

# **Different Types of Firms, Different Types of Products, and Their Dynamics: An Anatomy of China's Imports<sup>+</sup>**

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## **Abstract**

Using highly disaggregated HS 8-digit product-category level data collected by the Chinese Customs Office for 2000 and 2008, we perform an in-depth anatomy of China's imports of manufactured goods. We estimate both the extensive margins – number of products exported per product group or trade partner – and intensive margins – amount of imports per product group or trade partner – of China's imports. Our paper contributes to the literature of firm heterogeneity in international trade by addressing issues which have largely been neglected. First, we distinguish firms into foreign firms and domestic firms, which are further divided into private firms and public firms. Second, we distinguish products into final goods and intermediate goods. Third, we estimate gravity equations from the perspective of dynamics utilizing the a dynamic adjustment model. Overall, our analysis yields a number of new stylized facts about China's imports. These, in turn, help us to gain a fuller understanding of China's trade patterns in light of its recent emergence as a globally significant importer.

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## 1. Introduction

The focus of research on international trade has recently shifted from industries and countries to firms and products.<sup>1</sup> It is now a stylized fact that exporting firms are larger, more productive, more skill- and capital-intensive, and pay higher wages than non-exporting firms (Bernard and Jensen, 1995; Bernard et al., 2007).

While the early empirical literature on firm heterogeneity in international trade looks almost exclusively at firm export behavior, most recent work using firm-level trade transaction data has begun to examine firm import behavior as well (Bernard, 2011b). For U.S. manufacturing firms, Bernard et al (2007) find that importers are similar to exporters in that they are bigger, more productive, pay higher wages, and are more skill- and capital-intensive than non-importers. However, the majority of studies on firm behavior in international trade still only address exports, mainly due to the lack of relevant micro data on importing.

In the case of China, there is an even more glaring absence of studies on imports and import behavior. China is widely viewed as the factory of the world, so there is an understandable tendency to highlight exports and neglect imports (See for example, Amiti and Freund, 2010). However, due to its sheer size and explosive growth, China has emerged as a globally influential importer in its own right. In fact, healthy Chinese appetite for both manufactured goods and commodities contributed to global demand and growth during the global financial crisis. Furthermore, China's export success is to some extent based on importing parts and components and assembling them for export. In addition, China's ongoing rebalancing toward domestic demand will strengthen its demand for imports of final goods. Therefore, a more complete understanding of China's trade requires an understanding of its imports as well as its exports. Understanding China's imports, in turn, requires understanding the import behavior of its firms, which is what we do in this paper.

The seminal theoretical study of Melitz (2003) assumes that there is a competitive fringe of firms who are producing horizontally differentiated varieties within the industry under monopolistic competition and enter the export market by paying a fixed entry cost. In this model, each firm produces only one good which is purchased by consumers (i.e., final good) and all firms are domestic ones. The Melitz (2003) model has been expanded in many directions. For example, Bernard et al. (2011a) generalize Melitz's (2003) framework to develop a model of multi-product, multi-destination firm, but in their model, firms are still producing only final goods and there are no foreign-invested firms.

Thus, the firm heterogeneity theory of international trade and its empirical studies are still in infancy and there are still a few major areas that require further development. First, almost all theoretical and empirical studies in this literature neglect the importance of ownership difference. They implicitly assume exporting firms are domestic or do not explicitly differentiate domestic firms from foreign affiliates (Lu, et al., 2010). Foreign-invested firms enjoy, on average, higher productivity due to entry costs and pay higher wages, and often generate productivity "spillovers" to the host country. Thus, foreign firms are different from

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<sup>1</sup> Bernard, et al (2011a) provide a comprehensive survey.

domestic firms in terms of business culture and behavior as well as productivity, structure of employment, and other dimensions.

A number of recent empirical studies use Chinese "micro"-datasets to investigate the consequences of firm ownership on size, productivity, capital and skill-intensity, and wages. For example, Lu, et al. (2010) compare foreign affiliate exporters with domestic exporters and find that foreign affiliate exporters are less productive than non-exporters, while domestic exporters are more productive than non-exporters. Manova and Zhang (2009) find that compared to private domestic firms, foreign-invested firms trade more and import more products from more source countries, but export fewer products to fewer destinations. Manova et al. (2011) show that foreign-owned firms and joint ventures perform better than private domestic firms. Du, et al. (2012) find that exporting delivered significant productivity gains for domestic firms but not for foreign affiliates.

Second, the literature on firm heterogeneity in international trade tends to assume that products are differentiated but are all final goods and rule out the existence of intermediate goods. Intermediate goods – i.e. parts and components - are goods used as inputs in the production of other intermediate goods or final goods and hence purchased by other producers, while final goods – i.e. finished goods - are purchased by consumers. Using data from 10 OECD and four emerging countries, Hummels et al. (2001) find that vertical specialization accounts for about 20 percent of imports of these countries and grew by about 30 percent between 1970 and 1990. There have also been many studies confirming the existence of a high level of trade in intermediate goods between East Asian countries – Arndt and Kierzkowski, 2001; Athukorala, 2005, 2009, 2010; Athukorala and Yamashita, 2006, 2008; Ando and Kimura, 2003, 2009; Kimura, 2009 and Lee, et al., 2011, among others.

The presence of intermediate goods suggests the relevance of the theory of production network or fragmentation, in which foreign direct investment plays a major role. Foreign-invested firms trade more intensively in intermediate goods than domestic firms. The study by Goldberg et al. (2010) is of particular interest because it differentiates products into final and intermediate products, unlike other empirical and theoretical studies on the trading behavior of heterogeneous firms. Goldberg et al. (2010) find that, in the case of India's trade, around two thirds of the growth in imports of intermediate goods is accounted for by the extensive margin of newly imported products. They also find that industries which experienced greater tariff reductions in the early 1990s saw a larger increase in total value and variety of imported intermediate inputs.

Third, much of the theoretical and empirical literature on heterogeneous firms and trade examine the cross-section distribution of trade across firms, products and countries (Bernard et al., 2011a). Exceptions are Eaton et al. (2008), Eaton et al. (2011), Akhmetova (2011), Arkolakis (2011), Alborno et al. (2011), Ruhl and Wills (2011) and Segura-Cayuela and Vilarrubia (2008). However, none of these studies examines trade dynamics in a gravity framework which highlights the importance of market size and trade costs in international trade. Baier et al. (2011) use gravity equations of intensive and extensive margins, and find that they are affected by economic integration, but their study looks at total trade conducted by all firms, irrespective of their ownership structure and types of goods.

The main purpose of this paper is to provide an anatomy of China's imports, estimating the relative importance of extensive margin – number of goods – versus the intensive margin – the amount traded per good. Our paper contributes to the literature of firm heterogeneity in international trade, addressing the above-mentioned three issues which have been largely neglected in the literature. First, we distinguish firms into foreign firms and domestic firms, which are further divided into private firms and public firms. Second, we distinguish products into final goods and intermediate goods. Third, we estimate gravity variable from the perspective of dynamics utilizing the a dynamic adjustment model. Overall, our analysis yields a number of new stylized facts about China's imports.

For this purpose, we use Chinese firm trade flows data collected by Chinese Customs Office for two years - 2000 and 2008.<sup>2</sup> The database from Chinese Customs Office includes the f.o.b. value of both exports and imports of China for 243 destination/source economies and 7,526 different products at the 8-digit Harmonized System (HS) level. For each shipment, it also provides information on type of firm, transportation mode, customs office, and firm's geographic information.

The use of China's trade data is of particular interest. Since joining the WTO in 2001, China's international trade has expanded rapidly. The rapid growth of China's trade is related to its growing participation in international production networks. Lee, et al. (2011) provide a comprehensive analysis of the extent of China's trade in parts and components for the period 1992-2009 and assess its determinants using an augmented gravity model. This paper is an extension of Lee, et al. (2011). Using Chinese Customs Statistics database and an augmented gravity model, we distinguish exporters into different types of firms and investigate how different types of firms react to the various determinants of trade in parts and components, as compared to trade in final goods. Like our paper, Manova and Zhang (2009) also use trade data collected by the Chinese Customs Office to analyze China's trade pattern at the firm level and distinguishing between domestic firms and foreign firms. However, this paper differs from Manova and Zhang (2009) in that we look at product differences and perform econometric analysis whereas they do not.

The paper is organized as follows. Section 2 examines the role of different types of firms and products in China's imports in 2000 and 2008. Section 3 presents the empirical framework we use to estimate trade in intermediate goods, as compared to trade in final goods, by different types of firms. Section 4 reports and discusses the empirical results. Section 5 summarizes the main findings and conclude the paper.

## **2. Descriptive Statistics**

In this section, we provide some descriptive statistics pertaining to the role of different types of firms and products in China's trade.

### **2.1. The ownership structure of China's firm**

According to *Regulation of the People's Republic of China on the Management of*

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<sup>2</sup> The data collected by the Chinese Customs Office has also been used by Lu, et al (2010), Manova and Zhang (2009), Manova et al (2011), and Du, et al (2012) in their studies for the differential behavior of foreign vs. domestic firms in international trade.

*Registration of Corporate Enterprises*,<sup>3</sup> Chinese firms are classified into two groups; the domestic firms in which the owners are pure Chinese legal entities or individuals, and the foreign-invested firms, in which some or all investors are foreign legal entities or individuals. Domestic firms can be further categorized into two groups: public firms and private firms.

Public firms are again categorized into two groups: state-owned enterprises (SOEs) and collective owned enterprises. SOE refers to business entity whose entire assets are owned by the State. That is, SOEs are business entities established by central and local governments, who appoint their management team. Collective owned enterprise refers to business entity whose assets are owned collectively by a town or a group of people. Private firms are categorized into two types. Sole proprietorship company is solely invested by a natural person whereas joint-stock company is a company whose capital is divided into shares.

Foreign-invested firms can be categorized into three types: Sino-foreign cooperative enterprises, Sino-foreign joint ventures, and foreign-funded firms. In Sino-foreign cooperative enterprises, the foreign party typically supplies all or most of the capital and technologies, while Chinese party supplies land, factory buildings, and useful facilities. In Sino-foreign joint ventures, foreign companies or individuals and Chinese companies or individuals typically invest together, operate together, take risk according to the ratio of their capital, and jointly take responsibility for their losses and profits. Foreign-funded firms can be either wholly foreign-owned enterprises which are exclusively invested by foreign companies or foreign-funded share-holding companies which are share-holding companies partially funded by foreign companies or individuals.

Figure 1 summarizes different types of firms in China.

**[Figure 1 about here.]**

## 2.2. Relative Shares of China's Trade by Different Types of Firms

China's economy took off when it launched its economic reform and the open-door policy in 1978. Foreign direct investment and international trade have been the main driver of China's fast economic growth. Deng Xiaoping's *Nanxun* speech in 1992 further promoted China's reform and accelerated FDI inflows and international trade.

Figure 2 illustrates the changing pattern of China's imports for the period 1993-2010. During this period, China's imports grew steadily, except for 2009, when world trade contracted in the wake of global financial crisis. Since China joined the WTO in November 2001, its trade accelerated. China's imports expanded 2.7 times from about US\$ 92 billion in 1993 to US\$ 249 billion in 2000. By contrast, its imports increased 5.7 times from about US\$ 249 billion in 2000 to US\$ 1,430 billion in 2008. During this period, the majority of China's imports was carried out by foreign-invested firms, due to the massive FDI inflows to China.

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<sup>1</sup> China Statistical Yearbook 2010.

**[Figure 2 about here.]**

This study focuses on China's imports data for the two years of 2000 and 2008, noting that the former is the year before China joined the WTO and the latter is the year before the global trade collapsed in 2009 in the wake of global financial crisis.

Table 1 summarizes the relative shares of different firms in China's imports of different kinds of products. All goods are categorized into non-manufactured goods (HS 01 - 27) and manufactured goods (HS 28 - 92), which are further categorized into final goods and intermediate goods - i.e. parts and components. Our classification of intermediate goods follows Athukorala (2010), in which a total of 525 6-digit HS codes for manufactured goods (HS 28-96) were identified as intermediate goods. One difference is that we exclude the seventeen 6-digit HS codes in HS 93-96 which are classified as "Others".

As seen in Figure 2, foreign firms accounted for the majority of China's imports in 2008. Foreign firms accounted for about 55% of total imports in 2008, up from 48% in 2000. Foreign firms play a bigger role in manufactured goods imports than in the imports of non-manufactured goods: in 2008, foreign firms accounted for 56.6% of China's manufactured imports. Within manufactured imports, foreign firms play even a bigger role in intermediate goods imports: in 2008, foreign firms were responsible for 69.6% of China's total intermediate goods imports. To summarize, foreign-invested firms dominate China's imports of manufactured goods, particularly imports of intermediate goods.

Among China's domestic firms, public firms and private firms accounted for roughly the same share (22%) of total imports. The parts and components imports show a similar pattern. Public enterprises and private firms accounted for about 15% of total imports of intermediate products, respectively, in 2008. However, the share of private firms is expected to increase very rapidly in imports of all kinds of products. Between 2000 and 2008, total imports share of private firms rose from 1.0% to 22.8%, while the share of public firms declined sharply.<sup>4</sup>

**[Table 1 about here.]**

## 2.2. Extensive and Intensive Margins

A key implication of the Melitz (2003) model is that extensive margin of the number of exporting firms should increase with the size of destination market, since in larger markets firms of lower productivity can generate sufficient variable profits to cover the fixed costs of exporting. Bernard et al. (2009b) show that in the case of the U.S., while the majority of the variation in flows across countries can be explained by the extensive margins of the number of firms and products, year-on-year changes in trade are mostly driven by the intensive margin of trade within continuing firm-product-country trade relationships.

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<sup>4</sup> In 2003 China began accelerating the reform of state-owned enterprises. This policy has sent the small SOEs to market competition and many of small SOEs without efficiency went bankrupt. Meanwhile the private enterprises have increased rapidly since then.

Most researchers have examined "firm" extensive margin of trade, but recent researchers have also examined "goods" extensive margins and "country" extensive margins of trade. This section first examines China's "goods" extensive and intensive margins and then "country" extensive and intensive margins.

Country  $i$ 's aggregate imports from country  $j$  ( $T_{ij}$ ) can be decomposed into "product" extensive margin of the number of product observations with positive imports ( $N_{ij}$ ) and the "goods" intensive margin of average product imports conditional on positive imports ( $A_{ij} = T_{ij}/N_{ij}$ ):

$$T_{ij} = N_{ij}A_{ij}, \quad A_{ij} = T_{ij}/N_{ij}$$

Thus, China's total world ( $T$ ) imports can be decomposed into "goods" extensive margin of the number of product observations with positive imports ( $N$ ) and the "goods" intensive margin of average product imports conditional on positive trade ( $A = T/N$ ):

$$T = NA, \quad A = T/N$$

Table 2 summarizes the "goods" extensive and intensive margins of China's total world imports, respectively, by different types of firms. The "goods" extensive margin of imports is defined as the number of HS 8-digit classification codes with positive imports.<sup>5</sup> As seen in panel B of the tables, the "goods" extensive margin increased between 2000 and 2008 for imports of final goods, irrespective of the types of firms. In particular, that of private firms increased by over 100%. In contrast, for imports of intermediate goods, the "goods" extensive margin of domestic public firms and foreign-invested firms fell during the period, while that of private firms rose by over 50%. In 2008, the "goods" extensive margin was similar among the three types of firms for imports of both final and intermediate goods.

Panel C of Table 2 also reports the "goods" intensive margin, which is defined as the amount of total imports divided by the "goods" extensive margin. The "goods" intensive margin grew exceptionally fast between 2000 and 2008, irrespective of the types of firms. In particular, the goods intensive margin of domestic private firms rose by over 5,000%. Nonetheless, in 2008 the goods intensive margin was still the largest for foreign-invested firms for both final and intermediate goods.

**[Table 2 about here.]**

China's total imports from the rest of the world ( $T$ ) can also be decomposed into "country" extensive margin of the number of partner countries with positive imports ( $M$ ) and the "country" intensive margin of average imports to a partner country conditional on positive imports ( $B = T/M$ ):

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<sup>5</sup> Hummels and Klenow (2005) define each good as a 6-digit SITC category to decompose total trade into the "goods" margin of trade. In contrast, Hillberry and McDaniel (2002) and Kehoe and Ruhl (2009) decompose post-NAFTA trade among the participating members into goods extensive and intensive margins using 4-digit SITC data. In their gravity study on the relationship between economic integration agreements and the margins of international trade, Baier, et al (2011) also use SITC 4-digit classification to decompose bilateral trade between 149 countries. In contrast, each good is defined in this paper as a 8-digit HS category, the most disaggregated category, compared with other studies..

$$T = MB, \quad B = T/M$$

Table 3 (Panel B) reports the "country" extensive and intensive margins of China's imports by different types of firms. The extensive "country" margin increased, irrespective of types of goods and firms. In particular, the country extensive margin increased most rapidly for imports of intermediate goods by private firms.

**[Table 3 about here.]**

Comparing Tables 1, 2, and 3, increases in China's imports of manufactured goods between 2000 and 2008 were driven by increases in the intensive margin of imports for a given good (i.e., "goods" intensive margin) and for a given country ("country" intensive margin) and by the extensive margin of imports of the number of goods (i.e., "goods" extensive margin), but not by the extensive margin of the number of countries (i.e., "country" extensive margin).

It is also noted that in 2008, the country extensive margin of imports (i.e. the number of source countries) is greater for foreign-invested firms than for domestic public or private firms and the country intensive margin of imports (i.e. the average imported value from a given country) is also greater for foreign firms than for domestic firms. This is consistent with Manova and Zhang (2009) which finds that import product intensity and the number of source countries increase with foreign ownership.

### **3. Empirical Models of Parts and Components Trade by Different Types of Firms**

In this section, we present the empirical framework we use to estimate trade in intermediate goods.

#### **3.1. The Basic Model**

As noted in the introduction, we use the gravity equation to assess how the three different types firms behave differently with respect to choosing their trading partners depending for different product types. Since Tinbergen (1962) and Pöyhönen (1963), the simple gravity equation, in which the volume of trade between two countries is proportional to the product of their masses (GDPs) and inversely related to the distance between them, has proved empirically highly successful. Recently, with renewed interest among economists in geography, the model has again become widely used in the literature. Indeed, many researchers have shown that the gravity equation can be derived from many different models of international trade (Helpman and Krugman, 1985; Bergstrand, 1989; Deardorff, 1998; Evenett and Keller, 1998; Eaton and Kortum, 2002).

In addition, researchers such as Anderson and van Wincoop (2003) have shown that bilateral trade depends not only on country size and distance, but also on relative distance (i.e., multilateral price terms). That is, trade will be greater between country pairs that are far from the rest of the world than between country pairs that are close to the rest of the world. Thus, the standard gravity equation drawn from theory can take the following form:



$$\text{LnT}_{ijt} = \alpha + \beta_1 \text{LnGDP}_{it} + \beta_2 \text{LnGDP}_{jt} + \beta_3 \text{LnDIST}_{ijt} + \beta_4 \text{LnREMOT}_{it} + \beta_5 \text{LnREMOT}_{jt} + \varepsilon_{ijt}, \quad (1)$$

where

$\text{LnT}_{ij}$  = log of import flows from country  $j$  to country  $i$  at time  $t$

$\text{LnGDP}_i$  = log of GDP of country  $i$  at time  $t$

$\text{LnGDP}_j$  = log of GDP of country  $j$  at time  $t$

$\text{LnDIST}_{ij}$  = log of geographical distance between country  $i$  and country  $j$

$\text{LnREMOT}_{it}$  = log of remoteness of country  $i$  at time  $t$

$$= \log(1/\sum_k(\text{GDP}_k/\text{GDP}_w)/\text{DISTANCE}_{ik})$$

where  $\text{GDP}_w$  = world GDP

$\text{LnREMOT}_{jt}$  = log of remoteness of country  $j$  at time  $t$

$$= \log(1/\sum_k(\text{GDP}_k/\text{GDP}_w)/\text{DISTANCE}_{jk})$$

$\varepsilon_{ijt}$  = random disturbance term.

Because country  $i$  stands for only one country (China) and we take only two years, variables for country  $i$  are removed from the gravity equation. Therefore, Equation (1) becomes

$$\text{LnT}_{jt} = \alpha + \beta_1 \text{LnGDP}_{jt} + \beta_2 \text{LnDIST}_{jt} + \beta_3 \text{LnREMOT}_{jt} + \varepsilon_{jt}. \quad (2)$$

where

$\text{LnT}_j$  = log of imports flows to China from country  $j$  at time  $t$

$\text{LnDIST}_{ij}$  = log of geographical distance between China and country  $j$

In the equation above, we include dummy variables for island and landlocked countries.<sup>6</sup> Taking note of the debate about the role of the WTO (Rose, 2004; 2005; Subramanian and Wei, 2007), we also include a dummy variable for WTO member countries. We also include a dummy variable for China's bilateral FTA partners. Lastly, we include a dummy variable for Hong Kong and Taiwan, with which China shares a number of commonalities such as language and culture and maintains a special relationship. Thus, our augmented gravity equation is:

$$\text{LnT}_{jt} = \alpha + \beta_1 \text{LnGDP}_{jt} + \beta_2 \text{LnDIST}_j + \beta_3 \text{LnREMOT}_{jt} + \beta_4 \text{ISLAND}_j + \beta_5 \text{LANDLOCKED}_j + \beta_6 \text{RTA}_{jt} + \beta_7 \text{WTO}_{jt} + \beta_8 \text{HT} + \varepsilon_t + \varepsilon_{jt}, \quad (3)$$

where

$\text{ISLAND}_j = 1$  if country  $j$  is an island country

$= 0$  otherwise

$\text{LANDLOCKED}_j = 1$  if country  $j$  is a landlocked country

$= 0$  otherwise

$\text{RTA}_{jt} = 1$  if country  $j$  is China's RTA partner at time  $t$

$= 0$  otherwise.

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<sup>6</sup> It is also customary to include a dummy variable for country pairs sharing a land border. China shares borders with a number of countries, and hence we included a dummy variable for these border-sharing countries, but we found no significant results.

$WTO_{jt} = 1$  if country  $j$  is a WTO member at time  $t$   
 $= 0$  otherwise  
 $HT_t = 1$  if country  $j$  is Hong Kong or Taiwan<sup>7</sup>  
 $= 0$  otherwise.  
 $\varepsilon_t =$  year dummy.

Among the explanatory variables, GDP (in US dollars), GDP per capita, population, and area (in square kilometers) are taken from the World Bank's WDI Online data.<sup>8</sup> Geographical distance is taken from Centre d'Etudes Prospectives et d'Informations Internationales (CEPII)'s website.<sup>9</sup> It is noted that the distances are weighted distances, which use city-level data to assess the geographic distribution of population inside each nation. The remoteness index is also calculated by using the weighted distances. The variables indicating whether the country is landlocked or island are also taken from CEPII's website. Lastly, information on the members of the World Trade Organization (WTO) is taken from the website of the WTO and information on China's RTA is from China's official website "China FTA Network."<sup>10</sup>

As discussed above, China's aggregate imports from country  $j$  ( $T_j$ ) can be decomposed into the "goods" extensive margin of the number of product observations with positive imports ( $N_j$ ) and the "goods" intensive margin of average product imports conditional on positive trade ( $A_j = T_j/N_j$ ):

$$T_j = N_j A_j, \quad A_j = T_j / N_j$$

Therefore the log of the extensive margin ( $N_j$ ) and the log of the intensive margin ( $A_j$ ) will also be regressed, alternatively, against the regressors in the gravity equation presented in Equation (3).

Our benchmark model of the gravity equation is static with a year dummy, as our data are based on two years, 2000 and 2008 and country fixed effects cannot be estimated. Accordingly, in the next stage we estimate the so-called partial-adjustment model.

### 3.2. Partial-adjustment Model

The partial-adjustment model is useful because it can estimate not only the long-run factors but also the short-run factors influencing changes in trade between 2000 and 2008.<sup>11</sup> Suppose that the desired level of  $\text{Ln}T_j$  at time  $t$  is  $\text{Ln}T_{jt}^*$ ; then, the relationship between the actual and the desired level of  $\text{Ln}T_j$  may be specified as follows:

$$\Delta \text{Ln}T_j = \delta (\text{Ln}T_{jt}^* - \text{Ln}T_{jt-1}), \quad (4)$$

where  $\Delta \text{Ln}T_{jt} = \text{Ln}T_{jt} - \text{Ln}T_{jt-1}$  and  $\delta$  is the rate of adjustment bounded by zero and one. Because

<sup>7</sup> Macao is not included in our sample.

<sup>8</sup> <http://publications.worldbank.org/WDI>

<sup>9</sup> <http://www.cepii.fr/anglaisgraph/bdd/distances.htm>

<sup>10</sup> <http://rtais.wto.org/UI/PublicMaintainRTAHome.aspx>; <http://fta.mofcom.gov.cn/topic/chinaasean.shtml>

Wikipedia ([http://en.wikipedia.org/wiki/Trade\\_bloc#Most\\_active\\_regional\\_blocs](http://en.wikipedia.org/wiki/Trade_bloc#Most_active_regional_blocs))

<sup>11</sup> The partial-adjustment model can be found elsewhere, such as Curry and George (1983), Stone and Lee (1995), and Lee, et al (2008).

$\text{LnT}_{jt}^*$  is not observed, several formulations are possible. One formulation assumes that  $\text{LnT}_{jt}^*$  is determined by the level forms of the determinants of  $\text{LnT}_j$  in period  $t-1$ , as well as the difference forms (which incorporate changes in the long-run extent of  $\text{LnT}_j$  between periods  $t-1$  and  $t$ ). Thus, the equation for changes in  $\text{LnT}_{ij}$  is

$$\Delta \text{LnT}_j = -\delta \text{LnT}_{jt-1} + \lambda_1 X_{jt-1} + \lambda_2 (X_{jt} - X_{jt-1}), \quad (5)$$

where  $X$  is a vector of explanatory variables.

If the coefficients in Equation (5) are invariant to the choice of time period (which obtains at equilibrium with constant coefficients) and if the errors between  $t$  and  $t-1$  are not correlated, then the  $\lambda$  coefficient on each level variable divided by the rate of adjustment parameter ( $\delta$ ) equals the corresponding long-run coefficient ( $\beta$ ). The  $\lambda$  coefficients on the first-difference variables represent the short-run adjustments to contemporaneous changes in the determinants of  $\text{LnT}_j$ .

In our gravity equation, the distance variable and dummies for landlocked and island countries are time-invariant and hence enter only as "level" variables. On the other hand, China did not have any RTA partner in 2000 and hence the RTA dummy variable enters only as a "difference" variable. Specifically we estimate the following equation:

$$\begin{aligned} \Delta \text{LnT}_j = & -\delta \text{LnT}_{jt-1} + \beta_1 \text{LnGDP}_{jt-1} + \beta_2 \text{LnDIST}_j + \beta_3 \text{LnREMOTE}_{jt-1} + \beta_4 \text{ISLAND}_j \\ & + \beta_5 \text{LANDLOCKED}_j + \beta_6 \text{WTO}_{jt-1} + \beta_7 \text{HT}_j + \beta_8 \Delta \text{LnGDP}_j + \beta_9 \Delta \text{LnREMOTE}_j \\ & + \beta_{10\Delta} \text{RTA}_j + \beta_{11\Delta} \text{WTO} + \varepsilon_j, \end{aligned} \quad (6)$$

where  $t-1 = 2000$ ;  $t = 2008$

$$\Delta \text{LnGDP}_j = \text{LnGDP}_{jt} - \text{LnGDP}_{jt-1}$$

$$\Delta \text{LnREMOTE}_j = \text{LnREMOTE}_{jt} - \text{LnREMOTE}_{jt-1}$$

$$\Delta \text{RTA}_j = \text{RTA}_{jt} - \text{RTA}_{jt-1}$$

$$\Delta \text{WTO}_j = \text{WTO}_{jt} - \text{WTO}_{jt-1}.$$

Thus, we can distinguish the short-run contemporaneous effect from the long-run steady-state effect. Another advantage of this model is that by first-differencing the dependent variable and the time-variant explanatory variables, this methodology also accounts for unobserved country-fixed effects as well as observed country-fixed effects.

Equation (6) will also be estimated for the changes in the "goods" extensive margin ( $N_j$ ) and in the "goods" intensive margin ( $A_j$ ), alternatively.

#### 4. Empirical Results

In this section, we report and discuss the main empirical results.

##### 4.1. The basic model

Table 4 shows our benchmark regression results of the static gravity model in which the dependant variable is the value of imports of three groups of products - all manufactured

goods, final goods, and parts and components - for three different types of importing firms - public, private and foreign.

The gravity model works well for all equations, as indicated by the large size of  $R^2$ . China imports more from larger countries and less from more distant countries, irrespective of the types of firms and the types of products. A noticeable difference among the types of products is that China's imports of parts and components appear to be more responsive to the size of source economies and geographic distance, irrespective of the types of firms. Larger economies tend to have broader, deeper and more sophisticated manufacturing bases than smaller economies. As such, they are more reliable sources of parts and components. This matters a lot since reliable supply is a key precondition of cross-border supply chains. In a similar vein, the risk of transportation bottlenecks is likely to be smaller for geographically closer countries than distant countries. Again, cross-border supply chains depend critically on reliable supply of parts and components, and this may explain the greater responsiveness of parts and components imports to distance.

We also find all firms import less intermediate products from geographically remote countries. All three types of firms import less from landlocked countries, and domestic firms less from island countries. Transportation bottlenecks which disrupt cross-border supply chains is more likely for landlocked and island countries.

We have two variables related with trade liberalization: WTO dummy variable and RTA dummy variable. China seems to import more intermediate goods, but not final goods, from WTO member countries, irrespective of types of firms. The greater impact of WTO membership on imports of parts and components is intuitively plausible. Importing parts and components is an integral part of China's export-led growth strategy since a large part of China's exports involve assembling imported parts and components for exports. Against this backdrop, WTO membership further facilitated imports of parts and components.

However, China's free trade agreements does not have a significant effect. This is not surprising because in our sample, there was no RTA partner of China in 2000 and only few countries became China's RTA partners between 2000 and 2008.<sup>12</sup> It is also noted that because without taking full advantage of the panel data with country pair fixed effects (partner country effects in our case) or with first differences, our regression cannot accurately estimate the precise impact of FTA, as explained by Baier and Bergstrand (2007) and Baier, et al. (2011). Hong Kong and Taiwan are found to be the "special" trading partners for China's private firms in their imports of both final and intermediate products.

Table 5 reports the same benchmark regression results with the dependant variable replaced with the log of the "goods" extensive margin of China's imports, defined as the number of HS-8 classifications which enter with positive value of export flows to each country for each category products. Table 6 reports the results when the dependant variable is the log of the "goods" intensive margin, defined as the average value of export flows per each HS-8 classifications with positive export values.

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<sup>12</sup> In our sample, ASEAN (July 2005), Pakistan (July 2007), Chile (October 2006), and New Zealand (October 2008) are the only economies which became China's RTA partners between 2000 and 2008. Dates in parenthesis are the dates when the agreement entered into force.

[Table 4 about here.]

[Table 5 about here.]

[Table 6 about here.]

For both extensive and intensive margins of trade, the GDP of partners is positive and significant. Thus, China imports more from large economies because it (i) imports larger quantities of a given good (intensive margin) and (ii) imports a wider set of goods (extensive margin). Our finding is consistent with Eaton et al. (2004, 2011) which show that the number of firms and products selling to a market increases with market size, and with Bernard et al. (2011b) which show that the average exports per firm and product increases with market size.

The absolute size of the estimates for the distance variable is greater for the extensive margin than for the intensive margin for final goods imports, but vice versa for intermediate goods imports. In addition, China (both domestic and foreign) imports greater varieties of both final and intermediate goods from WTO members, and import greater average value of intermediate goods only. In contrast, the RTA dummy variable is not positively significant.

#### 4.2. Partial-adjustment Model

Table 7 presents ordinary least squares estimates of the partial-adjustment model in Equation (6) when the dependant variable is the first difference in the log of total value of imports for each category of products. As noted above, the partial-adjustment model allow us to distinguish the short-run contemporaneous effect from the long-run steady-state effect and to account for unobserved country-fixed effects as well as observed country-fixed effects, by first-differencing the dependent variable and the time-variant explanatory variables.

The adjustment rate, which is the coefficient of the lagged value of imports ( $\text{LnT}_{t-1}$ ), is the largest in absolute term for the equations for imports by private firms for both types of goods, suggesting that between 2000 and 2008, private firms, as compared to public firms or foreign-invested firms, increased their imports more rapidly from the sources from which they imported less in 2000.

The coefficients of the levels and difference-form variables of the log of GDP of partner economies have the expected positive signs and are significant at the one percent level. The log of distance has the expected negative sign and is highly significant in all of the equations, irrespective of the types of goods and firms. In terms of the size of the coefficient estimates, changes in imports of intermediate goods by foreign-invested firms are most responsive to geographical distance.

The lagged level form of the WTO dummy (i.e., the economies which were already members of the WTO as of 2000), WTO membership of trading partners does not seem to have contributed to an increase in imports of both final goods and intermediate goods. In contrast, imports of final goods by private firms has a positive and significant coefficient for the "difference" form of the WTO dummy (i.e., the dummy for the economies which joined the WTO between 2000 and 2008) but has negative and significant coefficients for the "difference" form of the WTO dummy.

Table 8 reports the results when the dependant variable is the first difference in the log of the "goods" extensive margin of China's imports (the number of imported products) for different types of goods traded by different types of firms, while Table 9 reports the results when the dependant variable is the first difference in the log of the "goods" intensive margin (the average value of each imported product) of China's imports.

China's imports of manufactured products (both final and intermediate products) appear to have increased more rapidly from fast growing countries, because both the extensive margin and intensive margin increased from fast growing countries. In contrast, China's imports appear to have increased more rapidly from geographically closer countries, mainly because the intensive margin increased more rapidly from geographically closer countries). This is especially so for imports of intermediate products.

**[Table 7 about here.]**

**[Table 8 about here.]**

**[Table 9 about here.]**

## **5. Concluding Observations**

The focus of research on international trade has recently shifted from industries and countries to firms and products. This mirrors the stylized fact that firm and product heterogeneity are important dimensions of international trade. For example, exporting firms are larger, more productive, more skill-and capital-intensive, and pay higher wages than non-exporting firms. Thus, previous studies look primarily at firm export behavior rather than firm import behavior. The emerging literature on the implications of firm and product heterogeneity also suffers from a number of shortcomings. First, almost all theoretical and empirical studies in the literature neglect ownership differences among firms. Second, the literature on firm heterogeneity in international trade assumes that all goods are final goods and rule out the existence of intermediate goods which are used in the production of other goods. Third, the literature tends to ignore the dynamics of firm trade behavior over time.

The central objective of our paper is to anatomize China's imports, and estimate the relative importance of extensive margin – number of goods – versus the intensive margin – the amount traded per good, while addressing the above issues which have largely been neglected in the literature on firm heterogeneity in trade. First, we distinguish firms into foreign firms and domestic firms, which are further divided into private firms and public firms. Second, we distinguish products into final goods and intermediate goods. Third, we estimate gravity equations from the perspective of dynamics utilizing the a dynamic adjustment model. Using highly disaggregated HS 8-digit product-category level data collected by the Chinese Customs Office for 2000 and 2008, we perform an in-depth anatomy of China's trade in manufactured goods. We estimate static gravity models with which we explain value of trade, extensive margins and intensive margins with a number of control variables, as well as a partial-adjustment model to capture dynamic trade behavior.

Our in-depth empirical analysis of China's imports, which takes into account firm and product heterogeneity, yields a number of interesting findings. For example, foreign firms dominate China's imports of manufactured goods, especially its imports of intermediate goods. In 2008, while the "goods" extensive margin – number of goods exported - was similar among the three types of firms of both final and intermediate goods, the "goods" intensive margin was higher for foreign firms of both types of goods. China imports more from large economies not only because large economies export larger quantities of a given good - intensive margin - but also because they export a wider range of goods.

To conclude, we hope that our attempt to address the major shortcomings in the current literature on firm heterogeneity in trade through empirical analysis of Chinese trade micro-data will contribute to the further development of this emerging literature as well as deepen our understanding of China's trade. Upon closer reflection, those shortcomings have a special resonance for China. For one, given China's central role in East Asian production networks and the large role of MNCs in its trade, failure to distinguish between final and intermediate goods will compromise any analysis of China's trade. Finally, at a broader level, our product-level analysis of China's imports will contribute to a fuller understanding of China's trade patterns in light of China's recent emergence as a globally significant importer.

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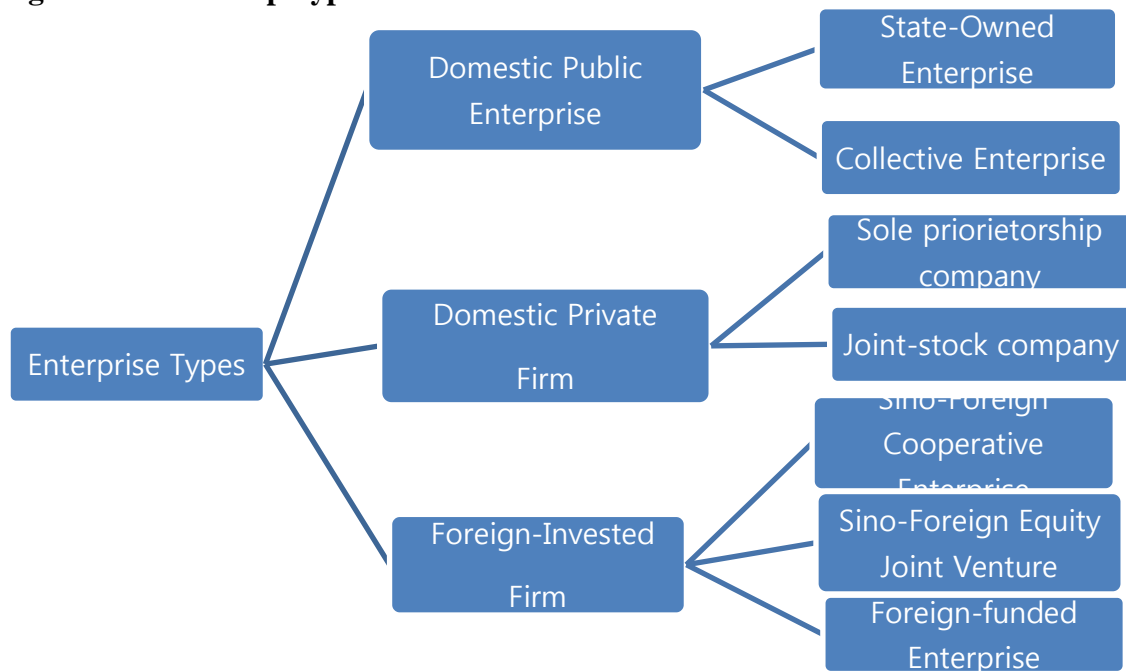
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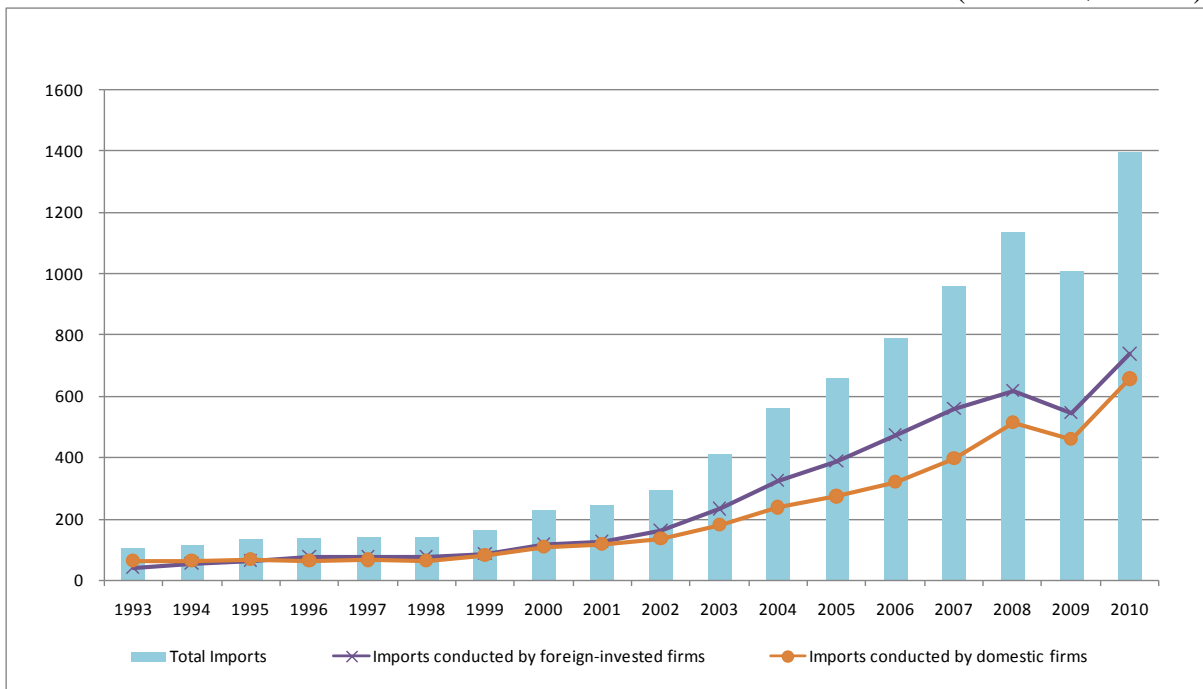
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**Figure 1: Ownership Types of Firms in China**



**Figure 2. Trend of China's Imports Shares Conducted by Domestic and Foreign-invested Firms**

(Unit: US\$ Billion)



Source: China Statistical Yearbook 2010

**Table 1. China's Imports of Different Types of Products by Different Types of Firms**  
(Unit: US\$ billion)

	Imports			
	2000	%	2008	%
<b>All goods</b>	225.1	100.0%	1132.0	100.0%
Domestic public firms	105.1	46.7%	382.6	33.8%
Domestic private firms	1.4	0.6%	124.8	11.0%
Foreign-invested firms	117.3	52.7%	619.2	55.2%
<b>Non-manufactured goods</b>	33.9	100.0%	312.1	100.0%
Domestic public firms	27.4	80.7%	230.1	73.7%
Domestic private firms	0.2	0.5%	29.1	9.3%
Foreign-invested firms	6.3	18.8%	52.8	16.9%
<b>Manufactured goods</b>	188.5	100.0%	812.2	100.0%
Domestic public firms	76.8	40.7%	151.9	18.7%
Domestic private firms	1.2	0.6%	95.2	11.7%
Foreign-invested firms	110.1	58.4%	564.0	69.4%
<b>Final goods</b>	119.9	100.0%	620.3	100.0%
Domestic public firms	57.5	48.0%	122.3	19.7%
Domestic private firms	1.0	0.8%	80.7	13.0%
Foreign-invested firms	61.1	51.0%	416.5	67.1%
<b>Parts and components</b>	68.6	100.0%	191.8	100.0%
Domestic public firms	19.3	28.1%	29.6	15.5%
Domestic private firms	0.2	0.3%	14.6	7.6%
Foreign-invested firms	49.0	71.5%	147.5	76.9%

Data: Chinese Customs Office

**Table 2. "Goods" Extensive and Intensive Margins of China's Imports by Different Types of Firms**

	Imports								
	A: Total imports			B: "Goods" extensive margin (Number of importing products)			C: "Goods" intensive margin (Average imports of each product)		
	(US\$ Million)						(US\$ Million)		
	2000	2008	Change (%)	2000	2008	Change (%)	2000	2008	Change (%)
<b>Manufactured goods</b>	188,503.3	812,164.5	330.8%	5,473	5,912	8.0%	34.5	137.3	297.7%
Domestic public firms	76,775.6	151,911.9	97.9%	5,349	5,520	3.2%	14.4	27.5	91.8%
Domestic private firms	1,185.6	95,230.3	7932.5%	2,340	5,534	136.5%	0.5	17.2	3282.7%
Foreign-invested firms	110,104.6	563,952.3	412.2%	5,250	5,676	8.1%	21.0	99.4	374.2%
<b>Final goods</b>	119,934.4	620,314.8	417.2%	4,660	5,150	10.5%	25.8	120.4	366.0%
Domestic public firms	57,507.8	122,264.9	112.6%	4,538	4,768	5.1%	12.7	25.7	102.6%
Domestic private firms	1,010.0	80,659.1	7886.4%	1,852	4,792	158.7%	0.5	16.8	2972.0%
Foreign-invested firms	61,107.1	416,457.7	581.5%	4,454	4,928	10.6%	13.7	84.6	517.9%
<b>Parts and components</b>	68,568.9	191,849.7	179.8%	813	762	-6.3%	84.4	252.0	198.6%
Domestic public firms	19,267.8	29,646.9	53.9%	811	752	-7.3%	23.8	39.4	65.4%
Domestic private firms	175.6	14,571.2	8198.2%	488	742	52.0%	0.4	19.7	5355.8%
Foreign-invested firms	48,997.5	147,494.6	201.0%	796	748	-6.0%	61.6	196.5	219.3%

Source: Chinese Customs Office

Notes: Number of exporting products is the number of HS 8-digit classified items. Average exports of each product is the total exports divided by the number of exporting products.

**Table 3. "Country" Extensive and Intensive Margins of China's Imports by Different Types of Firms**

	Imports								
	A: Total imports (a)			B: Number of countries			C: Average imports from each country		
	(US\$ Million)						(US\$ Million)		
	2000	2008	Change (%)	2000	2008	Change (%)	2000	2008	Change (%)
<b>Manufactured goods</b>	188,503.3	812,164.5	330.8%	184	217	17.9%	1024.5	3742.7	265.3%
Domestic public firms	76,775.6	151,911.9	97.9%	172	182	5.8%	446.4	834.7	87.0%
Domestic private firms	1,185.6	95,230.3	7932.5%	85	189	122.4%	13.9	503.9	3512.5%
Foreign-invested firms	110,104.6	563,952.3	412.2%	157	211	34.4%	701.3	2672.8	281.1%
<b>Final goods</b>	119,934.4	620,314.8	417.2%	181	213	17.7%	662.6	2912.3	339.5%
Domestic public firms	57,507.8	122,264.9	112.6%	169	179	5.9%	340.3	683.0	100.7%
Domestic private firms	1,010.0	80,659.1	7886.4%	80	183	128.8%	12.6	440.8	3391.3%
Foreign-invested firms	61,107.1	416,457.7	581.5%	153	204	33.3%	399.4	2041.5	411.1%
<b>Parts and components</b>	68,568.9	191,849.7	179.8%	129	193	49.6%	531.5	994.0	87.0%
Domestic public firms	19,267.8	29,646.9	53.9%	109	123	12.8%	176.8	241.0	36.4%
Domestic private firms	175.6	14,571.2	8198.2%	50	144	188.0%	3.5	101.2	2781.3%
Foreign-invested firms	48,997.5	147,494.6	201.0%	108	182	68.5%	453.7	810.4	78.6%

Source: Chinese Customs Office

Notes: Number of countries is the number of countries from which China imported. Average imports from each each country is the total imports divided by the number of importing countries.

**Table 4. Determinants of Total Value of Imports: Basic Model**

	All manufactured goods				Final goods				Parts and components			
	All firms	Public	Private	Foreign	All firms	Public	Private	Foreign	All firms	Public	Private	Foreign
GDP of partners (log)	0.996*** (0.103)	0.992*** (0.107)	0.916*** (0.110)	1.120*** (0.110)	0.988*** (0.106)	0.941*** (0.108)	0.859*** (0.111)	1.089*** (0.113)	1.396*** (0.134)	1.386*** (0.173)	1.153*** (0.151)	1.401*** (0.134)
Distance (log)	-2.154*** (0.342)	-2.303*** (0.354)	-1.912*** (0.310)	-1.919*** (0.379)	-2.122*** (0.340)	-2.310*** (0.356)	-1.859*** (0.310)	-1.923*** (0.365)	-2.566*** (0.515)	-2.719*** (0.576)	-3.140*** (0.493)	-2.647*** (0.521)
Remoteness (log)	-0.597 (0.402)	-0.341 (0.422)	0.367 (0.409)	-0.756* (0.413)	-0.435 (0.406)	-0.155 (0.428)	0.697* (0.416)	-0.469 (0.415)	-2.944*** (0.514)	-2.716*** (0.568)	-2.528*** (0.486)	-2.546*** (0.511)
Island countries	-0.291 (0.441)	-0.424 (0.475)	-0.877* (0.527)	0.007 (0.471)	-0.387 (0.452)	-0.422 (0.489)	-1.001* (0.578)	-0.259 (0.477)	1.412** (0.711)	1.091 (0.863)	0.232 (0.664)	1.284* (0.671)
Landlocked countries	-0.671 (0.481)	-0.439 (0.556)	-0.284 (0.635)	-1.219** (0.545)	-0.758 (0.533)	-0.424 (0.567)	-0.050 (0.544)	-1.235** (0.558)	-1.083* (0.584)	-0.434 (0.742)	-2.073*** (0.760)	-0.970 (0.615)
RTA partners	0.631 (0.881)	0.426 (0.910)	0.469 (0.733)	0.768 (1.017)	0.697 (0.871)	0.428 (0.917)	0.328 (0.734)	0.738 (1.008)	1.006 (1.348)	0.436 (1.672)	0.914 (1.183)	0.752 (1.345)
WTO membership	0.709 (0.465)	0.634 (0.560)	0.640 (0.530)	0.814 (0.506)	0.465 (0.473)	0.487 (0.621)	0.537 (0.557)	0.840 (0.523)	1.798*** (0.627)	1.864*** (0.703)	2.401*** (0.743)	2.283*** (0.617)
Hong Kong and Taiwan	0.573 (0.643)	0.444 (0.683)	-0.287 (0.459)	0.890 (0.775)	0.625 (0.687)	0.497 (0.703)	-0.276 (0.469)	0.883 (0.782)	0.660 (1.120)	-1.045 (1.558)	-0.545 (1.195)	0.665 (1.089)
2008 year dummy	2.750*** (0.369)	2.174*** (0.417)	5.303*** (0.510)	2.574*** (0.404)	2.805*** (0.380)	2.188*** (0.432)	5.361*** (0.540)	2.627*** (0.412)	2.218*** (0.551)	1.540** (0.612)	4.176*** (0.706)	1.847*** (0.588)
Constant	16.048** (6.833)	14.575** (6.928)	3.535 (6.040)	11.239 (7.159)	14.528** (6.873)	14.282** (6.969)	1.664 (5.897)	9.363 (7.179)	25.150*** (8.978)	23.876** (10.241)	28.514*** (8.774)	21.897** (8.842)
Number of observations	266	256	201	253	265	251	196	247	231	183	150	208
R2	0.565	0.494	0.548	0.579	0.536	0.455	0.543	0.565	0.618	0.554	0.627	0.623

Note: Shown in parentheses are robust standard errors. \*\*\*, \*\*, and \* denote one, five, and ten percent level of significance, respectively. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 5. Determinants of Total Number of Imported Products: Basic Model**

	All manufactured goods				Final goods				Parts and components			
	All firms	Public	Private	Foreign	All firms	Public	Private	Foreign	All firms	Public	Private	Foreign
GDP of partners (log)	0.611*** (0.055)	0.672*** (0.058)	0.586*** (0.061)	0.646*** (0.061)	0.619*** (0.056)	0.651*** (0.059)	0.560*** (0.059)	0.650*** (0.062)	0.557*** (0.054)	0.595*** (0.072)	0.494*** (0.071)	0.563*** (0.059)
Distance (log)	-1.157*** (0.196)	-1.283*** (0.208)	-1.183*** (0.211)	-1.109*** (0.221)	-1.226*** (0.198)	-1.347*** (0.208)	-1.211*** (0.204)	-1.216*** (0.218)	-0.758*** (0.193)	-0.967*** (0.218)	-1.011*** (0.214)	-0.830*** (0.205)
Remoteness (log)	-1.068*** (0.228)	-0.904*** (0.242)	-0.940*** (0.202)	-1.154*** (0.248)	-0.951*** (0.234)	-0.727*** (0.246)	-0.804*** (0.199)	-1.021*** (0.250)	-1.298*** (0.210)	-1.170*** (0.233)	-1.011*** (0.202)	-1.152*** (0.227)
Island countries	0.311 (0.228)	0.205 (0.242)	0.234 (0.257)	0.430 (0.270)	0.291 (0.227)	0.192 (0.249)	0.175 (0.253)	0.331 (0.263)	0.436 (0.270)	0.319 (0.319)	0.193 (0.300)	0.557** (0.279)
Landlocked countries	-0.637*** (0.209)	-0.615** (0.252)	-0.598*** (0.227)	-0.927*** (0.251)	-0.631*** (0.219)	-0.550** (0.255)	-0.564** (0.227)	-0.945*** (0.259)	-0.713*** (0.230)	-0.505* (0.300)	-0.897*** (0.292)	-0.663** (0.263)
RTA partners	0.287 (0.389)	0.112 (0.437)	0.342 (0.436)	0.200 (0.451)	0.257 (0.396)	0.082 (0.434)	0.271 (0.435)	0.168 (0.458)	0.434 (0.389)	0.198 (0.448)	0.492 (0.429)	0.207 (0.429)
WTO membership	0.655*** (0.197)	0.617*** (0.211)	0.686*** (0.205)	0.832*** (0.224)	0.677*** (0.208)	0.660*** (0.232)	0.720*** (0.217)	0.858*** (0.230)	0.612*** (0.198)	0.730*** (0.230)	0.903*** (0.284)	1.035*** (0.247)
Hong Kong and Taiwan	0.821*** (0.298)	0.674** (0.328)	0.102 (0.352)	0.932*** (0.345)	0.821*** (0.300)	0.656** (0.302)	0.139 (0.329)	0.917*** (0.335)	0.711*** (0.271)	0.354 (0.357)	0.059 (0.294)	0.410 (0.426)
2008 year dummy	1.418*** (0.189)	0.893*** (0.202)	2.857*** (0.262)	1.439*** (0.221)	1.384*** (0.195)	0.855*** (0.209)	2.796*** (0.262)	1.338*** (0.224)	1.059*** (0.207)	0.534** (0.240)	1.964*** (0.321)	0.955*** (0.246)
Constant	8.043** (3.986)	5.922 (4.211)	5.641 (3.866)	6.802 (4.355)	7.225* (4.036)	5.253 (4.209)	5.183 (3.733)	6.347 (4.381)	6.431* (3.682)	5.975 (4.274)	6.113 (3.942)	5.046 (3.904)
Number of observations	265	256	201	253	264	251	196	249	230	183	150	208
R2	0.710	0.695	0.726	0.679	0.700	0.666	0.715	0.682	0.669	0.622	0.616	0.625

Note: Shown in parentheses are robust standard errors. \*\*\*, \*\*, and \* denote one, five, and ten percent level of significance, respectively. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 6. Determinants of Average Value of Imports: Basic Model**

	All manufactured goods				Final goods				Parts and components			
	All firms	Public	Private	Foreign	All firms	Public	Private	Foreign	All firms	Public	Private	Foreign
GDP of partners (log)	0.383*** (0.066)	0.320*** (0.066)	0.331*** (0.074)	0.474*** (0.068)	0.368*** (0.068)	0.289*** (0.067)	0.298*** (0.077)	0.440*** (0.071)	0.835*** (0.088)	0.791*** (0.110)	0.659*** (0.094)	0.838*** (0.084)
Distance (log)	-0.995*** (0.208)	-1.020*** (0.225)	-0.730*** (0.204)	-0.810*** (0.212)	-0.895*** (0.209)	-0.963*** (0.229)	-0.648*** (0.216)	-0.715*** (0.206)	-1.733*** (0.356)	-1.752*** (0.381)	-2.128*** (0.345)	-1.817*** (0.353)
Remoteness (log)	0.473** (0.239)	0.563** (0.255)	1.308*** (0.304)	0.398* (0.224)	0.517** (0.240)	0.572** (0.258)	1.501*** (0.307)	0.567** (0.224)	-1.724*** (0.337)	-1.546*** (0.373)	-1.518*** (0.334)	-1.393*** (0.323)
Island countries	-0.609* (0.345)	-0.629* (0.374)	-1.110** (0.431)	-0.423 (0.332)	-0.684* (0.353)	-0.614 (0.379)	-1.177** (0.480)	-0.593* (0.341)	1.050** (0.491)	0.772 (0.587)	0.039 (0.445)	0.727 (0.456)
Landlocked countries	-0.041 (0.373)	0.176 (0.425)	0.314 (0.535)	-0.292 (0.404)	-0.132 (0.410)	0.125 (0.430)	0.514 (0.445)	-0.279 (0.403)	-0.322 (0.429)	0.071 (0.560)	-1.176** (0.589)	-0.307 (0.458)
RTA partners	0.345 (0.614)	0.314 (0.707)	0.128 (0.470)	0.567 (0.693)	0.441 (0.615)	0.346 (0.720)	0.057 (0.494)	0.564 (0.682)	0.629 (0.999)	0.238 (1.302)	0.422 (0.787)	0.544 (0.935)
WTO membership	0.058 (0.368)	0.017 (0.460)	-0.046 (0.455)	-0.019 (0.378)	-0.209 (0.372)	-0.174 (0.500)	-0.183 (0.478)	-0.029 (0.383)	1.137** (0.473)	1.134** (0.538)	1.499*** (0.554)	1.247*** (0.440)
Hong Kong and Taiwan	-0.253 (0.504)	-0.230 (0.625)	-0.390 (0.401)	-0.042 (0.617)	-0.200 (0.534)	-0.159 (0.634)	-0.415 (0.439)	-0.026 (0.590)	0.023 (0.909)	-1.398 (1.255)	-0.603 (0.942)	0.255 (0.776)
2008 year dummy	1.323*** (0.262)	1.281*** (0.300)	2.446*** (0.339)	1.134*** (0.260)	1.414*** (0.271)	1.333*** (0.309)	2.565*** (0.365)	1.316*** (0.264)	1.212*** (0.383)	1.006** (0.419)	2.211*** (0.454)	0.892** (0.386)
Constant	8.036** (3.563)	8.654** (3.672)	-2.107 (3.651)	4.437 (3.460)	7.328** (3.629)	9.029** (3.744)	-3.519 (3.690)	2.907 (3.493)	18.772*** (5.780)	17.900*** (6.395)	22.401*** (5.507)	16.851*** (5.433)
Number of observations	265	256	201	253	264	251	196	247	230	183	150	208
R2	0.263	0.194	0.289	0.299	0.236	0.174	0.317	0.277	0.536	0.455	0.542	0.560



**Table 7. Determinants of Total Value of Imports: Partial Adjustment Model**

	All manufactured goods				Final goods				Parts and components			
	All firms	Public	Private	Foreign	All firms	Public	Private	Foreign	All firms	Public	Private	Foreign
Lag dependant variable	-0.545*** (0.076)	-0.645*** (0.091)	-0.704*** (0.050)	-0.551*** (0.084)	-0.607*** (0.075)	-0.660*** (0.101)	-0.812*** (0.062)	-0.570*** (0.088)	-0.461*** (0.057)	-0.369*** (0.094)	-0.561*** (0.074)	-0.436*** (0.104)
Lag GDP of partners (log)	0.632*** (0.130)	0.725*** (0.170)	0.578*** (0.090)	0.860*** (0.156)	0.694*** (0.124)	0.727*** (0.183)	0.710*** (0.104)	0.934*** (0.161)	0.794*** (0.143)	0.686*** (0.207)	0.701*** (0.153)	0.755*** (0.225)
Distance (log)	-0.669** (0.270)	-0.758** (0.325)	-0.616*** (0.236)	-0.478 (0.292)	-0.773*** (0.261)	-0.867** (0.341)	-0.864*** (0.252)	-0.550* (0.289)	-1.073*** (0.326)	-0.216 (0.477)	-0.518** (0.260)	-1.040** (0.414)
Remoteness (log)	0.042 (0.301)	0.243 (0.305)	-0.416* (0.247)	-0.411 (0.322)	0.079 (0.328)	0.364 (0.326)	-0.099 (0.248)	-0.275 (0.333)	-1.382*** (0.421)	-1.218** (0.490)	-1.096* (0.570)	-1.088* (0.588)
Island countries	-0.705** (0.352)	-0.814** (0.395)	0.059 (0.364)	0.131 (0.361)	-0.540 (0.437)	-0.633 (0.461)	-0.149 (0.358)	0.011 (0.356)	-0.066 (0.503)	-0.769 (0.759)	0.348 (0.534)	-0.292 (0.701)
Landlocked countries	0.184 (0.409)	1.071** (0.434)	-0.448 (0.414)	-0.075 (0.530)	0.170 (0.411)	0.950** (0.447)	-0.129 (0.504)	0.009 (0.561)	0.695 (0.516)	-0.427 (0.671)	0.459 (0.487)	0.703 (0.588)
Lag WTO membership	0.921** (0.451)	1.086 (0.768)	-0.297 (0.267)	0.517 (0.471)	0.890* (0.493)	1.180 (0.957)	-0.372 (0.302)	0.437 (0.520)	0.468 (0.462)	0.011 (0.940)	-0.259 (0.490)	1.199 (0.880)
Hong Kong and Taiwan	0.831** (0.421)	0.801** (0.406)	-0.265 (0.278)	0.932 (1.011)	0.652 (0.425)	0.807* (0.471)	-0.655** (0.306)	0.697 (0.974)	1.550 (1.794)	-0.323 (3.385)	(dropped)	1.984 (1.790)
Δ GDP of partners (log)	0.459*** (0.125)	0.651*** (0.155)	0.503*** (0.091)	0.607*** (0.142)	0.530*** (0.121)	0.657*** (0.165)	0.649*** (0.096)	0.662*** (0.147)	0.509*** (0.146)	0.514*** (0.176)	0.514*** (0.156)	0.427** (0.182)
Δ Remoteness (log)	2.525 (2.195)	1.366 (2.326)	2.431* (1.422)	3.315 (2.811)	2.964 (2.366)	0.894 (2.708)	3.887** (1.753)	5.138* (2.916)	0.454 (2.904)	-0.974 (3.052)	2.433 (2.655)	-0.431 (4.021)
Δ RTA partners	0.008 (0.355)	0.126 (0.418)	0.733* (0.405)	0.234 (0.430)	0.084 (0.392)	0.145 (0.444)	0.844* (0.498)	0.293 (0.456)	0.682 (0.763)	0.948 (1.072)	1.138* (0.600)	0.326 (0.733)
Δ WTO membership	-0.920 (0.567)	-1.110* (0.648)	0.447** (0.212)	-0.693 (0.745)	-0.929 (0.590)	-1.031 (0.662)	0.665*** (0.252)	-0.668 (0.745)	-1.732* (0.931)	-2.587* (1.557)	-2.238*** (0.622)	-2.065** (0.984)
Constant	1.154 (4.126)	-1.607 (4.349)	9.919*** (3.071)	-2.496 (5.301)	1.318 (4.323)	-1.698 (4.619)	7.630** (2.991)	-4.449 (5.710)	9.675* (5.567)	1.530 (5.926)	8.100 (5.298)	6.655 (6.164)
Number of observations	126	121	69	113	125	118	66	109	97	79	43	81
R2	0.516	0.584	0.848	0.460	0.528	0.541	0.872	0.454	0.491	0.378	0.747	0.380

Note: Shown in parentheses are robust standard errors. \*\*\*, \*\*, and \* denote one, five, and ten percent level of significance, respectively.

**Table 8. Determinants of Total Number of Imported Products: Partial Adjustment Model**

	All manufactured goods				Final goods				Parts and components			
	All firms	Public	Private	Foreign	All firms	Public	Private	Foreign	All firms	Public	Private	Foreign
Lag dependant variable	-0.109 (0.188)	-0.303 (0.243)	-0.084 (0.266)	-0.042 (0.155)	0.014 (0.178)	-0.285 (0.235)	-0.290 (0.310)	0.020 (0.153)	-1.077*** (0.252)	-0.711*** (0.235)	-0.848*** (0.233)	-0.697*** (0.243)
Lag GDP of partners (log)	0.394* (0.206)	0.681*** (0.246)	0.357 (0.304)	0.453** (0.202)	0.340* (0.201)	0.678*** (0.236)	0.452 (0.305)	0.487** (0.203)	0.575** (0.243)	0.397* (0.229)	0.637** (0.255)	0.352 (0.246)
Distance (log)	0.064 (0.390)	-0.347 (0.443)	-0.048 (0.567)	0.128 (0.350)	-0.021 (0.390)	-0.492 (0.449)	-0.426 (0.615)	0.022 (0.359)	0.398 (0.435)	0.728* (0.410)	0.616 (0.606)	0.484 (0.390)
Remoteness (log)	-1.608*** (0.469)	-1.663*** (0.549)	-2.949*** (0.682)	-1.659*** (0.400)	-1.481*** (0.451)	-1.461*** (0.526)	-3.090*** (0.703)	-1.706*** (0.373)	-0.860 (0.578)	-0.344 (0.463)	-0.007 (0.607)	-0.305 (0.506)
Island countries	0.724 (0.617)	0.637 (0.711)	2.378*** (0.835)	0.952* (0.539)	0.800 (0.633)	0.568 (0.724)	2.539*** (0.811)	1.142** (0.548)	-0.326 (0.601)	-0.567 (0.522)	1.065* (0.552)	-0.123 (0.593)
Landlocked countries	-0.434 (0.471)	0.129 (0.551)	-2.050** (0.847)	-0.390 (0.405)	-0.409 (0.498)	0.164 (0.582)	-1.961* (1.065)	-0.206 (0.414)	-0.430 (0.733)	-0.842 (0.879)	1.299 (1.252)	1.056* (0.580)
Lag WTO membership	1.018* (0.572)	1.245** (0.603)	1.322 (0.877)	1.054* (0.562)	1.338** (0.588)	1.661** (0.658)	1.626* (0.943)	0.998* (0.537)	0.153 (0.680)	-0.072 (0.813)	-1.110 (0.984)	0.226 (0.807)
Hong Kong and Taiwan	1.251 (0.893)	1.189 (1.301)	3.991*** (0.684)	1.546 (1.215)	1.075 (0.899)	0.996 (1.329)	4.244*** (0.789)	1.346 (1.196)	1.898*** (0.547)	1.628*** (0.313)	(dropped)	2.083 (1.848)
Δ GDP of partners (log)	0.203 (0.172)	0.449* (0.246)	0.161 (0.275)	0.312* (0.170)	0.136 (0.176)	0.442* (0.244)	0.230 (0.276)	0.309* (0.177)	0.453* (0.242)	0.339 (0.238)	0.874*** (0.286)	0.314 (0.219)
Δ Remoteness (log)	1.532 (3.212)	4.131 (3.833)	-3.509 (3.458)	0.363 (2.565)	1.970 (3.327)	4.816 (3.846)	-2.122 (3.463)	1.791 (2.648)	-4.045 (3.013)	-3.048 (2.719)	-2.704 (3.563)	-2.484 (3.177)
Δ RTA partners	-0.295 (0.630)	-0.176 (0.893)	1.404 (0.975)	-0.578 (0.522)	-0.347 (0.655)	-0.211 (0.908)	0.498 (0.663)	-0.535 (0.564)	0.947 (0.650)	0.631 (0.438)	1.423* (0.771)	0.159 (0.726)
Δ WTO membership	0.306 (1.347)	-0.586 (1.813)	-2.698*** (0.572)	-0.311 (0.927)	0.083 (1.413)	-0.769 (1.865)	-3.304*** (0.713)	-0.301 (1.076)	-0.437 (0.433)	-0.036 (0.489)	-2.762*** (0.572)	-2.522** (1.131)
Constant	-4.185 (5.047)	-6.850 (6.015)	9.943 (8.182)	-6.225 (4.604)	-4.186 (5.155)	-7.914 (6.194)	12.297 (9.051)	-6.030 (4.709)	-13.981* (7.801)	-18.013*** (6.504)	-23.829*** (9.173)	-15.881** (6.838)
Number of observations	125	121	69	113	124	118	66	109	96	79	43	81
R2	0.253	0.255	0.465	0.408	0.278	0.258	0.446	0.467	0.435	0.407	0.489	0.362

Note: Shown in parentheses are robust standard errors. \*\*\*, \*\*, and \* denote one, five, and ten percent level of significance, respectively.

**Table 9. Determinants of Average Value of Imports: Partial Adjustment Model**

	All manufactured goods				Final goods				Parts and components			
	All firms	Public	Private	Foreign	All firms	Public	Private	Foreign	All firms	Public	Private	Foreign
Lag dependant variable	-0.533*** (0.101)	-0.662*** (0.095)	-0.672*** (0.093)	-0.593*** (0.121)	-0.639*** (0.100)	-0.696*** (0.094)	-0.815*** (0.097)	-0.636*** (0.123)	-0.476*** (0.062)	-0.433*** (0.101)	-0.498*** (0.105)	-0.539*** (0.104)
Lag GDP of partners (log)	0.339*** (0.096)	0.267** (0.107)	0.100 (0.117)	0.530*** (0.100)	0.356*** (0.096)	0.267** (0.114)	0.174 (0.123)	0.552*** (0.101)	0.585*** (0.093)	0.603*** (0.130)	0.547*** (0.130)	0.655*** (0.127)
Distance (log)	-0.391* (0.231)	-0.360 (0.262)	-0.408* (0.244)	-0.251 (0.246)	-0.403* (0.230)	-0.405 (0.268)	-0.517** (0.247)	-0.250 (0.239)	-1.009*** (0.301)	-0.186 (0.374)	-0.476** (0.222)	-1.098*** (0.363)
Remoteness (log)	0.613** (0.303)	0.789** (0.309)	0.308 (0.339)	0.288 (0.301)	0.675** (0.322)	0.780** (0.333)	0.675** (0.323)	0.403 (0.317)	-0.764** (0.300)	-0.734** (0.372)	-0.817* (0.426)	-0.456 (0.423)
Island countries	-0.801** (0.363)	-0.861** (0.377)	-0.262 (0.445)	-0.039 (0.368)	-0.674 (0.436)	-0.710 (0.438)	-0.620 (0.433)	-0.173 (0.382)	-0.028 (0.390)	-0.535 (0.567)	0.661 (0.444)	-0.273 (0.551)
Landlocked countries	0.660 (0.413)	1.377*** (0.447)	-0.253 (0.499)	0.447 (0.497)	0.655* (0.393)	1.218*** (0.465)	0.088 (0.537)	0.471 (0.513)	1.082** (0.500)	0.066 (0.500)	0.290 (0.481)	1.067* (0.576)
Lag WTO membership	0.731* (0.444)	0.687 (0.742)	-0.518 (0.389)	0.266 (0.487)	0.531 (0.467)	0.645 (0.855)	-0.678 (0.459)	0.134 (0.507)	0.306 (0.390)	-0.471 (0.760)	-0.164 (0.439)	1.193* (0.687)
Hong Kong and Taiwan	0.352 (0.443)	0.346 (0.826)	-1.557*** (0.354)	0.158 (0.594)	0.116 (0.492)	0.244 (0.896)	-2.109*** (0.365)	-0.115 (0.536)	1.004 (1.615)	-0.663 (2.985)	(dropped)	0.920 (1.700)
Δ GDP of partners (log)	0.221** (0.100)	0.256** (0.105)	0.128 (0.103)	0.343*** (0.097)	0.250** (0.099)	0.254** (0.106)	0.199** (0.098)	0.360*** (0.100)	0.422*** (0.097)	0.491*** (0.125)	0.424*** (0.142)	0.436*** (0.116)
Δ Remoteness (log)	3.250* (1.942)	2.201 (2.021)	0.982 (1.907)	4.239* (2.347)	3.759* (2.135)	2.311 (2.224)	2.490 (2.036)	5.774** (2.412)	1.387 (2.072)	-0.399 (2.522)	1.583 (2.563)	1.395 (2.905)
Δ RTA partners	-0.188 (0.349)	0.072 (0.449)	0.107 (0.457)	0.161 (0.395)	-0.046 (0.398)	0.136 (0.487)	0.231 (0.537)	0.244 (0.422)	0.099 (0.760)	0.821 (0.980)	1.132** (0.488)	0.059 (0.637)
Δ WTO membership	-0.888 (0.801)	-0.942 (1.163)	0.532 (0.394)	-0.216 (0.788)	-0.831 (0.908)	-0.807 (1.225)	0.974** (0.432)	-0.117 (0.759)	-1.649* (0.864)	-2.016 (1.315)	-2.061*** (0.389)	-1.818* (0.954)
Constant	-2.488 (3.975)	-1.206 (4.157)	8.902** (3.979)	-4.932 (4.835)	-1.674 (4.229)	-0.226 (4.402)	6.725* (3.436)	-5.643 (5.103)	7.049* (4.275)	-1.334 (4.836)	4.594 (4.556)	3.321 (4.839)
Number of observations	125	121	69	113	124	118	66	109	96	79	43	81
R2	0.408	0.505	0.677	0.410	0.462	0.498	0.754	0.438	0.476	0.400	0.681	0.431

Note: Shown in parentheses are robust standard errors. \*\*\*, \*\*, and \* denote one, five, and ten percent level of significance, respectively.

