Importing Guns and Butter:
Providing for the Common Defense
In an Era of Globalization

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Dr. Douglas Meade[1]

Dr. Garrett Summers[2]

Dr. Soyong Chong[3]

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[1] University of Maryland

[2] Office of the Secretary of Defense, Program Analysis and Evaluation

[3] Office of the Secretary of Defense, Program Analysis and Evaluation

1. Introduction and background

The U.S. is the dominant producer and purchaser of defense goods in the world. Direct imports of defense goods are only 5 percent of the size of U.S. defense exports.[4] At first glance, it would seem that the U.S. should be the last country to be concerned about import requirements for defense purchases. However, it is not only the direct purchases of defense goods and services that important to fulfilling the DoD's mission, but also the indirect purchases of goods and services that are required to produce them. Two classes of commodities that have received special attention are petroleum and related products, and various categories of strategic minerals. Vulnerability to disruption of these commodities is already ameliorated to some extent by the Strategic Petroleum Reserve, and the National Defense Stockpile (NDS) which have both been the subject of several studies.

In recent years, the U.S. economy has changed drastically, becoming more enmeshed in the global economy. This is evidenced in the U.S. trade statistics by increasing shares of imports and exports both in aggregate, and for individual goods and services. Concomitant with this increased globalization, the DoD has become more reliant on the private economy. Many important functions have been outsourced to private industry, and this is part of the explanation for the increasing share of services, as opposed to goods, in overall defense purchases. Furthermore, the internal structure of the U.S. economy has become more complex and interrelated, as activities that used to be performed within large firms have been contracted out or outsourced to other specialist firms.

The result of these changes in the economy and changes in the pattern of defense purchases means that the question of import requirements for defense has also become more complex. Even though the Buy American Act directs the Federal government to favor domestic suppliers, the indirect purchases required to produce defense goods may be imported. For example, the DoD may buy a computer system produced in the U.S., but with semiconductors and other components produced overseas. Key components of weapons systems may rely on special parts provided by foreign producers.

In this study we will make use of detailed import database compiled by Inforum, based on raw data provided by the U.S. Census Bureau, that provides information on imports of over 20 thousand products, classified by Harmonized Code, which are mapped to NAICS industries by Inforum. These data provide the basis for the Inforum *Iliad* model, which tracks U.S. imports for 360 goods and services industries. The *Iliad* model provides part of the underlying database for *IDEPPS*, the industry component of *DEPPS* (The Defense Employment and Purchases Projections System). Another important component of *DEPPS* is the Contract Awards database, which is used to determine the distribution of DoD purchases by industry and state. Records in the database are also mapped to NAICS industries, so that they can be incorporated into *DEPPS*. *DEPPS* determines direct and indirect requirements, and import requirements for each major category of defense outlays, for 360 industries. By comparing the detailed Census imports data with other

[4] See Stephanie Neuman, "Defense Industries and Global Dependency", *Orbis*, Summer 2006, Table 2 on p.437.

data compiled by Inforum on domestic production and imports, we will determine the level of import share of each product. We will then use this information to identify how much of DoD indirect import requirements are dependent on products with high import share. In this paper we will present this analysis for each of the major components of the Defense budget. However, this study could be extended through the analysis of more detailed data by weapons program. We conclude by comparing and relating our findings with those of previously published studies by the Industrial Policy office.

a. Review of Economic Issues Regarding Defense Imports

The era of globalization has generated a host of new national security issues. The rising levels of international trade and capital flows have led to concerns for implications of these developments on national security. With regard to defense purchases, imports may serve the role of cementing relationships with allies, or may be part of an exchange where the U.S. imports defense goods from a partner country, and exports U.S. defense goods to that country. In many cases, this may be formalized in an offsets agreement.

One of the foremost concerns is the concept of import dependence. Stated succinctly, import dependence refers to the idea that international competition has weakened the U.S. domestic industries as to leave the U.S. dependent on foreign suppliers for its needs. Where the economist sees market efficiency in comparative advantage and increased welfare from gains from trade, the defense analyst sees possibilities for foreign influence, control and dominance (Moran 1990). Arguments against reliance of imports for defense requirements include the benefits of self-sufficiency in times of war, when shipping may be interrupted; insulation from economic blackmail or sanctions; and development and maintenance of a domestic defense industrial base. Oil is currently the most visible good for which the U.S. depends on foreign sources to meet its domestic needs. Experience in the two world wars taught nations the importance of having a secure supply of oil on hand to prosecute the war effort. Though the outcomes of the wars were determined by many factors, countries with large, secure sources of oil had a great advantage over those that did not. Consequently, since that time nations, especially the U.S., have crafted their policies towards achieving what is termed “energy security”: secure supplies that can be used in times of national need (Painter 1991).

The concerns for U.S. national security in the face of import dependence broadly fall into two categories: general economic performance and national defense production. The first category rests on the assumption that a strong national security position rests on the back of a strong national economy. The richer a country is, the more security it can afford, typically in the form of defense spending (larger, well-equipped military). If the economic performance of the U.S. is dependent upon foreign suppliers of capital and goods, then that creates a strategic vulnerability that foreign adversaries may potentially exploit.

The second category involves national security directly by considering the fraction of inputs of national defense production that come from foreign sources. For example, while a jet fighter may be assembled within the United States, the electronics used in its systems and metal used in its airframe may come from outside the United States. The use of foreign supplies in weapon system construction lies behind the concern that the foreign

suppliers may use that dependence for strategic purposes detrimental to the security of the United States. Armstrong (1981) discovered a positive correlation between import dependence and political compliance as measured by United Nations votes. For example, France's nuclear weapon development program was severely hampered when the U.S. refused to export the required computers between 1964 and 1966. As early as 1988, the undersectretary of defense for acquisition warned that U.S. defense was increasingly relying on inputs from foreign sources[5].

One remedy for import dependence is to bolster domestic production either through direct government subsidy or through indirect trade protection measures like tariffs and quotas (Tolley and William 1977, Moran 1990). This approach comes with its own economic costs and may have end up having unintended consequences for security in the long run. Among them are the standard economic costs of inefficiency, and loss of economies of scale, which appear as real costs in the form of higher prices and lower quality from lack of competition (Cable 1995). Lack of competition removes the incentive to innovate which may lead to defense costs. Non-innovative domestic industries will fail to produce weapon systems of quality which can leave the U.S. in a far worse security position than it may otherwise be in (Vernon 1955). The spectacular failure of the Great Britain's attempt to compete their entirely domestically produced Airborne Early Warning (AEW) Nimrod against Boeing's Airborne Warning and Control System (AWAC) underscores the danger to national security in relying solely on domestic industries for defense production (Moran 1990).

Concerns for the quality of defense products have not stopped industries from seeking trade protection under the auspices of their importance to national security. Since World War II, national security interests have increasingly emerged as justification for protectionist policies. Article 99 of the ITO Charter (1948) recognized that there were a limited number of goods (fissionable materials and direct arms) where national security considerations may affect trade. The American watch industry successfully obtained a tariff increase by arguing that its products and expertise were essential in the production of time-precision machinery needed for bombs and missiles (Thorp 1960). The Trade Agreements Extension Act (1954-1955) provided the President authority to protect domestic industries deemed important for defense. This opened the door to a flood of petitions from myriad industries within the U.S. for trade protection, all claiming that they were indispensible to national security. Industries seeking protection ranged from photographic shutters and tungsten to dental burs and wool knit gloves. Most petitions were eventually withdrawn or denied, but the tendency for industries to seek economic rents by appealing to national security continues to the present day.

b. The "Buy American" policy

[5] U.S. DoD, Bolstering Defense Industrial Competitiveness: Preserving Our Heritage, Securing Our Future, July 1988.

The U.S. DoD has traditionally favored domestic suppliers for these and other reasons. In fact, a large percentage of direct contract dollars go to U.S. companies, or if a foreign company, to establishments located in the U.S.

In 1933, the 'Buy American Act' was passed by Congress and signed by President Herbert Hoover. The Act superseded an earlier 1875 statute that "related to preferential treatment of American material in contracts for public improvements". The purpose of this Act is to increase American made product purchases, and to protect the American jobs, the American manufacturing industry, the American investments, and product legal discrimination. The Act requires the United States government to prefer U.S.-made products in its purchases. All Federal construction contracts that are performed within the U.S. must use domestic construction materials.

The Act was modified twice since its inception. In 1988, the phrase "federal agency" replaced the phrase "department or independent establishment." The second modification came as a result of the Federal Acquisition Streamlining Act (FASA) of 1994, which inserted the last provision regarding the exemption of the Act from applying to micro-purchases (purchases that are $2500 or less). FASA legislation grew out of a panel study to recommend any acquisition system and legislative changes. Regarding the Buy American Act, they said:

> *The Panel recommends that the rule of origin for Buy American purposes be amended from a "50 percent components test" to a test of "substantial transformation" and that Congressionally imposed domestic source restriction be repealed.*

Their reasoning is the following:

> *Commercial sellers should be able to utilize their established facilities, technology, supplier networks, processes, employees and other standard commercial practices in performing Government contracts. The reality that global markets exist and that global market can be responsive to mobilization needs must be recognized. Waiver is not always possible under current regulations. It is to our strategic and economic advantage to maintain vital foreign sources during peacetime as well as domestic sources or at least have the option to do so when market conditions and the international situation so dictates.*

Ultimately, FASA failed to implement all the recommendations with respect to the Buy American Act, but did modify the Act to allow micro-purchases to be excluded.

Perhaps, the Act remains a Depression-era reminder of the protectionist policies of the United States prior to World War II and has had a deleterious effect on the Department of Defense's ability to forge multilateral development projects. The Act was cited under several challenges against federal procurement decisions in the 1980s. These challenges coincided with the recession of the mid-eighties, the rise of an anti-Japanese import sentiment. In 1982, a bill circulated in House of Representatives to require auto makers that sell in U.S. to use minimum percentages of American parts. Although defeated, the bill attempted to halt a trend of American auto makers buying parts abroad and force

foreign car companies to build more plants in U.S. or cut their exports to U.S. In 1984, the coal industry was successful passing legislation that forced the Pentagon to buy American coal to heat U.S. military bases in Europe, which cost the federal government about $15 million a year. In 1988, the National Council for Industrial Defense filed suit alleging that "the Pentagon routinely violates the Buy American Act and other federal regulations that require the military to make a concerted effort to purchase U.S.-made goods and services."

The Act is challenged again as the world-wide recession deepens in 2009. The House of Representatives' version of the economic stimulus bill contains a provision that only American made steel and other products be used for the infrastructure projects. The Senate version of the bill contains even stronger anti-free-trade provisions. World's reaction on U.S. stimulus bill is not very positive. The House provision caused a concern during the recent World Economic Forum at Davos, Switzerland by U.S. allies. The European Union has said that it will not stand by idly if the U.S. violates its trade agreements and its obligations to the World Trade Organization. Canadian officials expressed the exclusion of non-U.S. steel would violate the North American Free Trade Agreement, which lowered trade barriers among the U.S., Canada, and Mexico. The Buy American Act would effectively ban Canadian steel products and other raw materials from infrastructure projects receiving stimulus funds. Foreign steel would only be allowed if domestic products were either unavailable or drove up the cost of the project by 25% or more.

Furthermore, since the U.S. is the biggest exporter in the world, retaliation could cost America more jobs than the provision would create. It could also destabilize the global capital flows on which the U.S. depends to fund its deficit. Many economists and business groups argue that the Buy American provision could backfire, slowing economic growth instead of helping expand the American job market.

c. Critical Materials and the National Defense Stockpile

The idea of stockpiling important critical raw materials for military use dates back to just after World War I. Ideally, stockpiled items should be storable, not subject to decay or obsolescence, essential for defense production, and with insufficient domestic supply for wartime needs. Certain metals and minerals fulfill these criteria most closely, and today the National Defense Stockpile (NDS) consists almost entirely of these substances, although after World War II the stockpile also included large quantities of synthetic rubber.

Responsibility for the administration of the NSD has shifted over various federal agencies over its history.[6] Currently the responsibility rests with DoD, with the Defense Logistics Agency. The Institute for Defense Analysis (IDA) operates the FORCEMOB model, which is one of several inputs into the setting of materials requirements. This model estimates extraordinary military demands for given conflict scenarios. FORCEMOB

[6] See the National Research Council, *Managing Materials for a 21st Century Military* for an in depth description of the history, content and policy issues of the NDS.

makes use of the Inforum LIFT and Iliad models to determine defense and non-defense direct and indirect requirements by industry.[7] The quantities of strategic and critical minerals needed to produce the direct and indirect defense requirements are then estimated using materials consumption ratios (MCRs). These are estimates of materials needed per dollar of industrial output in a given sector, developed with the assistance of other government agencies. The scenarios analyzed by this modeling system highlight critical materials that are likely to be bottlenecks to defense production in a large-scale conflict.

In the last few years, large volumes of critical materials have been sold, and stockpile inventories have been reduced dramatically. However, it is not clear how much of this change in requirements is due to changes dictated by analytical modeling, and how much is due to other factors, such as a change in perception by policymakers of the security of the global supply chain. The modeling itself is fraught with various sources of uncertaintly, including weaknesses of the materials consumption data, the mix of defense goods required for a large conflict, and the availability of alternative sources of supply in such a conflict. A National Research Council study published in 2008 critically analyzed the strategic rationale for the NDS as well as the modeling system used to determine materials requirements. The ultimate impact of this study on the NDS and the FORCEMOB analysis is not yet known.

d. The Issues Underlying Strategic Dependency

When considering whether the U.S. suffers from import dependency in defense production, the correct question to ask is not, "What fraction of our defense goods are supplied by imports?" but rather, "How secure is our supply of defense inputs in the event of a crisis or conflict?" A heavily imported defense good cannot be considered a strategic vulnerability if close substitutes are available, or if it is produced by a large, diversified list of foreign suppliers. In the literature, researchers identify a set of necessary conditions that must be satisfied for a particular good in order for it to be considered a strategic vulnerability. These include: a high import share of consumption, a high share of imports coming from very few suppliers (concentration of supply), inelastic supply from other sources, unreliability of the largest foreign suppliers, and dependence of defense procurement on the good (Kellerman et al. 1996, Moran 1990, Russett 1984).

The increased levels of trade brought on by globalization also lay the foundation for a game-theoretic consideration of strategic trade policy. Any threat to withhold an important input of defense from the U.S. could harm not only the U.S. but also the foreign supplier, depending on how reliant the supplying country is on its exports for its own economic well being. Therefore, any calculation of import dependence should include some consideration of the costs to the supplier of executing the vulnerability. All else equal, the more reliant a foreign supplier is on U.S. markets for its own economic growth, the less willing it may be to withhold its products.

[7] The Inforum models have been used in support of this exercise from 1993 to the present. These are the same models that are part of the DoD DEPPS modeling system, described further below.

e. Describe recent efforts by DoD to evaluate the impact of foreign sourcing of systems.

Concerns about foreign vulnerability in DoD programs and systems have within the last decade prompted analysis which attempts to determine the extent to which different weapon systems are susceptible to any disruption in foreign supply. The 2004 National Defense Authorization Act directed the Secretary of Defense to report annually on the foreign vulnerability of the U.S. to foreign supply and the domestic industrial base capability in case of disruption. Since then, several studies have already been done by the Office of the Deputy Under Secretary for Defense for Industrial Policy (ODUSD Industrial Policy) on this issue.[8] These studies were larger in scope than the current study, and involved surveys and interviews with prime contractors and first and second tier subcontractors for several important weapons systems.

In January 2004, ODUSD Industrial Policy released the results of a study which examined 12 weapons systems consisting of several rockets, missiles, bombs and engines. The goal was to determine to what extent the subcontractors were foreign suppliers for each of those systems. The results showed that foreign vulnerability in these systems was very small. On average, foreign subcontracts comprised only 10 percent of the total value of all subcontracts per system and only about 4 percent of the prime contract value. Most of the foreign suppliers were from NATO states friendly to the U.S. and in almost all cases, the U.S. had the domestic capability to take over should there be any disruption in supply.

In the 2008 annual report on domestic capability and vulnerability to foreign supply, the ODUSD Industrial Policy studied the prime contracts in 10 major program areas.[9] The study revealed that only 1.5 percent of the total value of prime contracts in these areas was provided by foreign supplies. The largest values of contracts attributed to foreign suppliers were held in Canada, Germany, Norway and the U.K. These studies indicate that the exposure of the Defense Department to unreliable foreign supply is very weak.

2. *Globalization and the U.S. Economy*

Since WWII, the U.S. has steadily continued to become more enmeshed in the global economy. Throughout the 20th century, advances in transportation and communication technology steadily reduced the costs of both buying and selling in foreign markets. Since the 1980s, advances in information and communication technology have helped

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[8] *Study on Impact of Foreign Sourcing of Systems,* October, 2001 and January 2004. See also U.S. DoD *Fiscal Year Purchases from Foreign Entities*

[9] The program areas included: Airframes, Aircraft engines, Aircraft Equipment, Missile and Space, Ships, Combat vehicles, Non-combat vehicles, Weapons, Ammunition, and Electronics.

spur the growth in trade. In addition, a succession of global and regional trade agreements has reduced tariffs and other trade barriers.

Table 1, and figures 1 to 3 show U.S. GDP, exports and imports for selected years, from 1947 to 2008, from the U.S. National Income and Product Accounts (NIPA). This table throws into stark relief the increasing impact of international trade on the U.S. economy during this period. Just after the war, imports stood at only 3.2% of GDP. Total trade (imports plus exports) constituted 10.9% of GDP. Until about 1980, U.S. exports were greater than imports, so that the total trade share was more than twice the import share. In that year, import and export shares were both about 10%, with the total trade share reaching 20.6%. Import growth was particularly rapid from 1980 to 2005, when the import share reached 16.3% of GDP, with the export share remaining at about 10%. Since 2005, import and export shares have both increased, to 17.7% and 13% respectively.

What is missing from these figures is the ever increasing reliance of exports and imports on the activities of multinational corporations. The greater global reach of both U.S. and foreign multinationals has resulted in larger flows of foreign investment (Toyota plants in Kentucky and California, Ford plants in Spain) as well as a boom in process trade[10], such as the maquilidoras in northern Mexico. Foreign investment and process trade have been partly responsible for the shift in production of U.S. firms to other countries, resulting in a loss of output and jobs in the tradeable goods sectors. The voracious U.S. appetite for imports is also responsible for this loss.

Figure 4 shows the share of value added in national income of the agriculture, mining and manufacturing sectors, which are the source of most of the merchandise exports from the U.S. This share has fallen from 28% in 1977, to a low point of 15% in 2003, back to 16% in 2008. Along with this reduction in share of value added has been a reduction in the share of production capacity, as firms either shut down plants or but production of new plants. This decline in capacity is not necessarily bad, since the service sector has expanded to provide additional jobs. However, if the U.S. economy needed to expand this capacity, whether it were from financial pressures, or from wartime requirements, the expansion would take time, both for building new plant capacity and for training the labor required for this production.

Detailed industry data also show increasing import shares in recent years. The database for the Inforum *Iliad* model contains output, exports and imports for 360 sectors comprising the U.S. economy, classified by the 1997 NAICS[11]. Unfortunately, the time series of data available by NAICS are not as long as the total economy data discussed in the previous paragraphs. The database for *Iliad* starts in 1997, and extends to 2007.

At this detailed level of accounting, numerous industries show stark evidence of increases in import share over this relatively short period. Table 2 shows comparisons of apparent

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[10] Process trade is where different stages of processing of a product, such as a computer or an automobile, occur in different countries. A large share of Mexican imports from the U.S. are intermediate supplies or parts, which are assembled into finished or semi-finished products, and then exported back to the U.S. or to the world market.

[11] North American Industry Classification System.

consumption, imports, and the import share of consumption, for the top 60 industries, ranked by import share in 2007. These industries range from a high of .923 to a low of .370 in 2007. Of these 60 industries, only 4 have a decline in the import share from 1997 to 2007. For certain industries, the increase in the import share is especially notable, considering this is only a 10 year interval.

In table 3 we have extracted 14 selected commodities from this top 60 list that are important for defense and experienced relatively large increases in import shares. For example, Optical instruments and lenses, important for binoculars, telescopes and night vision equipment, have seen the import share rise from .6 to over .9. Turbine and turbine generator sets and Aircraft engines and engine parts both now have an import share of about .7, up from .27 and .37 respectively in 1997.

3. *Analysis of Projections of Defense Import Requirements*

Neither the U.S. National accounts nor the input-output table identify the quantities of imports used explicitly for defense requirements. However, under certain simplifying assumptions, those imports can be estimated.

The Defense Employment Purchases and Projections System (DEPPS) contains an industry component (IDEPPS) that identifies total requirements, direct and indirect requirements, and import requirements for each of 360 commodity goods and services comprising the U.S. economy. IDEPPS is derived from a combination of data from the Inforum *Iliad* model and the defense translator, derived by OSD/PA&E. IDEPPS is used to make projections of defense requirements by industry and program category for the interval of the Future Years' Defense Plan (FYDP)[12].

Table 4 summarizes the import intensity of each major program category over the projection interval. In 2008, the import shares vary from a low of 1.2% for Military personnel to 8.3% for Weapons and tracked vehicles. What is striking about these numbers is how much lower they are than the import intensity of the total economy, which is 17.7% in 2008. What is the reason for this large apparent difference?

Probably the most important explanation lies in the way the IDEPPS projection is calculated. In IDEPPS, it is assumed that the initial round of spending (direct requirements, or direct contracts) are purchased domestically, whereas the indirect requirements are supplied both by domestic production and by imports, the imports determined by the overall economy import share for that commodity. Therefore, if a commodity has a high ratio of direct to total purchases, the estimated defense import share will be much less than the total economy.

In table 5, the estimated IDEPPS import shares are shown for the same commodities as in table 3. The defense import shares and total economy import shares are compared in the last column. Two extreme cases are Optical instruments and lenses, and Other nonmetallic mineral mining. In the first case, although the total economy has a very high

[12] The most recent projections (as of May 2009) were completed in July 2008, for the FY08 defense translator and FYDP, and the projection interval was 2008 to 2013.

import share (.923) in 2007, the estimated defense import share is very small (.019). This is because most of the requirements of this commodity are direct, and DEPPS is assuming these are all produced domestically. The defense import share for Other nonmetallic mineral mining (.435) is not much lower than the total economy import share (.441), as most of the requirements for this commodity are indirect.

Table 6 shows more detail for both of these commodities and two others with a fairly high defense import share: Semiconductors and electron tubes (.369) and Magnetic and optical recording media (.550). The latter two commodities also have a large share of indirect requirements.

The DEPPS projections also estimate which program category uses each commodity and the share of use that is direct or indirect. The implied import share for any given commodity varies by program category, as shown in table 7. This table shows the total requirements, import requirements, and import share for the commodity Magnetic and optical recording media for all 11 IDEPPS program categories, for 2007 and the projection year 2013. The import shares of this commodity by each program category vary from .394 to .735. This is largely a function of what share of total requirements is direct or indirect expenditure.

How reasonable is the assumption that all direct expenditures are purchased domestically? Certainly the Buy American provisions act as a significant incentive to strongly favor U.S. suppliers, when there is a choice. However, for an industry such as Optical instruments and lenses, surely the high import share in the overall economy suggests that domestic production capacity is currently quite limited. For other products, such as Broadcast and wireless communication equipment, the average import share for the whole industry (.528) masks large differences in import share at finer levels of disaggregation. In other words, for some detailed products, there may in fact no longer be any U.S. production, in which case DoD is forced to buy from a foreign supplier.

The only evidence for the amount of foreign direct purchases is the contract awards database, which is now available at USASpending.gov. This database can be used to get an extract of awarded contracts with dollars obligated, vendor name, product or service code, and NAICS[13] code. There are two location fields that can be used to determine what contracts were awarded to overseas firms. The database includes vendor country as well as place of performance.

For this paper, we decided to extract and analyze DoD contracts for 2008 where both the vendor country and the place of performance were not the U.S. A foreign company operating in the U.S. certainly does not qualify as an import. A U.S. company operating in a foreign country is slightly more difficult, but it many of these records represent U.S. contractors supporting missions in Iraq, Afghanistan, Germany, South Korea or other countries where U.S. troups are stationed. Even the case of a foreign firm operating in a foreign country may be services to U.S. bases, ships or aircraft in that country.

[13] NAICS is the North American Industry Classification System. It is used to determine the industry that is providing the goods or services.

The entire database of DoD contracts for 2008 consists of 92,200 records, with a total dollar value of $360.1 billion. There are 4,826 records where both the vendor country and place of performance are outside the U.S., with a total dollar value of $14.9 billion, or 4.1% of the total contracts. Of this total value, $5.9 billion are for Petroleum refining (NAICS 324110) or Petroleum wholesalers (NAICS 424720). These are likely to be refueling services for ships, planes and vehicles on overseas missions. Of the remaining $9 billion in contracts, $1.8 billion are from grocery wholesales and $1.2 billion are for construction projects which are likely to be construction of base facilities and subsistence for personnel abroad. The remaining $6 billion in contracts (1.3% of total contracts) constitutes an upper bound on what may be direct contracts that consist of imports from a foreign country.

The IDEPPS estimates in table 4 indicate that about 3.7% of total defense requirements were imported, using the assumption that there were no imports for direct requirements. The IDEPPS calculation should be adjusted upwards by roughly 1.3%, to reflect what the contract awards data indicate for direct imports. This would result in an estimate of about 5% for the import share of total defense requirements, still significantly less than the 17% share of imports in the overall economy.

4. Conclusions

As the world economy has become more globalized and interconnected, trade shares of each country have experienced a continuous upward climb. In the U.S., which at one time had a very small trade share, the increase is most notable in imports, as the U.S. has run trade deficits since the early 1980s, and these deficits have grown quite large in the last 5 years. The resulting increase in imports and the trade deficit have been associated with a hollowing out of the U.S. mining and manufacturing sectors. The share of mining and manufacturing in the total U.S. economy, whether measured in output, employment or value added, have been declining steadily.

In this paper we have used trade data based on the detailed Census foreign trade statistics, compiled for the Inforum *Iliad* model and IDEPPS, to review how import shares have grown for selected commodities, and have shown some snapshots of projections from IDEPPS that can be used to analyze the import shares of specific commodities used in specific DoD program categories. While the overall import share of defense total requirements is quite small (probably 3.7% to 5.0%), the import share of total requirements for selected commodities is becoming quite large, over 50% for many commodities. As discussed in section 1 above, this is probably not a serious concern for most products, if the sources of supply are secure, substitute domestic capacity is available, or if the commodity can be stockpiled or held in inventory in quantities sufficient to sustain production of direct defense requirements in a sustained conflict.

However, the continued upward trend in U.S. import shares (and decline in domestic production capacity) of many products should be monitored closely, as situations could arise where we cannot easily substitute for the foreign suppliers quickly enough to satisfy production requirements. The Census imports data and the contract awards are useful tools for this monitoring process, as are the higher level tools of IDEPPS and the *Iliad* model.

An alternative scenario, which is appearing more likely as the current economic crisis plays out, is that the dollar may suffer a steep decline, and the U.S. trade deficit will eventually switch to a surplus, to help pay off accumulated foreign debt. In this case, the domestic mining and manufacturing sectors will be stimulated to generate exports, and substitute for imports, so that the steady rise in import shares may be reversed. However, even if this scenario comes to pass, increasing globalization may still lead to the result that the production of certain commodities becomes concentrated in locations outside the U.S.

Table 1. U.S. GDP and Trade
Billions of Dollars

	GDP	Exports	Imports	Import Share of GDP (%)	Trade Share of GDP (%)
1947	244.2	18.7	7.9	3.24	10.89
1950	293.8	12.4	11.6	3.95	8.17
1960	526.4	27.0	22.8	4.33	9.46
1970	1038.5	59.7	55.8	5.37	11.12
1980	2789.5	280.8	293.8	10.53	20.60
1990	5803.1	552.4	630.3	10.86	20.38
1995	7397.7	812.2	903.6	12.21	23.19
2000	9817.0	1096.3	1475.8	15.03	26.20
2005	12421.9	1311.5	2025.1	16.30	26.86
2006	13178.4	1480.8	2238.1	16.98	28.22
2007	13807.5	1662.4	2370.2	17.17	29.21
2008	14264.6	1859.4	2528.6	17.73	30.76

Source: U.S. National Income and Product Accounts (NIPA), Bureau of Economic Analysis

Figure 1.

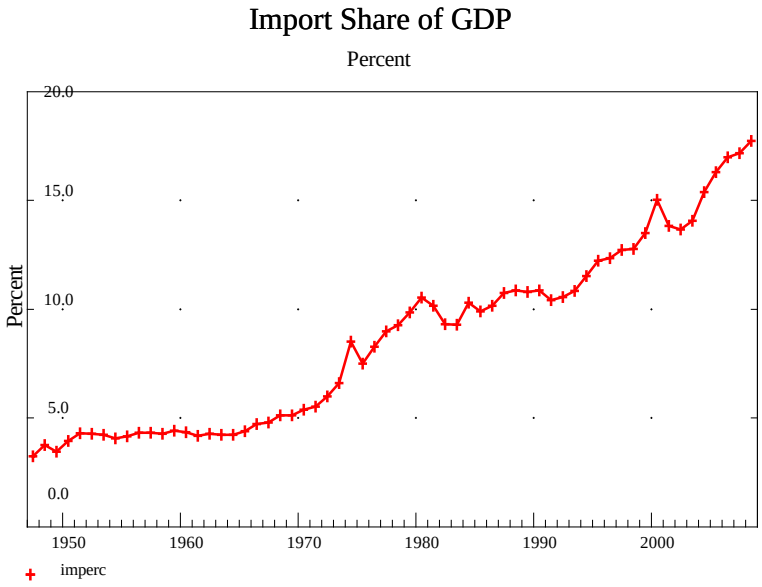


Figure 2.

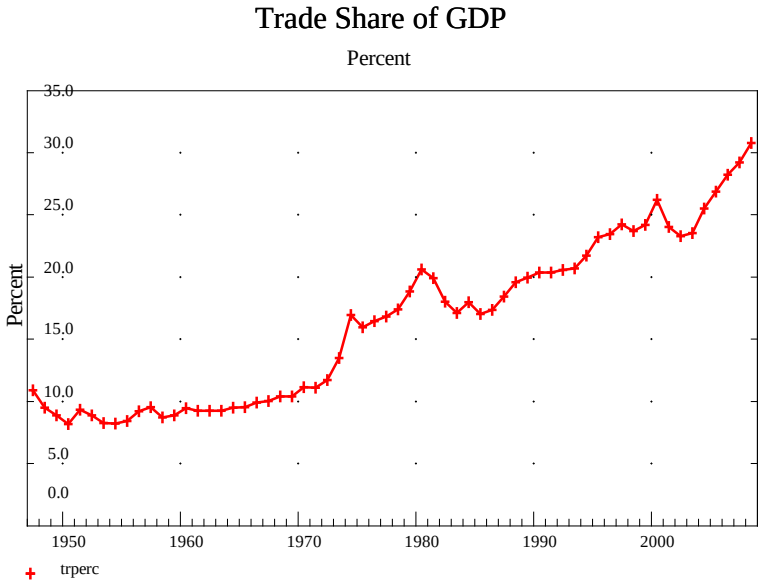


Figure 3.

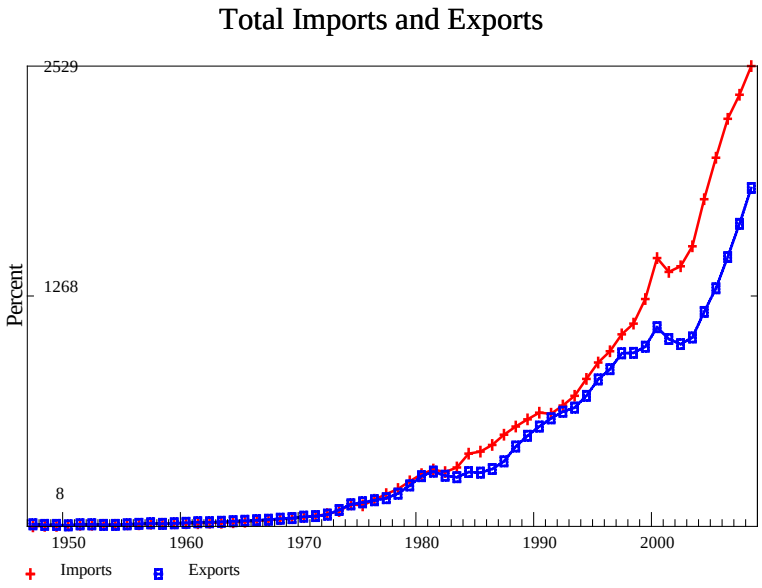
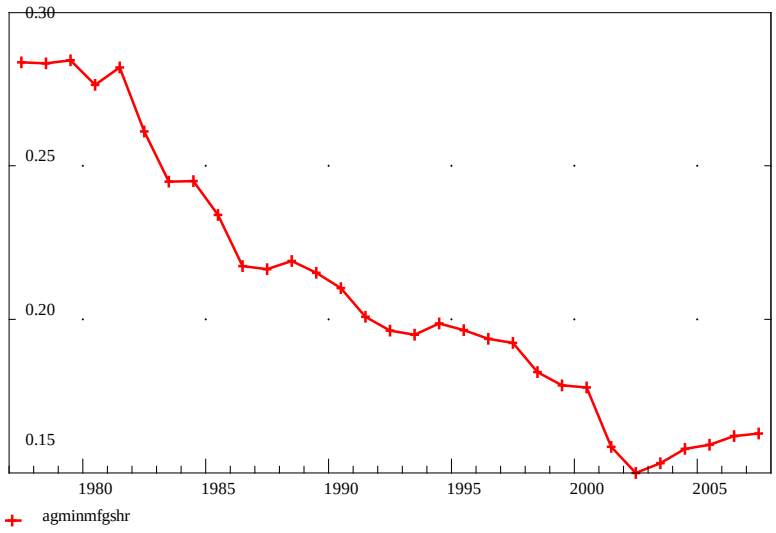


Figure 4.

Agriculture, Mining & Manufacturing Share of GDP



U.S. Import Share of Domestic Demand by Iliad Commodity
Millions of Dollars
(Ranked by Import Share in 2007)

			1997			2007			
Rank	Commodity Description	NAICS Code	Apparent Consumption	Imports	Import Share	Apparent Consumption	Imports	Import Share	Change in Import Share
1	Optical instruments and lenses	333314	3062.3	1839.9	0.601	4011.7	3704.6	0.923	0.323
2	Shoes and other leather products	316100, 316200, 316900	30266.3	21945.0	0.725	37915.1	33455.7	0.882	0.157
3	Accessories and other apparel	315900	6070.6	2657.0	0.438	6644.5	5859.9	0.882	0.444
4	Apparel, cut and sewn	315200	103238.7	52279.0	0.506	124591.8	109138.8	0.876	0.370
5	Audio and video equipment	334300	24091.5	19249.6	0.799	59720.1	50992.9	0.854	0.055
6	Other computer peripheral equipment	334119	40724.9	25882.0	0.636	43469.9	35854.4	0.825	0.189
7	Office machinery	333313	3844.5	1955.0	0.509	7201.1	5541.8	0.770	0.261
8	Scales, balances, and miscellaneous general purpose machinery	333997, 333999	6645.7	3701.3	0.557	11537.2	8654.5	0.750	0.193
9	Jewelry and silverware	339910	21382.8	10719.8	0.501	31982.4	23687.9	0.741	0.239
10	Nonferrous metal products, exept copper and aluminum	331419	10018.5	5902.9	0.589	24309.4	17905.0	0.737	0.147
11	Turbine and turbine generator set units	333611	2933.9	784.1	0.267	4107.4	2906.4	0.708	0.440
12	Aircraft engines and engine parts	336412	19341.8	7135.7	0.369	15713.6	11044.0	0.703	0.334
13	Magnetic and optical recording media manufacturing	334613	5432.1	1923.0	0.354	7114.1	4735.0	0.666	0.312
14	Curtain and linen mills	314120	12072.9	2394.6	0.198	17570.5	11541.7	0.657	0.459
15	Power-driven handtools	333991	4079.5	1363.9	0.334	4486.1	2934.9	0.654	0.320
16	All other electronic components	3344	65620.8	30835.7	0.470	77913.7	50673.0	0.650	0.180
17	Textile machinery	333292	2643.6	1661.6	0.629	1299.3	823.5	0.634	0.005
18	Computer storage devices	334112	26733.9	17586.7	0.658	17903.0	11059.5	0.618	-0.040
19	Crude oil extraction	211000 part	112378.4	58498.5	0.521	434071.9	267533.2	0.616	0.096
20	Kitchen utensils, pots and pans	332214	2011.7	754.3	0.375	2830.8	1708.0	0.603	0.228
21	Toys and sporting goods	339920, 339930	28795.7	15970.2	0.555	41756.9	25123.2	0.602	0.047
22	Fishing, hunting and trapping	114100, 114200	10515.1	6612.6	0.629	19600.3	11693.2	0.597	-0.032
23	Pottery, ceramics, and plumbing fixtures	327111, 327112, 327113	6002.9	2632.6	0.439	6329.0	3734.1	0.590	0.151
24	Photographic and photocopying equipment	333315	11385.3	6050.7	0.531	3649.0	2074.2	0.568	0.037
25	Sawmill and woodworking machinery	333210	1685.8	757.9	0.450	2226.9	1243.4	0.558	0.109
26	Musical instruments	339992	1976.9	982.2	0.497	3103.7	1726.2	0.556	0.059
27	Electric housewares, fans and vacuum cleaners	335211, 335212	7048.9	3176.9	0.451	11189.5	6222.1	0.556	0.105
28	Broadcast and wireless communications equipment	334220	36333.5	5567.3	0.153	71832.5	37895.3	0.528	0.374
29	Speed changers and mechanical power transmission equipment	333612, 333613	6050.9	2236.9	0.370	10327.5	5418.4	0.525	0.155
30	Motorcycle, bicycle, and parts	336991	4694.2	2360.5	0.503	11848.3	6171.3	0.521	0.018
31	Electric lamp bulb and part manufacturing	335110	3586.6	1100.2	0.307	3994.4	2057.1	0.515	0.208
32	Relays and industrial controls	335314	12091.0	3026.1	0.250	14135.1	7062.8	0.500	0.249
33	Carbon and graphite and miscellaneous electrical equipment	335991, 335999	9002.0	2980.7	0.331	11590.3	5785.4	0.499	0.168
34	Printing machinery and equipment	333293	4220.6	1995.7	0.473	4429.1	2184.7	0.493	0.020
35	Cut stone and stone products	327991	1967.6	757.7	0.385	7338.3	3585.6	0.489	0.104
36	Plastics and rubber industry machinery	333220	4366.2	1970.6	0.451	4257.9	2068.0	0.486	0.034
37	Telephone apparatus	334210	37914.2	9447.9	0.249	35489.4	16898.4	0.476	0.227
38	Pulp mills	322110	6113.4	2690.7	0.440	7897.1	3759.2	0.476	0.036
39	Ophthalmic goods	339115	4544.9	1784.9	0.393	8177.0	3856.1	0.472	0.079
40	Motors and generators	335312	12907.3	3624.0	0.281	18415.0	8560.5	0.465	0.184
41	Semiconductors and electron tubes	334411, 334413	81528.1	29034.3	0.356	59355.0	27474.9	0.463	0.107
42	Metal cutting and forming machine tool	333512, 333513	10279.1	5338.3	0.519	9462.9	4374.3	0.462	-0.057
43	Household and institutional furniture	33712	32368.3	7741.8	0.239	53311.9	24057.8	0.451	0.212
44	Other nonmetallic mineral mining	212390	4757.2	1123.0	0.236	5644.6	2487.8	0.441	0.205
45	Electronic computers	334111	52800.3	6773.4	0.128	62101.7	27012.3	0.435	0.307
46	Automobiles and light trucks	336110	265659.3	84213.2	0.317	344565.3	149556.7	0.434	0.117
47	Pharmaceuticals and medicines	325400	102442.0	27312.6	0.267	260092.0	110911.1	0.426	0.160
48	Air purification and ventilation equipment	333411, 333412	3961.5	918.8	0.232	6033.9	2529.9	0.419	0.187
49	Tires	326210	17456.1	3539.8	0.203	24661.0	9913.4	0.402	0.199
50	Small arms	332994	1491.5	366.3	0.246	2589.7	1038.1	0.401	0.155
51	Iron ore mining	212210	2375.0	654.0	0.275	3558.4	1417.8	0.398	0.123
52	Cutlery and flatware	332211	2749.8	699.6	0.254	3325.8	1321.8	0.397	0.143
53	Computer terminals	334113	1721.8	102.2	0.059	643.1	254.4	0.396	0.336
54	Electricity and signal testing instruments	334515	10363.8	2292.8	0.221	8325.8	3278.6	0.394	0.173
55	Lighting fixtures	335120	11201.8	2647.8	0.236	17620.8	6912.3	0.392	0.156
56	Household cooking appliances	335221	4972.5	1680.8	0.338	13298.2	5074.7	0.382	0.044
57	Watches, clocks, and other measuring and controlling devices	334518, 334519	7381.8	3518.1	0.477	12693.2	4821.5	0.380	-0.097
58	Surgical and medical instruments	339112	17435.2	3124.5	0.179	35713.6	13246.7	0.371	0.192
59	Fiber optic and other cable	335921, 335929	14152.5	2695.6	0.190	19821.8	7331.6	0.370	0.179
60	Industrial process furnaces and ovens	333994	2691.7	477.6	0.177	1987.8	731.4	0.368	0.191

Table 3. Large Changes Import Share in Commodities Important to Defense

Commodity Description	1997 Import Share	2007 Import Share	Change in Import Share
Optical instruments and lenses	0.601	0.923	0.323
Turbine and turbine generator set units	0.267	0.708	0.440
Aircraft engines and engine parts	0.369	0.703	0.334
Magnetic and optical recording media manufacturing	0.354	0.666	0.312
Broadcast and wireless communications equipment	0.153	0.528	0.374
Speed changers and mechanical power transmission equipment	0.370	0.525	0.155
Relays and industrial controls	0.250	0.500	0.249
Telephone apparatus	0.249	0.476	0.227
Motors and generators	0.281	0.465	0.184
Semiconductors and electron tubes	0.356	0.463	0.107
Other nonmetallic mineral mining	0.236	0.441	0.205
Electronic computers	0.128	0.435	0.307
Computer terminals	0.059	0.396	0.336
Fiber optic and other cable	0.190	0.370	0.179

Table 4. Import shares by major category of defense spending

	2008	2009	2010	2011	2012	2013
Import Shares						
Total Defense Requirements	0.037	0.036	0.036	0.035	0.035	0.034
RDT&E	0.038	0.037	0.036	0.036	0.035	0.034
Procurement	0.059	0.057	0.057	0.056	0.056	0.055
Military Construction	0.044	0.044	0.044	0.044	0.045	0.045
Operations & Maintenance	0.033	0.033	0.031	0.031	0.031	0.031
Military Personnel	0.012	0.012	0.012	0.012	0.012	0.012
Family Housing	0.035	0.037	0.037	0.037	0.037	0.036
Procurement Detail						
Aircraft	0.054	0.054	0.056	0.056	0.056	0.056
Missiles	0.049	0.043	0.043	0.041	0.041	0.040
Weapons & Tracked Vehicles	0.083	0.082	0.083	0.083	0.083	0.081
Ammunition	0.065	0.065	0.065	0.066	0.066	0.067
Ships	0.045	0.045	0.042	0.041	0.043	0.041
Other Procurement	0.059	0.059	0.059	0.060	0.060	0.060

Source: FY 2009 DEPPS Projections

Table 5. IDEPPS Estimated Import Shares for Defense for Selected Commodities

	2007	2013	2007 Total Economy Import Share	Difference in 2007
Optical instruments and lenses	0.019	0.024	0.923	0.905
Turbine and turbine generator sets	0.143	0.152	0.708	0.565
Aircraft engines and engine parts	0.121	0.082	0.703	0.582
Magnetic and optical recording media	0.550	0.647	0.666	0.115
Broadcast and wireless communication equipment	0.146	0.151	0.528	0.382
Speed changers and mechanical power transmission equipment	0.340	0.291	0.525	0.184
Relays and industrial controls	0.444	0.428	0.500	0.056
Telephone apparatus	0.171	0.129	0.476	0.305
Motors and generators	0.387	0.399	0.465	0.078
Semiconductors and electron tubes	0.369	0.328	0.463	0.094
Other nonmetallic mineral mining	0.435	0.524	0.441	0.006
Electronic computers	0.110	0.092	0.435	0.325
Computer terminals	0.072	0.068	0.396	0.323
Fiber optic and other cable	0.368	0.385	0.370	0.002

Table 6. Total, Direct, Indirect Requirements and Imports for Selected Commodities

Optical instruments and lenses	2007
Total requirements	990.2
Imports	18.4
Direct requirements	974.6
Indirect requirements	15.6
IDEPPS Import share	0.019

Other nonmetallic mineral mining	2007
Total requirements	117.7
Imports	55.7
Direct requirements	0.9
Indirect requirements	116.8
IDEPPS Import share	0.473

Semiconductors and electron tubes	2007
Total requirements	3965.0
Imports	1461.7
Direct requirements	257.4
Indirect requirements	3707.6
Import share	0.369

Magnetic and optical recording media	2007
Total requirements	234.9
Imports	129.2
Direct requirements	21.7
Indirect requirements	213.2
Import share	0.550

Table 7. Distribution of Total Requirements and Imports, and Import Share for Magnetic and Optical Recording Media

	Total Requirements		Import Requirements		Import Share	
	2007	2013	2007	2013	2007	2013
RDT&E	30.0	24.5	18.7	18.0	0.624	0.734
Military construction	3.0	3.3	1.8	2.3	0.609	0.708
Operations & maintenance	113.9	87.9	64.7	59.2	0.568	0.674
Military personnel	6.7	6.6	4.2	4.8	0.625	0.735
Family housing	1.3	0.5	0.8	0.4	0.613	0.716
Aircraft	29.4	34.1	11.1	16.4	0.378	0.482
Missiles	4.4	4.3	2.7	3.0	0.610	0.709
Weapons and tracked vehicles	16.2	6.1	7.3	2.4	0.449	0.394
Ammunition	0.8	0.8	0.5	0.6	0.616	0.723
Ships	6.2	8.3	3.9	6.0	0.619	0.728
Other procurement	23.0	20.9	13.6	14.4	0.593	0.690

Source: IDEPPS Calculations

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