had annual quota growth rates in 1994 of up to 7 percent. Pursuant to the ATC, countries with small supplier status, such as the Dominican Republic, Macau, and Mauritius, experienced immediate annual growth rates at the accelerated rate of the second stage--i.e., an increase of 25 percent, rather than 16 percent. Korea and Hong Kong, with annual quota growth rates in 1994 of 2.5 percent or less, will experience the lowest levels of quota growth. Non-WTO members, such as China and Taiwan, will not receive accelerated quota growth benefits and will retain an annual growth of 3 percent or less. Figure 3 illustrates the quota acceleration in category 340/640 shirts for various countries over the 10-year transition period.

**Figure 3**
**Selected country quota growth under the Uruguay Round Agreement on Textiles and Clothing: Men's and boys' cotton and manmade fiber shirts (category 340/640)**




Source: Annual growth rates and quota levels from the U.S. Department of Commerce, International Trade Administration, Office of Textiles and Apparel, *Summary of Agreements*, 1995.

Quota growth will vary by product, and the actual effect on sector trade will depend not only on the additional quota available to individual countries, but also on their ability to use it. That is, countries with a history of high quota utilization likely would tend to use all or a substantial portion of their additional quota. In the case of Korea and Hong Kong, however, the amount of additional quota that could be used is questionable since increasing production costs in these countries have resulted in some loss of competitiveness with lower cost suppliers to the U.S. market. Overall, it is likely that accelerated quota growth in category 340/640 shirts will have a significant liberalizing effect on trade because of the relatively high quota use by supplier countries.

## *Factors Affecting the Quota Phaseout*

Several factors will affect the quota phaseout and the actual liberalization of U.S. textile and apparel trade during the 10-year transition period. These include the specific provisions of the ATC and how the United States will interpret and implement them. Actions taken by the WTO Textile Monitoring Body (TMB) may also have an

effect.[13] Any disputes related to the implementation of the ATC are heard by the TMB, which then provides recommendations. Issues that remain unresolved after going though the TMB process may be brought up before the WTO Dispute Settlement Body (DSB).

## Safeguard Actions

The ATC contains a provision for safeguard actions allowing the establishment of new quotas in order to control surges in imports that cause or threaten to cause serious damage to a domestic industry. New quotas may be put in place on uncontrolled imports that have not been integrated into the GATT for a nonrenewable period of up to 3 years, or until the products are integrated.[14] The United States was the only WTO member to use the ATC safeguard procedure in 1995, initiating 24 actions, involving 9 products and 14 WTO members.[15] New quotas were established under the ATC with Colombia, Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras, India, Jamaica, Sri Lanka, and Turkey.

At the meeting of the WTO Council on Trade in Goods, exporting countries complained about the number of safeguard actions that the United States had initiated during the first few months of 1995. India stated that the U.S. actions could not be considered a sparing use of the safeguard provision as called for by article 6 of the ATC, and Pakistan complained that the actions effectively reversed the liberalization required by the ATC. In reply, the United States explained that the number of safeguard actions initiated at the beginning of 1995 was due to a unique set of circumstances at that time and that the drop in the number of actions since then reflected the downturn in U.S. textile imports. However, the United States added that it remains ready to initiate new safeguard actions if market conditions warrant. The United States further stated that it felt justified in the actions it had taken and has implemented all TMB recommendations directed to it.[16]

## Rules of Origin

Pursuant to the URAA, the rules that determine the country of origin of textiles and apparel entering the United States were changed effective July 1, 1996. Rules of origin affect the determination of which country's quotas will be charged for particular imports when manufacturing processes occur in more than one country. For most apparel, the country of origin will be based on where the garment is assembled rather than on where the fabric components were cut (which applied to most garments under the previous rules). With regard to non-apparel products, such as bed linens, tents, sails, and pillow shells, the country in which the fabric is produced will be the country of origin rather than the country in which the fabric is cut and then sewn (as was generally the case under the previous rules).

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[13] The TMB supervises the implementation of the ATC, examines all measures taken under its provisions, and hears disputes related to the implementation of the agreement. The TMB is empowered to make observations, findings, and recommendations on any matter under the ATC referred to it by a member government.

[14] Products that have been integrated into the GATT will be subject to safeguard measures that are applicable under normal GATT rules.

[15] In 11 cases, agreements were reached on new quota limits. In 3 of 10 cases where the matter was raised as a dispute, the TMB issued a recommendation that the United States rescind the safeguard measure that had been applied, and the United States complied. In three cases where the matter could not be resolved, the cases were brought before the Dispute Settlement Body (DSB). In 1996, the quota with Sri Lanka was dropped and the quotas with Costa Rica and India were brought before the DSB.

[16] U.S. Department of State telegram, "May 25 CTG Meeting on Textiles," prepared by U.S. Mission, Geneva, July 31, 1996.

Hong Kong, Taiwan, and Singapore export a significant portion of garments of fabric cut domestically but assembled in China, thus, these economies may experience some negative impact from the new U.S. rules of origin. Such imports that were previously charged to the quotas of Hong Kong, Taiwan, and Singapore must be charged to China's quotas under the new rules. Given that China's quotas are highly utilized, the rules changes could have the potential to reduce the amount of goods eligible for entry into the United States. Similarly, European designer scarves made of silk fabric formed in China but dyed, printed, cut, and hemmed in Europe would also be considered as originating in China under the new rules. Bed linens, kitchen and bathroom textiles, curtains and quilted and embroidered goods from the Philippines (which has very little domestic fabric production) will now be subject to quotas of countries where the fabric forming the goods was made rather than to the Philippine quotas.

## Circumvention

The ATC provides measures available to WTO countries to help combat commercial fraud, particularly as it pertains to the circumvention of quotas. WTO members are obligated to combat fraud within their territories and, subject to their domestic law, to cooperate with other parties in the investigation of circumvention practices. In comparison with the MFA, the ATC specifies more clearly the process for consultation and the expected nature of collaboration between concerned parties. Possible remedies that may be pursued include the denial of entry of circumvented goods; adjustment to import charges to reflect the true country of origin of circumvented goods; and establishment of new quota restraints on third parties through which goods have been shipped.

In most of its more recent bilateral agreements, the United States negotiated the inclusion of strengthened anti-circumvention language, with the view that such provisions could be used in conjunction with the provisions of the ATC. Some exporting countries, however, have voiced concern over the application of the U.S. bilateral provisions under the ATC, specifically with regard to the use of unilateral action in cases where mutual agreement cannot be reached.

## Changes in Administrative Practices or Procedures

Article 4 of the ATC preserves the rights of all WTO members regarding changes in administrative practices or procedures that result in changes in the implementation or administration of quotas maintained under the agreement. Members initiating such changes are obligated to inform and consult with the affected member or members prior to the implementation of such changes "with a view to reaching a mutually acceptable solution regarding appropriate and equitable adjustment."

Article 4 has already come into play with the new U.S. rules of origin. In recent months, the United States has consulted with numerous countries that have alleged that the change in rules would disrupt trade and damage their respective industries. The Philippine Government, not satisfied with the outcome of initial consultations, requested that the TMB review the U.S. actions. The Philippine Government later withdrew its request, after further consultations with the United States.[17]

[17] P.T. Bangsberg, "U.S. Grants Textile Concession to Philippines," *The Journal of Commerce*, Aug. 2, 1996.

## Non-WTO Members

The ATC requires that the benefits of the phaseout of quantitative restrictions on textile and apparel trade be extended only to WTO members. Therefore, non-WTO members--such as China and Taiwan--are not entitled to receive the benefits of the ATC until they accede to the WTO. China is of particular concern because of the growth of imports from that country in recent years and its further potential should current market restrictions be removed. Although the United States has stated that it will not give China WTO benefits without its acceptance into the WTO, the terms under which that country will participate in the multilateral trade system have not yet been defined.[18] Furthermore, negotiation of substantive market opening commitments will continue to play a major role regarding the accession of any new members to the WTO.

## Market Access

The ATC requires all WTO members, both developed and developing countries alike, to "achieve" improved market access for textile and apparel products through such measures as cutting and binding tariffs, reducing or eliminating nontariff barriers, and facilitating customs, administrative, and licensing procedures. In view of the phaseout of MFA quotas, obtaining substantive market access commitments from exporting countries was a major priority to the United States. During 1994, the United States obtained commitments from most of its key foreign suppliers to reduce tariffs and eliminate nontariff measures, such as discretionary licensing systems and import bans on textile and apparel products. Particularly significant were the market access agreements reached under the Uruguay Round with India and Pakistan, whose markets have been essentially closed to textile and apparel imports for more than 40 years.[19]

Although many developing countries have committed to significantly improving market access for textile and apparel products, it is likely that U.S. exports to most of those markets will remain relatively low. In most cases, apparel-exporting countries do not have a sufficiently developed higher end market or wage levels high enough to permit purchase of reasonable quantities of U.S. textile and apparel products. Further, penetration of most foreign markets will be slow because developing-country members have up to 10 years to reduce their tariffs and eliminate nontariff barriers. However, increased worldwide market access may provide some indirect benefit to the U.S. textile and apparel sector, as some of the flow of exports from other countries may be diverted to the newly opened markets.

Sentiment that other countries need to live up to market-opening commitments appears to be growing among the U.S. policy makers. In July 1996, legislation aimed at ensuring the competitiveness of the U.S. textile and apparel industries and increasing access for U.S. textile and apparel exports to foreign markets was introduced in both the House and the Senate.[20]

# *Conclusion*

The elimination of MFA quotas likely will have a significant impact on the U.S. textile and apparel sector given the level of protection that such restrictions have provided domestic producers over the past two decades.

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[18] See 58 F.R. 67274.

[19] As background, see USITC, "India and Pakistan Resist Commitments to Greater Market Access in the Textiles and Apparel Sector," *Industry, Trade, and Technology Review*, Aug. 1994.

[20] See proposed legislation entered under H.R. 3654 and S. 1951.

However, given the actions of the United States thus far in implementing the ATC, much of the impact will be delayed until the final years of the transition period. The U.S. private sector remains divided on the issue. The domestic textile and apparel industries and the labor unions have largely supported the preservation of quotas on import-sensitive goods until 2005, whereas the retail and importing community has promoted earlier integration of such products. Some of the more globally oriented textile and apparel producers have called for accelerated elimination of some quotas.[21]

Since the enactment of the ATC, concern has been raised by certain U.S. and foreign interests, regarding the fact that much of the trade will remain under quota throughout the 10-year period, thereby giving domestic producers less incentive to begin adjusting to a quota-free market. Some observers believe that when most of the quotas are eliminated on January 1, 2005, there will be much industry pressure placed on the U.S. Government to provide extended protection. Despite the likely pressure to provide some type of relief, the United States, as a WTO member, is committed to eliminating all MFA quotas by January 1, 2005. Further, any pressure to provide relief from imports would likely be less than existed during the mid- to late-1980s, given that the domestic industry has become and will likely continue to become more globally oriented.[22]

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[21] For example, at the hearing on Product Integration Under the Uruguay Round Agreement on Textiles and Clothing held in Washington, DC, on March 20, 1995, the American Apparel Manufacturers Association and Levi Strauss & Co. provided testimony in support of early integration of yarn-dyed woven shirts, stating that the product was not available in significant quantities domestically.

[22] For further information on the globalization of apparel production, see *Industry & Trade Summary--Apparel*, USITC publication 2853, Jan. 1995.

# WORLD SHIPBUILDING AND THE STATUS OF THE OECD AGREEMENT TO ELIMINATE SUBSIDIES

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*A multilateral Agreement to end shipbuilding subsidies was not implemented by its signatories because the United States has not enacted necessary legislation. Implementing legislation passed the U.S. House in June 1996 (H.R. 2754), but has not passed the Senate. The U.S. shipbuilding industry is divided on the question of implementation. Large U.S. shipbuilders contend that implementation of the Agreement will end U.S. government-backed loans that are currently providing new impetus to their economic recovery. Smaller U.S. shipbuilders favor implementation because foreign subsidies have significantly reduced the global market share of the U.S. shipbuilding industry. This article discusses international efforts to address shipbuilding subsidies, the global market structure, the status of implementing legislation among signatory countries, and competitive factors that have raised U.S. and foreign industry concerns regarding implementation of the Agreement.*

The OECD took up the issue of shipbuilding subsidies after U.S. shipyards approached the U.S. Government during the late 1980s to protest their inability to compete with heavily subsidized foreign yards. The United States had unilaterally ended its shipbuilding subsidies in 1981, when Congress did not authorize any further funds for the Title XI Loan Guarantee Program.[1] After the loan guarantees stopped, U.S. shipbuilding capacity dropped by more than one-half, and U.S. yards ceased building commercial vessels for export, concentrating instead on shipbuilding for the U.S. Navy. Over the years various legislative remedies were proposed, intended to arrest the declining number of vessels built by the U.S. shipbuilding industry. At that time, the majority of U.S. yards maintained that the best route toward fair competition in international shipbuilding was, in fact, a multilateral agreement to reduce subsidies.

Until Congress adjourned in October 1996, it had been considering implementing legislation for a multilateral agreement designed to gradually eliminate government subsidies for shipbuilding, and to curb potential "injurious pricing" practices in the world's major shipbuilding nations.[2] The Agreement, formally entitled "The Agreement Respecting Normal Competitive Conditions in the Commercial Shipbuilding and Repair Industry," was negotiated over a period of 5 to 6 years under the auspices of the Organization for Economic Cooperation and Development (OECD). The Agreement calls for the elimination of such trade-distorting practices as subsidies, export credits,

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[1] According to the Maritime Administration, the program, established pursuant to Title XI of the Merchant Marine Act, 1936, as amended, provides for a full faith credit guarantee by the U.S. Government of debt obligations issued by (1) U.S. or foreign shipowners for the purpose of financing or refinancing either U.S. flag vessels or eligible export vessels constructed, reconstructed, or reconditioned in U.S. shipyards; and (2) U.S. shipyards for the purpose of financing advanced shipbuilding technology and modern shipbuilding technology of a privately owned general shipyard facility located in the United States. The Program is administered by the Secretary of Transportation acting by and through the Maritime Administrator. Under the Federal Credit Reform Act of 1990, appropriations to cover the estimated costs of a project must be obtained prior to the issuance of any approvals of Title XI financing.

[2] The implementing legislation consists of two bills, H.R. 2754 and S. 1354, each entitled, "The OECD Shipbuilding Trade Agreement Act." See later discussion for status of action by other shipbuilding nations.

tariffs, tied aid, and predatory pricing. It contains a binding dispute settlement process based on that of the World Trade Organization (WTO) and a strong enforcement mechanism. In 1995, the Agreement was signed by the United States, the Member countries of the European Union, Japan, Norway, and Korea. These countries also agreed to a Memorandum of Understanding (MOU) on Export Credits for Ships, that would establish guidelines for regulating export credits and guarantees for such vessels.[3]

Recently, despite broad-based historical support within the U.S. shipbuilding industry for a multilateral agreement, the U.S. industry has become divided over whether to support the terms of the OECD Agreement, which includes a reduction in the level of assistance allowable under Title XI. Large U.S. shipyards favor maintaining the current level of Title XI assistance, whereas smaller yards favor the implementation of the Agreement as it was negotiated. As a result, it appears that the larger U.S. yards have determined that current Title XI provisions, along with the protected market of the domestic trades,[4] confer a greater advantage to them than do the subsidies to their competitors provided by other countries. However, the Title XI funding level, $50 million a year in aid to the U.S. industry in the form of guarantees,[5] does not appear to be commensurate with subsidy levels in certain other countries. The total value of European subsidies is estimated to be more than $1 billion annually.[6] Nevertheless, Title XI funding ensures that the largest U.S. yards can continue to build vessels for the domestic trades, at least.[7]

## *The Shipbuilding Market*

The world shipbuilding market is characterized by intense competition. Although demand has been forecast to increase over a several-year period, reflecting a somewhat improving market and the perceived age of the world fleet,[8] prices have been declining, in part because of substantial overcapacity, but also partly as a result of improved productivity and increased outsourcing of components. Currency fluctuations also have an impact on prices.[9] All foreign yards have been subject to competitive pressures, and most have dealt with declining market shares and/or reduced prices by restructuring. In such an environment, government assistance often can be the determining factor in a yard's ability to win contracts. Such assistance can take numerous forms, including direct subsidies, loans at preferential rates, government guaranteed loans, restructuring assistance, and research and development assistance. Quantifying and correlating the value of measures of assistance among competing countries can be problematic.

Although market conditions have become increasingly competitive, Japan has remained the world's largest commercial shipbuilder. Japan's share of world ship completions (by gross tonnage) rose from 22 percent in

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[3] As of 1994, collectively these countries accounted for approximately 80 percent of worldwide production of ocean-going vessels. Major ship producers not a party to the Agreement include Brazil, China, Poland, Russia, and the Ukraine.

[4] The domestic trades include the Jones Act trade. The Jones Act requires that only ships built in U.S. yards, and owned and crewed by the U.S. citizens, may carry cargo from one U.S. port to another.

[5] According to the Maritime Administration, since the Program is a guarantee program, funds secured by the guaranteed debt obligations are obtained in the private sector. The primary sources for such funds include banks, pension funds, life insurance companies, and bonds sold to the general public.

[6] David E. Sanger, "Suddenly, as the Election Nears, Ship Subsidies Don't Seem So Bad," *The New York Times*, Oct. 3, 1996.

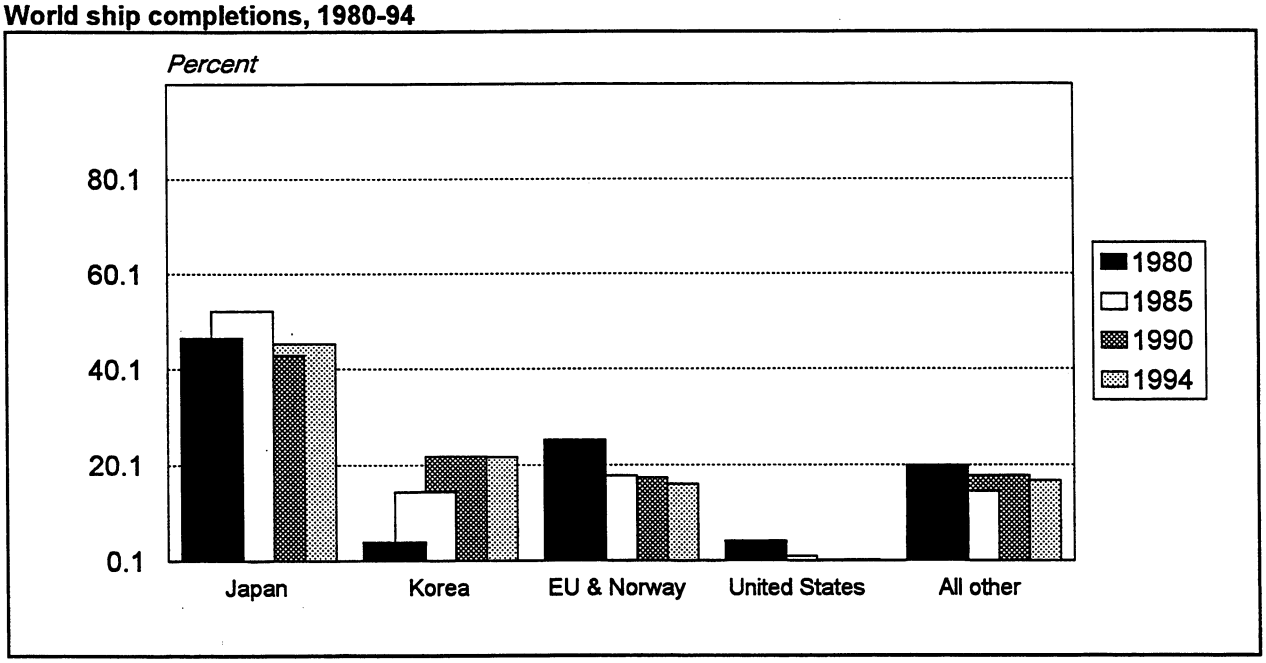
[7] Ibid.

[8] I.C. Davis, *The Ship Finance Market 1994-1995*, Daniel Stewart & Company, London, England, p. 4.

[9] Ship prices are dollar denominated. If the dollar drops against a shipbuilder's local currency, a vessel's selling price may not cover expenses based on the local currency.

1960 to a majority 53 percent share of world completions by 1984.[10] Through 1994, Japan's share held relatively steady at 45 percent of the world's completions; however, according to Japan's Institute of Marine Industries (IMI), Japan's share of orders dropped to 38 percent in 1995. Korea, now considered Japan's principal competitor, increased its position substantially, rising from less than 1 percent of completions in 1975 to nearly 22 percent of completions in 1994.[11] Also according to the IMI, Korea's position improved sharply to 32 percent of world orders in 1995.[12] By comparison (Figure 1), West European yards, which build a large number of passenger vessels, but fewer container, tanker, and bulkships than Far Eastern yards, have collectively maintained a smaller percentage of the world market.

**Figure 1**
**World ship completions, 1980-94**




Source: *Shipping Statistics Yearbook*, ISL, Bremen, Dec. 1995.

Despite lower prices and substantial competition from Korean shipbuilders, the Japanese shipbuilding industry has attempted to retain its competitive position through production rationalization and cost-cutting efforts.[13] A shipbuilding analyst has suggested that marginal companies may be eliminated from the Japanese industry because, at current exchange rates, Korean yards reportedly have an estimated 6-percent cost advantage over

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[10] Institute of Shipping Economics and Logistics, *Shipping Statistics Yearbook*, Bremen, Germany, Dec. 1995, pp. 307 and 359.

[11] Ibid, p. 308.

[12] Japan Institute of Marine Industry, "Report on Shipbuilding Trends," summarized in *Nikkei Sangyo Shimbun*, Jan. 23, 1996, as translated by Yong S. Park, and appearing in The ONR Asian Office's "Japan's Shipbuilder's Performance in 1995 and Projection for 1996, Relative to Korea's Shipbuilders," Jan. 23, 1996 [http://www.itd.navy.mil/ONRA/systems/1996/012396S1.html].

[13] Yong S. Park, Review on Japan's Shipbuilding: "Yards Battle Against Strong Yen," ONR Asian Office, Mar. 24, 1996 [http://www.itd.nrl.navy.mil/ONRA/systems/1996/032496s.html], commenting on "Japan Review," *Motor Ship*, Special Supplement, Feb. 1996.

Japanese shipbuilders.[14] To compensate, Japanese shipbuilders have attempted to improve productivity and lower costs by importing more production equipment at reduced prices, by using series production[15] techniques, and by improving manufacturing processes. Japan is hoping to maintain its superior position with respect to Korea by winning orders for vessels on the basis of better technology and better on-time delivery records.[16] In addition, country consortia are beginning to play a role in capturing competitive vessel contracts.[17]

There has been considerable concern among global competitors over the last few years about the significant increase in Korean shipbuilding capacity, which now equals that of all the Western builders combined. French builders have pointed out that Korean shipyards now employ 45,000 people, compared with 36,000 just 4 years ago, while combined employment in West European yards has fallen from 93,500 to 79,000.[18] In light of this, the potential elimination of West European subsidies is especially problematic. For example, French yards have been downsizing for some years, and German yards are undergoing substantial restructuring, partially as a result of difficulties stemming from reunification. Most of the former East German yards are in need of substantial investment for modernization.[19]

The global shipbuilding market is also undergoing a certain amount of restructuring because new entrants are competing for a relatively mature market,[20] which has resulted in diminishing market share for established shipbuilding countries.[21] A number of these new entrants, such as China and Poland, are gaining market share rapidly. For example, in 1995, Poland garnered about 5 percent of world shipbuilding orders, increasing to 1.62 million total tons from 0.95 million tons, or by nearly 59 percent, since 1994. The growing Chinese shipbuilding industry is benefiting from some assistance; the Export-Import Bank of China recently agreed to guarantee two

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[14] Japan Institute of Marine Industry, "Report on Shipbuilding Trends. "

[15] Series production refers to building a number of like ships using the same production processes to minimize costs.

[16] Japan Institute of Marine Industry, "Report on Shipbuilding Trends. "

[17] Kawasaki Heavy Industry, Mitsubishi Heavy Industry, and Mitsui Zosen jointly received a preliminary order of 10 container ships, valued at approximately ¥70 billion, from a Middle East shipping company. The contract was also bid on by a consortium of Korean shipbuilders including Hyundai, Samsung, and Daewoo Heavy Industries. The Japanese consortium's bid was accepted, reportedly because of more advanced technology and a better record of meeting contract delivery dates. While this order was for containerships, the three Japanese shipbuilders previously have received orders jointly for liquid natural gas (LNG) ships. It is the first time, however, that Korea's shipbuilders attempted a joint bid. The Japanese shipbuilders' price reportedly was competitive because they expect to take cost containment measures such as choosing standard designs and joint purchase of materials. Translation by Yong S. Park, "Japan's Three Shipbuilders Securing Order of 10 Container ships from Mid-East Shipping Company, Beating Competition by Korean Shipbuilders' Consortium," *Nikkei Sangyo Shimbun*, Jan. 23, 1996.

[18] Jeff Apter, "French Shipbuilders Fret Over Subsidy Agreement," *Journal of Commerce*, Knight-Ridder/Tribune Business News, June 14, 1996.

[19] Bremer-Vulkan, the largest of the German yards, is under investigation by the EU after allegedly diverting restructuring funds from former East German yards. Danish yards, while historically without subsidies, are at the center of a controversy involving an EU investigation of subsidy allegations. Bruce Barnard, "European Union Agrees To Extend Shipyard Subsidies," *Journal of Commerce*, Knight-Ridder/Tribune Business News, Sept. 24, 1996.

[20] Seiji Nagazuka, Japan Institute of Marine Industry, as quoted in "Report on Shipbuilding Trends, " summarized in *Nikkei Sangyo Shimbun*, Jan. 23, 1996, translated by Yong S. Park, and appearing in The ONR Asian Office's "Japan's Shipbuilder's Performance in 1995 and Projection for 1996, Relative to Korea's Shipbuilders," Jan. 23, 1996 [http://www.itd.navy.mil/ONRA/systems/1996/012396S1.html].

[21] For example, in 1996, world demand for new vessels is expected to decrease as a result of a 1995 decline in the number of tankers scrapped, and an increase in the number of orders placed for bulk carriers and container ships. Japan Institute of Marine Industry, "Report on Shipbuilding Trends. "

large-sum loans for the construction of vessels for export.[22] In 1994, China had 4 percent of world ship completions,[23] and its order book is increasing.

While the United States holds only a very small percentage of the global market at present, industry sources indicate that the larger U.S. shipyards are gaining orders, aided in part by the current U.S. Title XI shipbuilding program. Smaller U.S. yards, which have been operating to capacity building and repairing both military and commercial vessels on a global basis, therefore have been internationally competitive for some time. As a result, U.S. shipyard subcontractors have become increasingly competitive.[24] U.S. yards had only 0.2 percent of global completions in 1994, but as of July 1, 1995, U.S. yards had 1 percent of orders by tonnage.[25]

## *Characteristics of Proposed Implementing Legislation*

The proposed U.S. implementing legislation would add a new Title VIII to the Tariff Act, providing U.S. shipbuilders with protection from injurious pricing of vessels, because existing U.S. AD/CVD laws in Title VII of the Tariff Act of 1930 do not cover shipbuilding.[26] If enacted in its originally-proposed form, the implementing legislation would establish a procedure for determining injurious pricing; that is, investigating whether a foreign vessel has been sold in the United States at less-than-fair-value price and whether a U.S. industry has been injured or threatened with injury by such a sale. If a determination were made that a ship has been sold in the United States at less-than-fair-value, and the U.S. industry is determined to have been or is likely to be injured, an "injurious pricing charge" would be imposed on the sanctioned foreign shipbuilder. To ensure payment, "countermeasures" would be imposed if payment were not received within a specified period.[27] According to the proposed U.S. implementing legislation, countermeasures consist of not allowing the vessel or other vessels produced by the builder to call at a U.S. port. This would have the effect of reducing the usefulness and thus the value of vessels built by the yard in question.[28]

The terms of the Agreement and the proposed implementing legislation would also result in an end to duties on foreign repairs.[29] The proposed bills would amend the Tariff Act by eliminating the 50 percent ad valorem tariff

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[22] Xinhua (China News Service), "China's Eximbank Guarantees Syndicated Loan for Ships," Oct. 4, 1996.

[23] Institute of Shipping Economics and Logistics, pp. 307 and 359.

[24] U.S. Department of Commerce, International Trade Administration, Country Commercial Guides, Denmark: Economic Trends and Outlook 1995, Aug. 23, 1995.

[25] Institute of Shipping Economics and Logistics, *Shipping Statistics Yearbook*, Bremen, Germany, Dec. 1995, p. 333.

[26] Consumers for World Trade, "Shipbuilding Legislation Stuck in Dry Docked Congress," *Window on Washington*, Jan. 1996 [http://www.idsonline.com/cwt/pg5jan96.htm].

[27] Carl A. Valenstein, and Doug Hembrey, "Congress to consider Legislation to Implement OECD Shipbuilding Subsidies Agreement; Pact Would Reduce U.S. Title XI Program," Arent Fox Kintner Plotkin & Kahn, 1996 [http://www.arentfox.com/newslett/wir961a.htm].

[28] U.S. House, Committee on Ways and Means, Subcommittee on Trade, *Report on H.R. 2754, The Shipbuilding Trade Agreement Act*, Mar. 1996.

[29] Under the Tariff Act of 1930, the U.S. Customs Service assesses a duty equal to 50 percent of the value of all non-emergency repairs and maintenance, including parts, performed on U.S.-flag vessels in foreign shipyards. The provision calling for the non-application of the duty would be likely to reduce expected U.S. tariff revenue, although many observers believe that this will not be a significant obstacle to passing the legislation, since (1) the total number of U.S.-flag vessels already has been decreasing sharply for a number of years and (2) only about half of all overseas repairs and maintenance on U.S.-flag vessels is done in the shipyards of OECD Agreement signatory-countries. In

(continued...)

on overseas repairs and maintenance if these services are performed in the shipyards of a country that has signed the OECD shipbuilding Agreement.[30]

The changes in U.S. Title XI terms are generally viewed as among the most controversial provisions of the proposed implementing legislation. In 1993, the President signed legislation that reauthorized the Title XI loan guarantee program of the Merchant Marine Act of 1936, which enabled the U.S. Department of Transportation's Maritime Administration to guarantee loans to U.S. shipbuilders for the construction, reconstruction, and reconditioning of vessels. The 1993 legislation authorized a guarantee up to 87.5 percent of loans for the construction of vessels. The terms of the MOU on Export Credits for Ships as included in the Agreement would result in a reduction in the maximum Title XI loan guarantee rate from 87.5 percent to 80 percent. The MOU also would require all signatory countries to guarantee only loans that would be amortized within 12 years from the date of the delivery of the vessel. The Title XI program currently authorizes loans for a period of up to 25 years from the date of delivery.[31]

The MOU also includes a "standstill" clause that prohibits signatories from increasing the amounts of their subsidies prior to the date the MOU takes effect. However, the MOU allowed signatory countries to continue to make commitments of export assistance up to December 31, 1995, for vessels that would be completed by December 31, 1998. Since the United States did not put the Agreement that includes the MOU into effect by January 1, 1996, there remains uncertainty about the final date up to which signatory countries may make commitments, including assistance that exceeds the terms of the Agreement.[32]

## *The Enactment Process*

Before the Agreement can enter into force, it requires implementing legislation to be enacted by all of the signatory countries. As of mid-1996, all of the signatory countries had enacted implementing legislation, except the United States. The U.S. House of Representatives, on June 1, 1996, passed The Shipbuilding Trade Agreement Act (H.R. 2754) with an amendment that extended the loan guarantees another 30 months, until 1999. The addition of the amendment reflected a prevailing view among House representatives that the Agreement provides exceptions for government-backed restructuring in Europe and Korea.[33] The amendment also stipulates that nothing in the OECD Agreement may be interpreted as requiring the United States to weaken its cabotage laws under the Jones Act.[34] Despite passage by the House, the OECD date of June 15 to approve the shipbuilding Agreement passed without its entering into force, since the Senate has not acted upon the implementing legislation.

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[29] (...continued)
addition, there are a number of other exemptions to the duty.

[30] U.S. carriers support this provision strongly, as the present provision puts them at a competitive disadvantage against their foreign rivals, which may have repairs and maintenance performed at any foreign port without being charged a duty when they return home. Valenstein and Hembrey, 1996.

[31] U.S. House, Committee on Ways and Means, Subcommittee on Trade, *Report on H.R. 2754, The Shipbuilding Trade Agreement Act*, Mar. 1996.

[32] Valenstein and Hembrey, 1996.

[33] Bob Kemper, "House Approves Shipbuilding Anti-Subsidy Pact by Extending Subsidy," *Daily Press*, Newport News, VA, Knight-Ridder/Tribune Business News, June 14, 1996.

[34] William Roberts, "House Amendment Unravels World Trade Agreement Against Ship Subsidies," *Journal of Commerce*, Knight-Ridder/Tribune Business News, June 14, 1996.

The member countries of the European Union, Japan, Norway, and Korea are scheduled to meet with the United States in mid-March 1997 to assess prospects for passage of the agreement by the U.S. Congress. In the meantime, these signatory countries are expected to hold their subsidies at current levels under their standstill commitments.

## *U.S. and Foreign Concerns*

### Foreign Concerns

French shipbuilders were not satisfied with the terms of the Agreement; however, the industry was not able to persuade France's legislature to extend the period of time during which the shipbuilding industry could continue to receive government support.[35] Although the French industry criticized the Agreement as "remaining silent on artificial increases in building capacity that were not justified by a growth in the market," the Government of France asserted that it could use provisions in the accord allowing indirect aid to help French yards with research, development, and training to the amount of 2.6 billion French francs ($510 million), roughly equivalent to its past levels of indirect government support.[36]

In Japan, the decision to implement the Agreement was received by the Japanese shipbuilding industry with a number of doubts about its practical implementation.[37] Because Japan's shipbuilding industry holds a major portion of the world's market, the Japanese industry reportedly has concerns that a preponderance of cases filed may be directed toward Japanese yards. In addition, other difficulties regarding implementation (of the Agreement's provisions) that were noted by Japanese companies include the following:[38] 1) difficulty in establishing the basis for less-than-fair-value, since ship production takes from 2 to 3 years from securing an order to the date of delivery, and because exchange rates will fluctuate during the period; 2) difficulty with providing cost data that is based on a price comparison with the shipbuilders in the country that is filing the action; and 3) lack of clarity regarding the type of conditions that would constitute grounds for less-than-fair-value, given the level of competition in the world shipbuilding community. Japanese shipbuilders also expressed anxiety about the possibility of facing greater cost competition that could result in selling ships at depressed prices. However, sources also noted the converse possibility, that prices would rise if subsidies were eliminated, and that it would be to the industry's benefit if the Agreement leads to an improvement in ship prices after the steep declines of the last 2 years.[39]

### U.S. Concerns

The American Shipbuilders Association (ASA), which represents six of the largest U.S. shipbuilders, is opposed to the Agreement in its negotiated form. The ASA has stated that no Agreement is preferable to one that would

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[35] In Sept. 1996, The European Union agreed to extend the allowable level of shipyard subsidies (currently at 9 percent) until the end of 1997, or until the Agreement goes into effect.

[36] Apter, June 14, 1996.

[37] For further discussion of these issues see: Kumabashi Jo, ed., "OECD Agreement and Japan's Shipbuilding - Dumpings That Are Difficult To Prove - Problem Remains To Realize Co-existence Of Self-regulation And Self-restraint," *Nikkan Kogyo Shimbun*, Mar. 25, 1996, as translated by Yong S. Park, and appearing in The ONR Asian Office's "OECD Shipbuilding Agreement and Japan's Action", Mar. 25, 1996 [http://www.itd.navy.mil/ONRA/systems/1996/032596S1.html].

[38] Ibid.

[39] Ibid.

shorten the Title XI loan period from 25 years to 12 years, and reduce the amount to be financed.[40] The ASA also has maintained that the Agreement would allow foreign governments to challenge the Jones Act by imposing charges or placing bid restrictions on U.S. companies that build Jones Act ships, and that the MOU on Export Credits, by allowing foreign governments to continue to provide subsidies to their shipbuilders until January 1, 1999, would enable foreign shipbuilders to capture a sizeable share of a surge of demand for commercial newbuilding that is expected to last through this decade.[41]

According to the ASA, in 1995, Belgium, France, Portugal, and Spain adopted "special exceptions" to the subsidies disciplines in the MOU and that Korea's official efforts to boost its already sizeable shipbuilding capacity are "not covered or even addressed" in the Agreement.[42] However, U.S. Government representatives note that the Agreement prohibition on the sale of subsidized vessels indicate that official subsidies are, de facto, covered by the Agreement.[43]

The Shipbuilders Council of America (SCA), which represents 37 U.S. shipyards, supports passage of legislation to implement the Agreement, and maintains that failure by the United States to implement the Agreement may lead other signatories to abandon the Agreement.[44] The SCA views the Agreement as essential for smaller U.S. yards to be able to compete for foreign orders. According to the SCA, foreign subsidies have reduced the market share of the U.S. industry to less than 1 percent of vessels under construction, and have resulted in substantial job losses in the U.S. shipbuilding and ship repair industry, and the Agreement is the best way for the U.S. industry to be able to regain a measure of competitiveness.[45] The SCA also maintains, contrary to the ASA, that the Agreement does not allow other countries to continue their subsidies, and that subsidies are eliminated on the date the Agreement is entered into force, with no special exceptions for any signatory. Under the Agreement, the United States is the only country that is afforded protection of its cabotage laws, which require vessels engaged in the coastwise trades of the United States to be U.S.-built, U.S.-flagged and U.S.-crewed.[46]

The SCA has noted that "the Agreement does not eliminate the Title XI Loan Guarantee Program, but requires that Title XI conform to the international standard of 12-year, 80-percent guarantees. U.S.-flag carriers that own a majority of U.S.-flag tanker and liner vessels also support the implementation of the Agreement.[47]

## *Possible Consequences of Current Industry Positions*

During a substantial part of the negotiations for the Agreement, no Title XI financing was available to aid the U.S. shipbuilding industry, so that all U.S. shipbuilders were in favor of continuing negotiations.[48] Now, however, opponents of the implementation of the Agreement, including the ASA, assert that the current Title XI policy of 25-year/87.5 percent loan guarantees provides the United States' primary competitive advantage. On the other hand, smaller U.S. yards and the SCA believe that unless the Agreement is implemented, foreign

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[40] Valenstein and Hembrey, 1996.
[41] Ibid.
[42] Ibid.
[43] USTR official, telephone interview by USITC staff, July 17, 1996.
[44] Penny L. Eastman, President, Shipbuilders Council of America, "Opinion: Congress Must Vote to End Shipbuilding Subsidies," *The Journal of Commerce*, Knight-Ridder/Tribune Business News, May 13, 1996.
[45] Ibid.
[46] Ibid.
[47] Valenstein and Hembrey, 1996.
[48] Ibid.

shipyard subsidies will continue, ship prices will continue to decline, and U.S. yards will be unable to remain competitive internationally. As a point of note, as the United States has yet to pass the necessary implementing legislation, the European Union agreed in September 1996 to extend the allowable level of shipyard subsidies (currently at 9 percent) until the end of 1997, or until the Agreement goes into effect. The U.S. Congress again may address the issue of shipbuilding subsidies in 1997.[49]

Attempts to preserve the existing Title XI terms at the expense of the OECD Shipbuilding Agreement are likely to result in the continuing focus (of a number of U.S. yards) on U.S.-flag and Jones Act work (the domestic trades) rather than on the export market. According to the Maritime Administration, 79 percent of new Title XI loan guarantees approved in 1995-96 went to tankers in the Jones Act trades, even though the Maritime Administration also reports that, given existing tanker rates, a double-hull product tanker newly built for the domestic trades cannot be operated profitably.[50] However, Title XI loan guarantees enable U.S. shipyards to obtain contracts for domestic vessels that may not be economically viable to operate.[51]

With respect to international shipbuilding markets, in which the smaller U.S. yards must compete, it is possible that, if no Agreement to reduce subsidies enters into force, foreign yards will continue to receive subsidies that meet or exceed any advantage conferred by the current Title XI terms. Additionally, if subsidies are gradually bid up in a "subsidy war," this will keep all vessel prices low, and those nations with higher shipbuilding costs will be at the greatest disadvantage internationally.

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[49] Senate Finance Committee staff member, discussion with USITC staff, Oct. 1996.

[50] Tim Sansbury and Stephanie Nall, "Lawmakers Question MarAd Loan Program," *The Journal of Commerce,* Knight-Ridder/Tribune Business News, May 13, 1996.

[51] A vessel is not economically viable if capital costs are too high for the vessel to be operated profitably.

# THIN-SLAB CASTING/FLAT-ROLLING: NEW TECHNOLOGY TO BENEFIT U.S. STEEL INDUSTRY

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*This article is the fourth in a USITC series of ongoing Office of Industries research in the commercialization of new manufacturing processes for materials (NMPM). The commercialization of technology is considered an important factor in improving the competitiveness of industries. NMPM are viewed as potentially cost-effective means of ensuring increased productivity and efficiency.*

*Recent efforts to further develop and expand the role of thin-slab casting in the steel industry are highlighted. This process, combined with direct hot-rolling, greatly reduces capital investment and operating costs of producing hot-rolled carbon steel sheet. This article examines factors influencing adoption and commercialization of this technology, which has encouraged so-called "minimills" to enter the flat-rolled segment of the steel industry, until recent years the province solely of integrated steel producers.*

Certain recent and cumulative changes in steel casting and rolling,[1] called thin-slab casting/flat-rolling technologies, have lowered market-entry barriers, and have allowed the production of flat-rolled steel products (plate, sheet, and strip) in significantly smaller plants but with cost and quality benefits both to producers and to consumers. By altering cost structures, this technology has led to changes in steel industry market structure, and it may improve the international competitiveness of products the U.S. flat-rolled steel industry segment produces. This large market accounts for approximately 60 million metric tons of domestic shipments, and is a potentially lucrative source of revenues and profits to the cost-efficient producer.

Integrated steelmakers have dominated the flat-rolled steel market.[2] The capital costs of building a 3-million to a 6-million-ton-per-year integrated steel mill (the estimated minimum efficient scale[3] ) are estimated at more than

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[1] Most steelmakers today use a form of continuous-strand casting. Molten steel (produced in the furnace shop) is poured into one end of the continuous strand casting machine and is cooled, forming a metal skin around a liquid core (i.e., the molten steel solidifies from the outer cooled surfaces inward during the casting process) and a rectangular piece of steel is withdrawn downward from the bottom of the mold. At regular intervals, sections of the cast-steel strand are cut off, forming the semifinished product. This semifinished product is the raw material input for the hot-rolling mill, the subsequent process in a steel mill.

[2] Steel sheet is produced in a series of batch processes in an integrated steel mill: coke (produced from hard coal in coke ovens) is combined with iron ore and other raw material inputs in a blast furnace to produce molten iron and then refined in a basic oxygen furnace to produce steel. The liquid steel is then formed in a continuous-strand casting machine or ingot-casting molds into semifinished forms (called slab). Slab is usually inventoried and allowed to cool, but must be heated in a reheat oven to the proper temperature prior to being converted into flat-rolled products on the hot-strip mill. The resulting hot-rolled sheet may be cold-rolled and coated in subsequent processes.

[3] Minimum efficient scale of a plant refers to the smallest plant, measured by output or production capacity, for which economic production can be undertaken. Cost-size relationships are important in examining industry structure because, for many industries, increases in plant size lead to decreases in average cost. The cost necessary to achieve

(continued...)

$1,000 per annual ton of production capacity, which comes to about $4 billion to $5 billion per steel mill. This cost and the investment risk preclude the construction of "greenfield" integrated steel mills in the United States (none has been built since the 1960s), although considerable modernization of existing "brownfield" facilities has taken place. In contrast, a minimill[4] that produces thin-slab/flat-rolled steel can be constructed for about $200 per annual ton of capacity (equivalent to $400 to $500 million per mill), and it incurs lower operating costs (about 10 percent) in the production of steel sheet and coiled plate.

The shift toward small-scale technology is driven in large part by significant capital cost advantages of small-scale economies for producing many steel products. Even for existing plants, the annual reinvestment requirements are lower for smaller facilities. These economies--combined with Nucor Corp. (United States) operating success after installing the world's first thin-slab caster at a greenfield minimill--convinced five other companies to adopt this technology. The cumulative capacity of these eight thin-slab/flat-rolled mills may reach 16 million metric tons by 2000, and represents a significant increase of production capacity in this market segment that will likely affect U.S. imports and other domestic producers. In addition, three integrated U.S. steelmakers have selected thin-slab casting to replace obsolete ingot-casting facilities at brownfield sites.

## *Thin-Slab Casting Processes*

Significant reductions in minimum-efficient scale in the steel industry have occurred, brought about by better continuous casting technology that altered production of semifinished shapes (slabs, blooms, and billets).[5] These improvements, combined with certain others and with process linkage, simplified the economic production of steel products at significantly smaller plants, thereby lessening the capital needed to generate a dollar of sales.

Thin-slab casting technology evolved from continuous-strand slab casting, a process that was commercialized in the 1950s and which now accounts for more than 90 percent of total steel production in the United States.[6]

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[3] (...continued)
economies of scale may pose a barrier to market entry, or limit the number of firms in the industry. Several studies that estimate scale economies in the U.S. integrated steel segment suggest the minimum optimal size of conventional mills is 6 million net tons annually. For a recent study, see Robert P. Rogers, "The Minimum Optimal Steel Plant and the Survivor Technique of Cost Estimation," *American Economic Journal*, Sept. 1993, vol. 21, No. 3, pp. 30-37.

[4] Steel is typically produced in a "minimill" by refining steel scrap in an electric arc furnace. The molten steel is poured through a continuous-strand caster to produce semifinished products (usually, blooms and billets), that are hot-rolled on bar and rod mills. The steelmaking process in a minimill bypasses the coke-making and iron-making route, and the blooms and billets that enter the hot-rolling mill are typically smaller and lighter in weight than a slab. These differences along with the smaller scale of operations account for the smaller investment required for construction of a minimill and its lower operating cost, compared with an integrated mill. Significant advances in the technologies of electric arc steelmaking, secondary refining, and continuous-strand casting have allowed such minimills to increase in average production capacity, to begin producing thin-slab and flat-rolled products that had been largely restricted to integrated producers.

[5] Slabs are rolled to produce flat-rolled products including sheet, while blooms and billets are rolled to produce long products, including bar, rod, rails, and structurals. These semifinished products differ in terms of their dimensions, weight, the type of equipment needed for their processing, and their intended applications.

[6] Technological change is both incremental and continuous. The accumulation of incremental improvements or modifications to existing capabilities appears to be accelerating, and compresses the time frame for adopting and implementing new technology. An example is provided by thin-slab casting--in less than 10 years thin-slab casting progressed from an improved concept to full commercialization, and has nearly become a standard greenfield plant
(continued...)

Differences between thin-slab casting and conventional continuous-strand slab casting include the shape of the casting mold, the desired thickness of the slab, and the linkage of steel casting with direct hot rolling. The conventional continuous-strand slab casting technology produces a heavy slab[7] at a minimum of 8 inches thick. The capital investment required for this equipment and for the hot strip mill to roll the slab into sheet is high--on the order of $500 million to $1.5 billion.[8] In contrast, the thin-slab casting process makes a steel slab of about 2 inches thick with a much lower investment in the caster and rolling mill--approximately $150 million to $300 million.[9] This savings of investment and fixed costs is achievable because of two facts: (1) a thinner slab eliminates the need for primary breakdown in the hot-strip mill (enabling hot-rolling in the finishing stands of a conventional hot-strip mill); and, (2) the equipment needed to continuously cast a 2-inch thick slab is far less extensive than required for a conventional 8-inch or thicker slab.

Steelmakers adopting thin-slab casting also have tended to change plant configuration to link the caster with the hot rolling mill, and the slab immediately is rolled after casting. This change in configuration reduces the capital costs of slab handling equipment, and reduces the operating costs associated with reheating slab and maintaining slab inventories. However, steelmakers and consumers initially voiced concerns that steel sheet rolled from thin-slab casters would not possess desired formability and surface quality that would limit its use to less demanding applications. Another factor limiting application is posed by the maximum 60-inch width of such sheet (a maximum 80-inch wide sheet is produced by integrated mills).

There are currently six thin-slab casting versions that have been commercialized (shaded box). Although SMS Schloemann-Siemag is the dominant supplier of thin-slab casting machines, other equipment manufacturers have had success. Steelmakers and equipment manufacturers have relied on experience to create a second generation of thin-slab casters that include improved features such as electromagnetic braking, liquid-core slab reduction, and the capability to change slab thickness without downtime (termed by some as "flexible thickness" thin-slab casting). These enhancements have improved thin-slab cast sheet surface quality and, combined with further improvements in other aspects of steelmaking, allow producers of thin-slab cast sheet to move into more demanding market niches served by U.S. and foreign integrated steelmakers.

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[6] (...continued)
configuration.

[7] Dimensions are approximate, but the heavy slab measures about 8 inches to 12 inches thick, 6 feet to 8 feet wide, and 20 feet to 35 feet long. Slab thickness in thin-slab casting is typically about 2 inches but may range up to 4 inches or 5 inches in some versions.

[8] Estimates are for modernizing a brownfield site (existing mill) and construction of these facilities at an integrated mill on a greenfield (new) site. World Steel Dynamics (PaineWebber), Core Report ZZ, Dec. 1995, p. 14. For additional cost estimates see, Fr. William T. Hogan, S.J., *Minimills and Integrated Mills: A Comparison of Steelmaking in the United States* (Lexington, MA: Lexington Books, D.C. Heath and Co., 1987), p. 115.

[9] Ibid. Also see, Richard Preston, *American Steel: Hot Metal Men and the Resurrection of the Rust Belt* (New York: Prentice Hall Press, 1991), pp. 92-102. According to one industry executive, a 1.5-million-ton-per year sheet mill (including steel melt shop with casting and rolling facilities) can be built for about $300 million ($200 per annual ton of capacity), down from as much as $500 million 5 years ago. Martin Farricker, "Stepping in Gopher Holes Teaches Thin-Slab Lessons," *American Metal Market, Electric Furnace Steel Supplement*, Feb. 14, 1996, p. 19A.

*Commercialized Thin-Slab Casting Processes*

- ***Compact-Strip Production (CSP)*** is based on casting technology developed by SMS Schloemann-Siemag (Germany). A 50-millimeter (approximately 2 inches) thick slab is cast, which is then passed through a tunnel "equalizing furnace" and "hot-charged" into the finishing stands of a conventional hot-strip mill. CSP was the first thin-slab casting technology to be commercialized and is the most widely used process worldwide.

- ***In-Line Strip Production (ISP)*** was developed by Arvedi (Italy) and Mannesmann Demag (Germany). The as-cast 60mm slab is "soft" reduced to 40mm thickness by a set of rolls located below the mold, then the fully solidified slab is reduced to a 15mm-thick sheet by three shaping stands. ISP was commercialized at the Arvedi plant in Cremona, Italy. A similar casting-rolling process has been developed by Danielli (Italy) which also uses liquid core reduction (in use at Nucor, Hickman, AR and Algoma Steel, Canada).

- The ***Continuous Casting and Rolling (CONROLL)*** process was developed by Voest-Alpine (Austria). Slab thickness can be varied between 75mm to 125mm (3 to 5 inches thick); the slab is processed through a re-heating furnace (similar to the equalizing furnace) and channeled directly into the existing hot strip mill consisting of a roughing stand and six finishing stands. This was installed for use at Armco's plant in Mansfield, OH, and the existing plant was reconfigured to minimize process discontinuities between caster, reheat furnace, and rolling mill. This process does more hot-rolling (i.e., a greater amount of reduction in thickness is achieved in hot-strip mill) compared with CSP or ISP.

- The ***SMI*** process was developed by Japanese equipment makers Sumitomo Heavy Industries and Mitsubishi Heavy Industries. Slabs will be cast to a thickness of 90 mm but reduced to 70mm using liquid core reduction techniques (similar to the ISP process), channeled through a tunnel equalizing furnace into a hot strip mill with two roughing and five finishing stands. The SMI process reportedly is being installed at Trico Steel in Decatur, AL. Like CONROLL, more hot-rolling is performed in the SMI process compared with CSP or ISP.

- The ***Tippins-Samsung Process (TSP)***, named for the two equipment manufacturers, produces a variable thickness slab from 75mm to 150mm (3 to 6 inches) that is channeled through a reheat furnace to a two-stand reversing hot-strip mill. Reportedly, this design allows the production of plate up to 120 inches wide, good surface quality, and potential production capacity of between 1 and 2 million metric tons, at a cost of about $300 million. According to industry sources, it might be installed at Nova in Czech Republic.

- The ***Ultra Thin Hot-Strip (UTHS)*** process is being developed by Mannesmann Demag (Germany) and Chaparral Steel (United States), reportedly is to be installed at Natsteel, Singapore. A 90mm thick (3.5-inch) slab is cast, followed by breakdown rolling and finishing rolling down to below 1 mm thick.

Source: Compiled by staff of the USITC from various industry publications.

## *Commercialization of Thin-Slab Processes*

Since the mid-1980s, foreign equipment manufacturing companies and steelmakers in the private sector have developed thin-slab casting processes. Nucor Corp. commercial success with the first thin-slab caster (CSP design) installed at a greenfield minimill in 1989, has encouraged construction of more thin-slab casting facilities in the United States (table 1) and abroad. Approximately 20 companies worldwide have adopted or plan to adopt one or a combination of thin-slab casting technologies. The majority are in the United States, but the remainder are spread in Canada, Mexico, Japan, Korea, Malaysia, Thailand, China, Turkey, Czech Republic, and Italy. Each of the U.S. greenfield plants is a scrap-based electric furnace steelmaking operation (minimill) that has an actual or planned production capacity that exceeds 1 million metric tons annually (the majority plan for an expansion of production capacity to 1.5 to 2 million metric tons). In several instances in the United States, a traditional integrated company has formed a thin-slab minimill joint venture with an existing minimill company (e.g. Dofasco and Co-Steel, and BHP and North Star). Also, several U.S. integrated firms that currently operate coke-making, iron- and steelmaking facilities have adopted thin-slab processes, replacing obsolete ingot casting technology[10] and reducing production costs (table 1).

**Table 1**
**Thin-slab production capacity installed and announced in the United States, by company, facility location and process, capacity, and year expected to become operational**

| Company | Facility location/process | Capacity[1] (*Million metric tons*) | Year[2] |
|---|---|---|---|
| **Greenfield minimill plant construction** | | | |
| Nucor | Crawfordsville, IN/CSP | 1.0 + 1.0 | 1989 & 1994 |
| Nucor | Hickman, AR/CSP&ISP | 1.2 + 1.0 | 1992 & 1994 |
| Gallatin Steel[3] | Ghent, KY/CSP | 1.2 + 0.9 | 1995 & mid-1997 |
| IPSCO[4] | Muscatine, IA/ISP | 1.3 + 0.2 | 1996/97 |
| Steel Dynamics | Butler, IN/CSP | 1.0 + 1.0 | 1996/98 |
| Nucor | Charleston, SC/CSP | 1.0 + 0.6 | 1997/98 |
| Delta Steel[5] | Delta, OH/SMI | 1.6 + 1.0 | 1997/99 |
| TRICO[6] | Decatur, AL/SMI | 2.1 | 1997/98 |
| Total | 8 facilities | 10.4 - 16.1 | |
| **Brownfield integrated plant modification** | | | |
| Geneva Steel | Provo, UT/TSP | 1.9 | 1994/95 |
| Armco Steel | Mansfield, OH/CONROLL | 0.7/1.1 | 1995 |
| Acme Steel | Riverdale, IL/CSP | 0.9-1.8 | 1996 |

[1] Announced raw steel melting capacity in million metric tons; initial steel melting capacity plus planned capacity additions (phase-II additions).
[2] Start-up date(s) of initial installation and additional capacity (phase-II additions).
[3] Joint venture between Dofasco and Co-Steel, Canadian steelmakers.
[4] Canadian producer of pipe. Type of process not available.
[5] Joint venture between North Star Steel (a Cargill subsidiary) and BHP (Australia).
[6] Joint venture among LTV, Sumitomo (including the trading company, Sumitomo Metals, and Sumitomo Heavy Industries, the equipment manufacturer), and British Steel.

Source: Based on various industry publications and USITC staff telephone interviews with industry officials.

[10] These three companies are exceptions to the majority of other integrated steelmakers that have installed conventional continuous-strand casting equipment. See discussion later regarding reasons for adopting this technology.

## *Factors Aiding or Hindering Adoption of Thin-Slab Casting*

The reasons that companies have adopted thin-slab casting provide insights into corporate strategy and changes in industry structure. The adoption of technology often forms part of a firm's overall competitive strategy, and contributes to that strategy through its effect on financial and operating costs as well as the company's decisions regarding product mix, markets served, and pricing. Factors that influence the decision to adopt a technology and its timing may be tangible, or quantifiable, such as indicators of company financial or economic performance; and intangible, such as the risk-posture of the company's corporate culture, as summarized in table 2.

**Table 2**
**Certain tangible and intangible factors guiding company adoption of thin-slab casting technology**

| Element | Argument for adoption | Argument against adoption |
|---|---|---|
| ***Tangible factors*** | | |
| Financial or economic performance | May lower operating costs through increased productivity or may decrease energy consumption.<br><br>May improve quality of company's products or product mix (allow the company to produce increasingly technically sophisticated and value-added products). | Existing technology may embody sunk costs; new costs may have unfavorable impact on certain capital ratios.<br><br>May encounter lengthy learning curve adjustment period (possibly several years) to achieve product quality required by markets served.<br><br>Capital costs may be higher than expected rate of return; amount of investment capital available to industry or company may be limited. |
| Technological | May embody state-of-art, yielding enhanced flexibility in using raw materials or other inputs, productivity increases, or quality enhancements. | "Best fit" usually is in a greenfield facility and retrofit may not be appropriate for scale production economies or other reasons. Existing equipment may possess lengthy remaining economic life. Effect of new technology may be lessened by subsequent technological advances. |
| Industry structure | May reduce minimum economic scale, and ease entry; lucrative rewards may accrue to first innovator and market entrant. | Entry costs may remain high or unbridgeable; market strategies of existing players or later entrants may negate potential returns. Company already may be in market segment. Successful commercialization may encourage copycat imitations, reducing or eliminating advantages to the first innovator. |
| ***Intangible factor*** | | |
| Corporate culture | May see existing market structure or competitors as vulnerable to new entrants (risk-taking and receptive to innovation). | Approach to decision-making is risk-averse or risk-neutral; may be receptive to innovative technology, but adopts conservative wait-and-see posture. |

Source: Compiled by staff of the USITC from various industry publications.

Among the performance factors spurring the adoption of thin-slab casting technology has been the lower costs of capital investment and operations that are achievable for the production of flat-rolled steel sheet and strip compared with conventional integrated steelmaking. The capital costs of a greenfield integrated mill[11] have been illustrated earlier as significantly higher when compared with the costs of a thin-slab/flat-rolled minimill. In addition, trade sources indicate that construction costs and interest charges that accrue over the several years needed to bring an integrated plant on-line would render the average total costs of a new plant higher than costs at existing "best practice" integrated plants. However, retrofitting an existing integrated plant is still an option. For example, Acme Steel installed a CSP thin-slab caster to replace obsolete ingot casting because of cost, quality, and productivity benefits.[12] The potential difficulties of dovetailing thin-slab casting (or other "incremental technologies") with existing processes apparently have been minimized for the three steelmakers (table 1) that have done so. For other steelmakers that possess continuous-strand casters, retrofitting may not be an appropriate option for reasons of economic performance of their existing equipment and the technical needs of their customers.

When Nucor Corp. chose to be the first producer worldwide to adopt CSP thin-slab casting (and to build the first greenfield flat-rolled mill in the United States in nearly 30 years), it reportedly resulted from a perception that thin-slab casting provided a means of market entry to exploit a market opportunity.[13] Nucor's reported success and profitability has encouraged more market entrants, although increased prices for casting equipment and falling prices for hot-rolled band (the immediate downstream product produced by rolling thin-slab on a hot-strip mill) may have deterred some companies from considering expansion into the flat-rolled segment.[14] A comparison of estimated capital and operating costs for integrated mills producing flat-rolled products with a recently built thin-slab/flat-rolled mill is in table 3.

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[11] There are two sources of large-scale economies in an integrated steelmaking plant: these are the integration of iron-making and steelmaking operations and the hot-strip mill, which is used to roll all continuous-strand cast slab into hot-rolled band. Engineering estimates of minimum size range upwards from 5.4 million metric tons of annual raw steelmaking capacity. F.M. Scherer and David Ross, *Industrial Market Structure and Economic Performance*, 3d ed. (Boston: Houghton Mifflin Co., 1990), p. 102. The minimum efficient scale for a conventional continuous hot strip mill is estimated at 2.7 million metric tons per annum. Robert W. Crandall, *The U.S. Steel Industry in Recurrent Crisis: Policy Options in a Competitive World* (Washington, D.C.: The Brookings Institution, 1981), p. 11. In contrast, new mini-flat-rolled mills typically possess an initial capacity of about 1 million metric tons with a planned increase to about 2 million metric tons, making them on average, less complex and smaller than their integrated steel mill competitors.

[12] Reportedly, total manufacturing costs will decrease by 20 percent; processing time will decrease; finished product yield (the ratio of finished product to raw steel produced) will increase from 78 percent to 91 percent; energy requirement per ton of steel will decrease by about 46 percent; and manpower requirements per ton of steel are projected to fall by more than 50 percent. "Acme Steel Introduces the Minigrated Mill," *Purchasing*, July 11, 1996, p. 46.

[13] Preston, pp. 90-100. For a discussion of the relationship between entrepreneurship and technology adoption, see Peter F. Drucker, *Innovation and Entrepreneurship: Practice and Principles* (New York: Harper & Row, 1985), pp. 66-75.

[14] For example, World Class Processing (a steel finisher with a stand-alone rolling mill) announced it had decided not to proceed further with its plans to install steel melting capacity and thin-slab casting.

**Table 3**
**Estimated capital cost and operating cost for a greenfield conventional integrated mill, modernized integrated mill, and thin-slab/flat-roll minimill in the United States, by process, 1995.**

*(Dollars per metric ton[1])*

| Process | Greenfield conventional integrated mill | | Modernized integrated mill | | Thin-slab/flat-roll minimill | |
|---|---|---|---|---|---|---|
| | Capital cost | Operating cost | Capital cost | Operating cost | Capital cost | Operating cost |
| Iron-making[2] | 1,160 | 130-140 | (3) | 130 | (3) | (3) |
| Steelmaking[4] | 530 -1,134 | 185-200 | 290 | 185-200 | 125-130 | 180-185 (5) |
| Slab casting[6] | 275 - 435 | 215-225 | 200 | 220-230 | 60- 80 | 200-215 |
| Hot strip[7] | 1,000 | 250-260 | 290 | 260-280 | 200-220 | 225-235 |
| Cold-finishing[8] | 700 | 350-380 | (9) | (9) | 75 | 270-280 |
| Total | 3,670 -5,000 | (3) | 680 | (3) | 460-505 | (3) |

[1] Per metric ton. Capital costs are per ton of capacity per facility within a steel plant. Operating costs are the per ton cumulative product costs at that stage of the production process, but do not include financial costs like depreciation, interest, and taxes.
[2] Includes approximately $450 per mt in capital costs for sintering (iron ore preparation) and coke-making facilities, and $720 million for a 3.6 million metric ton blast furnace.
[3] Not applicable.
[4] Steelmaking costs for the greenfield integrated mill are based on about 4.4 million metric tons capacity (about $120 per metric ton of capacity); on about 3 million metric tons capacity (about $220 per metric ton of capacity) for the modernized integrated mill; and on 2.0 million metric tons capacity ($60 per tonne of capacity) for the mini-flat-rolled mill.
[5] These costs may vary with changes in prices for raw material inputs (e.g., scrap and other iron-bearing materials). It should be noted that a greater percentage of the production costs of a minimill vary with the business cycle.
[6] Conventional slab is approximately 8 inches thick. Thin-slab is approximately 2 inches thick.
[7] Costs include reheat furnace, primary breakdown mill and finishing mill in an integrated mill; minimill costs include a tunnel furnace and hot strip mill finishing stands. Product compared is hot-band.
[8] Includes costs for a "pickle" (acid clean) line, tandem mill, annealing, and temper mill. Product compared is cold-rolled sheet, tempered, and finished.
[9] Not available, but assumed to be similar with the cost structure of a greenfield conventional integrated mill. Depending on the circumstances, may not be applicable.

Source: World Steel Dynamics (PaineWebber), *Core Report ZZ*, Dec. 1995.

## *Competitive Effects of Process Commercialization and Outlook*

The expansion of production capacity and output by greenfield flat-rolled steel minimills has spurred increased price competition within the flat-rolled steel segment, and the new entrants have gained market share at the expense of both imports and established domestic producers. Shipments from greenfield thin-slab/flat-rolled plants in the United States are estimated to increase from about 2 million metric tons (accounting for nearly 5 percent of U.S. producer shipments of flat-rolled steel products) in 1992 to about 16 million metric tons (about 25 to 30 percent of shipments) by 2000.[15] The increased production from thin-slab/flat-rolled mills has contributed to more intense price competition as prices of hot-rolled sheet declined by 15 percent during 1994-95 and remained at relatively low levels during early 1996. The price difference between hot-rolled and cold-rolled sheet also narrowed as several thin-slab cast minimills began selling hot-rolled sheet in thinner gauges that heretofore were only achievable on an integrated steelmaker's cold-rolling mill. Reflecting these developments,

[15] Projection based on capacity estimates by industry sources as noted in table 1.

U.S. imports of commercial grade hot-rolled sheet and coiled plate have declined by 24 percent between 1994 and 1995, and by 30 percent during January-May 1996, when compared with imports during the same period in 1995.

These market conditions have placed competitive pressures on several of the higher cost U.S. integrated producers either to reduce costs, to move into more sophisticated niche products, or to exit the market segment for commercial grade hot-rolled sheet. Reportedly, some steelmaking capacity will be closed by integrated steelmakers,[16] which is expected to increase the market share of thin-slab/flat-rolled mills. According to industry estimates, about two-thirds of the total flat-rolled product market in the United States (between 30 million to 35 million metric tons)[17] may be within reach of thin-slab/flat-rolled mill operations, with the greatest increases in market shares accruing to hot-rolled sheet and hot-dipped galvanized sheet. Smaller market share increases are expected in other categories of coiled plate (in the thinner gauges of this product) and cold-rolled sheet. Continued improvements in surface quality and formability should allow thin-slab/flat-rolled minimills to increasingly penetrate the domestic market for sale to original equipment manufacturers (OEM) such as automotive and construction equipment, who have tended to purchase primarily from U.S. integrated steelmakers on a contract basis (usually a 1-year cycle).

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[16] One industry analyst estimates that integrated mills will close 3 million to 6 million metric tons of basic oxygen furnace-steelmaking capacity by 2000. This is in large part due to the closure of obsolete coke ovens and supply tightness in the coke market. World Steel Dynamics (Paine Webber), *Capacity Monitor*, Apr. 1996, p. 3.

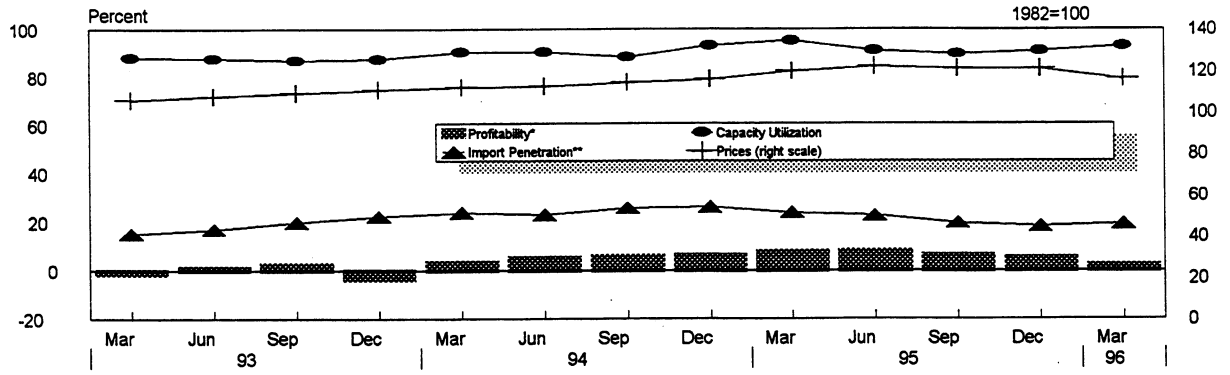
[17] World Steel Dynamics (PaineWebber), *Core Report ZZ*, "Steel's Thin-Slab/Flat-Rolling Revolution: Provoking Change, A Study of Steel Dynamics, Inc.," Jan. 1996, p. 15.

# APPENDIX A
# KEY PERFORMANCE INDICATORS OF SELECTED INDUSTRIES

- ☐ **STEEL** (Felix Bello, 202-205-3120/fbello@usitc.gov)
- ☐ **AUTOMOBILES** (Laura A. Polly, 202-205-3392/polly@usitc.gov)
- ☐ **ALUMINUM** (Karl S. Tsuji, 202-205-3434/tsuji@usitc.gov)
- ☐ **SERVICES** (Christopher Melly, 202-205-3461/melly@usitc.gov)
- ☐ **SEMICONDUCTORS** (Robert Carr,202-205-3402/carr@usitc.gov)

# STEEL

**Figure A-1**
**Steel mill products, all grades: Selected industry conditions**




* Operating income as a percent of sales for companies representing about 65 percent of production.
** Import share of apparent open market supply.

Source: American Iron and Steel Institute, U.S. Bureau of Labor Statistics

- Domestic shipments rebounded during the first quarter of 1996, rising 2.6 percent from the previous quarter to 24.9 million tons, reflecting strong demand from service centers, automakers, and the construction sector. Prices, however, continued to slide despite high levels of capacity utilization and efforts by steelmakers to raise them.

- The price collapse and inventory draw-down at the end of 1995, along with the strength of the dollar and softness of foreign steel markets had a strong impact on domestic steel trade during the first quarter of 1996. For the period, imports of all steel products rose 14.1 percent (5.6 million tons) while exports declined 28.9 percent (1.5 million tons). The increase in imports was mainly fueled by a 31.7 percent rise in semifinished products (to 1.9 million tons), which had consistently declined or remained flat since the fourth quarter of 1994. At the same time, imports of finished products rose 6.9 percent to 3.7 million tons following four consecutive double-digit quarterly declines.

- First quarter operating income by U.S. steelmakers reporting to the American Iron and Steel Institute fell 53.9 percent to $211 million despite sales rising 7.5 percent to $9.2 billion.[1] For the period, profitability for these firms fell 57.1 percent, reflecting declining prices and ample supply of steel products. This is the third consecutive quarter in which prices, operating income, and profitability declined, and the second consecutive quarterly decline for sales.

[1] Based on financial data reported to the American Iron and Steel Institute by producers accounting for approximately 65 percent of domestic shipments.

**Table A-1**
**Steel mill products, all grades**

| Item | March 1996 | Percentage change, March 1996 from December 1995[1] | January-March 1996 | Percentage change, Jan.-Mar. 1996 from Jan.-Mar. 1995[1] |
|---|---|---|---|---|
| Producer's shipments (*1,000 short tons*) | 8,428 | -3.0 | 24,868 | 0.1 |
| Imports (*1,000 short tons*) | 1,863 | 1.5 | 5,626 | 25.1 |
| Exports (*1,000 short tons*) | 513 | -2.3 | 1,490 | -24.8 |
| Apparent supply (*1,000 short tons*) | 9,777 | -2.2 | 29,004 | 7.0 |
| Ratio of import to apparent supply (*percent*) | 19.1 | [2] 3.6 | 17.8 | [2] 25.8 |

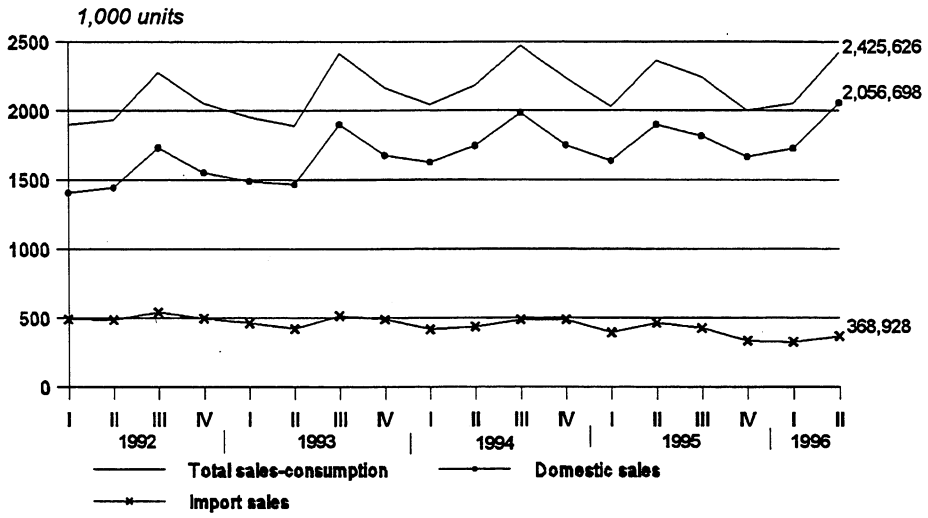
[1] Based on unrounded numbers.
[2] Percentage point change.

Note.--Because of rounding, figures may not add to the totals shown.

Source: American Iron and Steel Institute.

## AUTOMOBILES

**Figure A-2**
**U.S. sales of new passenger automobiles, by quarter**




Note.--Domestic sales include all automobiles assembled in Canada and imported into the United States under the United States-Canadian automobile agreement, these same units are not included in import sales.

Source: *Automotive News*; prepared by the Office of Industries.

**Table A-2**
**U.S. sales of new automobiles, domestic and imported, and share of U.S. market accounted for by sales of total imports and Japanese imports, by specified periods, Jan. 1995-June 1996**

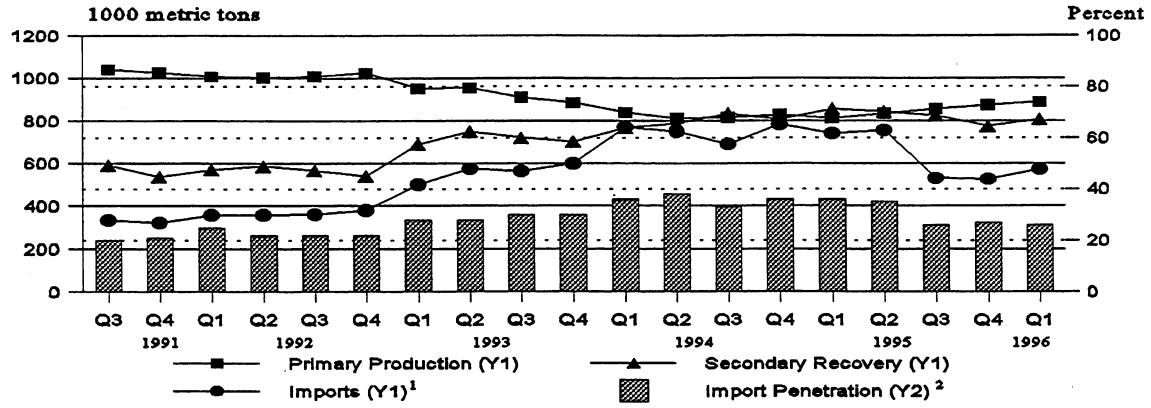
| Item | Apr.-June 1996 | Jan.-June 1996 | Percentage change-- Apr.-June 1996 from Jan.-Mar. 1996 | Percentage change-- Jan.-June 1996 from Jan.-June 1995 |
|---|---|---|---|---|
| U.S. sales of domestic autos (*1,000 units*)[1] | 2,057 | 3,782 | 19.2 | 9.2 |
| U.S. sales of imported autos (*1,000 units*)[2] | 369 | 694 | 13.2 | -9.9 |
| Total U.S. sales (*1,000 units*)[1, 2] | 2,426 | 4,476 | 18.3 | 5.7 |
| Ratio of U.S. sales of imported autos to total U.S. sales (*percent*)[1, 2] | 15.2 | 15.5 | -4.3 | -14.8 |
| U.S. sales of Japanese imports as a share of the total U.S. market (*percent*)[1, 2] | 7.9 | 8.2 | -10.8 | -34.0 |

[1] Domestic automobile sales include U.S.-, Canadian-, and Mexican-built automobiles sold in the United States.
[2] Does not include automobiles imported from Canada and Mexico.

Source: Compiled from data obtained from *Automotive News*.

# ALUMINUM

**Figure A-3**
**Aluminum: Selected U.S. industry conditions--**



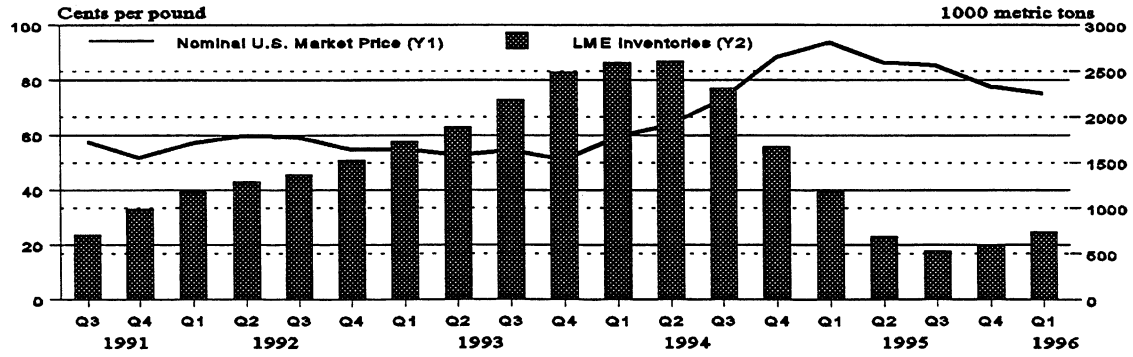

[1] Crude (metals and alloys) and primary (e.g. plates, sheets, and bars) forms for consumption.
[2] Percent share of imports to apparent domestic supply.

Source: U.S. Geological Survey.

- The 1994 Memorandum of Understanding (MOU), an agreement by six aluminum-producing countries and regions to reduce global production, expired at the end of January 1996. Global market conditions in 1st quarter 1996 appear similar to the immediate pre-pact period when primary ingot production was robust and metal accumulated in inventory at the LME. With restart of idled smelter capacity over the past quarter and recovery of the Canadian industry from labor strikes in October 1995, current production rates of primary metal among MOU signatories are up to or very near pre-pact levels, averaging nearly 1.1 million metric tons per month. Aluminum LME inventory rose for a second quarter to 741,000 metric tons, 40 percent above the low of 531,000 tons in Fall 1995. However, this level is only 29 percent of the 2.5 million metric tons accumulated two years ago just prior to signing of the MOU.

- In the U.S. market, output of primary ingot and recovery of aluminum from scrap in 1st quarter 1996 were up slightly from the previous quarter's levels to a total of nearly 1.7 million metric tons, despite disruption of transportation services in the Pacific Northwest and of natural gas supplies in the Midwest and Southeast due to extreme winter weather conditions. With U.S. consumption rebounding more slowly than anticipated and the industry continuing to drawdown backlogged inventories, the quarterly average price for primary ingot fell further to a new low of 75.2 cents per pound, a level not seen since late Summer 1994. U.S. imports of unwrought and semi-manufactured aluminum were 9 percent higher than the previous quarter, rising to 572,000 metric tons. As domestic production firmed and inventory drawdown continued, import penetration was down slightly to 26 percent, a low level not seen since early 1993.

**Figure A-4**
**Aluminum: Price and inventory levels--**

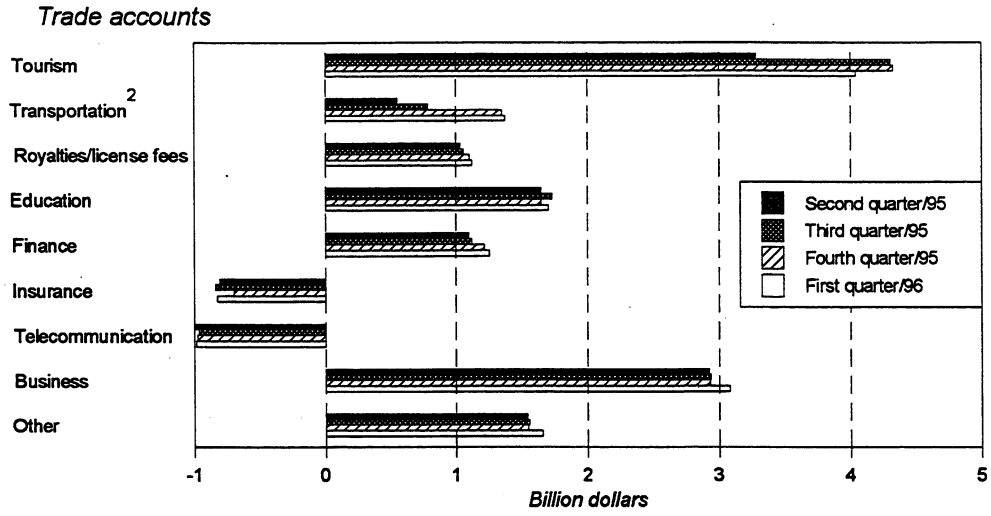



[1] Quarterly average of the monthly U.S. market price of primary aluminum ingots.
[2] End of quarter inventories.

Sources: U.S. Geological Survey, World Bureau of Metal Statistics, Metals Week, and U.S. Bureau of Economic Analysis.

## SERVICES

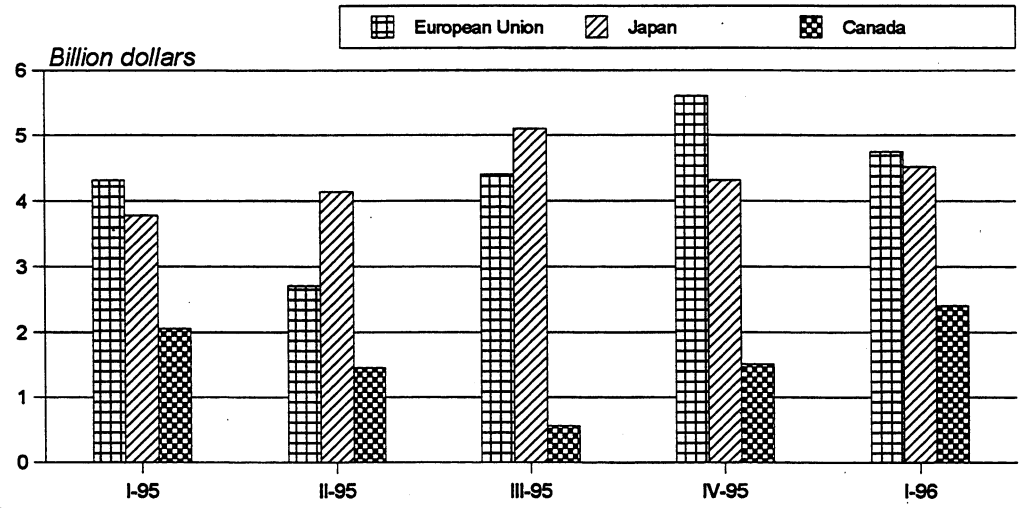
**Figure A-5**
**Balance on U.S. service trade accounts, second quarter 1995 through first quarter 1996[1]**




[1] Figures reflect trade among unaffiliated firms only.
[2] Includes port fees.

Source: Bureau of Economic Analysis, *Survey of Current Business.*

**Figure A-6**
**Surpluses on cross-border U.S. service transactions with selected trading partners, by quarter, 1995-96[1]**

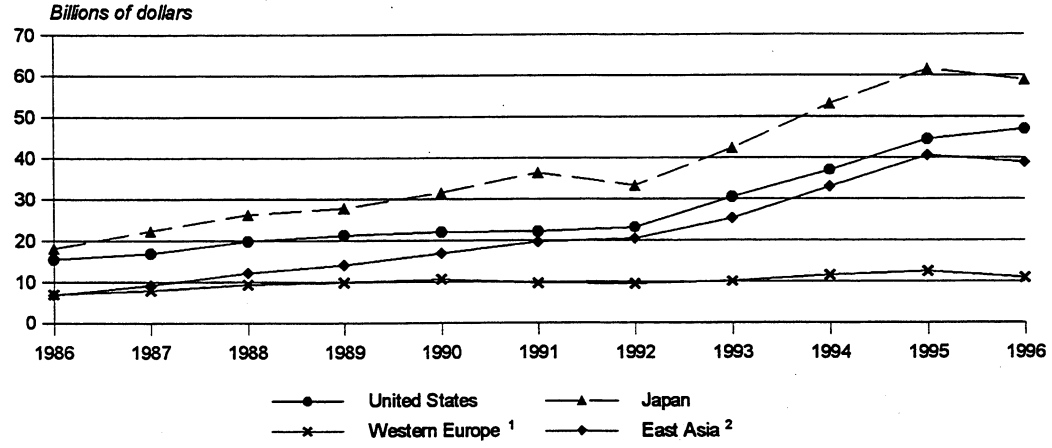



[1] Figures reflect private-sector transactions only; military shipments and other public-sector transactions have been excluded.

Source: Bureau of Economic Analysis, *Survey of Current Business.*

## SEMICONDUCTORS AND OTHER ACTIVE COMPONENTS

**Figure A-7**
**U.S. production and that of selected trading partners, 1986-96**

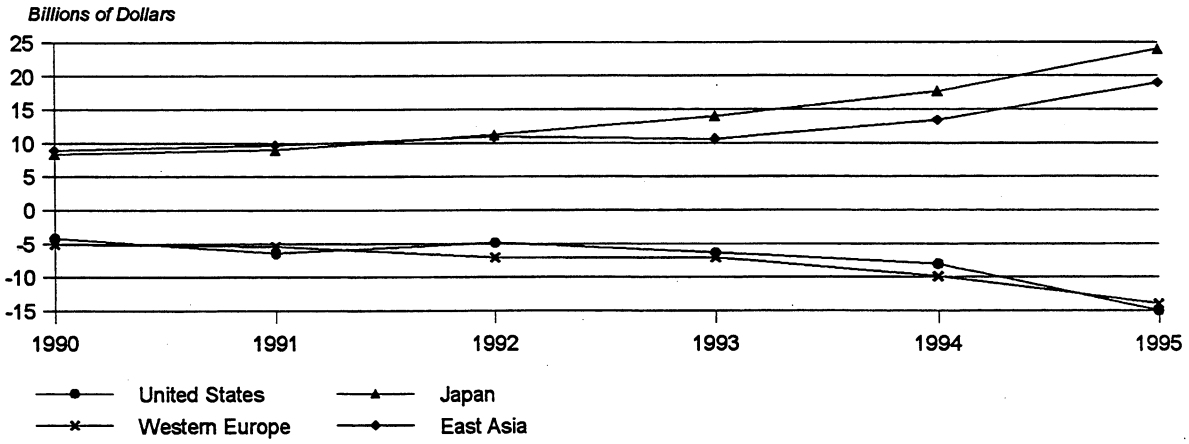



[1] Western Europe includes Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom.
[2] East Asia includes Malaysia, Philippines, Singapore, South Korea, Taiwan, and Thailand.

Source: Elsevier Advanced Technology for 1986-95; USITC staff estimates for 1996.

- East Asian production of semiconductors and other active components (including certain tubes, diodes, transistors, and other semiconductor devices) has doubled every 4 years since 1986 (figure A-7). South Korea has led the East Asian growth with its production doubling every three years since 1986 and is now the world's third largest producer.
- East Asian production is primarily geared toward export markets (expected to reach more than 95 percent of production in 1995). In 1994, East Asian exports ($40.1 billion) nearly equaled the combined exports of the United States and Japan ($41.1 billion).
- Production began in the East Asian countries during the 1970s largely in the form of production-sharing assembly operations. However, in the last decade, these countries have acquired their own manufacturing capabilities either by attracting multinational component fabricators or by the development of a domestic industry; production sharing as a share of total East Asian exports to the United States declined during 1991-95 from approximately 60 percent to 35 percent.
- Although increasingly reducing its reliance on foreign components to produce finished products, East Asian countries continue to import large quantities of unfinished components. Even though East Asian exports were more than 60 percent greater than Japan's in 1994, their trade surplus was lower (figure A-8) since their imports were more than 3.5 times greater than Japan's.

**Figure A-8**
**U.S. trade balance and that of selected trading partners, 1990-95**




Source: Elsevier Advanced Technology for 1990-94; USITC staff estimates for 1995.