



## Can We Apply Lessons From the German Trade Balance With China to the United States?

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### *Abstract*

In recent years, Germany has had higher per capita exports to China than the United States has had. Some policymakers and analysts have argued that the United States should attempt to replicate Germany's success in exporting manufactured products to China, or that Germany's relative success at exporting to China refutes those who attribute the U.S. trade deficit with China to Chinese government policies. This paper analyzes trade data and finds that a majority of Germany's exports to China likely consist of (1) mechanical and electrical intermediate and capital goods that are likely used in China's exports to other countries and (2) luxury cars. The paper then argues that, given this export profile, Germany's example does not offer a way for the United States to substantially reduce its trade deficit with China in a manner consistent with reducing global imbalances, and is potentially consistent with a model of the world in which some governments' policies exacerbate global imbalances.

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## **Can We Apply Lessons From the German Trade Balance With China to the United States?**

Over the last decade, German exports to China have been part of a relatively balanced trade relationship between China and Germany. Some policymakers and policy advisors have used the German example of a high-wage, developed country that is able to have high per capita exports to China as a potential model for other developed countries (including the United States, United Kingdom, and “peripheral” European Union countries). These policymakers and advisors have argued that the German trade relationship with China shows that a developed country can use policies designed to increase exports to China in order to balance high imports from China. Others have used Germany’s trade relationship with China as an admonition for those in the United States who attribute the U.S. trade deficit with China to Chinese government policies, *i.e.*, if Germany can have a relatively balanced trade relationship with China, then the United States should be able to as well.

Are German exports to China really a potential model for the United States and other developed countries? This paper examines German exports to China at a 4-digit HS level, and finds that the majority of German exports to China fall into two categories: (1) inputs likely used to build or supply Chinese factories, many of which are producing for export; and (2) luxury motor vehicles. Although this export profile is different from the profile of U.S. exports to China, the paper finds that the German export model is likely not a model for other countries that wish to decrease their trade deficits with China in a manner consistent with reducing global trade imbalances. Exporting inputs to China does not resolve trade imbalances between China and the world, and luxury vehicles are an inherently limited market. Furthermore, the nature of German exports to China is consistent with a model of world trade in which global trade imbalances are created or exacerbated by Chinese (and other) governments’ economic policies, and thus global trade imbalances cannot be reduced by having other developed countries imitate Germany.

### **I. The Recent German vs. U.S. Trade Relationship with China**

Popular media accounts attribute an “economic renaissance” in Germany to Chinese demand for German-made products. For example, a 2010 *Washington Post* article

described successful German exports of kitchens and kitchen appliances for the mass Chinese market (Faiola 2010). This trade relationship is sometimes contrasted to the U.S. trade relationship with China, in which there has been more tension over the large U.S. trade deficit with China (Hall 2010).

Germany runs a trade deficit with China, but it is not as large as the U.S. trade deficit with China, and per capita German exports to China are higher (and grew more quickly over 2005-2010) than per capita U.S. exports to China. These facts are shown in tables 1 and 2, and figure 1, which shows the ratio of German to U.S. per capita exports to China.

**TABLE 1** U.S. and German Trade Deficits with China, 2004-2010

Year	German trade deficit with China		U.S. trade deficit with China	
	percent of GDP	billions of dollars	percent of GDP	<i>billions of dollars</i>
2004	0.4	9.7	1.4	162.3
2005	0.6	17.4	1.6	202.3
2006	0.7	20.4	1.7	234.1
2007	0.8	26.4	1.8	258.5
2008	0.7	25.0	1.9	268.0
2009	0.3	10.8	1.6	226.9
2010	0.4	12.4	1.9	273.1

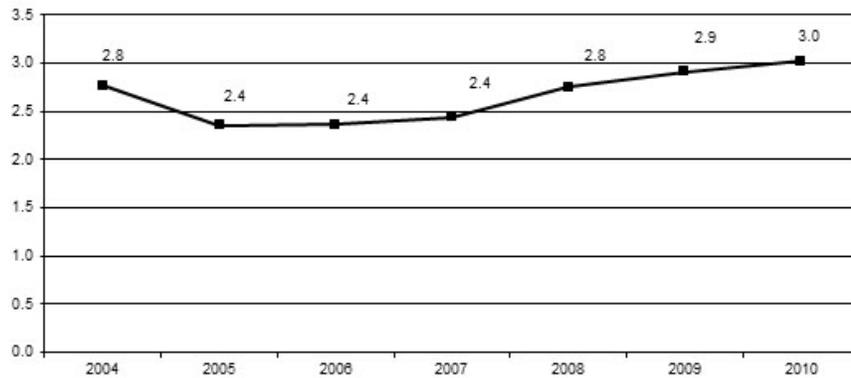
*Sources:* Global Trade Atlas, IMF (GDP data), and staff calculations.

**TABLE 2** German and U.S. exports to China, in values and per capita, 2004-2010

Year	German exports to China		U.S. exports to China	
	billions of dollars	dollars per capita	billions of dollars	dollars per capita
2004	25.9	313.9	34.4	113.3
2005	26.1	316.1	41.2	134.3
2006	33.8	410.3	53.7	173.3
2007	40.5	491.3	62.9	201.2
2008	50.1	608.5	69.7	220.9
2009	52.2	635.3	69.5	218.0
2010	71.1	865.9	91.1	285.6

*Sources:* Global Trade Atlas (trade data), United Nations (population data), and staff calculations.

**FIGURE 1** Ratio of per capita German exports to China to per capita U.S. exports to China



Sources: Global Trade Atlas, United Nations, and staff calculations.

It could be argued that Germany's trade relationship with China is merely an extension of its trade relationship with the world. Germany runs a merchandise trade surplus with the world as part of a current account surplus that stretches back to 2001.<sup>2</sup> Should we not simply see Germany's trade surplus with China as an extension of the German propensity to save, and not a policy question?

A current account surplus comes from government and corporate savings as well as household savings, and so we should not assume that German household savings explains German trade surpluses. Indeed, German household savings, as a percentage of national income, have been relatively stable since 1997, starting at 10.1 percent in 1997, hitting a low of 9.2 percent in 2000 and then reaching a high of 11.2 percent in 2008, while the German current account surplus has grown substantially.<sup>3</sup>

Meanwhile, the German government has run small financial deficits of up to 3.8 percent of GDP (in 2004) and a few small financial surpluses (as large as 1.3 percent of GDP in 2000).<sup>4</sup> It is possible that both German government and corporate savings rates have played a major role in German national savings, and these rates may be affected by some of the policies discussed later in this paper. Similarly, for the United States and China, national savings rates will be a function of corporate and government savings, and thus potentially affected by policies.

<sup>2</sup> OECD Factbook 2010 (2010).

<sup>3</sup> Ibid.

<sup>4</sup> OECD Economic Outlook (2011).

For example, policies to increase corporate profits in particular sectors could increase corporate savings, or policies to purchase other countries' currency could not only increase the government savings of the purchasing country but also lower interest rates (and possibly saving) in other countries.

Thus, for purposes of this paper, the question of whether the United States should attempt to replicate Germany's trade relationship with China will still be relevant whether global imbalances are framed as a national savings issue or as a trade balance issue.

## II. Calls for Imitating the German Model

Popular media, think tanks, interest groups, and economists have called for the United States (and other developed nations) to study and imitate the German model for exporting to China. Among such popular media calls, *Newsweek* attributed the 2010 rebound in the German economy to its success in exporting to the Chinese economy, and asked if China's consumption could "jump-start the West" (Theil 2010). Similarly, *Time* concluded that Germany's export success in China showed that a "high-cost" economy could create jobs and export to China (Schuman 2011), and *The New Republic* instructed readers on how to learn from Germany's exports to China (Wagner 2010).

Among think tanks and interest groups, the American Chamber of Commerce in Shanghai published a September 2010 report on U.S. exports to China. The report bemoaned an alleged U.S. "underperformance" in exporting to China, and added that Germany was a "model for export promotion [in China]."<sup>5</sup> Ed Gerwin of the Third Way<sup>6</sup> used a *Wall Street Journal* blog to claim that "[w]hen it comes to exports, the United States could learn something from Germany," and called on U.S. policy to support U.S. exports of the kinds of capital goods that Germany exports (Gerwin 2010). Similarly, Katherine Newman, writing for the New America Foundation, uses Germany's exports of industrial products to China as a potential model for the United States (Newman 2011).

Some of these calls have also come as criticism of U.S.-based commentators who have attributed at least part of the U.S. trade deficit with China to Chinese government

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<sup>5</sup> American Chamber of Commerce in Shanghai (2010).

<sup>6</sup> Third Way describes itself as a "a think tank that creates and advances moderate policy and political ideas." See [http://www.thirdway.org/about\\_us](http://www.thirdway.org/about_us), downloaded September 28, 2011.

policies. For example, Robert Roche of the American Chamber of Commerce in Shanghai has questioned those U.S. policymakers that wish to respond to Chinese currency policy by asking whether the United States ought not instead look at why other developed countries, including Germany, have been able to export successfully to China (Hall 2010). Additionally, German Finance Minister Wolfgang Schauble has criticized U.S. calls for a lower valued U.S. dollar as a boost to U.S. exports. He has instead attributed German success in exporting to China to the “increased competitiveness of companies” while the United States has been “neglecting its small and mid-sized industrial companies” (Spiegel 2010).

Beyond the United States, there have been calls for European countries, especially those that run large trade deficits, to follow the German model. Economists Jesus Felipe and Utsav Kumar argue that Europe’s “periphery” (i.e., Greece, Ireland, Italy, Spain, and Portugal) need to move away from producing the type of products produced by China and instead “should look upward and try to move in the direction of Germany” by exporting the types of products that Germany exports (Felipe 2011). Similarly, John Lucas, trade policy advisor at the British Chambers of Commerce, has called for British policymakers to “target” increasing manufacturing exports to China, as he claims that Germany has done (Lucas 2010).

Finally, the Obama Administration has called for an increase in U.S. exports, and while not always citing exports to China in particular, has also noted Germany’s success as a potential model. In January 2010, the Obama Administration announced its National Export Initiative with the goal of doubling U.S. exports by 2015 (Cooper 2010). While a member of the President Obama’s Economic Recovery Advisory Board, General Electric CEO Jeff Immelt stated that “Germany is the model” for developing U.S. exports to China (Carney 2010).

Analysts have noted multiple German policies that may have helped the German manufacturing sector, including German laws requiring worker representation on company boards, restrained German wages even as productivity rose (DeNardis 2010), increased labor force flexibility, and German infrastructure spending.<sup>7</sup> Additionally, Germany’s inclusion in the euro has provided it with a currency worth less than the value of what the deutsche mark would be worth today if it still existed.<sup>8</sup> Thus, the euro may give Germany a large net export advantage over other countries. Interestingly, one additional policy that is not mentioned often but might have also provided a

<sup>7</sup> For example, see “NYSE Merger: Lessons from Germany Inc.”, the Monitor’s View, *Christian Science Monitor*, February 10, 2011.

<sup>8</sup> Steven Rattner reports that if Germany left the euro, some estimate that its currency would appreciate 30 to 40 percent (Rattner 2011).

competitive advantage is the large, longtime, state ownership of major German firms such as Volkswagen.<sup>9</sup>

However, this paper does not discuss which German policies, if any, have led to Germany's trade relationship with China, nor whether these policies are worthy for other reasons. This paper also does not discuss whether reducing the U.S. trade deficit with China is a worthwhile policy goal, instead taking the goal as a given. The paper does ask what Germany exports to China, and whether that export outcome is one that the United States should seek to emulate if it wishes to increase its own exports to China in a manner consistent with reducing global imbalances.

### **III. What Does Germany Export to China?**

#### **German Exports of Inputs to China**

In order to understand whether the United States or other developed countries should follow Germany's model of exporting to China, it is first necessary to understand what Germany exports to China. WITS data show that most German exports to China are capital goods (table 3).

To address the goal of increasing U.S. exports to China, we would like to distinguish not only capital goods from intermediate goods, but "final" goods (*i.e.*, goods that go from Germany to China and stay there) from "input" goods (*i.e.*, goods that go from Germany to China and are then used to produce another product that is in turn exported out of China). The importance of this distinction is to answer the question of whether German exports to China are building and fueling China's export machine, or whether those products are staying in China to supply Chinese consumption.

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<sup>9</sup> From 1960 until at least 2007, the German state of Lower Saxony, in which most of Volkswagen's German employees live, was guaranteed by law to have at least 20 percent of voting shares in Volkswagen. In addition, labor representatives typically hold 50 percent of supervisory board seats of large German companies. See "VW Wheels, Porsche Driver?" *Bloomberg Businessweek*, October 23, 2007.

**TABLE 3** German Exports to China by Category

Type of export	2008	2009	2010
	percent		
Raw materials	2.9	2.5	2.1
Intermediate goods	15.2	15.9	13.3
Consumer goods	19.9	20.9	25.9
Capital goods	62.0	60.8	58.8

*Sources:* WITS and author's calculations.

*Note:* Percentages may not sum to 100 for each year due to rounding.

For example, if Germany exports semiconductor-making equipment to China, and China uses that equipment to make products that stay in China for Chinese consumption, then the German export (of semiconductor-making equipment) can be part of a balanced trade relationship between China, Germany, and the world. On the other hand, if (as is more likely with semiconductor-making equipment) the German exports are helping China produce even more products for export to the world, then the German exports may exacerbate global imbalances (because they would necessarily be producing even more Chinese exports).

Thus, for the purposes of this paper, a Chinese final-use product is defined as one that is consumed in China, whether it is a household product, a capital good used to produce products for domestic consumption, or an intermediate product, *e.g.*, materials that go into a Chinese construction project for domestic use. Final-use products are distinguished from inputs, which (for the purposes of this paper) are capital goods and intermediate products used to produce exports.<sup>10</sup>

Trade data can not tell us with complete certainty which Chinese imports are used for Chinese domestic uses and which are used for producing exports. For example, an imported air conditioner might be used for a household; alternatively, it might be

<sup>10</sup> This question is similar to those asked by Koopman, Wang and Wei (2008) in their paper on value-added in Chinese exports to the United States, a paper that examines how much Chinese value-added is in Chinese exports to the United States. This paper examines whether a German export to China stays in China or produces more Chinese exports to other countries. Using their methodology, it may be possible in the future to take results from more recent Chinese data and identify how much German exports to China contribute to Chinese exports to the world. The methodology used here has the advantage of not relying on Chinese data and of being more current. It has the disadvantage of relying on the author's judgment as to which German exports to China are likely consumed in China versus contributing to Chinese exports.

used for a factory producing for export. Likewise, an imported semiconductor might be put into a computer consumed in China, and it might be put into a computer produced for export.

However, the lack of perfect certainty should not prevent some reasonable assumptions. This paper assumes it is reasonable that most semiconductors imported by China are incorporated into products exported from China, a large exporter of products that use semiconductors. It also assumes that most air conditioners imported by China are used for household use (although they could also be used in factories producing for export).

Thus, in order to determine the share of German exports to China that consists of inputs, a set of HS codes was constructed as a proxy for many of the inputs that are likely used primarily in the production of other Chinese exports. The codes used were contained in HS 84 (nuclear reactors, boilers, machinery and mechanical appliances, parts thereof) and HS 85 (electrical machinery and parts thereof). Obviously, input products are likely present in other two-digit codes; restricting analysis to just these two codes allows us to make a conservative estimate of German exports of inputs to China.

In order to try to isolate inputs, 4-digit subcodes that covered likely final-use products were removed from HS 84 and HS 85. Table A-1 in appendix A summarizes the codes removed from HS 84. Most of the exclusions are likely to be final use products; 8407 and 8409 are likely products that go into motor vehicles. China does export some motor vehicles, but runs an overall trade deficit in motor vehicles. In the interest of a conservative estimate of inputs, these codes were also classified as final goods. Similarly, table A-2 lists which HS 85 4-digit codes were classified as inputs and which codes were classified as final goods (and thus excluded). As with codes 8407 and 8409 above, codes 8511 and 8512 were excluded as automotive-related final goods, as parts that may go into motor vehicles.

Using these modified HS codes, table 4 shows that mechanical and electrical intermediate and capital goods represent a substantial share of Germany's exports to China over 2005-2010, while not accounting for as large a share of U.S. exports to China over the same period. Appendix B presents the values of German and U.S. exports under these modified HS codes. Additionally, the top ten German products exported under HS 84 and HS 85 to China are presented in Appendix C.

**TABLE 4** Selected mechanical and electrical intermediate and capital goods as a percent of all U.S. and German exports to China

	2005	2006	2007	2008	2009	2010
Country	Selected mechanical and electrical intermediate and capital goods as a percentage of all exports to China					
Germany	47.0	43.0	43.1	43.7	41.6	37.8
United States	25.2	27.2	25.3	24.4	20.6	20.3
	Selected mechanical and electrical intermediate and capital goods as a percent of all exports to countries other than China					
Germany	20.7	20.8	20.5	21.1	20.2	20.2
United States	22.6	22.1	19.9	18.6	18.3	18.3

*Sources:* Global Trade Atlas and author's calculations.

*Note:* Selected mechanical and electrical intermediate and capital goods consists of selected parts of HS codes 84 and 85 (see Appendix A), and represents inputs.

As can be seen from table 4, mechanical and electrical intermediate and capital goods represent at least 37 percent of German exports to China in every year from 2005-2010, while representing one-fifth to one-quarter of U.S. exports to China in any year.<sup>11</sup> As we shall see later, the declining share of these products in German exports to China is largely due to a sharp increase in the share of German motor vehicles to China, and not to reduced exports of these products (as can be seen in Appendix B).

### **German Exports of Motor Vehicles to China**

One of the other most successful areas for recent German exports to China is in the automotive sector, and especially in vehicle exports, as can be seen in table 5. German exports have surged from \$1.3 billion in 2005 to \$9.6 billion in 2010, and now account for roughly one-sixth of German exports to China.

<sup>11</sup> Other large U.S. exports to China include those falling under HS codes 12 (oil seeds- mostly soybeans to China), 88 (aircraft and parts), 90 (precision instruments and parts), 87 (motor vehicles and parts, discussed below), metals under codes 72 (iron and steel- mostly waste and scrap to China), 74 (copper- mostly waste and scrap to China) and 76 (aluminum- mostly waste and scrap to China).

**TABLE 5** German Exports of Motor Vehicles to China and the Rest of the World

Year	German Exports of Motor Vehicles to China		German Exports of Motor Vehicles to All Countries Except China	
	<i>Billions of dollars</i>	<i>As a percent of all German exports to China</i>	<i>Billions of dollars</i>	<i>As a percent of all German exports to all countries except China</i>
2005	1.3	5.0	107.1	11.4
2006	2.3	6.7	113.6	10.6
2007	3.4	8.5	136.9	10.7
2008	5.0	10.0	136.0	9.7
2009	5.8	11.1	97.9	9.2
2010	12.0	16.9	117.8	9.9

*Source:* Global Trade Atlas data and author's calculations.

However, the unit value data for these exports suggest that German exports of motor vehicles to China are likely to be chiefly luxury vehicles, and not vehicles for the mass market. Table 6 compares unit values for German exports of motor vehicles (HS 8703) to selected countries. As the table shows, German exports of motor vehicles to China are priced similarly to those exported to Oman, Ecuador, Kuwait, and Uganda rather than those exported to the United States, Australia, France, Italy, or the United Kingdom (countries with developed mass markets).<sup>12</sup>

It should also be noted that foreign-produced vehicles remain a small part of the Chinese automotive market.<sup>13</sup> Germany may be capturing a substantial portion of that small import share through its sales of what are likely luxury vehicles, but it is not clear whether the United States would gain much from copying this approach. If the import market share of the Chinese automotive market is small and luxury-car-

<sup>12</sup> The relatively high price of German motor vehicles to China does not seem to be due to engine capacity. The 2010 average unit value for exports of large-capacity German motor vehicles to China was \$82,246, compared to \$61,723 for German exports to the world. Similarly, the 2010 average unit value for exports of small-capacity German motor vehicles to China was \$41,579, compared to \$25,808 for German exports to the world. Thus, China is buying more expensive Germany vehicles of both large and small engine capacities.

<sup>13</sup> According to the China Association of Automobile Manufacturers, Chinese sales of passenger automobiles were 13.8 million units in 2010. However, data from Global Trade Atlas show that Chinese imports of automobiles over the same period were only 0.8 million units, or less than 6 percent of the total Chinese automobile market. See Global Trade Atlas and <http://www.caam.org.cn/AutomotivesStatistics/20110121/1105051627.html> (Downloaded August 12, 2011).

**TABLE 6** 2010 Average Unit Values of German Exports of Motor Vehicles to Selected Countries, in U.S. dollars

Country	Average Unit Value for HS Code 8703
Oman	\$51,639
Ecuador	49,637
<b>China</b>	<b>47,845</b>
Uganda	47,777
Kuwait	47,455
United States	33,735
Australia	31,569
France	25,598
Italy	24,688
United Kingdom	23,666

*Source:* Global Trade Atlas using code 8703 for German exports to China.

oriented because of Chinese government policy, then there is an upper limit on potential exports without taking policy steps to further open this market.

### **Inputs and Luxury Cars**

German exports of inputs and German exports of automotive vehicles that likely supply the luxury car market in China together represent at least 49.7 percent, and usually a majority, of German exports to China in every year from 2004-2010. These products represent a smaller share of U.S. exports to China, as can be seen in table 7. To some extent, these differences reflect differences in German and U.S. exports to the rest of the world, but as Table 7 shows, there is a larger difference between German and U.S. exports to China than there is between German and U.S. exports to the rest of the world. German and U.S. exports to China, then, differ in that Germany has enjoyed greater success in exporting inputs and luxury vehicles to China. If the United States is to imitate the German example, it will need greater exports of inputs and luxury vehicles to China.

**TABLE 7** Passenger motor vehicles and selected mechanical and electrical intermediate and capital goods as a percent of all U.S. and German exports to China

	2005	2006	2007	2008	2009	2010
HS	Passenger motor vehicles and selected mechanical and electrical intermediate and capital goods as a percent of all exports to China					
Germany	52.0	49.7	51.6	53.8	52.7	54.7
United States	26.2	28.3	26.6	26.0	22.2	24.1
	Passenger motor vehicles and selected mechanical and electrical intermediate and capital goods as a percent of all exports to all countries except China					
Germany	32.1	31.4	31.2	30.8	29.3	30.1
United States	26.2	25.6	23.9	22.7	21.1	21.3

*Sources:* Global Trade Atlas and author's calculations.

*Note:* The data presented consist of selected parts of HS codes 84 (see Table 3), selected parts of 85 (see Appendix A), and 8703.

## IV. Policy Implications

A closer look at the trade data allows us to draw some conclusions about the German export record to China and its relevance to U.S. policymakers seeking to reduce the U.S. trade deficit with China.

First, to the extent that any popular description of Germany's success in exporting to China attribute that success to the export of finished goods to the Chinese mass market,<sup>14</sup> these descriptions are not an accurate reflection of most German exports to China, as the majority of such exports is either inputs or luxury vehicles.

Second, if the United States were to replicate German exports to China, the results would likely disappoint those who seek to reduce the U.S. trade deficit with China or to reduce global imbalances. To the extent German exports of inputs to China are used in China to produce products for export, such German exports do not reduce global imbalances; they exacerbate them. Thus, the export of inputs to China fuels more Chinese net exports to the rest of the world, with the United States being China's largest export destination. Even if other countries take some of the market share of German exports of capital equipment to China, they will likely only take Germany's place in globally imbalanced supply chains, not solve the underlying problem of global

<sup>14</sup> For example, see Faiola (2010).

imbalance. Indeed, the trade data offer some support for economist Sergio DeNardis' contention that "if all European countries tried to become like Germany, disruptive mercantilist attitudes would surely result."<sup>15</sup>

More informed descriptions of Germany's success in exporting to China do acknowledge that success has been based on capital equipment exports. For example, the aforementioned work by Gerwin and Newman as well as Felipe and Kumar acknowledge the fact that a large portion of German exports to China is capital goods and intermediate inputs, while still calling on the United States or peripheral Europe to imitate Germany's export pattern.<sup>16</sup>

The problem with even these more informed descriptions is that they lead to a policy conclusion that fundamentally conflicts with the notion of more balanced global trade: more developed countries cannot balance their exports and imports by shipping inputs to other countries, when those other countries are going to use those inputs to produce even more exports to the world.

Finally, German trade flows to China may provide some insight into German policymakers' statements on U.S. policy toward China. For example, Foreign Minister Schauble has criticized proposed U.S. action on other countries' currency policies, as well as describing the Federal Reserve's policy of monetary easing as "artificially depress[ing] the dollar exchange rate" (Spiegel 2010). Given what the trade data show, it is conceivable that the German Government's primary interest lies in helping its exporters that are building China's factories and producing luxury cars for those factories' Chinese owners and managers. Thus, these German Government criticisms may perhaps be viewed as coming from a party with an interest in the preservation of current global imbalances.

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<sup>15</sup> DeNardis here is referring to high German exports to the rest of the Eurozone, but his statement would also apply to other countries taking capital equipment exports to China away from Germany while global imbalances persist. See De Nardis (2010)

<sup>16</sup> Similarly, *The Economist* noted in 2010 that Germany's export success to China has been rooted in exports of capital goods and cars. However, *The Economist* too, in a vaguely worded recommendation, added that "other economies should perhaps think about the implications" of Germany's exports to China, perhaps indicating that other countries should imitate Germany's model. See *The Economist* (2010).

## Appendix A

### Definitions of Input Products in HS 84 and 85

**TABLE A-1** Definitions of HS codes removed from HS 84

HS Code	Definition
8407	Internal combustion piston engines
8409	Internal combustion engine parts
8415	Air conditioning machines
8416	Furnace burners and mechanical stokers
8418	Refrigerators and freezers
8422	Dishwashing and other cleaning machines
8443	Printing machinery
8450	Washing machines
8469	Typewriters
8470	Calculating machines and cash registers
8471	Automatic data processing machines
8472	Office machines
8476	Vending machines

*Source:* Author's summary of Harmonized System codes.

**TABLE A-2** Categorization of 4-Digit HS 85 codes as inputs or final goods

HS Code	Description	Input	Final
8501	Electric motors and generators (excluding generator sets)	X	
8502	Electric generating sets and rotary converters	X	
8503	Parts of electric motors, generators, generating sets, and rotary converters	X	
8504	Electrical transformers, static converters or inductors, power supplies for ADP machines or units; parts thereof	X	
8505	Electromagnets, permanent magnets and articles to be permanent after magnetization; electromagnetic or permanent magnet chucks, brakes, etc.; parts	X	
8506	Primary cells and primary batteries; parts thereof	X	
8507	Electric storage batteries, including separators thereof; parts thereof	X	
8508	Vacuum cleaners, parts thereof		X
8509	Electromechanical domestic appliances, with self-contained electric motor, other than vacuum cleaners; parts thereof		X
8510	Electric shavers and hair clippers and hair-removing appliances, with self-contained electric motor; parts thereof		X
8511	Electrical ignition or starting equipment used for spark-ignition or compression-ignition internal combustion engines, generators etc. therefor; parts		X
8512	Electrical lighting or signaling equipment NESIO, windshield wipers, defrosters, and demisters used for cycles or motor vehicles; parts thereof		X
8513	Portable electrical lamps designed to function on own energy source (dry batteries, storage batteries, magnetos) except for motor vehicles etc.; parts		X
8514	Industrial or laboratory electric furnaces and ovens; other industrial or laboratory induction or dielectric heating equipment; parts thereof	X	
8515	Electric laser, other light or photon beam etc. apparatus, for soldering or welding, etc.; electric machines for hot spraying of metals; parts thereof	X	
8516	Electric water heaters, etc., space and soil heating apparatus, electrothermic hair apparatus (curlers, etc.), hand dryers, flatirons, etc.; parts		X

Table continues on next page.

**TABLE A-2 –Continued** Categorization of 4-Digit HS 85 codes as inputs or final goods

<b>HS Code</b>	<b>Description</b>	<b>Input</b>	<b>Final</b>
8517	Telephone sets, including telephones for cellular networks or for other wireless networks; other apparatus for the transmission or reception		X
8518	Microphones and stands therefor; loudspeakers; headphones, earphones, etc.; audio-frequency electric amplifiers; electric sound amplifier sets; parts		X
8519	Sound recording or reproducing apparatus		X
8520	Magnetic tape recorders and other sound recording apparatus, whether or not incorporating a sound reproducing device		X
8521	Video recording or reproducing apparatus, whether or not incorporating a video tuner		X
8522	Parts and accessories suitable for use solely or principally with the apparatus of 8519 to 8521	X	
8523	Discs, tapes, solid-state non-volatile storage devices, "smart cards" and other media for the recording of sound or of other phenomena		X
8524	Records, tapes and other recorded media for sound or other similarly recorded phenomena, including matrices and masters for the production of records		X
8525	Transmission apparatus for radiobroadcasting or TV; TV cameras; still image video cameras and recorders		X
8526	Radar apparatus, radio navigational aid apparatus and radio remote control apparatus		X
8527	Reception apparatus for radio broadcasting, whether or not combined with sounds recording or reproducing apparatus		X
8528	Monitors and projectors, not incorporating television reception apparatus; reception apparatus for television, whether or not incorporating		X
8529	Parts for television, radio, and radar apparatus (of headings 8525 to 8528)	X	
8530	Electrical signaling, safety or traffic control equipment for railways, roads, inland waterways, parking facilities etc.; parts thereof		X
8531	Electric sound or visual signaling apparatus (bells, sirens, burglar or fire alarms, etc.) NESOI; and parts thereof		X

Table continues on next page.

**TABLE A-2 –Continued** Categorization of 4-Digit HS 85 codes as inputs or final goods

<b>HS Code</b>	<b>Description</b>	<b>Input</b>	<b>Final</b>
8532	Electrical capacitors, fixed, variable or adjustable (pre-set); parts thereof	X	
8533	Electrical resistors (including rheostats and potentiometers), other than heating resistors; parts thereof	X	
8534	Printed circuits	X	
8535	Electrical apparatus for switching or protecting electrical circuits, or for making connections to or in electrical circuits	X	
8536	Electrical apparatus for switching or protecting electrical circuits, or for making connections to or in electrical circuits	X	
8537	Boards, panels, etc. with two or more apparatus for switching, etc., electrical circuits (heading 8535, 8536) or optical etc. instrument of chapter 90	X	
8538	Parts for electrical apparatus for switching etc. electrical circuits (of heading 8535 or 8536) and panels, boards, consoles etc. (of heading 8537)	X	
8539	Electric filament or discharge lamps, including sealed beam lamp units and ultraviolet or infrared lamps, arc lamps, parts thereof	X	
8540	Thermionic, cold cathode or photocathode tubes (vacuum, vapor, or gas filled tubes, cathode ray tubes, television camera tubes etc); parts thereof	X	
8541	Diodes, transistors and similar devices; photosensitive semiconductor devices; light emitting diodes; mounted piezoelectric crystals; parts thereof	X	
8542	Electronic integrated circuits; parts thereof	X	
8543	Electrical machines and apparatus having individual functions, NESOI; parts thereof	X	
8544	Insulated wire, cable and other insulated electrical conductors; optical fiber cables, of individually sheathed fibers, with conductors etc. or not	X	

Table continues on next page.

**TABLE A-2 –Continued** Categorization of 4-Digit HS 85 codes as inputs or final goods

<b>HS Code</b>	<b>Description</b>	<b>Input</b>	<b>Final</b>
8545	Carbon electrodes, carbon brushes, lamp carbons, battery carbons and other articles of graphite or other carbon used for electrical purposes	X	
8546	Electrical insulators of any material	X	
8547	Insulating fittings for electrical machines etc., primarily of insulating materials, conduit tubing etc. of base metal lined with insulating material	X	
8548	Waste and scrap of primary cells and batteries, spent primary cells and batteries, electrical parts of machinery or apparatus, NESOI	X	

Sources: Harmonized Tariff System and staff analysis.

## Appendix B

### U.S. and German Exports to China by Selected HS Categories

**TABLE B-1** German exports to China by selected HS categories, *billions of U.S. dollars*

HS	2005	2006	2007	2008	2009	2010
billions of dollars						
84 <sup>1</sup>	8.9	10.1	11.9	14.8	14.8	18.4
85 <sup>2</sup>	3.4	4.4	5.5	7.1	6.9	8.4
84, 85 <sup>3</sup>	12.2	14.5	17.4	21.9	21.7	26.9
All	26.1	33.8	40.5	50.1	52.2	71.1

*Sources:* Global Trade Atlas and author's calculations.

*Note:* Lines 2 and 3 may not appear to sum to exactly line 4 due to rounding.

<sup>1</sup> Excludes exports under codes in table 3.

<sup>2</sup> Includes only exports of particular 4-digit codes; see table 3 and appendix A.

<sup>3</sup> The sum of all exports under the modified 84 and 85 categories.

**TABLE B-2** U.S. exports to China by selected HS categories, *billions of U.S. dollars*

HS	2005	2006	2007	2008	2009	2010
billions of dollars						
84 <sup>1</sup>	5.1	6.1	7.0	7.7	6.9	9.3
85 <sup>2</sup>	5.3	8.5	8.9	9.3	7.4	9.3
84, 85 <sup>3</sup>	10.4	14.6	15.9	17.0	14.3	18.6
All	41.2	53.7	62.9	69.7	69.5	91.9

*Sources:* Global Trade Atlas and author's calculations.

*Note:* Lines 2 and 3 may not appear to sum to exactly line 4 due to rounding.

<sup>1</sup> Excludes exports under codes in table 3.

<sup>2</sup> Includes only exports of particular 4-digit codes; see table 3 and appendix A.

<sup>3</sup> The sum of all exports under the modified 84 and 85 categories.

## Appendix C

### Top German Exports to China of Mechanical and Electrical Intermediate and Capital Input Products

**TABLE C-1** Top ten 2010 German exports to China of input products in HS codes 84 and 85

4-digit HS Code	Description	2010 Exports to China (billions of U.S. dollars)
<b>HS 84</b>		
8479	Machines and mechanical appliances <sup>1</sup>	1.6
8483	Transmissions, bearings, gears, etc.	1.2
8486	Machines and appliances for manufacturing semiconductors and flat panel displays	1.2
8481	Taps, valves, and shafts for pipes; boilers	1.0
8413	Pumps for liquids	0.9
8414	Air or vacuum pumps (air compressors) <sup>2</sup>	0.8
8477	Machinery for working rubber or plastics	0.8
8421	Centrifuges, purifying and filtering machinery	0.7
8419	Machinery for treatment of chemicals by change in temperature, including water heaters and parts	0.6
8482	Ball or roller bearings	0.6
<b>HS 85</b>		
8504	Electrical transformers	1.3
8537	Boards for switching electrical circuits	1.1
8536	Electrical apparatus for switching electrical circuits	1.0
8538	Boards for switching electrical circuits	0.7
8501	Electrical motors and generators	0.5
8542	Electronic integrated circuits	0.5
8541	Diodes, transistors, and photosensitive semiconductors	0.5
8543	Electrical machines and apparatus	0.4
8535	Electrical apparatus for switching circuits	0.3
8544	Insulated wire and cable and conductors	0.3

**TABLE C-1–Continued** Top ten 2010 German exports to China of input products in HS codes 84 and 85

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*Sources:* WITS (for order of products), Global Trade Atlas (for data) and author's summary of HS codes.

*Note:* HS 8409, 8422, and 8443 would be the eighth-, tenth-, and eleventh-largest German exports (respectively) under 84, but are not included in this table because they were excluded from tables 4 and 7.

<sup>1</sup> Most of the German exports to China in this category are under 8479.89 (an "other" category), 8479.90 (parts of 8479), 8479.30 (presses for manufacture of particle board or treatment of wood), and 8479.82 (mixing and grinding machines).

<sup>2</sup> Most of the German exports to China in this category are under 8414.80 (air or gas compressors), 8414.10 (vacuum pumps), 8414.90 (parts of vacuum pumps), and 8414.59 (fans).

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