



# Does the exchange rate matter to bilateral trade between Korea and Japan? Evidence from commodity trade data



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## ABSTRACT

This study examines the short- and long-run effects of exchange rate changes on trade flows in the context of disaggregating industry data of bilateral trade between Korea and Japan. For this purpose, an autoregressive distributed lag (ARDL) approach is used. Results show that Korea's exports and imports are relatively sensitive to the bilateral exchange rate in the short-run, but less responsive in the long-run. It is also found that income in the two countries has significant impacts on the bilateral trade flows in both the short- and long-run. Finally, exchange rate uncertainty and Japanese FDI to Korea are found to have little impacts on Korea's trade with Japan in the short- and long-run.

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## 1. Introduction

A large number of studies have examined the effects of changes in exchange rates (i.e., devaluation) on the trade balance. The literature tends to fall into one of the following three categories: (1) studies that used aggregate trade data, (2) studies that employed disaggregate trade data at bilateral level, and (3) recent studies that used disaggregate trade data at industry/commodity level. More specifically, the first type of study concentrates on the use of aggregate export and import data between a country and the rest of the world (e.g., United State and the rest of the world) in assessing the effectiveness of currency devaluation (e.g., Bahmani-Oskooee, 1986; Felmingham, 1988; Mahdavi and Sohrabian, 1993). These studies provide mixed conclusions for the effectiveness of devaluation on the trade balance. By arguing that the conflicting results could be related to aggregation bias of data, the second type of study tends to employ bilateral trade data between a country and its major trading partners to examine the issue (e.g., Arora et al., 2003; Bahmani-Oskooee and Ratha, 2004; Wilson, 2001).<sup>1</sup> Since the seminal work by Bahmani-Oskooee and Ardalani (2006), there has recently been a growing body of literature that argues that the second-generation study may still suffer from the aggregation bias problem, because significant exchange rate impacts

with some industries/commodities in a country could be more than offset by insignificant exchange rate effects with others, thereby resulting in an insignificant exchange rate impact and vice versa. These studies further contend that the first and second generation studies mostly rely on a standard trade balance model in which the trade balance defined as the difference between the value of exports and the value of imports is specified as a function of exchange rate and other determinants (i.e., income). By modeling exports and imports together, however, this conventional approach is not able to directly detect what sector (exports vs. imports) has relatively more responsibility for lack of any significant exchange rate impacts on the trade balance. As a result, the third type of study uses industry/commodity level data on bilateral basis and at the same time treats exports and imports separately in order to assess the relationship between exchange rates and the trade balance accurately.

The relationship between Korea's trade balance and its exchange rate (Korean won) has been studied extensively (e.g., Arize, 1994; Chang, 2005; Hsing and Savvides, 1996; Jung, 1996; Kim, 2009; Wilson, 2001). Until recently, however, these studies generally fall into the first two categories according to the classification above. Arize (1994), for example, examines the long-run effect of changes in the real exchange rate on the trade balance between Korea and the rest of the world; he finds that real depreciation of the Korean won indeed improves Korea's trade balance in the long-run. Similarly, Chang (2005) investigates the effect of the real exchange rate on the trade balance between Korea and the rest of the world; he shows that exchange rate is not an important factor affecting the trade balance. More recently, Kim (2009) analyzes the exchange rate impacts on the bilateral trade between Korea and its two major trading

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<sup>1</sup> The second type of study points out that, since a country's trade balance could be improving with one trading partner and at the same time deteriorating with another, the use of aggregate trade data between a country and the rest of the world could lead to a misinterpretation of the dynamic relationship between exchange rates and the trade balance.

partners—U.S. and Japan; she concludes that the exchange rate has a significant long-run effect on Korea's trade balance with the U.S., but not with Japan.<sup>2</sup> Accordingly, empirical work on the third category has so far received little attention. In other words, no study has attempted to assess the effectiveness of changes in the Korean won on Korea's exports and imports at the bilateral industry level.

The contribution of this study is to employ industry trade data at a bilateral level—between Korea and one of its major trading partners, Japan—and attempt to examine whether disaggregated trade data at industry level can advance our understanding of the dynamic (short- and long-run) relationship between the exchange rate and the bilateral exports and imports. The trade relationship between Korea and Japan has been an important one over the past four decades. During 1980–2009, for example, Japan has been the second-largest trading partner for Korea (after China), accounting for approximately 11–23% of Korea's total trade (Fig. 1). Likewise, Korea has been the third largest trading partner of Japan (after U.S. and China). The pattern of trade between the two countries is characterized by a high degree of intra-industry trade; machinery and transportation equipment (SITC 7), for example, is the largest of Korea's exports to Japan but is also the top of Korea's imports from Japan (Table 1). To achieve the objective, an autoregressive distributed lag (ARDL) approach to cointegration (referred to here as an ARDL model) developed by Pesaran et al. (2001) is used. This approach has several advantages over the standard cointegration methods (e.g., Engle and Granger, 1987; Johansen, 1995). First, since the ARDL uses the cointegrating, or long-run relationship as an error-correction term to provide flexible short-run dynamics via a simple linear transformation, it is widely used to estimate the short- and long-run parameters of the model simultaneously. Second, unlike other cointegration methods, the ARDL does not require pre-testing for the order of integration of the underlying series. Hence, it is a convenient approach to investigate dynamic interactions when variables used in the model are not known with certainty whether the series are purely  $I(1)$ , purely  $I(0)$ , or mutually cointegrated. Finally, the ARDL is proven to be more robust and performs better for small or finite sample sizes than other cointegration techniques (Panapoulou and Pittis, 2004; Pesaran and Shin, 1999).<sup>3</sup>

The remainder of this paper is organized as follows. The next section briefly introduces the empirical model associated with the ARDL estimation. The following two sections discuss the data used for the analysis and the empirical results. Finally, the last section makes some concluding remarks.

## 2. The model

In examining the effect of exchange rate changes on trade flows at a bilateral level, economists typically rely on a theoretical framework developed by Bahmani-Oskooee and Ardalani (2006). In its simplest form this model can be stated as follows:

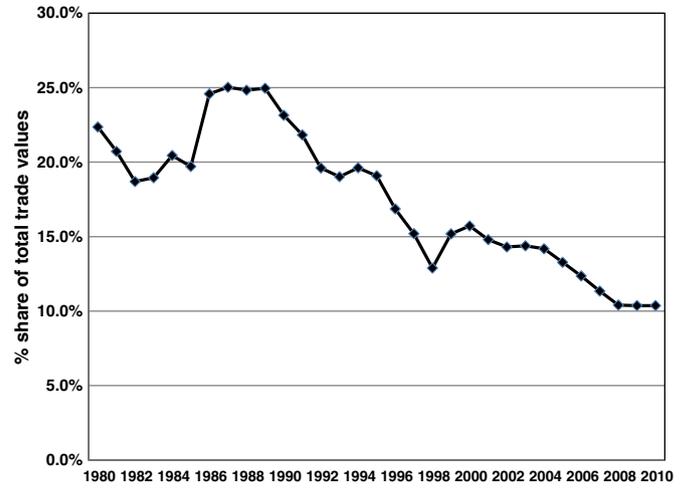
$$VX = VX(Y^*, ER) \tag{1}$$

$$VM = VM(Y, ER) \tag{2}$$

where  $VX$  ( $VM$ ) is the value of exports (imports);  $Y$  ( $Y^*$ ) is the real domestic (trading partner) income; and  $ER$  is the real bilateral exchange rate, which is defined as  $ER = NE \times \frac{P}{P^*}$ , where  $NE$  is the bilateral nominal exchange rate of currency of trading partner per unit of the domestic currency, and  $P$  ( $P^*$ ) is the domestic (trading partner) price

<sup>2</sup> The mixed results from these studies may be a result of aggregation bias problem as pointed out earlier.

<sup>3</sup> It should be pointed out, however, that since the ARDL is based on a single-equation approach, it could not be able to correct the potential endogeneity of the explanatory variables and hence produce inefficient estimates of the short- and long-run relationships among variables (Pesaran and Shin, 1999).



Source: Korea International Trade Association (KITA).

Fig. 1. Shares of Korea's trade value with Japan, 1980–2010. Source: Korea International Trade Association (KITA).

level. Eqs. (1) and (2) are known as the bilateral inpayments (value of exports or export earnings) and outpayments (value of imports or import costs) models.

In the empirical model used here we extend the bilateral inpayments and outpayments models to encompass more relevant variables (i.e., exchange rate volatility and foreign direct investment) in order to identify the driving forces (i.e., exchange rate effects) behind bilateral trade between Korea and Japan properly. In this model, the value of Korea's exports to Japan for industry  $i$  ( $VX_{it}^{KR}$ ) and the value of Korea's imports from Japan for industry  $i$  ( $VM_{it}^{KR}$ ) are specified as follows:

$$\ln VX_{it}^{KR} = a_0 + a_1 \ln Y_t^{JP} + a_2 \ln ER_t + a_3 \ln V_t + a_4 \ln F_t + \varepsilon_t \tag{3}$$

$$\ln VM_{it}^{KR} = b_0 + b_1 \ln Y_t^{KR} + b_2 \ln ER_t + b_3 \ln V_t + b_4 \ln F_t + \mu_t \tag{4}$$

In these equations, it is expected that  $a_1 > 0$  and  $b_1 > 0$ , if income growth in Japan ( $Y_t^{JP}$ ) and Korea ( $Y_t^{KR}$ ) leads to an increase in Korea's exports (imports) of industry  $i$  to (from) Japan. If a decrease in the bilateral real exchange rate between Korea and Japan ( $ER_t$ )—that is, real depreciation of the Korean won—results in an increase (decrease) in Korea's exports (imports) of industry  $i$  to (from) Japan, thereby increasing inpayments (decreasing outpayments), it is expected that  $a_2 > 0$  and  $b_2 < 0$ .<sup>4</sup> In addition, since numerous studies have shown that exchange rate volatility may have either positive or negative effects on trade flows (e.g., Arize et al., 2000; Baak et al., 2007; Doganlar, 2002), exchange rate volatility ( $V_t$ ) is included in the estimation. If an increase in exchange rate volatility causes bilateral trade to decrease, it is expected that  $a_3 < 0$  and  $b_3 < 0$ . Finally, another variable that may be important for Korea's trade with Japan is Japanese foreign direct investment (FDI) to Korea ( $F_t$ ). Sazanami et al. (2003) show that the persistent depreciation of East Asian currencies against the yen after the Asian financial crisis has generated a dramatic increase in Japanese FDI outflows to those countries (e.g., Thailand, Indonesia and Korea) in a strategy to avoid exchange rate volatility and to establish Japanese production networks in the host countries, which, in turn, has significantly affected trade patterns between Japan and the host countries. In this regard, therefore, Japanese FDI to Korea should be accounted for when analyzing bilateral trade between Korea and Japan properly.<sup>5</sup> If an increase in

<sup>4</sup> The bilateral real exchange rate used in this study is defined in a way that an increase reflects real depreciation of the Korean won or appreciation of the Japanese yen.

<sup>5</sup> In fact, the average annual inflow of Japanese FDI into Korea has reached approximately \$1.2 billion between 1999 and 2010, more than five times higher than the amount for the 1991–1998 period.

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