RESHAPING INSTITUTIONS: EFFECTS OF ICT ON BILATERAL TRADE

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ABSTRACT

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Internet and telecommunication technologies have changed the way people communicate and do business across the globe. This technology revolution has been visible not only in high income countries, but also in developing and lower income countries. It has impacted business transactions between these groups of countries. This dissertation studies the effect of the Internet on bilateral trade. A few studies have looked at the impact of the Internet on bilateral trade. This study offers a novel analysis of its interactions with the institutional underpinnings of trade by examining the effects of Internet use on trade in industries that require varying degrees of relationship-specific investments.

Industries can be categorized by their level of dependence on investments that are relationship-specific. A higher dependence on relationship-specific investments is generally associated with higher levels of risk in the transaction process. Countries with more stable and differentiated institutional arrangements are generally capable of better contract enforcement, and have often been the preferred trading partner in such industries. This study analyzes whether Internet use impacts industries with a higher need for institutional arrangements differently from those that have a smaller need for these institutional arrangements. Internet is able provide access to different kinds of information (verbal and visual) almost instantly, and this plays a role in reducing transaction costs (traditionally managed through the use of institutional arrangements between two countries). The underlying conceptual framework of this study takes into account the affordances of the technology based on past literature. The effect of these affordances or

features on coordination costs, information costs and productivity costs is analyzed to develop the hypothesis for this study. The adopted approach analyzes the impact of internet use on institutional intensive sectors by understanding the relationship of these different technological affordances on transaction and production costs in an industry.

A pooled OLS estimation and panel data estimation using gravity specifications of international trade was performed on 25 industries and for 72 countries between the time periods 2002 to 2010. The findings indicate that higher Internet use by the exporting country has a positive impact on trade with the US in sectors that require higher institutional arrangements. This has important policy implications because countries with relatively poorer institutional arrangements can now benefit from the use of Internet, as the technology is able to reduce transaction and information costs to some degree. It also implies that the use of Internet or broadband could reduce the need for stronger institutional arrangements in industries with relationship-specific investments.

The findings from this study also suggest that industries with low institutional intensities are positively impacted by the use of the Internet because of its effect on productivity particularly in markets that are highly competitive in nature. The underlying cause and reason for impact on industries with a lower need for institutional arrangements is a little more ambiguous because of multiple factors that can influence the outcome including the nature of the industry (competitive or not) and the existence of other potential importers in the market.

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1. INTRODUCTION

Over the last few decades, Internet and telecommunication technologies have been adopted across the globe. Unlike other technology revolutions, this growth has been visible not only in high income countries but also in developing and lower income nations. This large scale growth in communication across the globe has had multi-faceted impacts. Information and communication technologies have influenced interpersonal communications, social interactions, and are transforming economic activities at local, national and international levels.

ICTs affect business transactions in several ways. On an international level, information and communication technology can possibly have an impact on market-driven activities (international trade), activities that involve a more hierarchical structure of governance (some foreign direct investments, multinational corporations etc.) and activities that are more contractual in nature (licensing agreements etc.). The above mentioned kinds of economic structures are different in their coordination structures and hence have different costs and risks involved. The impact of information and communication technology on these cross-border economic activities varies with the differences in their respective organizational structure, cost structures and risks.

ICT benefits market-driven activities like international trade that are potentially affected by problems of asymmetric information by reducing search costs and basic logistics of trade are easier to monitor with the use of these technologies. More hierarchical organizations like multinational corporations have a more complex structure and require a higher level of co-ordination. These hierarchical economic activities typically also exhibit a high degree of asset specificity that might require large investments. ICTs have multiple affordances that improve coordination and transfer of information within these organizations. Use of video conferencing, centralized information networks and other such applications within these organizations have hugely reduced costs and improved efficiencies. Contractual economic relations, such as licensing agreements, are typically less complex, but there are certain information asymmetries that could result in poorer decisions about the licensing agreement. The use of ICT has also led to a more awareness about cultures around the world. There is more information about different kinds of markets making the global market more accessible to most countries. These are a few of the many ways in which ICT can help reduce information asymmetries and improve decision making. This study however, focuses only on the impact of these information and communication technologies on the market-driven activity of international trade.

While there are several studies that look at the impact of the Internet on international trade (Freund and Weinhold 2000, 2002, 2004; Berthelon and Freund 2008), this is a first attempt to understand the impact of information and communication technologies on international trade in different industrial sectors with varying levels of relationship-specific investments. A measure of the level of relationship-specific investments in a particular industry was constructed by Nunn (2007) and is termed "contract intensity" of that particular sector. In other studies such as Levchenko (2011), contract intensity is also called "institutional intensity" of an industrial sector, defined as the dependence of that particular industrial sector on relationship-specific investments and contracts.

Traditionally, countries with better institutional quality have a comparative advantage with respect to industries that involve relationship-specific investments and contracts (Levchenko 2004, Antras 2007, Acemoglu et al. 2005, Costinot 2005). The institutional dimension that is of interest in this scenario is the quality of contract enforcement in a country. In the literature, there are several variables that have been used as indicators of the quality of contract enforcement in a country. These include the "regulatory quality index" calculated by the World Bank (2004) and the "rule of law" from Kaufmann, Kraay and Mastruzzi (2003).

This study examines the effect of information and communication technologies on different industries to analyze if these technologies have changed the trends in trade in more institutionally intensive industries. While it is difficult to dispute that information and communication technology has had some role to play in the way international trade has changed over time, this study attempts to analyze whether the Internet influences institutionally intensive industrial sectors (investments in these industries are relationship specific) more than other sectors (sectors where investments are not as relationship specific), thereby indicating a reduction in transaction and information cost associated with institutionally intensive industries. Countries that have good institutional arrangements (better regulatory quality or better systems to enforce contractual obligations) had an advantage while trading in such institutionally intensive industries. Reduction of transaction costs not only benefits countries that have poorer institutional arrangements but also benefits countries that already have higher institutional quality by improving coordination and information transfer.

Internet and communication technologies have an impact on most kinds of economic activities as they usually act as enablers of communication between individuals and organizations, including those in different countries. Information and communication technologies enable information acquisition, market access, export promotion and efficient coordination. Costs associated with these activities have been identified as important impediments to international trade between two countries in a particular industry (Samiee and Walters, 1990 and Samiee 1998). Besides being able to reduce information asymmetries and transaction costs of these economic activities explicitly, Internet and communication technologies could lead to better awareness of national cultures and this could lead to more global cultural integration or fragmentation in some cases. In an organizational context, greater integration has frequently been linked to greater firm performance (Barney 1991, Chalmeta et al.. 2001). Hence, we expect that the integration enabled by Internet and communication technologies would also impact the overall production of the country and hence have a positive impact on its international trade. This study explores the role of information and communication technology in trade by reducing information asymmetries and transaction costs especially in industries that require relationship-specific investments. However, these technologies may also help highly competitive, but institutionally less intensive industries by reducing search costs and enabling better coordination.

Since 1980, the world has seen a disproportionate rise in trade volumes as compared to the increase in world real GDP (Berthelon and Freund 2008). New industries have come into existence and new trading partnerships are being entered into all over the world. It is possible that some of the factors that were traditionally responsible for facilitating better trade between some countries are now affected by the use of information and communication technology. The deluge of technical features in current-day technology is capable of impacting not only economic costs, but also cultural factors that traditionally played a role in international trade.

This study explores if broadband access influences bilateral trade flows in more institutionally intensive sectors more heavily than others. Better institutional quality of a country has been important for those countries trading in institutionally intensive sectors as these institutions by themselves are a critical factor in increasing the country's comparative advantage in that sector (Levchenko 2007, Nunn 2007). Better institutions enable more reliable transactions and lower coordination costs.

This study proposes that the availability of broadband technology in the last decade may have also played an important role in changing trends in bilateral trade by reducing certain costs associated with it. Costs associated with trade are broadly categorized as production costs, coordination costs (distance related and others) and information costs. Different industries are characterized by varying levels of these costs; hence one could hypothesize that the different affordances of the Internet have varying effects on trade in different industries. It is of interest to take a closer look and examine some whether certain sectors affected by the use of the technology more than others. Different sectors also have different levels of institutional intensity, and some manage to mitigate a significant amount of their production and transaction costs by adopting information and communication technologies. In other words, this study is interested in exploring if the adoption of information and communication technologies affects certain industry sectors more than others?

This study is a first of its kind to analyze the impact of Internet technologies on trade particularly on industrial sectors that have a high institutional intensity. The impact of institutions on trade has been studied before (McLaren 2000, Grossman and Helpman 2002, 2003, 2005, Levchenko 2004, Antras 2005, Acemoglu et al. 2005, Costinot 2005), but this is a first study that looks at how the use of Internet technology affects trade, with a particular emphasis on institutionally intensive sectors. It is interesting to investigate whether the Internet enhances the existing institutional arrangements in countries that are known to have good institutional arrangements, and further if the technology is able to provide some affordances of good institutions in those countries that lack these arrangements. In other words, it is intriguing to explore whether Internet technology is able to provide similar institutional affordances to countries that lack a high quality of contract enforcement, and give them a chance to compete in trade sectors that are more contractually intensive.

One motivation for this study is to examine whether the use of Internet affects trading firms in those countries where the government is rather sluggish in improving overall institutional arrangements along with influencing those countries that already have these arrangements in place. It must be kept in mind that the Internet benefits trade in multiple ways and could potentially also benefit sectors that are not institutionally intensive, especially sectors that are highly competitive.

The main contribution of this study is that it gives us an understanding of how Internet affects bilateral trade in different sectors by impacting the underlying costs in these sectors. This industry wise break up according to institutional intensities provides us with some insight into what sectors that benefit from the use of Internet technology in trade and why. Empirically, the dissertation analyzes the effect of broadband technology on bilateral trade in the US between 2002 and 2010. The study includes 22 industries characterized by different institutional intensities Nunn (2007). The study uses the traditional international trade gravity equation which is essentially designed around the concept that a country is more likely to trade with another country that is physically closer and larger, than a country that is smaller and further away. In this study, the gravity equation is modified to account for other factors important to trade including the size of the information and communication sector of the respective trading countries.

The study finds evidence that the use of ICT positively affects both sectors with high and low institutional intensity. The use of the technology plays a role in reducing transaction costs and production costs. Findings from this study have important policy implications for the use of

Internet technology for firms in countries with poorer institutional arrangements. Broadband Internet access increases their ability to compete in sectors that they traditionally had a disadvantage in. This study also has important policy implications for the use of Internet technology in industries that tend to be highly competitive in nature.

The next section of the dissertation will review the existing literature in this area of research. The following two sections provide a conceptual framework for the study as well as define the methodological approach. The final two sections look at the empirical evidence and its policy implications.

2. LITERATURE REVIEW

This dissertation studies the impact on overall bilateral trade flows as a result of technology adoption and use. It is interesting to study the effect of information and communication technologies on specific sectors or economic activities, and evaluate whom these technologies have benefited. This can also inform us on whether and how countries and industries should use these technologies to improve coordination, reduce risk and gain information in this highly interconnected and globalized world. Even in trade, it is possible that some countries benefit more than some others by using the technology because of the inherent nature of industries that they invest in or because of the existence of other country level factors (or lack of complementary resources) that make the adoption and efficient use of the technology difficult. In this section, we review literature that has investigated the economic impact of ICT. In the first section, we examine the broader literature that addresses the impact of ICT on overall economic productivity, which has repercussions for trade. In the next section, we narrow down to and review the literature that addresses the impact of ICT on one specific economic activity "trade". Broader findings that apply to the overall impact on economic productivity also apply to trade. Besides economic productivity, ICT also additionally impacts another important factor influencing trade called "transaction costs" (discussed in the third section). Finally, the last section highlights contributions of this dissertation and the motivations derived from past literature.

2.1 Internet and Communication Technology and Economic Productivity

Since the coining of the term "Solow's paradox" in which Robert Solow argued that you can see the computer everywhere except in productivity statistics, there have been several studies that have made an attempt to explain this observation. Solow's paradox was coined because a key finding was that since 1973 the residual economic growth had slowed down just when IT investments had risen. Residual growth is the spillover after growth of all inputs is taken into account (Robert Solow 1957). Several studies including Brynjolfsson and Yang (1996) did not find a correlation between IT and productivity. They largely attributed this to lack of data and inability of analytical methodologies to capture the impact quantitatively. A recent study by Forman et al. (2010) found evidence for increasing wage inequality with the adoption of the Internet.

However the paradox was largely demystified when scholars like Brynjolfsson looked into the reasons for the paradox and found them to be associated with measurement errors, lags in productivity and the lack of accountability of quality and variety changes brought about by these technologies. Brynjolfsson and Hitt (2000) find that complementary investments in institutions are required for benefits from IT investments to be fully realized. Other studies have tried to explain the reason for this paradox by defining conditions under which productivity is most likely to increase (Hughes and Morton 2005).

Some studies find that the impact of information technology depends on the availability of complementary resources. Some scholars (Brynjolfsson and Hitt 2000 and Draca et al. 2006) find that traditional studies confirming Solow's paradox do not account for the existence of these complementary resources. Others (Dedrick 2003) refuted the productivity paradox in both firm level and country level studies and explained that complementary investments accounted for difference between organizations. This was supported in some studies (Melville 2004) that also find that the impact of IT investments depends on the level of complementary environment. Complementary environment refers to other changes in organizational structure that make work environment more conducive to the use of IT (e.g. adequate worker training in IT). Some studies (Bresnahan and Trajtenberg 1995) advocated the idea that information and communication technology had some impact on productivity when they used a transaction cost perspective to discuss how general purposes technologies can act as 'engines of growth'. Similarly, some (Hubbard 2003) explored how Internet and other ICT products help increase productivity by improving the matching process between people and products. While some other scholars like Athey and Stern (2000) studied productivity effects in specific industries (in this study the researchers looked at how information technology impacts the health care industry in specific).

The above studies find that the productivity paradox was largely a result of empirical limitations, but in some cases the benefits of the technology were not realized because of a lack of complementary investments that are required to make the most of the technology. Van Aek and Inklaar (2005) find the impact of ICT on productivity is also time dependent as countries and economies take time to realize the benefits of the technology and adapt accordingly. Similarly, they find that different economic sectors benefit from the technology differently because of the inherent characteristics of the different sectors. Despite the typical endogeneity challenges that are involved in measuring the impact of technology on productivity, Crandall, Lehr and Litan (2007) find sufficient evidence that ICTs do impact productivity growth. A literature review of broadband' s impact on productivity (Holt and Jamison 2009, Kretschmer 2012) found that the technology had a positive impact on various productivity indicators, but it was hard to measure the impact of the technology with precision because of endogeneity issues that studies like these typically tend to have.

While it is difficult to evaluate the overall welfare gains from the use of information and communication technology, what we understand from previous literature is that the technology may help reduce costs in some sectors and increase productivity in some industrial sectors more than in others. While the use of information and communication technologies may result in net gains for consumers and some industrial sectors, there may be some sectors that for several reasons are unable to use the technology effectively for their benefit.

In a literature review about firm-level productivity effects, Pilat (2004) explores the different factors/ complementary resources that need to be considered while studying the impact of ICT on industry level impact. The factors that impact ICT at a firm level help understand why some sectors and some countries perform better with ICT investments. It depends on the level of ICT related skills that already exist and if they don't exist the technology takes longer to have an impact. The impact of ICT also depends on several organizational factors like the amount of training provided, the firm's experience with innovation and its use if advanced business practices and the restricting of the organization that should accompany ICT use for its benefits to be realized. There is also some correlation between the size and age of a firm on how it utilizes ICT to improve productivity. Larger and newer firms tend to use the technology better and hence see greater benefits. This firm level analysis does aggregate to overall impacts on the economy. Gretton et al. (2004) find considerable impacts of ICT while using firm level data in Australia. Hampell et al. (2004), Arvanitis (2004), Baldwin (2004) find that labor productivity increases are correlated with ICT use in German, Dutch, Swiss and Canadian firms. The above studies capture how these technologies have not only been able to cut down some transaction costs and information costs at the firm and industry level, but they have also created new markets and products.

2.2 ICT and its Effect on Trade

One area where information and communication technologies should have significant impact on productivity is trade. Internet and communication technology can affect trade by acting as an economic enabler as well as by integrating the country socially, economically and culturally with the rest of the world. Internet and communication technology can act as economic enabler in two possible manners. Information and communication technology have the ability to reduce transaction costs in trade, further Internet technology has also been rather successful in creating new opportunities that did not exist before. While both trade in goods and services are impacted by the availability of Internet and communication technologies, one must note that trade in goods is impacted largely by the reduction of non-distance related co-ordination and information costs. For example, some products have huge transportation costs that comprise a major chunk of their overall costs, and those costs probably cannot be substantially mitigated by ICT. ICT could improve the logistics involved in the transportation process in order to ensure that perishables and other time sensitive goods are delivered in time, but the actual costs of transportation still continue to exist. Hence some distance related costs are mitigated because of increased co-ordination and reduced transaction costs, but the cost of fuel and the actual transportation process are not impacted by the technology.

Trade in services just like trade in goods benefits from the lower transaction and information costs that Internet technology enables, but there is a bigger impact of information and communication technology on the trade of services because it can mitigate distance effects in some sectors completely and make services more tradable (although legal restrictions also have an impact). Internet technology adoption results in the creation of new opportunities because temporal and location boundaries now cease to exist because of the unique properties of the new technology (Freund and Weinhold 2002). Some studies (Choi 2010) have found that access to the Internet almost doubles the trade in services. The widespread use of the technology has also given rise to a new class of jobs requiring the skills to set up, maintain, upgrade, modify and innovate different uses of the technology itself.

Freund and Weinhold (2000) studied Internet technology specifically and found the following: first, trade benefits from information and communication technology because the risk of sunk costs associated with trade can be largely reduced. This is because the use of information and communication technology results in better information and co-ordination of the trade process. For products that involve relationship-specific investments, informed decision making reduces the risk of these investments as the trading parties involved are better informed about each other's expectations, and the co-ordination process involved in the supply chain is more regulated. They also found that for developing and new markets, Internet technology reduces the effect of historical linkages because better communication enables higher levels of trust and mutual understanding of the environment of business and partnership. They found that countries with the fewest past trade linkages (most likely the poor countries) have the most to gain from the Internet as it gives them the opportunity to build new relationships and develop new industries. If these countries had competitive advantages in particular industries but were unable to enter the market because of historical linkages, the information and communication technology provides them with tools to establish a trade relationship that is characterized by a higher level of information and co-ordination.

Several scholars have investigated further, and have found unique trends in trade when access to internet is increased. Clarke and Wallsten (2010) found that increases in internet access in developing countries increases trade but only exports to other developed countries. The widespread use of Internet technology does create some winners and some losers in the process. Countries that do not use the technology effectively to improve their processes are rendered more vulnerable. Similarly, countries that earlier benefited because of historical linkages may now have to face more competition. Countries that have some competitive disadvantage but could still trade with neighboring countries will now find it harder to find a market for their products. There are several studies that have looked at the effect of ICT in specific countries or regions (Dimelis and Papaioannou 2011, Martinez 2003, Rana 2012, Wong Pellan 2012). There are several studies that have studied the impact of ICT on a variety of outcomes including the effect on trade secrets (Majdali 2000), international conflicts (Mansfield and Pollins 2009), polarization of skills demand (Van Reenan 2012) and impact on culture (Affortunato et al 2013). Some studies in the past have looked at the effect of Internet on specific industries like health care, food and beverage and so on (Fleming 2011, Chung et al 2010, Corso and Gastaldi 2010). Whatever, the scenario it is likely that information and communication technologies have changed some trading patterns.

While there have been studies showing impact of trade on particular countries/regions, particular outcomes and particular industries, this study is the first one to analyze the impact of internet on bilateral trade on a list of industries specified by their institution intensities. In other words, we are particularly interested in the effect of Internet technology on trade to analyze if industries with high relationship-specific needs are impacted in any way. These industries traditionally tend to be very risky and there is a significant amount of trust involved in these trade relationships. It is possible that some of these industries are directly related to the ICT sector and their productivity is directly impacted by ICT investments and use. However, this study attempts to also include other relationship specific manufacturing and agricultural sectors in the sample to analyze if there is also a reduction in contractual transaction and information costs.

2.3 Transaction Costs and the Importance of Institutions

The concept of transaction cost was introduced by Ronald Coase (1937) who discussed why it was not efficient for all exchanges to be organized as markets and how firms played an important role in enabling exchanges and improving transactions. The argument was further elaborated by Williamson (1975, 1985) when he specified why transaction costs exist and what were the risks involved when transaction costs were high. The overall argument was that transaction costs existed because human beings were limited with respect to knowledge, foresight, skill and time. Certain institutional arrangements were required in order to avoid incomplete contracts and enable exchanges that would have been impossible otherwise. He goes on to state that there are essentially two types of risks involved in carrying out any exchange. One is relational risk that arises because of information asymmetries, limited foresight, lack of skills, cognitive abilities and even purely from coordination problems that arise because of communication issues. The next type of risk is environmental risk and does not pertain to the relationship between the two parties but exists because people have very limited knowledge about their environment as well as the environment of the party they are conducting business with. For example, people may not be aware of policy changes made by the government in their own country leave alone the country of the other business party involved.

Institutions are particularly important in industries that require relationship-specific investments and contracts. Several studies have depicted the importance of contract enforcement in these industries (Williamson 1985, Grossman and Hart (1986) and Klien, Crawford and Alchian 1978). The incomplete contracts literature shows that the absence of proper institutional arrangements could potentially lead to a well-known hold-up problem. Since investments in relationship specific contracts involve investments that are specific to the contract, there exist certain inefficiencies because of investment irreversibility. Parties often have to enter into elaborate contracts that prevent hold up problems or at least distribute the losses due to hold up problems by assigning appropriate property rights. Hence institutional arrangements become rather important in such industries and particularly in international trade. Levchenko (2008) states that institutions are a source of comparative advantage in industries that are more relationship-specific. Some countries have better institutions and are therefore able to attract more business in more relationship specific sectors. It is possible that the Internet could play an important role in reducing the importance of these institutional arrangements in more relationship specific or institutionally intensive sectors.

Keeping the basics of transaction cost theory, it is evident that ICT can reduce the burden from traditional institutions in a country that often play a critical role in reducing transaction costs in an international market exchange. Given the nature of ICT there is no doubt that it certainly has properties that reduces information asymmetries, improves coordination efforts, enables the provision of better communication technology at a very low marginal cost and transcends the boundaries of time and location to reduce transaction costs significantly. Both environmental and relational risks are significantly lowered with the use of Internet technology, which therefore should have a positive effect on exchanges that take place across boundaries.

As discussed earlier, there is rich economic literature that has shown that there is a significant gain in productivity from the use of Internet technology. Hubbard (2003) discusses how Internet and other ICT products help increase productivity by improving the matching process between people and products. In today's world where there is so much variety within and across nations. Internet and communication technology brings the most closely matching products to the buyer thereby leading to a productivity gain. The faster and easier search process results in inventory savings as well. The existence of various directories and search engines and communication technologies gives opportunities to the less established exporters to gain information about market conditions.

Hamill and Gregory (1997), Hoffman and Novak (1996), and Athey and Stern (2002) look at how information technology impacts the health care industry in specific. They look at lower transaction costs that have been achieved by the use of Internet technology because of an improvement in the speed of processing information. The speeding up of processes can reduce opportunity costs of both time and material by reducing market uncertainties. They find that in the medical industry prevention of lagged information produced economic gains that covered 85% of their costs. Paul David (1990) refers to the same thing in terms of 'amenities' provided by technology. In his paper, he goes on to look at the problem of productivity paradox that might arise because of the use of a new technology. This is particularly relevant to our study as we do not know whether Internet technology actually leads to productivity gains in trade in all sectors equally, or if only some sectors that are inherently capable of restructuring their businesses to use the technology most efficiently benefit. In this respect Chun et al. (2005) uses Schumpeter's creative destruction approach to explain how newer competitive firms use Internet and other information technologies to make more established firms obsolete. Even a non-exporting firm can enter the market in some industries if it is able to use the Internet and create a website to reach out to buyers in different parts of the world thereby creating a competitive advantage itself (Samiee 1998). It is also possible that some industries might end up exporting lesser because ICT improves search within a country and an exporting firm might end up supply more domestically and a non-exporting firm might find more business in its own country.

From the above literature it is clear that Internet and communication technologies may be useful in reducing transaction costs provided, some other basic economic and technological factors are taken care off. This is true particularly in the case of services where Internet technology not only lowers transaction costs but also creates new opportunities by transcending temporal and location boundaries (Freund and Weinhold 2002). In order for Internet and communication technologies to have a positive impact on trade, it is essential that the competitive advantage that ICT technology gives to some countries is larger than the competitive disadvantage that some trading nations(either because their ICT usage is low or because of increased competition) may now face (Samiee 1998). Secondly, even though the Internet and communication technologies might enable easier transactions, trade is possible only if a country decides to open its legal and regulatory framework to allow for these kinds of exchanges. Thirdly, technological misuse like intellectual property violation or lack or privacy or security could further cause impediments to trade and leading to higher transaction costs. Fourthly, it is important to keep in mind that the proper adoption and use of the technology is possible only if some basic socio-economic factors are taken into consideration and this may play an important role in which countries benefit by the use of the technology in trade (Benjamin and Wiegand, 1995; Hoffman and Novak, 1996; Quelch and Klein, 1996).

Under the right set of conditions, information and communication technologies can benefit both exporters and importers by lowering their firm level co-ordination costs, reducing risks involved in international trade by enabling better information flows, by helping some industries be more productive because of overall lower costs and by reducing cultural distance between countries. It is also possible that some industries that are not capable of restructuring in order to use the technology more effectively, may not see any changes. Additionally some industries with higher transportation costs might just end up finding suppliers domestically thereby reducing demand for exports.

2.4 Research Questions and Contributions of this Study

In this study, an attempt is made to use organizational communication literature as well as transaction cost theory to understand the mechanism by which information and communication technology (particularly the Internet) can benefit trade in some industrial sectors more than others. This study looks at how certain kinds of information and transaction cost in different industry sectors are reduced with the use of certain information and communication technologies, whereas certain other kinds of costs are not affected by information and communication technologies. A de-compositional framework is used that examines how affordances like audibility, visibility, co-presence, mobility, co-temporality, co-presence, reviewability and revisability affect the important collaborative tasks of initiating conversation, establishing common ground, and maintaining awareness of potentially relevant changes in the collaborative trade environment. These affordances are beneficial in varying degrees to different industrial sectors. A conceptual framework is developed to understand the contribution of the Internet in different industrial sectors that are largely classified by the degree relationship specific investments involved. While the reasons for the impact of Internet on trade in different sectors maybe difficult to test empirically, the conceptual framework will provide us with some understanding of the varying trends in different industries.

The main research question explored in this dissertation is how information and communication technologies have impacted international trade flows in sectors that have varying levels of relationship-specific investments. Do arguments of increased productivity due to ICT also hold for international trade in some sectors? Different industries have inherent characteristics that have varying levels of benefits from using the different of information and communication technologies. Industries can be classified by the nature of investments made in them. One particular kind of investment that involves high levels of transaction costs are relationship specific investments. Industries with higher levels of such investments require better institutional arrangements to avoid hold up problems (Levchenko 2008). Does the Internet or broadband technology provide some sort of alternative arrangements that reduce transaction and information costs? A detailed study of the different industries between 2002 and 2010 can shed light on which industries have benefited the most by the use of broadband technologies and hence what the policy implications for different trading nations are.

3. CONCEPTUAL FRAMEWORK

Information and communication technologies influence trade through their impact on multiple levels of economic activity. These technologies have an effect on productivity on a more aggregate industry and national level through their impact on the productivity at an individual firm level. Furthermore, information and communication technologies have an impact on trade because of its overall impact on transaction costs involved in trade. The following subsections are set up in the following manner. In the first subsection, technical affordances of the technology are discussed. Identifying these affordances is crucial in understanding how the technology impacts trade costs (transaction and production), and this impact on trade costs is discussed in the next subsection. The following subsection then goes into a discussion of institutional arrangements and how technology impacts trade in different industries through its impact on these institutional arrangements. In the final subsection, the overall framework is developed by understanding the relationship between the technological affordances that broadband provides and the factors that drive bilateral trade in different industries. Controlling for the other factors that play a major role in bilateral trade, a conceptual framework is developed to predict the relationship between broadband technology and trade in specific industrial sectors characterized by their relationship specific investments.

3.1 Affordances of Internet (Broadband Technology)

The Internet and in particular broadband technology has different technological affordances that can help mitigate costs involved in bilateral trade in different ways. Based on a study by (Clark and Brennan 1991 and Kraut el al 2002) the technological affordances of information and communication technologies are described in Table 1.

The first one is 'audibility' where the participants can hear people and the sounds of an environment. This enables quicker co-ordination as it allows for a simultaneous conversation to take place, doubts and questions can be immediately addressed and there is a slightly higher awareness about the general environmental and relational risks involved. The next affordance that is discussed is 'visibility', and this allows participants to view people and objects in the environment. The Internet is the only information and communications technology with this affordance as it enables one to see pictures, or chat live via video chatting services online and review documents and emails. Thirdly, Internet technology enables interacting entities to experience 'co-presence', and this essentially allows participants to be mutually aware that they share an environment. This affordance is slightly more difficult to comprehend in the context of trade, but can be interpreted as the ability of both trading partners to understand the physical environment in which they are carrying out the activity. Broadband Internet is able to offer this affordance at the highest level by enabling tracking of a product, performing quality check and so on by allowing for frequent conversations, exchange of documents and instantaneous updates on the status a delivery or production. The fourth affordance is 'mobility', which is a feature that enables participants to move around while sharing an environment (or exchanging information about it). Broadband Internet is becoming relatively more mobile these days with the availability of wireless service everywhere, and the ability of participants to access information from any computer that is connected to network service provider.

‘Co-temporality’ is an affordance that enables participants to be present simultaneously. This affordance is offered by broadband Internet to some degree, but requires individuals to use applications online that are specifically designed for this purpose. ‘Reviewability’ is an affordance that ensures that messages do not fade over time and can be reviewed at any time. Internet allows for this affordance at the highest level as documents can be exchanged between the two trading parties in short amounts of time. The final affordance that we are interested in is ‘revisability’, which essentially allows for messages to be revised or checked before being sent. Broadband Internet allows for revisability depending on the Internet application used, because the nature of most voice/video services requires conversations to be instantaneous, hence making ‘revisability’ more difficult while using those mediums of communication that instantaneously transfer voice and video messages. However, there exist several video and voice applications that only host visual and verbal messages that are pre-recorded and such applications do allow for ‘revisability’.

Besides having these technological affordances it should be noted that broadband technology has changed over the past decade contributing to a large extent on the effect that they have on international trade. According to Clemons et al. (1993), the ways in which ICT usually change over time is the following:

a. Decreasing cost of the technology: In the past decade markets have witnessed significant drop in the cost of broadband access. The falling cost of the service will result in these technologies having a bigger influence on trade over time.

b. Improved quality of the technology: The quality of broadband technology has changed over time thereby changing their technical affordances. While analyzing data over time it is important to keep in mind the additional and improved affordances offered by these technologies. For example, the mobile phone migrated from 2G to 3G and now to 4G and mobile Internet is widely used all over the world; information technology has seen increased processing capacity, better speeds of computer hardware, higher bandwidths, Internet speeds and larger number of applications being developed for the web. These changes need to be considered while understanding the influence of Internet technology over time.

c. Better connectivity and standardization: Open systems, standardized hardware etc. enable better coordination and dissemination of information. These changes have occurred because of technological improvements as well as policy changes. These changes are very important in enabling the use of broadband technology efficiently across countries and hence have had an impact on how they influenced international trade.

d. Growing number of applications: Not only has broadband infrastructure access and service improved over the last decade, but the number of applications that are developed and hosted over the network has exponentially grown. The growth of these applications have created added value for the network itself, and has given rise to huge network benefits (e.g. more peer to peer collaborations, use in government transactions) that impact economic activities all around the world.

In the following subsections we will discuss how these technological affordances impact trade by impacting transaction costs involved in trade and overall aggregate productivity at the industry level.

3.2 ICT and its Impact on Trade Costs

It is important that before we begin our discussion on ICT and its impact on international trade, we briefly discuss highlights of existing theories of international trade. The existing trade theories can be divided into two main groups. The first group assumes perfect competition and suggests that external economies of scale are the biggest driver of international trade. This group of trade theories generally makes an assumption that goods and services produced by a country is dependent on factors that are very country/region specific. Trade theories that fall into this group are Adam Smith's model of absolute advantage (Adam Smith 1776), the Ricardian model of comparative advantage, and finally the Heckscher-Ohlin model that states that international trade is determined differences in factor endowments. The second group consists of scholars that looked into the concept of imperfect competition and internal economies of scale. This was largely known as the new trade theory and demonstrated that countries trade with each other even when there is no perfect competition or specialization. This is because consumers like choice and consider varieties of the same product substitutable. Krugman (1980) and Helpman and Krugman (1985) found that firms produce a variety of goods with increasing returns to scale technology. This phenomenon was particularly helpful in explaining why two similar developed countries enter into trade. ICT in particular impacts both internal and external economies of scale by reducing production and transaction costs. In this study we use the gravity model derived from the Cobb Douglas expenditure system (derived from the production function) that is successful in empirically explaining trade patterns under both perfect specialization and imperfect specialization assumptions. Irrespective of whether we assume perfect competition or not, the use of the gravity equation helps empirically explain the trends in trade caused by ICT.

There are different ways in which ICTs affect economic activities. ICT is capable of reducing costs in production and transaction related activities, and this influence of ICT has been studied widely. Clemon et al. (1993) argue that information and communication technology because of its ability to lower coordination costs, reduces the need for more hierarchical organizational systems and one can observe that this gives rise to over-all higher economies of scale and better long term relationships between internal agents of the firm as well as external ones. The authors also find that most studies do not account for increase in quality and variety while studying productivity. Both increased quality and variety are very important to firms that want to enter the export market. They also find that for ICT to result in firm productivity, some amount of internal restructuring maybe required for a firm to fully realize all the benefits.

In this section, we will discuss the impact of ICT on the transaction costs involved in an activity like international trade, as well as impact of the technology on the overall productivity of industries. Transaction costs were first discussed by Ronald Coase, and are essentially the cost of coordinating a market exchange in the presence of imperfect information. Two important aspects of transaction costs are therefore the cost of coordinating the activity and the cost of gathering information or making decisions in the presence of limited information.

3.2.1 Effect on Transaction Costs

Bilateral trade benefits from information and communication technology because of its effects on overall transaction costs that include risks involved in the production and distribution process. Since information asymmetry is a root cause of risk that an agent has to deal with during its decision making process, this study will refer to the costs involved with better understanding and mitigating these risks as information costs. The cost of coordinating the market activity will be referred to as the coordination cost. In order to understand how these different information and communication technologies help reduce co-ordination/transaction and information costs in trade, we must understand these kinds of costs in more detail. For any agent involved in bilateral trade the overall reduction in transaction cost is the following:

1. Coordination costs: This category includes all costs that are involved in the process of carrying out the trade of the good or service between the buyer and seller or within the supplying firm. This could include logistical co-ordination costs, transportation costs and other possible costs involved in the process of trading a particular good or service. Co-ordination costs within a firm can also be lowered by ICT because use of these technologies lead to restructuring and work place re-organization that may help the firm focus on its area of core competency, increase specialization and reduce learning costs involved in the production process (Clemons et al. 1993, Bresnahan and Brynjolfsson 2002)

According to a detailed study by Malone and Crowston (1991), co-ordination activities can be categorized into different co-ordination processes. The four broad categories of co-ordination processes are managing shared resources, managing producer and consumer relationships, managing simultaneity constraints and managing task/subtask relationship. Managing shared resources and tasks/subtask relationships are important activities for exporting firms because they are involved in a production process that possibly uses shared resources and certainly has a certain distribution of tasks that need to be coordinated. However, these two co-ordination processes exist only for the exporting firm and are not very important in the actual market exchange involved in international trade. In the trade of goods and services, it is always the case that one partner produces a product or delivers a service without the involvement of the trading partner in the process of production. For the purpose of international trade, the two co-ordination activities that are important are managing consumer/producer relationships (in this case it is the relationship between the two trading partners) and managing simultaneity constraints, which essentially include the co-ordination of the logistics of scheduling, payment processes, transporting and so on. Malone and Crowston (1991) find that information and communication technology can reduce these co-ordination costs in the following ways

1. First-order effect of reducing coordination costs with ICT: substitution of the technology for some human coordination. For instance, many banks and insurance companies have substituted automated systems for large numbers of human clerks in their back offices.
2. Second-order effect of reducing coordination costs with ICT: Increase of the overall amount of co-ordination with the use of the technology.
3. Third-order effect of reducing coordination cost with ICT: Coordination intensive structures are set up or changed by the technology

2. Information Costs: The next category of cost that is involved in the process of carrying out the production or distribution (in this case the actual trade of a good or service) is information cost. This kind of cost arises out of information asymmetries that exist when working with someone based in a different country. These costs could be search costs or costs of finding a suitable trading partner, risks that producers may have from any asset specificity in that particular

industry (e.g. if a producer invests in specific machineries because they perceive a demand for the good, but they also face risks of having large sunk costs if for some reason their product goes out of demand), costs involved in finding information about the product price and quality as well as the cost of finding if there are any environmental risks involved in trading with a partner in a particular country or region. Based on the kind of industry the trade is taking place in, there are varying levels of these information costs. For example, some industries trade in products that are very country-specific and this entails added information costs about the demand of the product in the importing country. If sufficient information is not gathered about potential demand the exporting country could end up making investments on a product that cannot be exported in another market if demand falls short. Similarly, products in industries with specific environmental and health standards also require higher amount of information gathering.

Some industries find it beneficial to start the process of transaction and then gather all the information that they need. This is called the transaction to information model and often takes place when the transaction costs are low. The other model is the information to transaction model and this takes place in industries where the transaction costs are significantly high, so it is beneficial to first gather information about who is the most suitable trading partner, the costs involved and the risks involved if the agreement is to be entered into. Several of these costs are reduced by the use of information and communication technologies (Levchenko 2008).

Information costs are related to two categories of information asymmetry issues, namely uncertainty and equivocality (Daft, Lengel and Trevino 1987). According to these authors, uncertainty is the difference in the amount of information that is required to perform a task in the most efficient manner and the amount of information that is actually available. If the amount of information available about the task, environment and partners is low, then this creates a cost for the parties involved in the transaction. Equivocality on the other hand means ambiguity of messages and this is often present when two parties present in different locations carry out a transaction. Equivocality in trade can be mitigated to a large extent by the use of appropriate information and communication technologies that have the following features of (1) providing feedback, (2) providing multiple cues in the form of voice messages, visual gestures, documents and so on (3) language variety which includes languages, pictures or numbers in conveying a message and (4) providing personal focus which enables messages to be tailored to the frame of reference, needs and current situation of the receiver.

Transaction costs as described by Williamson (1979), arise from human cognitive limitations to receive, transmit and process information about the business transaction. Williamson discusses different kinds of governance structures and how they relate to transaction costs. As described earlier, this dissertation focuses on the market driven activity of trade and some inter firm transactions involved in the production process. Based on Williamson (1979, 1985), contracts are the most suitable governance structure to mitigate transaction costs in this kind of a market driven environment. This dissertation focuses on how Internet technology helps reshape the importance of this institution in particular. The affordances discussed earlier impact the different kinds of transaction costs and productivity costs to reshape the traditional institution of contracting.

In this section, we have discussed the different kinds of transaction costs involved in international trade. In the next section we will briefly discuss the impact on aggregate productivity before going on to a discussion of how affordances of ICT impact overall trade costs.

3.2.2 ICT and its impact on aggregate productivity

On an aggregate industry level, this means that broadband technology will increase overall firm productivity. It may even encourage certain new entrants to enter the market because of lower costs of coordination and information. Meltiz (2002), makes an argument for trade by saying that trade encourages the most productive firms to enter the market with the lesser productive firms producing for a domestic market. This may in the long run force less productive firms to leave the market and hence additional intra-industry reallocation of firms may take place towards more productive firms. If this argument is extended, it is possible to say that information technology further increases firm level productivity (through their impact on production, coordination and information costs as discussed earlier) and thereby results in reallocation of firms in the market to include firms that are more productive because of the use these information and communication technologies. This may have an impact at a country level because different countries have had varying degrees of success in adopting these technologies and this may affect the overall productivity of some of their industries.

There may also be varying influence on different kinds of industries based on inherent industry characteristics. This may result in compositional change in bilateral trade over time, meaning that the very nature of some industries may have changed over time because of changing technology, globalization, environmental standards or other reasons that have caused industries to change significantly over time. An example of an industry that has significantly changed in nature over time is the entertainment industry. ICT has given rise to different production models for TV shows over several mediums (TV and Internet). The above discussion of aggregate productivity of an industry should be studied for different industries differently. Based on inherent industry characteristics, different industries and firms with in them can use information and communication technologies with varying levels of success. Some industry characteristics that are important in this respect are the following (Levchenko 2008, Freund and Weinhold 2000, 2002, 2004).

1. Does the product involve relationship specific investment?
2. Is the product a durable or non-durable good?
3. Is there a significant transportation cost involved? Can this transportation cost be mitigated by information and communication technology and to what extent?
4. Has the nature of the product itself changed over time because of the influence on ICT?

These characteristics of the industry influence the degree to which information and communication technology can be successfully used to increase productivity. Different countries because of differences in factor proportions (theory of comparative advantage) or increasing returns to scale (new trade theory), choose to invest more in certain industries and this in turn affects the degree with which they can use the technology successfully. It is possible that better adoption of information and communication technologies at a national level benefits only those countries that primarily invest in certain industrial sector like services. For example, service oriented countries with a lower adoption of these technologies may face a setback, but countries that export natural resources may not be affected by the adoption of information and communication technologies to the same extent.

Increased productivity leveraged by the use of information and communication technology has an overall impact on trade because it brings down costs for the exporting country making the product cheaper. There are other theories about what impacts industry productivity in a country and what makes a country more favorable in trade. The most common theory being countries with a relative comparative advantages (or relative factor differences) in certain industries are more likely to enter into trade exchanges. However, new trade theory attributes the phenomenon of trade between countries with similar skill sets without relative factor differences between them to specialization over time in certain industries due to various reasons like learning over time and so on. Irrespective of the underlying framework driving trade between the two, ICT can supplement productivity and reduce transaction costs in both scenarios. Countries that are slower to adopt and utilize the technology may be significantly impacted in a competitive global environment. ICT may potentially also create new digital products in certain industries as a direct consequence of its use in the country. It may also make some products obsolete because of the availability of new digital counterparts. Hence, ICT impacts trade between two countries because of its role in reducing transaction costs and increasing productivity. ICT may also significantly change the industry itself and might have a direct impact on the industry over time. An example of an industry that has been created by the use of ICT is the digital books industry, causing reduced demand for the traditional paper book industry.

3.3 Impact of ICT on Trade through its Impact on Institutional Arrangements

The importance of institutions has been widely discussed in trade literature. Change in institutional arrangements is often cited as one of the most important variables influencing trade flows (Baier and Bergstrand 2001). Institutions can be described as a set of rules or explicit arrangements that authorize or prescribe certain business codes of conduct (Levchenko 2007 and Nunn 2007). They find that institutions play two major roles in trade. Institutions generate rents for some parties within the economy and are also a source of comparative advantage. Institutions according to Williamson (1985) also overcome the hold-up problem that could arise in any market exchange between two parties. Institutions are of high importance in those industrial sectors where transaction costs are high or there exist certain relationship specific investments. Transaction costs have been defined in the previous section as co-ordination and information costs involved in the trading process.

Relationship specific investment is one where the production investment is unique to the relationship between the two trading parties. These kinds of investments are riskier and could result in the well-known hold up problem if it is not backed up by strong institutional arrangements (Levchenko 2008). Countries with weaker institutions could have rather incomplete contracts making international trade more risky (Caballero and Hammour 1998). Institutions could therefore end up giving certain countries a comparative advantage in certain trading sectors (Levchenko 2008). Some traditional institutions used by countries as a source of comparative advantage is better judicial quality and predictability and the enforcement of contracts in countries. As discussed earlier, broadband Internet technology has certain affordances that could reduce transactions and information costs involved in trade. By that logic the use of broadband technology should give countries trading in institutionally intense sectors the similar benefits that institutional arrangements provide (E.g. better monitoring, reduced search costs). Countries that already have good institutions are further strengthened by the use of ICT, and countries that do not have good institutions now benefit from the use of broadband as it reduces certain transaction costs and uncertainties involved. As described earlier the use of ICT improves communication, allows for better and faster coordination and reduces information costs.

It is possible that with the use of broadband a country that has weak institutions but significant factor differences now becomes more favorable as a trading partner. In this study, institutional intensity is sourced from Nunn (2007). Institutional intensity is the quality of a certain industry to be more dependent on institutions because of higher transaction costs involved. The higher the institutional intensity of an industry the higher the risk faced by the producing country if for some reason the exchange does not go through. The risk is higher if an industry's inputs are tailored to very specific needs thereby making it more risky for both parties if trade is not successful. In Nunn (2007), it is defined as the fraction of each industry's inputs not sold on organized exchanges or reference priced, and is constructed based on US Input-Output Tables. Inputs that cannot be bought this way require relationship-specific investments and thus rely on good contracting institutions being in place leading to higher institutional intensity. Broadband technology can to some degree be a substitute to institutional arrangements in a particular country, though this might be empirically very difficult to show. While it improves coordination and reduces information asymmetry, it may be difficult to quantify the costs saved. In this study, we explore the possibility that broadband might have a higher impact on sectors that have high institutional intensity provided all other factors like transport costs and durability are similar.

3.4 Impact of Internet technology: Overall conceptual framework

In this section, we will analyze the relationship between the affordances of broadband technology and their effect on international trade in different industrial sectors. Based on the affordances of broadband technology and the two kinds of costs involved in trade, the following table summarizes the effect of broadband on the costs of coordination and information.

With these affordances of broadband technology taken into consideration, it can be inferred that broadband technology will have an impact on bilateral trade (in this case with the US). The use of the technology provides some sort of comparative advantage in a particular industrial sector by impacting coordination costs, information costs and improving productivity. As discussed in the previous subsections, one possible way of being a source of comparative advantage (Levchenko 2008), is by reducing transaction costs particularly in industries that are highly institutionally intensive. Institutionally intensive industries are often ones with higher information and coordination costs and therefore may benefit the most by use of ICT provided other factors remain constant (like changing nature of the industry, large transportation costs).

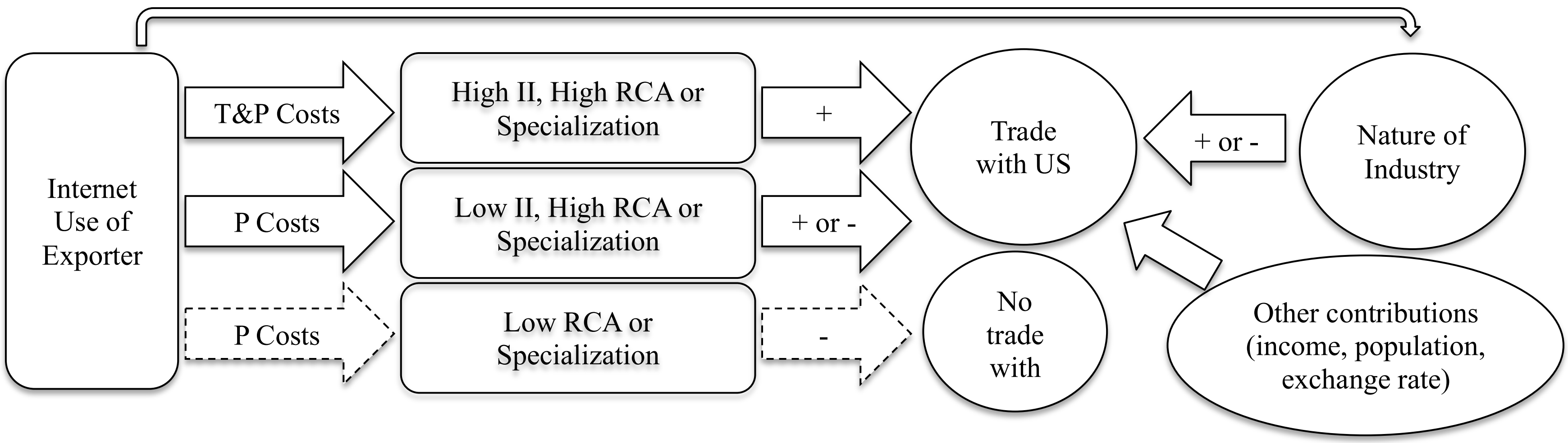
The second way in which broadband technology can impact bilateral trade with the US is if it helps the overall productivity of a particular sector. There are some sectors that do not require relationship specific investments but still benefit from ICT because the technology can make business processes more efficient (better management and logistic processes, better record keeping, better market information and so on). These industries trade with countries because of specialization or just differences in factor proportions. These industries benefit from broadband technology simply because of increased factor productivity and lower co-ordination costs that ICT may introduce.

Table 1: Affordances of broadband and effect on co-ordination and information costs

Technology	Features/ affordances	Effect on Coordination Costs	Effect on Information Costs	Effect on Productivity
Internet	Audibility, Visibility, Co-presence, Co-temporality, Reviewability and Revisability	1. Managing shared resources (2nd and 3rd order effect in reducing costs) 2.Managing task/subtasks (2nd and 3rd order effect in reducing costs) 3.Managing Producer / Consumer Relationships • Improves logistics (1st, 2nd and 3rd order effect in reducing costs) 4.Managing Simultaneity Constraints • Improves logistics (1st, 2nd and 3rd order effect in reducing costs) • Progressive arrangements(1st, 2nd and 3rd order effect in reducing costs)	1.Uncertainty (information costs, monitoring costs and vulnerability costs) • High effect on reducing costs 2. Equivocality (subjective messages) • High effect on costs by reducing the risk from equivocality enabled by technology features such as i. Feedback ii. Multiple cues iii. Language iv. Personal	1.Relationship specific Investment sector • High Effect in reducing costs 2. Managing shared resources (2nd and 3rd order effect in reducing costs) 3.Managing task/subtasks (2nd and 3rd order effect in reducing costs) 4.Managing Producer / Consumer Relationships • Improves logistics (1st, 2nd and 3rd order effect in reducing costs) 5.Managing Simultaneity Constraints • Improves logistics (1st, 2nd and 3rd order effect in reducing costs) • Progressive arrangements (1st, 2nd and 3rd order effect in reducing costs) 6.Change in nature of industry (1st order effect that may significantly impact the industry)

Finally broadband can also be instrumental in changing the nature of a particular sector (first order effect). This means that broadband technology has substituted technology for some human coordination or has changed the nature of a physical good or process of producing it. Broadband could have also increased demand of a product because of globalization and for some industries the technology may serve as a marketing tool (either directly or indirectly). The last decade has witnessed the nature of certain industries such as the entertainment industry, food and beverage industry and so on because of global information sharing that broadband technology has enabled. To summarize: broadband technology firstly reduces transaction costs in institutionally intensive sectors; secondly it also improves trading opportunities for countries that could trade with the US because of inherent differences in factor proportions by improving productivity; and finally broadband impacts trade by changing the very nature of certain industries (For example: music, books and entertainment), or could make information available more globally and increases the demand of certain products (for example: the demand for specialty food and beverage could increase because the world is more connected because of the technology).

Figure 1: Impact of Broadband on bilateral trade at an industry level



The above conceptual framework highlights the effect of Internet on bilateral trade with the US. Use of broadband technology could reduce both transaction costs and production costs in sectors that have higher institutional intensity (High II), Ricardian comparative advantage (where countries have factor differences causing the production of a certain good to be more efficient in the country with the relative comparative advantage thereby leading to trade between the two countries) and highly specialized trade sectors because these industries do have additional production costs because of relationship specificity that can be reduced by the use of the technology. In cases where the industry is a low institutional intensive industry, broadband technology can be still used by technologically superior countries to reduce co-ordination costs or improve search. In cases where there is no Ricardian comparative advantage (RCA) or lack of specialization, trade does not take place even with the availability of better Internet technology. The importer country (US) also can reduce its transaction costs in general by the use of this technology as it provides them with better co-ordination tools and higher information. It helps them improve their search process and identify countries with factor differences or specializations so that they can mutually benefit from international trade.

Based on the above framework of reduction in costs, we infer that highly institutionally intensive industries should benefit more from the use of broadband technology. Industries with low institutional intensities also benefit from the use of the technology in bilateral trade if there are factor differences or specialization that makes trade between the two countries beneficial. Finally, broadband could have an overall impact on the industries by changing the very nature of the industry. This can happen because of multiple reasons. Firstly, broadband could give rise to a new generation of products because technology can often replace some traditional goods and services. Second, broadband is playing a big role in making the world more globalized. People all over the world now have access to a huge range of information and this has changed people's tastes and preferences for certain goods and services.

In this study, we make an assessment of how Internet affects individual industries by studying how broadband has impacted trade with the largest importer in the world, the US. It may be difficult to tease out the exact nature of the impact, but the underlying framework will provide us with information about potential pathways causing these changes. Using the three-digit ISIC (International Standard Industrial Classification) Codes, we consider 25 different industries for our study. Since this study focusses on relationship-specific investments, the 25 industries were chosen such that it was easy to obtain their institutional intensities from Nunn (2007). This is discusses in more detail in the empirical evidence section.

3.5 Hypotheses to be Tested

Based on the different possible effects of Internet use on trade costs, the following two hypotheses are proposed.

H1: Internet use has a positive impact on sectors that have high institutional intensity.

As discussed earlier, there is literature that suggests that institutional arrangements themselves have become a source of comparative advantage along with being able to generate rents for some agents in the industry (Levchenko 2008). As discussed earlier, relationship specific investments require better co-ordination and the minimization of information costs. Since these products are not sold in the organized market or reference priced, connections between the two trading parties are made through search processes that are largely driven by pre-existing ties and networks (Fink et al. 2002). Since these sectors are associated with a well-known risk known as the 'hold up cost' it was common practice to trade with countries that were known to have better institutional arrangements. The growing popularity of Internet technology especially in business largely changes this trend because the affordances of the technology can now make it possible to monitor logistics and co-ordinate more effectively to minimize risk. The presence of multiple verbal and visual cues also makes it easier to minimize risk because of better information transfer between the concerned parties. Therefore the use of Internet technology can to some degree substitute for institutional arrangements in countries where superior technology for production exists but institutional arrangements are poorer.

H2: Internet use in sectors with low institutional intensity has a smaller positive impact (compared to high II sectors).

This hypothesis is driven by two primary factors; a) factor differences or specialization that a country may possess; and b) the low institutional requirement of that particular industrial sector.

The first factor could be positively impacted by the use of broadband technology. This is because use of ICT may lead to higher overall productivity in the sector (E.g. better coordination and management, better access to information). The second factor might cause a negative impact as far as bilateral trade flows with the US is concerned (though the use of broadband might have an overall positive effect for the exporting country). This is because trade exchanges in this industry are less relationship specific and are less contractual in nature. In a lot of cases, these industries have products that are sold in the commodities market, and already have instruments in place to mitigate any transaction costs that may exist in the process of trading these products. The use of ICT may actually increase market competition and the exporting country may seek better suppliers (ones with higher demand and willingness to pay) because ICT use makes search costs lower.

Let us discuss the first factor driving this hypothesis. If trade is beneficial because of existing difference in factor proportions, broadband technology can drive production costs down. Trade is often driven by factor proportion differences or by the specialization of a production process in a country over time. A country will export a product/service in sectors in which it has a cost advantage as far as factor proportions or are concerned, and will import products in sectors where the primary production factor costs are domestically very high. Since it makes sense that the difference in factor proportions will lead to trade, one must also note that countries can be rather competitive in their exports prices, and countries around the world benefit by taking measures to not only increase factor productivity, but also by improving logistics of supply. As discussed earlier, one such measure is to use Internet technology to improve factor productivity. As discussed before there are several affordances that the Internet has that make co-ordination within internal units involved in the production process easier. There is also literature that supports the link between the use of ICT and improved factor productivity (Stiroh 1999, 2001 and 2002). In cases where trade happens because of specialization or increasing returns to scale, the use of broadband technology has a similar impact by increasing productivity. Hence, any exporting country benefits by the use of broadband technology as it increases productivity and reduces some transaction costs.

Let us now discuss the second factor of low institutional intensity and examine how broadband technology may potentially impact bilateral trade is such industries. Low institutional intensity essentially means that countries have rather low transaction costs and products are not relationship specific. Of course, the degree of relationship specificity in every industry is different, but industries with a low institutional intensity have fewer transaction costs incurred because the product is rather generic in nature and can easily be resold in another country if trade with a particular partner does not successfully work out. Since the exporter's product is easily sold in another country, the use of broadband technology gives the exporting country the flexibility and the information tools to carry out trade with another country that has a demand for that product. This means that the use of broadband technology by a country has opened the country up to other potential trade partners, thereby leading to a potential negative impact on bilateral trade with the US. If the exporting country has high supplies and is capable of handling multiple trading partners then it is possible that bilateral trade with the US is not negatively impacted. The extent to which this factor drives down bilateral trade between the two countries depends on several factors like the overall demand of the product globally, the exchange rates between countries, the nature of the product (durable or not) and so on. An industry that is in high demand like Oil & Gas is likely to use the technology to find other trading partners if the terms of trade with the US are not favorable. The use of broadband gives them more information about the options available to them.

Finally, besides these two fundamental hypotheses, it must be noted that the use of broadband technology may have pervasive impacts on some industries by changing the very nature of the product itself, or by changing tastes and preferences in a country. This study will be unable to empirically tease out the reason for these changes, but it will be able to capture an anomaly in results for industries that have been significantly impacted. It is not difficult to then attribute a cause for the anomaly by observing the general trends in those industries.

4. METHODOLOGY

Existing literature has provided empirical evidence of the positive relationship of the Internet on international trade. This study explores if the Internet matters more in industries that are institutionally intensive. In other words, this study explores if the Internet plays a positive role in bilateral trade in sectors that are more institutionally intensive as opposed to sectors that are less institutionally intensive. As described earlier, institutions can be described as a set of rules or explicit arrangements that authorizes or prescribes certain business codes of conduct. Some industries have historically required the presence of institutions for trade, where as some other industries have a smaller need for institutional arrangements. As discussed earlier, there are various factors like relationship specificity and other transaction costs that impact the need for institutions.

In order to study the effect of technology on bilateral trade, the gravity equation is employed. The gravity equation has been used for such studies by numerous scholars like Freund and Weinhold (2000, 2002, 2004, 2008), Deardorff (1995), McCallum (1995), Frankel, Stein and Wei (1995), Helliwell (1996), and Wei (1996). Anderson (1979) used the Cobb Douglas expenditure system to develop the gravity equation. This equation was originally designed to describe bilateral trade patterns based on the distances between countries as well as their relative economic condition. The standard equation was as follows;

$$(1)\ \mathrm{Trade}_{i,j} = \alpha \frac{\mathrm{Gdp}_i \mathrm{Gdp}_j}{\mathrm{Distance}_{ij}}$$

The basis of the gravity model is that the volume trade between two countries is directly proportional to the size of the economy of each country and is inversely proportional to all the factors that contribute to the cost of trade. The gravity model of trade was used in several empirical studies with considerable success, but there were several scholars that questioned the theoretical justification of the model. The gravity equation is theoretically derived from the Cobb Douglas expenditure system Anderson (1979), and the model has been successful at explaining variation in bilateral trade under both constant returns to scale and increasing returns to scale. Several trade theories like the Ricardian, Heckscher-Ohlin (H-O), and increasing returns to scale (IRS) models (Helpman and Krugman 1985, Deardoff 1998 and Helpman 1998) can be used to derive the gravity equation. However, the biggest criticism of the gravity equation is that it assumes perfect specialization. In response to this critique, several scholars including Evenett and Keller (2001), evaluate the gravity equation with imperfect specialization, and find that when the model is based on increasing returns to scale, the gravity equation is successful in accounting for trade variations across country pairs even when there is no difference in factor proportions (large differences in factor proportions led to perfect specialization in constant returns to scale world). Further, Hummels and Levinshon (1995) and Helpman (1987) in separate studies find that the gravity prediction is an empirical success for developed countries if the model is based on an increasing returns scale. Moreover the gravity equation works for developing countries too because specialization in these countries is driven by factor proportion differences.

For the purpose of this dissertation, the gravity equation will be modified to evaluate the effect of various other variables, which are originally unaccounted for in the basic gravity equation. This can be simply done by using a first order log-linearization of equation (1) and is a common practice in studies using the gravity equation. Using this log transformation, the results are interpreted as percent changes. In other words, the coefficients allow to assess the percent effect of a one percent change in the independent variable on the dependent variable. In this case, trade is imports from country i to j in the time period t. Now if we represent trade by total bilateral trade exports between the two countries i,j as $imports_{ij}$ and then taking log on both sides of the gravity equation we get the following;

$$(2)\ logimports_{ijt} = \beta_1 + \beta_2\ loggdp_{it} + \beta_3\ loggdp_{jt} + \beta_4\ logdist_{ij} + \varepsilon_{ijt}$$

As commonly done in literature, we add cross-country specific effects. Since we are also interested in the effect of ICT we add the variable "hosts" which captures the number of secure servers in the respective countries. Internet hosts of both countries give us a measure of the extent businesses in the two countries use the Internet. The country effects are captured in the variables β_2 to β_9. This is represented in equation (3).

$$(3)$$

$$logimports_{ijt} =$$

$$\beta_1 + \beta_2\ loggdp_{it} + \beta_3\ loggdp_{jt} + \beta_4\ logpop_{it} + \beta_5\ logpop_{jt} + \beta_6\ logexrate_{ijt} + \beta_7\ logdist_{ij}$$

$$+ \beta_8\ loghosts_{it} + \beta_9\ loghosts_{jt} + \varepsilon_{ijt}$$

In the above equation, the economic sizes of the two trading countries are accounted along with the distance between the two countries. The income of the exporting country gdp_i and the population pop_i are included to account for supply (larger economies are usually capable of producing more). The income of the importing country gdp_j and the population pop_j are included to account for demand. Both income and population data is collected from the World Bank's 'world development indicators' (WDI) database. Exchange rate data is also collected from the world developmental indicators database as it affects both supply and demand between the two countries. The other gravity equation variable $dist_{i,j}$ is the average trading distance between the two trading countries and this is defined as the distance in kilometers between capital cities. This data is standard in the trade literature and is obtained from the IMF Direction of Trade Statistics.

Finally data on the Internet availability is collected from the World Development Indicators database. Two variables fixed broadband subscribers and number of secure servers (hosts) are two possible choices for studying the effect of Internet on trade. The use of secure hosts has some limitations (organization of the ISP and hosting market has an influence on the number of secure servers in a county) secure servers (hosts) still capture the use of Internet in businesses better that individual fixed broadband subscriber. The use of encryption technology in Internet transactions is a good indicator of whether the technology is actually used for business purposes or not. Several other studies have used number of Internet users per capita of a country's population for analysis. This data is based on the number of individual homes that have direct access to Internet and the average size of a family in the corresponding country. While this is a good reflection of the penetration of the Internet in developed countries, it may not be an efficient indicator of penetration in developing countries where Internet resources are heavily shared between multiple users. Internet hosts on the other hand refers to a machine or an application that is connected to the Internet and that has an Internet protocol address assigned to it. Hence, hosts stand to reflect more closely the penetration of Internet in a country. The number of Internet secure servers per capita of population of a country in particular reflects how embedded the Internet is in the commercial activities of a country.

Table 2: Data Sources

Variable	Source
Imports by country to the US	US Trade Online https://usatrade.census.gov/ Accessed through MSU main library
Population	World Development Indicators http://data.worldbank.org/data-catalog/world-development-indicators
GDP	World Development Indicators http://data.worldbank.org/data-catalog/world-development-indicators
Exchange Rate	World Development Indicators http://data.worldbank.org/data-catalog/world-development-indicators
Distance	IMF Direction of Trade Statistics http://www.imf.org/external/data.htm
Internet Hosts	World Development Indicators http://data.worldbank.org/data-catalog/world-development-indicators

Data on the dependent variable imports of country i to country j from 2002 onwards was collected from US Trade online that has monthly and annual data on U.S. imports and exports by country and U.S. customs port area with up to 10-digit Harmonized System classification detail. In their study of determinants of bilateral trade flows, Egger (2000) and Matyas (1997) propose the general gravity model which includes time and exporter and importer effects. In this study, a three-way gravity model capturing time and exporter and importer effects is used. The two-way model is a more generalized representation of a three-way model that only includes time invariant main effects. The two-way model includes all time invariant effects (time-invariant main effects and time invariant exporter and importer effects), whereas the three way model only includes the main effect. In addition to time invariant main effects, the two-way model also includes time-invariant bilateral effects, which the three-way model does not include. In this dissertation, the three-way model is adequate for purposes of our analysis because the only time invariant effect of interest is the main effect of 'distance' between the two countries. This is because the impact of 'Internet' on 'distance' and therefore transportation costs may have a crucial role to play in determining trade patterns between countries in certain industries.

The statistical software package used to perform the empirical analysis is Stata 11. In this dissertation, both cross sectional pooled regressions using OLS as well as panel data regression is used to estimate the above gravity equation. This approach examines the impact of Internet use on trade assuming that time is constant. The use of two different methods of estimation not only provides a robustness check on the results, but because the two methods have different pros and cons they help capture different aspects of the underlying process.

While the OLS estimation is more likely to have better goodness of fit because we are analyzing a larger amount of data, it also helps us eliminate co-trending variables over time (Freund and Weinhold 2004). The assumption the time is constant eliminates the bias that could arise out of two variables having a linear relationship in their trends. Our second method of estimation uses panel data and will help us avoid any omitted variable bias. The two most common ways of panel data estimation is a fixed effects model and a random effects model. According to scholars like Eggar (2002), the model selection depends not only on data properties, but also depends on the interest of the analysis.

In general it is assumed that the fixed effects model provides more robust results. However, one major restriction with the fixed effect model is that variables that are collinear with the fixed effects need to be dropped from the model. In our case, data that varies by exporter but is constant for the importer cannot be included in the model. Since the US is our primary importer in our study, using a model with this restriction on variables that are collinear with fixed effects will not work. Hence, the most obvious panel estimation choice here was the random effects model. Further, when we tested the three-way model for each set of regressions, the random effect model was determined to be more appropriate than the fixed effects model after conducting the Hausman test (Wooldridge 2001), that indicates that both the fixed effects and random effects model are consistent, but the random effects model is more efficient. The general rule of thumb as suggested by Judge et al. (1998) was also applied where he states that if the cross sectional units are regarded as random drawings, the number of cross-sectional units N is large (72 in our case) and T is small (9 in our case), the random effects model is more efficient than the fixed effects model. Taylor (1980) also has shown that for T greater than or equal to 3 and N-K greater than or equal to 9, where K is the number of regressors, the random effects model is more efficient. Hence after weighing both theoretical considerations and testing the data, the random effects model seemed more appropriate for this study. Additionally, in this study, regressions where carried out separately for different industries categorized by their institutional intensities. It would be possible to analyze the interactive effect of institutional intensity and Internet by introducing Institutional Intensity as a variable in the gravity equation. This approach was explored but ultimately not chosen because of empirical challenges of using a time invariant variable interacting with 'Internet Hosts' in a panel data estimation.

5. EMPIRICAL EVIDENCE

Data from the years 2002 to 2010 was used for this study based on data availability. After attempting to ensure that adequate data was available for the main variables in the gravity equation, as well as for the specific industries considered in this study the resulting sample size finally used in the analysis were 72 countries. After cleaning up the data for missing values we end up with a relatively large sample size of 72 countries. Even though data availability was a factor in selection of the sample, the sample does not only contain countries from developed or OECD nations. The sample includes a large number of medium and low income countries with different country characteristics. They also include countries from the American, African, Asian, Australian and European continents. This was critical since distance is an important determinant of trade patterns. Descriptive summary statistics of the variables are available in the appendix by each of the 25 industries.

Table 3: List of countries

Albania	Colombia	Lebanon	Romania
Algeria	Cote d'Ivoire	Macedonia, FYR	Russian Federation
Australia	Croatia	Madagascar	Saudi Arabia
Azerbaijan	Cyprus	Malaysia	Senegal
Bahamas, The	Czech Republic	Maldives	Slovak Republic
Bangladesh	Denmark	Mali	Sri Lanka
Belarus	Dominica	Moldova	Sweden
Belize	Dominican Republic	Morocco	Switzerland
Bolivia	El Salvador	Mozambique	Syrian Arab Republic
Bosnia and Herzegovina	Estonia	Namibia	Tanzania
Brazil	Ethiopia	New Zealand	Thailand
Bulgaria	Gabon	Nicaragua	Togo
Burkina Faso	Israel	Oman	Trinidad and Tobago
Cambodia	Japan	Panama	Ukraine
Cameroon	Jordan	Papua New Guinea	Uruguay
Canada	Kenya	Paraguay	Yemen, Rep.
Chad	Korea, Rep.	Peru	Zambia
China	Lao PDR	Philippines	Zimbabwe

The 25 industries selected are listed below in Table 4, along with their institutional intensities. The trade code used to categorize these industries is their three-digit ISIC (International Standard Industrial Classification) Codes. The institutional intensities used in this study to categorize the industries into low, medium and high institutional intensity sectors are taken from a study conducted by Nunn (2007). Institutional intensity as defined by Nunn (2007) as the share of intermediate inputs that cannot be bought on organized exchanges and is not reference priced. In his study Nathan used the ISIC codes and classified them into the Bureau of Economic Analysis (BEA) 1997 codes in order to calculate the institutional intensities. The data used for human capital and physical capital came from Antweiler and Trefler (2002), while the data for skill and capital intensities came from Bartelsman and Grey (1996). Data about relationship specific investments comes from the 1997 input-output table and data about input's that are relationship specific came from Rauch (1999). Since the data used to calculate institutional intensities come from specific sources and the calculation of these individual inputs for different time periods are rather time-consuming and beyond the scope of this dissertation, we will assume that the institutional intensities of these different industries have remained fairly constant over the time period of interest in this study.

It is possible that some inputs have changed over time and the institutional intensities may have altered, but for the purpose of this study we will assume that for the 25 industries included in the study, the nature of relationship specific investments has not changed drastically over a decade. Since the data used in this study spans from 2002 to 2010, it is reasonable to assume that institutional intensities calculated by Nathan Nunn in 2007 are relatively time appropriate to be used by this study to classify industries. In the 25 industries used for this study we observe that oil and gas is the least institutionally intensive and transportation equipment is the most. As suggested in Nathan Nunn's paper these numbers make sense for the time period of our study. Petroleum and Coal, and Oil and gas have the least relationship specific investments and that has not changed between 2002 and 2010, while transportation equipment require higher amounts of relationship specific investments as the country specific/location specific factors play a crucial role. It seems that the basic nature of these industries have not changed significantly even if there are some changes in costs or processes.

Table 4: Industries and their institutional intensities

Industry	Institutional intensity
324 Petroleum and Coal Products	0.057654288
211 Oil & Gas	0.171116009
325 Chemicals	0.240283594
112 Livestock & Livestock Products	0.271475737
311 Food & Kindred Products	0.330635756
313 Textiles & Fabrics	0.339565582
322 Paper	0.348113626
111 Agricultural Products	0.373506114
327 Nonmetallic Mineral Products	0.376581877
212 Minerals and Ore	0.395959088
326 Plastics & Rubber Products	0.407733738
332 Fabricated Metal Products	0.434656501
113 Forestry Products	0.482169494
312 Beverages & Tobacco Products	0.509090653
321 Wood Products	0.516188145
114 Fish, Fresh/chilled/frozen & Other Marine Products	0.521434605
337 Furniture & Fixtures	0.567659855
316 Leather & Allied Products	0.570608377
323 Printed Matter And Related Products	0.71282208
335 Electrical Equipment, Appliances & Components	0.740018547
315 Apparel & Accessories	0.745411098
333 Machinery, Except Electrical	0.763578296
334 Computer & Electronic Products	0.809803036
511 Newspapers, Books & Other Published Matter	0.830137992
336 Transportation Equipment	0.858740389

Other data used in the modified gravity model comes from several sources and data sources are referenced in table 2. In this study, the dependent variable is US imports and we are interested in understanding the impact of the number of Internet hosts in trading partner nations on US imports in these 25 industries that have varying levels of institutional intensities. An OLS pooled regression model and a modified gravity equation using a random effects model were selected for this study. The OLS pooled regression was used to eliminate the effect of co-trending variables as well as to distinctly capture the effect of distance on trading patterns. In the panel regression, a generalized least squares estimator was used to account for the correlation structure involved in panel data of this nature.

The data is analyzed for 72 countries between 2002 and 2010. Each industry was studied separately and then the standardized beta coefficients were compared. Table 5 provides summary statistics of the number of Internet hosts. It can be observed that the mean number of Internet hosts has increased by over ten times. The standard deviation over time seems to decline at first and then exponentially increase. As with most technologies, some early adopters first adopt the technology and this leads to the discovery glitches and issues with the technology. After things have been rectified and improved to make adoption easier, the rest of the population adopts the technology. At this stage, it is possible that different countries follow different trends in adopting the technology depending on their demographic and socio-economic factors. Urban populations are more likely to have access to the technology first, and the time it takes for the rural and less urban area to adopt and get access to the technology might vary depending on several factors. In this study, we proceed to analyze if this difference in access to the information and communication technologies affect trade in different industries differently.

Table 5: Summary Statistics of Internet Hosts by Countries in this Study

Year	Mean	Standard Deviation
2003	641.8361	4.242641
2004	1784.209	3.535534
2005	2350.957	1.414214
2006	2826.333	1.414214
2007	4214.139	2.828427
2008	5191.278	5.656854
2009	6163.324	9.899495
2010	8199.278	9.899495

The empirical findings of the OLS estimation are listed below in Table 6. The table depicts only the results of the internet host variable on imports. For results of other variables please refer to the appendix. The focus of this section is the use of Internet (secure hosts) by the exporting country as several studies in the past (Freund and Weinhold 2004) have indicated that it is technology use by the exporting country that impacts trade patterns. Additionally, since we are dealing with the same importing country (US), and the exporting country is the one that benefits by the decreasing production and transaction costs, we will focus on the impact of broadband use by the exporting country on bilateral trade.

In order to test for the assumption of normality, we checked the standardized normal probability plot (p-p) and found that the error distributions were not tailed. As discussed above, we tested for the absence of specification errors due to presence of endogenous variables in the model by running Hausman's endogeneity test for all the independent variables. The chi-squared values for the Hausman tests of all variables indicated that the differences in coefficients are not systematic, thereby ruling out endogeneity captured in an omitted variable bias or because of measurement error. Finally, since multi-collinearity may inflate standard errors, the significance of all the independent variables in our analysis indicates that collinearity between variables is not a significant threat to our results even if present. The large number of observations, high sample variance of explanatory variables and low residual variance makes multi-collinearity less of threat in this analysis. We also checked for heteroscedasticity between variables in the direct impact model and the Breusch-Pagan / Cook-Weisberg (Heij and Boer 2004 and Wooldridge 2001) test for heteroscedasticity ruled out any concerns of deviation from constant variance.

A first key finding is that hypothesis 1 is supported in most of the highly institutionally intensive sectors. The hypothesis states that industries that require more intensive institutional arrangements are likely to be positively impacted by the use of broadband technology. In general, industries with institutional intensities smaller than 0.4 are considered low, and ones higher than 0.6 are considered high. However, industries between 0.4 and 0.6 are more ambiguous and can fall into either categories depending on industry sub-classification. If industries with an institutional intensity of above 0.5 are considered, we find that with the exception of the newspaper industry all the industries have a positive standardized beta coefficient that is significant. The newspaper industry could be an exception because of the changing nature of the industry especially a migration towards online news sources. However, the result of the regression in this industry is not statistically significant.

Hypothesis 2 is also supported in most industries with a lower institutional intensity, but as discussed in the conceptual framework we find that there a few different factors that may influence the slightly more diverse results. Some of the low institutionally intensive sectors have a significant negative beta coefficient. This indicates that in these sectors, the exporting country may benefit from the use of broadband technology when products are not very relationship specific, because they can export their products to markets that are more favorable with a lot more ease. Another explanation for these negative values is that Oil and Gas, Petroleum, Coal and Agricultural products have low institutional intensity but also have very high demand. They are significantly impacted by trading arrangements/pacts between countries and Internet may have a small role to play. There is also a high transportation cost involved these industries and the affordances that Internet technology provides may not do much to lower these costs. These products are also observed to be ones that are traded in the commodity markets. Commodity markets are characterized by the use of instruments like futures contracts and other derivatives that have been used for decades. This existence of several instruments that already mitigate transaction costs have an impact on how much internet technology can impact these industries in general. Further, the importing country (US) may have also increased domestic production in these industries, and this could be a third explanation for these negative values. We also find that when institutional intensity is closer to 0.5, those industries generally tend to largely benefit from the use of broadband technology. In other words, even when the institutional intensity is low, some of these industrial sectors still do have some transaction costs that cause broadband technology to be of more utility in these sectors. They may also need to use digital processes if their business partners in the importing country use the technology. Some benefit more than others because broadband technology not only improves productivity in these sectors, but these sectors could also benefit from merging tastes and preferences as a result of the technology making the world a more global place. An example of an industry that benefits from this kind of globalization is the food and kindred products industry because knowledge of global foods is increasing demand for specialized food products from certain countries.

Table 6: Results of OLS Estimation: Impact of Internet Hosts of Importing Country on Imports

Industry	Inst. Intensity	Beta Host	SE	Pvalues	Rsquare
Industries with low institutional intensity					
324 Petroleum and Coal Products	0.057654	-0.1921	0.099145	0.053	0.2873
211 Oil & Gas	0.171116	-0.30136	0.139822	0.032	0.1623
325 Chemicals	0.240284	0.292402	0.05501	0	0.7835
112 Livestock & Livestock Products	0.271476	0.717319	0.116188	0	0.1442
311 Food & Kindred Products	0.330636	0.711624	0.072082	0	0.5784
313 Textiles & Fabrics	0.339566	0.365804	0.099331	0	0.0864
322 Paper	0.348114	0.430032	0.097421	0	0.2248
111 Agricultural Products	0.373506	-0.18928	0.097067	0.052	0.0464
327 Nonmetallic Mineral Products	0.376582	0.47875	0.066452	0	0.7226
212 Minerals and Ore	0.395959	0.089691	0.161863	0.58	0.004
Industries with high institutional intensity					
326 Plastics & Rubber Products	0.407734	0.202094	0.095358	0.035	0.0722
332 Fabricated Metal Products	0.434657	0.598627	0.05346	0	0.8157
113 Forestry Product	0.482169	0.294794	0.143966	0.041	0.2631
312 Beverages & Tobacco Products	0.509091	0.826213	0.076872	0	0.6579
321 Wood Products	0.516188	0.526411	0.094334	0	0.065
114 Fish, Fresh/chilled/frozen & Other Marine Products	0.521435	0.401206	0.130518	0.002	0.3796
337 Furniture & Fixtures	0.56766	0.538908	0.076039	0	0.6623
316 Leather & Allied Products	0.570608	0.498816	0.105447	0	0.0507
323 Printed Matter And Related Products	0.712822	0.500388	0.057191	0	0.798
335 Electrical Equipment, Appliances & Components	0.740019	0.264616	0.093287	0.005	0.1511
315 Apparel & Accessories	0.745411	0.267445	0.104976	0.011	0.0061
333 Machinery, Except Electrical	0.763578	0.676744	0.047444	0	0.8455
334 Computer & Electronic Products	0.809803	0.638674	0.057663	0	0.764
511 Newspapers, Books & Other Published Matter	0.830138	-0.22565	0.19825	0.257	0.5575
336 Transportation Equipment	0.85874	0.18737	0.095041	0.049	0.1252

In order to ensure that our results are robust and any omitted variable bias is captured a random effects panel model is also applied. The main empirical findings of the panel data regression study are listed in Table 7. Using the gravity equation, the main control variables used in this study are the GDPs of the importing and exporting country, the population of the two countries, the exchange rate between the two countries and the distance between the two trading countries. As discussed earlier, the two most common ways of panel data estimation is a fixed effects model and a random effect model. Even though most studies involving panel data use the fixed effects model because it provides robust results, we have discussed in the methodology section our reason for using the random effects model. It is often the case that in applied policy studies with specific subjects of interest the random effects model is a better. The impact of Internet hosts (secure servers) on bilateral trade (imports to the US) in 25 different industries is displayed below. The standard beta coefficients, standard errors, the goodness of fit R^2 and the p-values are reported below. The R square value varies between regressions conducted between the different industries. The gravity model used for this study has been kept as generic as possible to include several industries, but this means that there is a possibility of some omitted variable bias or the existence of other endogeneity issues that result in different goodness of fit for these different industries. If one observes the results tables, a lot of industries that exchange goods in the commodity markets have a poorer goodness of fit indicating the possible existence of an omitted variable. Examples of such industries are Minerals and Ore, Wood Products, Plastic and Rubber Products and Petroleum and Gas. These industries have lower goodness of fit in both OLS and panel data estimation. However, for comparison sake the equations for all 25 industries are kept generic and industry specific variables have not been accounted for. Some of these variables have been discussed in the interpretation of the results as it is important to account for these while analyzing the results of the OLS and panel data estimation.

Table 7: Results of Panel Data Estimation: Impact of Internet Hosts of Importing Country on Imports

Industry	Inst. intensity	Beta Host	SE	Pvalues	Rsquare
Industries with low institutional intensity					
324 Petroleum and Coal Products	0.057654288	-0.08605	0.145163	0.553	0.01
211 Oil & Gas	0.171116009	-0.3514197	0.197219	0.075	0.125
325 Chemicals	0.240283594	0.1035312	0.075238	0.169	0.7761
112 Livestock & Livestock Products	0.271475737	0.495167	0.157935	0.369	0.1375
311 Food & Kindred Products	0.330635756	0.1566343	0.066187	0.018	0.5318
313 Textiles & Fabrics	0.339565582	-0.0028095	0.145014	0.985	0.04
322 Paper	0.348113626	0.3122754	0.140285	0.026	0.233
111 Agricultural Products	0.373506114	-0.1962806	0.122963	0.11	0.0616
327 Nonmetallic Mineral Products	0.376581877	0.2631353	0.074559	0	0.7199
212 Minerals and Ore	0.395959087	0.0196294	0.411688	0.0962	0.03
Industries with high institutional intensity					
326 Plastics & Rubber Products	0.407733738	0.0049828	0.141387	0.972	0.0726
332 Fabricated Metal Products	0.434656501	0.2472891	0.06003	0	0.7967
113 Forestry Products	0.482169494	-0.0487679	0.112997	0.666	0.2563
312 Beverages & Tobacco Products	0.509090653	0.1047977	0.07147	0.143	0.5869
321 Wood Products	0.516188145	0.4086147	0.140056	0.004	0.075
114 Fish, Fresh/chilled/frozen & Other Marine Products	0.521434605	0.1513534	0.105199	0.15	0.3777
337 Furniture & Fixtures	0.567659855	0.3694672	0.067559	0	0.6568
316 Leather & Allied Products	0.570608377	0.0734178	0.15543	0.637	0.028
323 Printed Matter And Related Products	0.71282208	0.2699192	0.074428	0	0.794
335 Electrical Equipment, Appliances & Components	0.740018547	0.346459	0.138668	0.012	0.1639
315 Apparel & Accessories	0.745411098	0.3351666	0.143298	0.019	0.0215
333 Machinery, Except Electrical	0.763578296	0.2852997	0.060583	0	0.8188
334 Computer & Electronic Products	0.809803036	0.1079856	0.051087	0.035	0.723
511 Newspapers, Books & Other Published Matter	0.830137992	-0.1687481	0.218771	0.441	0.5744
336 Transportation Equipment	0.858740389	0.176982	0.118381	0.135	0.1385

Hypothesis 1 is supported in this study, because we see that Internet use has a positive impact on sectors that have high institutional intensity. Some sectors that have high institutional intensity and have significant results are 333 Machinery, 334 Computer &Electronic Products, 335 Electrical Equipment, 337 Furniture and Fixtures and 315 Apparel & Accessories. While the sign of the standardized beta coefficient is positive in all high institutional industries, a few industries have results that are not statistically significant. This could be because of co-trending variables or because of the smaller number of data points available for analysis using the panel regression method. However, the overall positive sign implies that the use of Internet does benefit industries that have high institutional intensities by reducing transaction costs (both co-ordination and information costs) and production costs. These industries often need high institutional arrangements to secure themselves against the well-known hold up problem that exist in industries with relationship specific investments. Similar to the OLS results, the newspaper industry is the only industry that is an exception and this is potentially because of the changing nature of the newspaper industry.

The panel data results of low institutionally intensive sectors support hypothesis 2, but are slightly different from the OLS estimates. Figure 2 and 3 demonstrates how industries with different institutional intensities are impacted by the use of Internet. These charts depict industries institutional intensities against the estimated parameters for both OLS and panel data estimation. The trend lines on both charts depict an upward trend indicating that Internet has a bigger impact on industries with high institutional intensities. It is interesting that the panel estimation have results that indicated that exporting countries in some low institutionally intensive sector are likely to find other more favorable export markets besides our primary importer US. This is because the use of Internet technology has affordances to provide higher amounts of information and better trade coordination. In this case, we also find that even though the signs of the coefficients support hypothesis 2 they are not statistically significant. Some low institutionally intensive exporting sectors also benefit from the use of the technology as discussed in the conceptual framework earlier. Irrespective of the institutional intensity of a sector, trade takes place when factor proportions are different or there is some specialization. These sectors do have productivity benefits of using broadband technology. The 311 Food and Kindred products, 112 Livestock and Livestock Products, 325 Chemicals, 326 Plastics and Rubber Products, 327 Nonmetallic Mineral Products and 322 Paper are found to be positively impacted by the use of Internet in the exporting country. Most of the estimates were statistically significant indicating that the use of Internet benefits overall productivity whether they are institutionally intensive or not. This indicates that the use of Internet reduces production costs in sectors that naturally have differences in factor proportions that benefit trade. This could indicate that co-ordination costs are reduced or search costs are reduced, and exporting countries are better able to put out information about their products because of the Internet. It could also indicate that with more countries using the Internet, the use of the technology becomes essential for any country that was to do business with other countries in this global world. Earlier, these kind of trading relationships were dictated either by trade agreements or traditional alliances. Now the presence of Internet in exporting firms around the world gives exporters a chance to display information about their products and prices very conveniently. This not only reduces search costs but improves the overall logistics involved in the trading process.

Figure 2: OLS Estimate vs. Industry Institutional Intensities

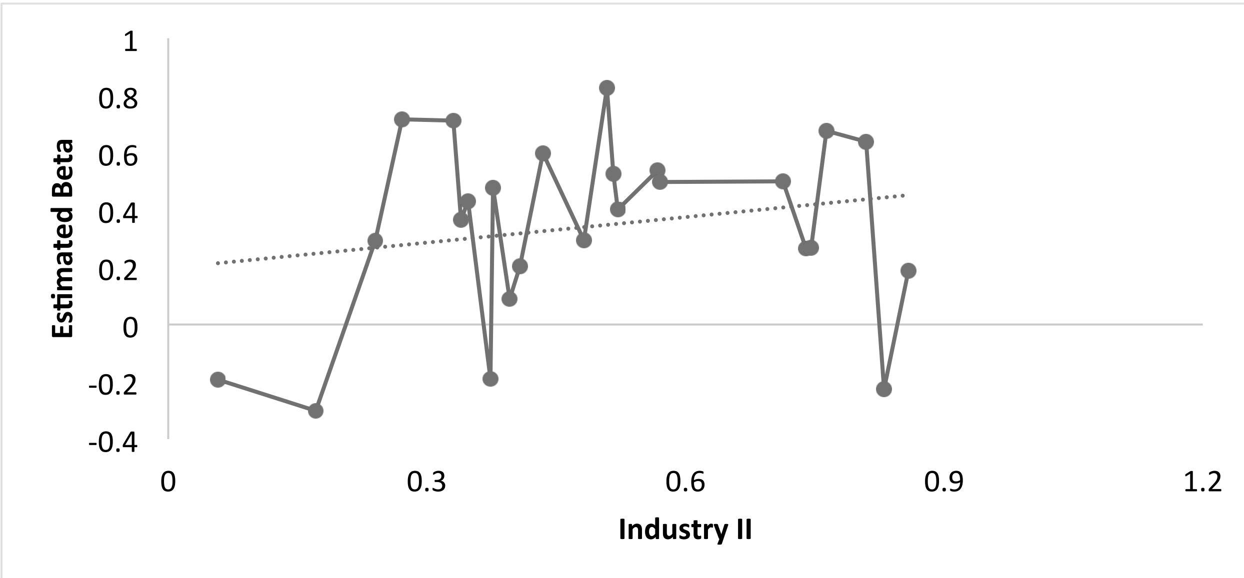
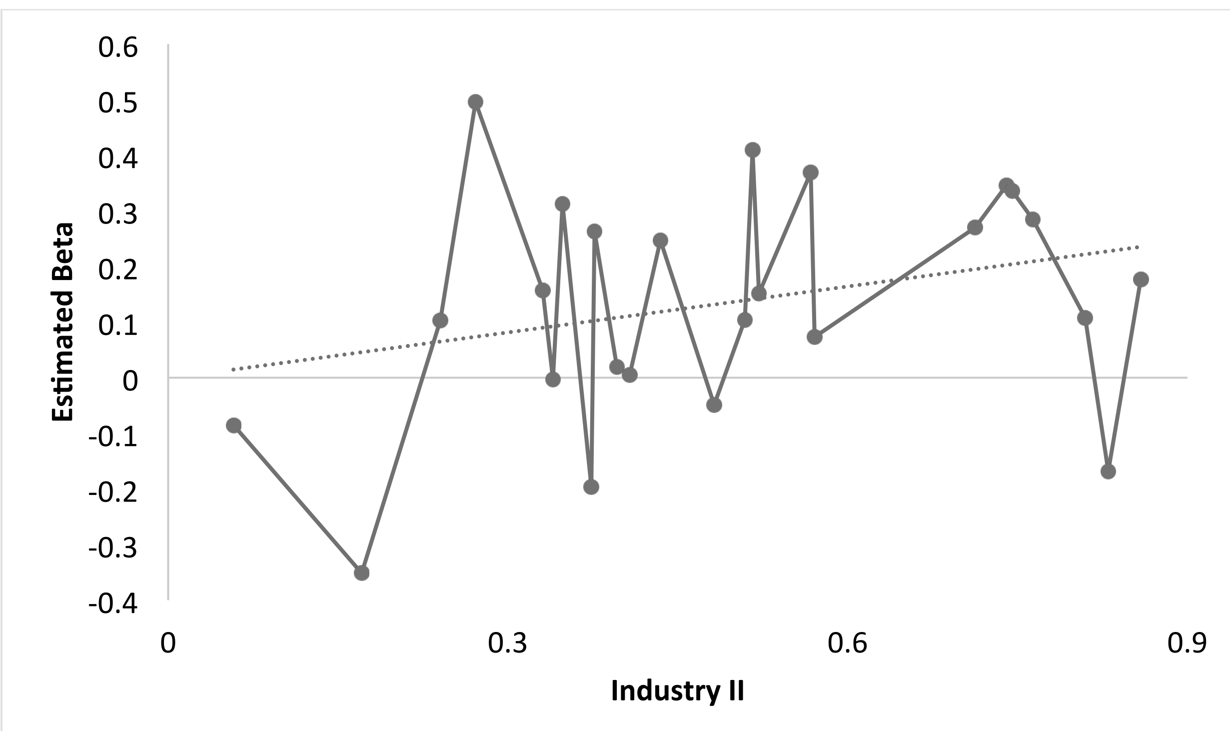


Figure 3: Panel Estimate vs. Industry Institutional Intensities



There are certain industries that do not fit the general pattern in the results using both estimation techniques. In sector 511 Newspaper, Books and Published Matter, we find that the use of Internet technology over time has a negative impact on trade. This can be explained by understanding the nature of this industry. The Internet has globalized the availability of news and similar published matter. We also find similar results in most industrial sectors using both estimation techniques. The OLS regression has more significant results adding to the robustness of this analysis. The panel data estimation has a larger number of negative beta coefficients in the low institutionally intensive sectors. However, since the results are not significant we cannot state this with statistical certainty. Hypothesis 1 is supported by both estimation techniques, and hypothesis 2 is supported more clearly in the OLS estimation. The panel data regression has more statistically insignificant results and the general goodness of fit is lower. This could be because the number of data points is fewer in the panel data estimation and the methodological assumption driving the pooled approach makes it easier to detect a pattern.

The other independent variables and their beta coefficients are also reported industry wise in the appendix of this study. The focus of this study if Internet technology and its effect on bilateral trade with the US and we largely find that the hypothesis H1 and H2 are supported in this study. These results indicate that Internet benefits industries that require high institutional arrangements, but trade between countries is largely benefited from the use of technology irrespective of the institutional intensity. Even in cases where a natural comparative advantage exists, Internet improves the total factor productivity because of its affordances that improve co-ordination and reduce information costs. The sectors in which Internet is negatively correlated with trade are ones like 324 Petroleum & Coal that have a high demand all around the world and thus traditional ties and alliances still play an important role. These products are not very relationship-specific, and the use of the technology allows the exporting country to export its product on more favorable terms of trade. This changes the patterns of bilateral trade, and gives rise to different groups of winners and losers. One other characteristic of these industries that show negative correlation to trade are the fact that they are products that are sold in commodities markets, and as discussed earlier there are several other instruments used in these market that already mitigate some transaction costs. The use of Internet may not have a significant impact on reducing these costs and may changes the patterns of trade by enabling more countries to enter the market.

6. CONCLUSION

This study looks at the impact of Internet technology on bilateral trade with the US. The focus is to understand if Internet use impacts industries that require higher institutional arrangements differently from those that do not. The motivation for this comes from studies in the past that have emphasized the importance of institutional arrangements in trade (Levchenko 2008, Kormenos et al. 2001) and from studies that have found that Internet access in a country may have some effect on trade (Freund and Weinhold 2000, 2002, 2004). Internet because of its inherent nature is able provide access to different kinds of information (verbal and visual) almost instantly, and this reduces transaction costs (traditionally managed through the use of institutional arrangements between two countries). However, no study had really attempted to look at the impact of Internet use on trade by categorizing industries based on their institutional intensities. This study is a first attempt to look at how Internet use impacts the importance of traditional institutional arrangements in trade.

One must be very careful in interpreting the importance of Internet on trade particularly in highly institutionally intensive sectors because trade is a rather complex phenomenon with various other important variables. This study has tried to control for important variables like the size of the economies, exchange rates and the importance of distance. However, there are certain other variables that might play a role–like cultural factors, languages and similar industry specific variables–that could not be accounted for due to data availability issues. This more parsimonious approach also allowed keeping the basic equation as generic as possible to most industries included. It is very important to acknowledge basic trade theories that state that comparative advantage makes trade possible and differences in factor proportions lead to specialization. This study maintains that differences in factor proportions and increasing returns to scale are the biggest factors leading to trade, and Internet just makes the transaction process easier. In cases where the institutional intensity is high, Internet may have an additional role to play because institutional arrangements themselves become a source of comparative advantage (Levchenko 2008).

An OLS and panel data estimation was performed on 25 different industries, and resulted in strong support of hypothesis 1 (with the exception of the newspaper industry), and a weaker support of hypothesis 2 (strongly supported by the OLS estimation, but lack of statistical significance in the panel data estimation). This indicates support for both hypothesis but a weaker one for hypothesis 2. Firstly, increase in use of Internet technology by the exporting country definitely has a positive impact on sectors that require higher institutional arrangements. This indicates that Internet use in businesses (through the use of secure servers and hosts) has the ability to change the way trading alliances are entered into. One often finds that institutional arrangements are of higher quality in more developed nations leading them to be the preferred choice in industries where institutional intensities are high. Internet technology makes it possible for firms in countries with poorer institutional arrangements to enter into trading agreements with firms in the US.

The Internet reshapes the importance of institutions because the technology has certain affordances that reduce the need for stronger institutional arrangements. In particular the Internet is able to reduce transaction costs and production costs in these sectors. The second hypothesis that this study tests is that Internet could continue to have positive effect on low institutionally intensive sectors because of productivity effects. However, certain sectors may also see a negative impact on bilateral trade (especially if relationship specificity of investments is very low or negligible) because they now can find other trading partners that perhaps have more favorable terms of trade. There are two processes in play here. If factor differences continue to exist (for example labor being expensive the US will import labor intensive products from countries where labor is cheaper) or a country is highly specialized in a particular industry the US is more likely to import those products from that country. Since there could be a large number of countries with those factor differences, the use of Internet technology could further help reduce production costs and some transaction costs particularly search costs and co-ordination costs. Countries that specialize in an industrial sector that is competitive therefore also benefit from the use of Internet technology. Internet plays a huge role in reducing production costs giving them an advantage when the market is competitive. However, there is also another factor that plays a role in bilateral trade patterns. If relationship specificity of an industry is low or almost negligible then there is a larger potential for trading goods with another country if for some reason terms of trade with the US is not favorable. This is supported in the OLS estimation and the panel data estimation also shows similar trends but without statistical significance.

This study not only emphasizes the importance of Internet in markets that are rather competitive (hypothesis 2), but also suggests that markets that require high institutional arrangements can positively benefit because of unique affordances of Internet technology that result in lower production and transaction costs (hypothesis 1 is strongly supported). There are several ways in which this study can be improved and extended. Firstly, it would be interesting if we could run the same OLS/panel regression on specialized industry sub-groups (based on trade alliances) to confirm the hypothesis. It would also be of interest to obtain a breakdown of costs in every industry to study the impact of broadband of the underlying cost structure of different industries. The above two questions are not dealt with in this study because of data limitations but would certainly be interesting extensions. However, this study is still the first one to look at the impact of Internet on trade by analyzing the how different industries with different institutional intensities are impacted. The results of this study definitely depicts that broadband technology does have an impact on bilateral trade. The nature of this impact is positive in sectors that are very relationship specific, but is more ambiguous in sectors that have low relationship specificity. There are several studies that have attempted to study impact of the Internet on trade, on overall economic productivity. However, this study looks at the impact Internet has on the importance of traditional institutional arrangements during trade. The fact that Internet positively impacts high institutionally intensive sectors does indicate that technological affordances of broadband plays an important role in reducing transaction and production costs in trade.

APPENDIX

Appendix A: Panel Regression Results

Table A.1 321 Wood Products

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	-0.4945	0.188129	-2.63 0.009	-0.86323	-0.12578
loggdpus	0.214551	0.141992	1.51 0.131	-0.06375	0.49285
logpop	0.337893	0.132072	2.56 0.011	0.079037	0.596749
logpopus	-0.18345	0.217424	-0.84 0.399	-0.60959	0.242694
logexrate	0.009554	0.063326	0.15 0.880	-0.11456	0.133671
logserv	0.408615	0.140056	2.92 0.004	0.13411	0.68312
logservus	-0.03687	0.258583	-0.14 0.887	-0.54369	0.469939
logdist	0.015675	0.07665	0.20 0.838	-0.13456	0.165907
_cons	0.025745	0.093763	0.27 0.784	-0.15803	0.209516

Table A.2 336 Transportation Equipment

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.194526	0.154784	1.26 0.209	-0.10885	0.497896
loggdpus	0.05083	0.149733	0.34 0.734	-0.24264	0.344301
logpop	-0.05474	0.103973	-0.53 0.599	-0.25852	0.149045
logpopus	-0.10625	0.229324	-0.46 0.643	-0.55572	0.343217
logexrate	0.055489	0.052639	1.05 0.292	-0.04768	0.15866
logserv	0.176982	0.118381	1.50 0.135	-0.05504	0.409004
logservus	0.045679	0.27299	0.17 0.867	-0.48937	0.58073
logdist	-0.13058	0.056815	-2.30 0.022	-0.24194	-0.01923
_cons	0.148346	0.084547	1.75 0.079	-0.01736	0.314056

Table A.3 313 Textiles and Fabrics

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.278869	0.199212	1.40 0.162	-0.11158	0.669318
loggdpus	0.039675	0.129757	0.31 0.760	-0.21464	0.293994
logpop	-0.02856	0.145004	-0.20 0.844	-0.31276	0.255644
logpopus	0.11211	0.198559	0.56 0.572	-0.27706	0.501279
logexrate	0.079232	0.06533	1.21 0.225	-0.04881	0.207276
logserv	-0.00281	0.145014	-0.02 0.985	-0.28703	0.281413
logservus	-0.11268	0.235658	-0.48 0.633	-0.57456	0.349204
logdist	-0.09192	0.087225	-1.05 0.292	-0.26288	0.079039
_cons	0.057293	0.097752	0.59 0.558	-0.1343	0.248883

Table A.4 323 Printed Matter and Related Products

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.626537	0.113618	5.51 0.000	0.40385	0.849224
loggdpus	0.107232	0.054616	1.96 0.050	0.000187	0.214278
logpop	-0.01179	0.089256	-0.13 0.895	-0.18673	0.16315
logpopus	-0.08231	0.085774	-0.96 0.337	-0.25043	0.085802
logexrate	0.026676	0.033041	0.81 0.419	-0.03808	0.091434
logserv	0.269919	0.074428	3.63 0.000	0.124043	0.415796
logservus	-0.09932	0.101073	-0.98 0.326	-0.29742	0.098776
logdist	-0.11417	0.054908	-2.08 0.038	-0.22179	-0.00656
_cons	-0.12051	0.056613	-2.13 0.033	-0.23147	-0.00955

Table A.5 326 Plastics and Rubber Products

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.249981	0.191642	1.30 0.192	-0.12563	0.625593
loggdpus	-0.00207	0.136162	-0.02 0.988	-0.26894	0.264803
logpop	-0.08824	0.136566	-0.65 0.518	-0.35591	0.179424
logpopus	0.032521	0.209295	0.16 0.877	-0.37769	0.442732
logexrate	-0.17901	0.064168	-2.79 0.005	-0.30478	-0.05325
logserv	0.004983	0.141387	0.04 0.972	-0.27213	0.282096
logservus	-0.00453	0.248307	-0.02 0.985	-0.4912	0.482147
logdist	-0.068	0.080456	-0.85 0.398	-0.22569	0.089692
_cons	0.085373	0.094793	0.90 0.368	-0.10042	0.271165

Table A.6 324 Petroleum and Coal Products

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.642431	0.202706	3.17 0.002	0.245134	1.039729
loggdpus	0.087269	0.125813	0.69 0.488	-0.15932	0.333859
logpop	-0.17032	0.148219	-1.15 0.251	-0.46083	0.120182
logpopus	-0.0403	0.194548	-0.21 0.836	-0.42161	0.341007
logexrate	-0.04353	0.06849	-0.64 0.525	-0.17777	0.090705
logserv	-0.08605	0.145163	-0.59 0.553	-0.37056	0.198469
logservus	-0.01946	0.230441	-0.08 0.933	-0.47112	0.432196
logdist	-0.24316	0.089762	-2.71 0.007	-0.41909	-0.06723
_cons	-0.01393	0.099493	-0.14 0.889	-0.20893	0.181077

Table A.7 322 Paper

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.245224	0.19068	1.29 0.198	-0.1285	0.61895
loggdpus	0.116775	0.13249	0.88 0.378	-0.1429	0.376451
logpop	-0.03383	0.136441	-0.25 0.804	-0.30125	0.233587
logpopus	-0.12329	0.202706	-0.61 0.543	-0.52058	0.274007
logexrate	0.112441	0.063357	1.77 0.076	-0.01174	0.236618
logserv	0.312275	0.140285	2.23 0.026	0.037323	0.587228
logservus	-0.00723	0.240623	-0.03 0.976	-0.47884	0.464384
logdist	-0.02332	0.080601	-0.29 0.772	-0.1813	0.134657
_cons	0.034244	0.093648	0.37 0.715	-0.1493	0.217791

Table A.8 211 Oil and Gas

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.755367	0.271322	2.78 0.005	0.223585	1.287149
loggdpus	-0.05854	0.169987	-0.34 0.731	-0.39171	0.27463
logpop	-0.09677	0.192159	-0.50 0.615	-0.4734	0.279854
logpopus	-0.0368	0.257485	-0.14 0.886	-0.54146	0.467865
logexrate	0.051831	0.133466	0.39 0.698	-0.20976	0.313419
logserv	-0.35142	0.197219	-1.78 0.075	-0.73796	0.035123
logservus	0.196439	0.309289	0.64 0.525	-0.40976	0.802635
logdist	-0.09959	0.109002	-0.91 0.361	-0.31323	0.114055
_cons	-0.2232	0.13524	-1.65 0.099	-0.48826	0.041869

Table A.9 511 Newspapers

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	1.272882	0.301984	4.22 0.000	0.681003	1.86476
loggdpus	-0.22704	0.143747	-1.58 0.114	-0.50878	0.054697
logpop	-0.43077	0.193532	-2.23 0.026	-0.81009	-0.05145
logpopus	-0.86906	0.202434	-4.29 0.000	-1.26583	-0.4723
logexrate	-0.18289	0.132475	-1.38 0.167	-0.44253	0.07676
logserv	-0.16875	0.218771	-0.77 0.441	-0.59753	0.260036
logservus	0.805205	0.240072	3.35 0.001	0.334673	1.275737
logdist	-0.01137	0.092567	-0.12 0.902	-0.19279	0.17006
_cons	-0.83404	0.157226	-5.30 0.000	-1.14219	-0.52588

Table A.10 327 Nonmetallic Minerals

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.565154	0.118794	4.76 0.000	0.332322	0.797986
loggdpus	0.09295	0.051068	1.82 0.069	-0.00714	0.193041
logpop	0.061412	0.099026	0.62 0.535	-0.13268	0.255499
logpopus	-0.1521	0.078241	-1.94 0.052	-0.30545	0.001247
logexrate	-0.00021	0.030929	-0.01 0.995	-0.06083	0.060409
logserv	0.263135	0.074559	3.53 0.000	0.117002	0.409268
logservus	-0.03305	0.093106	-0.35 0.723	-0.21553	0.149437
logdist	-0.11337	0.066453	-1.71 0.088	-0.24362	0.016872
_cons	-0.12192	0.065327	-1.87 0.062	-0.24996	0.006116

Table A.11 333 Machinery

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.685443	0.094205	7.28 0.000	0.500806	0.870081
loggdpus	0.07915	0.044157	1.79 0.073	-0.0074	0.165696
logpop	-0.0969	0.075726	-1.28 0.201	-0.24532	0.051522
logpopus	-0.27857	0.068471	-4.07 0.000	-0.41277	-0.14437
logexrate	0.032502	0.031097	1.05 0.296	-0.02845	0.09345
logserv	0.2853	0.060583	4.71 0.000	0.16656	0.404039
logservus	0.114429	0.080673	1.42 0.156	-0.04369	0.272545
logdist	-0.07111	0.048545	-1.46 0.143	-0.16625	0.024037
_cons	0.008652	0.048734	0.18 0.859	-0.08686	0.104168

Table A.12 112 Livestock and Livestock Products

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	-0.48019	0.210772	-2.28 0.023	-0.89329	-0.06708
loggdpus	-0.02325	0.161479	-0.14 0.885	-0.33975	0.293239
logpop	0.482869	0.144847	3.33 0.001	0.198973	0.766765
logpopus	-0.47313	0.249798	-1.89 0.058	-0.96272	0.016466
logexrate	0.080028	0.069884	1.15 0.252	-0.05694	0.216999
logserv	0.495167	0.157935	3.14 0.002	0.18562	0.804715
logservus	0.287928	0.296572	0.97 0.332	-0.29334	0.869199
logdist	-0.08523	0.082829	-1.03 0.303	-0.24757	0.07711
_cons	0.01511	0.105239	0.14 0.886	-0.19116	0.221374

Table A.13 316 Leather & Allied Products

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.093504	0.220356	0.42 0.671	-0.33839	0.525394
loggdpus	0.117388	0.129962	0.90 0.366	-0.13733	0.372109
logpop	-0.112	0.166455	-0.67 0.501	-0.43825	0.214244
logpopus	-0.30178	0.200221	-1.51 0.132	-0.69421	0.090643
logexrate	-0.0199	0.070865	-0.28 0.779	-0.1588	0.11899
logserv	0.073418	0.15543	0.47 0.637	-0.23122	0.378056
logservus	0.179958	0.236987	0.76 0.448	-0.28453	0.644443
logdist	0.021453	0.103397	0.21 0.836	-0.1812	0.224106
_cons	0.061286	0.110074	0.56 0.578	-0.15446	0.277027

Table A.14 337 Furniture and Fixtures

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.463165	0.120105	3.86 0.000	0.227763	0.698566
loggdpus	0.076532	0.045257	1.69 0.091	-0.01217	0.165235
logpop	0.063506	0.108419	0.59 0.558	-0.14899	0.276003
logpopus	-0.18898	0.070927	-2.66 0.008	-0.32799	-0.04996
logexrate	-0.00159	0.028612	-0.06 0.956	-0.05767	0.054487
logserv	0.369467	0.067559	5.47 0.000	0.237054	0.501881
logservus	-0.02264	0.083417	-0.27 0.786	-0.18613	0.140853
logdist	-0.11852	0.073324	-1.62 0.106	-0.26223	0.025194
_cons	-0.11156	0.071105	-1.57 0.117	-0.25092	0.027804

Table A.15 311 Food and Kindred Products

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.465457	0.119616	3.89 0.000	0.231014	0.699899
loggdpus	-0.03906	0.04487	-0.87 0.384	-0.127	0.048884
logpop	0.077938	0.111137	0.70 0.483	-0.13989	0.295762
logpopus	0.010817	0.069731	0.16 0.877	-0.12585	0.147487
logexrate	-0.07445	0.029862	-2.49 0.013	-0.13297	-0.01592
logserv	0.156634	0.066187	2.37 0.018	0.02691	0.286359
logservus	0.009429	0.081951	0.12 0.908	-0.15119	0.17005
logdist	-0.11488	0.078366	-1.47 0.143	-0.26847	0.038718
_cons	0.067067	0.074575	0.90 0.368	-0.0791	0.213231

Table A.16 114 Fish, Fresh/chilled/Frozen and Other Marine Products

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.234281	0.203559	1.15 0.250	-0.16469	0.633249
loggdpus	0.032212	0.063586	0.51 0.612	-0.09242	0.156839
logpop	0.316601	0.182843	1.73 0.083	-0.04176	0.674966
logpopus	-0.24929	0.097481	-2.56 0.011	-0.44035	-0.05823
logexrate	-0.36891	0.128626	-2.87 0.004	-0.62101	-0.1168
logserv	0.151353	0.105199	1.44 0.150	-0.05483	0.35754
logservus	0.158676	0.11443	1.39 0.166	-0.0656	0.382954
logdist	-0.12666	0.119431	-1.06 0.289	-0.36074	0.107419
_cons	-0.27457	0.125176	-2.19 0.028	-0.51991	-0.02923

Table A.17 332 Fabricated Metal Products

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.693771	0.095192	7.29 0.000	0.507198	0.880344
loggdpus	0.041683	0.043525	0.96 0.338	-0.04362	0.12699
logpop	-0.05946	0.079316	-0.75 0.453	-0.21491	0.095999
logpopus	-0.1548	0.06752	-2.29 0.022	-0.28713	-0.02246
logexrate	0.034692	0.026413	1.31 0.189	-0.01708	0.086461
logserv	0.247289	0.06003	4.12 0.000	0.129633	0.364945
logservus	0.008725	0.079961	0.11 0.913	-0.148	0.165446
logdist	-0.11022	0.053332	-2.07 0.039	-0.21475	-0.00569
_cons	-0.06328	0.052586	-1.20 0.229	-0.16635	0.039785

Table A.18 335 Electrical Equipment, Appliances & Components

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	-0.00324	0.187148	-0.02 0.986	-0.37004	0.363567
loggdpus	0.124741	0.136323	0.92 0.360	-0.14245	0.391928
logpop	0.020105	0.132533	0.15 0.879	-0.23965	0.279865
logpopus	-0.0256	0.209477	-0.12 0.903	-0.43616	0.384971
logexrate	-0.13305	0.062868	-2.12 0.034	-0.25627	-0.00983
logserv	0.346459	0.138668	2.50 0.012	0.074676	0.618242
logservus	-0.11613	0.248598	-0.47 0.640	-0.60337	0.371117
logdist	-0.0319	0.077562	-0.41 0.681	-0.18392	0.120115
_cons	0.038735	0.092856	0.42 0.677	-0.14326	0.22073

Table A.19 334 Computer and Electronic Products

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.75498	0.093319	8.09 0.000	0.572078	0.937883
loggdpus	0.006996	0.034666	0.20 0.840	-0.06095	0.07494
logpop	-0.10255	0.087017	-1.18 0.239	-0.2731	0.068001
logpopus	-0.1824	0.053406	-3.42 0.001	-0.28707	-0.07773
logexrate	-0.08	0.023048	-3.47 0.001	-0.12517	-0.03482
logserv	0.107986	0.051087	2.11 0.035	0.007857	0.208114
logservus	0.099543	0.062971	1.58 0.114	-0.02388	0.222965
logdist	-0.05818	0.061524	-0.95 0.344	-0.17876	0.062405
_cons	0.08208	0.058246	1.41 0.159	-0.03208	0.196241

Table A.20 312 Beverages & Tobacco Products

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.825902	0.133422	6.19 0.000	0.564399	1.087405
loggdpus	0.030754	0.045396	0.68 0.498	-0.05822	0.119729
logpop	-0.26155	0.121132	-2.16 0.031	-0.49896	-0.02413
logpopus	0.113172	0.07028	1.61 0.107	-0.02457	0.250918
logexrate	-0.0112	0.081537	-0.14 0.891	-0.17101	0.148606
logserv	0.104798	0.07147	1.47 0.143	-0.03528	0.244876
logservus	-0.13726	0.082644	-1.66 0.097	-0.29923	0.024723
logdist	-0.25006	0.082778	-3.02 0.003	-0.4123	-0.08782
_cons	-0.29835	0.081187	-3.67 0.000	-0.45748	-0.13923

Table A.21 315 Apparel and Accessories

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	-0.2991	0.190393	-1.57 0.116	-0.67227	0.074061
loggdpus	0.114489	0.154924	0.74 0.460	-0.18916	0.418135
logpop	0.153983	0.131611	1.17 0.242	-0.10397	0.411936
logpopus	-0.23219	0.237743	-0.98 0.329	-0.69816	0.233776
logexrate	0.060178	0.064582	0.93 0.351	-0.0664	0.186757
logserv	0.335167	0.143298	2.34 0.019	0.054307	0.616026
logservus	0.030134	0.2825	0.11 0.915	-0.52356	0.583825
logdist	-8.1E-05	0.074876	-0.00 0.999	-0.14683	0.146673
_cons	0.051702	0.09686	0.53 0.593	-0.13814	0.241544

Table A.22 111 Agricultural Products

logimports	Coef.	Std. Err.	z P>z	[95% Conf.	Interval]
loggdp	0.164918	0.161242	1.02 0.306	-0.15111	0.480947
loggdpus	0.195682	0.149698	1.31 0.191	-0.09772	0.489084
logpop	0.051216	0.108904	0.47 0.638	-0.16223	0.264664
logpopus	0.446262	0.230174	1.94 0.053	-0.00487	0.897395
logexrate	-0.15676	0.054903	-2.86 0.004	-0.26437	-0.04915
logserv	-0.19628	0.122963	-1.60 0.110	-0.43728	0.044723
logservus	-0.56125	0.273946	-2.05 0.040	-1.09818	-0.02433
logdist	0.056817	0.060028	0.95 0.344	-0.06084	0.17447
_cons	-0.04929	0.08643	-0.57 0.569	-0.21869	0.120114

Appendix B: OLS Regression Results

Table B.1 324 Petroleum and Coal Industry

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	0.803892	0.129284	6.22	0	0.549816	1.057968
loggdpus	0.076624	0.169984	0.45	0.652	-0.25744	0.410685
logpop	-0.29005	0.083107	-3.49	0.001	-0.45338	-0.12673
logpopus	0.000778	0.261638	0	0.998	-0.51341	0.514961
logexrate	-0.07745	0.043198	-1.79	0.074	-0.16235	0.007441
logserv	-0.1921	0.099145	-1.94	0.053	-0.38695	0.002745
logservus	-0.02407	0.311853	-0.08	0.939	-0.63694	0.588803
logdist	-0.21434	0.041939	-5.11	0	-0.29676	-0.13192
_cons	-0.01145	0.086693	0.13	0.895	-0.18183	0.158919

Table B.2 111 Agriculture Products

logimports	Coef.	Std. Err.	t	P>t	[95% Conf. In	terval]
loggdp	0.171429	0.125028	1.37	0.171	-0.07425	0.417113
loggdpus	0.201473	0.166245	1.21	0.226	-0.1252	0.52815
logpop	0.057257	0.080895	0.71	0.479	-0.1017	0.216219
logpopus	0.41747	0.254807	1.64	0.102	-0.08323	0.918173
logexrate	-0.13565	0.041769	-3.25	0.001	-0.21773	-0.05357
logserv	-0.18928	0.097067	-1.95	0.052	-0.38002	0.001455
logservus	-0.54899	0.304112	-1.81	0.072	-1.14658	0.048601
logdist	0.045467	0.041408	1.1	0.273	-0.0359	0.126835
_cons	-0.05744	0.083937	0.68	0.494	-0.22238	0.107493

Table B.3 315 Apparel and Accessories Industry

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	-0.1979	0.135216	-1.46	0.144	-0.46361	0.067798
loggdpus	0.117198	0.180004	0.65	0.515	-0.23651	0.470907
logpop	0.082451	0.087542	0.94	0.347	-0.08957	0.254471
logpopus	-0.17052	0.27485	-0.62	0.535	-0.71061	0.369561
logexrate	0.055385	0.045025	1.23	0.219	-0.03309	0.14386
logserv	0.267445	0.104976	2.55	0.011	0.061166	0.473723
logservus	0.001633	0.328113	0	0.996	-0.64311	0.64638
logdist	-0.00118	0.044836	-0.03	0.979	-0.08928	0.086928
_cons	0.05265	0.09069	0.58	0.562	-0.12555	0.230863

Table B.4 312 Beverage and Tobacco Products

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	-0.05092	0.099197	-0.51	0.608	-0.24593	0.144096
loggdpus	0.076026	0.128792	0.59	0.555	-0.17717	0.329224
logpop	0.164436	0.064039	2.57	0.011	0.038538	0.290334
logpopus	0.047406	0.196893	0.24	0.81	-0.33967	0.434486
logexrate	0.053022	0.035583	1.49	0.137	-0.01693	0.122975
logserv	0.826213	0.076872	10.75	0	0.675086	0.977339
logservus	-0.2393	0.235838	-1.01	0.311	-0.70295	0.224342
logdist	-0.20314	0.030314	-6.7	0	-0.26274	-0.14355
_cons	-0.22808	0.065689	-3.47	0.001	-0.35722	-0.09894

Table B.5 325 Chemical Industry

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	0.679811	0.072038	9.44	0	0.538234	0.821387
loggdpus	0.117185	0.094319	1.24	0.215	-0.06818	0.302551
logpop	-0.12226	0.046503	-2.63	0.009	-0.21365	-0.03087
logpopus	-0.22451	0.143976	-1.56	0.12	-0.50747	0.058449
logexrate	-0.02964	0.023707	-1.25	0.212	-0.07623	0.016954
logdist	-0.12953	0.023001	-5.63	0	-0.17473	-0.08432
logserv	0.292402	0.05501	5.32	0	0.184291	0.400513
logservus	-0.01386	0.171732	-0.08	0.936	-0.35137	0.323645
_cons	-0.02716	0.047602	0.57	0.569	-0.12072	0.066386

Table B.6 334 Computer and Electronics Industry

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	0.234847	0.07415	3.17	0.002	0.089138	0.380555
loggdpus	0.024643	0.097683	0.25	0.801	-0.16731	0.216597
logpop	0.130957	0.047566	2.75	0.006	0.037487	0.224426
logpopus	-0.25461	0.1487	-1.71	0.088	-0.54681	0.037594
logexrate	0.022221	0.024469	0.91	0.364	-0.02586	0.070304
logserv	0.638674	0.057663	11.08	0	0.525363	0.751986
logservus	0.045732	0.177697	0.26	0.797	-0.30345	0.394917
logdist	-0.01108	0.024283	-0.46	0.648	-0.0588	0.036636
_cons	0.110333	0.049108	2.25	0.025	0.013803	0.206803

Table B.7 335 Electrical Equipment, Appliances and Components

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	0.01989	0.120161	0.17	0.869	-0.21623	0.256008
loggdpus	0.103966	0.159961	0.65	0.516	-0.21036	0.418292
logpop	0.010075	0.077794	0.13	0.897	-0.14279	0.162942
logpopus	0.082012	0.244247	0.34	0.737	-0.39794	0.561961
logexrate	-0.1148	0.040012	-2.87	0.004	-0.19342	-0.03617
logserv	0.264616	0.093287	2.84	0.005	0.081306	0.447927
logservus	-0.15667	0.29158	-0.54	0.591	-0.72962	0.416293
logdist	-0.02665	0.039844	-0.67	0.504	-0.10494	0.051646
_cons	0.066293	0.080592	0.82	0.411	-0.09207	0.224658

Table B.8 332 Fabricated Metal Products

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	0.311619	0.070042	4.45	0	0.173955	0.449283
loggdpus	0.045627	0.089891	0.51	0.612	-0.13105	0.222305
logpop	0.11748	0.044219	2.66	0.008	0.030569	0.204391
logpopus	-0.19779	0.138025	-1.43	0.153	-0.46907	0.073494
logexrate	0.003398	0.022577	0.15	0.88	-0.04098	0.047773
logserv	0.598627	0.05346	11.2	0	0.493554	0.7037
logservus	-0.02521	0.165003	-0.15	0.879	-0.34952	0.299094
logdist	-0.06034	0.021805	-2.77	0.006	-0.1032	-0.01748
_cons	-0.02449	0.045764	0.54	0.593	-0.11444	0.065457

Table B.9 114 Fish and Marine Industry

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	-0.22848	0.162351	-1.41	0.16	-0.5479	0.090936
loggdpus	0.032036	0.188769	0.17	0.865	-0.33936	0.403429
logpop	0.558507	0.098507	5.67	0	0.364699	0.752316
logpopus	-0.26866	0.285126	-0.94	0.347	-0.82964	0.292308
logexrate	-0.30569	0.056487	-5.41	0	-0.41682	-0.19455
logserv	0.401206	0.130518	3.07	0.002	0.144418	0.657994
logservus	0.116803	0.338734	0.34	0.73	-0.54964	0.783247
logdist	-0.11575	0.040033	-2.89	0.004	-0.19452	-0.03699
_cons	-0.13306	0.095294	-1.4	0.164	-0.32054	0.054432

Table B.10 311 Food and Kindred Industry

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	-0.18462	0.092756	-1.99	0.047	-0.36689	-0.00235
loggdpus	0.004231	0.122696	0.03	0.973	-0.23687	0.245338
logpop	0.398755	0.05991	6.66	0	0.281028	0.516481
logpopus	0.043662	0.188519	0.23	0.817	-0.32679	0.414115
logexrate	-0.00114	0.030848	-0.04	0.971	-0.06176	0.059478
logserv	0.711624	0.072082	9.87	0	0.569978	0.853269
logservus	-0.16072	0.224737	-0.72	0.475	-0.60234	0.280904
logdist	-0.11454	0.030549	-3.75	0	-0.17457	-0.05451
_cons	0.065883	0.061862	1.07	0.287	-0.05568	0.187446

Table B.11 113 Forestry Products Industry

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	0.014146	0.183627	0.08	0.939	-0.34705	0.375345
loggdpus	0.015967	0.200512	0.08	0.937	-0.37845	0.41038
logpop	0.382458	0.108205	3.53	0	0.169617	0.595299
logpopus	-0.26591	0.31107	-0.85	0.393	-0.87779	0.345976
logexrate	0.049501	0.05748	0.86	0.39	-0.06356	0.162566
logserv	0.294794	0.143966	2.05	0.041	0.011608	0.57798
logservus	0.17207	0.36842	0.47	0.641	-0.55262	0.896762
logdist	0.029023	0.046061	0.63	0.529	-0.06158	0.119626
_cons	-0.08224	0.102926	0.8	0.425	-0.2847	0.120215

Table B.12 337 Furniture and Fixtures

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	0.188415	0.098457	1.91	0.056	-0.00512	0.38195
loggdpus	0.072763	0.120445	0.6	0.546	-0.16399	0.309521
logpop	0.206944	0.061265	3.38	0.001	0.086518	0.327371
logpopus	-0.13779	0.185832	-0.74	0.459	-0.50308	0.227494
logexrate	-0.06829	0.030532	-2.24	0.026	-0.1283	-0.00827
logserv	0.538908	0.076039	7.09	0	0.38944	0.688375
logservus	-0.07264	0.221804	-0.33	0.743	-0.50864	0.363356
logdist	-0.1079	0.029027	-3.72	0	-0.16496	-0.05084
_cons	-0.05363	0.0613	0.87	0.382	-0.17412	0.066868

Table B.13 316 Leather and Allied Products Industry

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	-0.41388	0.135824	-3.05	0.002	-0.68077	-0.14698
loggdpus	0.145447	0.180812	0.8	0.422	-0.20985	0.500746
logpop	0.127875	0.087935	1.45	0.147	-0.04492	0.300668
logpopus	-0.39564	0.276085	-1.43	0.153	-0.93815	0.14687
logexrate	0.090315	0.045227	2	0.046	0.001443	0.179188
logserv	0.498816	0.105447	4.73	0	0.291611	0.706021
logservus	0.167301	0.329587	0.51	0.612	-0.48034	0.814945
logdist	0.036487	0.045038	0.81	0.418	-0.05201	0.124987
_cons	0.086993	0.091098	0.95	0.34	-0.09202	0.266001

Table B.14 112 Livestock Industry

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	-0.702	0.148825	-4.72	0	-0.99448	-0.40951
loggdpus	0.006837	0.192769	0.04	0.972	-0.37201	0.385684
logpop	0.573186	0.094736	6.05	0	0.387002	0.759369
logpopus	-0.5427	0.296774	-1.83	0.068	-1.12595	0.040542
logexrate	0.102001	0.048579	2.1	0.036	0.006529	0.197472
logserv	0.717319	0.116188	6.17	0	0.488977	0.94566
logservus	0.256452	0.354022	0.72	0.469	-0.4393	0.952205
logdist	-0.04243	0.047531	-0.89	0.372	-0.13584	0.050981
_cons	0.014706	0.098481	0.15	0.881	-0.17884	0.208249

Table B.15 333 Machinery Industry

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	0.264997	0.061999	4.27	0	0.143149	0.386844
loggdpus	0.11163	0.081007	1.38	0.169	-0.04757	0.270833
logpop	0.086333	0.039949	2.16	0.031	0.007821	0.164846
logpopus	-0.34035	0.12445	-2.73	0.006	-0.58493	-0.09577
logexrate	-0.00326	0.02046	-0.16	0.873	-0.04347	0.036945
logserv	0.676744	0.047444	14.26	0	0.583503	0.769985
logservus	0.06293	0.148325	0.42	0.672	-0.22858	0.354435
logdist	-0.00791	0.019765	-0.4	0.689	-0.04676	0.030931
_cons	0.024047	0.040906	0.59	0.557	-0.05635	0.10444

Table B.16 327 Nonmetallic Mineral Products

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	0.312985	0.085075	3.68	0	0.145766	0.480205
loggdpus	0.064109	0.109894	0.58	0.56	-0.15189	0.280112
logpop	0.213855	0.053771	3.98	0	0.108164	0.319545
logpopus	-0.1945	0.168608	-1.15	0.249	-0.52591	0.13691
logexrate	0.018904	0.027377	0.69	0.49	-0.03491	0.072716
logserv	0.47875	0.066452	7.2	0	0.348136	0.609365
logservus	-0.03587	0.2018	-0.18	0.859	-0.43252	0.360784
logdist	-0.09386	0.026248	-3.58	0	-0.14545	-0.04227
_cons	-0.05983	0.056302	-1.06	0.289	-0.17049	0.050836

Table B.17 511 Newspaper Industry

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	1.426555	0.245628	5.81	0	0.941164	1.911945
loggdpus	-0.2968	0.239003	-1.24	0.216	-0.7691	0.175495
logpop	-0.53065	0.134136	-3.96	0	-0.79572	-0.26558
logpopus	-0.82103	0.337261	-2.43	0.016	-1.4875	-0.15456
logexrate	-0.16856	0.068575	-2.46	0.015	-0.30408	-0.03305
logserv	-0.22565	0.19825	-1.14	0.257	-0.61742	0.166113
logservus	0.872561	0.399686	2.18	0.031	0.082732	1.66239
logdist	-0.03452	0.042514	-0.81	0.418	-0.11853	0.049493
_cons	-0.79145	0.134849	-5.87	0	-1.05792	-0.52497

Table B.18 211 Oil and Gas Industry

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	0.642726	0.186227	3.45	0.001	0.276131	1.009321
loggdpus	-0.05352	0.242283	-0.22	0.825	-0.53046	0.42342
logpop	-0.01686	0.115898	-0.15	0.884	-0.24501	0.211292
logpopus	-0.21558	0.367715	-0.59	0.558	-0.93944	0.508278
logexrate	0.051765	0.068659	0.75	0.452	-0.08339	0.186922
logserv	-0.30136	0.139822	-2.16	0.032	-0.5766	-0.02611
logservus	0.334794	0.441261	0.76	0.449	-0.53384	1.203432
logdist	-0.05167	0.049809	-1.04	0.3	-0.14972	0.046383
_cons	-0.08746	0.125577	0.7	0.487	-0.33467	0.159738

Table B.19 322 Paper Industry

logimports	Coef.	Std. Err.	t	P>t	[95 Conf.	Interval]
loggdp	0.0262451	1.256974	0.21	0.835	-.2207588	0.2732489
loggdpus	0.138371	0.167689	0.83	0.410	-.1911488	0.467892
logpop	0.085947	.0813482	1.06	0.291	-0.739075	0.2458018
logpopus	0.076553	-0.25469	-0.3	0.764	-.5770381	0.423932
logexrate	0.098299	0.042037	2.34	0.02	0.015694	0.180904
logserv	.4300322	.0974211	4.41	.000	.2385931	.6214713
logservus	-0.07952	0.30429	-0.26	0.794	-0.677475	0.518426
logdist	-.0250036	.0415246	-.60	0.547	-.1066023	0.0565951
_cons	0.0413514	0.084074	0.49	0.623	-.1238598	0.2065626

Table B.20 326 Plastics Industry

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	0.000335	0.122828	0	0.998	-0.24102	0.241693
loggdpus	0.031068	0.163512	0.19	0.849	-0.29023	0.35237
logpop	0.030113	0.079521	0.38	0.705	-0.12615	0.186372
logpopus	0.087903	0.249668	0.35	0.725	-0.4027	0.578504
logexrate	-0.04344	0.0409	-1.06	0.289	-0.12381	0.036931
logserv	0.202094	0.095358	2.12	0.035	0.014715	0.389473
logservus	-0.11457	0.298051	-0.38	0.701	-0.70025	0.4711
logdist	-0.0648	0.040728	-1.59	0.112	-0.14483	0.015234
_cons	0.101313	0.082381	1.23	0.219	-0.06057	0.263192

Table B.21 323 Printed Matter and Related Products

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	0.405238	0.075421	5.37	0	0.256984	0.553493
loggdpus	0.107945	0.094684	1.14	0.255	-0.07818	0.294065
logpopus	-0.07895	0.147435	-0.54	0.593	-0.36876	0.210861
logpop	0.13	0.048079	2.7	0.007	0.035492	0.224509
logexrate	0.038183	0.024112	1.58	0.114	-0.00921	0.08558
logserv	0.500388	0.057191	8.75	0	0.387969	0.612808
logservus	-0.1588	0.175431	-0.91	0.366	-0.50365	0.186041
logdist	-0.08983	0.022948	-3.91	0	-0.13494	-0.04473
_cons	-0.1173	0.048968	-2.4	0.017	-0.21356	-0.02104

Table B.22 313 Textile Industry

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	-0.16621	0.127567	-1.3	0.193	-0.41689	0.084469
loggdpus	0.101689	0.170155	0.6	0.55	-0.23268	0.436056
logpop	0.167939	0.082616	2.03	0.043	0.005592	0.330286
logpopus	0.077162	0.258723	0.3	0.766	-0.43125	0.585573
logexrate	0.149528	0.042598	3.51	0	0.065821	0.233236
logserv	0.365804	0.099331	3.68	0	0.170611	0.560998
logservus	-0.1806	0.309073	-0.58	0.559	-0.78795	0.426752
logdist	-0.05075	0.042098	-1.21	0.229	-0.13348	0.031974
_cons	0.077049	0.085507	0.9	0.368	-0.09098	0.245077

Table B.23 336 Transportation Industry

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	0.134735	0.12242	1.1	0.272	-0.10582	0.375293
loggdpus	0.051924	0.162969	0.32	0.75	-0.26831	0.372161
logpop	-0.03108	0.079257	-0.39	0.695	-0.18682	0.124664
logpopus	-0.04215	0.24884	-0.17	0.866	-0.53113	0.446821
logexrate	0.027111	0.040764	0.67	0.506	-0.05299	0.107213
logserv	0.18737	0.095041	1.97	0.049	0.000612	0.374128
logservus	-0.00266	0.297063	-0.01	0.993	-0.5864	0.581068
logdist	-0.12116	0.040593	-2.98	0.003	-0.20093	-0.04139
_cons	0.157787	0.082108	1.92	0.055	-0.00356	0.31913

Table B.24 321 Wood Industry

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	-0.61342	0.121527	-5.05	0	-0.85223	-0.37462
loggdpus	0.230696	0.161481	1.43	0.154	-0.08662	0.548015
logpop	0.36201	0.078445	4.61	0	0.207862	0.516158
logpopus	-0.15544	0.246312	-0.63	0.528	-0.63945	0.328579
logexrate	0.059183	0.040342	1.47	0.143	-0.02009	0.138458
logserv	0.526411	0.094334	5.58	0	0.34104	0.711783
logservus	-0.08017	0.294093	-0.27	0.785	-0.65808	0.497744
logdist	0.039144	0.04004	0.98	0.329	-0.03954	0.117825
_cons	0.052597	0.081096	0.65	0.517	-0.10676	0.211955

Table B.25 212 Minerals and Ore

logimports	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
loggdp	-0.12061	0.204529	-0.59	0.556	-0.5232	0.281971
loggdpus	-0.15167	0.260524	-0.58	0.561	-0.66447	0.361131
logpop	0.042427	0.131162	0.32	0.747	-0.21575	0.300599
logpopus	-0.12651	0.402629	-0.31	0.754	-0.91903	0.666003
logexrate	-0.0244	0.070516	-0.35	0.73	-0.1632	0.114395
logserv	0.089691	0.161863	0.55	0.58	-0.22891	0.408295
logservus	0.19615	0.477506	0.41	0.682	-0.74375	1.13605
logdist	0.016198	0.062252	0.26	0.795	-0.10634	0.138733
_cons	0.044138	0.132096	0.33	0.739	-0.21587	0.30415

Appendix C: Summary Statistics

Table C.1 111 Agriculture Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	645	5.026783	1.670139	0	6.39693
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.2 111 Agriculture Correlation and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.0964	1					
loggdpus	-0.0627	0.0827	1				
logpop	0.1532	0.6845	0.0759	1			
logpopus	-0.0626	0.1016	0.9009	0.093	1		
logexrate	-0.1032	-0.1851	0.0401	0.0716	0.0307	1	
logserv	-0.0134	0.7915	0.2268	0.2353	0.2628	-0.3482	1
logservus	-0.0747	0.0932	0.9469	0.0865	0.9813	0.0358	0.2538
logdist	0.084	0.04	0.0277	0.3101	0.0293	0.2313	-0.1726

Table C.3 112 Livestock & Livestock Products Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	594	4.43017	2.077538	0	6.216606
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.4 112 Livestock & Livestock Products Correlations and Covariance

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.2205	1					
loggdpus	-0.0326	0.0778	1				
logpop	0.2221	0.6868	0.0738	1			
logpopus	-0.0495	0.0963	0.8999	0.0948	1		
logexrate	0.0045	-0.1573	0.0345	0.0883	0.0339	1	
logserv	0.2214	0.7947	0.2202	0.2381	0.2528	-0.3287	1
logservus	-0.0397	0.0897	0.9466	0.0873	0.9814	0.0341	0.2466
logdist	-0.0057	0.0657	0.0326	0.3302	0.0353	0.2211	-0.1578

Table C.5 114 Fish, Fresh/Chilled/Frozen and Other Marine Basic Statistics

Variable	Obs	Mean	Std.	Min	Max
logimports	425	15.65378	3.117196	7.696213	21.41443
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.6 114 Fish, Fresh/Chilled/Frozen and Other Marine Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.5049	1					
loggdpus	0.0652	0.0954	1				
logpop	0.4111	0.6962	0.0951	1			
logpopus	0.0676	0.1215	0.9036	0.124	1		
logexrate	-0.3126	-0.1113	-0.0024	0.1828	-0.0033	1	
logserv	0.4396	0.7912	0.2659	0.2249	0.2985	-0.3482	1
logservus	0.0676	0.1121	0.949	0.114	0.981	-0.0002	0.2902
logdist	-0.0833	0.1017	0.0135	0.3347	0.0164	0.2497	-0.1214

Table C.7 211 Oil and Gas Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	376	2.986719	2.285671	0	5.513429
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.8 211 Oil and Gas Correlations and Covariance

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.3875	1					
loggdpus	0.0562	0.0365	1				
logpop	0.3579	0.7424	0.0641	1			
logpopus	0.0523	0.0444	0.8994	0.089	1		
logexrate	0.0533	-0.0974	-0.0718	0.0571	-0.0569	1	
logserv	0.226	0.804	0.2113	0.3409	0.2267	-0.2874	1
logservus	0.0583	0.041	0.947	0.0798	0.9812	-0.0599	0.2264
logdist	0.0485	0.1501	-0.0025	0.302	0.0166	0.1497	-0.0244

Table C.9 311 Food and Kindred Products Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	629	15.85557	3.360476	7.667158	23.11375
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.10 311 Food and Kindred Products Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.6799	1					
loggdpus	0.0687	0.0871	1				
logpop	0.408	0.6852	0.0834	1			
logpopus	0.0969	0.1043	0.9002	0.0987	1		
logexrate	-0.2326	-0.1764	0.0326	0.0753	0.0254	1	
logserv	0.7045	0.7921	0.2257	0.2363	0.2618	-0.3437	1
logservus	0.0849	0.0966	0.9464	0.0933	0.9813	0.0299	0.2519
logdist	-0.1365	0.0473	0.0276	0.3138	0.0302	0.2211	-0.1666

Table C.11 312 Beverages and Tobacco Products Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	492	14.47918	3.027795	7.72533	20.63566
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.12 312 Beverages and Tobacco Products Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.6517	1					
loggdpus	0.0569	0.0806	1				
logpop	0.2775	0.7368	0.0863	1			
logpopus	0.0778	0.0978	0.9002	0.1071	1		
logexrate	-0.2093	-0.0837	0.0266	0.0975	0.034	1	
logserv	0.7778	0.7775	0.2232	0.2844	0.2588	-0.2923	1
logservus	0.0691	0.0915	0.9467	0.1013	0.9813	0.0354	0.2515
logdist	-0.2208	0.1289	0.0427	0.3264	0.0455	0.176	-0.0741

Table C.13 313 Textiles and Fabrics Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	634	4.3212	2.200151	0	6.251904
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.14 313 Textiles and Fabrics Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.2359	1					
loggdpus	0.0713	0.0883	1				
logpop	0.1444	0.6843	0.0795	1			
logpopus	0.0745	0.1028	0.902	0.094	1		
logexrate	0.0567	-0.1813	0.0345	0.0701	0.0278	1	
logserv	0.2586	0.7893	0.236	0.2319	0.2665	-0.3458	1
logservus	0.0713	0.0959	0.9477	0.0883	0.9814	0.031	0.2594
logdist	-0.0436	0.0435	0.0278	0.3109	0.0307	0.2245	-0.1687

Table C.15 315 Apparel and Accessories Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	647	5.259247	1.37909	0	6.437752
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.16 315 Apparel and Accessories Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.0629	1					
loggdpus	0.0168	0.0841	1				
logpop	0.007	0.6845	0.0762	1			
logpopus	-0.002	0.1029	0.9013	0.0933	1		
logexrate	0.0011	-0.1863	0.0318	0.0703	0.023	1	
logserv	0.1108	0.7911	0.2299	0.2353	0.2658	-0.3523	1
logservus	0.0047	0.0946	0.9473	0.0868	0.9813	0.0276	0.2568
logdist	-0.0226	0.0402	0.0283	0.3101	0.0299	0.229	-0.1717

Table C.17 316 Leather and Allied Products Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	647	5.031027	1.669294	0	6.400258
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.18 316 Leather and Allied Products Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.0559	1					
loggdpus	0.0621	0.0841	1				
logpop	-0.0314	0.6845	0.0762	1			
logpopus	0.0317	0.1029	0.9013	0.0933	1		
logexrate	0.0056	-0.1863	0.0318	0.0703	0.023	1	
logserv	0.1655	0.7911	0.2299	0.2353	0.2658	-0.3523	1
logservus	0.0461	0.0946	0.9473	0.0868	0.9813	0.0276	0.2568
logdist	-0.0112	0.0402	0.0283	0.3101	0.0299	0.229	-0.1717

Table C.19 321 Wood Products Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	632	4.887999	1.788474	0	6.356108
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.20 321 Wood Products Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.0499	1					
loggdpus	0.1056	0.0895	1				
logpop	0.0853	0.6826	0.0827	1			
logpopus	0.0798	0.1087	0.9011	0.0986	1		
logexrate	0.0199	-0.1891	0.027	0.0709	0.0197	1	
logserv	0.1163	0.7923	0.2287	0.2332	0.2648	-0.3574	1
logservus	0.089	0.0998	0.9472	0.0923	0.9812	0.0233	0.255
logdist	0.0528	0.0408	0.0301	0.3112	0.0313	0.2303	-0.1711

Table C.21 322 Paper Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	630	3.819961	2.409088	0	6.144186
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.22 322 Paper Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.4299	1					
loggdpus	0.0971	0.0915	1				
logpop	0.2113	0.6888	0.0768	1			
logpopus	0.0911	0.1055	0.902	0.0939	1		
logexrate	-0.0568	-0.1698	0.0211	0.0723	0.0201	1	
logserv	0.463	0.7883	0.2418	0.2372	0.2713	-0.3354	1
logservus	0.0924	0.0984	0.9477	0.0874	0.9813	0.0225	0.2639
logdist	-0.0523	0.0494	0.0227	0.3117	0.028	0.2182	-0.1627

Table C.23 323 Printed Matter and Related Products Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	533	12.94797	3.321482	7.649693	21.55362
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.24 323 Printed Matter and Related Products Correlations and Covariances

Variables	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.8539	1					
loggdpus	0.005	0.0572	1				
logpop	0.4814	0.6939	0.0666	1			
logpopus	0.0024	0.0646	0.9001	0.0746	1		
logexrate	-0.2142	-0.1703	0.0391	0.0733	0.0363	1	
logserv	0.8065	0.7878	0.2049	0.2386	0.2347	-0.3371	1
logservus	0.0024	0.0635	0.9462	0.0722	0.9818	0.0368	0.2311
logdist	-0.0859	0.0728	0.0433	0.3072	0.043	0.2118	-0.1232

Table C.25 324 Petroleum and Coal Products Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	612	3.015609	2.524168	0	5.924256
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.26 324 Petroleum and Coal Products Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.4452	1					
loggdpus	0.0212	0.0742	1				
logpop	0.149	0.6955	0.0815	1			
logpopus	0.0132	0.0883	0.901	0.0998	1		
logexrate	-0.1993	-0.1467	0.0353	0.0781	0.0347	1	
logserv	0.4254	0.7805	0.2249	0.2358	0.2538	-0.3187	1
logservus	0.0147	0.0828	0.9471	0.0929	0.9815	0.0362	0.2488
logdist	-0.2413	0.0726	0.0364	0.3197	0.0428	0.2081	-0.1444

Table C.27 326 Plastic & Rubber Products Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	648	4.620459	2.035555	0	6.329721
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.28 326 Plastic & Rubber Products Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.2226	1					
loggdpus	0.0394	0.0841	1				
logpop	0.0634	0.6845	0.0762	1			
logpopus	0.0505	0.1029	0.9013	0.0933	1		
logexrate	-0.1537	-0.1863	0.0318	0.0703	0.023	1	
logserv	0.2804	0.7911	0.2299	0.2353	0.2658	-0.3523	1
logservus	0.0451	0.0946	0.9473	0.0868	0.9813	0.0276	0.2568
logdist	-0.1207	0.0402	0.0283	0.3101	0.0299	0.229	-0.1717

Table C.29 327 Non Metallic Mineral Ores Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	546	14.53994	3.601517	5.568345	22.36176
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.30 327 Non Metallic Mineral Ores Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.8173	1					
loggdpus	0.0051	0.0738	1				
logpop	0.4968	0.6905	0.0873	1			
logpopus	0.0086	0.0949	0.9002	0.1083	1		
logexrate	-0.2045	-0.1636	0.0298	0.0927	0.023	1	
logserv	0.7505	0.7912	0.2137	0.2389	0.2475	-0.345	1
logservus	0.0074	0.0876	0.9469	0.1009	0.9814	0.0253	0.2423
logdist	-0.0796	0.0714	0.0329	0.3155	0.0348	0.2176	-0.1413

Table C.31 332 Fabricated Metal Products Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	566	14.26057	4.093736	7.613325	23.42445
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.32 332 Fabricated Metal Products Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.8443	1					
loggdpus	0.0135	0.0675	1				
logpop	0.4397	0.6942	0.0751	1			
logpopus	0.0248	0.091	0.9003	0.093	1		
logexrate	-0.2672	-0.171	0.0381	0.0827	0.0303	1	
logserv	0.8421	0.7919	0.2119	0.245	0.2511	-0.3458	1
logservus	0.0209	0.082	0.9467	0.0856	0.9813	0.0336	0.243
logdist	-0.0915	0.0741	0.0368	0.3151	0.0372	0.216	-0.1367

Table C.33 333 Machinery, Except Electrical Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	588	14.85973	4.166297	7.634337	23.93851
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.34 333 Machinery, Except Electrical Correlations and Covariances

logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv	logservus
logimports	1						
loggdp	0.8475	1					
loggdpus	-0.0078	0.032	1				
logpop	0.4598	0.7268	0.0807	1			
logpopus	-0.0154	0.0498	0.8931	0.1055	1		
logexrate	-0.2602	-0.1414	0.0465	0.0793	0.0457	1	
logserv	0.8006	0.8082	0.2801	0.472	0.298	-0.2441	1
logservus	-0.0172	0.0342	0.9642	0.0885	0.9499	0.0476	0.2903
logdist	-0.0259	0.0974	0.075	0.3057	0.0832	0.2206	-0.0525

Table C.35 334 Computer and Electronic Products Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	635	14.98132	4.367618	6.309918	25.61189
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.36 334 Computer and Electronic Products Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.8172	1					
loggdpus	0.0447	0.0871	1				
logpop	0.4254	0.6858	0.0764	1			
logpopus	0.0495	0.1038	0.9017	0.0936	1		
logexrate	-0.2425	-0.1794	0.0264	0.0709	0.0221	1	
logserv	0.82	0.7933	0.2344	0.2388	0.267	-0.346	1
logservus	0.0476	0.0958	0.9475	0.0869	0.9813	0.0256	0.259
logdist	-0.0711	0.0463	0.0264	0.3125	0.0297	0.2233	-0.1689

Table C.37 335 Electrical Equipment, Appliances & Components Basic Statistics

Variable	Obs	Mean	Std. Dev	Min	Max
logimports	648	4.490916	2.11918	0	6.302619
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.38 335 Electrical Equipment, Appliances & Comps Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.3009	1					
loggdpus	0.0708	0.0841	1				
logpop	0.0808	0.6845	0.0762	1			
logpopus	0.0763	0.1029	0.9013	0.0933	1		
logexrate	-0.2542	-0.1863	0.0318	0.0703	0.023	1	
logserv	0.3836	0.7911	0.2299	0.2353	0.2658	-0.3523	1
logservus	0.0722	0.0946	0.9473	0.0868	0.9813	0.0276	0.2568
logdist	-0.111	0.0402	0.0283	0.3101	0.0299	0.229	-0.1717

Table C.39 336 Transportation Equipment Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	648	4.206718	2.273535	0	6.244167
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.40 336 Transportation Equipment Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.2924	1					
loggdpus	0.0648	0.0841	1				
logpop	0.0807	0.6845	0.0762	1			
logpopus	0.0654	0.1029	0.9013	0.0933	1		
logexrate	-0.109	-0.1863	0.0318	0.0703	0.023	1	
logserv	0.3459	0.7911	0.2299	0.2353	0.2658	-0.3523	1
logservus	0.0656	0.0946	0.9473	0.0868	0.9813	0.0276	0.2568
logdist	-0.1757	0.0402	0.0283	0.3101	0.0299	0.229	-0.1717

Table C.41 337 Furniture and Fixtures Basic Statistics

Variable	Obs	Mean	Std. Dev	Min	Max
logimports	544	14.19315	3.610159	5.843544	23.44755
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.42 337 Furniture and Fixtures Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.7553	1					
loggdpus	0.0212	0.061	1				
logpop	0.3922	0.6699	0.0564	1			
logpopus	0.0244	0.081	0.899	0.076	1		
logexrate	-0.3179	-0.1905	0.0444	0.0765	0.0436	1	
logserv	0.7503	0.7977	0.2243	0.2184	0.2549	-0.3534	1
logservus	0.0205	0.0723	0.9459	0.0696	0.9813	0.0463	0.2466
logdist	-0.1446	0.053	0.0132	0.3035	0.0159	0.225	-0.1484

Table C.43 511 Newspapers, Books & Other Published Matter Basic Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
logimports	160	12.14138	2.373729	7.646832	16.83724
loggdp	578	23.97549	1.863965	19.4306	29.27214
loggdpus	648	30.06781	0.04693	29.98035	30.11611
logpop	648	16.12662	1.599653	11.12368	21.01467
logpopus	648	19.51439	0.023611	19.47779	19.54902
logexrate	643	3.265752	2.709218	-2.89864	22.62881
logserv	549	4.127796	2.641877	0	11.32446
logservus	576	12.52186	0.360845	11.83873	13.0103
logdist	648	8.967749	0.541395	6.598359	9.677719

Table C.44 511 Newspapers, Books & Other Published Matter Correlations and Covariances

Variable	logimports	loggdp	loggdpus	logpop	logpopus	logexrate	logserv
logimports	1						
loggdp	0.6706	1					
loggdpus	0.0933	0.2477	1				
logpop	0.273	0.7102	0.1311	1			
logpopus	0.0918	0.2781	0.9153	0.1453	1		
logexrate	-0.1017	0.0607	-0.0584	0.1204	-0.0259	1	
logserv	0.6199	0.7743	0.4592	0.2178	0.5006	-0.121	1
logservus	0.1027	0.2654	0.9565	0.142	0.98	-0.0307	0.4867
logdist	-0.0875	0.024	0.0155	0.1598	0.0144	0.0576	-0.0869

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