How serious is the omission of bilateral tariff rates in gravity?

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ABSTRACT

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This paper presents a constructed dataset of worldwide bilateral tariff rates to explore the seriousness of omitting bilateral tariff rates from gravity equations. Results indicate, first, that omitting bilateral tariff rates presents no serious issue related to the omitted variable bias because coefficients for the usual gravity variables remain unchanged before and after their inclusion. Second, the widely used dummy variable for regional trade agreements is not a statistical substitute for tariff rates because the coefficient for bilateral tariff rates remains significant even if it is included. Similarly, time-invariant pair fixed effects alongside time-variant importer and exporter fixed effects do not substitute statistically for omitted tariff rates. *J. Japanese Int. Economies* **27** (2013) 81–94. Bangkok Research Center, Japan External Trade Organization, 16th Floor, Nantawan Building, 161 Rajadamri Road, Pathumwan, Bangkok 10330, Thailand.

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1. Introduction

In international economics, the "gravity equation" is considered the most powerful empirical tool for investigating determinants of bilateral trade values. The traditional gravity equation features a log of bilateral trade as a dependent variable, and as independent variables, it includes logs of importers'

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and exporters' GDPs plus a log of the distance between trading partners. Since its estimation presents an excellent empirical fit, many scholars have employed the gravity equation to investigate bilateral trade. It can be used to clarify causes for post-World War Two growth in world trade (Baier and Bergstrand, 2001). The impact of international agreements such as free trade agreements (FTAs) (Baier and Bergstrand, 2007) and of international organizations such as the World Trade Organization (WTO) (Rose, 2004) can also be evaluated using the gravity equation. The development of these papers proves the gravity equation's usefulness in empirical analysis. In addition, numerous theoretical models support the gravity equation (see Combes et al., 2008, p. 127).

Nevertheless, no previous studies have included the crucial variable of bilateral tariff rates in a gravity equation involving a worldwide sample. An important difference between international and regional economics is that regional boundaries are in fact national borders, and not city or state borders. Thus, in international economics, theoretical models are formalized so that firms conducting transactions across regional boundaries incur trade costs. Unlike other fields of regional economics, trade costs in international economics include not only physical transportation costs but also policy-related costs, namely, tariff and non-tariff barriers. Thus, tariff rates are the critical variable in differentiating international economics from other fields in regional economics. Despite their importance, gravity studies for a worldwide sample have excluded time-variant pair-specific tariff rates.[1]

Omitting tariff rates from the gravity analysis may yield serious biases due to omitted variables. If factors affecting bilateral tariff rates are related to other gravity variables, coefficients for those variables suffer biases that produce misunderstandings and under/overestimation of results. For example, the literature of gravity analyses debates "the distance puzzle" (Disdier and Head, 2008). That is, the estimated coefficient for geographical distance between countries has not declined in gravity studies employing up-to-date data. Unexpected changes in the coefficient of the distance variable over time may partly arise from serious biases that result from omitting tariff rates. Also, some papers conduct simulation analyses using gravity estimates. For example, Redding and Venables (2004) examine the effect of having a common border with large-market countries on per capita GDP. In their study, biases from omitting tariff rates may affect empirical findings and mislead policymakers.

Unavailability of data is the obvious reason for omitting bilateral tariff rates in gravity analysis. Countries impose several kinds of tariffs and levy different duties on trading partners, including most-favored nation (MFN) status, a generalized system of preferences (GSP), and FTA preferences. Based on whether trading partners belong to the WTO, are developing countries, and/or belong to the same FTA, each trading partner's applied tariff scheme differs. Thus, we first need to collect comprehensive tariff information for each country. Although each country reports this information, its global collection is a huge task. As mentioned above, even after successfully collecting such data, we need to classify tariff schemes according to trading partners. In short, this crucial variable is one of the most difficult measures to construct in international economics.

Recent efforts have been under way to construct a tariff database (see Bouet et al., 2005): the Hemispheric Database by the Inter-American Development Bank; the WTO's Integrated Database (IDB); the Integrated Tariff Analysis System (ITAS) by the Australian Government Productivity Commission; MAcMap by the Centre d'Informations Internationales (CEPII); and Trade Analysis and Information System (TRAINS) by the United Nations Conference on Trade And Development (UNCTAD). The World Integrated Trade Solution (WITS)[2] is the most comprehensive software developed by the World Bank, UNCTAD's International Trade Center (ITC), United Nations Statistical Division (UNSD), and the WTO. WITS includes national tariff, para-tariff, and non-tariff measures by origin for more than 200 countries. In short, WITS overcomes some of the above-mentioned difficulties in constructing bilateral tariff data, and it is expected to become the premier source for tariff data in international economics.

Using a worldwide dataset of bilateral tariff rates drawn from WITS, this paper explores the seriousness of omitting bilateral tariff rates from gravity equations. We first examine how coefficients of other variables (e.g., geographical distance) change pre- and post-bilateral tariff rates' introduction

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[1] Some studies examine bilateral tariff rates when analyzing international trade for a few sample countries such as the United States (Caliendo and Parro, 2012; Head and Ries, 2001; Romalis, 2007; Debaere and Mostashari, 2010). However, no studies have introduced bilateral tariff rates in worldwide gravity analysis.

[2] http://wits.worldbank.org/WITS/.