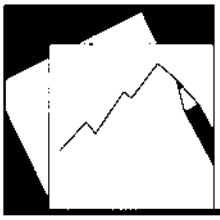
Working Paper

INTERNATIONAL MONETARY FUND

WP/08/14



IMF Working Paper

The Impact of Trade Liberalization on the Trade Balance in Developing Countries

Yi Wu and Li Zeng

INTERNATIONAL MONETARY FUND

 WP/08/14

IMF Working Paper

Policy Development and Review

The Impact of Trade Liberalization on the Trade Balance in Developing Countries

Prepared by Yi Wu, Li Zeng

Authorized for distribution by Thomas Dorsey

January 2008

Abstract

Using two recently constructed measures of trade liberalization dates, this research studies the impact of trade liberalization on imports, exports, and overall trade balance for a large sample of developing countries. We find strong and consistent evidence that trade liberalization leads to higher imports and exports. However, in contrast Santos-Paulino and Thirwall (2004) who find a robustly negative impact of trade liberalization on the overall trade balance, we only find mixed evidence of such a negative impact. In particular, we find little evidence of a statistically significant negative impact using our first measure of liberalization dates which extends Li (2004). Using a second measure of liberalization dates compiled by Wacziarg and Welch (2003), we find some evidence that liberalization worsens the trade balance, but the evidence is not robust across different estimation specifications, and the estimated impact is smaller than that reported by Santos-Paulino and Thirwall (2004).

JEL Classification Numbers: F49

Keywords: Trade liberalization, trade balance

Author's E-Mail Address: ywu@imf.org, lzeng@berkeley.edu

*We would like to thank Maria Oliva Armengol, Azim Sadikov, Dustin Smith, and especially Tom Dorsey, Hans Peter Lankes, and Brad McDonald for very helpful comments, and Xiangming Li for sharing with us her data set. All remaining errors are our own. The views expressed herein are those of the authors and should not be attributed to the IMF, its Executive Board, or its management.

Contents Page

I. Introduction 3
II. Two measures of trade liberalization dates 4
III. Regression Analysis 8
A. Specification and data 8
B. Impact of trade liberalization on imports 10
C. Impact of trade liberalization on exports 12
D. Impact of trade liberalization on the trade balance 14
IV. Concluding remarks 16

Tables
1. Trade Liberalization Episodes (Measure of Liberalization Dates Based on Li (2004)) 6
2a. Import, Export, and Trade Balance to GDP Ratios Before and After Trade Liberalization (The Extended Li Trade Liberalization Measure, 1970–2004) 7
2b. Import, Export, and Trade Balance to GDP Ratios Before and After Trade Liberalization (The Wacziarg-Welch Trade Liberalization Measure, 1970-2001) 8
3a. Trade Liberalization and Imports (The Extended Li Trade Liberalization Measure, 1970–2004) 10
3b. Trade Liberalization and Imports (The Wacziarg-Welch Trade Liberalization Measure 1970–2001) 11
4a. Trade Liberalization and Exports (The Extended Li Trade Liberalization Measure, 1970–2004) 13
4b. Trade Liberalization and Exports (The Wacziarg-Welch Trade Liberalization Measure, 1970–2001) 13
5a. Trade Liberalization and the Trade Balance (The Extended Li Trade Balance (The Extended Li Trade Liberalization Measure, 1970–2004) 15
5b. Trade Liberalization and the Trade Balance (The Wacziarg-Welch Trade Liberalization Measure, 1970–2001) 16

References 18

I. INTRODUCTION

Many developing countries have substantially liberalized their trade regime over the past three decades, either unilaterally or as part of multilateral initiatives. Nevertheless, trade barriers remain high in many developing countries. One of the concerns that attributes to the reluctance of many of these countries to liberalize their trade regime is the possible worsening of the trade balance.[1] This is the question we want to investigate in this study: did past liberalization episodes in developing countries lead to a deterioration of their trade balance?

On the theoretical ground, Ostry and Rose (1992) offer an extensive survey of the macroeconomic effects of trade tariffs based on different theoretical frameworks, including the income-expenditure approach, the monetary approach, and the intertemporal approach. The authors conclude that there is no clear conclusion about the effect of a tariff change on the trade balance. The effect depends on the behavior of real wages and exchanges rates, on the values of a variety of elasticities, the degree of capital mobility, and whether the tariff shock is perceived as temporary or permanent. The impact of trade liberalization on the trade balance, therefore, needs to be investigated empirically.

One stream of the related empirical literature attempts to find out how trade liberalization affects a country's imports, and generally finds a positive impact (see, e.g., Melo and Vogt, 1984; Bertola and Faini, 1991; and Santos-Paulino, 2002a). There are also empirical researches focusing on the effects of trade liberalization on exports, where the findings are more mixed. Some of them show that countries which embarked on liberalization programs have improved their export performance (see, e.g., Ahmed, 2000; Thomas et al., 1991; and Santos-Paulino, 2002b) while others have found little evidence of such a relationship (see, e.g., Greenaway and Sapsford, 1994; Jenkins 1996).

For policy makers, the impact of trade liberalization on the overall balance would be the more important question. There have been however surprisingly few cross-country empirical studies on the subject. Ostry and Rose (1992) studied the impact of tariff changes on the trade balance using five different data sets, mostly data from OECD countries, and found no statistically significant effect. UNCTAD (1999) studied the effect of trade liberalization on the trade balance for 15 developing countries over the period of 1970 to 1995, and found a significant negative relationship. In a more recent paper, Santos-Paulino and Thirlwall (2004) studied the effect of trade liberalization on imports, exports and the overall trade balance using a sample of 22 developing countries for the period of 1972–1997. They found that liberalization stimulated export growth but raised import growth by more, leading to a worsening of the overall trade balance.

One constraint researchers on the subject often face is the lack of systematic data measuring the dates of trade liberalization. Indeed, due to data limitation, most of the empirical studies on the subject are constrained to country case studies. In this paper, we use two recently compiled data sets establishing trade liberalization dates that cover a large sample of developing

[1] Another common concern is the decline in tariff revenue—often a major source of revenue for developing countries. Baunsgaard and Keen (2005) find that low-income countries have mostly not been able to offset reductions in trade tax revenues by increasing their domestic tax revenues.

countries for a long period of time. In particular, our two samples cover 39 and 77 developing countries for the period of 1970–2004, and 1970–2001, respectively. Our study focuses on the impact of trade liberalization for developing countries, for whom the policy relevance of this question remains especially high. We find strong evidence that trade liberalization leads to faster import and export growth. The evidence on the overall trade balance, however, is mixed. Using our first measure of trade liberalization dates, we find little evidence that trade liberalization worsens the trade balance. There is some evidence that liberalization leads to a deterioration of the trade balance when we use our second measure of liberalization dates, although the finding is not robust to alternative estimation specifications.

The rest of the paper is organized as the following. Section 2 discusses the two measures of liberalization dates and reports some stylized facts. The estimation results are presented in section 3. Finally, section 4 provides some concluding remarks.

II. TWO MEASURES OF TRADE LIBERALIZATION DATES

Our first measure of trade liberalization dates is based on Li (2004). Li (2004) has individually documented trade liberalization episodes in 45 countries between 1970 and 1995. We extended the liberalization measure for the 39 developing countries[2] in her data set to 2004 using the tariff data from the UNCTAD's TRAINS database (supplemented by data from the IMF's TPID database). In doing so, a trade liberalization episode is identified if there is a continuous and accumulated tariff reduction by at least 35 percent (e.g., a tariff reduction from 15% to 9.75%).[3] However, once a country's overall tariff level reaches 10 percent or lower, we regard it as open and a further tariff cut, even by more than 35 percent, will no longer be considered as a liberalization episode.[4] The IMF's TPID database also rates a country's non-tariff barrier level into three categories (open, moderate, and restrictive). In addition to looking at tariff reductions, we also take the reductions in non-tariff barriers into consideration when defining a liberalization episode. However, it turns out that reductions in non-tariff barriers are usually accompanied by large tariff cuts.

Table 1 reports our first measure of liberalization dates covering the period between 1970 and 2004, with the years of liberalization episodes highlighted (tariff reductions typically spread over several years). Two observations are worth mentioning. First, the period of 1985–1995 seems to be the "opening-up decade" for developing countries. Almost all the countries in our sample experienced one or more episodes of liberalization during this period. Secondly, many countries experienced multiple episodes of liberalization (this is the case for 20 of the 39 countries in the sample). Indeed, trade liberalization is still an ongoing process for many developing countries.

---

[2] According to the World Bank's classification (http://go.worldbank.org/K2CKM78CC0).

[3] Ideally we would like to use the weighted average tariff, but often only the simple average tariff data are available.

[4] One example where this 10-percent threshold is applied is Chile. Over the period of 1999–2004, Chile's simple average tariff rate was reduced from ten percent to five percent, which was a cut of 50 percent. However, since the 10-percent threshold was already met at the initial tariff level, this period is not treated as a liberalization episode.

For countries that experienced multiple liberalization episodes, a subsequent liberalization is often implemented either because the earlier one was limited in scope or was later reversed (at least partially). We therefore define a trade liberalization dummy, which takes the value of one after the end of the last recorded liberalization episode for a country and zero beforehand.[5]

Our second measure of trade liberalization dates is from Wacziarg and Welch (2003). Wacziarg and Welch define the liberalization date as the date after which all of the Sachs and Warner (1995) openness criteria are continuously met. In particular, Wacziarg and Welch classify a country as closed if it displays at least one of the following characteristics: (i) average tariff rates of 40% of more; (ii) nontariff barriers covering 40% or more of trade; (iii) a black market exchange rate that is depreciated by 20% or more relative to the official exchange rate, on average; (iv) a state monopoly on major export; and (v) a socialist economic system. However, data limitations often forced them to reply on country case studies of trade policy. One advantage of the Wacziarg-Welch data set is that it covers a substantially larger sample of developing countries. The Wacziarg-Welch liberalization dates are also reported in the last column of Table 1 (only for the overlapping countries).

We note in many cases the identified dates are very close across the two measures. For example, our first measure would identify 1992 as the year that Argentina liberalized its trade regime, compared with 1991 in Wacziarg and Welch (2003). For multiple liberalization episodes identified by our first measure, in several cases the Wacziarg-Welch date is closer to the first episode. For example, our first measure suggests that Chile had two episodes of liberalization, during 1974–79 and 1985–92, respectively. Thus our first liberalization dummy will be one starting from 1993. The Wacziarg-Welch liberalization measure, instead, identifies 1976 as the year after which the economy has been open. This misses the reversal afterwards and the second liberalization during 1985–92.[6] Finally, in a few cases, the identified liberalization dates are quite different across the two measures. For example, Li (2004) identifies a liberalization era lasting from 1985 to 1996 for Indonesia (average nominal tariff more than halved), while Wacziarg and Welch classify Indonesia as open from 1970.

[5] We made one exception for China. China's (simple average) tariff was reduced from 39.7% in 1992 to 16.7% in 1997, and then from 15.4% in 2001 to 10.7% in 2003, and further to 9.8% in 2004. This is a 36% tariff reduction from 2001 to 2004. The classification will make the liberalization dummy zero for China for our sample period, and the analysis would miss the dramatic opening up and trade promotion that had happened during the 1990s. We therefore assign the liberalization dummy as one for China after 1998. Nevertheless, the regression results would be broadly similar even if we did not make such an exception.

[6] Chile's uniform tariff was raised to 20 percent in 1983, then to 35 percent in 1984. During 1985–92, the uniform tariff rate was reduced to 15 percent, while the average tariff dropped from 36 percent to 12 percent. Non-tariff barriers were also lowered (see Li, 2004).

Table - 1 Trade Liberalization Episodes (Measure of Liberalization Dates Based on Li (2004))

Country	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	W-W Open Year
Argentina	0	0	0	0	0	0	x	x	x	x	0	0	0	0	0	0	0	0	x	x	x	x	0	0	0	0	0	0	0	0	0	0	0	0	0	1991
Benin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	0	0	0	0	0	0	0	0	0	0	0	1990
Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	x	x	0	0	0	0	0	0	0	0	0	0	0	1991
Cameroon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	x	0	0	0	0	0	0	0	0	0	0	1993
Chile	0	0	0	0	x	x	x	x	x	x	0	0	0	0	0	x	x	x	x	x	x	x	x	0	0	0	0	0	0	0	0	0	0	0	0	1976
China	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	x	x	0	0	0	0	0	x	0	n.a.
Colombia	0	0	0	x	x	x	x	x	x	x	0	0	0	0	0	x	x	x	x	x	0	0	x	0	0	0	0	0	0	0	0	0	0	0	0	1986
Costa Rica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1986
Ecuador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	x	x	x	0	0	0	0	0	0	0	0	0	0	0	0	1991
Gambia, The	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1985
Ghana	0	0	0	0	0	0	0	0	0	0	0	0	0	x	0	0	x	x	x	x	x	x	x	0	0	0	0	0	0	0	0	0	0	0	0	1985
Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1988
Guinea-Bissau	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	0	0	0	0	0	0	0	0	0	0	0	0	x	0	0	0	0	1987
Guyana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	0	0	0	0	0	0	0	x	x	x	0	0	0	1988
Honduras	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	0	0	0	0	0	0	0	0	0	0	0	0	1991
India	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	0	0	x	x	x	x	x	x	x	0	0	0	0	0	0	0	n.a.
Indonesia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	x	x	x	x	x	x	x	x	0	0	0	0	0	0	0	0	1970
Jamaica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	x	0	0	0	0	0	0	x	x	0	0	0	1989
Kenya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	x	x	0	0	0	0	0	0	x	x	x	x	x	1993
Malaysia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	0	0	0	0	0	0	0	0	0	1963
Mali	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	0	0	0	0	0	0	0	0	0	0	0	0	0	1988
Mauritania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	0	0	0	0	0	0	0	0	0	0	x	0	0	0	0	1995
Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1986
Morocco	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	x	x	x	0	0	0	0	0	0	0	x	0	0	0	0	0	0	0	1984
Nepal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	0	0	0	0	0	0	0	0	0	0	0	1991
Nicaragua	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	0	0	0	x	x	0	0	0	0	0	0	0	0	0	0	0	0	1991
Nigeria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n.a.
Pakistan	0	0	x	x	x	x	x	x	x	0	0	0	0	0	0	0	0	0	0	x	x	x	x	x	x	x	0	0	x	x	x	x	x	0	0	2001
Paraguay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1989
Peru	0	0	0	0	0	0	0	0	0	x	x	x	0	0	0	0	0	0	0	0	0	x	0	0	0	0	0	0	0	0	0	0	0	0	0	1991
Philippines	0	0	0	0	0	0	0	0	0	0	0	x	x	x	0	0	x	0	0	0	0	x	x	x	x	x	x	x	x	x	0	0	0	0	0	1988
Sri Lanka	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	x	0	0	0	0	x	0	0	0	0	0	1991
Thailand	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	0	0	0	x	x	x	0	0	x	x	x	x	x	x	Always
Tunisia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	x	x	x	x	0	0	0	0	0	0	0	0	0	0	0	1989
Turkey	0	0	0	0	0	0	0	0	0	0	x	x	x	x	x	x	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1989
Uganda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	x	0	0	0	0	0	0	0	1988
Uruguay	0	0	0	0	x	x	x	x	x	x	x	x	0	0	0	0	0	0	0	0	0	x	x	x	x	0	0	0	0	0	0	0	0	0	0	1990
Venezuela	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	0	0	0	0	0	0	0	0	0	0	0	0	1996
Zambia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	x	0	0	0	0	0	0	0	0	1993

Table 2a. Import, Export, and Trade Balance to GDP Ratios Before and After Trade Liberalization (The Extended Li Trade Liberalization Measure, 1970–2004)

	Imports/GDP (%)		Exports/GDP (%)		Trade balance/GDP (%)	
Country	Before lib.	After lib.	Before lib.	After lib.	Before lib.	After lib.
Argentina	6.2	9.1	8.1	11.5	2.0	2.4
Benin	27.6	28.8	10.3	18.6	-17.4	-10.2
Brazil	7.5	9.1	8.1	9.7	0.6	0.6
Cameroon	16.8	15.6	15.5	18.1	-1.3	2.5
Chile	18.6	24.4	18.8	24.4	0.3	0.0
China	11.5	20.1	11.4	22.4	-0.1	2.3
Colombia	12.2	15.2	11.7	13.2	-0.4	-2.0
Costa Rica	31.3	35.7	24.3	29.5	-7.0	-6.2
Ecuador	17.9	21.9	21.2	22.6	3.3	0.7
Gambia, The	52.1	54.5	26.8	8.4	-25.4	-46.2
Ghana	22.7	42.2	22.0	26.5	-0.7	-15.7
Guatemala	17.3	24.6	15.4	14.0	-2.0	-10.6
Guinea-Bissau	37.9	29.7	9.5	28.6	-28.4	-1.1
Guyana	69.9	81.0	62.9	71.2	-7.0	-9.9
Honduras	29.7	44.7	25.8	24.8	-3.9	-19.8
India	6.9	11.4	5.4	9.2	-1.5	-2.2
Indonesia	15.6	24.0	22.0	34.3	6.4	10.3
Jamaica	40.5	42.2	24.1	14.5	-16.4	-27.7
Kenya	26.3	.	17.0	.	-9.3	.
Malaysia	47.0	83.0	52.4	97.7	5.4	14.7
Mali	22.2	29.6	10.4	20.5	-11.8	-9.0
Mauritania	31.6	32.6	36.3	26.7	4.7	-6.0
Mexico	8.9	24.1	9.0	22.0	0.0	-2.1
Morocco	24.8	32.2	15.3	20.8	-9.4	-11.3
Nepal	15.4	28.8	5.9	10.6	-9.5	-18.3
Nicaragua	34.8	41.6	21.2	14.9	-13.5	-26.7
Nigeria	23.4	23.8	29.4	40.3	5.9	16.6
Pakistan	17.5	17.3	11.6	14.2	-5.9	-3.1
Paraguay	13.3	31.1	9.3	15.1	-4.0	-15.9
Peru	11.7	13.6	13.8	12.1	2.1	-1.5
Philippines	27.0	49.0	19.8	46.0	-7.3	-2.9
Sri Lanka	31.1	38.9	22.4	29.7	-8.8	-9.1
Thailand	32.5	.	28.2	.	-4.3	.
Tunisia	35.2	43.3	22.0	30.7	-13.2	-12.6
Turkey	10.5	21.0	5.6	13.6	-4.9	-7.5
Uganda	13.4	22.5	12.7	8.5	-0.7	-14.0
Uruguay	14.4	17.5	13.8	13.8	-0.6	-3.6
Venezuela	17.8	15.6	24.8	27.3	7.0	11.7
Zambia	27.7	31.9	35.6	26.5	8.0	-5.4
Average	23.8	30.6	19.5	24.1	-4.3	-6.5
Before<After	33		28		15	
Before>After	4		9		22	

Nevertheless, the two measures are significantly and positively correlated, with a correlation coefficient of 0.57 (for countries in which they overlap).

Table 2a tabulates the average import, export and trade balance to GDP ratios using our first measure of trade liberalization for the periods before and after liberalization. Reported at the bottom of the table are cross-country averages. In general, countries not only import but also export more after they liberalized their trade regimes. The cross-country average import-to-GDP ratio increased from 23.8% to 30.6%, with 33 countries seeing their import-to-GDP ratio increased versus four countries experiencing a decline. The average export-to-GDP ratio increased from 19.5% to 24.1%, with the ratio increased in 28 countries and reduced in nine countries. The average increase in exports however is smaller than that of imports, as the average trade deficit slightly increased from 4.3 percent to 6.5 percent. However, the picture is not uniform across countries: 22 countries experienced a deterioration of the trade balance after liberalization, and 15 countries actually had an improved trade balance.

Table 2b reports the summary statistics using the Wacziarg-Welch measure of trade liberalization dates.[7] The average import-to-GDP ratio increased from 25.1% before liberalization to 29.9% afterwards. 47 out of the 62 developing countries that experienced trade liberalization during the period had higher import-to-GDP ratios. The average export-to-GDP ratio increased from 18.5% to 20.4%, with 40 countries experiencing an increase in the average ratio and 22 countries a decrease. Finally, the average trade deficit increased from 6.5% to 9.5%, with 41 out of 62 countries experienced a worsening of their trade balance.

Table 2b. Import, Export, and Trade Balance to GDP Ratios Before and After Trade Liberalization (The Wacziarg-Welch Trade Liberalization Measure, 1970–2001)

	Imports/GDP (%)		Exports/GDP (%)		Trade balance/GDP (%)	
Country	Before lib.	After lib.	Before lib.	After lib.	Before lib.	After lib.
Average	25.1	29.9	18.5	20.4	-6.5	-9.5
Before<After	47		40		21	
Before>After	15		22		41	

Tables 2a and 2b are nevertheless only simple summary statistics. To pin down the partial impact of trade liberalization on the trade balance, one needs regression analysis to control for other factors that also affect the trade balance, which we do in the next section.

III. Regression Analysis

A. Specification and data

We follow Santos-Paulino and Thirwall (2004) to use trade balance over GDP as the dependent variable and estimate the following dynamic panel equation:

[7] We excluded former Soviet Union and former Yugoslavia countries due to substantially shorter time series.

$$\frac{TB}{GDP_{it}} = \alpha + \beta_1 \frac{TB}{GDP_{it-1}} + \beta_2 lib_{it} + \beta_3 \hat{y}_{it} + \beta_4 \hat{y}^*_{it} + \beta_5 \hat{reer}_{it} + \beta_6 \hat{TOT} + \beta_7 fisr + u_i + v_{it},$$

where *TB* denotes the trade balance (the lagged dependent variable is included in the equation to control for adjustment dynamics); *lib* is the trade liberalization dummy; $\hat{y}_{it}$ and $\hat{y}^*_{it}$ are domestic and foreign real GDP growth respectively; $\hat{reer}_{it}$ and $\hat{TOT}$ denote the change in (log) real exchange rate and terms of trade respectively. We also include fiscal balance to GDP ratio (*fisr*) to control for the impact of government fiscal policy on the trade balance. Finally, u_i represents time-invarying country-specific effects, and v_{it} is a well-behaved disturbance term.

Trade, GDP, and fiscal balance data are from the IMF's *International Financial Statistics* (IFS) database. Terms of trade data are from the IMF's WEO database. Foreign (real) GDP growth is the weighted growth rates of a country's export market countries, where the weight is the market country's 1990 share of the home country's total exports. Bilateral trade data used to calculate the weights are from the IMF's *Direction of Trade Statistics* database. Finally, the real exchange rate is calculated as a geometric weighted average of bilateral real exchange rates between home country and its trading partners:

$$reer_i = \prod_j \left(\frac{E_{i,us} CPI_i}{E_{j,us} CPI_j} \right)^{W_{ij}},$$

where *i* indicates home country and *j* indicates trading partner countries. $E_{i,us}$ is the nominal exchange rate of country *i* in U.S. dollar per local currency unit, and W_{ij} is the share of country *j* in country *i*'s total trade with its major trading partners. Countries whose trade share in home country is larger than 10 percent are included as major trading partners in calculating *reer* except China, because of incomplete CPI data (both CPI and bilateral exchange rate data are from the IFS). An increase in *reer* indicates a real appreciation.

Before studying the impact of trade liberalization on the overall trade balance, we first analyze its impact on imports and exports separately. The standard trade equation would use the log of import and export volume as the dependent variable to derive income and price elasticities. This, however, will dramatically reduce our sample size due to missing import/export price data for many countries. Because income and price elasticities are not our primary interests, we use import and export to GDP ratio (in log)[8] as the dependent variable in the import and export analyses to maintain our sample size and for consistency between import/export regressions and the trade balance regressions (where trade balance over GDP is the dependent variable).

[8] Using the ratios in level yields broadly similar results.

B. Impact of trade liberalization on imports

The regression results using our first measure of liberalization dates are reported in Table 3a. The sample covers 39 countries with 1202 observations. Column one reports the fixed effects panel regression as a benchmark. The trade liberalization dummy is positive and significant at the 1% level, indicating that liberalization leads to higher import growth. In addition, higher domestic growth also leads to higher import to GDP ratio, suggesting an income elasticity larger than one. Both real exchange rate appreciation and improved terms of trade (through lower import prices) lead to lower imports (in value), suggesting a price elasticity lower than one.[9] Finally, the positive sign on the fiscal balance is a bit puzzling, as we would expect that an improvement in the fiscal balance lowers the import demand.

Table 3a. Trade Liberalization and Imports (The Extended Li Trade Liberalization Measure, 1970–2004)

	(1)	(2)	(3)	(4)	(5)
Dep. Variable: Imports/GDP (in log)	Fixed effects	GMM (one-step)	GMM (2, 3) (one-step)	GMM (two-step)	GMM (2, 3) (two-step)
Lagged dependent var.	0.778***	0.897***	0.854***	0.883***	0.859***
	(0.018)	(0.023)	(0.037)	(0.072)	(0.046)
Trade liberalization	0.082***	0.037***	0.047***	0.041*	0.043**
	(0.013)	(0.010)	(0.011)	(0.024)	(0.017)
Domestic GDP growth	0.005***	0.005**	0.004	0.005*	0.004
	(0.001)	(0.002)	(0.002)	(0.003)	(0.002)
Change in real effective exchange rate	-0.115***	-0.141***	-0.127***	-0.135**	-0.124**
	(0.026)	(0.050)	(0.049)	(0.054)	(0.054)
Changes in terms of trade	-0.001***	-0.001***	-0.002**	-0.002**	-0.002**
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Fiscal balance/GDP	0.003*	0.001	0.00	0.001	0.003
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
No. of countries	39	39	39	39	39
No. of obs.	1202	1202	1202	1202	1202
Arellano-Bond test for AR(2) in first differences (p value)		0.36	0.37	0.36	0.37
Hansen test of joint validity of instruments (p value)		1.00	1.00	1.00	1.00

Note: *, **, and *** represent significant at 10%, 5%, and 1% level. Robust standard errors are in parenthesis, with robust standard errors for the two-step estimates calculated using the Windmeijer (2005) correction.

[9] Developing countries' imports could be more inelastic if the share of imports of intermediate inputs is high.

However, under the dynamic panel setting fixed effects estimates, even if the country fixed effects assumption is correct, will be consistent only if the time series dimension of the panel goes to infinity. We therefore use the system generalized method of moments (GMM) developed in Blundell and Bond (1998) to get consistent estimates.[10] As a robustness check, we report both one-step and two-step estimates. The two-step procedure involves the additional computation of an optimal weight matrix but is theoretically more efficient. We first follow the standard procedure to use all available lags of the dependent variable and the exogenous regressors in levels dated *t*-2 to all earlier years as instruments in the estimation.[11] However, too many instruments can "overfit" endogenous variables and bias coefficient estimates, as well as weaken Hansen test of instrument validity (see, e.g., Ziliak, 1997; Bowsher, 2002), and it has been suggested that shorter lags of instruments be used (see, e.g., Arellano, 2003; Roodman,

Table 3b. Trade Liberalization and Imports (The Wacziarg-Welch Trade Liberalization Measure, 1970–2001)

	(1)	(2)	(3)	(4)	(5)
Dep. Variable: Imports/GDP (in log)	Fixed effects	GMM (one-step)	GMM (2, 3) (one-step)	GMM (two-step)	GMM (2, 3) (two-step)
Lagged dependent var.	0.767***	0.811***	0.793***	0.812***	0.787***
	(0.014)	(0.029)	(0.037)	(0.038)	(0.039)
Trade liberalization	0.061***	0.069***	0.074***	0.070***	0.077***
	(0.012)	(0.016)	(0.019)	(0.021)	(0.020)
Domestic GDP growth	0.003***	0.003*	0.002	0.002	0.001
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Change in real effective exchange rate	-0.124***	-0.127**	-0.120**	-0.126**	-0.118**
	(0.022)	(0.050)	(0.049)	(0.052)	(0.051)
Changes in terms of trade	-0.001***	-0.001**	-0.001**	-0.001**	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Fiscal balance/GDP	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
No. of countries	77	77	77	77	77
No. of obs.	2039	2039	2039	2039	2039
Arellano-Bond test for AR(2) in first differences (p value)		0.43	0.44	0.43	0.46
Hansen test of joint validity of instruments (p value)		1.00	0.93	1.00	0.93

Note: *, **, and *** represent significant at 10%, 5%, and 1% level. Robust standard errors are in parenthesis, with robust standard errors for the two-step estimates calculated using the Windmeijer (2005) correction.

[10] The Stata program is from Roodman (2006).

[11] This is for the transformed (first-difference) equation. The contemporaneous first difference is used as the instrument in the levels equation.

2007). We therefore also report GMM estimates only using lags dated *t*-2 and *t*-3 as instruments (labeled as GMM(2, 3) in the tables). The GMM estimates are reported in columns (2)–(5) of Table 3a.

The results are broadly similar to the fixed effects regression[12] except that the fiscal balance now becomes insignificant and domestic GDP growth becomes insignificant when shorter lags are used as instruments. In all specifications, trade liberalization is shown to lead to higher imports. The Arellano-Bond test confirms the absence of second order correlation of the disturbance term required for consistency, and the Hansen test also does not reject the null hypothesis of joint validity of instruments.[13]

Table 3b reports the import regressions using the Wacziarg-Welch measure of trade liberalization dates which covers a larger sample of 77 developing countries (62 of which "opened up" during the sample period) with 2039 observations. The results are broadly similar to those reported in Table 3a except that the fiscal balance now becomes negative as expected, although insignificant. The trade liberalization dummy is positive and significant at the 1% level in all specifications. The estimated coefficients are larger than those reported in Table 3a. For example, for one-step GMM (2, 3), the coefficient on the trade liberalization dummy is 0.074 vs. 0.047 in Table 3a.

C. Impact of trade liberalization on exports

The regression results for exports are reported in Tables 4a and 4b, for the two measures of trade liberalization dates, respectively. The pattern of coefficients is broadly as expected and consistent across the two measures: higher foreign growth and terms of trade improvement lead to higher exports, and real exchange rate appreciation lowers exports.

The trade liberalization dummy is positive and significant either at the 5% or 10% level in all regressions except in the fixed effects regression when the Wacziarg-Welch trade liberalization dates are used. This suggests that developing countries not only import more after liberalizing their trade regime, but also export more. We observe, however, that the coefficients on the trade liberalization dummy from the export regressions tend to be smaller than those from the import regressions. For example, for one-step GMM (2, 3), the coefficients from the export regressions are 0.030 and 0.036 for the two measures of liberalization dates, respectively, while the corresponding coefficients from the import regressions are 0.047 and 0.074, respectively. This indicates that liberalization may lead to higher import growth than export growth, possibly leading to a deterioration in the overall trade balance.[14]

---

[12] We note that the fixed effects estimate of the lagged dependent variable is smaller than the GMM estimates as one would expect (Bond 2002).

[13] A very high p-value for the Hansen test, however, is often a sign of instrument proliferation weakening its ability to detect the problem.

[14] Krueger (1978) suggests that there is evidence that import flows respond more rapidly than exports to trade liberalization, causing temporary trade imbalances.

Table 4a. Trade Liberalization and Exports (The Extended Li Trade Liberalization Measure, 1970–2004)

	(1)	(2)	(3)	(4)	(5)
Dep. Variable: Exports/GDP (in log)	Fixed effects	GMM (one-step)	GMM (2, 3) (one-step)	GMM (two-step)	GMM (2, 3) (two-step)
Lagged dependent var.	0.855***	0.924***	0.874***	0.919***	0.882***
	(0.015)	(0.021)	(0.043)	(0.025)	(0.050)
Trade liberalization	0.040***	0.025**	0.030**	0.026**	0.033*
	(0.013)	(0.012)	(0.015)	(0.013)	(0.018)
Foreign GDP growth	0.007*	0.011***	0.010***	0.013***	0.011***
	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)
Change in real effective exchange rate	-0.225***	-0.217***	-0.199**	-0.207**	-0.219**
	(0.028)	(0.085)	(0.095)	(0.086)	(0.093)
Changes in terms of trade	0.003***	0.002***	0.002***	0.002***	0.002***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
No. of countries	39	39	39	39	39
No. of obs.	1203	1203	1203	1203	1203
Arellano-Bond test for AR(2) in first differences (p value)		0.84	0.87	0.87	0.88
Hansen test of joint validity of instruments (p value)		1.00	1.00	1.00	1.00

Table 4b: Trade Liberalization and Exports (The Wacziarg-Welch Trade Liberalization Measure, 1970–2001)

	(1)	(2)	(3)	(4)	(5)
Dep. Variable: Exports/GDP (in log)	Fixed effects	GMM (one-step)	GMM (2, 3) (one-step)	GMM (two-step)	GMM (2, 3) (two-step)
Lagged dependent var.	0.821***	0.895***	0.860***	0.897***	0.856***
	(0.013)	(0.016)	(0.032)	(0.027)	(0.038)
Trade liberalization	0.019	0.028**	0.036**	0.031**	0.042**
	(0.012)	(0.013)	(0.016)	(0.014)	(0.018)
Foreign GDP growth	0.005	0.008***	0.007**	0.008***	0.007**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Change in real effective exchange rate	-0.226***	-0.224***	-0.214***	-0.226***	-0.214***
	(0.023)	(0.070)	(0.072)	(0.073)	(0.074)
Changes in terms of trade	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
No. of countries	77	77	77	77	77
No. of obs.	2055	2055	2055	2055	2055
Arellano-Bond test for AR(2) in first differences (p value)		0.82	0.84	0.83	0.86
Hansen test of joint validity of instruments (p value)		1.00	0.91	1.00	0.91

D. Impact of trade liberalization on the trade balance

In this section we study the impact of trade liberalization on the overall trade balance. The regression results using the Li measure of liberalization dates are presented in Table 5a. Among the control variables, domestic GDP growth is negative and significant. Foreign GDP growth is positive although only significant in the fixed effects and one-step GMM regressions. The change in real effective exchange rate is negative although insignificant. This is not too surprising given that it is negative in both the import and export regressions. The change in terms of trade is consistently positive and significant. Finally, the fiscal balance is positive as expected, although only significant in the one-step GMM regressions.

The liberalization dummy is negative and significant in the fixed effects regression. However, it becomes insignificant in all the GMM regressions although it remains negative. Since GMM yields consistent estimates, the evidence here gives little support to the claim that that trade liberalization has a negative and significant impact on the overall trade balance.

Table 5b reports the results using the Wacziarg-Welch measure of trade liberalization dates. The results for the control variables are again broadly as expected. Higher domestic GDP growth leads to a deterioration of the trade balance, while higher foreign GDP growth improves a country's trade balance. Real exchange rate appreciation also tends to lead to a deterioration in the trade balance, although for the GMM regressions the coefficient is only significant when the shorter list of instruments are used. There is strong evidence across different specifications that positive terms of trade shocks improve the trade balance. For the fiscal balance, although the coefficient is always positive as expected, it is only significant in the fixed effects regression.

In contrast to the results in Table 5a, the trade liberalization dummy is negative and significant in all specifications except in the standard two-step GMM estimation. For example, the one-step GMM (2,3) estimate of the trade liberalization dummy is -1.30, suggesting an immediate worsening of the trade balance-to-GDP ratio of 1.3 percent after liberalization, which we note is substantially smaller than the estimates (-2.52 and -3.57) reported in Santos-Paulino and Thirlwall (2004).

Finally, we re-run the trade balance regressions using the Wacziarg-Welch liberalization dates, but limit the sample to the 39 countries in the Li data set. The results (not reported) are broadly similar to those reported in Table 5b. In particular, the trade liberalization dummy is negative and significant in all specifications except in the standard two-step GMM. This suggests the difference between Tables 5a and 5b is more likely from the difference in the measure of liberalization dates than from the difference in country coverage.

In summary, unlike in the import and export analyses, where we get consistent results across the two measures of liberalization dates, in the analysis of liberalization's impact on the overall trade balance, we get different results depending on the measure used. There is little evidence that liberalization worsens the overall trade balance using the Li measure, but some evidence of a negative impact when the Wacziarg-Welch measure is used.

Table 5a. Trade Liberalization and the Trade Balance (The Extended Li Trade Liberalization Measure, 1970–2004)

	(1)	(2)	(3)	(4)	(5)
Dep. Variable: Trade balance/GDP	Fixed effects	GMM (one-step)	GMM (2, 3) (one-step)	GMM (two-step)	GMM (2, 3) (two-step)
Lagged dependent var.	0.694***	0.883***	0.787***	0.919***	0.742***
	(0.020)	(0.035)	(0.053)	(0.099)	(0.071)
Trade liberalization	-0.951***	-0.395	-0.588	-4.591	-0.259
	(0.307)	(0.292)	(0.375)	(4.403)	(1.530)
Domestic GDP growth	-0.185***	-0.162**	-0.143*	-0.177***	-0.188**
	(0.032)	(0.071)	(0.085)	(0.066)	(0.083)
Foreign GDP growth	0.156*	0.187***	0.167**	0.048	0.118
	(0.090)	(0.065)	(0.079)	(0.218)	(0.139)
Change in real effective exchange rate	-0.810	-0.957	-0.839	-0.356	-1.106
	(0.682)	(1.643)	(1.594)	(1.673)	(1.325)
Changes in terms of trade	0.086***	0.089***	0.083***	0.080***	0.079***
	(0.009)	(0.026)	(0.026)	(0.023)	(0.024)
Fiscal balance/GDP	0.036	0.090*	0.116*	0.10	0.143*
	(0.039)	(0.053)	(0.071)	(0.069)	(0.082)
No. of countries	39	39	39	39	39
No. of obs.	1202	1202	1202	1202	1202
Arellano-Bond test for AR(2) in first differences (p value)		0.90	0.88	0.81	0.88
Hansen test of joint validity of instruments (p value)		1.00	1.00	1.00	1.00

Note: *, **, and *** represent significant at 10%, 5%, and 1% level. Robust standard errors are in parenthesis, with robust standard errors for the two-step estimates calculated using the Windmeijer (2005) correction.

Table 5b. Trade Liberalization and the Trade Balance (The Wacziarg-Welch Trade Liberalization Measure, 1970–2001)

	(1)	(2)	(3)	(4)	(5)
Dep. Variable: Trade balance/GDP	Fixed effects	GMM (one-step)	GMM (2, 3) (one-step)	GMM (two-step)	GMM (2, 3) (two-step)
Lagged dependent var.	0.637***	0.842***	0.752***	0.839***	0.754***
	(0.017)	(0.029)	(0.042)	(0.035)	(0.042)
Trade liberalization	-1.260***	-0.844**	-1.300***	-0.843	-1.249***
	(0.294)	(0.334)	(0.484)	(1.059)	(0.466)
Domestic GDP growth	-0.106***	-0.079**	-0.077*	-0.083**	-0.085**
	(0.022)	(0.037)	(0.040)	(0.038)	(0.037)
Foreign GDP growth	0.217***	0.214***	0.237***	0.211***	0.227***
	(0.070)	(0.070)	(0.073)	(0.081)	(0.076)
Change in real effective exchange rate	-1.887***	-1.910	-2.033*	-1.953	-2.235**
	(0.553)	(1.188)	(1.175)	(1.324)	(1.136)
Changes in terms of trade	0.076***	0.082***	0.079***	0.082***	0.078***
	(0.007)	(0.016)	(0.015)	(0.017)	(0.015)
Fiscal balance/GDP	0.071***	0.04	0.05	0.04	0.05
	(0.022)	(0.040)	(0.049)	(0.041)	(0.048)
No. of countries	77	77	77	77	77
No. of obs.	2039	2039	2039	2039	2039
Arellano-Bond test for AR(2) in first differences (p value)		0.75	0.76	0.75	0.78
Hansen test of joint validity of instruments (p value)		1.00	0.98	1.00	0.98

Note: *, **, and *** represent significant at 10%, 5%, and 1% level. Robust standard errors are in parenthesis, with robust standard errors for the two-step estimates calculated using the Windmeijer (2005) correction.

IV. CONCLUDING REMARKS

It is a common concern among developing countries that trade liberalization could lead to a deterioration of their trade balance. Despite the importance of the question, cross-country empirical studies on the subject have been scarce. In a recent paper, Santos-Paulino and Thirwall (2004), using a data set of 22 developing countries for the period of 1976–1998, find strong evidence of such a negative impact. In this paper, we studied the impact of trade liberalization on imports, exports and the trade balance for developing countries using two recently compiled measures of trade liberalization dates that cover a much larger sample of developing countries and for longer time periods.

We find robust and consistent evidence using both measures that trade liberalization in developing countries promotes both imports and exports. The results, however, are mixed for the impact on the overall balance depending on the liberalization measure used. Using an extended Li (2004) measure of liberalization dates, we find little evidence of a statistically

significant negative impact of liberalization on the overall trade balance. There is, however, some evidence that liberalization worsens the trade balance when the Wacziarg-Welch liberalization dates are used, although the evidence is not robust across different estimation specifications. And even in this case, the estimated impact is smaller than that reported by Santos-Paulino and Thirwall (2004).

References

Ahmed, N., 2000, "Export responses to trade liberalisation in Bangladesh: a cointegration analysis", *Applied Economics* 32, pp. 1077–84.

Arellano, M., 2003, "Modeling Optimal Instrumental Variables for Dynamic Panel Data Models," CEMFI Working Paper 0310.

_____, and S. Bond, 1991, "Some Tests of Specification for Panel Data: Mon Carlo Evidence and An Application to Employment Equations," *Review of Economic Studies* 58, pp. 277–297.

_____, 1998, "Dynamic panel data estimation using DPD98 for Gauss: guide for users", mimeo, Banco de España.

Baunsgaard, Thomas and Michael Keen, 2005, "Trade Revenue and (or?) Trade Liberalization," IMF Working Paper No. 05/112.

Bertola, Giuseppe, and Faini Riccardo, 1991, "Import demand and non-tariff barriers: the impact of trade liberalization," *Journal of Development Economics* 34, pp. 269–286.

Bond, Stephen R., 2002, "Dynamic Panel Data Models: A Guide to Micro Data Methods and Practice," cemmap working paper CWP09/02.

Bowsher, C.G., 2002, "On Testing Overidentifying Restrictions in Dynamic Panel Data Models," *Economics Letters* 77, pp. 211–20.

Blundell, Richard, Bond, Steve, 1998, "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models," *Journal of Econometrics* 87, pp. 115−143.

Greenaway, D. and Sapsford, D., 1994, "What does liberalisation do for exports and growth," *Review of World Economics* (*Weltwirtschaftliches Archiv*) 30, pp. 157–74.

Jenkins, R., 1996, "Trade performance and export performance in Bolivia," *Development and Change* 27, pp. 693–716.

Krueger, Anne O., 1978, "Foreign Trade Regimes and Economic Development: Liberalisation Attempts and Consequences," Lexington, MA, Ballinger Press for NBER.

Li, Xiangming, 2004, "Trade Liberalization and Real Exchange Rate Movement," *IMF Staff Papers* 51, pp. 553–584.

Melo, Oscar, and Michael G. Vogt, 1984, "Determinations of the Demand for Imports of Venezuela," *Journal of Development Economics* 14, pp. 351–358.

Ostry, D. Jonathan and Andrew K. Rose, 1992, "An empirical evaluation of the macroeconomic
effects of tariffs," *Journal of International Money and Finance* 11, 3–79.

Roodman, D. 2006. "How to do xtabond2: An Introduction to 'Difference' and 'System' GMM in Stata," Working Paper 103. Center for Global Development, Washington DC.

_____, 2007, "A Short Note on the Theme of Too Many Instruments," Working Paper 125. Center for Global Development, Washington DC.

Santos-Paulino, Amelia U., 2002a, "The Effects of Trade Liberalization on Imports in Selected Developing Countries," *World Development* 30, pp. 959–974.

_____, 2002a, "Trade Liberalisation and Export Performance in Selected Developing Countries," *Journal of Development Studies* 30, pp. 959–974.

_____, and A. P. Thirlwall, 2004, "The Impact of Trade Liberalisation on Exports, Imports, and the Balance of Payments of Developing Countries," *Economic Journal* 114, pp. 50–72.

Sachs, Jeffrey D. and Andrew Warner, 1995, "Economic Reform and the Process of Global Integration," *Brookings Papers on Economic Activity* 1, pp.1–118.

Thomas, V., Nash, J. and Edwards, S., 1991, Best Practices in Trade Policy Reform, Oxford: Oxford University Press for the World Bank.

UNCTAD, 1999, Trade and Development Report 1999, Geneva.

Wacziarg, Romain and Karen H. Welch, 2003, "Trade Liberalization and Growth: New Evidence," NBER Working Paper No. 10152.

Windmeijer, F., 2005, "A Finite Sample Correction for the Variance of Liner Efficient Two-step GMM Estimators," *Journal of Econometrics* 126, pp. 25–51.

Ziliak, James P., 1997, "Efficient Estimation with Panel Data When Instruments are Predetermined: An Empirical Comparison of Moment-Condition Estimators," *Journal of Business and Economic Statistics* 16 pp. 419–31.