ESSAYS ON INTERNATIONAL TRADE

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Declaration

I hereby declare that this thesis is my original work and it has been written by me in its entirety. I have duly acknowledged all the sources of information which have been used in the thesis.

This thesis has also not been submitted for any degree in any university previously.

Signed: Yu Jiajie

Date: **May 15, 2017**

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Contents

Summary

This thesis consists of three independent chapters. To be more specific, the bulk of my thesis aims to answer the following questions:

1. Does trade openness facilitate output growth via improving the access to intermediate inputs?

2. How does corruption affect the pattern of trade?

3. How long is the duration of cultural goods export from China?

These topics seem to be diverse, but they are connected by the idea that there are linkages between trade and development. The main objective of my thesis is to identify the linkages, to quantify the costs and benefits associated with them, and to derive relevant policy implications.

The first chapter, "Trade Openness, Intermediate Inputs, and Output Growth", investigates whether trade openness facilitates output growth via improving the access to intermediate inputs. Specifically, we examine if industrial sectors with higher intermediate input diversity will grow relatively faster in those countries that are more open to trade. Through an adoption of the difference-in-differences approach, we find strong evidence that this is true for a large sample of countries in the 1963-2011 period. The results are robust to a series of specification checks and unlikely to be driven by omitted variables,

outliers, or reverse causality.

The second chapter, "Corruption and the Pattern of Trade",[1] examines how corruption affects the pattern of trade. By adopting the measure of sales unpredictability, our findings provide evidence of a novel channel through which corruption plays an important role in shaping the pattern of trade. In particular, we find that corruption decreases trade volumes in a more severe way for industries with a higher degree of sales unpredictability, as these industries are more likely to be subject to the rent-seeking behavior. The trade-impeding effect of corruption is both statistically significant and economically sizeable. Our results are robust to controlling for a wide range of alternative explanations.

The third chapter, "Survive and Thrive: the Duration of Cultural Goods Export from China", employs survival analysis to study the duration of cultural goods export from China. We use the disaggregated product-level data from 1995 to 2013 to explore the export dynamics of Chinese cultural goods and investigate the underlying determinants. It is found that the early stage of exporting relationship is characterized by the high hazard rate. However, if Chinese cultural goods can survive in the foreign market during the early stage, they will face a lower probability of failure and tend to survive a longer

[1] This is co-authored with Prof. Davin CHOR and Prof. Quoc-Anh DO.

period. In addition, we find that the cultural distance is more of an obstacle to the exports of cultural goods.

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Chapter 1

Trade Openness, Intermediate Inputs, and Output Growth

1.1 Introduction

Does trade boost growth? This question of great importance attracts extensive attention mostly on account of its vital implication for economic advancement. So far examining the relationship between trade openness and output growth remains one of the major challenges in the field of international economics. In spite of a major wave of trade liberalization undertaken during the last several decades, the debate on the causality between trade and growth is still open (Rodríguez and Rodrik, 2000 [93]). Ultimately, whether trade openness has positive effect on growth is an empirical question, as theoretical literature tends to provide mixed results based on diverse model assumptions. This study thereupon aims to shed light on this topic and examines the relationship from an empirical perspective.

There are two major issues related to the empirical analyses of trade-growth linkage: the way trade openness is measured on the one hand, and the identification methodology on the other hand. To measure trade openness, the most straightforward approach is to adopt the ratio of total trade volume (i.e., the sum of exports and imports) relative to GDP. This simple measure, however, is subject to criticism with regard to the endogeneity problem. For instance, better growth performance will lead to increased exchange of goods and thus enhance the total trade volume, which could cause the bias in estimation resulting from simultaneity. An alternative indicator of openness has been proposed by Sachs and Warner (1995) [98] based upon several specific trade policies, and afterwards revisited by Wacziarg and Welch (2008) [111] with updated data. Since trade-related policies play a large and often decisive role in defining the status of trade liberalization, the openness indicator constructed using the Sachs-Warner criteria enables us to assess how trade policies influence the outcome of growth. It is worth noting that the composite policy-based openness indicator alone is not necessarily a complete solution to the simultaneity problem. Therefore, we employ a difference-in-differences estimation strategy to further mitigate the concern about endogeneity, and to better establish a causal link running from trade openness to output growth.

To deepen our understanding of the causality between trade and growth, it is instructive to focus on a specific channel through which trade openness may affect output growth. In particular, increased access to intermediate inputs could play an important role in promoting output growth when trade opens up. The objective of this paper is to scrutinize whether trade openness facilitates output growth via improving the access to intermediate inputs. The output-promoting effects are expected to be more pronounced in industries where intermediate inputs are more diversified, since these industries would benefit more from trade liberalization. Therefore, we intend to investigate if industrial sectors with higher intermediate input diversity will grow relatively faster in those countries that are more open to trade.

The main contribution of this study is to provide concrete evidence that industries diversified in intermediate goods will indeed experience higher output growth rates in more outward-oriented countries. The empirical analysis is conducted based upon 22 industries from 123 countries in the period of 1963-2011. More importantly, our results are robust to a series of specification checks and unlikely to be driven by omitted variables, outliers, or reverse causality. Firstly, a difference-in-differences estimation strategy is undertaken to examine the research hypothesis. We incorporate an exhaustive set of pairwise fixed effects and control for a number of determinants as best we can in the estimation. Secondly, our findings remain qualitatively identical and quantitatively similar after trimming the outliers. Thirdly, the concern about reverse causality should be alleviated as we focus on the industry-level growth rather than the country-level growth. Moreover, the carefully constructed measures utilized in the estimation should be able to further shield against the endogeneity issue.

The remainder of this chapter is structured as follows. The next section, Section 1.2, reviews the related literature. Section 1.3 elaborates our research hypothesis, illustrates the underlying rationale of the hypothesis, and elucidates the estimation strategy employed to test the hypothesis. Section 1.4 describes the data sources and provides some summary statistics. Section 1.5 presents our empirical results, robustness checks, and relevant discussions. Finally, Section 1.6 concludes.

1.2 Literature Review

Exploring the foundation of the relationship between trade and growth appears to be a promising area of research. There is a large number of studies which attempt to investigate the underlying mechanism through which trade liberalization fosters economic growth. In a remarkably influential paper, Frankel and Romer (1999) [40] exploit an instrumental variable (IV) approach to disentangle the causality in the estimation. Nonetheless, what they genuinely estimate is not the effect of trade on growth per se, but the effect of trade on standards of living (i.e., income per capita). In addition, Rodríguez and Rodrik (2000) [93] point out that Frankel and Romer's geographically constructed trade share of GDP may not be a valid IV, as geography could potentially affect income per capita through other determinants besides trade, such as quality of institutions and factor endowments. Moreover, Rodríguez and Rodrik (2000) [93] extensively re-examine a recent round of empirical research with regard to the growth effects of trade openness, including Dollar (1992) [29], Ben-David (1993) [10], Sachs and Warner (1995) [98], and Edwards (1998) [32]. One common finding of these studies is about the positive impact of trade openness on economic growth. In particular, Sachs and Warner (1995) [98] construct a neatly dichotomous policy indicator of trade openness and affirm the assertion that outward-oriented economies will typically outperform inward-oriented economies in terms of growth outcome. Subsequently, Wacziarg and Welch (2008) [111] update the Sachs-Warner policy-based openness indicator and extend their study with more recent data. It is found that countries which liberalize their trade regimes will experience average annual growth rates that are about 1.5 percentage points higher than before trade liberalization.

In this paper, we aim to explore the interplay between trade openness and output growth with a particular focus on the channel of intermediate inputs. Previous studies have shown that increased access to intermediate inputs will enhance firm productivity in several countries, including Indonesia (Amiti and Konings, 2007 [2]), Chile (Kasahara and Rodrigue, 2008 [62]), India (Goldberg et al., 2010 [42]), and Hungary (Halpern et al., 2015 [46]). One common feature of this strand of literature is to identify the productivity gains from trade through imported intermediate goods based on plant-level micro data. It has been established that industries are better able to achieve production improvement and increase the level of productivity by importing more varieties of intermediate inputs under liberalized regimes.

Apart from the empirical evidence, theoretical models also provide enlightened insights into an understanding of the interrelation between trade and growth through the impacts of intermediate inputs. In line with the empirics, the importance of intermediate inputs for productivity growth has been emphasized in numerous trade and growth models (e.g., Ethier, 1982 [34]; Romer, 1987 [95]; Markusen, 1989 [78]; Grossman and Helpman, 1991 [43]; Rivera-Batiz and Romer, 1991 [92]). In these models, increased access to intermediate inputs will generate both static and dynamic gains from trade. On the one hand, when trade barriers are dismantled, output level will be promoted by improving access to intermediate inputs that were previously unavailable or available but at a higher cost. The instantaneous improvement of productivity will bring about the static gains. On the other hand, access to a wide variety of intermediate inputs after trade liberalization can also create technological spillovers and lower the costs of innovations, which in turn will engender the dynamic gains.

This paper examines whether trade openness facilitates output growth via improving the access to intermediate inputs. The identification strategy undertaken by our study is to make predictions based on the interaction of industry characteristics with country characteristics. Fundamentally, the interaction term in estimation specification arises due to the complementarity between industries' intrinsic features and countries' essential particularities. Ever since the reduced form difference-in-differences rationale provided by Rajan and Zingales (1998) [90], research interest of focusing on this specific type of interaction has been revived. By exploiting an interaction between the external finance dependence at the industry-level and the financial development at the country-level, Rajan and Zingales (1998) [90] uncover that financially developed countries will grow disproportionately faster in industries relying more on external financing. Fisman and Love (2007) [39] revisit the results in Rajan and Zingales (1998) [90] and further corroborate the hypothesis that financial development benefits industries with global growth opportunities. As counterpart examples, Beck (2003) [9] and Manova (2008 [76], 2013 [77]) interact country measure of private credit availability with industry measure of external finance dependence to demonstrate that countries with better financial development tend to export more in industries that are more dependent on external financing. Through adopting an analogous approach, Romalis (2004) [94] provides structural underpinnings of Heckscher-Ohlin forces, while Levchenko (2007) [71] and Nunn (2007) [87] separately examine institutional impacts on comparative advantage. Putting all these elements together, Chor (2010) [22] extends the Eaton and Kortum (2002) [31] model to quantify different sources of comparative advantage, which are determined by the interactions between industry characteristics and country characteristics.

1.3 Hypothesis and Estimation

1.3.1 Research Hypothesis

In light of existing literature and previous analysis, we propose the following research hypothesis: *industrial sectors with higher intermediate input diversity will grow relatively faster in those countries that are more open to trade.*

The rationale behind our research hypothesis lies in the following considerations. First of all, if intermediate good use is dominated by a few inputs for certain industries, these industries are more exposed to hold-up problems in the production process (Levchenko, 2007 [71]). For example, the major intermediate input supplier may use this type of specific relation as a leverage to "hold up" the producer who is heavily relying on that particular intermediate input. Moreover, it has been well-established that the hold-up problem could lead to detrimental economic consequences such as inefficiency and underinvestment (Grossman and Hart, 1986 [44]; Hart and Moore, 1990 [49]; Nunn, 2007 [87]). These resulting organizational frictions will bring about higher costs for producers, which in turn negatively affect their output growth. In the next place, the market of intermediate inputs would be "thicker" for industries located in more liberalized countries. If the intermediate inputs are sold on a global market rather than a domestic market, the scope for hold-up problem is limited as the market becomes more competitive. In other words, hold-up problem is more severe in those countries that are closed to international trade or less outward-oriented. From a macroeconomic perspective, industrial sectors situated in more liberalized countries are less vulnerable to aggregate shocks due to a richer array of practicable alternatives that are available to them. Finally, more accessible imports of intermediate goods could give a big boost to the output growth. By adopting the cutting-edge technologies embedded in imported intermediate inputs from more advanced countries, domestic industries will be capable of taking advantage of research and development (R&D)

abroad and thereby improving the efficiency of production.[1]

The research hypothesis has two key ingredients, one is linked to diversity of intermediate inputs and the other is related to trade openness. On the one hand, the Herfindahl index will be utilized to indicate the diversity of intermediate goods used in the production process. Industry i's Herfindahl index is constructed as $\sum_j \theta_{ij}^2$, where θ_{ij} denotes the share of intermediate input j used in industry i's final good production. Clague (1991a [23], 1991b [24]) adopts the Herfindahl index to measure the self-containment of an industry. It is found that developing countries are more specialized in production that is more self-contained, as these countries have poorly developed distribution and communication infrastructures. The Herfindahl index has also been used as an indicator of input complexity in the literature (e.g., Blanchard and Kremer, 1997 [17]; Cowan and Neut, 2002 [25]).[2] In the context of our study, the Herfindahl index increases with input concentration, namely, decreases with input diversity.

On the other hand, in order to characterize trade openness, we obtain a binary indicator from Wacziarg and Welch (2008) [111], which is built on the Sachs and Warner (1995) [98] criteria. The openness indicator is defined

[1]For instance, Keller (2002) [64] provides notable industry-level empirical evidence of R&D spillovers through trade in differentiated intermediate goods.

[2]Note that the complexity indicator is defined as one minus the Herfindahl index. It equals to zero if there is only one input and tends to one if an industry uses many inputs with equal proportions.

on the basis of trade policies rather than total trade volume as a share of GDP, which should mitigate the concern about endogeneity in our estimation. We will elaborate on this point in more depth when addressing the reverse causality issue in a later section.

1.3.2 Estimation Equation

We test the research hypothesis by estimating the following equation:

$$Growth_{ict} = \alpha + \beta HI_i \times Openness_{ct} + \boldsymbol{X'_{ict}\gamma} + D_{ic} + D_{it} + D_{ct} + \epsilon_{ict}, \quad (1.1)$$

where i indexes industry, c denotes countries, and t represents time period here and throughout this paper. The dependent variable $Growth_{ict}$ is the output growth rate for industry i in country c at time t. The coefficient of interest β is on the interaction between the Herfindahl index of intermediate inputs HI_i and the trade liberalization dummy variable $Openness_{ct}$. According to the aforementioned research hypothesis, β is expected to be negative (i.e., $sgn(\beta) < 0$) on account of the fact that the Herfindahl index decreases with the intermediate input diversity.[3] We employ a variety of fixed effects in this panel specification. Specifically, industry-country, industry-time, and country-time fixed effects are indicated by D_{ic}, D_{it}, and D_{ct} respectively. This set of

[3]Recall that the more an industry diversifies in its intermediate inputs, the lower the Herfindahl index would be. In principal, we can construct the diversity index as $1 - HI_i$ or just simply $-HI_i$, which is increasing in the intermediate input diversity. Nevertheless, doing so will not change the interpretations of our findings in any way whatsoever.

fixed effects included in the estimation equation is exhaustive, in the sense that only those explanatory variables that are varying by industry, country and time simultaneously can be estimated. This should largely alleviate the concerns regarding omitted variables and alternative explanations. In particular, the estimate of β is essentially capturing how the within-country variations in trade openness affect the output growth differentially across industries. Moreover, $\boldsymbol{X_{ict}}$ is a vector of controls for robustness checks, which will be discussed in details later. In a conventional manner, α is the intercept while ϵ_{ict} is the idiosyncratic disturbance.

In addition to employing a set of saturated pairwise fixed effects, we further control for other potential determinants of comparative advantage. To be more specific, the vector of controls $\boldsymbol{X_{ict}}$ consists of various interactions between industry characteristics and country characteristics, incorporating overall development controls as well as factor endowment controls. Firstly, it includes the interaction between industry-level Herfindahl index and country-level real GDP per capita. This is meant to isolate the effect of trade openness from that of comprehensive economic development. Secondly, it incorporates the interaction between industry-level Herfindahl index and country-level Polity score. According to Marshall et al. (2016) [79], the Polity score characterizes the institutional constraints. This interaction control is able to account for the episodes of democracy that may not be captured by trade openness or real GDP per capita. Thirdly, it embodies the interaction between industry indicators of financial vulnerability (e.g., external finance dependence, asset tangibility) and country measures of financial development. This is to control for the well-documented distinctive growth effects of financial development (Rajan and Zingales, 1998 [90]; Braun, 2003 [19]; Levchenko et al., 2009 [72]). For instance, outside capital would be more accessible to industries with higher level of tangibility for the reason that tangible assets can serve as collateral to raise funds. This contributing factor could in practice influence the growth outcome of industrial sectors, especially for those that are intensive in upfront fixed cost (e.g., R&D expenditure). Finally, it is comprised of interactions between industries' physical capital, human capital, and natural resources intensities with countries' corresponding per capita factor endowments. It has been demonstrated that factor proportions are indeed important determinants of production structure and international trade (Romalis, 2004 [94]), which will translate into the sources of comparative advantage. Therefore it is of great importance to control for the Heckscher-Ohlin determinants in our estimation. To sum up, exploiting a full set of controls in this way allows us to further shield against omitted variables bias.

Prior to the discussion of our empirical findings, we will describe the data sources in details and expound industry characteristics and country characteristics in the next section.

1.4 Data Sources

The empirical analysis requires three major components: data on output growth across industries and countries for different time periods, measures of industry characteristics, and measures of country characteristics. This section describes the data we utilize in our empirical study, explains the construction of corresponding measures, and provides some descriptive statistics.

1.4.1 Output Growth

We obtain the output data from INDSTAT2 2014 ISIC Rev. 3 database published by United Nations Industrial Development Organization (UNIDO). The data are arranged at the 2-digit level of the International Standard Industrial Classification (ISIC) Revision 3 pertaining to the manufacturing sector, which comprises 22 industries (see Table 1A.1). The INDSTAT2 2014 ISIC Rev. 3 database contains data for the period from 1963 to 2011 for 123 countries (see Table 1A.2). The availability of almost 50 years of data makes it possible to compare the growth performance of different industries across a large number of countries that are under liberalized and non-liberalized regimes. As expected, the three-dimensional panel data are unbalanced.

For the benchmark regression, the dependent variable is 5-year average growth rate computed over non-overlapping windows. In addition, 3-year average and annual growth rates will be used for the purpose of comparisons.

1.4.2 Industry Characteristics

Our empirical strategy requires an indicator that captures the diversity level of intermediate inputs for different industries. Specifically, we adopt the Herfindahl index, which is computed from the U.S. Input-Output (IO) Use Table in 2002 (cf. Stewart et al., 2007 [106]), in order to characterize the degree of diversity for intermediate inputs.

We follow Cowan and Neut (2002) [25] and construct the Herfindahl index from the 2002 U.S. IO Use Table. The 6-digit IO categories are mapped into the 2-digit ISIC Rev. 3 using the concordance tables provided by the U.S. Bureau of Economic Analysis (BEA) and the U.S. Census Bureau (CB).

Computing the Herfindahl index from the U.S. data is motivated by the following considerations. Firstly, the existing structure of intermediate good use is mainly driven by technological differences across industries and these differences tend to persist across countries. Secondly, our identification strategy does not require that industries have exactly the same Herfindahl index of intermediate inputs in each country. It merely rests on the assumption that the ranking of industries' indices remains relatively stable for different countries. The measures constructed from the U.S. data indeed capture quite a considerable technological component that is inherent in the manufacturing sector and are thus reasonable proxies for ranking different industries across countries. Finally, using the U.S. as a reference country is convenient in virtue of limited data for many other countries in our sample.

In addition, we calculate the Herfindahl index of intermediate inputs using 1997 and 2007 U.S. IO Tables to demonstrate the stability of the index ranking over time. Table 1A.3 lists the three least diversified (denoted by the highest Herfindahl index) and the three most diversified (denoted by the lowest Herfindahl index) industries in terms of using intermediate inputs, for the year 1997, 2002, and 2007 respectively. As has been shown in Table 1A.3, the ranking of industries' indices is rather stable over time. For instance, industries such as refined petroleum products and chemical products are of the highest Herfindahl index, which indicates that they are the least diversified in using the intermediate inputs. On the contrary, industries including furniture and non-metallic mineral products are with the lowest Herfindahl index, which implies that they are the most diversified in using the intermediate inputs. Moreover, Table 1A.4 shows that the coefficients of pairwise correlations are all above 0.9 for the Herfindahl index computed in different years. Hence it is valid to use 2002 as the benchmark year to calculate the Herfindahl index in our empirical analysis, as supported by the preceding findings from Table 1A.3 and Table 1A.4.

The remaining industry measures of external finance dependence, asset tangibility, physical capital intensity, human capital intensity, and natural resources intensity are from Braun (2003) [19]. These measures of industry characteristics are constructed using the data for all publicly listed U.S.-based companies from Compustat's annual industrial files for the 1986-1995 period, with the exception being natural resources intensity that is a binary indicator.

As in Rajan and Zingales (1998) [90], external finance dependence is calculated as the fraction of capital expenditures not financed by internal cash flows. Asset tangibility is similarly defined as the share of net property, plant, and equipment in total book-value assets. Both of these two measures are averaged over the period 1986-1995 for the median U.S. firm in each industry. It is worthwhile to note that the measures of external finance dependence and asset tangibility appear quite stable over time when compared to values computed from 1966-1975 and 1976-1985.

Physical capital intensity corresponds to the median ratio of gross fixed capital formation to value added in the U.S. for the 1986-1995 period in each industry. Human capital intensity records the median ratio of average wage for each industry over that for the whole U.S. manufacturing sector for the 1986-

1995 period. Natural resources intensity is a binary indicator that is equal to 1 for the following industries (and 0 otherwise): wood products (excluding furniture); paper and paper products; coke, refined petroleum products, nuclear fuel; and basic metals.

Table 1A.5 shows the summary statistics of industry characteristics, and Table 1A.6 reports the pairwise correlations of industry characteristics.

1.4.3 Country Characteristics

In addition to the Herfindahl index, the other key element from the interaction term of particular interest is the trade openness variable. We collect the data on trade openness from Wacziarg and Welch (2008) [111], who update the binary indicator originally coded by Sachs and Warner (1995) [98] after a painstaking check of the Sachs-Warner classification of openness. Sachs and Warner (1995) [98] construct a trade openness dummy variable based on five specific trade-related criteria. A country will be classified as closed to trade if it displays at least one of the following five characteristics: average tariff rates are at least 40% (TAR); non-tariff barriers cover at least 40% of trade (NTB); a black market exchange rate is at least 20% lower than the official exchange rate (BMP); a state monopoly on major exports (XMB); or a socialist economic system (SOC). Based on the updated data set provided in Wacziarg and Welch (2008) [98], the trade openness indicator equals to 1 if a country is open to trade and 0 otherwise. It should be emphasized that a country labeled as "closed" under this classification may still engage in international trade but would in principle incur comparatively higher trade costs. Figure 1.1 depicts the number of countries that are open to trade throughout the entire period of 1963-2011. In 1963, out of total 123 countries, only 22 were open to trade based on the above criteria. A major wave of trade liberalization took place between 1980 and 2000, with 63 countries switching from "closed" to "open". And yet 27 countries remained closed to trade after 2000. Figure 1.2 describes the percentage of world population in countries that are open to trade. The share of total population living in countries under liberalized regimes had increased from roughly one fifth to almost a half during the entire sample period.

[Insert Figure 1.1 Here]

[Insert Figure 1.2 Here]

Apart from the trade openness dummy, the remaining measures of country characteristics consist of real GDP per capita, Polity score, financial development, and corresponding factor endowments (i.e., physical capital, human capital, and natural resources) per capita. Real GDP per capita, physical capital per capita, and human capital per capita are all taken from the Penn

World Tables (PWT) Version 9.0. The country-level Polity score is sourced from Polity IV database, which captures the regime authority spectrum on a scale ranging from -10 (hereditary monarchy) to +10 (consolidated democracy). As in Beck et al. (2000) [9], financial development is defined as the ratio of private credit by deposit money banks and other financial intermediaries to GDP, which is from Financial Development and Structure Dataset (updated Nov. 2013). It captures the amount of credit channeled through banks and other financial institutions to private sectors. Following Romalis (2004) [94], natural resources per capita is measured by total land area divided by total population, or equivalently, the inverse of population density. This simple but arguably imperfect estimate of the abundance of natural resources is obtained from the World Development Indicators (WDI).

Table 1A.7 shows the summary statistics of country characteristics, and Table 1A.8 reports the pairwise correlations of country characteristics.

1.5 Empirical Results

In this section, we start with the baseline results. Then we turn to the empirical findings with overall development controls, factor abundance controls, and a full set of controls respectively. After that, we revisit the results focusing on different time periods and using the Herfindahl index constructed based on tradeable goods and services. Lastly, we provide relevant discussions.

1.5.1 Baseline Results

Preliminary estimates of Equation (1.1) with $\boldsymbol{X_{ict}}$ being a null vector, are reported in Table 1.1. The dependent variables are 5-year average growth rate, 3-year average growth rate, and annual growth rate for Column (1), (2), and (3) respectively. At a first glance, the estimated coefficient of interest, β, is negative across all three columns, which corroborates our research hypothesis.

[Insert Table 1.1 Here]

With the aim of coping with potential heteroskedasticity, we report three categories of standard errors in Table 1.1: (i) robust standard errors; (ii) standard errors adjusted for clustering within countries, as in Bertrand et al. (2004) [11]; and (iii) standard errors adjusted for two-way clustering within industries and within countries, following Cameron et al. (2009) [21]. In the first column, the coefficient on the interaction term of the Herfindahl index and the trade openness variable is negative and statistically significant at the 1% level based on three different types of reported standard errors. Similarly, we obtain a highly significant coefficient β with the expected negative sign in the second column. In the third column, we also find the negative and significant effect of the interaction term as predicted by the hypothesis. When annual growth rate enters the estimation equation as the dependent variable, β is significant at the 1% level when standard errors are adjusted for two-way clustering. It remains significant at the 5% level on the basis of robust standard errors as well as standard errors adjusted for clustering within countries. As can be seen from Table 1.1, standard errors adjusted for clustering within countries (shown in parentheses) are the largest across different columns, whereas the other two types of standard errors are relatively smaller. To be more conservative, we report the standard errors clustered by country for the remaining tables.

Despite being all negative and significant, the coefficient of interest apparently varies in magnitudes across different columns in Table 1.1. The absolute magnitude increases as the length of time frame for calculating output growth expands. The absolute magnitude estimated in Column (1) is almost twice as large as that reported in Column (3). Meanwhile, the absolute magnitude of β in Column (2) is approximately two-thirds of that in Column (1). It could be said that the output-promoting effects arising from intermediate input diversity interacting with trade openness are more pronounced for the long-term growth.

Since the difference-in-differences approach is adopted as the identification strategy, one way to get a sense of the magnitude of the interaction term is as follows. The industry at the 25th percentile of the Herfindahl index (i.e., more diversified in intermediate inputs) is machinery, with the index 0.097. Correspondingly, the industry at the 75th percentile of the Herfindahl index (i.e., less diversified in intermediate inputs) is textiles, with the index 0.187. Thus the difference between the 25th percentile and the 75th percentile of the Herfindahl index is -0.09 in the sample of 22 manufacturing industries. Similarly, the difference between the trade liberalization dummy variable denoting "open" and the one denoting "closed" is 1. Take Column (1) in Table 1.1 for instance, the point estimate implies that industry more diversified in intermediate inputs (25th versus 75th percentile) will grow by 2.5 percentage points faster in those countries that are more open to trade, ceteris paribus.[4] Likewise, the differences are 1.8 and 1.6 percentage points for 3-year average growth rate and annual growth rate respectively.[5]

In the next subsection, we will scrutinize whether the baseline results remain intact when other determinants are further incorporated into the estimation equation.

1.5.2 Robustness Checks

Table 1.2 reports the estimation results from a specification that embodies overall development controls. By conditioning on industry measures interact-

[4]Note that the number is calculated as $(-0.281) \times (-0.09) \times 1 = 0.025$.

[5]Similarly, the numbers are calculated as $(-0.200) \times (-0.09) \times 1 = 0.018$ and $(-0.174) \times (-0.09) \times 1 = 0.016$.

ing with real GDP per capita, Polity score, and financial development, we can prevent the estimated coefficient of interest from picking up those effects stemming from overall development factors. Column (1)-(4) of Table 1.2 separately take into account various of interaction terms, viz., (i) Herfindahl index with log real GDP per capita; (ii) Herfindahl index with Polity score; (iii) external finance dependence with financial development; and (iv) asset tangibility with financial development. Column (5) includes the former two interaction terms, since they are directly related to the key measure of Herfindahl index. Column (6) combines the latter two interaction terms, as both of them are pertaining to industry indicators of financial vulnerability interacting with country measures of financial development. Finally, all of the above controls are entirely incorporated in Column (7).

[Insert Table 1.2 Here]

In the first instance, the top row of Table 1.2 indicates that the coefficient of interest is significantly negative across all columns and remains approximately the same magnitude as the baseline estimation from Table 1.1. The estimate of β in Table 1.2 suggests that our results are rather robust after conditioning on overall development controls, although the real GDP per capita and Polity score controls appear to be insignificant in the estimation. In the next place, we find a positive coefficient on the interaction between external finance dependence and financial development, which is statistically significant at the 5% level. It confirms that industries more intensive in outside finance will grow disproportionately faster in countries with higher level of financial development, which echoes the findings in Rajan and Zingales (1998) [90]. Last but not least, the estimated coefficient for the interaction of asset tangibility and financial development is negative. It implies that sectors with less collateralizable assets tend to grow faster in those countries that are more financially advanced, albeit not significantly so. This is also consistent with the results in Braun (2003) [19].

[Insert Table 1.3 Here]

We further explore whether the role of the Herfindahl index interacting with the trade openness differs across subsamples of countries. Therefore, the whole sample has been split into two groups, namely, OECD countries and non-OECD countries, according to the level of overall development. Table 1.3 shows that our findings are mostly robust to the sample division, with the only exception being Column (5). In terms of the coefficient magnitudes, it could be inferred that the effects of trade liberalization are more pronounced in economies with relatively lower level of development (i.e., non-OECD countries), which tend to be less outward-oriented at the very beginning of the time frame.

[Insert Table 1.4 Here]

The standard Heckscher-Ohlin model predicts that countries rich in physical capital, human capital, or natural resources, are more likely to possess comparative advantage in products that are intensive in those abundant input factors. Table 1.4 demonstrates the impacts of Heckscher-Ohlin forces on the pattern of output growth. Specifically, we control for countries' log of per capita physical capital, human capital, and natural resources interacting with industries' corresponding factor intensities. The coefficient of interest, which still carries the expected negative sign, is significant at the 1% level for Columns (1)-(2), at the 5% level for Columns (3)-(4), and at the 10% level for Columns (5)-(6). One noteworthy fact is that only the physical capital interaction term and the natural resources interaction term are occasionally entering the estimation significantly. Moreover, Table 1.4 shows that industries more intensive in physical capital (respectively natural resources) tend to grow faster in countries endowed with abundant physical capital (respectively natural resources). This is in line with the canonical prediction delivered by Heckscher-Ohlin model, which states that factor endowment abundances will translate into sources of comparative advantage for industries that are intensive in those factors. Therefore, controlling for the Heckscher-Ohlin factors in the estimation does not seem to alter our main findings.

[Insert Table 1.5 Here]

Now we turn to the results with a full set of controls and examine whether previous findings remain the same. Table 1.5 encompasses all the controls that we have hitherto examined, including overall development controls and factor abundance controls. Column (1a) is the benchmark regression with 5-year average growth rate being the dependent variable. It is worth noting that the estimated coefficient on the interaction term of our particular interest, β, stays negative and statistically significant at the 1% level. As for the magnitude, it remains virtually identical as the baseline estimate in Table 1.1, suggesting that industry with higher diversity level in intermediate inputs (1st versus 3rd quartile of the Herfindahl index) will grow by 2.6 percentage points faster in countries that are more liberalized in international trade. To gauge the relative importance of all the explanatory variables in the regression, Column (1b) reports the standardized beta coefficients based on the specification in Column (1a). The standardized beta coefficient is meant to capture the change in standard deviation units of the dependent variable induced by one standard deviation change in the independent variable. In other words, one standard deviation change in $HI \times Openness$ will lead to -0.231 standard deviation change in 5-year average output growth rate. To further quantify the impacts of all the explanatory variables, Column(1c) reports the factor changes of growth in the 75th compared to the 25th percentile industry and country. The interaction of $HI \times Openness$ will bring about a change of 2.6 percentage points in growth. Compared with other interactions, it appears to have the greatest impact on the growth outcome. In Column (2), the dependent variable is 3-year average growth rate. The coefficient on $HI \times Openness$ is still negative and statistically significant (at the 5% level). The economic importance of the interaction term remains sizable, as can be deduced from the point estimate. When annual growth rate is used as the dependent variable, Column (3) shows that β remains negative but only tends to approach statistical significance. The estimated coefficient implies a differential of 1.5 percentage points, which is still quite substantial in the context of output growth.

[Insert Table 1.6 Here]

As has been pointed out previously, it is the within-country variations in trade openness that we are exploiting in order to estimate β. Since the overall status of trade liberalization varies substantially across time, it is of particular interest to split the entire sample period into two and re-estimate the specification with a full set of controls. This exercise helps to identify which time episode of liberalization is more important in terms of output growth. As can be seen from Figure 1.1, a major wave of trade liberalization took place between 1980 and 2000. We divide the entire sample time period into two using 1980, 1990, and 2000 as the cut-off respectively. The results are presented in Table 1.6. Three major findings stand out. Firstly, we observe a negative and significant β for the earlier time episodes (i.e., before 1980, before 1990, and before 2000). It suggests that, in contrast to the latter periods, the earlier periods seem to be relatively more important for industrial output growth. Secondly, the estimated effect stemming from the trade openness interacting with the intermediate inputs diversity is remarkably pronounced for the period before 1990, with the magnitude being approximately twice as the benchmark regression for the entire period. Thirdly, the coefficient of interest, β, is omitted in Column (7) for the period after 2000. To be more precise, it has been absorbed by the industry-country fixed effects D_{ic} in Equation (1.1), as there is no variation across time in the trade liberalization dummy variable $Openness_{ct}$ after 2000, which essentially degenerates to $Openness_c$.[6]

[Insert Table 1.7 Here]

Given the emerging consensus on the importance of institutional comparative advantage, we further control for the interaction between the Herfindahl index and the institutional quality as in Levchenko (2007) [71]. Due to data limitations, the institutional quality variable is not available for the entire

[6] As shown in Figure 1.1, the overall status of trade liberalization is quite stable after 2000. As we discussed above, it is the within-country variations in trade openness that result in the estimate of β.

period of 1963-2011. There are two major data sources of institutional quality: "law and order" from International Country Risk Guide (ICRG) back to the mid-1980s, along with "rule of law" from Worldwide Governance Indicators (WGI) mainly after 2000. Since variations across time in the $Openness_{ct}$ variable are essential for estimating β, we thus use the "law and order" data that are available for a relatively longer time span. The results with additional law and order controls are reported in Table 1.7. The estimate of β remains virtually unchanged when we incorporate the interaction between the Herfindahl index and the institutional quality. Taking into account the influence of institutional quality does not alter our main findings. Nevertheless, the insignificance of β is largely due to the sample period, which is similar to Column (3) and Column (5) in Table 1.6.

[Insert Table 1.8 Here]

It is worthwhile to note that the Herfindahl index is constructed using all intermediate inputs, including tradeable goods (e.g., agriculture, fishing, mining, manufacturing, etc.) as well as services (e.g., utility, transportation, communication, financial intermediary, etc.). To better establish that the growth-promoting effect from trade liberalization is indeed operating through the diversity of intermediate inputs which are by nature tradeable, we perform a placebo test by calculating the Herfindahl index based on tradeable goods and services respectively. One would expect to find a significant coefficient for the Herfindahl index using tradeable goods but probably not so for the one using service inputs, since the openness variable is measuring, by and large, to what extend the goods could be freely traded. Table 1.8 confirms that this is exactly the case. We find a negative and significant β in Column (2), in which the Herfindahl index is constructed using tradeable intermediate inputs. In contrast, an insignificant and even positive β appears in Column (3), in which the Herfindahl index is based on service inputs. These results are not surprising given the fact that trade liberalization usually pertains to tradable goods, and should have less of a direct impact on services. Furthermore, Table 1A.9 shows that the Herfindahl index constructed using all inputs is highly and significantly correlated with the one based on tradeable goods, and the coefficient of correlation is close to 0.9. It implies that the diversity of all intermediate inputs is primarily driven by the diversity of tradeable intermediate goods, which further corroborates our research hypothesis.

1.5.3 Discussions

In this subsection, to address the validity of our empirical findings, we provide several related discussions.

In the first place, our results are less likely to be subject to criticism about omitted variable bias. Firstly, this paper adopts a difference-in-differences approach to examine the research hypothesis. The nice feature of this methodology is that we make predictions about growth differences based on the interaction between industry characteristics and country characteristics. As a consequence, it enables us to overcome the concerns about omitted variables. Secondly, one of the major strengths of our empirical strategy is the ability to employ an extensive set of fixed effects. Conditioning on a variety of pairwise fixed effects in the estimation makes it possible to control for various unobservables and guard against omitted variable bias. Lastly, we also take into account the determinants of overall development (e.g., real GDP per capita, Polity score, financial development, institutional quality), along with the factor endowments. These elements are generally believed to have potential impacts on the growth outcome. Importantly, our results remain qualitatively identical and quantitatively similar after incorporating all these controls. Altogether, our empirical findings are robust against omitted variable bias problem.

In the second place, we trim the tails of the growth rate distribution to inspect whether these results are robust to outliers. We re-estimate the same specification after truncating the extreme values and obtain the same findings as before.[7] Reducing the effect of possibly spurious outliers through a truncation leaves our results essentially unchanged. Moreover, we further exclude

[7]Winsorizing the tails leads to a similar outcome as truncating the extreme values in this study.

those countries with less than ten years of data from the sample. By doing so, very few countries are affected in our sample.[8] Once again, we retrieve virtually identical results.

Last but not least, the reverse causality issue is limited in this study for the following considerations. Firstly, reverse causality appears to be a major cause of concern in the trade openness and growth literature. However, the main focus of our investigation is the industry-level growth, rather than the country-level growth. It is unlikely that the growth performance of manufacturing industry could have a huge impact on the timing of trade liberalization. This helps to alleviate the concern about reverse causality. Secondly, the openness variable is constructed based on relevant trade policies, as opposed to the trade volume as a share of GDP, which is usually found to be positively correlated with the growth. The exact timing of trade liberalization is arguably exogenous from the perspective of manufacturing industry. Finally, the Herfindahl index of intermediate inputs is calculated using the U.S. data, instead of being constructed individually for each and every country. This feasible method also helps to shield against the endogeneity problem. The variation in intermediate input diversity across sectors allows us to establish

[8]Seven countries with less than ten years of observations are Benin (BEN), Belarus (BLR), Croatia (HRV), Liberia (LBR), Lesotho (LSO), Tajikistan (TJK), and Uganda (UGA).

more firmly that the direction of causality is indeed running from trade openness to growth.

Taken all together, we provide well-grounded evidence that our empirical findings are unlikely to be driven by omitted variables, outliers, or reverse causality.

1.6 Conclusion

This paper seeks to shed light on understanding the underlying relationship between trade openness and output growth with a specific focus on the diversity of intermediate inputs. We provide concrete evidence that industrial sectors with higher intermediate input diversity will grow relatively faster in those countries that are more open to trade. The estimation indicates that an industry more diversified in intermediate inputs (25th versus 75th percentile) will grow by 2.6 percentage points faster in more outward-oriented countries. These results are not only statistically significant, but also economically sizable.

In the context of the trade literature, our study suggests substantial effects of trade openness on output growth, which provides important policy implications. A broader lesson from this empirical analysis is that identifying the mechanism through which trade openness facilitates output growth helps to evaluate different trade policies. Our findings point to additional gains from trade liberalization that could be whittled down by increased protectionism, and more so for industrial sectors that are diversified in intermediate inputs. Finally, examining the microfoundations of the linkage between trade openness and output growth remains to be an important topic for future research.

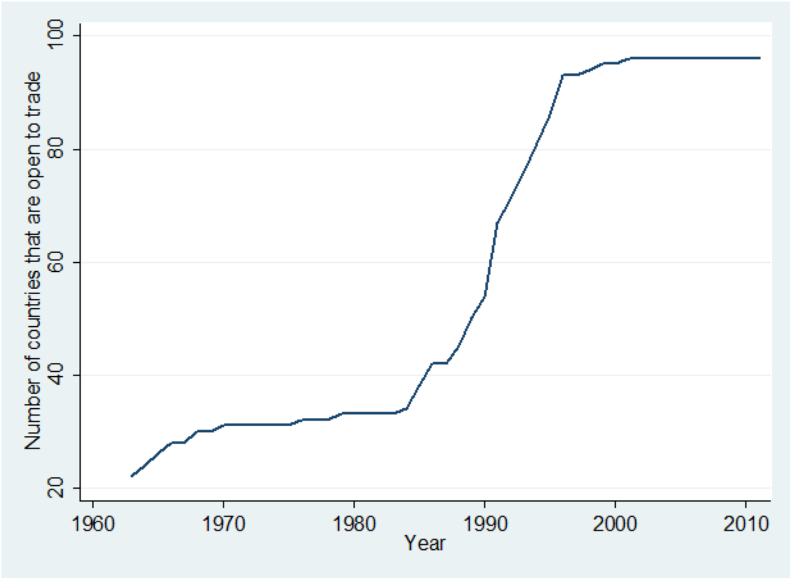

Figure 1.1: Number of countries that are open to trade

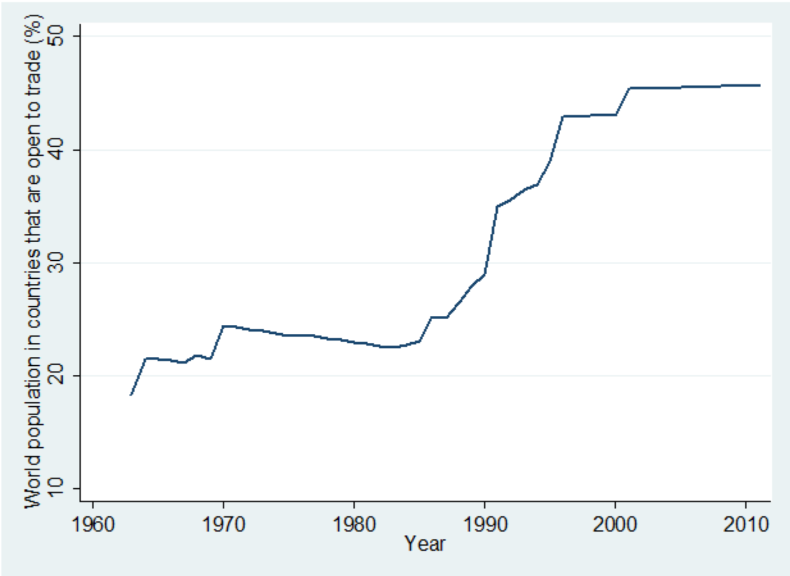

Figure 1.2: Percentage of world population in countries that are open to trade

Table 1.1: Baseline results

Dependent Variable	5-Year Average Growth	3-Year Average Growth	Annual Growth
	(1)	(2)	(3)
HI × Openness	-0.281	-0.200	-0.174
	[0.078]***	[0.074]***	[0.082]**
	(0.087)***	(0.082)***	(0.083)**
	{0.047}***	{0.055}***	{0.051}***
Industry-Country FE	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes
Country-Time FE	Yes	Yes	Yes
# Industries	22	22	22
# Countries	118	121	123
# Observations	8,593	15,311	50,766
R-squared	0.69	0.55	0.43

Notes: The dependent variables are 5-year average growth rate, 3-year average growth rate, and annual growth rate for Column (1), (2), and (3) respectively. Constant terms are included in the regressions, but not displayed in the table. Three categories of standard errors are reported below the coefficients, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively. The first, reported in square brackets, is robust standard errors. The second, reported in parentheses, is standard errors adjusted for clustering within countries. The third, reported in curly brackets, is standard errors adjusted for two-way clustering within industries and within countries.

Table 1.2: Results with overall development controls

Dependent Variable	5-Year Average Growth						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
HI × Openness	-0.275***	-0.285***	-0.282***	-0.288***	-0.287***	-0.286***	-0.292***
	(0.085)	(0.089)	(0.098)	(0.099)	(0.086)	(0.099)	(0.105)
HI × ln(RGDPPC)	0.039				0.018		-0.002
	(0.100)				(0.101)		(0.104)
HI × Polity		0.008			0.007		0.005
		(0.005)			(0.006)		(0.006)
FinDep × FinDevt			0.038**			0.037**	0.039**
			(0.018)			(0.018)	(0.018)
Tang × FinDevt				-0.031		-0.019	-0.018
				(0.041)		(0.041)	(0.043)
Industry-Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Industries	22	22	22	22	22	22	22
# Countries	115	114	107	107	112	107	103
# Observations	8,498	8,282	7,534	7,534	8,232	7,534	7,296
R-squared	0.70	0.71	0.63	0.63	0.71	0.63	0.64

Notes: The dependent variable is 5-year average growth rate. Constant terms are included in the regressions, but not displayed in the table. Standard errors are clustered by country, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 1.3: Results with overall development controls for different country groups

Dependent Variable	5-Year Average Growth			3-Year Average Growth			Annual Growth		
Country Group	All	OECD	Non-OECD	All	OECD	Non-OECD	All	OECD	Non-OECD
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
HI × Openness	-0.292***	-0.242***	-0.350***	-0.270**	-0.126	-0.379***	-0.209*	-0.211***	-0.281*
	(0.105)	(0.077)	(0.123)	(0.111)	(0.077)	(0.144)	(0.107)	(0.075)	(0.153)
HI × ln(RGDPPC)	-0.002	0.131	-0.007	0.116	0.228**	0.122	0.010	0.140	-0.029
	(0.104)	(0.135)	(0.145)	(0.094)	(0.109)	(0.145)	(0.079)	(0.127)	(0.107)
HI × Polity	0.005	0.009	0.003	0.004	0.003	0.004	0.001	0.004	-0.004
	(0.006)	(0.006)	(0.010)	(0.006)	(0.003)	(0.010)	(0.006)	(0.005)	(0.009)
FinDep × FinDevt	0.039**	-0.009	0.052**	-0.007	0.002	-0.006	0.032**	0.012	0.041**
	(0.018)	(0.017)	(0.021)	(0.021)	(0.020)	(0.028)	(0.016)	(0.021)	(0.019)
Tang × FinDevt	-0.018	0.010	-0.036	0.037	0.044	0.017	0.011	0.044	-0.004
	(0.043)	(0.036)	(0.059)	(0.047)	(0.037)	(0.069)	(0.038)	(0.045)	(0.052)
Industry-Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Industries	22	22	22	22	22	22	22	22	22
# Countries	103	32	71	108	32	76	109	32	77
# Observations	7,296	3,227	4,069	12,891	5,645	7,246	42,583	18,460	24,123
R-squared	0.64	0.72	0.63	0.54	0.64	0.52	0.36	0.50	0.34

Notes: The dependent variables are 5-year average growth rate for Columns (1)-(3), 3-year average growth rate for Columns (4)-(6), and annual growth rate for Columns (7)-(9). Constant terms are included in the regressions, but not displayed in the table. Standard errors are clustered by country, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 1.4: Results with factor endowment controls

Dependent Variable	5-Year Average Growth		3-Year Average Growth		Annual Growth	
	(1)	(2)	(3)	(4)	(5)	(6)
HI × Openness	-0.225***	-0.219***	-0.192**	-0.184**	-0.153*	-0.144*
	(0.076)	(0.076)	(0.085)	(0.086)	(0.081)	(0.082)
Kint × ln(KPC)	0.165	0.162	0.371**	0.326**	0.409**	0.379*
	(0.150)	(0.151)	(0.167)	(0.161)	(0.189)	(0.199)
Hint × ln(HPC)	0.003	0.003	0.002	0.011	-0.053	-0.046
	(0.048)	(0.048)	(0.049)	(0.048)	(0.065)	(0.067)
Nint × ln(NPC)		0.008		0.037*		0.024
		(0.017)		(0.021)		(0.028)
Industry-Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Time FE	Yes	Yes	Yes	Yes	Yes	Yes
# Industries	22	22	22	22	22	22
# Countries	112	112	115	115	117	117
# Observations	8,335	8,208	14,825	14,603	49,048	48,378
R-squared	0.67	0.67	0.55	0.55	0.39	0.39

Notes: The dependent variables are 5-year average growth rate for Columns (1)-(2), 3-year average growth rate for Columns (3)-(4), and annual growth rate for Columns (5)-(6). Constant terms are included in the regressions, but not displayed in the table. Standard errors are clustered by country, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 1.5: Results with a full set of controls

Dependent Variable	5-Year Average Growth			3-Year Average Growth	Annual Growth
	(1a)	(1b)	(1c)	(2)	(3)
HI × Openness	-0.288***	-0.231***	-0.026	-0.265**	-0.171
	(0.106)			(0.112)	(0.105)
HI × ln(RGDPPC)	-0.048	-0.317	-0.007	0.092	-0.005
	(0.112)			(0.102)	(0.090)
HI × Polity	0.005	0.053	0.007	0.005	0.001
	(0.006)			(0.006)	(0.006)
FinDep × FinDevt	0.026*	0.225*	0.012	-0.017	0.020
	(0.015)			(0.022)	(0.015)
Tang × FinDevt	-0.039	-0.143	-0.008	0.027	-0.001
	(0.046)			(0.049)	(0.040)
Kint × ln(KPC)	0.223	0.562	0.011	0.082	0.148
	(0.168)			(0.154)	(0.184)
Hint × ln(HPC)	0.034	0.243	0.014	0.009	-0.011
	(0.055)			(0.064)	(0.061)
Nint × ln(NPC)	-0.004	-0.135	0.000	0.013	-0.000
	(0.021)			(0.022)	(0.036)
Industry-Country FE	Yes	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes	Yes
Country-Time FE	Yes	Yes	Yes	Yes	Yes
# Industries	22	22	22	22	22
# Countries	100	100	100	105	105
# Observations	7,033	7,033	7,033	12,473	41,123
R-squared	0.64	0.64	0.64	0.54	0.36

Notes: The dependent variables are 5-year average growth rate for Columns (1a)-(1c), 3-year average growth rate for Column (2), and annual growth rate for Column (3). Column (1b) reports standardized beta coefficients from Column (1a), while Column (1c) reports the factor changes of growth in the 75th compared to the 25th percentile industry and country. Constant terms are included in the regressions, but not displayed in the table. Standard errors are clustered by country, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 1.6: Results with a full set of controls for different time periods

Dependent Variable	5-Year Average Growth						
Time Period	All Time	T<=1980	T>1980	T<=1990	T>1990	T<=2000	T>2000
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
HI × Openness	-0.288***	-0.235*	-0.208	-0.661***	-0.003	-0.277**	—
	(0.106)	(0.126)	(0.137)	(0.108)	(0.099)	(0.130)	—
HI × ln(RGDPPC)	-0.048	0.133	0.128	0.297	0.222	-0.046	-0.488
	(0.112)	(0.383)	(0.211)	(0.212)	(0.349)	(0.139)	(1.198)
HI × Polity	0.005	0.003	0.006	0.003	0.010	0.006	-0.027
	(0.006)	(0.010)	(0.007)	(0.008)	(0.012)	(0.008)	(0.048)
FinDep × FinDevt	0.026*	0.028	0.022	0.063***	0.020	0.032	-0.079
	(0.015)	(0.037)	(0.020)	(0.023)	(0.023)	(0.021)	(0.060)
Tang × FinDevt	-0.039	-0.040	-0.025	-0.093	-0.028	-0.035	-0.023
	(0.046)	(0.179)	(0.056)	(0.085)	(0.074)	(0.060)	(0.138)
Kint × ln(KPC)	0.223	0.105	0.280	-0.062	0.067	0.342*	-2.101
	(0.168)	(1.034)	(0.313)	(0.440)	(0.552)	(0.204)	(2.212)
Hint × ln(HPC)	0.034	0.238	0.066	-0.065	0.168	-0.068	0.912
	(0.055)	(0.296)	(0.100)	(0.167)	(0.183)	(0.076)	(0.658)
Nint × ln(NPC)	-0.004	0.008	0.020	-0.023	0.028	-0.022	0.657*
	(0.021)	(0.120)	(0.043)	(0.048)	(0.083)	(0.034)	(0.330)
Industry-Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Industries	22	22	22	22	22	22	22
# Countries	100	58	95	70	88	96	71
# Observations	7,033	1,784	5,249	3,071	3,962	5,082	1,951
R-squared	0.64	0.70	0.63	0.70	0.65	0.66	0.69

Notes: The dependent variable is 5-year average growth rate. The time periods are all time, before 1980, after 1980, before 1990, after 1990, before 2000, and after 2000, for Column (1), (2), (3), (4), (5), (6), and (7) respectively. Constant terms are included in the regressions, but not displayed in the table. Standard errors are clustered by country, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 1.7: Results with additional law and order controls after 1985

Dependent Variable	5-Year Average Growth			
Time Period	T>1985			
	(1)	(2)	(3)	(4)
HI × Openness	-0.127	-0.126	-0.095	-0.096
	(0.119)	(0.119)	(0.155)	(0.155)
HI × Law and Order		0.043		0.008
		(0.039)		(0.043)
HI × ln(RGDPPC)			0.155	0.147
			(0.310)	(0.306)
HI × Polity			0.015	0.015
			(0.010)	(0.010)
FinDep × FinDevt			0.027	0.027
			(0.020)	(0.020)
Tang × FinDevt			-0.042	-0.043
			(0.066)	(0.067)
Kint × ln(KPC)			-0.005	-0.004
			(0.418)	(0.418)
Hint × ln(HPC)			0.120	0.117
			(0.121)	(0.124)
Nint × ln(NPC)			0.038	0.039
			(0.055)	(0.054)
Industry-Country FE	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes
Country-Time FE	Yes	Yes	Yes	Yes
# Industries	22	22	22	22
# Countries	97	97	88	88
# Observations	5,041	5,041	4,448	4,448
R-squared	0.64	0.64	0.64	0.64

Notes: The dependent variable is 5-year average growth rate. The time period corresponds to after 1985, for which the law and order data are available from International Country Risk Guide (ICRG). Constant terms are included in the regressions, but not displayed in the table. Standard errors are clustered by country, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 1.8: Results with Herfindahl index for different input categories

Dependent Variable	5-Year Average Growth		
HI Constructed Using	All Inputs	Tradeable Goods	Services
	(1)	(2)	(3)
HI × Openness	-0.288***	-0.168**	0.012
	(0.106)	(0.067)	(0.187)
HI × ln(RGDPPC)	-0.048	0.007	0.111
	(0.112)	(0.073)	(0.235)
HI × Polity	0.005	0.001	-0.005
	(0.006)	(0.004)	(0.010)
FinDep × FinDevt	0.026*	0.026*	0.027*
	(0.015)	(0.015)	(0.015)
Tang × FinDevt	-0.039	-0.041	-0.026
	(0.046)	(0.045)	(0.046)
Kint × ln(KPC)	0.223	0.164	0.290
	(0.168)	(0.178)	(0.177)
Hint × ln(HPC)	0.034	0.032	0.030
	(0.055)	(0.054)	(0.063)
Nint × ln(NPC)	-0.004	-0.004	0.002
	(0.021)	(0.021)	(0.021)
Industry-Country FE	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes
Country-Time FE	Yes	Yes	Yes
# Industries	22	22	22
# Countries	100	100	100
# Observations	7,033	7,033	7,033
R-squared	0.64	0.64	0.64

Notes: The dependent variable is 5-year average growth rate. The Herfindahl index is constructed using all inputs, tradeable goods, and services for Column (1), (2), and (3) respectively. Constant terms are included in the regressions, but not displayed in the table. Standard errors are clustered by country, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 1A.1: List of 2-digit ISIC Rev. 3 industries (22)

ISIC Code	Industry
15	Food and beverages
16	Tobacco products
17	Textiles
18	Wearing apparel, fur
19	Leather, leather products and footwear
20	Wood products (excluding furniture)
21	Paper and paper products
22	Printing and publishing
23	Coke, refined petroleum products, nuclear fuel
24	Chemicals and chemical products
25	Rubber and plastics products
26	Non-metallic mineral products
27	Basic metals
28	Fabricated metal products
29	Machinery and equipment n.e.c.
30	Office, accounting and computing machinery
31	Electrical machinery and apparatus
32	Radio, television and communication equipment
33	Medical, precision and optical instruments
34	Motor vehicles, trailers, semi-trailers
35	Other transport equipment
36	Furniture; manufacturing n.e.c.

Table 1A.2: List of countries in the sample (123)

Code	Country Name	Code	Country Name	Code	Country Name
ALB	Albania	GBR	United Kingdom	MYS	Malaysia
ARG	Argentina	GEO	Georgia	NER	Niger
ARM	Armenia	GHA	Ghana	NGA	Nigeria
AUS	Australia	GMB	Gambia	NIC	Nicaragua
AUT	Austria	GRC	Greece	NLD	Netherlands
AZE	Azerbaijan	GTM	Guatemala	NOR	Norway
BDI	Burundi	HND	Honduras	NPL	Nepal
BEL	Belgium	HRV	Croatia	NZL	New Zealand
BEN	Benin	HTI	Haiti	PAK	Pakistan
BFA	Burkina Faso	HUN	Hungary	PAN	Panama
BGD	Bangladesh	IDN	Indonesia	PER	Peru
BGR	Bulgaria	IND	India	PHL	Philippines
BLR	Belarus	IRL	Ireland	PNG	Papua New Guinea
BOL	Bolivia	IRN	Iran	POL	Poland
BRA	Brazil	IRQ	Iraq	PRT	Portugal
BRB	Barbados	ISL	Iceland	PRY	Paraguay
BWA	Botswana	ISR	Israel	ROU	Romania
CAF	Central African Republic	ITA	Italy	RUS	Russia
CAN	Canada	JAM	Jamaica	SEN	Senegal
CHE	Switzerland	JOR	Jordan	SGP	Singapore
CHL	Chile	JPN	Japan	SLV	El Salvador
CHN	China	KAZ	Kazakhstan	SOM	Somalia
CIV	Côte d'Ivoire	KEN	Kenya	SVK	Slovakia
CMR	Cameroon	KGZ	Kyrgyzstan	SVN	Slovenia
COG	Congo	KOR	South Korea	SWE	Sweden
COL	Colombia	LBR	Liberia	SWZ	Swaziland
CRI	Costa Rica	LKA	Sri Lanka	SYR	Syria
CYP	Cyprus	LSO	Lesotho	THA	Thailand
CZE	Czech Republic	LTU	Lithuania	TJK	Tajikistan
DEU	Germany	LUX	Luxembourg	TTO	Trinidad and Tobago
DNK	Denmark	LVA	Latvia	TUN	Tunisia
DOM	Dominican Republic	MAR	Morocco	TUR	Turkey
DZA	Algeria	MDA	Moldova	TZA	Tanzania
ECU	Ecuador	MDG	Madagascar	UGA	Uganda
EGY	Egypt	MEX	Mexico	UKR	Ukraine
ESP	Spain	MKD	Macedonia	URY	Uruguay
EST	Estonia	MLT	Malta	USA	United States
ETH	Ethiopia	MMR	Myanmar	VEN	Venezuela
FIN	Finland	MOZ	Mozambique	YEM	Yemen
FRA	France	MUS	Mauritius	ZAF	South Africa
GAB	Gabon	MWI	Malawi	ZMB	Zambia

Table 1A.3: Industries with highest and lowest Herfindahl index

Year	Highest Herfindahl Index			Lowest Herfindahl Index		
	Ranking	ISIC Code	Industry	Ranking	ISIC Code	Industry
1997	1	23	Refined petroleum products	1	36	Furniture; manufacturing n.e.c.
	2	18	Wearing apparel, fur	2	26	Non-metallic mineral products
	3	24	Chemicals and chemical products	3	31	Electrical machinery
2002	1	23	Refined petroleum products	1	36	Furniture; manufacturing n.e.c.
	2	18	Wearing apparel, fur	2	26	Non-metallic mineral products
	3	24	Chemicals and chemical products	3	33	Medical and precision instruments
2007	1	23	Refined petroleum products	1	36	Furniture; manufacturing n.e.c.
	2	24	Chemicals and chemical products	2	26	Non-metallic mineral products
	3	25	Rubber and plastics products	3	33	Medical and precision instruments

Table 1A.4: Pairwise correlations of Herfindahl index for different years

	HI for 1997	HI for 2002	HI for 2007
HI for 1997	1		
HI for 2002	0.97***	1	
HI for 2007	0.90***	0.95***	1

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Table 1A.5: Summary statistics of industry characteristics

ISIC Code	Industry	Herfindahl Index	External Finance Dependence	Asset Tangibility	Physical Capital Intensity	Human Capital Intensity	Natural Resources Intensity
15	Food and beverages	0.163	0.107	0.329	0.062	0.973	0
16	Tobacco products	0.117	-0.451	0.221	0.018	1.354	0
17	Textiles	0.187	0.401	0.373	0.073	0.688	0
18	Wearing apparel, fur	0.239	0.029	0.132	0.019	0.502	0
19	Leather, leather products and footwear	0.139	-0.109	0.104	0.025	0.610	0
20	Wood products (excluding furniture)	0.171	0.284	0.380	0.065	0.741	1
21	Paper and paper products	0.153	0.176	0.558	0.132	1.139	1
22	Printing and publishing	0.111	0.204	0.301	0.052	0.934	0
23	Coke, refined petroleum products, nuclear fuel	0.507	0.188	0.487	0.135	1.404	1
24	Chemicals and chemical products	0.199	0.212	0.304	0.092	1.308	0
25	Rubber and plastics products	0.157	0.683	0.362	0.077	0.906	0
26	Non-metallic mineral products	0.090	0.062	0.331	0.068	0.952	0
27	Basic metals	0.159	0.046	0.421	0.101	1.175	1
28	Fabricated metal products	0.143	0.237	0.281	0.053	0.914	0
29	Machinery and equipment n.e.c.	0.097	0.445	0.183	0.058	1.119	0
30	Office, accounting and computing machinery	0.153	0.445	0.183	0.058	1.119	0
31	Electrical machinery and apparatus	0.095	0.768	0.213	0.077	1.064	0
32	Radio, television and communication equipment	0.175	0.768	0.213	0.077	1.064	0
33	Medical, precision and optical instruments	0.090	0.961	0.151	0.053	1.234	0
34	Motor vehicles, trailers, semi-trailers	0.191	0.307	0.255	0.071	1.322	0
35	Other transport equipment	0.134	0.307	0.255	0.071	1.322	0
36	Furniture; manufacturing n.e.c.	0.068	0.353	0.226	0.039	0.727	0
	Mean	0.161	0.292	0.285	0.067	1.026	0.182
	Std. Dev.	0.086	0.308	0.112	0.029	0.251	0.386

Table 1A.6: Pairwise correlations of industry characteristics

	HI	FinDep	Tang	Kint	Hint	Nint
HI	1					
FinDep	-0.14	1				
Tang	0.42*	-0.13	1			
Kint	0.50**	0.22	0.82***	1		
Hint	0.21	0.06	0.23	0.49**	1	
Nint	0.48**	-0.18	0.74***	0.66***	0.17	1

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Table 1A.7: Summary statistics of country characteristics

	Mean	Std. Dev.	Min.	25th	Median	75th	Max.
Openness	0.59	0.49	0	0	1	1	1
ln(RGDPPC)	9.03	1.08	5.75	8.29	9.15	9.89	11.34
Polity	3.43	7.17	-10	-5	7	10	10
FinDevt	3.44	0.94	-0.77	2.85	3.42	4.18	5.65
ln(KPC)	10.13	1.30	5.94	9.15	10.25	11.23	12.64
ln(HPC)	2.23	0.73	1.01	1.58	2.24	2.84	3.71
ln(NPC)	9.80	1.41	4.91	9.01	9.69	10.73	13.46

Table 1A.8: Pairwise correlations of country characteristics

	Openness	ln(RGDPPC)	Polity	FinDevt	ln(KPC)	ln(HPC)	ln(NPC)
Openness	1						
ln(RGDPPC)	0.53***	1					
Polity	0.50***	0.56***	1				
FinDevt	0.44***	0.69***	0.39***	1			
ln(KPC)	0.54***	0.94***	0.58***	0.67***	1		
ln(HPC)	0.55***	0.80***	0.65***	0.53***	0.78***	1	
ln(NPC)	-0.14***	-0.04**	-0.09***	-0.20***	-0.09***	-0.04**	1

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Table 1A.9: Pairwise correlations of Herfindahl index for different input categories

	HI for All Inputs	HI for Tradeable Goods	HI for Services
HI for All Inputs	1		
HI for Tradeable Goods	0.89***	1	
HI for Services	-0.06	0.08	1

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Chapter 2

Corruption and the pattern of trade

2.1 Introduction

It is widely accepted that corruption has an important influence on the economic development. However, there is little evidence of the precise mechanisms through which it affects the economic activity. In fact, the debate persists between a view of corruption as a distortionary tax that decreases economic efficiency and a view of corruption as "greasing the wheels" of doing business. On the one hand, corruption has been shown to lower economic growth (Mauro, 1995 [81]), distort government expenditure (Mauro, 1998 [82]), and impede investment (Wei, 2000 [112]). On the other hand, the notion "greasing the wheels" was coined by Rose-Ackerman (1997) [97] to demonstrate that corruption could be efficiency-enhancing in countries where other facets of governance are defective, since it removes government-imposed rigidities and compensates the consequences of defective bureaucracies. To test whether corruption "greases" or "sands" the wheels, Méon and Sekkat (2005) [85] disentangle the interplay between the impact of corruption on growth and investment, and a wide range of indicators of the governance quality. Their findings tend to reject the hypothesis of "greasing the wheels" and support the view of "sanding the wheels" on corruption.

Our study provides evidence that corruption acts as a trade barrier and its deterrent effect is more pronounced in industries with a higher degree of sales unpredictability. Specifically, we argue that corruption constitutes an impedient as it diminishes the expected profit from trade. This impeding effect is even stronger for industries where the sales of products are more unpredictable, since contingent shipments are more prevalent for these industries and they are more likely to be subject to the rent-seeking behavior within the customs administration. Indeed, according to a large multinational survey of opinion leaders commissioned by the World Bank (World Bank, 2003 [113]), customs are generally ranked among the most corrupt government agencies.[1] To examine how corruption impacts trade volumes across different sectors, we focus on the corruption effect in exporting and importing procedures, including both custom clearance and other administrative processes required for international

[1] The survey included 2,600 opinion leaders in 48 developing and industrial countries.

trade. Corruption in customs, and other administrative processes required for trading, impacts trade flows through the power to delay the goods in transit. In effect, corruption may manifest itself as the bribe payment in exchange for faster processing, which should be considered as trade costs that are accruing to each transaction. Therefore, we expect that corruption has an overall deterring effect on trade and a differentially stronger effect in sectors with a higher degree of sales unpredictability.

To the extent that timely shipping is more important for goods with uncertain demand, time-related corruption is equivalent to the trade cost that is increasing in the time-sensitivity of the traded goods. Time-sensitivity is defined as the rate at which the expected value of a given product decreases with the time it takes in transit. We characterize it using the measure of sales unpredictability built in Serfaty-de Medeiros (2007) [104]. The underlying rationale of adopting sales unpredictability as a measure of time-sensitivity, is that, the ex ante expected values of goods decrease with time-to-market since forecasting errors will increase with the time lag and hence create potential over-stocks and under-stocks. For instance, by the time a product reaches its destination, the market demand for it has vanished, its value drops substantially. In this regard, the existence of unanticipated variations in demand levels is indeed an important source of time-sensitivity. The advantage of employing the measure of sales unpredictability is that it has been constructed for a large array of sectors using firm-level data and is distinctly interpretable in an explicit theoretical framework by Serfaty-de Medeiros (2007) [104]. In addition, it has been shown to influence the choice of air versus sea transportation, implying that the sales unpredictability is indeed an empirically important element of time-sensitivity.

We introduce an interaction term between the sales unpredictability at the sector-level with the corruption at the country-level and find that its coefficient is significantly negative. Specifically, it is the variation in the effect of corruption across sectors with different degrees of sales unpredictability that enables us to identify the novel mechanism. The empirical results corroborate the hypothesis that the detrimental effect of corruption on trade flows is stronger in sectors that experience a higher degree of sales unpredictability. In addition, we incorporate an extensive set of controls for further robustness checks.

The remainder of this chapter is structured as follows. The next section, Section 2.2, provides a review of related literature. Section 2.3 describes the data we utilize in the empirical study. Section 2.4 presents identification strategies and estimation results. Finally, Section 2.5 concludes.

2.2 Literature Review

This paper relates to two main strands of literature, with one examining the relationship between corruption and trade, and the other investigating the interplay between timeliness and trade.

The impact of corruption on economic activity has been extensively debated in the literature.[2] On the one hand, corruption is viewed as an impediment that distorts agents' decisions and decreases economic efficiency (e.g., Krueger, 1974 [68]; Rose-Ackerman, 1978 [96]; Klitgaard, 1988 [65]; Shleifer and Vishny, 1993 [105]; Mauro, 1995 [81], 1998 [82]; Wei, 2000 [112]). On the other hand, the beneficial effects of corruption can be justified by the so-called "greasing the wheels" hypothesis, which states that graft may act as a trouble-saving device, thereby leading to an improvement in the overall efficiency of allocating resources (e.g., Leff, 1964 [70]; Leys, 1965 [73]; Bailey, 1966 [5]; Huntington, 1968 [59]; Lui, 1985 [75]; Beck and Maher, 1986 [7]; Lien, 1986 [74]; Rose-Ackerman, 1997 [97]). Knack and Keefer (1995) [66] investigate how institutional quality affects economic performance and point out that more direct indicators are needed to properly account for the influence of institutions. In the context of trade, Levchenko (2007) [71] and Nunn (2007) [87] study the effect of institutional quality on comparative advantage and the

[2] See Bardhan (1997) [6], Aidt (2003) [1], and Svensson (2005) [107] for detailed surveys.

pattern of trade. In contrast, our paper focuses on the impact of corruption on trade and examines the underlying mechanism. Based on a standard gravity approach extended to incorporate institutional quality indicators and price indices, Anderson and Marcouiller (2002) [3] find that corruption and imperfect contract enforcement dramatically reduce international trade. What differs from Anderson and Marcouiller (2002) [3] is that a direct measure of corruption is embodied in our empirical analysis. Dutt and Traca (2010) [30] develop a corruption-augmented gravity model and empirically identify the dual impact of corruption on trade flows. The dual role of corruption, in terms of "extortion" or "evasion", hinges on the level of tariffs. More specifically, they show that corruption itself could be either a trade-impeding extortionary factor when tariffs are low, or a trade-enhancing tool to evade tariffs in an environment of high tariffs. Thede and Gustafsson (2012) [108] perform a detailed examination of a systematic multifaceted corruption impact on trade. Their estimation results provide strong evidence of negative corruption effects on economic exchange. Using a rich dataset on bribe payments at ports matched to firm-level data, Sequeira and Djankov (2014) [103] investigate how corruption affects firm behavior. They further document the inefficiency of corruption in transport networks and its potential costs.

There is also a series of papers that are specifically analyzing how the interplay between timeliness and demand uncertainty influences trade, location, and modal choice (e.g., Evans and Harrigan, 2005 [35]; Harrigan and Venables, 2006 [48]; Hummels, 2007a [55], 2007b [56]; Harrigan, 2010 [47]; Hummels and Schaur, 2010 [57]). Particularly, in a seminal paper, Hummels (2001) [54] examines the importance of time as a trade barrier, estimates the magnitude of time costs, and relates these to pattern of trade. It is found that each additional day spent in transport reduces the probability that the U.S. sources a manufactured good from a given country by 1% to 1.5%.[3] Serfaty-de Medeiros (2007) [104] takes a close look at how sales unpredictability affects the choice of transportation mode and the distance elasticity. The paper develops a model with heterogeneous firms under demand uncertainty along with empirical estimations of its predictions. It shows that firms facing higher unpredictability have more incentives to choose air transportation over sea transportation. At the sector-level, unpredictability predicts the prevalence of air transportation, which in turn determines the distance elasticity of trade flows. In our paper, the methodology of constructing the sales unpredictability measure is drawn from Serfaty-de Medeiros (2007) [104]. Djankov et al. (2010) [28] study how time delays affect trade and find that the overall time taken by administra-

[3] Hummels (2001) [54] estimates that each day saved in shipping time is worth 0.8% ad valorem for manufactured goods. In a later version of the study, Hummels and Schaur (2013) [58] report that each day in transit is equivalent to an ad valorem tariff ranging between 0.6% and 2.3%.

tive procedures has a negative effect on trade. The estimation results of a gravity equation indicate that each additional day that a product is delayed prior to being shipped reduces trade by more than 1%. The size of the effect suggests that a one-day reduction in delays is equivalent to reducing the distance to trading partners by about 70 kilometers on average. Martincus et al. (2015) [80] estimate the effects of customs-related delays on firms' exports and show that customs-driven delays have a significantly negative impact on firms' foreign sales along several dimensions.

Our paper bridges the literature on corruption and trade with the literature on timeliness and trade. It contributes to the existing literature by precisely identifying how corruption deters trade through rent-seeking activities in administrative procedures. More specifically, we show that corruption decreases trade more severely in sectors where products are more time-sensitive, or equivalently, more unpredictable in terms of sales. In order to determine the channel through which corruption hinders trade, our empirical analysis will be focusing on the interaction between a pivotal sector-level characteristic, sales unpredictability, with an important country-level institutional variable, corruption. One important feature of this identification strategy is that it enables us to directly control for industry fixed effects and country fixed effects, leading to an estimation that has the identical logic as a difference-in-differences approach (see Rajan and Zingales, 1998 [90]; Romalis, 2004 [94]; Chor, 2010 [22]).

2.3 Data Sources

2.3.1 Trade Data

Data on trade flows are from BACI (Base pour l'Analyse du Commerce International) developed by the CEPII (Centre d'Etudes Prospectives et d'Informations Internationales). After reconciling the declarations and correcting for various inconsistencies of the exporters and the importers, BACI has a larger coverage of countries for which trade data are available, as compared to the original UN Comtrade dataset (Gaulier and Zignano, 2010 [41]).

BACI provides bilateral trade data at the Harmonized System (HS) 6-digit level. We map the 1992 version 6-digit HS categories into the 1987 version 3-digit SIC format using the concordance weights derived from Feenstra et al. (2005) [37].

2.3.2 Industry Characteristics

Unpredictability

The measure of unpredictability is constructed at the 3-digit SIC level, following the methodology in Serfaty-de Medeiros (2007) [104]. For each firm in a given 3-digit SIC sector, we obtain the unpredictable share of sales growth as the residual of a prediction equation including lagged values of sales growth at both the firm-level and the sector-level,[4] together with the quarterly dummies accounting for seasonality. The unpredictability for each firm is built by taking the standard deviation of the unpredictable share of sales growth. The unpredictability for each 3-digit SIC sector, as one of the major industry characteristics in the estimation, is a median value of the unpredictability across all the firms in that particular sector.

To see the construction of the unpredictability measure more clearly, consider the following prediction equation for each firm:

$$\begin{aligned} ln\Delta S_t = \kappa_1 ln\Delta S_{t-1} + \kappa_2 ln\Delta S_{t-2} + \kappa_3 ln\Delta S_{t-3} + \lambda_1 ln\Delta S'_{t-1} \\ + \lambda_2 ln\Delta S'_{t-2} + \lambda_3 ln\Delta S'_{t-3} + \sum_{i=1}^{4} \mu_i Q_i + \omega_t, \end{aligned} \tag{2.1}$$

where t is the quarter index, S_t and S'_t are the sales at the firm-level and at the sector-level in quarter t respectively, $\Delta S_t = \frac{S_t}{S_{t-1}}$, $\Delta S'_t = \frac{S'_t}{S'_{t-1}}$. Q_i are quarterly dummies, and the residual ω_t is the unpredictable share of sales growth in the prediction equation. The unpredictability for each firm is given by $\hat{\sigma} = stdev(\hat{\omega})$, whereas the unpredictability for each 3-digit SIC sector is taking a median value of $\hat{\sigma}$ across all the firms within the sector. Note that

[4] In contrast to Serfaty-de Medeiros (2007) [104], we further include the lagged values of sales growth at the sector-level, which also appear to have substantial explanatory powers in the prediction equation.

the sectoral measure of unpredictability ranges from 0.027 to 0.181, with the mean of 0.092 and the standard deviation of 0.029.

However, the measure of unpredictability is not available across a large sample of countries. We therefore rely on the commonly made assumption that the sectoral measure is intrinsic to each industry and does not vary dramatically across countries. Moreover, our identification strategy does not require that each industry has exactly the same measure of unpredictability for different countries. It only rests on the assumption that the ranking of the unpredictability measure remains relatively stable across countries.[5] We take the U.S. as a reference country to calculate the unpredictability using Compustat database over the period 1990-1999.

Factor Intensity

Factor intensity variables are calculated for each 3-digit SIC industry from the NBER-CES Manufacturing Industry Database. Human capital intensity is the log of the ratio of non-production workers to total employment. Physical capital intensity is the log of the ratio of real capital stock to total employment. Both variables are taking the average over the period 1990-1999.

[5] see Rajan and Zingales (1998) [90] for further discussion.

External Finance Dependence

The external finance dependence variable is constructed following Rajan and Zingales (1998) [90] using Compustat database over the period 1990-1999. A firm's dependence on external finance is the share of capital expenditures not financed by internal cash flow. The median value across firms in each 3-digit SIC category is adopted.

2.3.3 Country Characteristics

Corruption

The measure of corruption is sourced from Worldwide Governance Indicators (WGI) that are constructed based on a variety of surveys (Kaufmann et al., 2009 [63]). In terms of the country samples, the WGI dataset has a better coverage than other corruption perception datasets such as International Country Risk Guide (ICRG) and Corruption Perceptions Index (CPI) from Transparency International (TI).

Focusing on a specific dimension of governance in WGI, "Control of Corruption", we take the opposite of the index (i.e., multiplied by -1) to create an indicator that is increasing in the level of corruption. The data are available for 1996, 1998, 2000, and annually for 2002-2013. The indicator of corruption follows a standard normal distribution, with the mean of zero, the standard deviation of one, and ranges from approximately -2.5 to +2.5, with higher values corresponding to more severe corruption.

Factor Endowments

Human capital per worker and physical capital per worker are constructed using Penn World Table (PWT 8.1) and World Development Indicators (WDI).

GDP per Capita

The variable of GDP per Capita is from Penn World Table (PWT 8.1).

Polity

The indicator of the democracy at the country-level is from Polity IV database, which captures the regime authority spectrum on a scale ranging from -10 (hereditary monarchy) to +10 (consolidated democracy).

Trading Procedures

The data on exporting and importing procedures are from Doing Business dataset under the section of "Trading across Borders". It records the number of documents, the time, and the cost associated with the logistical process of exporting and importing goods.

Financial Development

The financial development variable is from Beck et al.'s (2000) [9] Financial Development and Structure Dataset (updated Nov. 2013). The level of financial development is defined as the log of private credit by deposit money banks and other financial intermediaries divided by GDP.

2.4 Empirical Results

2.4.1 Summary Statistics

Prior to the discussion of the main empirical findings, we provide the summary statistics of industry characteristics in Table 2A.1, the summary statistics of country characteristics in Table 2A.2, and the pairwise correlations of country characteristics in Table 2A.3. In addition, the industries with highest and lowest measure of unpredictability are listed in Table 2A.4. Note that the unbalanced panel dataset consists of 197 countries and territories (see Table 2A.5), 105 3-digit SIC manufacturing industries (see Table 2A.6) and 15 years (i.e., 1996, 1998, 2000, and 2002-2013, for which the data on corruption are available) in the most extensive scenario.

We first take a look at whether a country's corruption level is negatively correlated with its trade volumes. Figure 2.1 plots each exporter's log of average exports (across different industries and years) against its average level of corruption (over the entire sample period). Analogously, Figure 2.2 is the importer's counterpart.

[Insert Figure 2.1 Here]

[Insert Figure 2.2 Here]

As can be seen from the two figures above, the correlation is indeed significantly negative for both exports and imports. In addition, in terms of the magnitude, the estimated coefficients differ from each other, with -1.15 for exports and -0.81 for imports. The magnitude differential implies that, in comparison with the importers, corruption hinders trade flows in a more severe way for exporters. Without taking into account the industry characteristics, we find that the overall corruption effect on trade volumes is negative, which is in accordance with a wide range of literature.[6] The next step is to further explore how corruption deters trade flows when incorporating the sales unpredictability into our analysis.

Here we look at two specific industries with different degrees of sales unpredictability: one at the 90th percentile of the unpredictability measure (i.e., more unpredictable), which is SIC 381 (search, detection, navigation, guidance, aeronautical, and nautical systems, instruments, and equipment); and the other at the 10th percentile of the unpredictability measure (i.e., less unpredictable), which is SIC 204 (grain mill products). Focusing on these two industries, Figure 2.3 and Figure 2.4 demonstrate that the correlations between the level of corruption for exporters (respectively importers) and their

[6] For example, Shleifer and Vishny (1993) [105], Bardhan (1997) [6], Aidt (2003) [1], and Svensson (2005) [107].

export (respectively import) volumes remain significantly negative.

[Insert Figure 2.3 Here]

[Insert Figure 2.4 Here]

In addition to being downward sloping for both industries, the fitted line for SIC 381 at the 90th percentile of the unpredictability measure, is obviously steeper than that for SIC 204 at the 10th percentile of the unpredictability measure. In other words, the trade-impeding effect stemming from corruption is indeed stronger for an industry that is more unpredictable in terms of sales. However, it should be noted that these graphical results are still preliminary, since we have not taken into account other potential determinants at this stage. We intend to systematically estimate how corruption shapes the pattern of trade and proceed in the following three steps: (1) the pattern of exports; (2) the pattern of imports; and (3) the pattern of bilateral trade.

2.4.2 The Pattern of Exports

For the pattern of exports, we examine whether exporters' corruption will negatively and more severely affect their exports in industries with a higher degree of sales unpredictability. We test the hypothesis by estimating the following equation:

$$lnX_{ikt} = \alpha + \beta_{ex} Unpredictability_k \times Corruption_{it} + \boldsymbol{Z'_{ikt}} \boldsymbol{\gamma_{ex}}$$
$$+ D_{it} + D_{kt} + \epsilon_{ikt}, \tag{2.2}$$

where i indexes exporter, k denotes industry, and t represents time period. The dependent variable is the log of exports from exporter i for industry k in year t. The coefficient of interest, β_{ex}, is on the interaction between $Unpredictability_k$ and $Corruption_{it}$. According to our hypothesis, β_{ex} is expected to be negative (i.e., $sgn(\beta_{ex}) < 0$). Additionally, $\boldsymbol{Z_{ikt}}$ is the vector of controls, which will be discussed in more detail later. D_{it} and D_{kt} are the exporter-year and industry-year fixed effects respectively. In a conventional manner, α is the intercept and ϵ_{ikt} is the disturbance.

[Insert Table 2.1 Here]

Table 2.1 displays the estimation results for the pattern of exports. When evaluating the interactive effect of unpredictability at the industry-level and the corruption at the country-level, we include exporter-year fixed effect D_{it} and industry-year fixed effect D_{kt}. The reason for not including exporter-industry fixed effect (i.e., D_{ik}) is that the interaction term of interest mostly varies at the exporter-industry level. Therefore the exporter-industry fixed effect tends to soak up the variation of the interaction term, which leaves little to be explored. In addition to the panel results in Table 2.1, we also report the cross-sectional results in Table 2A.7,[7] which concentrate on the year of 2006 and simultaneously control for exporter fixed effect D_i and industry fixed effect D_k. For all the estimates, standard errors are clustered by exporter to adjust the potential serial correlation and heteroskedasticity.[8] As can be seen from the comparison between Table 2.1 and Table 2A.7, the panel regressions and the cross-sectional regressions lead to qualitatively and quantitatively similar results. This is not surprising given the fact that it is the cross-sectional variations at the exporter-industry level that we are exploiting in the estimations.

Column (1) of Table 2.1 solely includes the interaction term of particular interest. The negative and highly significant coefficient provides empirical support for our hypothesis, which confirms that corruption acts as an even greater hurdle to the exports of goods with higher sales unpredictability. One way to get a sense of the coefficient magnitude is to see how much smaller export volumes would be for exporting country at the 75th versus 25th percentile of the corruption level, and for the industry at the 75th versus 25th percentile of the unpredictability measure. The interquartile gap of the unpredictability

[7]The specification in Table 2A.7 is: $lnX_{ik} = \alpha + \beta_{ex} Unpredictability_k \times Corruption_i + \boldsymbol{Z'_{ik}\gamma_{ex}} + D_i + D_k + \epsilon_{ik}$, which is analogous to Equation (2.2) with the time dimension being compressed to $t = 2006$. Note that $t = 2006$ is selected simply because this is the very first year for which all of the control variables are available in the data. It should be emphasized that the patterns of cross-sectional results are very similar across different years. These results are not reported due to space constraints, but they are available upon request.

[8]See Bertrand et al. (2004) [11] for further discussion.

at the industry-level is 0.036 (as in Table 2A.1), while the interquartile gap of the corruption at the country-level is 1.382 (as in Table 2A.2). The estimated coefficient in column (1) implies that export volumes would decrease by a sizable factor of $exp(-3.13 \times 0.036 \times 1.382) = 0.86$, namely a 14% decrease, when moving from the 25th percentile country and industry to the 75th percentile.

Column (2) of Table 2.1 controls for unpredictability interacting with log of GDP per capita and the level of democracy, which is to ensure that we are indeed capturing the effect stemming from corruption. There remains a negative and highly significant effect for the interaction between unpredictability and corruption, albeit a modest decrease in the magnitude. Moreover, despite the insignificance, countries with higher GDP per capita and countries that are more democratic will export more in those industries with higher sales unpredictability.

Column (3) of Table 2.1 further controls for the Heckscher-Ohlin forces, the canonical comparative advantage factors, as well as the interaction term of external finance dependence at the industry-level with financial development at the country-level. These determinants are all entering the specification with the expected signs. It suggests that countries which are more abundant in human capital (respectively physical capital) exhibit higher volumes of exports in those industries that are more skill-intensive (respectively capital-intensive).

Similarly, the better financially-developed countries tend to export more in industries that are relying more on external capital funding, which echoes the findings in Beck (2003) [8] and Monova (2008 [76], 2013 [77]). The coefficient on the interaction between corruption and unpredictability remains significantly negative, which is robust to the above controls.

Column (4) of Table 2.1 expands the set of controls to incorporate the trading procedures, which consist of the number of documents, the time, and the cost associated with the logistical process of exporting. After separating the effects arising from the inherent complexity of exporting procedures, the coefficient of interest, β_{ex}, is negative and significant at the 10% level. The point estimate implies that export volumes would decrease by a sizable factor of $exp(-1.75 \times 0.036 \times 1.382) = 0.92$, namely an 8% decrease, when moving from the 25th percentile country and industry to the 75th percentile. In order to gauge the relative importance of all the explanatory variables, Column (4a) reports the standardized beta coefficients from Column (4), and Column (4b) reports the factor changes of exports at the 75th compared to the 25th percentile exporter and industry. The interaction term $Unpredictability \times Corruption$ is apparently one of those determinants that have substantial impacts on the exports. The estimation with a full set of controls confirms the hypothesis that the deterring effect is stronger for industries with higher sales unpredictability located in more corrupt exporters.

2.4.3 The Pattern of Imports

For the pattern of imports, we investigate whether importers' corruption will negatively and more severely affect their imports in industries with a higher degree of sales unpredictability. We test the hypothesis by estimating the following equation:

$$\begin{aligned} lnX_{jkt} = \alpha + \beta_{im} Unpredictability_k \times Corruption_{jt} + \boldsymbol{Z'_{jkt}\gamma_{im}} \\ + D_{jt} + D_{kt} + \epsilon_{jkt}, \end{aligned} \tag{2.3}$$

where j indexes importer, k denotes industry, and t represents time period. The dependent variable is the log of imports to importer j for industry k in year t. The coefficient of interest, β_{im}, is on the interaction between $Unpredictability_k$ and $Corruption_{jt}$. According to our hypothesis, β_{im} is expected to be negative (i.e., $sgn(\beta_{im}) < 0$). $\boldsymbol{Z_{jkt}}$ is the vector of controls. D_{jt} and D_{kt} are the importer-year and industry-year fixed effects respectively.

[Insert Table 2.2 Here]

Table 2.2 presents the estimation results for the pattern of imports. Column (1) is the baseline regression and Column (2) includes a full set of controls. To further quantify the impacts of all the explanatory variables, Column (2a) reports the standardized beta coefficients from Column (2), and Column (2b) reports the factor changes of imports at the 75th compared to the 25th percentile importer and industry. We display the cross-sectional results in Table 2A.8,[9] which are almost identical to the panel estimations. It is found that the coefficient of interest, β_{im}, is negative and highly significant, which is in accordance with our hypothesis. The point estimate in Column (2) indicates that import volumes would decrease by a sizable factor of $exp(-1.69 \times 0.036 \times 1.382) = 0.92$, namely an 8% decrease, when moving from the 25th percentile country and industry to the 75th percentile. As has been shown in Column (2a) and Column (2b), similar to the pattern of exports, the interaction term $Unpredictability \times Corruption$ is of great importance among all the determinants for the pattern of imports. These findings suggest that, at the importer side, corruption also acts as a trade barrier, and even more so for those industries that experience a higher degree of sales unpredictability.

2.4.4 The Pattern of Bilateral Trade

For the pattern of bilateral trade, we consider both the exporter side and the importer side by disaggregating the trade flows into exporter-importer pairs. The estimation specification is the following:

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[9]The specification in Table 2A.8 is: $lnX_{jk} = \alpha + \beta_{im} Unpredictability_k \times Corruption_j + \boldsymbol{Z'_{jk}\gamma_{im}} + D_j + D_k + \epsilon_{jk}$, which is analogous to Equation (2.3) with the time dimension being compressed to $t = 2006$.

$$
\begin{aligned}
lnX_{ijkt} = \alpha &+ \beta_{ex} Unpredictability_k \times Corruption_{it} \\
&+ \beta_{im} Unpredictability_k \times Corruption_{jt} \\
&+ \boldsymbol{Z'_{ikt}\gamma_{ex}} + \boldsymbol{Z'_{jkt}\gamma_{im}} + D_{ij} + D_{it} + D_{jt} + D_{kt} + \epsilon_{ijkt},
\end{aligned} \tag{2.4}
$$

where i indexes exporter, j indicates importer, k denotes industry, and t represents time period. The dependent variable is the log of trade flows from exporter i to importer j for industry k in year t. The two coefficients of particular interest, β_{ex} and β_{im}, characterize how corruption affects the pattern of trade through the channel of sales unpredictability for exporter and importer. According to our hypothesis, β_{ex} and β_{im} are expected to be negative (i.e., $sgn(\beta_{ex}) < 0$ and $sgn(\beta_{im}) < 0$). In addition, $\boldsymbol{Z_{ikt}}$ and $\boldsymbol{Z_{jkt}}$ are the vectors of controls specific to exporter i and importer j respectively. We incorporate exporter-importer fixed effect D_{ij}, exporter-year fixed effect D_{it}, importer-year fixed effect D_{jt}, and industry-year fixed effect D_{kt} in the estimation. In particular, the exporter-importer fixed effect D_{ij} controls for the traditional time-invariant gravity variables (e.g., distance, contiguity, colony, common language, etc). The exporter-year and importer-year fixed effects (i.e., D_{it} and D_{jt}) are to capture the multilateral resistance terms demonstrated by Anderson and Van Wincoop (2003) [4]. Otherwise, the estimates of β_{ex} and β_{im} would be biased due to the omission of multilateral resistance terms.

[Insert Table 2.3 Here]

Table 2.3 shows the estimation results for the pattern of bilateral trade. Moreover, the cross-sectional results are shown in Table 2A.9,[10] which are again quite similar to the panel results in Table 2.3. For all estimates, standard errors are adjusted for two-way clustering by exporter-industry pair and importer-industry pair.[11] Several remarks are in order. First of all, across different specifications, the coefficients are all negative and highly significant for the interactions between the sales unpredictability and the level of corruption at both the exporter side and the importer side. Secondly, the corruption effect appears to be more pronounced for exporters as compared to importers. As indicated by the first two rows of Table 2.3, the coefficient magnitude for the exporters is about twice to five times as that for the importers. Thirdly, at the importer side, countries with higher GDP per capita and countries that are more democratic tend to import a larger volume of goods from industries that have a higher measure of sales unpredictability. In the meantime, at the exporter side, countries with more documents required and higher costs associated with trading procedures are inclined to export less products with uncertain demand. Fourthly, in line with the existing literature, the Heckscher-

[10] The specification in Table 2A.9 is: $lnX_{ijk} = \alpha + \beta_{ex} Unpredictability_k \times Corruption_i + \beta_{im} Unpredictability_k \times Corruption_j + \boldsymbol{Z'_{ik}\gamma_{ex}} + \boldsymbol{Z'_{jk}\gamma_{im}} + D_{ij} + D_k + \epsilon_{ijk}$, which is analogous to Equation (2.4) with the time dimension being compressed to $t = 2006$.

[11] See Cameron et al. (2011) [21] for further discussion.

Ohlin determinants and financial development factor are indeed the sources of comparative advantage for exporting. Last but not least, to get a sense of how corruption affects exports and imports, we focus on Column (4) of Table 2.3, which controls for a wide variety of determinants. The point estimates imply a 16% and a 9% decrease in the trade volumes, for the exporters and the importers, respectively. The trade-impeding effect of corruption is both statistically significant and economically sizable.

2.5 Conclusion

This paper aims to shed light on the interplay between corruption and the pattern of trade. In particular, our findings provide evidence of a novel channel, sales unpredictability, through which corruption hinders trade volumes. We focus on the interaction between the sale unpredictability at the industry-level with the corruption at the country-level and show that its coefficient is significantly negative. The estimations corroborate the hypothesis that the trade-impeding effect of corruption is stronger in industries that are more unpredictable in terms of sales, as these industries are more likely to be subject to the rent-seeking behavior. Our results are robust to controlling for relevant institutional features and inherent complexity of the trading procedures.

These findings contribute to the understanding of the relationship between institutions and trade by highlighting a specific mechanism through which an important institutional feature of countries, corruption, shapes the pattern of trade. In a broader perspective, our results add to the current policy debate on non-tariff barriers to trade. In terms of trade facilitation, merely simplifying trading procedures is not a substitute to decreasing corruption levels. Changing regulations may be an important step, but corruption definitely hinders trade well beyond the effect of cumbersome regulations.

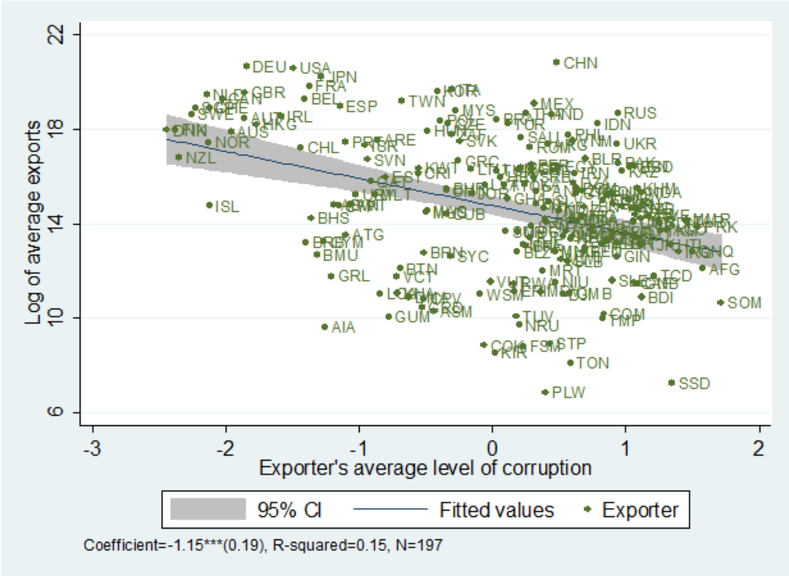

Figure 2.1: Exporter's corruption and exports

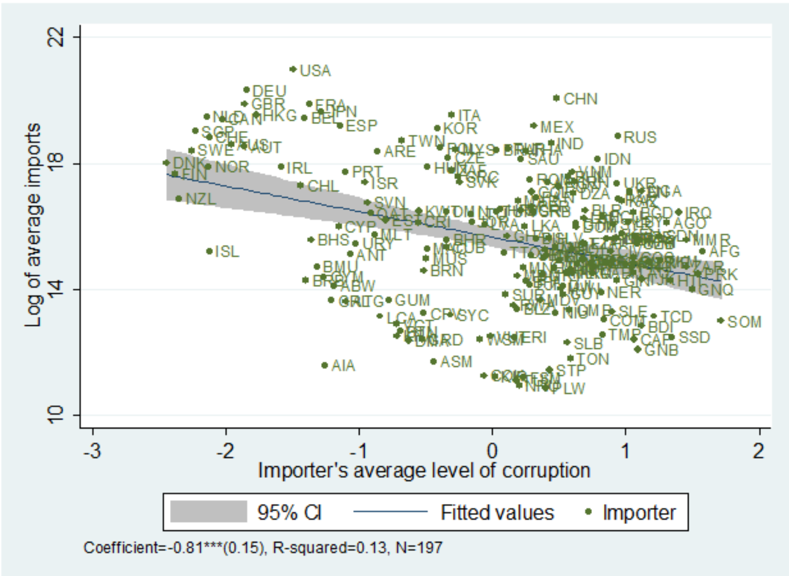

Figure 2.2: Importer's corruption and imports

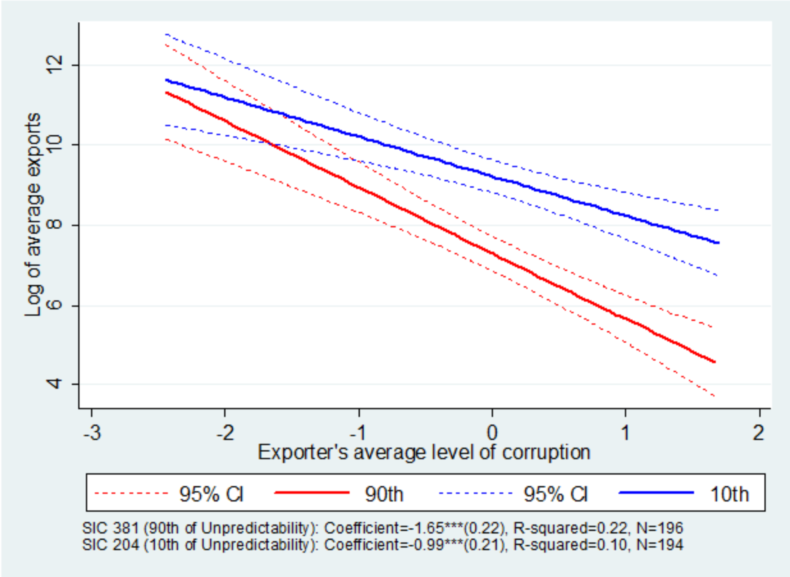

Figure 2.3: Exporter's corruption and exports (90th vs. 10th percentile of unpredictability)

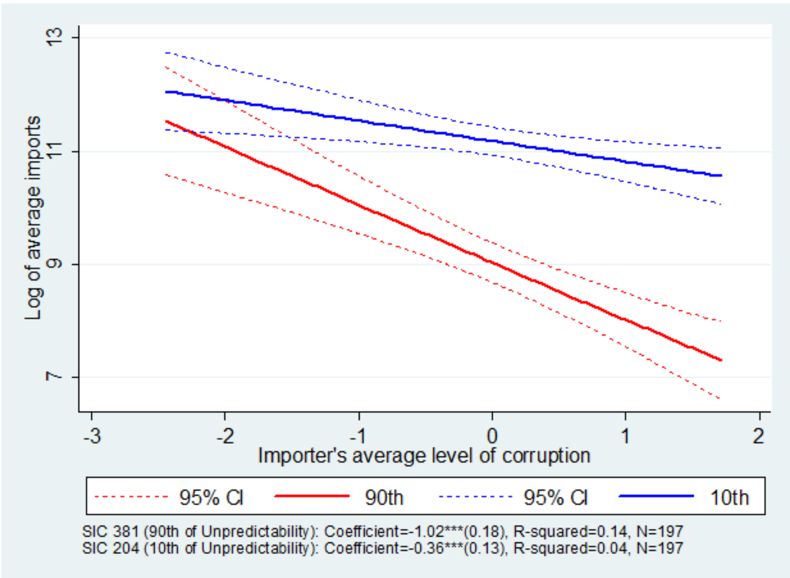

Figure 2.4: Importers corruption and imports (90th vs. 10th percentile of unpredictability)

Table 2.1: The pattern of exports

Dependent variable=ln(X_{ikt}), log of exports from exporter i for industry k in year t						
	(1)	(2)	(3)	(4)	(4a)	(4b)
Unpredictability × Corruption	-3.13***	-2.20***	-2.13***	-1.75*	-0.05*	0.92
	(0.46)	(0.71)	(0.76)	(1.05)		
Unpredictability × ln(GDPPC)		0.79	0.01	-0.24	-0.02	0.98
		(0.53)	(0.62)	(0.79)		
Unpredictability × Polity		0.11	0.02	0.01	0.00	1.00
		(0.10)	(0.12)	(0.15)		
Hint × ln(H/L)			0.52***	0.42***	0.14***	1.19
			(0.14)	(0.15)		
Kint × ln(K/L)			0.01	-0.00	-0.00	1.00
			(0.03)	(0.03)		
FinDep × FinDevt			0.02	0.01	0.02	1.01
			(0.01)	(0.01)		
Unpredictability × Documents to Export				-0.63	-0.05	0.93
				(0.44)		
Unpredictability × Time to Export				0.07	0.03	1.04
				(0.07)		
Unpredictability × Cost to Export				-0.00	-0.04	0.97
				(0.00)		
Exporter-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
# Exporter	197	143	118	106	106	106
# Industry	105	105	105	105	105	105
# Year	15	13	13	6	6	6
# Observation	268,594	180,696	141,409	57,535	57,535	57,535
R-squared	0.82	0.82	0.83	0.82	0.82	0.82

Notes: Column (4a) reports standardized beta coefficients from Column (4), and Column (4b) reports factor changes of exports at the 75th compared to the 25th percentile exporter and industry. Standard errors are clustered by exporter, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 2.2: The pattern of imports

Dependent variable=ln(X_{jkt}), log of imports to importer j for industry k in year t				
	(1)	(2)	(2a)	(2b)
Unpredictability × Corruption	-1.82***	-1.69***	-0.06***	0.92
	(0.31)	(0.57)		
Unpredictability × ln(GDPPC)		1.00**	0.10**	1.08
		(0.41)		
Unpredictability × Polity		0.12*	0.03*	1.05
		(0.07)		
Unpredictability × Documents to Import		-0.30	-0.04	0.97
		(0.18)		
Unpredictability × Time to Import		0.05	0.04	1.04
		(0.04)		
Unpredictability × Cost to Import		0.00	0.02	1.01
		(0.00)		
Importer-Year FE	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes	Yes
# Importer	197	131	131	131
# Industry	105	105	105	105
# Year	15	6	6	6
# Observation	294,580	80,679	80,679	80,679
R-squared	0.89	0.88	0.88	0.88

Notes: Column (2a) reports standardized beta coefficients from Column (2), and Column (2b) reports factor changes of imports at the 75th compared to the 25th percentile importer and industry. Standard errors are clustered by importer, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 2.3: The pattern of bilateral trade

Dependent variable=ln(X_{ijkt}), log of trade flows from exporter i to importer j for industry k in year t						
	(1)	(2)	(3)	(4)	(4a)	(4b)
Unpredictability × Exporter Corruption	-5.06***	-4.03***	-4.26***	-3.48***	-0.11***	0.84
	(0.42)	(0.68)	(0.74)	(0.81)		
Unpredictability × Importer Corruption	-2.13***	-0.80**	-0.90***	-1.90***	-0.06***	0.91
	(0.26)	(0.34)	(0.34)	(0.39)		
Unpredictability × Exporter ln(GDPPC)		1.55**	-0.61	-0.90	-0.07	0.94
		(0.68)	(0.77)	(0.74)		
Unpredictability × Importer ln(GDPPC)		1.38***	1.35***	1.48***	0.12***	1.11
		(0.29)	(0.30)	(0.33)		
Unpredictability × Exporter Polity		0.09	-0.10	0.08	0.01	1.03
		(0.09)	(0.10)	(0.10)		
Unpredictability × Importer Polity		0.19***	0.20***	0.16***	0.03***	1.06
		(0.04)	(0.04)	(0.04)		
Hint × ln(H/L)			1.18***	0.99***	0.36***	1.52
			(0.08)	(0.09)		
Kint × ln(K/L)			0.07***	0.04**	0.13**	1.08
			(0.02)	(0.02)		
FinDep × FinDevt			0.02	0.01	0.02	1.01
			(0.01)	(0.01)		
Unpredictability × Documents to Export				-1.46***	-0.10***	0.85
				(0.37)		
Unpredictability × Documents to Import				-0.11	-0.01	0.99
				(0.09)		
Unpredictability × Time to Export				0.07	0.02	1.04
				(0.07)		
Unpredictability × Time to Import				0.04**	0.02**	1.03
				(0.02)		
Unpredictability × Cost to Export				-0.00**	-0.04**	0.95
				(0.00)		
Unpredictability × Cost to Import				0.00***	0.04***	1.04
				(0.00)		
Exporter-Importer FE	Yes	Yes	Yes	Yes	Yes	Yes
Exporter-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
# Exporter-Importer	29,913	18,419	15,451	12,160	12,160	12,160
# Industry	105	105	105	105	105	105
# Year	15	13	13	6	6	6
# Observation	11,070,381	7,560,878	6,628,898	2,327,621	2,327,621	2,327,621
R-squared	0.58	0.59	0.60	0.60	0.60	0.60

Notes: Column (4a) reports standardized beta coefficients from Column (4), and Column (4b) reports factor changes of trade flows at the 75th compared to the 25th percentile country and industry. Standard errors are two-way clustered by exporter-industry pair and importer-industry pair, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 2A.1: Summary statistics of industry characteristics

	Mean	Std. Dev.	Min.	25th	Med.	75th	Max.
Unpredictability	0.092	0.029	0.027	0.073	0.091	0.109	0.181
Hint	-1.287	0.406	-2.228	-1.512	-1.320	-1.025	-0.180
Kint	4.221	0.819	2.310	3.744	4.067	4.621	6.767
FinDep	-0.300	1.364	-10.829	-0.567	-0.258	0.043	6.004

Table 2A.2: Summary statistics of country characteristics

	Mean	Std. Dev.	Min.	25th	Med.	75th	Max.
Corruption	0.047	1.002	-2.586	-0.579	0.296	0.803	2.057
ln(GDPPC)	8.774	1.256	4.661	7.798	8.850	9.827	15.344
Polity	3.503	6.477	-10.000	-2.000	6.000	9.000	10.000
ln(H/L)	2.492	0.568	1.136	2.044	2.615	2.908	3.619
ln(K/L)	10.030	1.296	6.434	9.070	10.113	11.107	12.771
FinDevt	3.382	1.092	-4.533	2.685	3.436	4.174	5.651

Table 2A.3: Pairwise correlations of country characteristics

	Corruption	ln(GDPPC)	Polity	ln(H/L)	ln(K/L)	FinDevt
Corruption	1					
ln(GDPPC)	-0.72***	1				
Polity	-0.44***	0.29***	1			
ln(H/L)	-0.60***	0.75***	0.49***	1		
ln(K/L)	-0.69***	0.94***	0.32***	0.76***	1	
FinDevt	-0.71***	0.71***	0.37***	0.57***	0.68***	1

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Table 2A.4: Industries with highest and lowest unpredictability

SIC Code	Industry	Unpredictability
	10 Industries with Highest Unpredictability	
283	Drugs	0.1812
287	Agricultural Chemicals	0.1582
394	Dolls, Toys, Games and Sporting and Athletic Goods	0.1537
274	Miscellaneous Publishing	0.1520
355	Special Industry Machinery, Except Metalworking Machinery	0.1465
376	Guided Missiles and Space Vehicles and Parts	0.1448
261	Pulp Mills	0.1418
239	Miscellaneous Fabricated Textile Products	0.1409
369	Miscellaneous Electrical Machinery, Equipment, and Supplies	0.1342
381	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical Systems, Instruments, and Equipment	0.1305
	10 Industries with Lowest Unpredictability	
211	Cigarettes	0.0265
272	Periodicals: Publishing, or Publishing and Printing	0.0428
322	Glass and Glassware, Pressed or Blown	0.0449
332	Iron and Steel Foundries	0.0464
285	Paints, Varnishes, Lacquers, Enamels, and Allied Products	0.0487
201	Meat Products	0.0492
263	Paperboard Mills	0.0495
323	Glass Products, Made of Purchased Glass	0.0523
265	Paperboard Containers and Boxes	0.0526
271	Newspapers: Publishing, or Publishing and Printing	0.0528

Table 2A.5: List of countries and territories (197)

ISO Code				
ABW	COL	HRV	MMR	SRB
AFG	COM	HTI	MNE	SSD
AGO	CPV	HUN	MNG	STP
AIA	CRI	IDN	MOZ	SUR
ALB	CUB	IND	MRT	SVK
ANT	CYM	IRL	MUS	SVN
ARE	CYP	IRN	MWI	SWE
ARG	CZE	IRQ	MYS	SYC
ARM	DEU	ISL	NER	SYR
ASM	DJI	ISR	NGA	TCD
ATG	DMA	ITA	NIC	TGO
AUS	DNK	JAM	NIU	THA
AUT	DOM	JOR	NLD	TJK
AZE	DZA	JPN	NOR	TKM
BDI	ECU	KAZ	NPL	TMP
BEL	EGY	KEN	NRU	TON
BEN	ERI	KGZ	NZL	TTO
BFA	ESP	KHM	OMN	TUN
BGD	EST	KIR	PAK	TUR
BGR	ETH	KNA	PAN	TUV
BHR	FIN	KOR	PER	TWN
BHS	FJI	KWT	PHL	TZA
BIH	FRA	LAO	PLW	UGA
BLR	FSM	LBN	PNG	UKR
BLZ	GAB	LBR	POL	URY
BMU	GBR	LBY	PRK	USA
BOL	GEO	LCA	PRT	UZB
BRA	GHA	LKA	PRY	VCT
BRB	GIN	LTU	QAT	VEN
BRN	GMB	LVA	ROM	VNM
BTN	GNB	MAC	RUS	VUT
CAF	GNQ	MAR	RWA	WSM
CAN	GRC	MDA	SAU	YEM
CHE	GRD	MDG	SDN	ZAF
CHL	GRL	MDV	SEN	ZAR
CHN	GTM	MEX	SGP	ZMB
CIV	GUM	MHL	SLB	ZWE
CMR	GUY	MKD	SLE	
COG	HKG	MLI	SLV	
COK	HND	MLT	SOM	

Table 2A.6: List of 3-digit SIC industries (105)

SIC Code	Industry
201	Meat Products
202	Dairy Products
203	Canned, Frozen, and Preserved Fruits, Vegetables, and Food Specialties
204	Grain Mill Products
205	Bakery Products
206	Sugar and Confectionery Products
207	Fats and Oils
208	Beverages
209	Miscellaneous Food Preparations and Kindred Products
211	Cigarettes
221	Broadwoven Fabric Mills, Cotton
222	Broadwoven Fabric Mills, Manmade Fiber and Silk
225	Knitting Mills
227	Carpets and Rugs
232	Men's and Boys' Furnishings, Work Clothing, and Allied Garments
233	Women's, Misses', and Juniors' Outerwear
234	Women's, Misses', Children's, and Infants' Undergarments
239	Miscellaneous Fabricated Textile Products
242	Sawmills and Planing Mills
243	Millwork, Veneer, Plywood, and Structural Wood Members
245	Wood Buildings and Mobile Homes
251	Household Furniture
252	Office Furniture
253	Public Building and Related Furniture
261	Pulp Mills
262	Paper Mills
263	Paperboard Mills
265	Paperboard Containers and Boxes
267	Converted Paper and Paperboard Products, except Containers and Boxes
271	Newspapers: Publishing, or Publishing and Printing
272	Periodicals: Publishing, or Publishing and Printing
273	Books
274	Miscellaneous Publishing
275	Commercial Printing
276	Manifold Business Forms
278	Blankbooks, Looseleaf Binders, and Bookbinding and Related Work

281	Industrial Inorganic Chemicals
282	Plastics Materials and Synthetic Resins, Synthetic Rubber, Cellulosic and other Manmade Fibers, except Glass
283	Drugs
284	Soap, Detergents, and Cleaning Preparations; Perfumes, Cosmetics, and other Toilet Preparations
285	Paints, Varnishes, Lacquers, Enamels, and Allied Products
286	Industrial Organic Chemicals
287	Agricultural Chemicals
289	Miscellaneous Chemical Products
291	Petroleum Refining
295	Asphalt Paving and Roofing Materials
302	Rubber and Plastics Footwear
306	Fabricated Rubber Products, Not Elsewhere Classified
308	Miscellaneous Plastics Products
314	Footwear, except Rubber
322	Glass and Glassware, Pressed or Blown
323	Glass Products, Made of Purchased Glass
324	Cement, Hydraulic
325	Structural Clay Products
327	Concrete, Gypsum, and Plaster Products
329	Abrasive, Asbestos, and Miscellaneous Nonmetallic Mineral Products
331	Steel Works, Blast Furnaces, and Rolling and Finishing Mills
332	Iron and Steel Foundries
333	Primary Smelting and Refining of Nonferrous and Metals
335	Rolling, Drawing, and Extruding of Nonferrous and Metals
336	Nonferrous Foundries (Castings)
339	Miscellaneous Primary Metal Products
341	Metal Cans and Shipping Containers
342	Cutlery, Hand tools, and General Hardware
343	Heating Equipment, except Electric and Warm Air; and Plumbing Fixtures
344	Fabricated Structural Metal Products
345	Screw Machine Products, and Bolts, Nuts, Screws, Rivets, and Washers
346	Metal Forgings and Stampings
348	Ordnance and Accessories, except Vehicles and Guided Missiles
349	Miscellaneous Fabricated Metal Products

351	Engines and Turbines
352	Farm and Garden Machinery and Equipment
353	Construction, Mining, and Materials Handling Machinery and Equipment
354	Metalworking Machinery and Equipment
355	Special Industry Machinery, except Metalworking Machinery
356	General Industrial Machinery and Equipment
357	Computer and Office Equipment
358	Refrigeration and Service Industry Machinery
359	Miscellaneous Industrial and Commercial Machinery and Equipment
361	Electric Transmission and Distribution Equipment
362	Electrical Industrial Apparatus
363	Household Appliances
364	Electric Lighting and Wiring Equipment
365	Household Audio and Video Equipment, and Audio Recordings
366	Communications Equipment
367	Electronic Components and Accessories
369	Miscellaneous Electrical Machinery, Equipment, and Supplies
371	Motor Vehicles and Motor Vehicle Equipment
372	Aircraft and Parts
373	Ship and Boat Building and Repairing
374	Railroad Equipment
375	Motorcycles, Bicycles, and Parts
376	Guided Missiles and Space Vehicles and Parts
379	Miscellaneous Transportation Equipment
381	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical Systems, Instruments, and Equipment
382	Laboratory Apparatus and Analytical, Optical, Measuring, and Controlling Instruments
384	Surgical, Medical, and Dental Instruments and Supplies
385	Ophthalmic Goods
386	Photographic Equipment and Supplies
387	Watches, Clocks, Clockwork Operated Devices, and Parts
391	Jewelry, Silverware, and Plated Ware
394	Dolls, Toys, Games and Sporting and Athletic Goods
395	Pens, Pencils, and other Artists' Materials
396	Costume Jewelry, Costume Novelties, Buttons, and Miscellaneous Notions, except Precious Metal
399	Miscellaneous Manufacturing Industries

Table 2A.7: The pattern of exports in 2006

Dependent variable=ln(X_{ik}), log of exports from exporter i for industry k in 2006				
	(1)	(2)	(3)	(4)
Unpredictability × Corruption	-3.25***	-2.42**	-2.86***	-2.53**
	(0.58)	(1.01)	(1.00)	(1.11)
Unpredictability × ln(GDPPC)		0.35	-0.97	-1.22
		(0.70)	(0.78)	(0.83)
Unpredictability × Polity		0.14	-0.01	0.02
		(0.13)	(0.14)	(0.16)
Hint × ln(H/L)			0.51***	0.42**
			(0.15)	(0.16)
Kint × ln(K/L)			0.03	0.01
			(0.03)	(0.03)
FinDep × FinDevt			0.03**	0.03**
			(0.02)	(0.02)
Unpredictability × Documents to Export				-0.40
				(0.44)
Unpredictability × Time to Export				-0.02
				(0.10)
Unpredictability × Cost to Export				-0.00
				(0.00)
Exporter FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
# Exporter	192	142	112	98
# Industry	105	105	105	105
# Observation	18,465	14,223	11,414	9,975
R-squared	0.82	0.82	0.82	0.82

Notes: Standard errors are clustered by exporter, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 2A.8: The pattern of imports in 2006

Dependent variable=ln(X_{jk}), log of imports to importer j for industry k in 2006		
	(1)	(2)
Unpredictability × Corruption	-1.68***	-1.69***
	(0.37)	(0.63)
Unpredictability × ln(GDPPC)		1.45**
		(0.63)
Unpredictability × Polity		0.15*
		(0.09)
Unpredictability × Documents to Import		-0.11
		(0.17)
Unpredictability × Time to Import		0.08
		(0.05)
Unpredictability × Cost to Import		-0.00
		(0.00)
Importer FE	Yes	Yes
Industry FE	Yes	Yes
# Importer	192	125
# Industry	105	105
# Observation	20,027	13,087
R-squared	0.89	0.89

Notes: Standard errors are clustered by importer, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 2A.9: The pattern of bilateral trade in 2006

Dependent variable=ln(X_{ijkt}), log of trade flows from exporter i to importer j for industry k in 2006				
	(1)	(2)	(3)	(4)
Unpredictability × Exporter Corruption	-5.25***	-4.75***	-5.16***	-4.41***
	(0.44)	(0.76)	(0.83)	(0.88)
Unpredictability × Importer Corruption	-2.10***	-1.32***	-1.41***	-2.47***
	(0.28)	(0.39)	(0.39)	(0.44)
Unpredictability × Exporter ln(GDPPC)		0.98	-1.48*	-0.59
		(0.73)	(0.83)	(0.89)
Unpredictability × Importer ln(GDPPC)		1.02***	1.02***	1.68***
		(0.33)	(0.33)	(0.39)
Unpredictability × Exporter Polity		0.06	-0.13	0.02
		(0.10)	(0.11)	(0.11)
Unpredictability × Importer Polity		0.13***	0.13***	0.09*
		(0.05)	(0.05)	(0.05)
Hint × ln(H/L)			1.21***	1.01***
			(0.08)	(0.09)
Kint × ln(K/L)			0.08***	0.05**
			(0.02)	(0.02)
FinDep × FinDevt			0.02	0.02
			(0.01)	(0.01)
Unpredictability × Documents to Export				-0.06
				(0.39)
Unpredictability × Documents to Import				0.09
				(0.09)
Unpredictability × Time to Export				-0.00
				(0.08)
Unpredictability × Time to Import				0.06***
				(0.02)
Unpredictability × Cost to Export				-0.00***
				(0.00)
Unpredictability × Cost to Import				0.00***
				(0.00)
Exporter-Importer FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
# Exporter-Importer	20,305	14,174	12,124	9,007
# Industry	105	105	105	105
# Observation	792,971	627,277	573,693	403,593
R-squared	0.60	0.61	0.62	0.62

Notes: Standard errors are two-way clustered by exporter-industry pair and importer-industry pair, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Chapter 3

Survive and Thrive: the Duration of Cultural Goods Export from China

3.1 Introduction

When countries trade with each other, how long can the trade relationships last? To answer the question, Besedeš and Prusa (2006a [14], 2006b [15]) and Besedeš (2008) [12] have investigated the duration of trade and found that most of the trade relationships are far more fragile than previous thought. These results are somewhat surprising since trade theories generally suggest that the trade relationships ought to be long-lived. For instance, under the Heckscher-Ohlin framework, trade is based upon the differentiations of factor endowments. When the comparative advantage is developed for a particular product, the trade relationship tends to persist as factor endowments are rarely subject to huge shocks. Similarly, Melitz's (2003) [84] seminal paper suggests that the ongoing cost of servicing a foreign market is modest after the sunk market-entry cost is made. Therefore, the trade relationships should be robust once they are established. The sharp contrast between theoretical predictions and empirical findings suggests that there is a remarkable amount of entry and exit in the export market. From the perspective of exporters, entering into a foreign market is no guarantee that they will be servicing the market over a long period of time; said differently, they have to survive before they can thrive in the export market.

This paper employs survival analysis to examine the duration of cultural goods export from China, using the disaggregated product-level data from 1995 to 2013. We utilize the definition and the classification of cultural goods made by UNESCO (2005) [109]. Cultural goods cover the following domains: cultural heritage; printed matter and literature; music and the performing arts; visual arts; and audio and audiovisual media. According to UNESCO (2005) [109], cultural and creative industries alone are estimated to account for over 7% of the world's GDP. In particular, exports of cultural goods from China constitute an increasingly important component in the global market. Figure 3.1 shows that, during the period of 1995-2013, the export value of cultural goods has doubled from \$150 billion to \$300 billion for the entire world. Meanwhile, the number has increased from \$12 billion to approximately

$90 billion for China. Figure 3.2 indicates that China's share in world exports of cultural goods has grown substantially, from less than 10% to almost 30% during the sample period.

[Insert Figure 3.1 Here]

[Insert Figure 3.2 Here]

As shown above, cultural goods export from China is indeed an empirically important issue. Despite the importance of the topic, trade in cultural goods from China has not been much studied in the literature, especially under the framework of survival analysis. In this paper, we conduct the survival analysis in two steps. In the first step, we use the Kaplan-Meier product limit estimator to estimate the survival function in a non-parametric way. A nice feature of the Kaplan-Meier estimator is that it is robust to censoring and uses information from both censored and non-censored observations. We show that the early stage of exporting relationship is characterized by the high hazard rate. However, if Chinese cultural goods can survive in the foreign market during the early stage, they will face a lower probability of failure and tend to survive a longer period. In the second step, we use the Cox proportional hazards model to derive semi-parametric estimates of the covariates that are determining survival. In the Cox model, the baseline hazard function indicates how hazard changes over time, and the estimated coefficients describe how hazard relates to a set of covariates. An advantage of the Cox model is that the baseline hazard function is given no specific parameterization and thus can be left unestimated. We show that the initial export value significantly lowers the hazard rate, while the cultural distance increases it but not in a significant way. In addition to the survival analysis, we further estimate how cultural distance affects the exports of cultural goods and non-cultural goods under the gravity framework. Firstly, we consider the full bilateral matrix of countries. Secondly, we focus on the exports from China and examine whether the effect of cultural distance differs for China's pre- and post-WTO accession periods. We find that the cultural distance is more of an obstacle to the exports of cultural goods and its impeding effect remains the same even after China's WTO accession.

The remainder of this chapter is structured as follows. The next section, Section 3.2, reviews the related literature. Section 3.3 describes the data and explains how the measure of cultural distance is constructed. Section 3.4 conducts the survival analysis of cultural goods export from China. Section 3.5 examines how cultural distance affects exports and presents the empirical findings. Finally, Section 3.6 concludes.

3.2 Literature Review

3.2.1 Duration of Trade

The duration of trade is often overlooked in standard models of international trade. Some models suggest that the pattern of trade tends to be static, while others examine the dynamics of trade (e.g., Vernon, 1966 [110]; Krugman, 1979 [69]; Grossman and Helpman, 1991 [43]) and indicate a fairly predictable pattern which evolves slowly. All these models appear to emphasize the stability of trade patterns and seem to be incapable of explaining the short episodes of trade relationships observed in the data.

Examining duration of trade has been inspired by the findings of Feenstra and Rose (2000) [38], Haveman and Hummels (2004) [50], and Schott (2004) [101], who document that in any given year and for any given product, many countries do not trade. In a series of papers, Besedeš and Prusa (2006a [14], 2006b [15]) and Besedeš (2008) [12] provide a novel approach to examine the duration of trade and show that most trade relationships are short-lived. They investigate the duration of U.S. imports and find that the median relationship lasts just one year. In contrast to the model predictions, trade patterns observed in the data are surprisingly dynamic. Nitsch (2009) [86] studies the duration of German imports at the 8-digit product level from 1995 to 2005 and shows that the majority of trade relationships exist for only one to three years. Besedeš and Blyde (2010) [13] point out that export relationships are generally short-lived but there also exists significant differences across regions. In particular, Latin America exhibits lower export survival rates than the U.S., the EU and East Asia. Brenton et al. (2010) [20] provide evidence that learning-by-doing substantially improves the export survival for developing countries. Besedeš and Prusa (2011) [16] examine the relationship between duration and export growth and show that the survival issue is indeed an important factor in explaining the export performance in the long run. Hess and Person (2012) [51] replicate the results by Besedeš and Prusa (2006b) [15] using discrete-time hazard models and demonstrate that such models are better suited for analyzing the duration of trade.

3.2.2 Trade in Cultural Goods

There are very few empirical studies systematically analyzing the trade flows of cultural goods. Schulze (1999) [102] examines whether trade theory is applicable for explaining trade in art. It is found that trade theory can be applied to trade in reproducible art (e.g., books, movies, music), which is governed by product differentiation. Nevertheless, it is not a good candidate to explain trade in unique art (e.g., antiques, sculptures, paintings), which is characterized by exchanges between consumers. Disdier at al. (2010) [27] focus on bilateral trade in cultural goods and investigate its determinants. They find that common language has the positive impact on trade in cultural goods with a written support, while colonial relationship reinforces trade in cultural heritage goods and visual arts.

This study is also related to the literature on how cultural proximity affects the pattern of trade. Several studies have found that cultural proximity has a positive influence on trade by reducing the trade costs.[1] Linguistic similarity, colonial ties, and bilateral trust are shown to be trade-enhancing. Our paper adds to the literature on constructing the measure of cultural distance based on Hofstede (2001) [52] and Hofstede et al. (2010) [53] and exploring how cultural distance impacts the duration and the volume of trade in cultural goods.

3.3 Data Sources

3.3.1 Trade Data

Data on trade flows during the 1995-2013 period are from BACI (Base pour l'Analyse du Commerce International) developed by the CEPII (Centre d'Etudes Prospectives et d'Informations Internationales). After reconciling the declarations and correcting for various inconsistencies of the exporters and the importers, BACI has a larger coverage of countries for which trade data are

[1]For example, see Boisso and Ferrantino (1997) [18], Melitz (2008) [83], and Guiso et al. (2009) [45].

available, as compared to the original UN Comtrade dataset (Gaulier and Zignano, 2010 [41]). The data are arranged at the Harmonized System (HS) 6-digit level. Note that out of around 5000 products, 151 are categorized as cultural goods according to the classifications by UNESCO [109], which are listed in Table 3A.1. Cultural goods can be grouped into the following five domains: cultural heritage; printed matter and literature; music and the performing arts; visual arts; and audio and audiovisual media. In addition, Table 3A.2 displays the product structure of cultural goods export from China. Panel (a) of Table 3A.2 indicates that China exports cultural goods to various importers. The median number of importers is 137 (out of 202). The most common cultural product has been exported to 199 importers, whereas the least common cultural product has been exported to only 4 importers. Panel (b) of Table 3A.2 shows that on average, China exports around 100 (out of 151) cultural products to an importer. The U.S. and Singapore have imported 150 cultural products from China, while Anguilla and Ethiopia have imported only 1 and 2. Table 3A.3 illustrates the export spells of Chinese cultural goods for a sample of importers. As shown, China has exported the product "Pictures, Designs, Photographs (HS code: 491191)" over the sample period from 1995 to 2013. However, not all of the importers have imported the product from China every year. The black circle represents a year of an active trade relationship (i.e., the value is positive). The white circle denotes a year of an failure event (i.e., the value is zero). The episodes of China continuously exporting the product to the importers are referred as “spells”. The maximum length of a spell in the sample is 19 years. At the extreme, China may export the product to an importer every other year so that there could be, for a given product-importer pair, a maximum number of 10 spells and 9 failures. Calculating the duration is thus straightforward: it is simply the consecutive time period that a trade relationship has been active.[2] In addition, calendar time is not as important as analysis time, which is the object of study in survival analysis. Analysis time is measured relative to the time origin. Under the survival analysis framework, the dynamics of duration can be modeled as a sequence of conditional probabilities, which will be discussed in more detail later. Note that the total number of trade observations for all possible combinations of cultural products, importers and years is 579,538 (151 products × 202 importers × 19 years). However, most of these potential

[2]One possible concern about the multiple spells is the measurement error. In particular, if the gap between two spells is short, it could be that the gap is due to the measurement error. It may be more appropriate to interpret the two spells as one longer spell. To allow for such misreporting, a one-year gap between spells will be considered as an error. We adjust the data accordingly by merging the spells with the one-year gap. Gaps of two or more years are assumed to be accurate and no adjustment is made. For instance, in Table 3A.3, after adjusting for such measurement error, the length of spell will be 19 years (i.e., from 1995 to 2013) for both Colombia and Singapore, and 14 years (i.e., from 2000 to 2013) for Guatemala. There are two spells for Dominica, with the length being 4 years (i.e., from 2001 to 2004) and 1 year (i.e., 2007) respectively. No adjustment is made for the other countries. Our findings remain largely unchanged using the gap-adjusted data instead and hence are robust to the measurement error.

trade relationships are non-existent; the number of observations with non-zero trade is 169,267 (about 30% of the sample). In addition, the majority of these active trade observations are small in value. Figure 3.3 provides a histogram of Chinese cultural goods export values by product-importer pair. About 60% of export values by product-importer pair are less than $100,000; over 80% are less than $1,000,000.

[Insert Figure 3.3 Here]

3.3.2 Gravity Variables

Gravity variables, including geographical distance, dummies for contiguity, common language, colonial relationship, and landlocked country, are sourced from Gravity Dataset developed by CEPII. The data of GDP and GDP per capita come from Penn World Table (PWT 9.0).

3.3.3 Cultural Distance

Cultural distance is defined as the degree to which cultural norms and values differ from one country to another. In this paper, the measure of cultural distance is constructed based on the indicators of culture from Hofstede (2001) [52] and Hofstede et al. (2010) [53]. According to Hofstede's cultural dimensions theory, national culture consists of six dimensions: Power Distance Index (PDI); Individualism versus Collectivism (IDV); Masculinity versus Femininity

(MAS); Uncertainty Avoidance Index (UAI); Long Term Orientation versus Short Term Orientation (LTO); and Indulgence versus Restraint (IND). The cultural dimensions represent independent preferences for one state of affairs over another that distinguish countries (rather than individuals) from each other. The country scores on the dimensions are relative. In other words, culture can be only used meaningfully by comparison. The values of these six indicators are between 0 and 100, with detailed explanations provided in Table 3A.4. Following Kogut and Singh (1988) [67], the measure of cultural distance is constructed as:

$$CulDist_{ij} = \frac{1}{K} \sum_{k=1}^{K} (I_{ik} - I_{jk})^2 / V_k, \tag{3.1}$$

where $CulDist_{ij}$ is the cultural distance between country i and country j. K is the number of cultural indicators (indexed by k). I_{ik} and I_{jk} are the values of indicator k, for country i and country j, respectively. V_k is the variance of indicator k over all countries in the sample. Table 3A.5 shows the importers with short and long cultural distance to China. Importers such as Hong Kong and Singapore are quite close to China in terms of cultural distance, while Denmark and Sweden are far away.[3] In addition, it is worth noting that there is no systematic correlation between the cultural and the geographical distances to

[3] Due to the geographical proximity, Hong Kong may have engaged in re-exportation of goods from China to the rest of the world. However, it should be emphasized that our results remain virtually unchanged after excluding Hong Kong from the sample.

China across all the importers. The coefficient of pairwise correlation between the cultural distance and the geographical distance is close to zero and thus negligible.

3.4 Survival Analysis

3.4.1 Duration Model

Since time is discrete in our analysis, let T be a non-negative and discrete random variable denoting the time to a failure event. Suppose T is taking the value of t_i with the corresponding probability density function $p(t_i) = Pr(T = t_i)$, where $i = 1, 2, ..., n$ and $0 \leq t_1 < t_2 < ... < t_n$. The survival function for a random variable T is given by:

$$S(t) = Pr(T > t) = \sum_{t_i > t} p(t_i). \tag{3.2}$$

The hazard function is given by:

$$h(t_i) = Pr(T = t_i \mid T \geq t_i) = \frac{p(t_i)}{S(t_{i-1})}, \tag{3.3}$$

where $S(t_0) = 1$.

The survival function and the hazard function are related by:

$$S(t) = \prod_{t_i < t} [1 - h(t_i)]. \tag{3.4}$$

3.4.2 Non-parametric Estimation

The estimator of Kaplan and Meier (1958) [61] is a non-parametric estimate of the survival function $S(t)$, which is the probability of survival past time t, or equivalently, the probability of failing after time t. The Kaplan-Meier product limit estimator of the survival function is given by:

$$\hat{S}(t) = \prod_{t_i<t} (\frac{n_i - d_i}{n_i}), \tag{3.5}$$

where n_i is the number of subjects at risk of failing at time t_i, and d_i is the number of observed failures at time t_i.

The hazard function is estimated by taking the ratio between the number of subjects who fail and the number of subjects at risk of failing at time t_i:

$$\hat{h}(t_i) = \frac{d_i}{n_i}. \tag{3.6}$$

An important advantage of the Kaplan-Meier estimator is that it takes into account both censored and non-censored observations. The estimator follows the philosophy of non-parametric analysis, which is letting the data speak for themselves and making no assumptions of the functional form of the survival function.

[Insert Figure 3.4 Here]

Figure 3.4 shows the estimated survival function $\hat{S}(t)$, which is downward sloping with a decreasing slope. The hazard rate is particularly high for the first few years, and then decreases rapidly. Most of the export relationships are short-lived, with the median duration of just one year. As can be seen from Figure 3.4, only a quarter of export relationships can survive after the first year. However, once a relationship is established and has survived the first few years, it is highly likely to survive a longer period. Among all the export relationships that have survived after the first year, about half of them will span the entire sample period. The pattern indicates negative duration dependence, that is, the conditional probability of failure decreases as duration increases. This finding is consistent with that documented by Pakes and Ericson (1998) [89].[4]

3.4.3 Semi-parametric Estimation

The Kaplan-Meier estimator is one of the most frequently used methods for survival analysis. Nonetheless, it is limited in its ability to estimate covariate-adjusted survival. In contrast, the Cox (1972) [26] proportional hazards model provides a semi-parametric estimate of survival adjusted for covariates. The proportional hazards condition assumes that covariates mutiplicatively shift the baseline hazard function. In the Cox model, the hazard function h is

[4] They consider two models of firm behavior that allow for heterogeneity among firms, idiosyncratic (or firm-specific) sources of uncertainty, and discrete outcome (exit and/or entry): a Bayesian learning model due to Jovanovic (1982) [60], and a model of research and exploration due to Ericson and Pakes (1995) [33]. They show that the first model with passive Bayesian learning is consistent with the data on retail trade.

parameterized as the following:

$$h(t, \boldsymbol{x}, \boldsymbol{\beta}) = h_0(t) exp(\boldsymbol{x'\beta}), \tag{3.7}$$

where t denotes survival time, $\boldsymbol{x}$ is a set of explanatory variables, and $\boldsymbol{\beta}$ is a vector of coefficients to be estimated from the data. The baseline hazard function, $h_0(t)$, characterizes how the hazard function, h, changes as a function of survival time t. A nice feature of the Cox model is that the baseline hazard function $h_0(t)$ is given no specific parameterization and thus can be left unestimated.

[Insert Table 3.1 Here]

Table 3.1 presents the estimation results using the Cox proportional hazards model. We control for traditional gravity variables, cultural distance, and initial export value in the Cox model. Column (1) reports the coefficients and Column (2) reports the corresponding hazard ratios. Note that an estimated hazard ratio less (greater) than 1 implies that the variable lowers (raises) the hazard rate. As can be seen from Table 3.1, initial export value and GDP per capita significantly lower the hazard rate. In particular, the finding that duration increases with initial export value is in accordance with the matching model in Rauch and Watson (2003) [91]. A larger initial order implies a more robust exporter-importer relationship, which in turn increases the duration. Longer cultural distance is associated with higher hazard rates and thus shorter spells. Nevertheless, this effect is not significant.

3.5 Cultural Distance and Exports

In this section, we further explore how cultural distance affects the exports of cultural goods and non-cultural goods under the gravity framework. Firstly, we consider the full bilateral matrix of countries. Secondly, we focus on the exports from China and examine whether the effect of cultural distance differs with regard to China's pre- and post-WTO accession periods.

3.5.1 Estimation of Gravity Equation by OLS

We estimate the gravity equation for the full bilateral matrix of countries using the Ordinary Least Squares (OLS) estimator:

$$\begin{aligned} lnX_{ijt} = \beta_1 ln(GeoDist_{ij}) + \beta_2 ln(CulDist_{ij}) + \beta_3 Contig_{ij} \\ + \beta_4 Comlang_{ij} + \beta_5 Colony_{ij} + D_{it} + D_{jt} + \epsilon_{ijt}, \end{aligned} \tag{3.8}$$

where i indicates exporter, j denotes importer, and t represents time period. The dependent variable lnX_{ijt} is the log of aggregate exports from exporter i to importer j in year t. The explanatory variables in the gravity equation are comprised of log of geographical distance, log of cultural distance, contiguity dummy, common language dummy, and colonial relationship dummy. We include exporter-year fixed effect D_{it} and importer-year fixed effect D_{jt} to control for the multilateral resistance (MR) terms (Anderson and Van Wincoop, 2003 [4]).

[Insert Table 3.2 Here]

Table 3.2 presents the estimation results by OLS. Column (1), (2), and (3) focus on the exports of all goods, cultural-goods, and non-cultural goods, respectively. The canonical gravity variables, including geographical distance, dummies for contiguity, common language, and colonial relationship, are all entering the gravity equation significantly with the expected signs. As for the cultural distance, it significantly hinders the exports of cultural goods. Every 1% increase in the bilateral cultural distance will reduce the volume of cultural goods exports by 0.15%. However, the effects of cultural distance are negligible for the exports of all goods and non-cultural goods. In other words, the cultural distance is more of an obstacle to the exports of cultural goods.

3.5.2 Estimation of Gravity Equation by PPML

In addition to the OLS estimation, we also estimate the gravity equation using the Poisson Pseudo-Maximum Likelihood (PPML) estimator, following the recommendations made by Santos Silva and Tenreyro (2006 [99], 2011 [100]) who argue in favor of the PPML estimator to make use of the information contained in the zero trade flows and to account for the heteroskedasticity. In addition, Fally (2015) [36] shows that when the gravity equation is estimated with PPML, the estimated fixed effects are exactly equal to their structural gravity counterparts (i.e., the MR terms). Taking these considerations into account, we employ the following PPML estimation:

$$\begin{aligned} X_{ijt} = exp\{&\beta_1 ln(GeoDist_{ij}) + \beta_2 ln(CulDist_{ij}) + \beta_3 Contig_{ij} \\ &+ \beta_4 Comlang_{ij} + \beta_5 Colony_{ij} + D_{it} + D_{jt}\} + \epsilon_{ijt}, \end{aligned} \tag{3.9}$$

where the dependent variable X_{ijt} is the aggregate exports from exporter i to importer j in year t, and the explanatory variables are the same as those in Equation (3.8).

[Insert Table 3.3 Here]

Table 3.3 displays the estimation results by PPML, which are qualitatively similar to those by OLS. The negative effects of cultural distance on exports are more pronounced for cultural goods, as indicated by the magnitude of coefficient as well as the level of significance. So far we have examined how cultural distance affects exports using the full bilateral matrix of countries. The OLS estimation and the PPML estimation corroborate each other. The next step is to explore how cultural distance impacts the exports from China.

3.5.3 Cultural Distance and Exports from China

To examine how cultural distance affects the exports from China, we estimate the following equation:

$$lnX_{jt} = \beta_1 ln(GeoDist_j) + \beta_2 ln(CulDist_j) + \beta_3 ln(GDP_{jt}) + \beta_4 ln(GDPPC_{jt}) + \beta_5 Contig_j + \beta_6 Comlang_j + \beta_7 Landlocked_j + D_t + \epsilon_{jt}, \tag{3.10}$$

where j denotes importer and t represents time period. The dependent variable lnX_{jt} is the log of aggregate exports from China to importer j in year t. The explanatory variables in the regression include log of geographical distance, log of cultural distance, log of GDP, log of GDP per capita, contiguity dummy, common language dummy, and landlocked country dummy.[5] The year fixed effect D_t is incorporated in the estimation.

[Insert Table 3.4 Here]

Table 3.4 shows the estimation results. Column (1), (2), and (3) focus on the exports of all goods, cultural-goods, and non-cultural goods from China, respectively. Several findings stand out as noteworthy. Firstly, geographical distance has a negative and significant effect on the exports of all goods and non-cultural goods, but not on the exports of cultural goods. Secondly,

[5] Note that the colonial relationship dummy is always equal to zero (i.e., no colonial ties) between China and all the importers. Therefore, it is not included in Equation (3.10).

cultural distance impedes the exports of all goods, cultural goods, and non-cultural goods. This impeding effect appears to be stronger for cultural goods, although it is not significant. Every 1% increase in the cultural distance between China and the importer will decrease the exports of cultural goods from China by 0.17%. Thirdly, log of GDP, log of GDP per capita, and common language facilitate the exports from China across all three categories of goods.

We further examine whether the effect of cultural distance differs with regard to China's pre- and post-WTO accession periods. Based on Equation (3.10), we introduce an interaction term between log of cultural distance and a dummy variable indicating the post-WTO accession.

$$
\begin{aligned}
lnX_{jt} = {} & \beta_1 ln(GeoDist_j) + \beta_2 ln(CulDist_j) + \beta_3 ln(CulDist_j) \times Post2001_t \\
& + \beta_4 ln(GDP_{jt}) + \beta_5 ln(GDPPC_{jt}) + \beta_6 Contig_j + \beta_7 Comlang_j \\
& + \beta_8 Landlocked_j + D_t + \epsilon_{jt},
\end{aligned} \tag{3.11}
$$

where the dummy variable $Post2001_t = 1$ for all t after 2001.

[Insert Table 3.5 Here]

As can be seen from Table 3.5, Column (1) and Column (3) suggest that, when it comes to the exports of all goods and non-cultural goods, the impeding effect of cultural distance will be reduced to one third after China's WTO accession. It appears that China's WTO accession does act to offset the inhibiting effect of cultural distance on these two categories of aggregate exports. On the contrary, Column (2) shows that the interaction term casts a negative effect on the exports of cultural goods from China. In other words, with regard to the exports of cultural goods, China's WTO accession does not seem to mitigate the negative effect of cultural distance. One possible explanation for this finding could be as follows. To the extent that cultural distance corresponds to difference in cultural norms and values between two countries, the exports of Chinese cultural goods are more sensitive to the intangible barriers that are created by cultural distance. The benefit from entering WTO may not outweigh the cost associated with cultural distance. This is in line with Obstfeld and Rogoff (2000) [88] who emphasize the importance of intangible barriers, including incomplete information barriers and cultural barriers, in explaining the persistence of transactional distance between countries. From a theoretical point of view, such transaction cost imposes a barrier to trade, especially for the trade of cultural goods.

3.6 Conclusion

Chinese cultural goods constitute an increasingly important component in the global market. This paper employs survival analysis to examine the duration of cultural goods export from China. We use the disaggregated product-level data from 1995 to 2013 to explore the export dynamics of Chinese cultural goods and investigate the underlying determinants.

Our findings provide trade economists and policy makers with a set of interesting and surprising results. Firstly, we use the Kaplan-Meier product limit estimator to estimate the survival function in a non-parametric way. We show that the early stage of exporting relationship is characterized by the high hazard rate. However, if Chinese cultural goods can survive in the foreign market during the early stage, they will face a lower probability of failure and tend to survive a longer period. Secondly, we use the Cox proportional hazards model to derive semi-parametric estimates of the covariates that are determining survival. We show that the initial export value significantly lowers the hazard rate, and the cultural distance increases it but not in a significant way. Thirdly, we further estimate how cultural distance affects the exports of cultural goods and non-cultural goods under the gravity framework. It is found that the cultural distance is more of an obstacle to the exports of cultural goods and its impeding effect remains the same even after China's WTO accession. The intangible barriers created by cultural distance carry the potential to increase the transaction costs and are more likely to hinder the exports of Chinese cultural goods. Further study could examine in more detail the influence of different constituent dimensions of cultural distance, in order to shed more light on the relevance of different underlying mechanisms that give rise to the trade patterns.

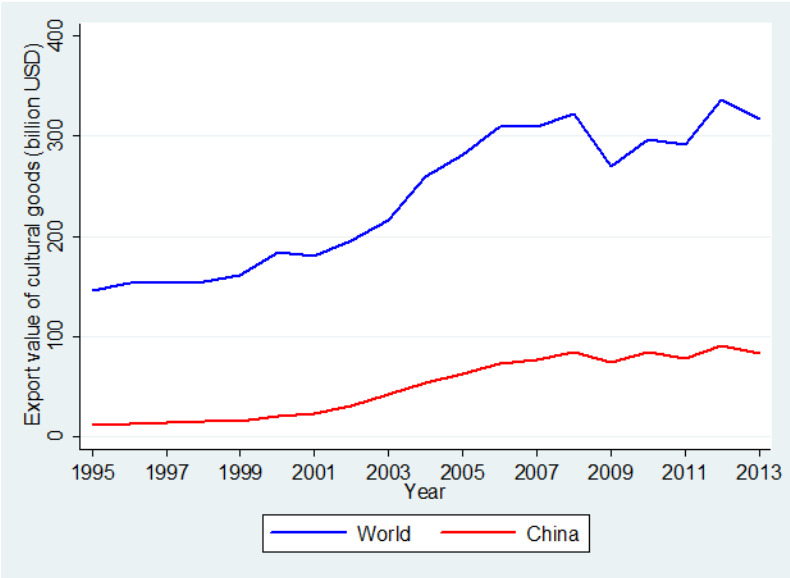

Figure 3.1: Export value of cultural goods

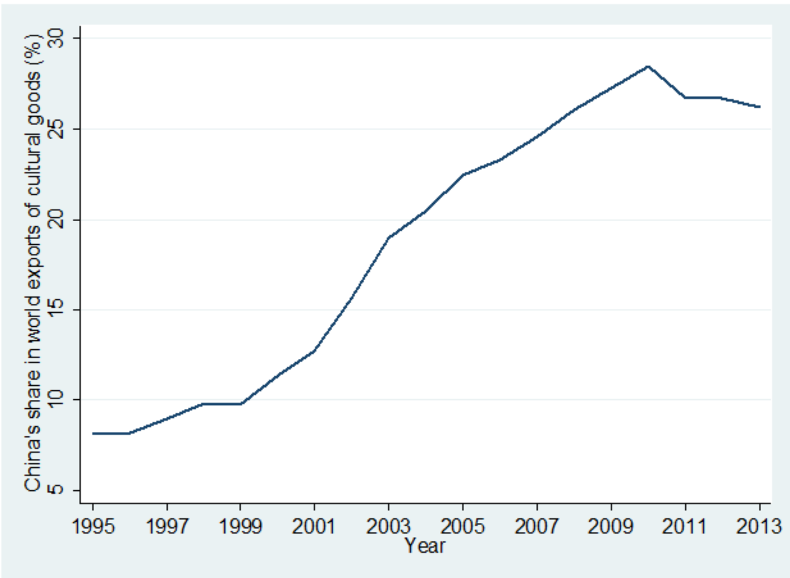

Figure 3.2: China's share in world exports of cultural goods

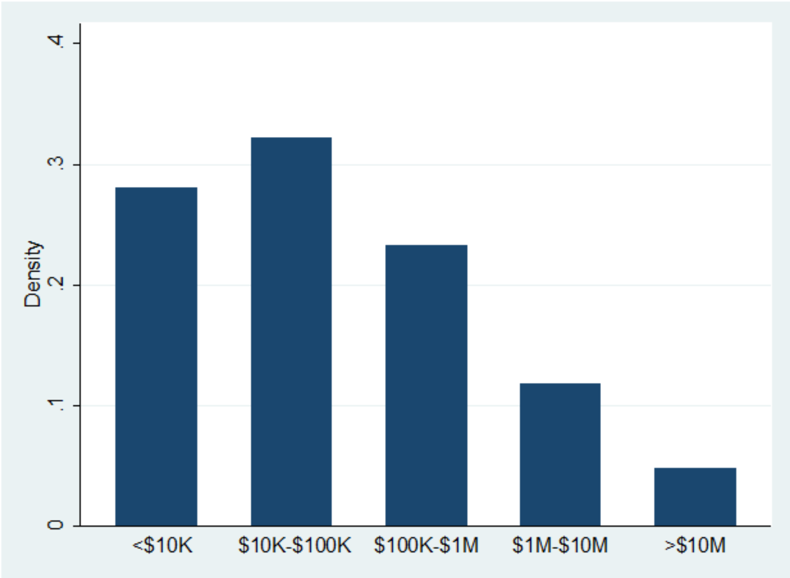

Figure 3.3: Histogram of Chinese cultural goods export values by product-importer pair

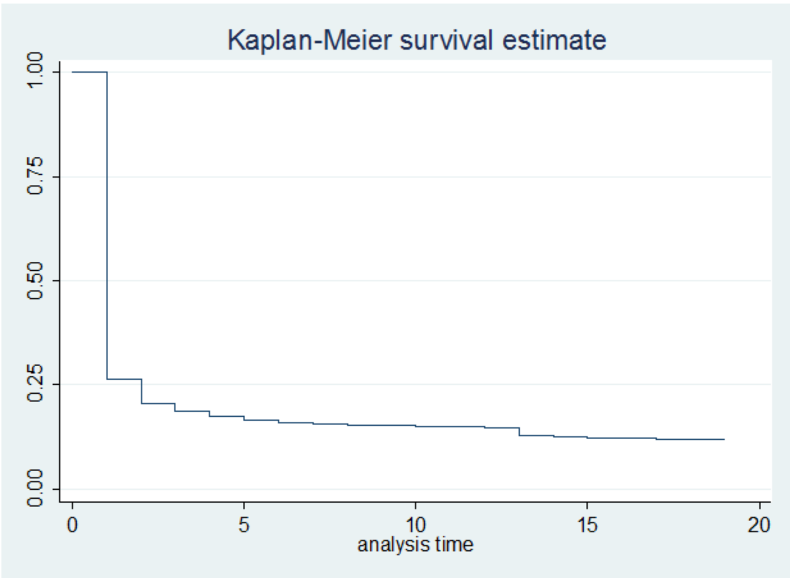

Figure 3.4: Kaplan-Meier survival estimate

Table 3.1: Cox regression

Cox Proportional Hazards Model		
	(1)	(2)
ln(GeoDist)	-0.103	0.902
	(0.076)	(0.068)
ln(CulDist)	0.019	1.020
	(0.111)	(0.113)
ln(GDP)	-0.011	0.989
	(0.033)	(0.032)
ln(GDPPC)	-0.126*	0.881*
	(0.072)	(0.064)
ln(InitVal)	-0.274***	0.760***
	(0.011)	(0.009)
Contiguity	0.024	1.025
	(0.132)	(0.135)
Common Language	0.147	1.158
	(0.218)	(0.252)
Landlocked	-0.077	0.926
	(0.133)	(0.123)
# Importer	77	77
# Product	151	151
# Year	19	19
# Observation	46,143	46,143
Chi-squared	655.79	655.79

Notes: Column (1) reports the coefficients and Column (2) reports the corresponding hazard ratios. An estimated hazard ratio less (greater) than 1 implies that the variable lowers (raises) the hazard rate. Standard errors are clustered by importer, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 3.2: Estimation of gravity equation by OLS

Dependent variable=ln(X_{ijt}), log of aggregate exports from exporter i to importer j in year t			
OLS	All Goods	Cultural Goods	Non-Cultural Goods
	(1)	(2)	(3)
ln(GeoDist)	-1.275***	-1.310***	-1.275***
	(0.026)	(0.031)	(0.026)
ln(CulDist)	-0.009	-0.153***	-0.007
	(0.028)	(0.033)	(0.028)
Contiguity	0.320**	0.528***	0.321**
	(0.131)	(0.145)	(0.131)
Common Language	0.551***	1.056***	0.540***
	(0.070)	(0.082)	(0.070)
Colony	0.713***	0.799***	0.715***
	(0.120)	(0.120)	(0.120)
Exporter-Year FE	Yes	Yes	Yes
Importer-Year FE	Yes	Yes	Yes
# Exporter-Importer	6,139	5,709	6,137
# Year	19	19	19
# Observation	110,197	84,436	110,106
R-squared	0.83	0.81	0.83

Notes: The dependent variables are log of aggregate exports of all goods, cultural goods, and non-cultural goods for Column (1), (2), and (3) respectively. Standard errors are clustered by exporter-importer pair, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 3.3: Estimation of gravity equation by PPML

Dependent variable=X_{ijt}, aggregate exports from exporter i to importer j in year t			
PPML	All Goods	Cultural Goods	Non-Cultural Goods
	(1)	(2)	(3)
ln(GeoDist)	-0.692***	-0.599***	-0.696***
	(0.008)	(0.014)	(0.008)
ln(CulDist)	-0.018*	-0.050***	-0.019*
	(0.010)	(0.015)	(0.010)
Contiguity	0.527***	0.677***	0.519***
	(0.026)	(0.035)	(0.026)
Common Language	0.075***	0.087**	0.077***
	(0.029)	(0.038)	(0.029)
Colony	0.064***	0.142***	0.062***
	(0.024)	(0.034)	(0.024)
Exporter-Year FE	Yes	Yes	Yes
Importer-Year FE	Yes	Yes	Yes
# Exporter-Importer	6,139	5,709	6,137
# Year	19	19	19
# Observation	110,197	84,436	110,106
R-squared	0.84	0.91	0.84

Notes: The dependent variables are aggregate exports of all goods, cultural goods, and non-cultural goods for Column (1), (2), and (3) respectively. Standard errors are clustered by exporter-importer pair, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 3.4: Cultural distance and exports from China

Dependent variable=ln(X_{jt}), log of aggregate exports from China to importer j in year t			
OLS	All Goods	Cultural Goods	Non-Cultural Goods
	(1)	(2)	(3)
ln(GeoDist)	-0.369**	0.139	-0.390**
	(0.163)	(0.223)	(0.161)
ln(CulDist)	-0.112	-0.168	-0.108
	(0.200)	(0.285)	(0.197)
ln(GDP)	0.875***	0.928***	0.873***
	(0.048)	(0.061)	(0.048)
ln(GDPPC)	0.461***	0.891***	0.448***
	(0.109)	(0.137)	(0.108)
Contiguity	0.309	0.358	0.306
	(0.478)	(0.594)	(0.472)
Common Language	1.362**	1.420**	1.362**
	(0.527)	(0.703)	(0.521)
Landlocked	0.060	0.064	0.061
	(0.146)	(0.205)	(0.146)
Year FE	Yes	Yes	Yes
# Importer	77	77	77
# Year	19	19	19
# Observation	1,463	1,460	1,463
R-squared	0.90	0.85	0.90

Notes: The dependent variables are log of aggregate exports of all goods, cultural goods, and non-cultural goods for Column (1), (2), and (3) respectively. Standard errors are clustered by importer, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 3.5: Cultural distance and exports from China (pre- and post-WTO accession)

Dependent variable=ln(X_{jt}), log of aggregate exports from China to importer j in year t			
OLS	All Goods	Cultural Goods	Non-Cultural Goods
	(1)	(2)	(3)
ln(GeoDist)	-0.369**	0.139	-0.389**
	(0.163)	(0.223)	(0.161)
ln(CulDist)	-0.190	-0.158	-0.188
	(0.244)	(0.339)	(0.242)
ln(CulDist) × Post2001	0.122	-0.015	0.125
	(0.110)	(0.159)	(0.110)
ln(GDP)	0.876***	0.928***	0.873***
	(0.048)	(0.061)	(0.048)
ln(GDPPC)	0.462***	0.891***	0.449***
	(0.110)	(0.138)	(0.109)
Contiguity	0.310	0.358	0.306
	(0.478)	(0.594)	(0.473)
Common Language	1.361**	1.420**	1.360**
	(0.527)	(0.703)	(0.521)
Landlocked	0.060	0.064	0.061
	(0.146)	(0.205)	(0.146)
Year FE	Yes	Yes	Yes
# Importer	77	77	77
# Year	19	19	19
# Observation	1,463	1,460	1,463
R-squared	0.90	0.85	0.90

Notes: The dependent variables are log of aggregate exports of all goods, cultural goods, and non-cultural goods for Column (1), (2), and (3) respectively. Standard errors are clustered by importer, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively.

Table 3A.1: List of cultural goods (151)

HS Code	Cultural Domain	Product Description
370110	Audio and Audiovisual Media	Photographic Plates and Film in the Flat, for X-ray
370120	Audio and Audiovisual Media	Instant Print Film in the Flat
370130	Audio and Audiovisual Media	Photographic Plates and Film in the Flat, with Any Side Exceeding 255mm
370191	Audio and Audiovisual Media	Photographic Plates and Film in the Flat, for Color Photography (Polychrome)
370199	Audio and Audiovisual Media	Other Photographic Plates and Film in the Flat
370210	Audio and Audiovisual Media	Photographic Film for X-ray, in Rolls
370220	Audio and Audiovisual Media	Instant Print Film in Rolls
370231	Audio and Audiovisual Media	Photographic Film in Rolls, for Color Photography (Polychrome)
370232	Audio and Audiovisual Media	Photographic Film in Rolls, with Silver Halide Emulsion
370239	Audio and Audiovisual Media	Other Photographic Film in Rolls
370241	Audio and Audiovisual Media	Color Film in Rolls (Width Exceeding 610mm, Length Exceeding 200m)
370242	Audio and Audiovisual Media	Photographic Film in Rolls (Width Exceeding 610mm, Length Exceeding 200m)
370243	Audio and Audiovisual Media	Photographic Film in Rolls (Width Exceeding 610mm, Length Not Exceeding 200m)
370244	Audio and Audiovisual Media	Photographic Film in Rolls (Width Exceeding 105mm, Not Exceeding 610mm)
370251	Audio and Audiovisual Media	Color Film in Rolls (Width Not Exceeding 16mm, Length Not Exceeding 14m)
370252	Audio and Audiovisual Media	Color Film in Rolls (Width Not Exceeding 16mm, Length Exceeding 14m)
370253	Audio and Audiovisual Media	Color Film for Slides (Width 16-35mm, Length Not Exceeding 30m)
370254	Audio and Audiovisual Media	Color Film in Rolls (Width 16-35mm, Length Not Exceeding 30m)
370255	Audio and Audiovisual Media	Color Film in Rolls (Width 16-35mm, Length Exceeding 30m)
370256	Audio and Audiovisual Media	Color Film in Rolls (Width Exceeding 35mm)
370291	Audio and Audiovisual Media	Photographic Film in Rolls (Width Not Exceeding 16mm, Length Not Exceeding 14m)
370292	Audio and Audiovisual Media	Photographic Film in Rolls (Width Not Exceeding 16mm, Length Exceeding 14m)
370293	Audio and Audiovisual Media	Photographic Film in Rolls (Width 16-35mm, Length Not Exceeding 30m)

370294	Audio and Audiovisual Media	Photographic Film in Rolls (Width 16-35mm, Length Exceeding 30m)
370295	Audio and Audiovisual Media	Photographic Film in Rolls (Width Exceeding 35mm)
370310	Audio and Audiovisual Media	Photographic Paper, Paperboard, Textiles in Rolls (Width Exceeding 610mm)
370320	Audio and Audiovisual Media	Other Photographic Paper, Paperboard, Textiles for Color Photo
370390	Audio and Audiovisual Media	Other Photographic Paper, Paperboard, Textiles, N.E.S.
370400	Audio and Audiovisual Media	Photographic Plates, Film, Paper, Paperboard, Textiles (Exposed)
370510	Audio and Audiovisual Media	Photographic Plates and Film for Off Set Reproduction (Exposed and Developed)
370520	Audio and Audiovisual Media	Microfilms (Exposed and Developed)
370590	Audio and Audiovisual Media	Other Photographic Plates and Film (Exposed and Developed)
370610	Audio and Audiovisual Media	Cinematograph Film (Exposed and Developed)
370690	Audio and Audiovisual Media	Other Cinematograph Film (Exposed and Developed)
392640	Visual Arts	Statuettes and Other Ornamental Articles of Plastics
442010	Visual Arts	Statuettes and Other Ornaments of Wood
490110	Printed Matter and Literature	Printed Books, Brochures, Leaflets and Similar Printed Matter
490191	Printed Matter and Literature	Dictionaries and Encyclopedias, and Serial Installments
490199	Printed Matter and Literature	Printed Books, Brochures, Leaflets and Similar Printed Matter, N.E.S.
490210	Printed Matter and Literature	Newspapers, Journals and Periodicals, Appearing at Least Four Times a Week
490290	Printed Matter and Literature	Newspapers, Journals and Periodicals, Appearing Less Than Four Times a Week
490300	Printed Matter and Literature	Children's Picture, Drawing or Coloring Books
490400	Printed Matter and Literature	Music, Printed or in Manuscript, Whether or Not Bound or Illustrated
490510	Printed Matter and Literature	Globes
490591	Printed Matter and Literature	Maps and Hydrographic or Similar Charts, in Book Form
490599	Printed Matter and Literature	Maps and Hydrographic or Similar Charts, N.E.S.
490600	Audio and Audiovisual Media	Plans and Drawings for Architectural, Engineering, Industrial, Commercial, Topographical
490900	Printed Matter and Literature	Printed or Illustrated Postcards
491000	Printed Matter and Literature	Calendars of Any Kind, Printed, Including Calendar Blocks
491110	Audio and Audiovisual Media	Trade Advertising Material, Commercial Catalogs and the Like
491191	Printed Matter and Literature	Pictures, Designs and Photographs

691310	Visual Arts	Statuettes and Other Ornamental Ceramic Articles, of Porcelain or China
691390	Visual Arts	Statuettes and Other Ornamental Ceramic Articles, N.E.S.
830621	Visual Arts	Statuettes and Other Ornaments, Plated with Precious Metal
830629	Visual Arts	Statuettes and Other Ornaments, N.E.S.
851910	Music and the Performing Arts	Coin- or Disc-operated Record-players
851921	Music and the Performing Arts	Other Record-players, without Loudspeaker
851929	Music and the Performing Arts	Other Record-players
851931	Music and the Performing Arts	Turntables (Record-decks), with Automatic Record Changing Mechanism
851939	Music and the Performing Arts	Other Turntables (Record-decks)
851940	Music and the Performing Arts	Transcribing Machines
851991	Music and the Performing Arts	Turntable, Record Players, Cassette Players of Cassette Type
851999	Music and the Performing Arts	Other Sound Reproducing Apparatus
852010	Music and the Performing Arts	Dictating Machines Not Capable of Operating without an External Source
852020	Music and the Performing Arts	Telephone Answering Machines
852031	Music and the Performing Arts	Other Magnetic Tape Recorders Incorporating Sound Reproducing Apparatus, of Cassette-type
852039	Music and the Performing Arts	Other Magnetic Tape Recorders, Sound Reproducing Apparatus
852090	Music and the Performing Arts	Other Sound Recording Apparatus and Magnetic Tape Recorders
852110	Music and the Performing Arts	Video Recording or Reproducing Apparatus, Magnetic Tape-type
852190	Music and the Performing Arts	Other Video Recording or Reproducing Apparatus
852311	Music and the Performing Arts	Magnetic Tapes, Unrecorded, of a Width Not Exceeding 4mm
852312	Music and the Performing Arts	Magnetic Tapes, Unrecorded, of a Width Exceeding 4mm but Not Exceeding 6.5mm
852313	Music and the Performing Arts	Magnetic Tapes, Unrecorded, of a Width Exceeding 6.5mm
852320	Music and the Performing Arts	Magnetic Discs, Unrecorded
852390	Music and the Performing Arts	Other Prepared Unrecorded Media for Sound Recording
852410	Music and the Performing Arts	Gramophone Records
852421	Music and the Performing Arts	Magnetic Tapes, Recorded, of a Width Not Exceeding 4mm
852422	Music and the Performing Arts	Magnetic Tapes, Recorded, of a Width Exceeding 4mm but Not Exceeding 6.5mm
852423	Music and the Performing Arts	Magnetic Tapes, Recorded, of a Width Exceeding 6.5mm

852490	Music and the Performing Arts	Other Recorded Media for Sound or Other Similarly Recorded Phenomena
852711	Audio and Audiovisual Media	Radio-broadcast Receivers, with Sound Recording or Reproducing Apparatus
852719	Audio and Audiovisual Media	Radio-broadcast Receivers, Operating without an External Source
852721	Audio and Audiovisual Media	Radio-broadcast Receivers, Combined with Sound Recording or Reproducing Apparatus, for Motor Vehicles
852729	Audio and Audiovisual Media	Radio-broadcast Receivers, for Motor Vehicles, N.E.S.
852731	Audio and Audiovisual Media	Radio-broadcast Receivers, with Recording or Reproducing Apparatus
852732	Audio and Audiovisual Media	Radio-broadcast Receivers, Not Combined with Recording or Reproducing Apparatus
852739	Audio and Audiovisual Media	Radio-broadcast Receivers, N.E.S.
852790	Audio and Audiovisual Media	Reception Apparatus for Radio-broadcasting
852810	Audio and Audiovisual Media	Color Television Receivers
852820	Audio and Audiovisual Media	Black and White or Other Monochrome Television Receivers
900610	Audio and Audiovisual Media	Cameras of a Kind Used for Preparing Printing Plates or Cylinders
900620	Audio and Audiovisual Media	Cameras of a Kind Used for Recording Documents on Microfilm, Microfiche or Other Microforms
900630	Audio and Audiovisual Media	Cameras Specially Designed for Underwater Use, for Aerial Survey or for Medical Examination
900640	Audio and Audiovisual Media	Instant Print Cameras
900651	Audio and Audiovisual Media	Cameras, Single Lens Reflex (SLR), for Roll Film of a Width Not Exceeding 35 mm (14 inch)
900652	Audio and Audiovisual Media	Cameras for Roll Film of a Width Less Than 35 mm (14 inch)
900653	Audio and Audiovisual Media	Cameras for Roll Film of a Width of 35 mm (14 inch), N.E.S.
900659	Audio and Audiovisual Media	Photographic Cameras (Other Than Cinematographic), N.E.S.
900661	Audio and Audiovisual Media	Discharge Lamp (Electronic) Flashlight Apparatus
900662	Audio and Audiovisual Media	Flashbulbs, Flashcubes, and the Like
900669	Audio and Audiovisual Media	Other Photographic Flashlight Apparatus
900691	Audio and Audiovisual Media	Parts and Accessories for Still Photo Cameras
900699	Audio and Audiovisual Media	Other Parts and Accessories for Photographic Flashlight Apparatus and Flashbulbs
900711	Audio and Audiovisual Media	Cinematographic Cameras for Film of Less Than 16mm (6 inch) in Width
900719	Audio and Audiovisual Media	Other Cinematographic Cameras
900721	Audio and Audiovisual Media	Projectors for Film of Less Than 16mm (6 inch) in Width
900729	Audio and Audiovisual Media	Other Projectors

900791	Audio and Audiovisual Media	Parts and Accessories for Cinematographic Cameras
900792	Audio and Audiovisual Media	Parts and Accessories for Projectors
900810	Audio and Audiovisual Media	Slide Projectors
900820	Audio and Audiovisual Media	Microfilm, Microfiche or Other Microform Readers
900830	Audio and Audiovisual Media	Other Image Projectors
900840	Audio and Audiovisual Media	Photographic (Other Than Cinematographic) Enlargers and Reducers
900890	Audio and Audiovisual Media	Parts and Accessories for Image Projectors, Enlargers and Reducers
901010	Audio and Audiovisual Media	Apparatus and Equipment for Automatically Developing Photographic (Including Cinematographic) Film
901020	Audio and Audiovisual Media	Other Apparatus and Equipment for Photographic (Including Cinematographic) Laboratories
901030	Audio and Audiovisual Media	Projection Screens
901090	Audio and Audiovisual Media	Parts and Accessories for Apparatus and Equipment for Photographic
920110	Music and the Performing Arts	Upright Pianos
920120	Music and the Performing Arts	Grand Pianos
920190	Music and the Performing Arts	Harpsichords and Other Keyboard Stringed Instruments
920210	Music and the Performing Arts	String Musical Instruments, Played with a Bow
920290	Music and the Performing Arts	Other String Musical Instruments
920300	Music and the Performing Arts	Keyboard Pipe Organs, Harmoniums and Similar Keyboard Instruments with Free Metal Reeds
920410	Music and the Performing Arts	Accordions and Similar Instruments
920420	Music and the Performing Arts	Mouth Organs
920510	Music and the Performing Arts	Brass-wind Instruments
920590	Music and the Performing Arts	Other Wind Musical Instruments
920600	Music and the Performing Arts	Percussion Musical Instruments (Drums, Xylophones, Cymbals, Castanets, Maracas)
920710	Music and the Performing Arts	Keyboard Instruments, Other Than Accordions
920790	Music and the Performing Arts	Other Musical Instruments, Electrically
920810	Music and the Performing Arts	Music Boxes
920890	Music and the Performing Arts	Fairground Organs, Mechanical Street Organs, Mechanical Singing Birds, Musical Saws and Other Musical Instruments
920910	Music and the Performing Arts	Metronomes, Tuning Forks and Pitch Pipes
920920	Music and the Performing Arts	Mechanisms for Music Boxes

920930	Music and the Performing Arts	Musical Instrument Strings
920991	Music and the Performing Arts	Parts and Accessories for Pianos
920992	Music and the Performing Arts	Parts and Accessories for String Musical Instruments (Guitars, Violins)
920993	Music and the Performing Arts	Parts and Accessories for Keyboard Pipe Organs, Harmoniums, Reed Organs
920994	Music and the Performing Arts	Parts and Accessories for Electric Musical Instruments
920999	Music and the Performing Arts	Other Parts and Accessories of Musical Instruments
950410	Audio and Audiovisual Media	Video Games of a Kind Used with a Television Receiver
960110	Visual Arts	Worked Ivory and Articles of Ivory
960190	Visual Arts	Worked Other Animal Carving Material, and Articles of These Materials
970110	Visual Arts	Paintings, Drawings and Pastels, Executed Entirely by Hand
970190	Visual Arts	Collages and Similar Decorative Plaques
970200	Visual Arts	Original Engravings, Prints and Lithographs
970300	Visual Arts	Original Sculptures and Statuary, in Any Materials
970400	Printed Matter and Literature	Postage or Revenue Stamps, Stamp-postmarks, and the Like, Used
970500	Cultural Heritage	Collections and Collectors' Pieces
970600	Cultural Heritage	Antiques of an Age Exceeding One Hundred Years

Table 3A.2: Product structure of cultural goods export from China

(a) Number of importers to which a product is exported (202 importers in total)	
Maximum	199
Median	137
Mean	128
Minimum	4
(b) Number of products exported to an importer (151 products in total)	
United States	150
Singapore	150
Median	107
Mean	96
Ethiopia	2
Anguilla	1

Table 3A.3: Illustration for export spells of Chinese cultural goods

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Number of Spells
Australia	○	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	1
Burkina Faso	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	●	●	○	○	1
Colombia	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●	●	●	●	●	3
Dominica	○	○	○	○	○	○	●	○	●	●	○	○	●	○	○	○	○	○	○	3
Guatemala	○	○	○	○	○	●	●	○	●	●	●	○	●	●	●	●	●	●	●	3
India	●	○	○	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	2
Niger	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	1
Singapore	●	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	2
United States	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	1
Vietnam	○	○	●	○	○	○	○	●	●	●	●	●	●	●	●	●	●	●	●	2

Notes: HS code: 491191 (Pictures, Designs and Photographs). "●" represents a year of positive export from China to a particular importer, and "○" denotes zero.

Table 3A.4: The six dimensions of national culture

Power Distance Index (PDI) This dimension expresses the degree to which the less powerful members of a society accept and expect that power is distributed unequally. The fundamental issue here is how a society handles inequalities among people. People in societies exhibiting a large degree of power distance accept a hierarchical order in which everybody has a place and which needs no further justification. In societies with low power distance, people strive to equalize the distribution of power and demand justification for inequalities of power.
Individualism versus Collectivism (IDV) The high side of this dimension, called individualism, can be defined as a preference for a loosely-knit social framework in which individuals are expected to take care of only themselves and their immediate families. Its opposite, collectivism, represents a preference for a tightly-knit framework in society in which individuals can expect their relatives or members of a particular in-group to look after them in exchange for unquestioning loyalty. A society's position on this dimension is reflected in whether people's self-image is defined in terms of "I" or "we."
Masculinity versus Femininity (MAS) The masculinity side of this dimension represents a preference in society for achievement, heroism, assertiveness and material rewards for success. Society at large is more competitive. Its opposite, femininity, stands for a preference for cooperation, modesty, caring for the weak and quality of life. Society at large is more consensus-oriented.
Uncertainty Avoidance Index (UAI) The uncertainty avoidance dimension expresses the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity. The fundamental issue here is how a society deals with the fact that the future can never be known: should we try to control the future or just let it happen? Countries exhibiting strong UAI maintain rigid codes of belief and behavior and are intolerant of unorthodox behavior and ideas. Weak UAI societies maintain a more relaxed attitude in which practice counts more than principles.
Long Term Orientation versus Short Term Orientation (LTO) Every society has to maintain some links with its own past while dealing with the challenges of the present and the future. Societies prioritize these two existential goals differently. Societies who score low on this dimension, for example, prefer to maintain time-honored traditions and norms while viewing societal change with suspicion. Those with a culture which scores high, on the other hand, take a more pragmatic approach: they encourage thrift and efforts in modern education as a way to prepare for the future.
Indulgence versus Restraint (IND) Indulgence stands for a society that allows relatively free gratification of basic and natural human drives related to enjoying life and having fun. Restraint stands for a society that suppresses gratification of needs and regulates it by means of strict social norms.

Source: https://geert-hofstede.com/national-culture.html

Table 3A.5: Cultural distance to China

Short Distance		Long Distance	
Importer	Cultural Distance	Importer	Cultural Distance
Hong Kong	0.313	Denmark	5.003
Singapore	0.549	Sweden	4.639
Indonesia	0.550	Iceland	4.599
Vietnam	0.633	El Salvador	4.500
India	0.715	Australia	4.468
Bangladesh	0.857	Norway	4.415
Albania	0.938	New Zealand	4.264
Taiwan	1.151	Venezuela	4.080
Slovakia	1.186	United States	4.039
Malaysia	1.248	Netherlands	3.939

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