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Measuring Political Barriers in US Exports to China

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The trade imbalance between the United States and China has expanded rapidly over the past two decades. Exactly how much US export controls contribute to this development is an important question. This article examines the various political barriers constraining US exports to China, and in particular their impact on the export of dual-use products with high military applications. The article then quantitatively measures the magnitude of this impact and the corresponding potential US export capability were certain levels of export control to be liberalized. The conclusion drawn here is that the United States has the potential to significantly increase its exports to China by liberalizing its export constraints against the PRC.

Introduction

US–Sino trade underwent rapid growth in the mid-1980s, during which time both countries exported approximately the same volume of goods (hereafter 'exports') to one another. As at 1988, the annual growth rate of US exports to China was 43.6% while that of imports from China to the United States was 35.2%. Since 1989, however, US exports have witnessed a dramatic decline. The growth rate in 1989 dropped to 14.6%, and in 1990 plummeted to −16.5%. The growth rate of imports from China, meanwhile, was 40.9% in 1989 and 27.1% in 1990. In the years following, US imports from China grew rapidly while export growth remained at a low level. As a result, US exports to China gradually fell to about one-fifth or less of China's exports to the United States, and trade deficits became a serious issue. In the lead-up to 2008, the US–Sino trade deficit approached a peak value of $268.94

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Table 1 The 1985–2009 US–Sino Trade Data (Unit: $1 million)

Year	Exports	Imports	Balance	Import Growth Rate (%)	Export Growth Rate (%)	Year	Exports	Imports	Balance	Import Growth Rate (%)	Export Growth Rate (%)
1985	**3855.7**	**3861.7**	**−6.0**								
1986	3106.3	4771.0	−1664.7	23.55	−19.44	1998	14 241.2	71 168.6	−56 927.4	13.76	10.72
1987	3497.3	6293.6	−2796.3	31.91	12.59	1999	13 111.1	81 788.2	−68 677.1	14.92	−7.94
1988	5021.6	8510.9	−3489.3	35.23	43.59	2000	16 185.2	10 0018.2	−83 833.0	22.29	23.45
1989	5755.4	11 989.7	−6234.3	40.87	14.61	2001	19 182.3	102 278.4	−83 096.1	2.26	18.52
1990	4806.4	15 237.4	−10 431.0	27.09	−16.49	2002	22 127.7	125 192.6	−103 065.0	22.40	15.35
1991	6278.2	18 969.2	−12 691.0	24.49	30.62	2003	28 367.9	152 436.1	−124 068.0	21.76	28.20
1992	7418.5	25 727.5	−18 309.0	35.63	18.16	2004	34 427.8	196 682.0	−162 254.0	29.03	21.36
1993	8762.9	31 539.9	−22 777.0	22.59	18.12	2005	41 192.0	243 470.1	−202 278.0	23.79	19.65
1994	9281.7	38 786.8	−29 505.1	22.98	5.92	2006	53 673.0	287 774.4	−234 101.0	18.20	30.30
1995	11 753.7	45 543.2	−33 789.5	17.42	26.63	2007	62 936.9	321 442.9	−258 506.0	11.70	17.26
1996	11 992.6	51 512.8	−39 520.2	13.11	2.03	2008	69 732.8	337 772.6	−268 040.0	5.08	10.80
1997	12 862.2	62 557.7	−49 695.5	21.44	7.25	2009	69 576.0	296 402.1	−226 826.0	−12.25	−0.22

Source: USITC Interactive Tariff and Trade DataWeb Version 3.1.0, http://dataweb.usitc.gov/.

billion. Table 1 clearly shows that the growth rate of US exports to China since 1989 is considerably lower than that of its Chinese imports.

US–China trade deficit is now an important topic in Washington D.C. when the United States considers its policy towards China. Why are US exports to China so much smaller than its imports from the PRC? The US and Chinese governments have both similar and differing opinions on this question. In general, the United States focuses on improving American manufacturers and service providers' access to the Chinese market and obtaining better intellectual property protection. China, meanwhile, is concerned with reducing US restrictions on the export of dual-use high-technology products to China.[1]

A number of US government officials and experts have blamed the trade deficit on China. Davis accused the Chinese government of a lack of transparency in policy-making and of failing to fully implement mutual agreements.[2] Perlow claimed that China has obtained unfair comparative advantages vis-à-vis the United States by abusing human rights and labour rights, failing to uphold environmental protection, and refusing to abide by relevant international standards.[3] Zhang et al. reported that American merchandise had experienced trade barriers from China and lack of access to the Chinese market.[4] Others have cited the unpredictability of the future etc.[5]

Since 2003, that China intentionally depressed wages and undervalued the RMB (Chinese currency Renmin Bi) to facilitate exports has become a prevailing view within the US government and among experts.[6] Certain US government officials and experts have stated publicly in Congressional testimony that it was the undervalued RMB that caused the cheap dumping of

1 Kang Juan, 'US Economic Remedy Questioned', *Global Times*, July 28, 2009.

2 Elizabeth Van Wie Davis, *Chinese Perspective on Sino-American Relations 1950-2000* (New York: The Edwin Mellen Press, 2000), p. 174.

3 Jim Perlow, 'Trade Deficit with China Puts Us at Disadvantage', http://phoenix.bizjournals.com/phoenix/stories/2002/10/14/editorial4.html.

4 Zhang Yansheng, Liu Xu, and Ping Xinqiao, *Zhong Mei maoyi shuncha jiegou fenxi yu duice* (*Structural Analysis on China's Trade Surplus with the US and Policy Suggestions*) (Beijing: Zhongguo caizheng jingji chubanshe, 2006), p. 7.

5 Geza Feketekuty, 'Addressing Concerns on the Growing US Trade Deficit with China', http://www.commercialdiplomacy.org/ma_projects/us_chinatrade.htm.

6 Morris Goldstein, 'Testimony Before the Subcommittee on Domestic and International Monetary Policy, Trade, and Technology Committee on Financial Services', US House of Representatives Washington, DC, http://www.iie.com/publications/testimony/testimony.cfm?ResearchID=266; John Taylor, 'Economic Relations Between the United States and China and China's Role in the Global Economy', Under Secretary of Treasury for International Affairs: Committee on Ways and Means, http://www.ustreas.gov/press/releases/js956.htm; Fred Bergsten, 'The Chinese Exchange Rate and the US Economy', Testimony before the Hearing on the Treasury Department's Report to Congress on International Economic and Exchange Rate Policy and the Strategic Economic Dialogue Committee on Banking, Housing and Urban Affairs, January 31, 2007, http://www.iie.com/publications/papers/paper.cfm?ResearchID=706.

Chinese goods in America, and that the only way to solve this trade imbalance was to appreciate the RMB or free float the RMB exchange rate.[7]

But this is not the only view. Quite a few studies have made clear that the RMB was not, in fact, undervalued.[8] Moreover, other researchers discovered that adjustment of the RMB exchange rate policy could hardly improve the US–Sino trade balance situation,[9] and that neither RMB appreciation nor free float of exchange rate could reduce the US–China trade deficit.[10] For such reasons, a large number of scholars countered that a more realistic and diversified policy and measures were required to solve the trade deficit issue.[11]

The Chinese government, on its part, has complained about the current US export control regime, accusing it of acting as a barrier and hence of exacerbating the trade deficit. China has on a number of occasions urged the United States to liberalize the export control restrictions levelled against it.[12] For example, Chinese premier Wen Jiabao said: 'The country's trade imbalance would be much smaller if the United States would approve more high-tech exports to China.'[13] He also stated, 'I sincerely hope the Europe Union

[7] Nicholas Lardy, 'China: The Great New Economic Challenge?' in C. Fred Bergsten, ed., *The United States and the World Economy: Foreign Economic Policy for the Next Decade* (Washington D.C.: Institute for International Economics, 2005).

[8] Yu Qiao, 'Purchasing Power Parity, Real Exchange Rate and International Competitiveness: Theoretical Approach Measuring Weighted Real Exchange Index in China', *Journal of Finance*, No. 1 (2000), pp. 57–62; Dou Xiangsheng and Yang Xi, 'Estimating of RMB Equilibrium Exchange: A PPP Approach', *Science, Technology and Engineering*, No. 2 (2004), pp. 140–3; Ming He Goh and Yoonbai Kim, 'Is the Chinese Renminbi Undervalued?', *Contemporary Economic Policy*, Vol. 24, No.1 (2006), pp. 116–26.

[9] Mohsen Bahmani-Oskooee and Yongqing Wang, 'United States-China Trade at the Commodity Level and the Yuan-Dollar Exchange Rate', *Contemporary Economic Policy*, Vol. 25, No. 3 (2007), pp. 341–61; Yajie Wang, Xiaofeng Hui, and Abdol S. Soofi, 'Estimating Renminbi (RMB) Equilibrium Exchange Rate', *Journal of Policy Modeling*, Vol. 29, No. 3 (2007), pp. 417–29; Zhichao Zhang, 'China's Exchange Rate Reform and Exports', *Economics of Planning*, Vol. 34, No. 1–2 (2001), pp. 89–112.

[10] Patrick Higgins and Owen F. Humpage, 'The Chinese Renminbi: What's Real, What's Not', Federal Reserve Bank of Cleveland, *Economic Commentary*, August 15, 2005, pp. 1–4; Ronald McKinnon and Gunther Schnabl, 'The Case for Stabilizing China's Exchange Rate: Setting the Stage for Fiscal Expansion', *China & World Economy*, Vol. 17, No. 1 (2009), pp. 1–32; Ronald McKinnon, 'Why China Should Keep Its Dollar Peg', *International Finance*, Vol. 10, No. 1 (2007), pp. 43–70.

[11] Ronald McKinnon, 'Why China Should Keep Its Dollar Peg', pp. 43–70; Abdol S. Soofi, 'China's Exchange Rate Policy and the United States' Trade Deficits', *Journal of Economic Studies*, Vol. 36, No. 1 (2009), pp. 36–65; Yajie Wang, Xiaofeng Hui, and Abdol S. Soofi, 'Estimating Renminbi (RMB) Equilibrium Exchange Rate', pp. 417–29. Zhenhui Xu, 'China's Exchange Rate Policy and Its Trade Balance with the US', *Review of Development Economics*, Vol. 12, No. 4 (2008), pp. 714–27. This article does not focus on RMB issues, but only to prove that there are alternative factors that impact upon the status of US–China trade. Essentially, we are trying to study the trade deficit from a number of different viewpoints.

[12] 'Report to Congress of the U.S.-China Economic and Security Review Commission', November 2006, p. 141; 'Report to Congress of the U.S.-China Economic and Security Review Commission', November 2009, p. 22.

[13] 'Premier Wen Jiabao Communicates with Netizens on Xinhua Net', February 27, 2010, http://www.chinadaily.com.cn/micro-reading/politics/2010-02-27/26081.html.

and the United States will recognize China's market economy status and lift restrictions on the exports of high-tech commodities to China because that will help promote trade balance in the world.'[14] Elsewhere, Zhang Yansheng of the National Development and Reform Commission said, 'on one hand, the United States asks Beijing to reduce its trade surplus. On the other hand, it refuses to sell high-tech commodities to China. What does it really want?'[15] According to China's Foreign Ministry, 'We hope that the US can take concrete measures to relax or lift its restrictions on high-tech exports to China, to better address the imbalances of China-US trade.'[16] Liao Xiaoqi, vice minister of the Chinese Ministry of Commerce, pointed out at the Sino–US Relations Forum held in Beijing in 2005 that the United States had lost at least $25 billion in exports to China through refusing to export nuclear and electronic technical devices, satellites and other high-tech products, so directly exacerbating the US–Sino trade deficit.[17] Certain scholars have studied the chain reactions that may result from the hypothetical liberalization of the US high-tech export control regime that is in place against China. They have shown that the regime has not only amplified the trade deficit but also driven down the high-tech intra-industry trade level between the two countries. By lifting restrictions on high-tech exports to China, the United States could both handily alleviate the trade deficit and highly promote the mutual Intra-industry Trade Level.[18]

In response to such accusations, the US government has repeatedly claimed that the impact of export restrictions is extremely small and can hence be ignored. For example, US Secretary of Commerce Carlos M. Gutierrez stated that: 'These factors contribute to our trade deficit with China. Some in China contend that our trade deficit would evaporate if the United States relaxed our export controls. But the tiny percentage of trade blocked by export license denials is little more than a rounding error. Make no mistake: US export controls don't create our trade deficit.'[19] He continued: 'The total value of US exports to China in federal fiscal year 2005 was roughly $40 billion and the total value of denied exports—$12.5 million—was only slightly more than three-hundredths of one

[14] 'China's Trade Surplus with US Misread', March 16, 2010, http://www.chinadaily.com.cn/bizchina/2010-03/16/content_9598941.htm.

[15] *Ibid.* Zhang Yansheng was director of the Institute of Foreign Trade, National Development, and Reform Commission, China.

[16] 'China Seeks Reduced US Export Controls', June 27, 2006. http://www.textileglobal.com/2010/06/china-seeks-eased-us-export-controls.html.

[17] Ling Lin and Sang Jun, 'Discussion on the Reasons for US-Sino High-Tech Trade Deficit', *Commercial Times*, No. 35 (2007), pp. 29–31.

[18] Du Li, 'The Empirical Research on the Intra-Industry Trade in Sino-US ATP Trade', *The Journal of Quantitative & Technical Economics*, No. 8 (2006), p. 96.

[19] 'Remarks by US Secretary of Commerce Carlos M. Gutierrez, Bureau of Industry and Security Update Conference', October 24, 2005, http://www.bis.doc.gov/news/2005/doc-secretary.htm.

percent of that total value.'[20] In addition, Christopher Padilla, US assistant secretary of commerce for export controls remarked in Shenzhen, China, on January 2007 that: 'Indeed, total licensed trade in 2005 was about $2.4 billion, or only 4.7% of total US exports to China. And in terms of actual exports of "advanced technology products" (ATP), only 0.6% of such US exports to China required an individual validated license, and more than $350 million in ATP exports went to China under one of several license exceptions available in our regulations. The license burden on high-tech sales to China isn't out of line with export license requirements for other destinations; about 0.4% of actual US ATP exports to the European Union also required an export license.'[21] In July of the same year, Mario Mancuso, United States under secretary of commerce for industry and security, published a paper on Chinese media, in which he claimed that: 'About $230 million worth of high-tech exports to China—1.3%—required a license in 2006, the majority of which were approved for export. Actually, the value of denied exports to China by DOC was $17.7 million, and only represented a 0.03% proportion of the total exports... Taking into account that more than 99% of US exports to China were approved, export regulation is not a problem.'[22]

These arguments have obvious logical problems and factual inconsistencies. As the Chinese Ministry of Commerce pointed out: 'The statistic quoted by [the] US side constitutes a metaphysics method... For example, a piece of dual-use chip planted on a Boeing airplane costs only $1,000. But the entire trade related to such application is the whole plane, which probably values up to billions of dollars. These two values have a one million-fold difference. More seriously, upon observing the denial of an application for a certain export, other exporters of a similar product would not spend the time and money necessary to apply for such license. Therefore, the actual affected trade value could possibly be even greater. So the statistic with respect to export license applications cannot exactly reflect the entire corresponding trade amount.'[23] It seems that the US export system poses larger invisible barriers against China than the US government has acknowledged.

[20] US-China Economic and Security Review Commission, 'Hearing on China's Military Modernization and US Export Controls, Testimony of Francis Record', March 17, 2006, http://origin.www.uscc.gov/sites/default/files/transcripts/3.16-17.06HearingT.pdf; see also US Office of Inspector General, Department of Commerce, 'US Dual-Use Export Controls for China Need to Be Strengthened', Washington, DC, March 2006, p. 3, http://www.oig.doc.gov/OIGPublications/IPE-17500.pdf.

[21] Christopher Padilla said in an interview with the *21st Century Business Herald* during his visit to China (http://www.bis.doc.gov/news/2007/padilla02012007.htm).

[22] Mario Mancuso, 'Explanation of the Details of High-Tech Export Regulation toward China', http://www.eeo.com.cn/industry/it_telecomm/2007/07/16/76189.shtml.

[23] 'Comment of Ministry of Commerce of People's Republic of China on "the Proposed Rule Revisions and Clarification of Export and Reexport Controls for the People's Republic of China (PRC); New Authorization Validated End-User, US Department

Another fact is that US exports to China have been significantly influenced by mutual political relations, and determined not just by global economic developments in the last 20 years. For example, after the political event in Tian'anmen Square in 1989 US exports to China experienced negative growth in 1990, and after the crisis over the Taiwan Strait in 1995 the overall export growth rate in 1996 fell to almost zero. US exports to China fell again to negative growth in 1998 after accusations of Chinese spying on technology in the United States. In contrast, in 1994 when the RMB depreciated, the growth rate of US exports fell to 5.9%, but rapidly increased to 26.6% the following year. Such phenomena suggest that political factors in US exports to China might have greater impact than economic factors, namely the currency exchange rate.

Furthermore, China has rigid demands for US exports. Drops in the growth rate of US exports to China are always followed by big jumps. For example, after a year of negative growth, exports in both 1991 and 2000 achieved growth rates of 30.6% and 23.4%, respectively. But US export barriers might constrain such demand.

Therefore, the biggest question in the debate is: how much is the US potential export capability blocked by its own barriers? Is it negligible, as stated by US governmental officials, on a level equal to that of a rounding error? Or is it very large, as stated by Chinese government officials, to the extent of accounting for a significant proportion of the US–China trade deficit? Before answering this question, we need to understand what the US export barriers to China comprise, and how they work.

US Barriers

The major barriers to US exports to China are largely based on the political and security concerns of the United States, that is, the fear that exporting to China products with military applications may strengthen China's military power and thus hurt US national security. These barriers, according to their function, are in three categories:

Administrative Barrier: export applications are denied by the administrative process and included in US government statistics on export control impact. The US government strictly constrains exports of dual-use products and technologies to China.[24] 'China is the focus of US export control policy' according to Vann H. Van Diepen, acting deputy assistant secretary of state for non-proliferation control in his testimony to the US-China Commission on 17 January 2002. Van Diepen went on to state that 'the Administration applies strong export controls on both dual-use items and munitions with

of Commerce"', http://cys.mofcom.gov.cn/aarticle/ag/200804/20080405476262.html?3774840321=2320678451.

[24] 'Report to Congress of the U.S.-China Economic and Security Review Commission', November 2009, p. 22.

the goal of not contributing to nuclear, missile, CBW and other military programmes of concern in China or elsewhere… The overall number of munitions-list exports to China since 1989 has been extremely small.' A further example was in 2001, when the US semiconductor manufacturer Semiconductor Manufacturing International Corporation (SMIC) initiated cooperation to build a chip factory in Shanghai and applied for two technology transfer cases related to electron beam technology to China. Soon afterwards, the Missile Technology Export Committee (METC) (consisting of Department of Defense and Department of State) noted the potential military use of the technology and the technology export application was eventually withdrawn.[25] Many companies may not try to apply for export licenses if they know in advance that there is no hope of getting through the administrative application process. For this reason, potential exports that do not materialize remain largely outside the statistics of denied export applications.

Institutional Barrier: exports are abandoned over concerns related to the export control regime including various regulations, acts, and control lists. In this area, the US Congress adopts legislative measures to constrain high-tech exports to China. For example, 'The President shall certify to the Congress at least 15 days in advance of any export to the People's Republic of China of missile equipment or technology that: (1) such export is not detrimental to the United States space launch industry; and (2) the missile equipment or technology, including any indirect technical benefit that could be derived from such export, will not measurably improve the missile or space launch capabilities of the People's Republic of China' (Strom Thurmond National Defence Authorization Act for Fiscal Year 1999 SEC. 1512.). The US administration also promulgates export regulations and imposes sanction lists to control certain exports to China. For example, according to current export regimes, China is listed in Group D and hence subject to a level of export regulations almost as strict as those reserved for US-hostile nations like Cuba, Iran, North Korea, and Syria.[26] In addition, besides the general export regulations, specific acts and lists have been designed for China and are currently in force. Understanding as they do that there is likely no hope of receiving export licenses given the control regimes, some potential exporters tend to abandon applications and give up their exports. Many companies have also established Internal Control Programmes that abort any export plans that are at odds with export control regulations. Therefore, many US potential exports to China never enter the process of export applications and abandon the export process. Other potential exporters may worry about the cost, time,

[25] http://www.bis.doc.gov/licensing/acronym.htm.
[26] EAR Supplement No. 1 to Part 740, Country Groups, http://www.gpo.gov/bis/ear/ear_data.html.

and uncertainties of license applications and in end-use monitoring if their products are on control lists. For example, certain American manufacturers complained that 'the time taken to get a license has increased from 104 to 150 days'.[27] So the institutional barrier may stop a large scope of potential exports, but only a small portion of cases actually enter the license process, and these tend to encounter the administrative export barrier. Thus, the calculation the US government has made on the impact of its control on exports to China fails to include potential exports that are abandoned before entering the licensing process.

Political Barrier: exports are resigned under political pressures. American news media and opinion leaders always place pressure on companies who sell high-tech products to China or have interest in doing so. The concern is that such exports could hurt US national security, even when certain businesses may not be explicitly forbidden under US export control regulations. Critics in the United States have objected to the decision to ease restrictions on exports to China.[28] The US congress closely scrutinizes any important high-tech transfers to China, such as those entailed in the US satellite launch services that China provides. In general, Congress is highly concerned about the technical flow from the United States to China, and whether this has the potential to hurt US national security. The US government also adopts a cautious position on high-tech sales to China. For instance, on the Bureau of Industry and Security (BIS) homepage, there are only two country-related titles listed. They are: 'India high-tech trade' and 'China high-tech trade'. The subject in the India link is 'Facilitating US-India High Technology Trade', but for China it is 'Securing US-China High Technology Trade'.[29] Faced with this political pressure, companies might feel obliged by an invisible moral force to give up their exports to China. The potential exports relinquished under this ethos are not, of course, included among those that are either authorized or denied in the licensing process.

Owing to these barriers, especially the last two, certain potential export opportunities may be abandoned altogether and completely ignored within the statistics of actual export license applications. All these barriers contribute to overall deductions in US exports to China. It is therefore necessary to estimate the total size of all deductions rather than just calculate the number of export applications that the US government has denied.

[27] Centre for Strategic and International Studies, 'Regulating Satellite Exports', March 12, 2002, http://www.csis.org/tech/satellites/.

[28] Michael Levyveld, 'Eased Exports for China Unlikely', *Radio Free Asia*, December 10, 2009. Also see the United States-China Economic and Security Review Commission's Reports for previous reporting cycles for analyses of China's proliferation activities.

[29] Lora Saalman, 'A Comparative Study of Shifts in Sino-Indian Security Perceptions – Under Changes in US-E.Export Controls', PhD Dissertations, Tsinghua University, 2010; 'India High-Tech Trade', http://www.bis.doc.gov/internationalprograms/indiacooperation.htm; 'China High-Tech Trade', http://www.bis.doc.gov/uschinaexportrule.htm.

One hypothetical method is to estimate the total size of potential exports that are given up before entering the licensing process by summing up and interviewing the relevant American enterprises. However, this method may not be feasible because many enterprises may have become ignorant of their potential markets in China if past efforts to export to China proved impossible due to export barriers.

Another method is to measure China's high-tech import transfers from the United States to other regions. Li estimated the impact of the US export barrier on China by analysing China's high-tech imports transferred to other countries from the United States.[30] This method is only feasible, however, when applied to the first few years the United States began to raise its high-tech export barriers against China. In recent years, the United States has moreover increased pressure on its allies and other suppliers also to constrain high-tech and dual-use exports to China. For instance, when the European Union discussed ending the arms embargo against China, the US government warned that such an action would endanger existing technology-sharing programmes, such as the F-35 Joint Strike Fighter, stating indirectly 'the issue has since dropped off the radar screen',[31] and more directly, 'As much as we favour expanding trade with China, we will not knowingly approve any export that will help China modernize its military capabilities. We continue to support the arms embargo and have urged our European allies to do likewise. We will also require a license for all exports that an exporter knows could materially assist the Chinese military. We will review any application that supports the advancement of Chinese military capabilities under a general policy of denial. We will encourage our allies to adopt similar positions.'[32] As other countries follow the United States in controlling sensitive dual-use exports to China, current methods of calculating the transfer of Chinese high-tech imports are no longer sufficient in estimating US export barriers against China.

We propose a new method of comparing US export compositions to different countries, and of estimating how US export barriers against China make the US export composition to China different from that to other countries. The more the United States assumes that a country is a military threat the less it wants to sell products with military applications to said country. Consequentially, export barriers in the United States change both the total amount and the pattern of US exports to a country. In another words, the relevance of the total amount in relation to the pattern of US

[30] Zhijun Li, 'On the USA Technology Export Control To China and Adverse Balance of Trade Between China and USA: Essence and Proposals,' *World Sci-Tech R&D*, Vol. 21, No. 4 (1999), pp. 97–100.

[31] Sharon Weinberger, 'Industry, Government Make Renewed Push to Change U.S. Export Control Regime', *Aviation Week & S pace Technology*, July 16, 2006.

[32] 'Speech by Acting under Secretary Peter Lichtenbaum in 8th National Forum on Export Controls', http://www.bis.doc.gov/news/2005/usnationalforum.htm.

exports to a country offers a clue when ascertaining how exports may be promoted by reducing export barriers.

Compared to countries in Groups A and B of the Export Administration Regulation (EAR) list, those in Groups D and E are subject to much more stringent restrictions. Put simply, more products are not allowed, especially those with military applications.[33] For exports to countries involved in special acts and regulations, the licensing procedure is even more complex and the volume of export blocked is correspondingly higher. Additionally, US government officials in charge of export control exercise more caution when dealing with exports to countries that engender special security concerns in the United States. All such discriminations lead to divergent patterns of export composition to different countries.

Through a comparison of US exports to different countries, the article tries to answer the central question: to what extent are US potential exports to China blocked by US barriers? The answer to this question can also be extended to answer a secondary question, that is, how many US potential exports to China could be realized if the US were to liberalize its export control regime against China, in line with those of other benchmark countries.

Model

US exports are classified as 137 common items (see Appendix Table A1). Most are dual use for both military and civilian purposes, and only a few are exclusively for military or civilian use. Certain dual-use items have relatively direct military applications compared with others. To prevent importers from taking military advantage of US technologies, the US government has constructed an export control system to constrain the export of military items or items with high military applications. Fundamentally, the scope of control varies according to the importing countries. Countries that are viewed by the United States as serious military threats are less likely to receive items with high military applications. As a result, the proportion of items with high military applications among the total exported to these countries is relatively small. By comparing the compositions of US exports to different countries, one can ascertain exactly how serious US export barriers against these countries actually are.

Definitions

Export items are controlled differently according to their potential military use. First of all, military products are those most restricted, e.g. '(50030) Military trucks, armoured vehicles, etc.' (see Appendix Table A1). Exports

[33] EAR Supplement No. 1 to Part 740, Country Groups, http://www.gpo.gov/bis/ear/ear_data.html.

of military products are the most sensitive and generally strictly controlled. Consequently, control barriers against the export of military products are incredibly rigid. Secondly, dual-use products—items that could be applied to both civil and military use—are the next type of product that is strictly controlled. Some export items obviously include many dual-use products, e.g. '(21400) Telecommunications equipment'. Dual-use products with high military applications are more strictly controlled. Third, items with low military applications and insignificant dual-use face fewer export controls, e.g. '(00000) Wheat'.

All in all, we categorize the aforementioned export items (137 in total) into two groups. The first group includes military products and dual-use items with high military applications, and is defined as 'Exports of Items with Most Military Applications (EIMMA)'. The second group includes items with low military applications, or that are widely available in the world market, like '(00000) Wheat' and is defined as 'Exports of Items with Least Military Application (EILMA)'. We also define the value proportions of the two groups in total exports as 'Weight of Export with Most Military Application' (Weight of EIMMA) and 'Weight of Export with Least Military Application' (Weight of EILMA):

$$\begin{aligned} &\text{Weight of EIMMA} = \text{value of EIMMA/total export value} \\ &\text{Weight of EILMA} = \text{value of EILMA/total export value} \end{aligned} \quad (1)$$

If the EILMA value of the United States to a certain country is L and the entire export value is E, the value of EIMMA is $M = E - L$. Thus the formula (1) could be written as:

$$\begin{aligned} &\text{Weight of EILMA}(W_L) = L/E \\ &\text{Weight of EIMMA}(W_M) = M/E \end{aligned} \quad (2)$$

The concept of EIMMA as defined in this article should be different from the concept of Advanced Technology Product (ATP). The EIMMA definition is according to the application of military use. Though most military-use items contain advanced technology, not all ATP are EIMMA. Within the 10 categories of ATP,[34] most items in Biotechnology and Life Science are not EIMMA; some portions of Information and Communications are not EIMMA; and a small number of items from Electronics are counted as EIMMA.

[34] 'Biotechnology, Life Science, Opto-Electronics, Information & Communications, Electronics, Flexible Manufacturing, Advanced Materials, Aerospace, Weapons, Nuclear Technology', http://www.census.gov/foreign-trade/reference/glossary/a/atp.html#general.

The total amount of ATP exports far surpasses the value of EIMMA. For example, in 2005, the US–Sino civil ATP trade deficit reached $38 billion, and total ATP deficit exceeded $40 billion. From 2001 to 2006, the US ATP share of China ATP imports dropped from 18.3% to 9.1%. Accounting according to such data, US ATP exports to China were at a loss of at least $70 billion.[35] Most ATP value accrues not from items with high military applications, but more from civil electronic products and other non-agricultural and modern industry products.

The concept of EIMMA is proposed to measure the group of items that have high military applications and are therefore subject to US export barriers based on security and political concerns. As an index, the Weight of EILMA could imply the seriousness of US export barriers against a country, because a higher Weight of EILMA corresponds to a smaller proportion of exports with high military applications in the total. Some countries have similar spectrums of import demands. If the United States views a country as a military threat, it would not like to sell dual-use items with high military applications to this country. As a result, export barriers in the United States stop a lot of exports with potential high military applications to this country and lead to a low Weight of EIMMA and a high Weight of EILMA. By using formula (2) we can then calculate the weights of EILMA and EIMMA for different countries. Table 2 shows the calculation results by using Selection II of EILMA and EIMMA defined in the Appendix Table A1.

In Table 2, among the four countries of France, Brazil, India, and China, the weight of EILMA increases in the same order as that of the increase in US security concerns. China has the highest weight of EILMA and the lowest weight of EIMMA of the four countries and, among the four, is the country that most concerns the United States in terms of military competition. The UK and Japan have special reasons to have high weights of EILMA, as explained below.

Variable Control

Besides export barriers, three other factors may in principle also determine the weight of EILMA. They are: demands of the importer, the competitiveness of products and the productivity of the exporter. However, in our research, these three variables can be well controlled by carefully selecting countries for comparison.

Demands of the Importer: diversified demands made by importers might lead to different patterns of imports, reflected in the difference in the weights of EILMA. For example, the US weights of EILMA to the UK and Japan are significantly higher than those to France, which could be explained by the demands of importers. Both the UK and Japan are island countries with

[35] http://chinasourcing.mofcom.gov.cn/content2.jsp?id=5203.

Table 2 US Weight of EILMA to Different Countries (2004–2009 Average)

Country	France	Brazil	India	U.K.	Japan	China
Weight of EILMA (%)	34.90	43.81	47.96	53.84	58.15	72.49
Weight of EIMMA (%)	65.10	56.19	52.04	46.16	41.85	27.51

relatively small territory and low agricultural resources. These importers hence have higher demands for EILMA. Even so, the US weight of EILMA to China is still much higher than that to the UK and Japan. China has a much higher demand for EIMMA products from the United States than developed island countries such as the UK and Japan, according to their industrial structures, which suggests that the US barriers to EIMMA against China are indeed very high. In order to exclude the impact of importers' different demands, we take India, Brazil, and France as benchmark countries as they all have their own agricultures and therefore similar import demands.

Competitiveness of Products: a product that is not competitive in a market may only take a small share of that market. However, the US EIMMA (usually high-tech products) are much more competitive in China than US EILMA (including many foods and other non-high-tech products). Substitutes for US EIMMA products, moreover, are more difficult to find in China than are EILMA. Many EILMA products may face cultural import barriers, for example, different tastes in foods. Certain other market factors, e.g., exchange rate, have much less influence on the competitiveness of high-tech products than on that of others. And even if certain American EIMMA products are not competitive for specific reasons, this should impede EIMMA to all countries rather than only to China. The competitiveness of US products, therefore, is not relevant to the analysis of this article.

Productivity of the Exporter: the exporter's inability to produce enough to satisfy the demands of the importer could cause insufficient EIMMA. There is no claim or other evidence that the productivity of US high-tech products is insufficient to meet China's demands. If the production of a product cannot temporarily meet the demand of the market, it lowers the supply to all importers and should not change the comparison of EIMMA across different countries.

It seems that the aforementioned three economic factors are irrelevant to lowering US high-tech exports to China. At the very least none reduces EIMMA exports solely to China.

Besides the three variables, certain trivial factors may also have some effect on China's demand for or America's supply of individual products. For example, some Chinese may like certain foods produced in the United States while disliking others due to their particular tastes. However, these

effects are randomly distributed and believed to offset each other in the aggregates of all products in EILMA and EIMMA.

Certain macroeconomic factors may have impact on trade between China and the United States too. For example, China's participation in the World Trade Organization in 2001 and fluctuations in the world economic situation changed the export and import conditions in the two countries. The impact of the macro factors on most products should hence be similar, and consequently lead to changes in the trade structure that are relatively insignificant when compared with those in the total trade volume.

The only reasonable explanation for the abnormally high US weight of EILMA to China is that there is a selective mechanism in the United States that is blocking US high-tech exports to China, mostly high military application dual-use products. Thus, controlling economic variables would come to a conservative assumption in favour of the opposite side of our conclusion.

Methodology

After controlling for the major economic variables, the only independent variable is US export barriers, and the dependent variable is the weight of EILMA.

Formula (2) could thus be written as:

$$E = \frac{L}{W} \qquad (3)$$

If the export barriers are liberalized from higher strictness level 1 to lower level 2, both the volumes of EIMMA exports (M) and EILMA exports (L) will rise due to fewer obstacles. As EIMMA exports are more sensitive to export barriers than EILMA exports, the rise of M should be significantly larger than of L. So according to formula (2), the liberalization of export barriers should lead to a declination of the Weight of EILMA.

According to (3):

$$\frac{E_2}{E_1} = \frac{L_2}{L_1}\frac{W_1}{W_2} \qquad (4)$$

In formula (4), E_1 is the export value under a higher level of export regulation; L_1 and W_1 are the corresponding values of EILMA and Weight of EILMA. E_2, L_2, and W_2 are the corresponding values on a lower level of export regulation.

Formula (4) could thus be transformed into:

$$E_2 = \frac{L_2}{L_1}\frac{W_1}{W_2}E_1 \qquad (5)$$

In formula (5), L_2/L_1 reflects the growth rate of EILMA value caused by adjustment of export regulations. Supposing that there is a precisely selected EILMA group absolutely exclusive of the influence caused by the adjustments, i.e. $L_1 = L_2$, formula (5) could be simplified as:

$$E_2 = \frac{W_1}{W_2} E_1 \qquad (6)$$

Furthermore, the trade deficit should respond to the adjustments of export regulations. If the value of import is I and trade balance is B, it could be deduced from formula (6) that, influenced by the liberalization of regulations, export growth rate would be:

$$r = \frac{\Delta E}{E} = \frac{W_1}{W_2} - 1 \qquad (7)$$

The corresponding trade deficit deduction rate would be:

$$s = \frac{\Delta B}{B} = \frac{\Delta E - \Delta I}{E - I} \qquad (8)$$

Here ΔI could be ignored, because US imports receive no direct influence from export regulation system. Thus formula (8) could be transformed into (9):

$$s = \frac{\Delta E}{E - I} = \frac{rE}{B} \qquad (9)$$

Substitute (7) for (9):

$$s = \left(\frac{W_1}{W_2} - 1\right)\frac{E}{B} \qquad (10)$$

Formula (10) indicates the relation between the liberation of export control and the corresponding trade deficit reduction.

Selection of Items in EILMA and EIMMA

The selections of items in the EILMA and EIMMA groups are according to the military applications of the 137 export items. The items that have very few military applications are categorized under the EILMA group. The rest come under the EIMMA group. A requirement of formula (6) is that the EILMA group is very small, so that the items in the category do not encounter export barriers. However, if the EILMA group is small to the extent of containing only a few items, the amount of the group's exports might be sensitive to certain economic factors, e.g., the demands of the importer. To control these economic factors, the number of items in the EILMA group shall not be much smaller than the total 137 items.

To test the sensitivity of our selection, we choose three different scopes of items from among the total 137 items, from small to large, for the EILMA group. To estimate the upper boundary of export control, Selection I

simulates the most severe situation, which includes the largest range of EIMMA (45 items recognized as exports with military applications). Conversely, to approach the inferior limit, Selection III is set for the minimum scope of EIMMA including only 27 items. Standard II is in-between Selections I and III.

Data

The trade data source is the United States International Trade Commission (USITC) Interactive Tariff and Trade DataWeb Version 3.1.0.[36] Data is queried for 1989–-2009 Total FAS Value.

Trade Type: US Total Exports.
Aggregate Level & Type: End Use 5.
Time-Line for the Report: Annual.
Destination: China.

Results and Discussion

The weights of the US EIMMA to China, France, Brazil, and India are calculated and compared below. Bearing in mind the similarity of their import demands, the comparison is useful for understanding US export barriers applicable to these countries.

Figure 1 shows the evolutions of the US weights of EIMMA to China, France, Brazil, and India. The calculation is based on the Selection II as explained in the Appendix Table A1. Before 1998, the weights of EIMMA to the four nations were approximately at the same level and with similar fluctuations. However, the situation changed from 1999 onwards, when the US weight of EIMMA to China dropped dramatically far below than that to the other three countries. Notably by 2002, the weight of EIMMA to China had slumped sharply and remained at an extremely low level. In contrast, that to the other three nations remained stable and developed at a basically unchanged level. So the question is why did the US weight of EIMMA to China witness an abnormal slump from 1999 onwards?

Slump in the Weight of EIMMA

The abnormal slump in the US weight of EIMMA to China is attributable to political relations, as reflected in the overall development of US export regulations for China during this period. In early 1999, the *Report of the Select Committee on US National Security and Military/Commercial Concerns with the People's Republic of China* (the Cox Report) was published, reaffirming the importance of high-tech export controls on China. This issue partially induced the severe decline in weight of EIMMA to

[36] http://dataweb.usitc.gov/.

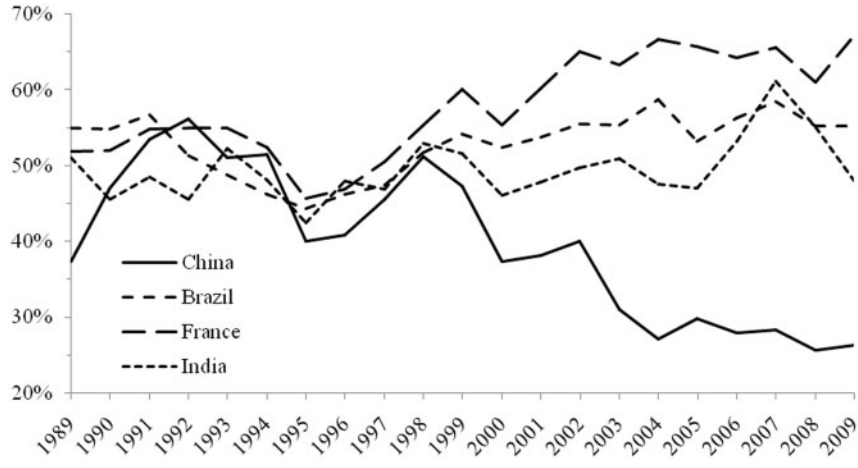

Fig. 1 Weights of US EIMMA to China, France, Brazil, and India, 1989–2009.

China, which later export regulations exacerbated. For example, with respect to commercial satellite exports, 'although the Administration transferred the licensing jurisdiction for commercial satellites from State to Commerce by actions in 1992 and 1996, Congress moved the jurisdiction back to State in the National Defence Authorization Act for Fiscal Year 1999 due to technology transfer concerns'.[37] This decision actually intensified export regulations on military-related items.

After September 11 2001, the Bush administration reinforced US export controls; US high-tech product exports experienced a severe trend of comprehensive restriction. However, China was subject to excessive levels of export controls, far beyond those applicable to other countries. Proportionally more export applications to China were treated as approved with provisos rather than approved. According to a US Government Accountability Office (GAO) analysis of State data, in fiscal years 2002–2004 (by April 30), 52% of license applications were approved, 34% approved with provisos, 13% returned without action, and 1% denied. However, in fiscal years 1999–2001, 56% of license applications were approved, 29% approved with provisos, 13% returned without action, and 1% denied.[38] 'When the business relationship involves controlled dual-use items, these realities require export control policy and individual licensing decisions that strike an appropriate balance between traditional security concerns and US economic security.' A year later after the Cox

[37] The Cox Report 1999, Select Committee United States House of Representatives, Chapter 9, Summary, http://www.house.gov/coxreport/pref/preface.html.

[38] Katherine V. Schinasi, 'Defense Trade: Arms Export Control System in the Post-9/11 Environment', GAO Reports, U.S. Government Accountability Office, 2005, p. 1, http://www.gao.gov/new.items/d05234.pdf.

Report, the 'US decided in February 2000 not to approve satellite licenses or waivers for China . . . the US in September 2001 sanctioned a Chinese entity, and, by extension, certain activities of the Chinese government. These missile sanctions preclude for two years approval of new export licenses for the export to China of any items on the Missile Technology Control Regime (MTCR).'[39] In February 2002, the United States General Accounting Office submitted a report entitled *Export Controls: Rapid Advances in China's Semiconductor Industry Underscore Need for Fundamental US Policy Review* to the Ranking Minority Member, Committee on Governmental Affairs of the US Senate, which focused on the possibilities of the implementation of export controls on China.[40] On December 26 2002, the Office of Defence Trade Controls (now known as the Directorate of Defence Trade Controls), Bureau of Political Military Affairs, United States Department of State sent a letter to Hughes Electronics Corp. and Boeing Satellite Systems charging them with allegedly committing 123 violations of the US Arms Export Control Act and its implementing regulations, and the International Traffic in Arms Regulations (which was further broadly reported by Chinese media in a 32-page indictment submitted to the Federal Courts). Lastly, the two corporations named above were fined $32 million by the administrative order on March 4 2003.[41] This case was by no means unique. Numerous others like it had emerged by 2001. Consequently, the weight of EIMMA to China slumped further after 2002, displaying a significant difference from that of the basically stable status of other countries.

Since 2006, the latest, most specialized round of US adjustments to export regulations on China has been initiated. In 2007, the weight of EIMMA to China slumped to an abnormally low level. David H. McCormick, under secretary for industry and security at that time, said that 'our changes to China Export Control Policy will do just that by achieving these two complementary objectives – growth in civilian high tech trade and enhanced security'.[42] However, the reality did not live up to this optimism, as only the latter objective came into force. *The Final Revisions to the Export Controls for the People's Republic of China (PRC)* was published on June 20 2007, and modified on April 29 2009. The BIS announced on January 13

[39] Statement of Van Diepen, Acting Deputy Assistant Secretary, for Nonproliferation Controls before US-China Commission on January 17, 2002, http://www.uscc.gov/researchpapers/2000_2003/pdfs/vand.pdf.

[40] Joseph Christoff, 'Export Controls: Rapid Advances in China's Semiconductor Industry Underscore Need for Fundamental U.S. Policy Review', GAO Reports, U.S. Government Accountability Office, 2002, p. 1, http://www.gao.gov/assets/240/234373.pdf.

[41] The letter, order and consent agreement of Department of State are available from: http://www.pmddtc.state.gov/compliance/consent_agreements/HughesElectronic.htm.

[42] 'Win-Win High Technology Trade With China', Presentation by Under Secretary David McCormick at Centre for Strategic and International Studies, June 9, 2006, http://www.bis.doc.gov/news/2006/mccormick06-9-06.htm (accessed 14 January 2011).

2009 full implementation of the Validated End-User Program for China.[43] This new export control policy towards China was perceived by both the government and scholars of China as a de facto restricting adjustment.[44] The establishment of the Validated End User (VEU) regime not only undermined the interests of China, but also interfered with US corporate business in the country, to the great regret of China's Ministry of Commerce.

More generally speaking, China is discriminatively placed in an anomalous position in the US export control regime, a development that runs contrary to the commitment of 'building a positive, cooperative and comprehensive US-China relationship for the 21st century, and . . . concrete actions to steadily build a partnership to address common challenges'.[45] The BIS, Department of Commerce, is in charge of export regulations according to the EAR, implemented in March 1997.[46] In EAR, nations are listed in four groups. 'Cooperating governments are the national governments of countries listed in Country Group A:1. Group B is for countries with license exceptions: 'Export Control Classification Number (ECCN), provided the items are destined to civil end-users for civil end-uses. Country Group D:1 'Prohibits exports and reexports of replacement parts to countries in Country Group E:1.'[47] With regards to the countries studied in this article, France, UK, and Japan are listed in Groups A/B and Brazil appears in Groups A/B/D. China, however, is listed only in Group D.[48] Furthermore, China is the only economic entity addressed in a separate chapter in EAR, in Part 744, *Control Policy: End-User and End-Use Based*, Chapter 21, *Restrictions on certain military end-uses in the People's Republic Of China (PRC)*. In this article, it is stipulated that 'in addition to the license requirements for items specified on the Commerce Control List (CCL), you (exporter) may not export, reexport, or transfer any item subject to the EAR listed in Supplement No. 2 to Part 744 to the PRC without a license . . .'. At the same time, the complexity of regulations on export to

[43] http://search.usa.gov/search?sc=0&query=Authorization+VEU+china+2007&affiliate=bis.doc.gov&locale=en&m=&commit=Search, Modification available at https://www.bis.doc.gov/news/2009/bis_press04292009.htm; Final implement available at http://www.bis.doc.gov/news/2009/bis_press01132009.htm. For more details see 'Proposed Rule Revisions and Clarification of Export and Reexport Controls for the People's Republic of China (PRC); New Authorization Validated End-User', BIS, July 6, 2006, http://www.bis.doc.gov/finalchina.html.

[44] Wang Lili, 'The Direction of Innovation under the "Ban Toward China"', *China Equipment*, No. 7 (2009), pp. 87–89.

[45] 'US-Sino Joint Statement', November 17, 2009, http://www.whitehouse.gov/the-press-office/2011/01/19/us-china-joint-statement.

[46] Export Administration Regulations Database, http://www.gpo.gov/bis/ear/ear_data.html.

[47] Group C is reserved, no countries listed in. Five embargoed countries are Cuba, Iran, DPRK, Sudan, and Syria. Besides, countries in the same group are receiving distinguishing regulation, separately in to Missile Technology Control Regime, Australia group, nuclear supplier group, etc. See EAR part 740, http://www.gpo.gov/bis/ear/ear_data.html.

[48] Country might be listed into more than one group simultaneously which refers to different regulation objects. EAR Supplement No. 1 to Part 740, Country Groups.

China is also demonstrated in the rules stating 'when submitting a license application pursuant to this section, you must state in the "additional information" section of the application that "this application is submitted because of the license requirement in §744.21 of the EAR (Restrictions on Certain Military End-uses in the People's Republic of China)." In addition, either in the additional information section of the application or in an attachment to the application, you must include all known information concerning the military end-use of the item(s). If you submit an attachment with your license application, you must reference the attachment in the "additional information" section of the application.'

The particularity of treatment for China was also apparent in recent US policies, especially when compared to that applicable to other great powers. For instance, the VEU regime was explained as enabling a number of Chinese corporations to import sensitive technology from the United States more easily.[49] However, in reality the United States removed 159 Indian corporations from the 'entity list', but only offered VEU treatment to five China corporations,[50] even though India conducted a nuclear test in 1998. Therefore, India was subject to far fewer US export constraints compared to China. This explains why the US EIMMA to China dramatically dropped, as illustrated in Figure 1.

Potential US Exports to China

China has a great demand for high-tech products from the United States and holds substantial and sufficient foreign exchange reserves. If the United States were to liberalize its export constraints against China, the country's imports of dual-use products from the United States would significantly rise, leading to an increment in the weight of EIMMA and a decline in the weight of EILMA. Our calculation enables us to estimate the potential growth in exports, and how much the US–China trade deficit would be reduced if the United States were to liberalize its export constraints against China.

The estimations are carried out in two ways. The first analyses the differences between US weights of EIMMA to China and to other countries. The second compares the US weight of EIMMA to China in 1998 with that in more recent years. The first analysis explores the potential for US exports if the United States were to treat China the same as other countries. The

[49] 'BIS declaimed that for the sake of improving US-Sino trade relation, five screened companies in China have been approved for VEU, including Applied Materials China, Boeing Hexcel AVIC I Joint Ventu, Semiconductor Manufacturing International Corporation (SMIC), National Semiconductor Corporation and Shanghai Hua Hong NEC Corporation (HHNEC).' 'New BIS Program Changes Export Rules on Targeted Products For Select Companies in China', http://www.bis.doc.gov/news/2007/china10182007.htm.

[50] Lora Saalman, *A Comparative Study of Shifts in Sino-Indian Security Perceptions – Under Changes in U.S.-E.U. Export Controls*, Doctor of Law dissertation, Tsinghua University 2010, p. 56.

Table 3 Potential US Exports to China (2004-2009 Average)

Export Barriers against China Liberated to the Level Against	Exports Increment (%) by Selection			($1 billion) by Selection			Deficit Reductions (%) by Selection		
	I	II	III	I	II	III	I	II	III
France	137.59	107.70	82.71	76.0	59.5	45.7	33.74	26.41	20.28
Brazil	99.41	65.48	24.25	54.9	36.2	13.4	24.38	16.06	5.95
India	56.94	51.16	21.74	31.5	28.3	12.0	13.96	12.54	5.33
China in 1998	68.45	48.47	32.23	76.0	59.5	45.7	16.79	11.89	7.90

second type of analysis is useful for understanding the level of exports the United States could achieve if it reverted to its export pace during the 1990s. The estimate results are shown in Table 3.

According to average 2004–2009 data, if the United States were to liberalize its export barriers against China to the same level as those applicable to France, US exports to China would increase by $45.7–76.0 billion, at a growth rate of 82.71–137.59%, thereby narrowing the US–Sino trade deficit by 20.28–33.74%. Similarly, should the US adjust its export barriers against China according to those applicable to Brazil, the increment of exports would be $13.5–54.9 billion, a growth rate of 24.25–99.41%, narrowing the Sino–US trade deficit by 5.95–24.38%. At India's level, the increment of exports would be $12.0–31.5 billion, a growth rate of 21.74–56.94%, narrowing the Sino–US trade deficit by 5.33–13.96%. And if the United States rolled back its export barriers against China to the 1998 level, its exports to China would increase by $17.8–37.8 billion, at a growth rate of 32.23–68.45%, narrowing the deficit by 7.90–16.79%.

Conclusion

In conclusion, the US export barriers against China amount not to 'little more than a rounding error' but to an outstandingly huge volume of exports. The existing barriers have disordered the pattern of US exports by significantly reducing the weight of dual-use products exported to China compared with that of those to other countries, namely, France, Brazil, and India. Should the US government choose to export more products to China, China would welcome such an export increase. Liberalizing US export constraints against China would help to restore the normal, reasonable pre-1999 pattern, effectively promoting US exports to China, and redress the high US–Sino trade deficit.

Appendix

Table A1 US Usual Export Items and Standards for EIMMA and EILMA

Code	Items (Categorized by Five End-use code)	Standard		
		I	II	III
00000	Wheat			
00010	Rice and other food grains			
00100	Soybeans			
00110	Other oilseeds and food oils			
00200	Corn			
00210	Other feed grain (sorghum, barley, oats)			
00220	Other animal feeds, not elsewhere classified			
00300	Meat, poultry and other edible animals			
00310	Dairy products and eggs			
00320	Fruits and preparations, including frozen juices			
00330	Vegetables and preparations			
00340	Nuts and preparations			
00350	Bakery and confectionary products			
00360	Other foods (lard, soft beverages, spices, etc.)			
00370	Wine and related products			
01000	Fish and shellfish			
01010	Alcoholic beverages, except wine and related products			
01020	Other non-agricultural foods and food additives			
10000	Cotton, incl. linters-raw			
10100	Tobacco, unmanufactured			
10120	Hides, skins, and fur skin-raw			
10130	Other agricultural materials for industry-unmanufactured			
10140	Agricultural materials for farming-unmanufactured			
10150	Other agricultural materials-manufactured			
11010	Metallurgical grade coal			
11020	Other coal and related fuels			
11100	Crude			
11110	Fuel oil			
11120	Other petroleum products	√	√	
11130	Natural gas liquids and manufactured gas			
11200	Gas-natural			
11300	Nuclear fuel materials and fuels	√	√	√
12000	Steelmaking and Ferroalloying Materials			
12100	Iron and steel mill products			
12110	Iron and steel products, except advanced manufactures			
12200	Aluminium and alumina			
12210	Copper			

(continued)

Table A1 Continued

Code	Items (Categorized by Five End-use code)	Standard		
		I	II	III
12260	Non-monetary gold			
12270	Other precious metals	√		
12290	Other non-ferrous metals			
12300	Finished metal shapes and advanced metal mfgrs, incl. advanced steel	√		
12420	Paper base stocks-pulpwood and woodpulp			
12430	Newsprint and other paper products			
12500	Plastic materials			
12510	Fertilizers, pesticides, and insecticides	√	√	
12530	Industrial inorganic chemicals	√	√	
12540	Industrial organic chemicals	√	√	
12550	Other chemicals (colouring agents, photographic chemicals, printing inks, paint)	√	√	√
12600	Cotton and other natural fibre cloth and fabric, thread, and cordage			
12620	Manmade cloth and fabric, thread and cordage			
12630	Other materials (hair, waste materials, etc.)			
12640	Finished textile supplies (labels, braids, etc.)			
12650	Leather and fur-unmanufactured			
12700	Synthetic rubber-primary			
12720	Non-metallic minerals, n.e.c.-unmanufactured (industrial diamonds, sulphur, etc.)			
12750	Industrial rubber products	√	√	
12760	Mineral supplies-manufactured (clay, glass, etc.)			
12765	Blank audio and visual tapes and other media			
12770	Other-manufactured and unmanufactured	√	√	
13100	Logs, lumber, plywood, and veneers			
13110	Wood supplies, manufactured (millwork, prefabs, etc.)			
13200	Glass-plate, sheet, etc. except automotive			
13210	Other- (shingles moulding, wallboard, stone, sand, cement, and lime)			
13220	Non-textile floor and wall tiles and other coverings			
20000	Generators, transformers, and accessories			
20005	Electric apparatus and parts, n.e.c.			
21000	Drilling and oil field equipment includes rigs and platforms	√	√	
21010	Specialized mining and oil processing equipment			
21030	Excavating, paving, and construction machinery			
21040	Nonfarm tractors and parts	√	√	
21100	Industrial engines, pumps, compressors, and generators			
21110	Food and tobacco processing machinery			

(continued)

Table A1 Continued

Code	Items (Categorized by Five End-use code)	Standard		
		I	II	III
21120	Machine tools, metal working, moulding, and rolling mill machinery	√		
21130	Textile, sewing, and leather working machinery			
21140	Woodworking, glass working, and plastic and rubber moulding machinery			
21150	Pulp and paper machinery, bookbinding, printing and packaging machinery			
21160	Measuring, testing, and control instruments	√		
21170	Materials handling equipment	√		
21180	Other industrial machinery	√		
21190	Photo and service industry machinery and trade tools	√	√	√
21200	Agricultural machinery and equipment	√	√	
21300	Computers	√	√	√
21301	Computer accessories, peripherals, and parts	√		
21320	Semiconductors and related devices			
21400	Telecommunications equipment	√	√	√
21500	Business machinery and equipment, except computers and related products	√	√	√
21600	Laboratory testing and control instruments	√	√	√
21610	Other scientific, hospital, and medical equipment	√	√	√
22000	Civilian aircraft, complete-all types	√	√	√
22010	Parts for civilian aircraft	√	√	√
22020	Engines for civilian aircraft	√	√	√
22090	Civilian aircraft, engines, equipment, and parts	√	√	√
22100	Railway transportation equipment			
22200	Passenger and cargo vessels, except scrap	√	√	√
22210	Other commercial vessels (barges, tugboats, fishing, and patrol boats)	√		
22220	Marine engines and parts	√	√	√
22300	Spacecraft, engines, and parts, except military	√	√	√
30000	Passenger cars, new and used			
30100	Trucks, buses, and special purpose vehicles			
30200	Engines and engine parts (carburettors, pistons, rings, and valves)	√	√	√
30210	Bodies and chassis for passenger cars			
30220	Automotive tyres and tubes	√	√	√
30230	Other parts and accessories	√	√	
40000	Textile apparel, footwear, and household goods			
40030	Nontextile apparel, footwear, and household goods			
40050	Sporting and camping apparel and gear			
40100	Medicinal, dental, and pharmaceutical preparations, including vitamins	√	√	√

(continued)

Table A1 Continued

Code	Items (Categorized by Five End-use code)	Standard		
		I	II	III
40110	Books, magazines, and other printed matter			
40120	Toiletries and cosmetics			
40130	Cigars, cigarettes, other tobacco manufactures			
40140	Other products (notions, writing and art supplies, etc.)			
41000	Furniture, household items, baskets			
41010	Glassware, porcelain, and chinaware			
41020	Cookware, cutlery, house and garden wares, tools			
41030	Household and kitchen appliances			
41040	Rugs and other textile floor coverings			
41050	Other (clocks, portable typewriters, other household goods)			
41110	Pleasure boats and motors			
41120	Toys, shooting and sporting goods, including bicycles and motorcycles, excluding apparel			
41140	Musical instruments, photographic and optical equipment, and other recreational equipment			
41200	Television receivers, video receivers, and other video equipment			
41210	Radios, phonographs, tape decks, and other stereo equipment			
41220	Records, tapes, and disks			
41300	Numismatic coins			
41310	Jewellery (watches, rings, etc.)			
41320	Artwork, antiques, stamps, and other collectibles			
42000	Nursery stock, cut flowers, Christmas trees			
42100	Gem diamonds and other gem stones			
50000	Military aircraft, complete	√	√	√
50010	Aircraft launching gear, parachutes, etc.	√	√	√
50020	Engines and turbines for military aircraft	√	√	√
50030	Military trucks, armoured vehicles, etc.	√	√	√
50050	Tanks, artillery, missiles, rockets, guns, and ammunition	√	√	√
50060	Military apparel and footwear	√	√	√
50070	Parts; special category goods, not elsewhere classified	√	√	√
60000	Minimum value shipments	√	√	√
60010	Miscellaneous domestic exports and special transactions	√	√	√

Notes: The items are ranked by the five end-use code. EIMMA are marked '√'and EILMA are blank.