

Exchange and Capital Controls as Barriers to Trade

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This paper considers the effect of exchange and capital controls on trade in the gravity-equation framework, in which bilateral exports depend on the distance between countries, the countries' size and wealth, tariff barriers, and exchange and capital controls. The extent of exchange and capital controls is measured by unique indices. In view of the degree to which countries have liberalized their exchange systems, controls on current payments and transfers are found to be a minor impediment to trade, while capital controls significantly reduce exports into developing and transition economies. Thus, further capital account liberalization could significantly foster trade. [JEL F13, F31]

In 1944, the Bretton Woods conference recognized the fundamental link between exchange and capital controls¹ and international trade. One of the purposes of the International Monetary Fund, which was created at the conference, was to assist in “the elimination of foreign exchange restrictions which hamper the growth of world trade.”² However, the maintenance of capital controls was not viewed as inconsistent with this objective, partly because capital controls were considered necessary for supporting the system of fixed exchange rates and thus fostering trade. More than 50 years

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¹Hereinafter, the term “controls on current payments and transfers” refers to exchange controls over current international transactions, while “capital controls” encompasses controls pertaining to capital account transactions. The term “exchange and capital controls” covers both of the above types of controls.

²Article I of the IMF's Articles of Agreement (IMF, 1993).

later, the question about the economic effects of exchange and capital controls is again at the forefront of economic policy debates. Most countries have liberalized controls on current payments and transfers, and the focus of economic policy is increasingly shifting toward liberalizing capital account transactions.

The effect of exchange and capital controls on international trade depends on the structure and effectiveness of controls and their interaction with other distortions in the economy. Exchange controls act as a tax on the foreign currency required for purchasing foreign goods and services and, by raising the domestic price of imports, they tend to reduce trade. Besides this basic effect, exchange and capital controls can influence trade through other channels, for example, transaction costs, exchange rates, foreign exchange risk hedging, and trade financing. Capital controls, in particular, can affect trade in goods by reducing intertemporal trade and portfolio diversification, which may substitute or complement intratemporal trade. Given the importance and ambiguity of the link between exchange and capital controls and trade, the systematic empirical evidence on the matter is critical, but it remains limited.

This paper examines the effect of exchange and capital controls on trade for 1996 in the empirical gravity-equation framework, in which bilateral exports depend on the distance separating the countries, the countries' size and wealth, tariff barriers, and exchange and capital controls. The extent of exchange and capital controls is measured by unique indices, which aggregate information on 142 individual types of control based on the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*.

Overall, the paper finds that exchange and capital controls have a significant negative impact on bilateral exports. However, this result varies depending on the level of development in the country and the type of exchange and capital control. Controls on current payments and transfers are a minor barrier to trade. In contrast, capital controls significantly reduce exports into developing and transition economies and not into industrial countries. These results may reflect the extent to which restrictions on current payments and transfers have been liberalized generally, while the liberalization of controls on capital flows have so far been focused largely on industrial countries.

I. Theoretical Evidence

Theoretically, the impact of exchange and capital controls on trade is ambiguous. With respect to net flows, the effects of controls on trade and capital flows are closely related in the context of a standard balance of payments accounting.³ Since measurement problems are more severe for capital flows than trade flows, the analysis of the relationship between exchange and capital controls and net trade flows may help enhance understanding of the effect on net capital flows. This is not, however, an

³In the balance of payments, the sum of the current account, the capital account, and the change in reserves is by definition equal to zero. If exchange and capital controls are effective and have a statistically significant impact on the capital account, the balance of payments identity implies that they must also affect the current account and/or reserves in a regime of managed or fixed exchange rates, and the current account under the floating exchange rate regime. The author is grateful to an anonymous referee for underscoring this point. For a detailed review of the literature on capital controls, see Dooley (1996).

objective of this paper. The paper mainly focuses on the impact of exchange and capital controls on gross trade flows.⁴

Exchange and capital controls can affect trade through a multitude of (inter-related) channels, including the domestic price of imports, transaction costs, the volatility of exchange rates, intertemporal trade, and portfolio diversification. The overall effect of exchange and capital controls on trade through these channels depends critically on the structure and effectiveness of exchange and capital controls and their interaction with other distortions in the economy. The main effects of exchange and capital controls on trade are discussed in more detail below.

The basic economics of exchange controls is similar to that of quantitative restrictions on imports of various goods and services. By taxing foreign money required to purchase foreign goods and services, exchange controls⁵ cut the quantity imported and/or raise the domestic relative price of imports.⁶ Moreover, if the government allocates foreign exchange according to noncompetitive rules, low-valued uses often get approved instead of higher-valued ones, decreasing trade further.

Exchange and capital controls often raise transaction and other trade-related costs, thus reducing trade. Costs and uncertainty associated with international transactions increase, because exchange controls tend to stifle the development of liquid and efficient foreign exchange markets and modern payment instruments. Additionally, exchange and capital controls often encourage evasion and rent-seeking, which impose unproductive costs on firms.

Furthermore, exchange and capital controls can reduce trade by limiting the transfer of technology, managerial expertise, and skills through foreign direct investment. Controls on repatriation of profits and dividends, surrender requirements, and direct controls on foreign investment in certain sectors are likely to discourage direct foreign investment and thus limit the dissemination of technological and managerial knowledge and learning by doing. The empirical evidence indicates that foreign direct investment tends to increase host countries' exports and imports (although the impact on imports is relatively weak).⁷ In the presence of tariff barriers, however, controls on foreign direct investment may encourage trade. Foreign direct investment and exports are alternative strategies in this case, and, if foreign direct investment is allowed, a multinational company may prefer to avoid paying tariffs by supplying the host country's market through a subsidiary company.

Capital controls often limit business opportunities for hedging foreign exchange risks and financing trade, thus inhibiting trade. In the presence of capital controls, financial intermediation is less efficient, and savings are not allocated to the most

⁴For a discussion of the relationship between the intensity of capital controls and net capital flows, see Johnston and others (forthcoming). The study developed a methodology for constructing simple, yet comprehensive, indices of exchange and capital controls and found that the intensity of the controls is negatively correlated with net direct, portfolio, and other capital flows. The present paper uses these indices to examine the impact of exchange and capital controls on trade flows.

⁵It can be shown that dual exchange rates are equivalent to capital controls, while exchange controls are similar to trade restrictions, according to Adams and Greenwood (1985) and Greenwood and Kimbrough (1987), respectively.

⁶See, for example, Greenwood and Kimbrough (1987) and Stockman and Hernández (1988).

⁷For the review of the literature on foreign direct investment, see, for example, World Trade Organization (1996).

efficient uses. The intermediation margin is often high, and local financial institutions enjoy substantial market power. The range of available financial products and services tends to be narrow. As a consequence, opportunities for hedging foreign exchange risks and financing trade are either unavailable or costly, and trade is likely to fall. Notwithstanding the above, however, capital controls may foster trade indirectly by serving prudential objectives and helping to protect weak financial systems.

Fundamentally, capital controls affect trade by decreasing intertemporal trade and portfolio diversification. The impact on trade in goods depends on whether this intratemporal trade substitutes for or complements intertemporal trade and portfolio diversification. If trade in goods and trade in factors are substitutes (for example, as found in the basic Heckscher-Ohlin model), the volume of trade in goods is likely to fall. The terms of trade effect is unclear and depends on changes in the patterns of consumption and production in the recipient and the source countries (also known as the transfer problem) for clarification. If trade in goods and trade in factors are complements (as, for example, in some models with increasing returns to scale), the volume of trade in goods increases.

In addition, a number of macroeconomic channels through which capital controls can potentially help foster trade have been suggested in theory.⁸ The specific effect of capital controls on trade through these macroeconomic channels depends critically on the interaction of capital controls with other distortions and on specific characteristics of the economy. In principle, capital controls may help limit short-term speculative capital flows and hence exchange rate volatility. With a stable exchange rate, trade is likely to increase (particularly if domestic financial markets are not well developed and do not offer adequate opportunities for hedging foreign exchange risk). Exchange and capital controls, on the other hand, are often associated with an overvalued exchange rate, which can inhibit trade. Moreover, if capital controls can help retain domestic savings, and higher savings lead to higher investment in export sectors, trade may increase. When the taxation of foreign source income is nonenforceable, capital controls could help expand the domestic tax base. The adequate tax revenues raised by domestic taxes may induce the government to lower tariff rates, stimulating trade. These effects, however, are likely to be inconsequential in practice, because they tend to be offset by capital flight and the decrease in capital inflow owing to capital controls. Not surprisingly, these arguments have received only limited empirical support so far.

Likewise, the empirical evidence on the effects of exchange and capital controls on trade remains scarce. Most of the earlier studies (see, for example, Lee, 1993) used the black market premium to measure the extent of exchange and capital controls and found that exchange and capital controls tend to reduce trade. Although the black market premium often indicates the circumvention of restrictive regulations, it is an imperfect measure of the extent of exchange and capital controls. It may capture the effects of other nontariff barriers to trade, for example, import quotas. Also, information on

⁸See Dooley (1996) for a review of the literature on capital controls. The empirical literature suggests that capital controls may affect yield differentials, but their role in improving the balance of payments is limited (see, for example, Johnston and Ryan, 1994).

the size of the black market premium is not always reliable. Moreover, the black market premium cannot isolate the effects of controls on current payments and transfers and capital controls. This paper, in contrast, uses unique indices of the extent of exchange and capital controls to examine their effect on international trade in the empirical gravity-equation framework.

II. An Empirical Model of Trade with Exchange and Capital Controls

The gravity model has been used extensively in empirical studies of international economics since the 1960s. According to this static general equilibrium model, bilateral trade is determined by the wealth and size of countries, the distance between them, and other factors that distort trade. The theoretical foundations of the gravity model are based on the theory of trade under imperfect competition and have recently been integrated with the factor-proportions and demand-based theories of international trade.⁹ The basic gravity equation is given by

$$X_{kj} = \alpha_0 (Q_k/N_k)^{\alpha_1} (N_k)^{\alpha_2} (Q_j/N_j)^{\alpha_3} (N_j)^{\alpha_4} (D_{kj})^{\alpha_5} (A_{kj})^{\alpha_6} e_{kj}, \quad (1)$$

where X_{kj} is exports from country k to country j , (Q_k/N_k) and (Q_j/N_j) are the per capita incomes of countries k and j ; N_k and N_j are the populations of countries k and j ; D_{kj} is the geographical distance between countries k and j ; A_{kj} denotes factors distorting trade; and e_{kj} is a log normally distributed error term. For the empirical analysis, the above equation is modified by taking natural logs and defining tariffs and exchange and capital controls as trade distortions, as follows:

$$\begin{aligned} \ln X_{kj} = & \alpha_0 + \alpha_1 \ln(Q_k/N_k) + \alpha_2 \ln N_k + \alpha_3 \ln(Q_j/N_j) \\ & + \alpha_4 \ln N_j + \alpha_5 \ln D_{kj} + \alpha_6 \ln(1 + T_{jk}) + \alpha_7 E_j + \varepsilon_{kj}, \end{aligned} \quad (2)$$

where T_{jk} is the import duty imposed by country j on imports from country k , and E_j is an aggregate measure of exchange and capital controls in country j . The intercept accounts for the effect of unmeasured trade distortions on exports. The model can be estimated by the ordinary-least-squares method.

III. Data

The estimation of the model requires cross-sectional data on bilateral exports of goods and services, population, gross domestic product (GDP) per capita, and measures of tariff barriers and exchange and capital controls by country for a given year. The model is estimated for a sample of 40 industrial, developing, and transition countries. The data described below refer to 1996, unless specified otherwise.

⁹For more details on the general-equilibrium foundations of the gravity model, see Anderson (1979), Helpman and Krugman (1985), Helpman (1987), and Bergstrand (1985, 1989, and 1990).

Data on exports of goods and services (denoted by “EX”) are from the IMF’s *Direction of Trade Statistics Yearbook*. GDP per capita (denoted by “GDPIM” and “GDPEX” for importing and exporting countries, respectively) are adjusted according to the purchasing power parity and come from the World Bank’s *World Tables*. Population data (denoted by “POPIM” and “POPEX” for importing and exporting countries, respectively) are for 1996 or the latest available year, as published in the IMF’s *International Financial Statistics*. The geographic distance (denoted by “DIST”) is measured as the direct-line distance between the capital cities of countries.¹⁰

Trade restrictions are represented by mean tariff rates (denoted by “TAR”) by country. The tariff data for 1995 or the latest available year come from the World Bank’s World Development Indicators Database. Tariff rates are adjusted to take into account free trade agreements, as reported in the World Trade Organization’s *Annual Report*. This measure of trade restrictions is imperfect because it does not reflect the extent of nontariff barriers—for example, import quotas and voluntary export restraints—which tend to cover a substantial share of imports, particularly in developing countries. The measurement of the intensity of nontariff barriers is challenging, and the available measures are inadequate. Therefore, in this study, the effect of nontariff barriers (other than exchange and capital controls) is not measured separately but is accounted for in the intercept.

The extent of national exchange and capital controls is captured in three aggregate measures: the indices of controls on current payments and transfers (CCI), capital controls (KCI), and exchange and capital controls in their entirety (ECI). The indices summarize information on 142 individual types of national exchange and capital control from the IMF’s *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER).¹¹ Table 1 depicts individual types of exchange and capital control and their aggregation into categories and indices. The appendix describes the methodology used to construct the indices.¹² Each index ranges from zero (the lowest extent) to one (the highest extent). CCI measures the extent of controls on current payments and transfers, and KCI reflects the pervasiveness of controls on capital movements. ECI comprises capital controls as well as controls on payments and transfers for current international transactions and hence reflects the overall extent of exchange and capital controls. It can be also interpreted as a broad measure of capital controls that takes into account the scope for the circumvention of capital controls through current international transactions. Table 2 shows the indices of exchange and capital controls for the countries in the sample.

Despite their limitations, the indices have some advantages over alternative measures of the extent of exchange and capital controls, for example, the black market premium and dummy variables. Unlike the black market premium, the indices do not

¹⁰Fitzpatrick and Modlin (1986).

¹¹In 1997, the information in the AREAER was presented for the first time in a new tabular format, which classified and standardized the information on members’ exchange systems and expanded the coverage of capital controls. The classification of the AREAER information with this new tabular format has made it possible to develop and apply more comprehensive indices of the extent of exchange and capital controls for 1996.

¹²For more details on the indices of exchange and capital controls, see Johnston and others (forthcoming).

Table 1. Structure of Indices of Exchange and Capital Controls

A. Index of Controls on Current Payments and Transfers

Exchange arrangement

- Exchange rate structure (dual, multiple)
- Exchange tax
- Exchange subsidy
- Forward exchange market (prohibited, official cover of forward operations required)

Arrangements for payments and receipts

- Prescription of currency requirements
- Bilateral payments arrangements (operative, inoperative)
- Other payments arrangements (regional, clearing, barter, and open accounts)
- International security restrictions (in accordance with IMF Executive Board Decision No. 144-(52/51), in accordance with UN sanctions, other)
- Payments arrears (official, private)
- Controls on trade in gold (coins and/or bullion) (on domestic ownership and/or trade, on external trade)
- Controls on exports and imports of banknotes (on exports and imports of domestic and foreign currency)

Resident accounts

- Foreign exchange accounts held domestically (prohibited, approval required)
- Foreign exchange accounts held abroad (prohibited, approval required)

Nonresident accounts

- Foreign exchange accounts (prohibited, approval required)
- Domestic currency accounts (prohibited, approval required)
- Blocked accounts

Imports and import payments

- Foreign exchange budget
- Financing requirements for imports (minimum financing, advance payments, advance import deposit)
- Documentation requirements for release of foreign exchange for imports (domiciliation requirements, preshipment inspection, letters of credit, import licenses used as exchange licenses, other)
- Import taxes collected through the exchange system

Exports and export proceeds

- Documentation requirements (letters of credit, guarantees, domiciliation, preshipment inspection, other)
- Export taxes collected through the exchange system

Table 1. (continued)

Payments for invisible transactions and current transfers

- Freight and insurance (prior approval, quantitative limits, indicative limits/bona fide test)
- Unloading and storage costs (prior approval, quantitative limits, indicative limits/bona fide test)
- Administrative expenses (prior approval, quantitative limits, indicative limits/bona fide test)
- Commissions (prior approval, quantitative limits, indicative limits/bona fide test)
- Interest payments (prior approval, quantitative limits, indicative limits/bona fide test)
- Profit and dividends (prior approval, quantitative limits, indicative limits/bona fide test)
- Payments for travel (prior approval, quantitative limits, indicative limits/bona fide test)
- Medical costs (prior approval, quantitative limits, indicative limits/bona fide test)
- Study abroad costs (prior approval, quantitative limits, indicative limits/bona fide test)
- Subscriptions and membership fees (prior approval, quantitative limits, indicative limits/bona fide test)
- Consulting and legal fees (prior approval, quantitative limits, indicative limits/bona fide test)
- Foreign workers' wages (prior approval, quantitative limits, indicative limits/bona fide test)
- Pensions (prior approval, quantitative limits, indicative limits/bona fide test)
- Gambling and prize earnings (prior approval, quantitative limits, indicative limits/bona fide test)
- Family maintenance and alimony (prior approval, quantitative limits, indicative limits/bona fide test)
- Credit card use abroad (prior approval, quantitative limits, indicative limits/bona fide test)

B. Index of Capital Controls

Proceeds from exports, invisibles, and current transfers

- Repatriation requirements for export proceeds
- Surrender requirements for export proceeds
- Repatriation requirements for proceeds from invisibles and current transfers
- Surrender requirements for proceeds from invisibles and current transfers
- Restrictions on use of funds

Controls on capital and money market instruments

- On capital market securities (purchase in the country by nonresidents, sale or issue locally by nonresidents, purchase abroad by residents, sale or issue abroad by residents)
- On money market instruments (purchase in the country by nonresidents, sale or issue locally by nonresidents, purchase abroad by residents, sale or issue abroad by residents)
- On collective investment securities (purchase in the country by nonresidents, sale or issue locally by nonresidents, purchase abroad by residents, sale or issue abroad by residents)

Table 1. (concluded)

Controls on derivatives and other instruments
Purchase in the country by nonresidents
Sale or issue locally by nonresidents
Purchase abroad by residents
Sale or issue abroad by residents
Controls on credit operations
Commercial credits (by residents to nonresidents, to residents from nonresidents)
Financial credits (by residents to nonresidents, to residents from nonresidents)
Guarantees, sureties, and financial backup facilities (by residents to nonresidents, to residents from nonresidents)
Controls on direct foreign investment
Outward direct investment
Inward direct investment
Controls on liquidation of direct investment
Controls on real estate transactions
Purchase abroad by residents
Purchase locally by nonresidents
Sale locally by nonresidents
Provisions specific to commercial banks and other credit institutions
Borrowing abroad
Maintenance of accounts abroad
Lending to nonresidents (financial or commercial credits)
Lending locally in foreign exchange
Purchase of locally issued securities denominated in foreign exchange
Differential treatment of nonresident deposit accounts and/or deposit accounts in foreign exchange (reserve requirements, liquid asset requirements, interest rate controls, investment regulations, credit controls, open foreign exchange position limits)
Provisions specific to institutional investors
Limits (max.) on portfolio invested abroad
Limits (min.) on portfolio invested locally
Currency-matching regulations on assets/liabilities composition

Table 2. Indices of Exchange and Capital Controls, 1996

Country	CCII ^a	KCI2 ^b	ECI3 ^c
Argentina	0.03	0.19	0.11
Australia	0.04	0.20	0.12
Brazil	0.31	0.60	0.46
Canada	0.09	0.06	0.07
Chile	0.22	0.89	0.56
China	0.33	0.73	0.53
Czech Republic	0.04	0.33	0.19
Denmark	0.02	0.07	0.05
Egypt	0.12	0.30	0.21
France	0.04	0.16	0.10
Germany	0.04	0.07	0.05
Greece	0.06	0.06	0.06
Hungary	0.10	0.57	0.33
India	0.22	0.87	0.55
Indonesia	0.18	0.50	0.34
Israel	0.16	0.54	0.35
Italy	0.10	0.06	0.08
Japan	0.09	0.16	0.12
Kazakhstan	0.30	0.95	0.62
Kenya	0.05	0.17	0.11
Korea, Republic of	0.10	0.70	0.40
Latvia	0.10	0.10	0.10
Mexico	0.05	0.36	0.21
Morocco	0.27	0.72	0.49
Netherlands	0.05	0.01	0.03
New Zealand	0.02	0.09	0.05
Norway	0.01	0.05	0.03
Pakistan	0.31	0.66	0.48
Philippines	0.16	0.47	0.32
Poland	0.12	0.69	0.40
Russia	0.27	0.91	0.59
Saudi Arabia	0.03	0.21	0.12
South Africa	0.29	0.56	0.43
Spain	0.04	0.11	0.08
Thailand	0.17	0.63	0.40
Tunisia	0.21	0.81	0.51
Turkey	0.16	0.36	0.26
United Kingdom	0.03	0.07	0.05
United States	0.05	0.13	0.09
Uruguay	0.09	0.13	0.11

^aIndex of controls on current payments and transfers.

^bIndex of capital controls.

^cIndex of exchange and capital controls.

reflect the effects of other nontariff barriers, such as import quotas, and focus exclusively on exchange and capital controls. Unlike dummy variables, the indices summarize information about a broad array of controls, and thus can capture a variety of changes in the regulatory regime. The indices, however, do not explicitly take into account the supervision and enforcement of exchange and capital controls and hence reflect legal (*de jure*) rather than actual (*de facto*) incidence of controls.¹³

The study analyzes a cross-section of 40 industrial, developing, and transition economies for which the indices of exchange and capital controls are available. The countries represent various geographical regions and levels of economic development. All but two of these countries (Brazil and Egypt) have accepted the obligations of Article VIII of the IMF's Articles of Agreement.¹⁴ The sample includes 15 industrial countries (Australia, Canada, Denmark, France, Germany, Greece, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, Spain, the United Kingdom, and United States), 19 developing countries (Argentina, Brazil, Chile, China, Egypt, India, Indonesia, Kenya, Republic of Korea, Mexico, Morocco, Pakistan, Philippines, Saudi Arabia, South Africa, Thailand, Tunisia, Turkey, and Uruguay), and 6 transition economies (Czech Republic, Hungary, Kazakhstan, Latvia, Poland, and Russia).¹⁵

Summary statistics and correlations are presented in Tables 3 and 4, respectively. The exchange system in industrial countries is highly liberal, while developing and transition economies have more extensive exchange and capital controls. For instance, the mean ECI for industrial and for developing and transition economies is 0.09 and 0.35, CCI is 0.05 and 0.17, and KCI is 0.12 and 0.54, respectively. Controls on current payments and transfers (as measured by CCI) are less pervasive than capital controls (KCI) in industrial and developing and transition economies. Another interesting observation is that controls on current payments and transfers and capital controls are highly correlated with each other (correlation coefficient is above 0.8), and, of course, with the overall measure of exchange and capital controls, ECI (correlation coefficients are above 0.9).¹⁶

IV. Empirical Evidence

We estimate equation (2) with three alternative measures of exchange and capital controls—CCI, KCI, and ECI¹⁷—denoting the respective equations as (2a), (2b), and (2c). The results suggest that exchange and capital controls are a notable barrier to trade in

¹³Although the intensity of exchange and capital controls is not taken into account explicitly, the indices are found to be robust to weighing by subjective intensity measures.

¹⁴Under Article VIII of the IMF's Articles of Agreement, members undertake obligations to avoid imposing restrictions on the making of payments and transfers for current international transactions, without the approval of the IMF.

¹⁵The study uses the IMF's classification of industrial, developing, and transition countries.

¹⁶For the analysis of correlation between the indices and measures of economic development, the efficiency of the financial system, foreign direct and portfolio investment, exchange rate volatility, and trade policy, see Johnston and others (forthcoming).

¹⁷Including both CCI and KCI in the model intensifies multicollinearity, since the indices are highly correlated with each other (correlation coefficients of 0.8–0.9). Testing for redundant coefficients shows that CCI is redundant. Testing for the stability of coefficients suggests that they are unstable at the 5 percent level of significance.

Table 3. Summary Statistics

	<i>EX</i>	<i>DIST</i>	<i>POPEX</i>	<i>POPIM</i>	<i>GDPEX</i>	<i>GDPIM</i>	<i>1 + TAR</i>	<i>CCI</i>	<i>KCI</i>	<i>ECI</i>
All countries										
Mean	1,897.73	4,879.75	107.31	107.41	10,674.08	10,730.40	113.97	0.13	0.38	0.25
Standard deviation	8,268.54	3,873.06	235.45	235.47	7,485.27	7,490.82	13.49	0.10	0.30	0.19
Minimum	0.01	137.00	2.49	2.49	1,380.00	1,380.00	100.00	0.01	0.01	0.03
Maximum	164,761.40	79,635.00	1,221.50	1,221.50	26,980.00	26,980.00	156.30	0.33	0.95	0.62
Count	1,519	1,519	1,519	1,519	1,519	1,519	1,519	1,519	1,519	1,519
Industrial countries										
Mean	3,800.36	4,800.26	107.33	52.46	10,412.25	19,465.68	105.33	0.05	0.12	0.09
Standard deviation	12,679.61	4,475.58	236.13	66.61	7,408.38	3,488.17	3.55	0.04	0.12	0.07
Minimum	0.01	187.00	2.49	3.57	1,380.00	11,710.00	100.00	0.01	0.01	0.03
Maximum	164,761.40	79,635.00	1,221.50	266.56	26,980.00	26,980.00	110.50	0.16	0.54	0.35
Count	581	581	581	581	581	581	581	581	581	581
Developing and transition countries										
Mean	719.24	4,928.99	107.29	141.44	10,836.26	5,319.74	119.33	0.17	0.54	0.35
Standard deviation	2,758.47	3,449.13	235.15	289.91	7,531.88	2,598.78	14.56	0.10	0.26	0.17
Minimum	0.01	137.00	2.49	2.49	1,380.00	1,380.00	100.00	0.03	0.10	0.10
Maximum	56,760.80	62,333.00	1,221.50	1,221.50	26,980.00	18,940.00	156.30	0.33	0.95	0.62
Count	938	938	938	938	938	938	938	938	938	938

Table 4. Correlations

	<i>EX</i>	<i>DIST</i>	<i>POPEX</i>	<i>POPIM</i>	<i>GDPEX</i>	<i>GDPIM</i>	<i>1 + TAR</i>	<i>CCI</i>	<i>KCI</i>	<i>ECI</i>
<i>EX</i>	1.000									
<i>DIST</i>	-0.113	1.000								
<i>POPEX</i>	0.036	0.009	1.000							
<i>POPIM</i>	0.037	0.014	-0.028	1.000						
<i>GDPEX</i>	0.231	-0.002	-0.238	0.001	1.000					
<i>GDPIM</i>	0.230	0.009	0.001	-0.239	-0.032	1.000				
<i>1 + TAR</i>	-0.136	0.097	0.028	0.554	-0.057	-0.608	1.000			
<i>CCI</i>	-0.103	-0.009	-0.006	0.428	0.021	-0.631	0.615	1.000		
<i>KCI</i>	-0.125	-0.006	-0.005	0.340	0.022	-0.661	0.583	0.829	1.000	
<i>ECI</i>	-0.124	-0.007	-0.005	0.374	0.023	-0.675	0.611	0.901	0.990	1.000

developing and transition economies but not in industrial economies. Controls on current payments and transfers reduce bilateral trade flows insignificantly.

Estimation results are summarized in Table 5. The adjusted R^2 s are above 0.70, and F -statistics are significant at the 99 percent level.¹⁸ Tests of the stability of coefficients and the recursive analysis of coefficients indicate that coefficients are stable at the 95 percent significance level. The estimated intercept is negative, implying that unmeasured trade distortions tend to reduce exports. Distance has a significant negative effect on bilateral exports, in part because trade costs (e.g., transportation and communication) are likely to increase with distance. Tariff barriers in the importing countries also tend to have a negative, albeit insignificant, effect on exports into these countries. Per capita GDP and population, on the other hand, have significant positive effects on bilateral exports.

Overall, exchange and capital controls (as measured by ECI) represent a notable nontariff barrier. The negative parameter on ECI is significant at the 95 percent level for the full sample, suggesting that exchange and capital controls in their entirety significantly reduce bilateral exports. Another interpretation of this result is that capital controls in a broad sense (i.e., including capital controls and controls on current payments and transfers that are used to prevent the circumvention of capital controls) are a significant barrier to trade. The effect of exchange and capital controls on trade, however, varies depending on the type of control.

Capital controls (as measured by KCI) are found to be a significant barrier to trade for the full sample. In contrast, controls on current payments and transfers (as measured by CCI) do not reduce exports significantly. Most countries in the sample have already liberalized exchange controls on current payments and transfers, and the remaining exchange controls, including those on current invisible payments such as tourism, do not affect trade noticeably. Very few countries presently maintain significant exchange controls on trade-related transactions or factor services. In contrast, capital controls remain more widespread, particularly in developing and transition economies. The variation in the extent of the liberalization of exchange and capital controls across industrial and developing and transition countries is reflected in the estimation results for the respective subsamples.

Exchange and capital controls are a barrier to exports into developing and transition economies, but not to exports into industrial countries. This finding can be attributed to capital controls, which noticeably reduce bilateral exports into developing and transition economies, and have only a minor negative impact on bilateral exports into industrial countries. The reason is that industrial economies have relatively liberal regimes for international capital movements, while many developing and transition economies continue to maintain various capital controls. Controls on current payments and transfers represent only a minor barrier to bilateral exports into all countries, since these controls have been substantially liberalized worldwide.

The results appear to be robust with respect to the type of the exchange rate regime and individual country effects. To check whether the effect of exchange and capital controls on export flows varies depending on the exchange rate regime, we add

¹⁸Since heteroscedasticity may be a problem due to differences in the country size, standard errors and covariances are calculated on the basis of the White heteroscedasticity-consistent matrix.

Table 5. Gravity Model with Exchange and Capital Controls: Basic Results

	All Countries			Industrial Countries			Developing and Transition Countries		
	(2a)	(2b)	(2c)	(2a)	(2b)	(2c)	(2a)	(2b)	(2c)
<i>C</i>	-37.13*	-37.34*	-37.11*	-33.57*	-33.29*	-33.74*	-38.76*	-38.08*	-38.99*
<i>ln DIST</i>	-0.91*	-0.91*	-0.91*	-0.58*	-0.60*	-0.58*	-1.06*	-1.04*	-1.07*
<i>ln POPIM</i>	0.94*	0.94*	0.94*	0.94*	0.95*	0.93*	0.96*	0.95*	0.96*
<i>ln POPEX</i>	1.03*	1.03*	1.03*	0.99*	0.99*	0.99*	1.06*	1.06*	1.06*
<i>ln GDPIM</i>	1.37*	1.39*	1.37*	0.97*	0.93*	0.99*	1.49*	1.41*	1.52*
<i>ln GDPEX</i>	1.90*	1.90*	1.90*	1.77*	1.77*	1.77*	1.99*	1.98*	1.99*
<i>ln (1 + TAR)</i>	-0.73	-0.83	-0.73	-7.21*	-6.77*	-7.37*	-0.18	-0.62	-0.07
<i>ECI</i>	-0.66*			-1.20			-0.76**		
<i>CCI</i>		-0.89			-2.18			-0.65	
<i>KCI</i>			-0.42*			-0.71			-0.54**
Number of observations	1,519	1,519	1,519	581	581	581	938	938	938
<i>R</i> ²	0.76	0.76	0.76	0.80	0.80	0.80	0.72	0.72	0.72
<i>F</i> -statistic	697.05*	694.76*	697.26*	319.42*	319.07*	319.21*	334.10*	332.21*	334.63*

Notes: Column headings indicate equation number. One asterisk denotes a coefficient that is significant at the 99 percent level; two asterisks denote a coefficient that is significant at the 95 percent level.

a measure of the exchange rate regime—a dummy variable indicating a fixed exchange rate system (*EXRD*) or the average monthly volatility of the U.S. dollar exchange rate (*EXRV*)—to the set of regressors.¹⁹ Coefficients for both measures of the exchange regime are statistically insignificant (Table 6), while the results concerning the effect of exchange and capital controls on trade are found to be consistent, independent of the type of the exchange regime. Next we check robustness of the results to alternative experimental designs. We allow the intercepts and slopes, and then only intercepts, to vary across countries and use an *F*-test to check the validity of these alternative specifications. The null hypothesis is rejected for all models, implying that the differentiated country effects are statistically insignificant.

The results should be interpreted with caution, in view of the potential endogeneity and measurement problems. The endogeneity problem may emerge because exchange and capital account regulations depend on the level of economic development and trade flows in a given year. The simultaneous equation bias, however, is likely to be limited in the gravity model of bilateral trade flows, because exchange and capital controls are likely to depend (if at all) on aggregate, rather than bilateral, trade flows. In turn, the measurement problem can be traced to the fact that the indices of exchange and capital controls do not account for the enforcement of controls. Controlling for this measurement error requires using the instrumental variable approach and is left for a future study. The measure of trade barriers (mean tariff rate) does not account for differences in actual tariff rates across export partners other than those due to free trade agreements. To control for this measurement problem, we use several alternative measures of trade barriers: import duties as a share of imports (calculated on the basis of the IMF's *Government Finance Statistics Yearbook*), both adjusted and unadjusted for free trade agreements; mean tariff rates unadjusted for free trade agreements; and simple average tariff rates from the trade policy database compiled by the IMF.²⁰ The results are found to be robust to the alternative measures of trade barriers.

V. Conclusion

After analyzing the foregoing results, we have determined on an overall basis for 1996 that exchange and capital controls represent a significant barrier to trade. This finding, of course, depends on the level of development in each country and the type of exchange and capital controls in place. Controls on current payments and transfers are a negligible impediment to trade. Capital controls, in contrast, reduce bilateral trade for developing and transition economies, but not for industrial countries. These results reflect the variation in the extent of liberalization across countries and types of control: controls on current payments and transfers have been largely abolished world-

¹⁹The former variable is constructed on the basis of the *AREAER*, and figures for the latter come from the *International Financial Statistics*.

²⁰The trade policy database is compiled by the IMF's Trade Policy Division of the Policy Development and Review Department, on the basis of various sources (among others, the International Monetary Fund, the World Trade Organization, and the United Nations Conference on Trade and Development). The author thanks Robert Sharer and the staff of the Trade Policy Division for providing the data.

Table 6. Gravity Model with Exchange and Capital Controls:
Controlling for Exchange Rate Regime

	All Countries			Industrial Countries			Developing and Transition Countries											
	(2a)	(2b)	(2c)	(2a)	(2b)	(2c)	(2a)	(2b)	(2c)									
<i>C</i>	-37.21*	-37.19*	-37.43*	-37.46*	-37.18*	-37.16*	-34.07*	-33.56*	-33.89*	-33.27*	-34.19*	-33.74*	-38.89*	-38.81*	-38.17*	-38.12*	-39.17*	-39.02*
<i>ln DIST</i>	-0.91*	-0.91*	-0.91*	-0.91*	-0.91*	-0.91*	-0.58*	-0.58*	-0.60*	-0.60*	-0.60*	-0.58*	-1.06*	-1.06*	-1.04*	-1.04*	-1.07*	-1.06*
<i>ln POPIM</i>	0.94*	0.94*	0.94*	0.94*	0.93*	0.93*	0.94*	0.94*	0.96*	0.95*	0.94*	0.93*	0.96*	0.96*	0.95*	0.95*	0.96*	0.96*
<i>ln POPEX</i>	1.03*	1.03*	1.03*	1.03*	1.03*	1.03*	0.98*	0.99*	0.98*	0.99*	0.99*	0.99*	1.06*	1.06*	1.06*	1.06*	1.06*	1.06*
<i>ln GDPIM</i>	1.37*	1.37*	1.39*	1.39*	1.37*	1.37*	1.01*	0.97*	0.97*	0.93*	0.93*	1.02*	0.99*	1.51*	1.49*	1.43*	1.41*	1.56*
<i>ln GDPEX</i>	1.90*	1.90*	1.90*	1.90*	1.90*	1.90*	1.77*	1.77*	1.77*	1.77*	1.77*	1.77*	1.99*	1.99*	1.98*	1.98*	1.99*	1.99*
<i>ln (1 + TAR)</i>	-0.69	-0.67	-0.82	-0.78	-0.70	-0.69	-6.73*	-7.18*	-6.12**	-6.71*	-6.94*	-7.36*	-0.17	-0.14	-0.62	-0.58	-0.08	-0.04
<i>EXRD</i>	0.03	0.01	0.01	0.02	0.02	0.02	0.07	0.07	0.09	0.01	0.07	0.00	-0.06	-0.05	-0.05	0.02	0.01	0.01
<i>EXRV</i>	0.02	0.01	0.01	0.01	0.01	0.01	-1.21	-1.21	-2.32	-2.22	-0.71	-0.71	-0.75**	-0.78**	-0.62	-0.72	-0.54**	-0.55**
<i>ECI</i>	-0.68*	-0.69*	-0.90	-0.94	-0.43*	-0.43*												
<i>CCI</i>																		
<i>KCI</i>																		
Number of observations	1,519	1,519	1,519	1,519	1,519	1,519	581	581	581	581	581	581	938	938	938	938	938	938
<i>R</i> ²	0.76	0.76	0.76	0.76	0.76	0.76	0.80	0.80	0.80	0.80	0.80	0.80	0.72	0.72	0.71	0.71	0.72	0.72
<i>F</i> -statistic	609.57*	609.61*	607.52*	607.58*	609.75*	609.76*	279.23*	279.01*	279.07*	278.71*	279.00*	278.82*	292.12*	292.09*	290.43*	290.44*	292.79*	292.52*

Notes: Column headings indicate equation number. One asterisk denotes a coefficient that is significant at the 99 percent level; two asterisks denote a coefficient that is significant at the 95 percent level.

wide, while controls on capital flows continue to prevail in many developing and transition economies, but not in industrial countries. An implication of this study is that further liberalization of exchange and capital controls can discernibly foster trade.²¹

APPENDIX

Indices of Exchange and Capital Controls

The tabular presentation of the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* identifies 142 individual types of exchange and capital control. These are aggregated hierarchically into 16 categories; these categories are aggregated into indices, which measure the extent of exchange and capital controls (Table 1). The index of controls on current payments and transfers includes exchange controls pertaining to the exchange arrangement, arrangements for payments and receipts, resident and nonresident accounts, import payments, and export proceeds. The index of capital controls encompasses controls on capital and money market securities, derivatives, credit operations, foreign direct investment, real estate transactions; provisions specific to commercial banks, other credit institutions and institutional investors; and surrender and repatriation requirements. The index of exchange and capital controls covers controls on current payments and transfers and capital movements.

The presence of control i in country j is reflected in a dummy variable D_{ij} , which is assigned a value of 1 when the individual type of control is in place and 0 otherwise, according to the conventions described below. The index of controls in category k (denoted by CI_{kj}) is defined as the actual number of controls normalized by the total feasible number of controls in the category (N_k), as follows:

$$CI_{kj} = \frac{1}{N_k} \sum_i^{N_k} D_{ij}. \quad (\text{A1})$$

The indices of controls on current payments and transfers and capital controls (CCI_j and KCI_j , respectively) are the averages of the indices for the respective categories:

$$CCI_j = \frac{1}{N_{CCI}} \sum_i^{N_{CCI}} CI_{kj}, \quad (\text{A2})$$

$$KCI_j = \frac{1}{N_{KCI}} \sum_i^{N_{KCI}} CI_{kj}, \quad (\text{A3})$$

where N_{CCI} and N_{KCI} denote the number of categories in CCI and KCI, respectively. The overall index of exchange and capital controls (ECI_j) is the average of CCI_j and KCI_j :

²¹The findings concern the relationship between exchange and capital controls and bilateral exports and thus cannot be interpreted to judge the effect of controls on net trade, net capital flows, or the balance of payments; the latter issues are a topic for future research.

$$ECI_j = \frac{1}{2}(CCI_j + KCI_j). \quad (A4)$$

Conventions for assigning values of the dummy variables D_{ij} are as follows. The value of 1 corresponds to prohibitions, quantitative limits, approval and registration requirements,²² restrictions on investors' opportunity set (for example, the type and maturity of securities), as well as the transactions infeasible due to the absence of the respective markets. The value of 0 is assigned for measures for statistical purposes, administrative verification,²³ optional official cover of forward operations, liberal granting of licenses, and the lack of access to the formal market for foreign exchange transactions.²⁴

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²²Likewise, registration requirements are treated as restrictions in World Bank (1997).

²³Under the IMF's jurisdiction, registration or licensing used to monitor rather than restrict payments and verification requirements, such as a requirement to submit documented evidence that a payment is bona fide, does not constitute an exchange restriction, unless the process results in undue delays. With indicative limits, authorities approve all requests for foreign exchange for bona fide current international transactions in excess of limits or for transactions for which there is no basic allocation of foreign exchange. If the public is made aware of such a policy, indicative limits do not constitute a restriction.

²⁴On average, 99 percent of the *AREAER* data on exchange and capital controls are available for the countries in the sample. Nonetheless, the baseline indices are defined as the averages of the indices calculated under two alternative assumptions about missing data: controls and no controls.

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