Tariff Rate Quotas on U.S. Steel Imports: The Implications on Global Trade and Relative Competitiveness of Industries*

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Abstract

In March 2002, the United States imposed tariff-rate quotas (TRQs) of about 30 percent on most imported steel above set quotas. This measure is expected to reduce steel exports from East Asian countries, particularly from Japan and Korea. At the same time, the U.S. action is likely to harm its automobile, metal products, and other related industries by raising the cost of intermediate input. In this paper, we evaluate the effects of U.S. steel protection on the economic welfare, steel trade, and sectoral output and unit cost of the United States and its trading partners over the period 2002-2005.

The preliminary results indicate that although the U.S. welfare increases in 2002-2003, it declines in 2004-2005 mainly because the price of steel increases in the U.S. market. U.S. steel imports from East Asian countries and the EU decline by 2.5-2.8 percent, whereas those from Canada and Mexico increase by 2.2 percent, thus largely offsetting the fall in the total U.S. steel imports. The protection causes output contraction in the steel-consuming industries in the United States and output expansion in those industries in most of the U.S. trading partners, but these effects are extremely small. These results suggest that the impact of the U.S. imposition of TRQs is minimal.

JEL classification: F13; F14

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1. Introduction

In the last three decades, the U.S. steel industry has been protected by quantitative restrictions, voluntary restraint agreements (VRAs), antidumping and countervailing duties, and other import relief measures including the trigger price mechanism (TPM) and safeguard measures. The U.S. imposition of tariff-rate quotas (TRQs)[1] of about 30 percent on most imported steel above set quotas in March 2002 under Section 201 of the 1974 Trade Act was the latest of a series of U.S. protection of its steel industry.[2] This safeguard measure is to be imposed for a period of three years, but it is not imposed on the NAFTA trading partners (Canada and Mexico), Israel, and the great majority of developing countries. Some of the developing countries that are not exempted include China and Brazil, which are major steel producers in the world.

The problems facing the steel industry will not be resolved by tit-for-tat retaliatory trade measures, which have been standard practice for decades among the big steel producing nations. In June of 2001, the United States had over 159 anti-dumping and countervailing duties actions on various types of steel products from virtually all of its trading partners. Clearly, these protective actions — with a history dating back to at least 1968 in the United States — have failed to produce the required rationalization of steel production in the United States or elsewhere. Yet rising prices since tariffs have made consolidation hard, as creditors hold out for a better deal. Part of the consolidation problem in the United States is related to the so-called legacy costs, i.e., the costs of relatively generous pension and health benefits to previous employees. Some estimates suggest that these costs add up to as much as $13 billion over the actuarial lifetimes of workers and retirees (Hufbauer and Goodrich, 2002).

The recent safeguard action of the United States might reduce its steel imports from East Asian countries, particularly from Japan and Korea. At the same time, the U.S. action is likely to harm its automobile, heavy equipment, construction, and other related industries by raising the cost of intermediate input (e.g., Hufbauer and Goodrich, 2001). Francois and Baughman (2001) suggest that the provision of import relief remedies for steel would impose cost of $1.9-4.0 billion a year on consumers and reduce U.S. national

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[1] In the tariff-rate quota scheme, a given tariff rate is applied to imports up to a specified quantity (i.e., the quota), and then a higher tariff rate is applied to imports over the quota.

[2] Detailed information on the Section 201 remedy is available at the United States Trade Representative website (http://www.ustr.gov).

income by $500 million to $1.4 billion a year. U.S. steel producers would gain $242-496 million, but these gains would not re-establish the U.S. steel industry to be profitable.

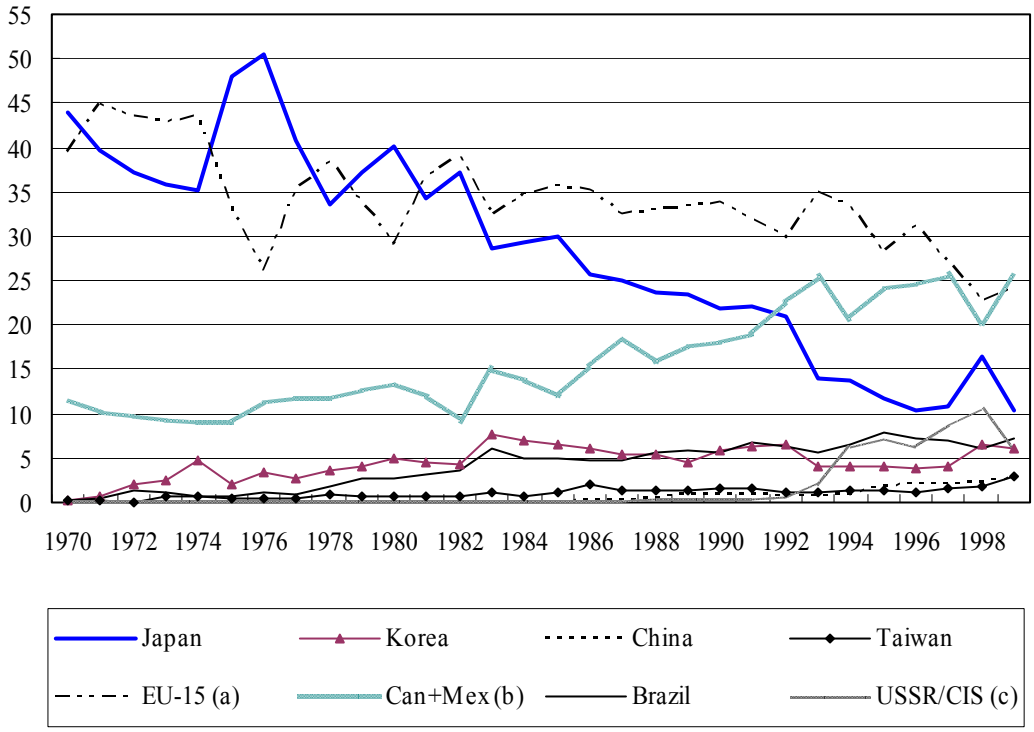
In this paper, we evaluate the effects of U.S. steel protection on the economic welfare, steel trade, and sectoral output and unit cost of the United States and its trading partners, with particular attention to those of Japan, China, Korea, and Taiwan, over the period 2002-2005. We use a dynamic multi-country computable general equilibrium (CGE) model to assess important policy issues. The next section provides the trends in U.S. steel imports by trading partners during the 1970-99 period. An overview of the model is given in section 3, followed by a brief description of the scenario and assessments of computational results in section 4. The final section summarizes the main policy conclusions.

2. Trends in U.S. Steel Imports by Trading Partners, 1970-99

Figure 1 provides the trends in the shares of U.S. steel imports from selected trading partners over the period 1970-99. Several noticeable trends are readily observable from this figure. First, the share of U.S. steel imports from Japan declined from about 50 percent in 1976 to about 10 percent in 1999. The decline in the Japanese share over the 1976-92 period were largely attributable to two factors: (1) the introduction of TPM where minimum reference prices for imported steel were instituted, and (2) VRAs were in effect until 1992. Second, the share of imports from the EU also declined – from about 45 percent in 1971 to about 24 percent in 1999. Third, despite Korea's steel exports to the United States increased rapidly during the 1970-83 period, its exports to the U.S. relative to other trading partners have not increased since 1983. Fourth, China, now the world's largest steel producer, started to export its steel to the United States in the 1980s, but the share has remained relatively small.

Given the U.S. import shares of East Asian and European countries have declined over time, which countries have been able to increase the market shares in the United States? As Figure 1 clearly indicates, steel exports from Canada and Mexico to the United States have increased significantly since the mid-1980s. The NAFTA partners accounted for about 25 percent of U.S. import share of steel in 1999, up sharply from 12 percent in 1985. The share of CIS countries (primarily Russia, Ukraine, and Kazakhstan) also increased during the 1990s.

Figure 1. Shares of U.S. Steel Imports by Trading Partners, 1970-99
(percent)



Notes:
(a) Includes Austria, Belgium, Denmark, Finland, France, Germany, Great Britain, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, and Sweden.
(b) Canada and Mexico.
(c) CIS countries include Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

Sources: OECD (1997, 2001).

3. Overview of the Model

We use a dynamic global CGE model developed by van der Mensbrugghe (2001), or the LINKAGE 5 model, in this study. In the current version, all sectors are assumed to be perfectly competitive and operate under constant returns to scale. Production in each sector is modeled by a series of nested CES production functions, which are intended to represent the different substitution and complementarity relations across the various inputs in each sector. Labor can have three different skill levels: unskilled, skilled, and highly skilled. The first two are substitutable and combined in a CES aggregation function as a

single labor bundle. Highly skilled labor is combined with capital to form a physical plus human capital bundle.

In each period, the supply of primary factors — capital, labor, and land — is generally predetermined. The supply of land is assumed to be sensitive to the contemporaneous price of land, however. Land is assumed to be partially mobile across agricultural sectors. Thus rates of return are sector-specific, but sectoral land supply reacts to changes in relative rates of return. Some of the natural resource sectors also have a sector-specific factor whose contemporaneous supply is price sensitive. The model includes adjustment rigidities. An important feature is the distinction between *old* and *new* capital goods. In addition, capital is assumed to be partially mobile, reflecting differences in the marketability of capital goods across sectors. Labor and population growth are exogenous. Labor within each skill category is perfectly mobile across sectors.

All income generated by economic activity is assumed to be distributed to consumers. A single representative consumer (or household) allocates optimally his/her disposable income among the consumer goods and saving. The consumption/saving decision is static: saving is treated as a good and its amount is determined simultaneously with the demands for the other goods. The price of saving is set arbitrarily equal to the average price of consumer goods. Investment is driven by aggregate saving, or the sum of household, government, and foreign savings. We assume that foreign saving is exogenous and that the ratio of government expenditures to GDP remains constant in each region over time.

Products are differentiated by region of origin and modeled as imperfect substitutes. On the import side, this is reflected by the implementation of the so-called Armington assumption, where a constant elasticity of substitution (CES) specification is used to incorporate imperfect substitution of imported goods with respect to domestically produced goods. A symmetric specification is used to model export supply, the latter being implemented with constant elasticity of transformation (CET) functions. Trade measures are fully bilateral and include both export and import taxes/subsidies. Trade and transport margins are also included; therefore world prices reflect the difference between FOB and CIF pricing.

The model is calibrated to a given baseline from 1997 to 2005. The per capita GDP growth rates are broadly consistent with the World Bank's long-term forecast. Productivity is calibrated in the baseline to achieve the desired GDP trends. Several assumptions underline the calibration of productivity. Agricultural productivity is exogenous, user-determined and varies across regions. Manufacturing productivity growth

is assumed to be higher than services productivity growth. An economywide productivity factor is calibrated to achieve the given GDP target, and productivity growth is assumed to be labor-augmenting.

TRQ Implementation

The basic equations for implementing TRQs in the LINKAGE 5 model are given below:

$$WTF^{in}_{r',r,i} \leq WTF^{q}_{r',r,i} \qquad \tau^{p}_{r',r,i} \geq 0$$

$$\tau^{p}_{r',r,i} \leq \tau^{out}_{r',r,i} - \tau^{in}_{r',r,i} \qquad WTF^{out}_{r',r,i} \geq 0$$

$$WTF^{d}_{r',r,i} = WTF^{in}_{r',r,i} + WTF^{out}_{r',r,i}$$

The first constraint reflects that in-quota imports, WTF^{in} are capped at the overall quota level, WTF^{q}, where the triple index reflects the region of origin, r', the importing region, r, and the sector, i. The inequality is linked with the lower bound on the tariff premium, τ^{p}, which cannot fall below zero. The second constraint caps the upper bound on the import premium. The upper bound is given by the difference in the over-quota tariff rate, τ^{out}, and the in-quota tariff, τ^{in}. This inequality is associated with the lower bound cap on the over-quota imports, which is zero. The third constraint is the identity linking total imports, WTF^{d}, to the sum of in- and over-quota imports. The first two constraints are linked to two orthogonality conditions, easily implemented using mixed complementarity programming (MCP). The two orthogonality conditions can be written as:

$$\left(WTF^{q}_{r',r,i} - WTF^{in}_{r',r,i}\right)\tau^{p}_{r',r,i} = 0$$

$$\left(\tau^{p}_{r',r,i} - (\tau^{out}_{r',r,i} - \tau^{in}_{r',r,i})\right)WTF^{out}_{r',r,i} = 0$$

The first condition reflects two regimes — either the premium is 0 and imports are below quota, or else the premium is positive and in-quota tariffs are binding at the quota level. The second similarly reflects two regimes — either over-quota imports are zero and therefore the tariff premium is less than the difference in the over- and in-quota tariffs, or that over-quota imports are positive in which case the premium has reached the upper-bound.

Other equations in the model need to be adjusted to reflect the TRQs. For example, the premium income accruing to the exporting country is revenue for the sector subject to the TRQ, i.e., the exporting sector receives the premium income. The government revenue equation also needs to be modified. The first adjustment comes from the tariff revenues, which include both the in- and over-quota revenues. The second adjustment comes from the additional revenue from the importing country's share of the premium income. For other equations that are modified, see van der Mensbrugghe (2003).

Most of the data used in the model come from the GTAP database, version 5, which provides 1997 data on input-output, value added, final demand, bilateral trade, tax and subsidy data for 66 regions and 57 sectors.[3] For the purpose of the present study, the database is aggregated into 14 regions and 17 sectors as shown in Table 1. The regional detail focuses on East Asian steel producers as well as major U.S. trading partners in steel. The sectoral detail focuses on steel and its downstream industries, such as metal products, motor vehicles, other transport equipment, and construction.

Two caveats should be borne in mind when we evaluate the effects of U.S. steel protection in the next section. First, the present model assumes that all industries are perfectly competitive, but it is more realistic to assume that the steel industry is oligopolistic in the domestic market. Previous studies (e.g., Harris, 1984; Brown and Stern, 1989; Francois and Roland-Holst, 1997) have shown that the gains from trade liberalization could be significantly larger when some of the sectors are characterized by imperfect competition and increasing returns to scale. Thus, the costs of steel protection are likely to become substantially higher if we relax the assumption of perfect competition and incorporate oligopolistic competition and scale economies into the model.[4]

Second, the model assumes full utilization of capital, which is probably not a reasonable assumption. There appears to be significant overcapacity of steel production in many countries.[5] When capital is fully utilized, an increase in output of steel raises the rental rate of capital, thereby increasing the marginal cost of production in the steel industry. By contrast, when capital is considerably underutilized, an increase in output is unlikely to raise the rental rate of capital. In other words, the greater the extent of underutilization of capital, the smaller will be an increase (a reduction) in the marginal

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[3] See Dimaranan and McDougall (2001) for detailed descriptions of the GTAP database, version 5.

[4] Incorporating oligopolistic competition in a dynamic CGE model, however, is a very difficult task because it often causes non-convergence of a solution.

[5] Hufbauer and Goodrich (2001) suggest that world steel overcapacity has often exceeded 20 percent of production during the past 30 years.

cost resulting from an expansion (a contraction) of output. Thus, the costs of protection are likely to become lower in the countries/regions where steel output increases, and they are likely to become higher where steel output contracts. Consequently, the effects of relaxing the assumption of full utilization of capital are ambiguous.

Table 1. Regional and Sectoral Aggregation

A. Regional Aggregation

Countries/Regions	Corresponding economies/regions in the GTAP database
United States	United States
Japan	Japan
China	China, Hong Kong
Korea	Korea
Taiwan	Taiwan
ASEAN[a)]	Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam
EU-15	Austria, Belgium, Denmark, Finland, France, Germany, Great Britain, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden
Canada and Mexico	Canada, Mexico
Other OECD	Australia, New Zealand, Switzerland, Rest of European Free Trade Area
Brazil	Brazil
Rest of Latin America	Central America and the Caribbean, Colombia, Peru, Venezuela, Rest of Andean Pact, Argentina, Chile, Uruguay, Rest of South America
Former Soviet Union	Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan
Cent. and E. Europe	Hungary, Poland, Rest of Central European Associates
Rest of the world	All the other economies/regions

B. Sectoral Aggregation

Sectors	Corresponding commodities/sectors in the GTAP database
Agriculture	Agriculture, forestry, fishing
Energy	Coal, oil, gas, petroleum and coal products, electricity, gas manufacture and distribution
Minerals	Minerals
Processed food	Food products, beverages and tobacco products
Textiles and apparel	Textiles, wearing apparel, leather products
Chemical products	Chemical, plastic and rubber products
Iron and steel	Iron and steel
Nonferrous metals	Nonferrous metals
Metal products	Metal products
Machinery	Machinery
Electronic equip.	Electronic equipment
Motor vehicles	Motor vehicles and parts
Other transp. equip.	Other transport equipment
Other manufactures	Wood products, paper products, publishing, non-metallic mineral products, other manufactures
Construction	Construction
Transport services	Sea transport, air transport, transport n.e.s.
Other services	Trade, communication, financial services, other services

[a] In the GTAP database, Brunei, Cambodia, Laos, and Myanmar are aggregated into the rest of the world.
Source: GTAP database, Version 5.

4. Scenarios and Results

To assess the consequences of U.S. imposition of TRQs on imported steel, the following policy scenario is considered:

- The United States imposes a 30 percent tariff rate on steel imports from non-exempted countries or regions above the set quotas over the three-year period 2002-2004. The set quotas are assumed to be the volume of U.S. bilateral imports of steel at the 2000 level. Non-exempted countries/regions are: (1) Japan, (2) China, (3) Korea, (4) Taiwan, (5) ASEAN countries[6], (6) EU-15, (7) other OECD (Australia, New Zealand, Iceland, Norway, and Switzerland), (8) Brazil, and (9) the former Soviet Union (CIS countries). Exempted countries/regions are: (1) Canada and Mexico, (2) Latin America other than Brazil, (3) Central and Eastern Europe[7], and (4) the rest of the world.

It is implicitly assumed that TRQs are binding during the period they are imposed.

4.1 Effects on Economic Welfare

Aggregate welfare gains and/or losses summarize the extent trade distortions are hindering growth prospects and the ability of economies to use the gains to help those whose income could potentially decline. We compared the above policy scenario with the baseline situation in the terminal year, 2005. Economic welfare is measured by Hicksian equivalent variation (EV). This represents the income consumers would be willing to forego to achieve post-policy well-being (u^p) compared to baseline well-being (u^b) at baseline prices (p^b):

$$EV = E\left(p^b, u^p\right) - E\left(p^b, u^b\right)$$

[6] ASEAN includes both exempted countries (e.g., Indonesia, Philippines, and Thailand) and non-exempted countries (e.g., Malaysia and Singapore). However, its classification is unlikely to affect the results because ASEAN's steel exports to the United States are extremely small.

[7] Like ASEAN, the Central and Eastern Europe contains both exempted countries (e.g., Bulgaria, Hungary, Poland, Romania, and Slovakia) and non-exempted countries (e.g., Czech Republic). Again, its classification is unlikely to affect the results.

where E represents the expenditure function to achieve utility level u given a vector of prices p (superscript b represents baseline levels, and p the post-reform levels). The model uses the extended linear expenditure system (ELES), which incorporates savings in the consumer's utility function (Lluch, 1973; Howe, 1975). The ELES expenditure function is easy to evaluate at each point in time.

The welfare results are summarized in Table 2. In the first year the United States imposes TRQs (i.e., in 2002), its welfare is estimated to increase by $10.6 million. However, the deviations in U.S. welfare from the baseline values decline over time: $4.8 million in 2003, –$0.5 million in 2004, and –$16.5 million in 2005. The welfare losses in 2005 are largely caused by an increase in the price of steel in the domestic market.

As expected, the non-exempted countries will suffer welfare losses. In absolute terms, the EU would be the biggest loser with a decline in its EV by $53.0-$60.0 million a year over the 2002-2004 period, followed by the former Soviet Union ($22.0-$23.9 million), Japan ($21.8-$24.0 million), Brazil ($13.6-$14.7 million), and Korea ($11.0-$12.7 million). In percentages terms, the former Soviet Union, Korea, and Brazil incur losses of 0.002-0.003 percent compared with the baseline values in 2003.

Table 2. Effects of Temporary U.S. Impositions of TRQs on Economic Welfare
(Deviations in equivalent variations from the baseline in respective years)

	Absolute changes ($1997 million)				Percent changes
	2002	2003	2004	2005	in 2003
United States	10.6	4.8	-0.5	-16.5	0.0001
Japan	-21.8	-22.9	-24.0	-3.1	-0.0007
China	0.2	-0.1	-0.4	-0.1	0.0000
Korea	-11.0	-11.8	-12.6	-1.5	-0.0027
Taiwan	-2.3	-2.7	-3.1	-0.8	-0.0009
ASEAN	-1.5	-1.6	-1.8	-0.1	-0.0003
EU-15	-53.0	-56.6	-60.0	-6.5	-0.0008
Canada and Mexico*	28.6	29.8	31.2	1.1	0.0032
Other OECD	-5.8	-6.1	-6.6	-0.6	-0.0008
Brazil	-13.6	-14.1	-14.7	1.0	-0.0022
Rest of Latin America*	2.1	2.1	2.3	0.0	0.0003
Former Soviet Union	-22.0	-22.8	-23.9	-1.0	-0.0034
Cent. and E. Europe*	4.7	4.8	5.1	0.0	0.0020
Rest of the world*	4.4	4.5	4.7	0.2	0.0003
World total	-80.5	-92.7	-104.3	-27.9	-0.0004

The countries/regions with an asterisk (*) are exempted from U.S. impositions of TRQs.
Source: Simulation experiments.

On the contrary, economic welfare of all four exempted regions is expected to increase following the U.S. impositions of TRQs on steel imports from the non-exempted regions. In particular, Canada and Mexico experience increases in their EV of $28.6-31.2 million a year over the three-year period. This is largely because their steel exports to the United States increases, thereby stimulating overall demand and leading to increases in production and real income.

Overall, the effects of U.S. steel protection on economic welfare are extremely small. This might be partly caused by the fact that the volume of imports affected by the U.S. protection is quite small relative to the world trade, but it also highlights how small the steel industry is in economic terms. The results might explain why there are so few complaints about the costs of protectionism in the steel industry.

4.2 Effects on Bilateral and World Trade Flows

Table 3 presents bilateral trade flow adjustments (in several cases with respect to aggregate trading partners like the EU) in steel resulting from the U.S. imposition of TRQs. Figures are given in percent deviations from the baseline scenario in 2003, the mid-year of the three-year period of protection. To what extent East Asian countries and other non-exempt countries' steel exports to the United States might be reduced? Would steel exports of the NAFTA partners and other exempt regions increase? Would major East Asian steel exporters, such as Japan and Korea, increase their exports to the EU and East Asian markets to compensate for the reductions in their market shares in the United States? Answers to these questions are of particular interests to policy makers.

As Table 3 shows, U.S. steel imports from the non-exempted countries decline by 2.5-2.8 percent, whereas those from the NAFTA partners and other exempted countries increase by around 2.2 percent, thus largely offsetting the fall in the total U.S. steel imports. Japan and Korean do not increase their exports to the EU and East Asian markets. Instead, their exports to Canada and Mexico increase slightly. Other than U.S. imports, adjustments in bilateral trade flows are extremely small. In the aggregate, the U.S. steel imports decline by 0.9 percent (the last row of Table 3), whereas Japanese and Korean exports fall by 0.2 percent (the last column).

Table 3. Changes in Bilateral Trade Flows in Steel resulting from U.S. Steel Protection
(Percent deviations from the baseline in 2003)

		Importers														(Percent changes)
Exporters		usa	jpn	chn	kor	twn	asean	eu15	cmx	oecd	bra	rla	fsu	cee	row	Total
United States	usa		-0.11	-0.10	-0.13	-0.11	-0.10	-0.13	0.09	-0.11	-0.17	-0.07	-0.16	-0.08	-0.08	0.01
Japan	jpn	-2.67		0.00	-0.04	-0.02	-0.01	-0.04	0.19	-0.02	-0.08	0.02	-0.07	0.01	0.01	-0.22
China	chn	-2.64	-0.02	-0.01	-0.04	-0.02	-0.01	-0.04	0.19	-0.02	-0.08	0.02	-0.07		0.01	-0.05
Korea	kor	-2.65	-0.02	0.00		-0.01	0.00	-0.03	0.19	-0.01	-0.08	0.03	-0.07		0.01	-0.21
Taiwan	twn	-2.52	-0.02	0.00	-0.04		0.00	-0.04	0.19	-0.02	-0.08	0.02			0.01	-0.08
ASEAN	asean	-2.57	-0.03	-0.01	-0.05	-0.03	-0.01	-0.04	0.18	-0.03					0.00	-0.07
EU-15	eu15	-2.68	-0.02	0.00	-0.04	-0.01	0.00	-0.03	0.19	-0.01	-0.08	0.02	-0.07	0.01	0.01	-0.21
Canada and Mexico	cmx	2.16	-0.06	-0.04	-0.08	-0.06	-0.05	-0.08	0.15	-0.06	-0.12	-0.02	-0.11		-0.03	0.17
Other OECD	oecd	-2.76	-0.02	0.00	-0.04	-0.01	0.00	-0.03	0.19	-0.02	-0.08	0.02	-0.07	0.01	0.01	-0.24
Brazil	bra	-2.79	0.00	0.02	-0.02	0.01	0.02	-0.01	0.22	0.01		0.05	-0.05	0.03	0.03	-0.47
Rest of Latin America	rla	2.21	-0.02	-0.01	-0.04	-0.02	-0.01	-0.04	0.19	-0.02	-0.08	0.02	-0.07		0.01	0.24
Former Soviet Union	fsu	-2.72	0.00	0.02	-0.02	0.01	0.02	-0.01	0.21	0.00	-0.06	0.04	-0.05	0.03	0.03	-0.30
Cent. And E. Europe	cee	2.22	-0.02	0.00	-0.04	-0.02	0.00	-0.04	0.19	-0.02	-0.08	0.02	-0.07	0.01	0.01	0.03
Rest of the world	row	2.21	-0.03	-0.01	-0.05	-0.02	-0.01	-0.04	0.19	-0.02	-0.08	0.02	-0.07	0.01	0.01	0.12
World total	Total	-0.90	-0.02	0.00	-0.05	-0.02	0.00	-0.03	0.13	-0.02	-0.09	0.01	-0.06	0.01	0.01	-0.12

Source: Simulation experiments.

4.3 Effects on Sectoral Output and Average Cost

The impact of U.S. steel protection is expected to vary significantly across sectors. In particular, those industries that use steel as an intermediate input are likely to be adversely affected by the imposition of TRQs in the steel industry. To what extent the steel-related industries in the United States and East Asian countries are affected by the U.S. protection is of great concerns to policy makers in these countries.

Table 4 provides real output results for the year 2003 on steel and selected related industries – metal products, motor vehicles, other transport equipment, and construction – resulting from the temporary U.S. protection. Real output of steel in the United States increases by 0.23 percent, whereas that of Canada and Mexico increases by 0.44 percent, mainly driven by a sharp increase in the exports to the United States. The contraction in output of East Asian producers is extremely small, ranging from –0.01 percent (China) to –0.09 percent (Korea).

Table 4. Changes in Output of Steel and Related Industries resulting from U.S. Steel Protection (percent deviations from the baseline in 2003)

	Iron and steel	Metal products	Motor vehicles	Other trans. equipment	Construc-tion
United States	0.229	-0.010	-0.010	-0.008	-0.001
Japan	-0.051	0.003	0.007	0.005	0.000
China	-0.014	0.003	0.000	0.002	0.000
Korea	-0.088	0.006	0.004	0.010	-0.001
Taiwan	-0.043	0.013	0.003	0.005	-0.001
ASEAN	-0.043	0.006	0.000	0.005	0.000
EU-15	-0.088	0.003	0.003	0.008	0.000
Canada and Mexico	0.439	0.017	-0.016	-0.016	0.001
Other OECD	-0.062	0.003	0.001	0.004	0.000
Brazil	-0.142	0.002	0.009	0.008	0.000
Rest of Latin America	0.059	0.002	-0.002	-0.002	0.000
Former Soviet Union	-0.162	0.003	0.004	0.009	-0.001
Cent. and E. Europe	0.041	0.000	-0.002	0.002	0.000
Rest of the world	0.034	0.002	-0.001	0.002	0.000
World total	-0.001	0.000	-0.001	-0.001	0.000

Source: Simulation experiments.

The U.S. protection of steel appears to cause output contractions in the metal products, motor vehicles, other transport equipment, and construction sectors although the impact on these related industries is extremely small. By contrast, it leads to output

expansions in the steel-consuming industries in Japan, Korea, and Taiwan, even though the impact is again very small. The impact on these industries in China is virtually zero.

The effects on output of the steel-consuming industries are largely attributable to changes in their average costs. Table 5 summarizes the effects on average costs of steel and related industries resulting from the U.S. imposition of TRQs on steel imports. In the United States, the average costs of steel-consuming industries rises mainly because the price of steel goes up. On the contrary, the average costs of the same industries in the non-exempted countries either fall or stay the same. Had the United States set much lower levels of quotas, they might have lead to significant deteriorations in the international competitiveness of U.S. steel-consuming industries.

Table 5. Changes in Average Costs of Steel and Related Industries resulting from U.S. Steel Protection (percent deviations from the baseline in 2003)

	Iron and steel	Metal products	Motor vehicles	Other trans. equipment	Construc-tion
United States	0.022	0.021	0.009	0.006	0.005
Japan	-0.001	-0.001	-0.002	-0.001	-0.002
China	0.000	-0.001	0.000	0.000	0.000
Korea	-0.002	-0.002	-0.003	-0.002	-0.003
Taiwan	-0.001	-0.001	-0.001	0.000	-0.001
ASEAN	0.002	-0.001	0.000	0.000	0.000
EU-15	-0.002	-0.002	-0.001	-0.001	-0.002
Canada and Mexico	0.009	0.009	0.008	0.008	0.010
Other OECD	-0.001	-0.001	-0.001	-0.001	-0.002
Brazil	-0.007	-0.007	-0.007	-0.007	-0.007
Rest of Latin America	0.000	0.001	0.001	0.001	0.002
Former Soviet Union	-0.006	-0.006	-0.006	-0.006	-0.007
Cent. and E. Europe	-0.001	0.000	-0.001	0.000	0.000
Rest of the world	0.000	0.000	0.000	0.000	0.000
World average	0.001	0.001	-0.001	0.000	0.000

Source: Simulation experiments.

5. Concluding Remarks

This paper has provided a preliminary assessment of U.S. imposition of TRQs for three years (2002-2004) using a 14-region, 17-sector dynamic CGE model. The results suggest that the effects of this temporary protection on economic welfare, trade flows, and real output of steel and the related industries are extremely small. Nevertheless, it is worthwhile to report that while the U.S. welfare marginally increases in 2002 and 2003, it is predicted to decline in 2004 and 2005. This is largely caused by increases in the price of steel in the U.S. market.

U.S. steel imports from East Asian countries and other non-exempted regions decline by 2.5-2.8 percent, whereas those from the NAFTA partners and other exempted regions increase by around 2.2 percent, thus largely offsetting the fall in the total U.S. steel imports. Real output of steel in the United States increases by 0.23 percent, whereas that of East Asian producers contract by 0.01–0.09 percent. Canada and Mexico would realize a relatively large gain in real output, mainly driven by a sharp increase in the exports to the United States. The effects on output of steel-consuming industries are negative in the United States and positive in East Asian countries, but they are extremely small. These results suggest that the impact of the U.S. imposition of TRQs is minimal.

The magnitudes of our results are significantly smaller than those obtained by Francois and Baughman (2001), who estimate that U.S. imports of steel would fall by 18.5-35.9 percent. This is because they evaluate the effects of the imposition of 9.2-20.7 percent tariffs on steel imports, which are of much higher protection rates than used in our study. They also include only Canada and Mexico in the exempted countries, whereas the great majority of developing countries (with notable exceptions of China and Brazil) are assumed to be exempted from the U.S. TRQs in this study.

In addition, we have only attempted to estimate the new protection that became into effect in March 2002. Thus, no attempt has been made to assess the effects of the U.S. protection of its steel industry that existed prior to March 2002, which are much more substantial. The impact of the temporary imposition of TRQs is likely to be extremely small as we have estimated, but the past U.S. protection policies might have had substantial effects on the bilateral trade flows in steel, as well as the efficiency and competitiveness of steel and the related industries in the United States and East Asia.

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