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International trade and macroeconomic dynamics: The case of U.S. bilateral trade with G-7 countries

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ABSTRACT

The short- and long-run effects of exchange rates, income, interest rates and government spending on U.S. bilateral trade with the other G-7 countries are investigated using an auto-regressive distributed lag (ARDL) model. The primary contribution of this study is to consider separating the analysis of exports and imports in an integrated model that empirically encompasses four major schools of thoughts – elasticity, Keynesian income, absorption and monetary approaches – in order to identify macroeconomic linkages to U.S. bilateral trade with the other G-7 countries accurately. Results suggest that, in both the short- and long-run, U.S. imports and exports are highly sensitive to changes in U.S. and foreign income, while U.S. imports and exports are relatively insensitive to changes in bilateral exchange rate. It is also found that both exports and imports are more responsive to changes in government spending than changes in interest rates in both the short- and long-run.

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1. Introduction

The theories analyzing the relationship between macroeconomic variables and the trade balance generally can be classified into four approaches: (1) elasticity approach; (2) Keynesian income approach; (3) absorption approach; and (4) (international) monetary approach (Whitman, 1975; Dornbusch, 1975; Frenkel and Johnson, 1977). The elasticity approach argues that the exchange rate plays a key role in determining the trade balance. The Keynesian income approach claims that the growth in domestic income relative to foreign income causes deterioration in the trade balance. The absorption approach, on the other hand, suggests that, since the trade balance is equal to the difference between the GDP (how much is produced) and the domestic absorption (how much is consumed domestically), an increase (decrease) in GDP (domestic absorption) improves the trade balance. Both monetary and fiscal policy directly influences the domestic absorption. Finally, given the belief that the trade balance is essentially a monetary phenomenon, the monetary approach claims that the rapid growth of money supply relative to that of the rest of the world is a major culprit behind the trade balance deficit.

A number of studies have examined the effects of macroeconomic variables on bilateral trade between the United States and its major trading partners (for example, Rose and Yellen, 1989; Backus, 1993; Bahmani-Oskooee and Brooks, 1999; Blonigen, 2001; Breuer and Clements, 2003; Bahmani-Oskooee and Ratha, 2004; Bahmani-Oskooee and Hegerty, 2008; Bahmani-Oskooee and Wang, 2009; Kim, 2009). Until recently, however, studies tackling this issue have typically relied on a trade model in which a country's trade balance is only related to a measure of (domestic and foreign) income and exchange rates; hence, they generally fall into the first two approaches. Backus (1993), for example, examines the effects of changes in exchange rates and income on the trade balance between the U.S. and Japan; he finds that real

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depreciation of the U.S. dollar improves the trade balance. Recently, Bahmani-Oskooee and Wang (2009) use disaggregated trade data to identify the dynamics of exchange rates and income on the composition of bilateral trade between the U.S. and Australia; they conclude that both U.S. exports and imports response to exchange rate changes. Accordingly, relatively little effort has been made to construct an empirical model in which the trade balance is related to other relevant macroeconomics factors such as fiscal and monetary policy related variables in addition to exchange rates and income. In other words, no study has empirically modeled all four major schools of thought in examining macroeconomic linkages to the trade balance between the U.S. and its major trading partners.

In this study, therefore, we attempt to extend the scope of previous work by examining the effects of macroeconomic variables on U.S. bilateral trade in an integrated model that encompasses all four schools of thought together. The empirical focus is on identifying the short- and long-run effects of exchange rates, income, interest rates and government spending on bilateral trade of aggregated commodity groups (e.g., agricultural goods, chemicals and materials, machinery and transport equipment and manufactured goods) between the U.S. and each of the other 6 members of the group of seven industrialized countries (G-7)—Canada, Japan, France, Germany, Italy and the United Kingdom (UK). For this purpose, an autoregressive distributed lag (ARDL) approach to cointegration (ARDL) (Pesaran et al., 2001) is applied to quarterly data for 1989–2011. The remaining section presents the empirical model, data, empirical results, and concluding remarks.

2. Empirical model

It is important to note that the trade balance model analyzing exports and imports together is not able to directly identify what variables are impacting exports or imports and by how much. Several studies (e.g., Bahmani-Oskooee and Ardalani, 2006; Bahmani-Oskooee and Hegerty, 2008), for example, find that U.S. exports are more sensitive to changes in the U.S. dollar, while U.S. imports are more responsive to U.S. income. As a result, models treating exports and imports separately is indeed desirable to indentify the driving forces behind bilateral trade between the U.S. and the other G-7 countries properly, which is what we intend to do in this study.

In examining the macroeconomic linkages to bilateral trade between the U.S. and the other G-7 countries, we extend the bilateral export and import models developed by Bahmani-Oskooee and Goswami (2004) to empirically encompass all four schools of thought. In this model, the values of exports and imports between the U.S. and the other G-7 countries are specified as follows:

$$\ln(VX_{ijt}) = \alpha_0 + \alpha_1 \ln(Y^*_{it}) + \alpha_2 \ln(ER_{it}) + \alpha_3 \ln(r^*_{it}/r^{US}_t) + \alpha_4 \ln(G^*_{it}) + \varepsilon_t \tag{1}$$

$$\ln(VM_{ijt}) = \beta_0 + \beta_1 \ln(Y^{US}_t) + \beta_2 \ln(ER_{it}) + \beta_3 \ln(r^*_{it}/r^{US}_t) + \beta_4 \ln(G^{US}_t) + \mu_t \tag{2}$$

where $VX_{ijt}(VM_{ijt})$ is the value of commodity group j's U.S. exports (imports from) to its trading partner i – in this study, for example, i=Canada, Japan, France, Germany, Italy and the UK, and j=agricultural goods, chemicals & materials, machinery & transport equipment and manufactured goods; ER_{it} is the real bilateral exchange rate between the currency of trading partner i and the United States; (r^*_{it}/r^{US}_t) is the ratio of the interest rate of trading partner i to the U.S. interest rate[1]; and $G^*_{it}(G^{US}_t)$ is the government spending of trading partner i (U.S.)[2].

Following Pesaran et al. (2001), the error-correction representations of the ARDL specification model for Eqs. (1) and (2) are given by

$$\begin{aligned}\Delta\ln(VX_{ijt}) = {} & \alpha'_0 + \sum_{k=1}^{p} \alpha'_1 \Delta\ln VX_{ij,t-k} + \sum_{k=0}^{p} \alpha'_2 \Delta\ln Y^*_{i,t-k} + \sum_{k=0}^{p} \alpha'_3 \Delta\ln ER_{i,t-k} \\ & + \sum_{k=0}^{p} \alpha'_4 \Delta\ln r_{i,t-k} + \sum_{k=0}^{p} \alpha'_5 \ln(G^*_{it}) + \alpha_1 \ln VX_{ij,t-1} \\ & + \alpha_2 \ln Y^*_{i,t-1} + \alpha_3 \ln ER_{i,t-1} + \alpha_4 \ln r_{i,t-1} + \alpha_5 \ln G^*_{i,t-1} + \xi_t \end{aligned} \tag{3}$$

$$\begin{aligned}\Delta\ln(VM_{ijt}) = {} & \beta'_0 + \sum_{k=1}^{p} \beta'_1 \Delta\ln VM_{ij,t-k} + \sum_{k=0}^{p} \beta'_2 \Delta\ln Y^{US}_{t-k} + \sum_{k=0}^{p} \beta'_3 \Delta\ln ER_{i,t-k} \\ & + \sum_{k=0}^{p} \beta'_4 \Delta\ln r_{i,t-k} + \sum_{k=0}^{p} \beta'_5 \ln(G^{US}_t) + \beta_1 \ln VM_{ij,t-1} \\ & + \beta_2 \ln Y^{US}_{t-1} + \beta_3 \ln ER_{i,t-1} + \beta_4 \ln r_{i,t-1} + \beta_5 \ln G^{US}_{t-1} + \upsilon_t \end{aligned} \tag{4}$$

where Δ denotes the first difference operator; p is lag order. Eqs. (3) and (4) are called the error-correction version of the ARDL, since the linear combination of lagged variables (terms with α_1, α_2, α_3, α_4, α_5 and β_1, β_2, β_3, β_4, β_5) replaces the

[1] Following McCallum (1999), the ratio of the interest rates between Japan and the U.S. is used as a proxy for monetary policy in both countries, providing an indicator of the price of capital.

[2] Government spending in both countries means government expenditures excluding transfer payments. The inclusion of transfer payments would not represent public purchases, and thus would dilute the real effects. The effect of transfer payments (or private purchases) could be captured by income.

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