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2010

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Recommended Citation

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The Impact of Monetary Regimes on International Trade:

Are EU Experiences Relevant for Asia?

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December 1, 2009

Abstract. We extend much research that has been devoted to the effects of the EMU on international trade by introducing monetary regime variables in bilateral export equations with the objective of capturing the effects on trade of changes in monetary regimes relative the pure EMU effects. In addition, we make a strong attempt to distinguish between EU and EMU effects on trade. To identify these different effects we include three groups of countries in our sample: EMU countries which are also members of the EU, EU countries outside the EMU and non-EU countries. The last control group consists of either non-EU industrial countries or non-EU industrial plus emerging market countries in the empirical analysis.

       Asian experiences with inflation targeting are discussed and compared to the empirical results we obtain for trade effects of monetary regimes. Even if deeper monetary integration leads to greater trade expansion, it involves political complexity. The choice of an appropriate monetary regime can be a relatively simple unilateral tool for expanding trade.

The Impact of Monetary Regimes on International Trade: Are EU Experiences Relevant for Asia?

1. Introduction

The perceived success of regional integration in Europe has inspired debate in other parts of the world about potential economic benefits of different types of integration. In Asia in particular, monetary and financial integration has received attention. What are the benefits and how large are they? In this study we focus on trade effects of monetary integration and monetary policy regimes. The formation of the European Monetary Union (EMU) was associated with a monetary regime shift for most of the countries joining the currency union. Thus, trade creation effects of the currency union per se should be distinguished from trade volume effects of monetary regime shifts. From the point of view of Asian countries we ask whether substantial trade expansion can be achieved by the appropriate choice of monetary and exchange rate regimes without having to take on the political complications associated with a currency union.

We argue that the commonly observed trade creating effect of the formation of the EMU on January 1, 1999 may not be a pure single currency effect but it may be caused by reduced macroeconomic uncertainty in many EMU countries as a result of changes in monetary policy institutions, procedures and targets. Several countries that later became members of the EMU had pre-EMU central banks with little credibility in terms of a monetary policy targets, and the targets shifted strongly towards low inflation with the creation of the EMU. To the extent EMU effects are the result of changes in policy-making institutions, procedures and targets, the lesson from EMU might be that institutions and targets should be changed and the currency union itself could be relatively unimportant.

Inflation targeting has become a common monetary policy regime and it has been observed by, for example, Rose (2007) that this regime contributes to exchange rate predictability in spite of the flexibility of exchange rates associated with this regime. Thus, we may ask whether a shift to inflation targeting can substitute for a currency union for countries seeking to expand trade.

We extend much research that has been devoted to the effects of the EMU on international trade by introducing monetary regime variables in bilateral export equations with the objective of capturing the effects on trade of changes in monetary regimes relative the pure EMU effects. In addition, we make a strong attempt to distinguish between EU and EMU effects on trade. To identify these different effects we include three groups of countries in our sample; EMU countries which are also members of the EU, EU countries outside the EMU and non-EU countries. The last control group consists of either non-EU industrial countries or non-EU industrial plus emerging market countries in the empirical analysis.

The selection of control groups along with other econometric issues are frequently identified as the cause of the sensitivity and discrepancy of the estimates of the common currency effects on trade in different studies (Frankel, 2008). Rose (2001), who initiated the research on trade effects of currency unions, found extremely large effects of currency unions on trade. Due to unavailability of trade data for the EMU countries at the time of study, Rose analyzed trade creation effects of currency unions in existence before the EMU. Using a sample covering 186 countries during the period 1970-1990, he finds that the value of trade among countries using the same currency would increase by more than 200 percent.

Most economists found Rose's result implausible. Much research has been devoted to refining the analysis. Although the estimated trade effects of a common currency have been

substantially reduced, the magnitude of the effects varies substantially across studies. For example, Persson (2001) finds the trade effect of the common currency of 13%-66%. Drawing conclusions based specifically on the effect of EMU, Micco et al (2003) obtain an intra-EMU trade effect of 7%-10% and Berger and Nitsch (2008) find the effect to be 31%.[1]

Frankel (2008) reviews much of the literature with the objective of explaining the discrepancy among the studies. He estimates a gravity model of the euro effect on trade employed in earlier studies. He identifies five possible factors that could explain the discrepancy among estimates among those studies; i) the long-run and lag effects of the euro, ii) the bias from omitting variables capturing specific characteristics of a country pair, iii) causality problems, iv) the implausible magnitude of the estimate, and v) the comparison of the currency union effects for countries with different size. Frankel's estimates of the euro effect on trade lie within a very wide range from 10 percent to 200 percent. He does not introduce alternative monetary regimes, however.

In Frankel's study, the largest euro-effect on trade is found when estimates are obtained within the EU sample. Time series effects are important in this case. The euro effect on bilateral trade flows becomes lower when using the sample of developed countries and even lower or insignificant in the model specification with the full sample including developing countries. The euro effects are also sensitive to the length of the pre- and post-EMU periods in the sample. Although there is evidence of significantly increasing trade among the EMU member countries during 1999-2002, the effect of the euro on trade did not continue to rise from 2002 through 2006.

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[1] See Angkinand, Permpoon and Wihlborg (2009) for a comprehensive review of literature on the trade effect of a common currency.

Our empirical analysis of EU and EMU effects is based a sample of 68 countries during the period 1980-2007. Taking account of monetary regimes as well, the analysis is limited to the period of 1999-2007. Since the EMU was formed in 1999, the EMU effects identified for this shorter period can be thought of as cross-section effects of the EMU while the longer period takes into account time series effects to a greater extent.

The disadvantage with the longer period from the point of view of drawing implications for Asia is that many unidentified aspects of the deepening integration within the EU may influence the results. We make an attempt to distinguish between EU and EMU effects, however. The disadvantage with the shorter period wherein cross section effects of the EMU and the EU are more important is that we may miss important effects unless relevant cross-section characteristics of counties can be identified and controlled for.

In the following section 2 we describe the data and empirical methodology on EU-, EMU- and monetary regime effects on bilateral exports. The empirical results with respect to trade effects of the EMU, the EU and monetary regimes are reported in Section 3. In Section 4 trade effects in percent of membership in the EU, the EMU and monetary regime groups are calculated taking into account that membership in these groups are overlapping. Thereafter, we turn in Section 5 to experiences with inflation targeting, in particular, in Asia. We show how trade has developed for four countries that have adopted inflation targeting and interpret these developments in light of the results of the empirical analysis. Finally, lessons for Asia are discussed in the concluding Section 6.

2. Analyzing effects of EU, EMU and monetary regimes on bilateral exports: data and approach.

We estimate the effects of EMU, EU and monetary regimes on exports using the panel data model. Our sample includes 68 industrial and emerging market economies during 1980-2007. When analyzing the effect of monetary regimes on exports, the sample period coverage is limited to 1999-2007 due to the availability of consistent monetary regime data.

Following Flam and Nordstrom (2003) we use bilateral exports as the dependent variable in an extended gravity model with dummies for EU and EMU country groups and monetary regime characteristics. The purpose of using bilateral exports, and not total bilateral trade flows, (bilateral exports plus imports) is to be able to examine whether the monetary regime of exporters or importers generally and more significantly affect trade. Country-pair and year- fixed effects dummies are included in the panel regressions in order to minimize bias caused by time trends and special country relationships as suggested in the existing literature.[2] The model specification is as follows:

$$Log(Export)_{12,t} = \alpha + \beta_1 Log(GDP)_{1,t} + \beta_2 Log(GDP)_{2,t} + \beta_3 Log(POP)_{1,t} + \beta_4 Log(POP)_{2,t} +$$

$$\beta_5 RER_{1,t} + \beta_6 RER_{2,t} + \beta_7 RTA_{12,t} + \gamma_j EU/EMU_{j,12,t} + \theta_k Monetary$$

$$Regime_{k,1,t} + \omega_k Monetary\ Regime_{k,2,t} + v_{12} + \mu_t + \varepsilon_{12,t}$$

The dependent variable is the logarithm of the real value (in U.S. dollar) of bilateral exports from an exporting country (with subscript 1) to an importing country (with subscribe 2) at year t. The exports data are from the IMF Direction of Trade Statistics (the August, 2009 version). GDP is the real GDP (in U.S. dollar), POP is the total population, and RER is the real exchange rate relative to the U.S. dollar. RTA is a dummy of one if two countries belong to the same Regional Trade Arrangement. v_{ij} denotes the unobserved characteristics of a country pair, μ_t denotes the unobservable time effects, and ε_{ijt} is an error term.

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[2] See, for example, Anderson and van Wincoop (2003), Micco et al (2003) and Carrère (2006).

Our main interest is the two independent variables: *EU/EMU* and *Monetary Regime*. To study the currency union effect and the EU effect separately, we group the countries observations into three groups, which are: 1) the member countries of EMU, 2) the EU countries that are not the EMU members including members of the European Economic Area, EEA (EU/nonEMU), and 3) the non-EU countries (nonEU). Table 1 reports the list of countries in each group as well as the year that countries become the members of EMU and EU/nonEMU.

[Table 1 here]

The important aspect of the EU/nonEMU that we try to capture is the internal market that got a boost with the 1992 program. In creating the "internal market" with the so called "four motilities" of goods, services, labor, and capital, a great variety of discriminatory practices in markets of all kinds were removed and in some areas rules and regulation were harmonized, although the legal frameworks remain very different across countries in Europe. For this reason, EU/nonEMU includes the EU 15 plus Norway and Iceland starting in 1992[3]. In 1999, 11 EU countries became EMU members while the other 6 countries remained EU/nonEMU. Greece became an EMU country in 2001. Remaining outside are Denmark, Sweden and the U.K., plus Iceland and Norway that participate in the Internal Market as members of the European Economic Area. In 2004, 10 countries in Eastern Europe became EU/nonEMU. The nonEU group for the whole period includes 6 developed countries and 32 emerging market economies, of which 9 are emerging Asian countries.

From the three groups of exporting counties and three groups of importing countries, we can analyze the difference of bilateral exports among nine pairs of countries; 1) EMU exports to EMU, 2) EMU exports to EU/Non-EMU, 3) EMU exports to non-EU, 4) EU/NonEMU exports

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[3] Austria, Finland and Sweden did not become members of the EU until 1995 but they were participating in the internal market. Therefore, we treat them the same way as pre-1995 EU 12 members.

to EMU, 5) EU/nonEMU exports to EU/Non EMU, 6) EU/NonEMU exports to non EU, 7) Non-EU exports to EMU, 8) Non-EU exports to EU/non EMU, and 9) Non-EU exports to Non-EU.

The *EU/EMU* in the model specification above, therefore, refers to the first eight country pair dummies. The ninth country pair dummy capturing exports from Non-EU to other Non-EU countries is omitted to avoid the perfect multicollinearity.

Monetary Regime data in different years are obtained from the IMF's Classification of Exchange Rate Arrangements and Monetary Policy Frameworks, which is available from 1999. IMF classifies monetary policy frameworks into five group: exchange rate anchor, monetary aggregate anchor, inflation targeting framework, IMF-supported or other monetary program, and Other frameworks (such as the conduct of monetary policy without an explicitly stated nominal anchor). The descriptions of these monetary regimes variables are summarized in the Table 2. According to the IMF data, the countries in the Euro Area are counted within the last group. However, in our empirical analysis the member countries of EMU are treated as inflation target countries as well as members of the EMU group.

[Table 2 here]

The nature of monetary regimes has implication for the compatibility of exchange rate regimes. They also represent an indirect channel through which the monetary policy has effect on trade through predictability of exchange rates and interest rates in particular. More specifically, the monetary regime data shows that countries that follow inflation targeting and monetary aggregate regimes tend to have more flexible exchange rate policy such as crawling band, managed float with no pre-announced path for exchange rate, and independent float. The Exchange rate anchor regime involves more rigid exchange rate policy such as arrangements with no separate legal tender, pegged exchange rates within horizontal bands, crawling pegs, and

other conventional fixed peg arrangements. The remaining two regimes, IMF supported and 'Other', have countries that practice a variety of exchange rate regimes from exchange rate arrangements with no separate legal tender, managed float, and independent float. Table 3 reports the exchange rate- and monetary regimes for 9 Asian economies from 1999. Note that some countries are classified as adopting more than one nominal anchor in conducting monetary policy within the same period (e.g. China has adopted both exchange rate anchor and monetary aggregate regimes. Indonesia, Korea and the Philippines had adopted the monetary aggregate and IMF-supported during the post-Asian crisis period). According to IMF, it would not be possible to determine which of the two monetary regimes plays the principal role in conducting monetary policy.

[Table 3 here]

3. Effects of the EU, the EMU and monetary regimes on bilateral exports

We begin by showing the trade effects of the EMU and the EU in a baseline model without controlling for monetary regime characteristics in Table 4. Thereafter, monetary regime characteristics are introduced in Table 5. The regressions in both tables include country-pair and year fixed effects. In Table 4, we report results based on the sample of industrial alone (IND) and the sample of ALL countries (industrial and emerging market countries). According to previous studies, the control group matters in drawing the conclusion regarding the euro effects on international trade. Most studies include only countries with similar characteristics such as western European or OECD countries on the grounds that developing countries are too different to be useful as a control group. We take into account different country characteristics between industrial and emerging countries by including an interactive dummy for time and emerging market country in the regressions using a sample for ALL countries as exporters or importers.

The baseline panel regressions in Table 4 are based on the time period of 1980-2007. The results in both regressions based on the sample of IND and ALL show that exporters' and importers' GDPs and populations are significant with expected signs. This result is consistent to the gravity model where bilateral trade flows depend positively on national income of a pair of countries.[4] The effects of bilateral real exchange rates (of exporters and importers relative to the dollar) and the regional trade agreement dummy, RTA, are generally significant but the sign for the exporter county's real exchange rate depends on whether emerging market economies are included in the sample coverage.

The eight EU and EMU dummies are generally significant. The magnitude and significance levels of each dummy is compared to the omitted dummy, namely the exports from non-EU to other non-EU countries. In both regressions, the largest coefficient is obtained from bilateral exports between EMU countries (EMU1 to EMU2). The next groups that have relatively large trade effects are between EMU and EU/nonEMU countries, and between EU/NonEMU countries. We discuss the relative magnitudes of coefficients below. Without controlling for different monetary regimes across countries, the results in Table 4 support the trade creation effects of both the adoption of the euro and the formation of internal markets.

The main difference of results in the two regressions in Table 4 is when bilateral trade involves non-EU countries and whether the non-EU country group includes either industrial and emerging market countries or industrial countries alone. In the first regression using the IND sample, all dummies are positive and significant except the coefficient for exports from non-EU to EMU. Using industrial countries as a control group, this result would indicate that the EMU

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[4] The gravity model also predicts that bilateral trade flows depends negatively on the distance between two countries, reflecting lower transportation and other transaction costs being associated with more trade. Since the country-pair fixed effects are included in the panel regressions, the distance variable, which is time-invariant, cannot be included due to the perfect multicollinearity.

has had a relatively large effect of trade among the member countries as well as from the member countries to all countries outside the EU and EMU. When emerging markets are included in the control group for EU and EMU effects, the coefficients for trade between NonEU countries and EU/NonEMU countries becomes negative indicating that the formation of the EU, as well as the formation of the EMU, may have diverted trade of members of these groups from Non-EU countries to other members of the same groups. Another possibility discussed below is that the coefficients for trade effects of the EU and the EMU capture other factors that affected the development of trade over time. We return to this issue below.

[Table 4 here]

The first column in Table 5 shows the regression for the period 1999-2007 with unchanged specification relative to Table 4 regressions.[5] Thus, the EMU effects and the EU effects in Table 5 are dominated by cross-section effects of membership in these groups while the coefficients in Table 4 are influenced strongly by time series effects. If all relevant variables affecting the volume of trade between countries had been included the coefficients should be similar. The coefficients are very different, however, indicating substantial sensitivity to the regression specification as noted by Frankel (2008). In his study, the EMU effect on trade was significant for the period 1999-2004 but insignificant as in Table 5 when the period of the study was extended to 2006.

Missing variables could affect the cross-section effects of the EMU and the EU in Table 5 as well as the time series effects in Table 4. All regressions include year-dummies to capture

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[5] We do not report regressions using the sample of IND countries alone since there is no sufficient variation in observations under each category of eight dummies when the sample includes only the post-EMU period and IND countries.

time trends, as well as country pair- dummies to capture unobservable factors affecting trade between country pairs.

[Table 5 here]

The second regression in Table 5 introduces monetary regime variables. Consistent data for monetary regimes from International Monetary Fund are available only from 1999. The period coverage in Table 5 is therefore limited to 1999-2007. The results support our argument for the importance of monetary policy characteristics on international trade discussed in earlier section. All coefficients of monetary regimes of both exporting and importing countries are significant with the exception of the coefficient for the money aggregate anchor regime for importing countries (Money2). Furthermore, in comparison with column 1 the coefficients for trade effects of EMU internally and between the EMU and EU/NonEMU become significant. They remain negative, however.

Turning to the question whether commonly observed EMU effects on trade can be explained by the shifts in monetary regimes and conduct of monetary policy of the individual EMU members, as opposed to by the introduction of the common currency per se, we must identify EMU effects more clearly and separate EMU effects from EU effects. The coefficients for EMU countries in the regressions include EU effects since all EMU countries are also members of the EU. We return to this issue.

In order to evaluate the relative impact of each monetary regime we perform pairwise significance tests for the statistical differences between coefficients for the impact of each regime. The results are reported in Table 6. As the Wald-Test statistics shows, the coefficient of the inflation targeting regime dummy for exporting countries is significantly different from other monetary regime dummies. The monetary regimes of importing countries seem to matter less

since no single regime dominates the trade creation effect. The effects of Inflation target, Money aggregate and Exchange rate anchor for importing countries are not significantly different from one another (Table 6).

[Table 6 here]

4. Bilateral trade effects of joining the EU, the EMU and monetary regimes.

In Tables 7 and 8 we calculate the percent change in total trade of a country in one group with a country in the same or another group from changes in EU and EMU memberships and from adoption of particular monetary regimes. The percent change figures are obtained from the coefficients in Tables 4 and 5 showing effects on log exports. The effects on total trade of, for example, an EMU country with a Non-EU country (row (2) in Table 7) is obtained by taking the average of the percent change in exports from an EMU country to a Non-EU country and the percent change in exports of a Non-EU country to an EMU country. In Table 7, the percent changes in rows (1), (2), (4), (5) and (7) are transformations of the coefficients in Tables 4 and 5. The data in these rows are used as inputs in calculations of EMU effects in particular since the EMU countries are also members of the EU and, therefore, subject to both EU and EMU effects. Joining the EMU may also be associated with a monetary regime shift.

We use Table 7 to calculate internal and external EU effects on trade, as well as internal and external EMU effects. For example, row (8) show the *bilateral internal EMU effect* as the difference between the percent change of bilateral EMU to EMU trade (relative to bilateral Non-EU trade) and the percent change of bilateral EU to EU trade (relative to bilateral Non-EU trade). The estimated internal EMU effects vary greatly depending on the specification of the regression. Before discussing different measures of internal EMU effects, external and internal EU effects as well as external EMU effects are calculated and discussed.

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Row (1) in the table shows the *external EU effect* as the percent change in trade between an EU country outside the EMU and a non-EU country relative to trade between two Non-EU countries. Three out of the four regressions imply substantial trade diversion[6] effects of EU membership in the sense that EU-membership reduces bilateral trade with non-EU countries.

The *external EMU effect* in row (3) is obtained by taking the difference between row (2) showing the change in trade of EMU countries with Non-EU countries and row (1) showing the external EU effect. The result depends on which set of regressions the estimate is based on. The regressions for the longer period in Table 4 indicate a positive external EMU effect while the regressions for the shorter period in Table 5 indicate that joining the EMU adds to the trade diversion of EU membership.

The changes in row (4) refer to the *internal EU effect* as the percent change in trade between two EU members outside the EMU relative to trade between two non-EU countries. The estimates of this effect are positive in all cases but they vary between +84 percent and +2.1 percent. The lowest estimate is obtained when monetary regimes are included in the regressions for the period 1999-2007.

Row (5) refers to changes in trade between EMU countries and EU countries outside the EMU relative to trade between Non-EU countries Thus, these changes incorporate the internal EU effect as well as an external EMU effect relative to other EU countries. An *external EMU effect relative to EU* countries in row (6) can be calculated as the difference between rows (5) and (4).

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[6] The trade diversion from trade with Non-EU countries to EU or EMU countries does not imply that there is a welfare loss, since the change in trade patterns is caused by transactions or information costs rather than by tariffs or quotas.

The *external EMU effect relative to EU* in row (6) can be compared to the external EMU effect in row (3). There is no obvious reason for these effects to be very different unless EMU and EU effects interact or the estimate of the EMU effect relative to the EU depends on unobservable factors. A comparison between the rows show that the two estimates of the external EMU effect based on data for the shorter time period are consistent while the estimates based on the longer time series are inconsistent and very sensitive to the sample of countries included in the regressions. This observation is a cause for concern with respect to the estimates based on data for the longer period.

Turning to internal bilateral trade effects of EMU membership we produce two alternative estimates in rows (8) and (9). As noted, one estimate is the *bilateral internal EMU effect* in row (8) defined as the difference between row (7) for the percent increase in internal EMU trade relative to internal non-EU trade and row (4) for the internal EU effect. The estimates based on the longer data series are extremely large while the estimates based on the shorter time series are small and even negative (but clearly not statistically significant) when monetary regime shifts have been accounted for. These results are puzzling

Since joining the EMU involves joining a currency union as well as a change in monetary regime and conduct of monetary policy a better measure of the trade enhancing effect of the currency union may be the difference between the percent change in bilateral trade between EMU countries in row (7) (relative to bilateral NonEU trade) and the percent change in bilateral trade between EMU and other EU countries (relative to NonEU trade) in row (5). This *unilateral internal EMU effect* in row (9) controls for the change in monetary regime and policy of the trading partner joining the EMU. This effect is the relevant measure of the trade expansion facing an EU country joining the EMU.

The estimate of the unilateral internal EMU effect is also very sensitive to the length of the estimation period. Estimates based on Table 4 regression are of the magnitude 100 percent while estimates based on data for the shorter period in Table 5 regressions are of the magnitude 10 percent. It can be noted that controlling for monetary regime of both trading partners increases the estimate of the internal EMU effect from 8 to 13 percent.

The very large estimates of internal EMU effects based on Table 4 regressions are consistent with Rose's (2001) original estimates of currency union effects on trade. We are nevertheless skeptical of estimates of this magnitude, in particular, because the effects of the EMU on external trade between the EMU and other EU countries are very large as well. These effects cannot be explained by the currency union per se. It is possible that EMU effects and EU effects cannot be clearly disentangled and that the effects of the EMU on the conduct of monetary policy are not sufficiently accounted for in the monetary regime variables.

The final row in Table 7 shows the trade effect for two countries joining a regional trade arrangement based on the regressions for the period 1980-2007 in Table 4. These effects are on the same order of magnitude as the internal EMU effects and the internal EU effect.

[Table 7 here]

In Table 8 trade expansion effects (exports plus imports) of different monetary regimes are shown in percent relative to trade between two countries belonging to the group "Other" in the IMF classification. The regime of the exporting country is shown horizontally while the regime if the importing country is shown vertically. Thus, the diagonal shows the trade effect when both countries belong to the same group. A pattern emerges although the differences among regimes are not statistically significant in Table 6 with the exception of inflation targeting relative to other regimes

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The strongest trade enhancing effect occurs when both trading partners target inflation (19.5 percent). Inflation targeting is also the most trade enhancing regime for exporters in trade with countries using other regimes (15.7 percent on the average), as well as for importers in trade with exporters using other regimes (13 percent on the average). While countries classified as adopting Other monetary regime clearly trade less than other countries, there is no clear ranking of trade effects of Money aggregate targeting, Exchange rate targeting and IMF supported regimes. Targeting a monetary anchor seems to have the second largest effect for exporters while ER anchor seems to have the second largest effect for importers. Thus, the only unambiguous conclusion we can draw from Table 8 is that inflation targeting contributes to trade expansion independent of the regime of the trading partner.

[Table 8 here]

5. Trade expansion and inflation targeting in Asia

The analysis in the previous section indicates that the trade creation effects of regional integration going beyond basic trade policy can be substantial. The reduction in a variety of barriers to mobility of goods and services in Europe has been in process for several decades within the EU framework. A range of political forces arising in the aftermath of World War II played an important part in motivating the European countries to trade off a degree of sovereignty against increased political and economic integration. There are no obvious similar political motivations for Asian countries to emulate the European model for both widening and deepening integration in the foreseeable future.

Monetary regime shifts can be implemented by a country without coordination with other countries. The results presented in the previous section indicate that inflation targeting, in particular, expands international trade even if trading partners do not adopt the same regime. In

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this section we take a closer look at the development of international trade of inflation targeting countries in Asia.

There are many case studies on emerging markets' economic performance under inflation targeting. Most of these studies look at output and inflation and focus on the sample of Latin American and emerging transition countries. In general, these countries adopted inflation targeting for the purpose of disinflation.[7]

The statistical evidence supporting inflation targeting as a successful monetary policy regime is inconclusive. Vega and Winkelried (2005), IMF (2006), and Conçalves and Salles (2008) suggest that developed and developing countries adopting inflation targeting have experienced lower inflation as well as better output performance. Ball and Sheridan (2005) argue that the decline in inflation after the introduction of inflation targeting in OECD countries is simply the result of inflation reverting to its mean after a period of relatively high inflation. They do not observe any output effect. Mishkin and Schmidt-Hebbel (2007) divide the sample of non inflation targeting countries into control groups with different regimes in order to evaluate inflation targeting relative to different benchmarks. They find that the choice of control group is important for the results. Inflation targeting leads to reduced inflation in countries relative the period before inflation targeting but when these countries are compared with non-targeting countries there is no gain.

Monetary policy consideration cannot be disentangled from exchange rate policy. Inflation targeting requires exchange rate flexibility. When adopting inflation targeting, most countries accept that market fundamentals determine the exchange rates although there are varying degrees of foreign exchange market intervention. Schaechter, Stone, and Zelmer (2000)

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[7] See, for example, see Bernanke, Lauback, Mishkin, and Posen (1999) and Levin, Natalucci and Piger (2004).

note that under inflation targeting "exchange rate stability can be defined as a policy framework with an exchange rate value credible enough to convince markets that the inflation target will not be threatened by a currency crisis." (p. 19). This statement implies that there are constraints on intervention under inflation targeting but intervention can contribute to a degree of exchange rate stability as long as the exchange rate is consistent with longer term fundamentals.

Schaechter, Stone, and Zelmer find in case studies of six emerging countries[8], that six of the countries experienced several years of sound macroeconomic policies and exchange rate stability after the adoption of inflation targeting. The exception was Brazil where the exchange rate was under pressure in 1999.

Rose (2007) find that exchange rate volatility of inflation targeting countries is relatively low. He uses cross-sectional analysis of 42 industrialized and emerging market based on monthly data for exchange rates for the period 1990-2005. Edwards (2006) finds that the adoption of inflation targeting did not increase nominal and real exchange rate volatility.

The performance of inflation targeting countries in terms of real exchange rate volatility as well as general macroeconomic stability can contribute to the trade expansion associated with inflation targeting as noted in the previous section.

Turning to experiences with inflation targeting in Asia, four countries have adopted this regime as of 2009 as shown in Table 3. The four countries are Indonesia, the Philippines, South Korea and Thailand. Indonesia shifted from monetary aggregate targeting to inflation targeting in 2005. The Philippines made the same shift in 2003, South Korea in 2001. Thailand shifted from an IMF supported regime[9] to inflation targeting in 2001. The Philippines and South Korea are

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[8] Brazil, Chile, Czech Republic, Israel, Poland, and South Africa.
[9] See Table 2 for definitions of regimes

considered independently floating while Indonesia and Thailand intervene to dampen exchange rate fluctuations.

Table 3 shows the exchange rate and monetary regimes for other Asian countries as well. China, Hong Kong and Singapore are exchange rate anchor countries. India and Malaysia are classified by IMF as adopting "Other" monetary regime in combination with managed floating. In other words, the latter countries have neither a pegged exchange rate nor a floating rate. Although they do not announce an exchange rate target they are likely to have one.

Figure 1 shows how the volume of exports and the ratio of exports to GDP developed before and after the adoption of inflation targeting in Thailand, South Korea, the Philippines and Indonesia. The volume of exports increased in all the countries before as well as after the regime shift until the financial crisis in 2008 caused a decline in exports. The export ratio, on the other hand, seems to have declined for a period after the adoption of inflation targets in all the four countries. The decline seems to have been temporary in Thailand and South Korea but the declines in the Philippines and Indonesia look like trends.

[Figure 1 here]

On the face of it the patterns in Figure 1 seem to contradict the empirical results presented in the previous section. However, the patterns could be explained if the shift to inflation targeting also caused real exchange rate adjustment. Figure 2 shows real exchange rate developments and ratios of exports to GDP in nine Asian countries. The real exchange rates of both Indonesia and the Philippines have been appreciating and the export ratios have been declining since the countries adopted inflation targets. South Korea's export ratio fell to begin with along with an appreciating currency after the adoption of inflation targeting in 2001 but since 2003 the export ratio has been increasing in spite of an appreciating real exchange rate.

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Thailand also began a period of real appreciation at the time of the shift to inflation targeting in 2001 but the trendwise increase in the export ratio continued for most of the period.

Observation of the diagrams in Figure 2 alone gives the impression of a negative effect on the export ratio of inflation targeting. Thus, the positive effect on trade of the inflation target regime observed in the analysis in the previous section is conditional on controlling for real exchange rate changes. The shift to inflation targeting may cause a real appreciation for a period because the monetary regime shift is often associated with a shift towards a more disciplined macroeconomic policy. The real appreciation should be temporary, however. Therefore, the trade creating effect of a shift to inflation targeting may not be observable during an adjustment period.

[Figure 2 here]

6. Conclusions and Implications

Searching for a stable monetary regime is a challenge for central bankers around the world and a crucial issue among Asian policymakers for two reasons. First, Asian crisis-hit economies during 1997-98 were forced to abandon the fixed exchange rate system. Since then, the exchange rates of most Asian countries have been floating more or less freely. Second, in the past two decades Asian economies have experienced a marked increased in international trade and capital flows particularly from, and lately to, developed countries. Although openness often improves long-run macroeconomic performance, it may expose countries to the risks of economic and financial disruption in times of global shocks. Choosing the right monetary and exchange rate regimes can be critical for alleviating the effects of external shocks and enhancing the prospects for long-term export led economic growth.

The European model for deeper regional monetary integration and increased monetary stability may seem attractive. The evidence presented here and in other papers indicates that the European Monetary Union (EMU) has contributed to increased trade but the magnitude of the internal trade creating effects remain controversial and estimates range from very large in the order of magnitude of 100 percent to small and almost negligible. It has proven difficult to disentangle currency union effects from long term trends of increased integration within the internal market, and to disentangle the effects of the creation of a currency union from effects of simultaneous shifts in the monetary regimes and the conduct of monetary policy in the countries joining the currency union.

The estimates of very large trade creating effects of the EMU in regressions for the period 1980-2007 are associated with large trade effects relative to countries outside the currency union as well. We take that as an indication that other factors than the creation of the currency union per se explain most of the trade creation. Effects of deepening of the internal market and of changes in the conduct of monetary policy may be particularly important.

The political circumstances that led to deepened integration, including monetary integration are not easily reproduced. Even if the political will for increased economic integration exists the most immediate gains are likely to follow from the reduction of barriers to mobility of goods, services and factors of production. There is no strong evidence that a currency union contributes much to such mobility. The choice of monetary regime as well as the conduct of monetary policy matter, however. The results presented here indicate that inflation targeting contributes substantially to trade. The trade creating effects of the EMU may also be partly explained by the shift to inflation targeting by the European Central Bank for countries that prior to the EMU had central banks with low credibility.

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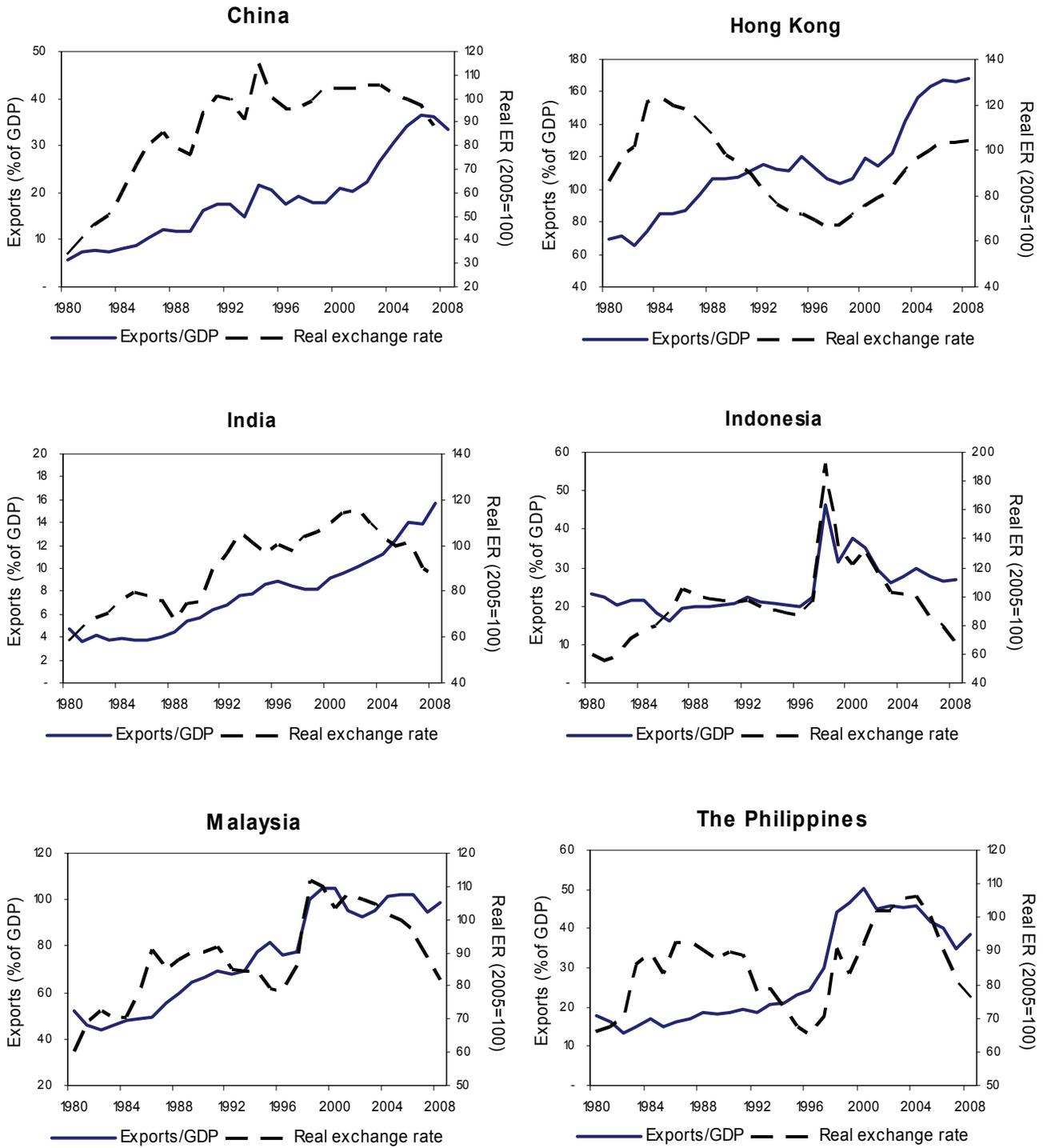
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Figure 1. Exports/GDP during the pre- and post adoption of inflation targeting regimes for four Asian countries, quarterly data, 1993:Q1 – 2008: Q4

Thailand: July 2000

South Korea: January 2001

The Philippines: January 2002

Indonesia: July 2005
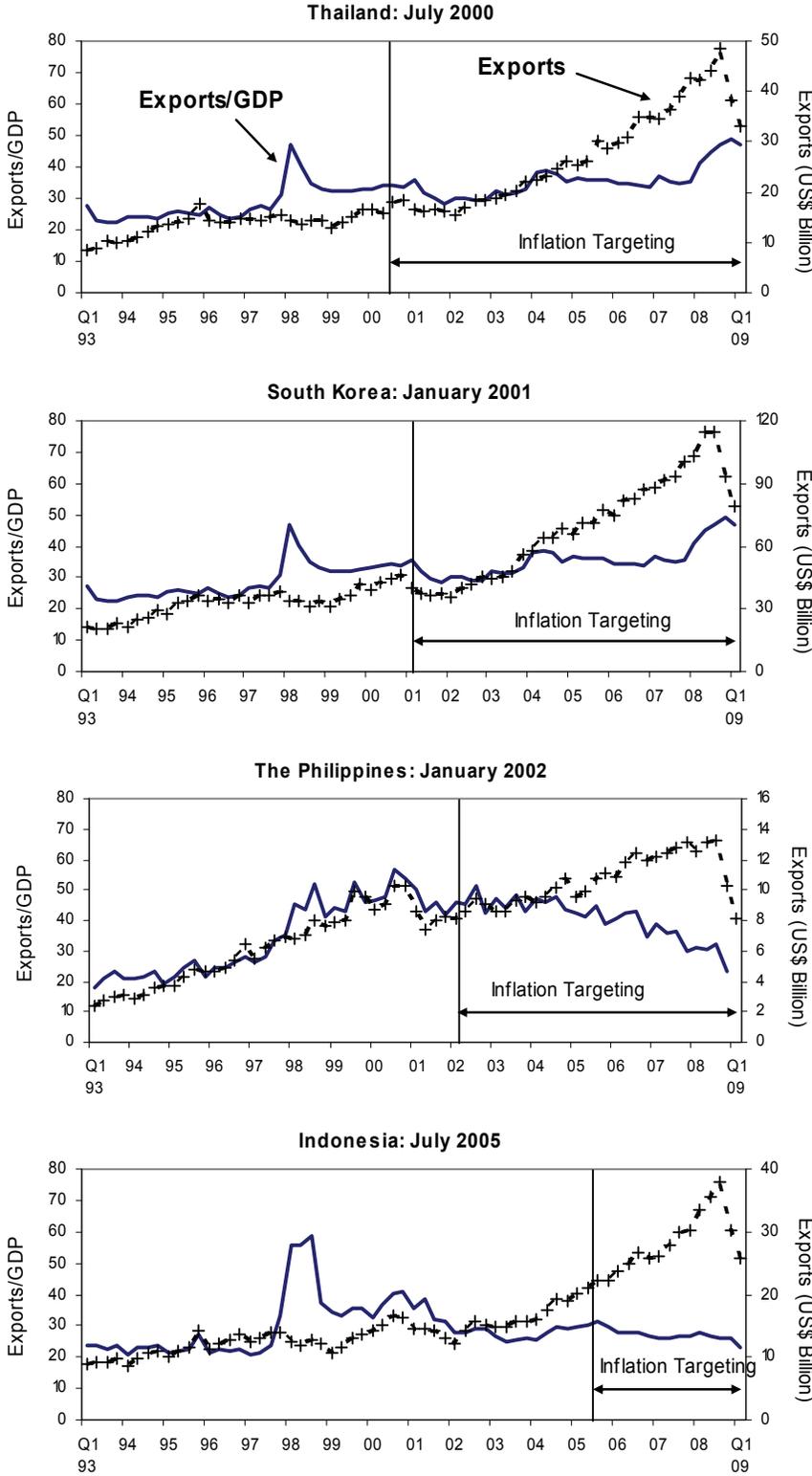
Note: The date for the adoption of the inflation targeting regime is from Rose (2007).

Figure 2. Real Exchange Rates (relative to the U.S. dollar) and Exports for our sample of Asian Economies

Singapore

South Korea

Thailand
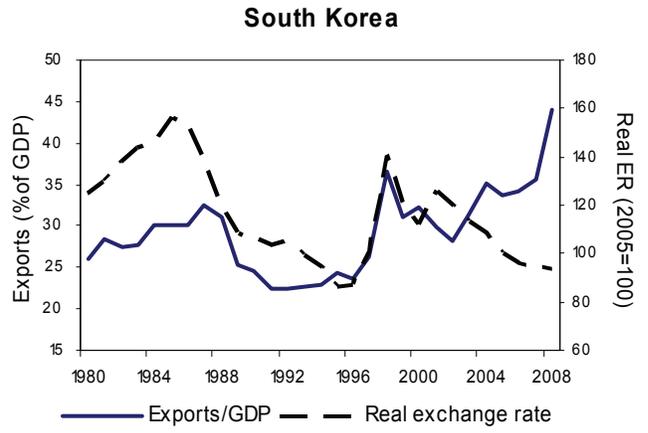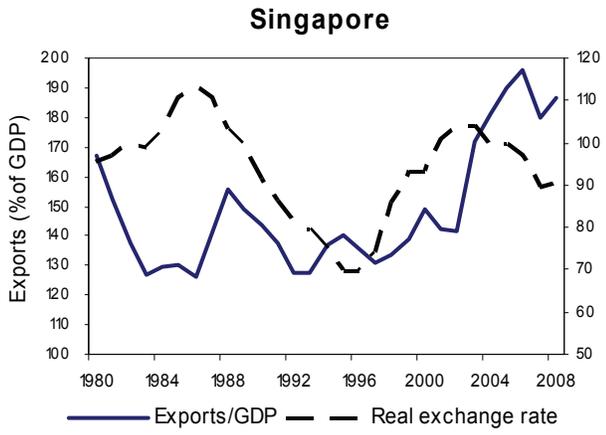
Table 1. List of Three Groups of Countries in Our Empirical Analysis

1. EMU		2. EU/NonEMU		3. Non EU		
Date of joining EMU		Date of joining EU		Industrial Countries	Emerging Markets	
1-Jan-1999	Austria	1973	Denmark	Australia	Argentina	Philippines
	Belgium	1973	United Kingdom	Canada	Brazil	Mexico
	Finland	EEA, 1992	Iceland	Japan	Bulgaria	Morocco
	France	EEA, 1992	Norway	New Zealand	Chile	Nigeria
	Germany	EEA, 1992	Sweden	Switzerland	China	Pakistan
	Ireland	1-May-2004	Czech Republic	United States	Colombia	Paraguay
	Italy		Estonia		Croatia	Peru
	Luxembourg		Cyprus		Ecuador	Romania
	Netherlands		Latvia		Egypt	Russia
	Portugal		Lithuania		Hong Kong	Singapore
	Spain		Hungary		India	Sri Lanka
1-Jan-2001	Greece		Malta		Indonesia	South Africa
1-Jan-2007	Slovenia		Poland		Israel	Thailand
1-Jan-2008	Cyprus		Slovenia		Jordan	Turkey
	Malta		Slovak Republic		Korea, South	Ukraine
1-Jan-2009	Slovakia	1-Jan-2007	Bulgaria		Malaysia	Venezuela
			Romania			

Note: this table lists the dates of joining EU and EMU from 1973-2009. However, our sample coverage in the empirical test is based on the period of 1980-2007. Countries in group (1) EMU is classified as EU/NonEMU before the time of joining EMU and countries in group (2) EU/nonEMU are classified as non EU members before joining EU. Iceland and Norway are not EU members and Sweden did not become members of the EU until 1995. These three countries have participated in the European Economic Area (EEA) since 1992; therefore, they are treated the same way as EU members.

Table 2. Data Descriptions and Sources

Real exports	The logarithm of the real value (in US dollar) of bilateral exports (the nominal values of bilateral exports are adjusted to the real values using the U.S. GDP deflator (2005=100)). *Sources*: IMF Direction of Trade Statistics, August 2009 and the International Financial Statistics.
Real GDP	The log of the real GDP. *Source*: The Penn World Table, PWT 6.3.
Population	The log of the total population. *Source*: The Penn World Table, PWT 6.3.
RTA	A dummy of one if a pair of countries belong to the same regional trade arrangement. RTAs include ASEAN-Association of South East Asia (1992), CAN-Andean Community (1998), MERCOSUR-Southern Common Market (1991), NAFTA-North American Free Trade Agreement (1994), CER-Closer Economic Relation (1983), and SAPTA-South Asian Preferential Trade Agreement (1995). European Union is not included because dummies for member countries are included in the EU/EMU dummies. *Source:* Information on RTAs is from the WTO website.
Real ER	The real exchange rate (RER) is the nominal exchange rate relative to U.S. dollars (2005=100) adjusted by the relative price index (2005=100). *Source:* Nominal exchange rate is from the Penn World Table, PWT 6.3
ER Anchor	A dummy of one in the years that a country uses the exchange rate (ER) anchor as a monetary policy framework. Under ER anchor, the ER serves as the nominal anchor or intermediate target of monetary policy and monetary authority stands ready to buy or sell foreign exchange to maintain the exchange rate at its pre-announced level or range. Exchange rate regimes with no separate legal tender, currency board arrangements, fixed pegs with and without bands, and crawling pegs with and without bands are covered under the ER anchor regime. *Source:* IMF's Classification of Exchange Rate Arrangements and Monetary Policy Frameworks
Money Anchor	A dummy of one in the years that a country uses the monetary aggregate anchor as a monetary policy framework. Under this framework, the targeted monetary aggregate serves as the nominal anchor or intermediate target of monetary policy. The monetary authority uses its instruments to achieve a target growth rate for a monetary aggregate, such as reserve money, M1, or M2. *Source:* IMF's Classification of Exchange Rate Arrangements and Monetary Policy Framework
Inflation Targeting (IT)	A dummy of one in the years that a country uses the inflation targeting (IT) framework. Under IT, the monetary authority announces medium-term numerical targets for inflation, which is the intermediate target of monetary policy, and commits to use its instruments to achieve the announced target. *Source:* IMF's Classification of Exchange Rate Arrangements and Monetary Policy Frameworks
IMF	A dummy of one in the years that a country uses the monetary and exchange rate policies that are guided and supported by the International Monetary Fund (IMF). *Source:* IMF's Classification of Exchange Rate Arrangements and Monetary Policy Frameworks
Other (MP regime)	A dummy of one in the years that a country uses other monetary policy framework. According to IMF, this includes a country that has no explicitly stated nominal anchor but rather monitors various indicators in conducting monetary policy, or there is no relevant information available for the country. *Source:* IMF's Classification of Exchange Rate Arrangements and Monetary Policy Frameworks

Table 3. Exchange Rate- and Monetary Regimes for Asian Countries

Country	Year	Exchange Rate Regimes	Monetary Policy Regimes
China	1999-2006	Other Conventional Fixed Peg Arrangements	Exchange Rate Anchor (against a single currency) and Monetary Aggregate
	2007	Crawling pegs	Exchange Rate Anchor (against a single currency) and Monetary Aggregate
	2008-present	Crawling pegs	Exchange Rate Anchor (against a single currency)
Hong Kong	1999-present	Currency Board Arrangements	Exchange Rate Anchor
India	1999	Independently Floating	Monetary Aggregate
	2000	Independently Floating	Other
	2001-present	Managed Floating with No Pre-announced Path for Exchange Rate	Other
Indonesia	1999-2001	Independently Floating	IMF
	2002-2003	Managed Floating with No Pre-announced Path for Exchange Rate	Monetary Aggregate and IMF
	2004-2006	Managed Floating with No Pre-announced Path for Exchange Rate	Monetary Aggregate
	2007-present	Managed Floating with No Pre-announced Path for Exchange Rate	Inflation Targeting Framework
Korea	1999-2000	Independently Floating	Monetary Aggregate and IMF
	2001-present	Independently Floating	Inflation Targeting Framework
Malaysia	1999-2005	Other Conventional Fixed Peg Arrangements	Exchange Rate Anchor (against a single currency)
	2006-2007	Managed Floating with No Pre-announced Path for Exchange Rate	Other
Philippines	1999-2002	Independently Floating	Monetary Aggregate and IMF
	2003-present	Independently Floating	Inflation Targeting Framework
Singapore	1999-2007	Managed Floating with No Pre-announced Path for Exchange Rate	Other
	2008-present	Managed Floating with No Pre-announced Path for Exchange Rate	Exchange Rate Anchor (against a composite)
Thailand	1999-2000	Independently Floating	IMF
	2001	Independently Floating	Inflation Targeting Framework
	2002-present	Managed Floating with No Pre-announced Path for Exchange Rate	Inflation Targeting Framework

Source: De Facto Classification of Exchange Rate Regimes and Monetary Policy Frameworks, International Monetary Fund.

Table 4. The EMU and EU Effects on Exports, 1980-2007

	IND		ALL	
	Coefficient	Std Err	Coefficient	Std Err
Log of Real GDP1	1.103**	0.070	1.297**	0.017
Log of Real GDP2	1.233**	0.070	0.984**	0.017
Log of Population1	-1.598**	0.224	-1.053**	0.038
Log of Population2	-0.471**	0.224	-1.013**	0.038
Real ER1	0.061*	0.035	-0.0004**	0.0001
Real ER2	-0.081**	0.035	-0.00001	0.0001
RTA	0.249	0.162	0.317**	0.051
EMU1 to EMU2	0.602**	0.044	0.565**	0.035
EMU1 to EU/nonEMU2	0.163**	0.044	0.346**	0.030
EMU1 to NonEU2	0.230**	0.047	0.018	0.021
EU/nonEMU1 to EMU2	0.412**	0.044	0.349**	0.030
EU/nonEMU1 to EU/nonEMU2	0.123**	0.029	0.127**	0.020
EU/nonEMU1 to NonEU2	0.088**	0.026	-0.095**	0.013
NonEU1 to EMU2	-0.026	0.047	-0.111**	0.022
NonEU1 to EU/nonEMU2	0.060**	0.026	-0.115**	0.013
Constant	-19.318**	0.000	-19.100**	0.677
No. of Observations	11,981		101,697	
No. of Country Pairs	462		4,289	
F-Statistics	214.64		677.15	
Prob > F-Statistics	0.000		0.000	
Within R-Square	0.446		0.408	
Country Pair Dummy	Yes		Yes	
Year Dummy	Yes		Yes	
Emerging market Dummy × Year Dummy	No		Yes	

The dependent variable is the log of real exports. *, ** indicate the significance levels of 10% and 5%, respectively. 1 stands for an exporting country and 2 for an importing country. For the sample, IND = industrial countries and ALL = industrialized countries plus emerging markets.

Table 5. The EMU, EU and Monetary Regime Effects on Exports, 1999-2007

	ALL		ALL	
	Coefficient	Std Err	Coefficient	Std Err
Log of Real GDP1	0.867**	0.047	0.610**	0.052
Log of Real GDP2	1.478**	0.047	1.198**	0.052
Log of Population1	-1.475**	0.130	-2.035**	0.136
Log of Population2	-1.229**	0.130	-1.839**	0.136
Real ER1	0.028**	0.008	0.047**	0.008
Real ER2	-0.099**	0.008	-0.077**	0.008
EMU1 to EMU2	0.021	0.075	-0.013*	0.078
EMU1 to EU/nonEMU2	-0.032	0.050	-0.097**	0.052
EMU1 to NonEU2	-0.200**	0.045	-0.168**	0.046
EU/nonEMU1 to EMU2	0.005	0.050	-0.039	0.052
EU/nonEMU1 to EU/nonEMU2	0.090**	0.028	0.009	0.029
EU/nonEMU1 to NonEU2	-0.025	0.020	-0.031	0.020
NonEU1 to EMU2	-0.138**	0.045	-0.099**	0.046
NonEU1 to EU/nonEMU2	-0.105**	0.020	-0.127**	0.020
Inflation Targeting1			0.086**	0.015
Money1			0.040**	0.015
IMF1			0.027**	0.010
ER Anchor 1			0.025**	0.012
Inflation Targeting2			0.069**	0.015
Money2			0.012	0.015
IMF2			0.052**	0.010
ER Anchor 2			0.061**	0.012
Constant	-14.089**	1.744	7.473**	2.354
No. of Observations	38,599		38,599	
No. of Country Pairs	4,289		4,289	
F-Statistics	594.48		399.42	
Prob > F-Statistics	0.000		0.000	
Within R-Square	0.342		0.349	
Country Pair Dummy	Yes		Yes	
Year Dummy	Yes		Yes	
Emerging market Dummy × Year Dummy	Yes		Yes	

The dependent variable is the log of real exports. *, ** indicate the significance levels of 10% and 5%, respectively. 1 stands for an exporting country and 2 for an importing country. For the sample, IND = industrial countries and ALL = industrialized countries plus emerging markets. The RTA dummy is dropped in the country- and time- fixed effect model due to time-invariant of the data after 1999.

Table 6. The Wald-Test for the equality between two coefficients of monetary regimes for:

Exporting countries

	Inflation Targeting1	Money1	IMF1
Money1	8.44 (0.0037)		
IMF1	12.41 (0.0004)	0.56 (0.4526)	
ER Anchor 1	12.20 (0.0005)	0.94 (0.3333)	0.02 (0.8762)

Importing countries

	Inflation Targeting2	Money2	IMF2
Money2	13.14 (0.0003)		
IMF2	1.02 (0.3115)	5.11 (0.0238)	
ER Anchor2	0.20 (0.6510)	9.19 (0.0024)	0.36 (0.5504)

The number in the parenthesis is the probability value of the F-statistics.

Table 7. EU, EMU and RTA effects in percent on bilateral trade within and between members of different country groups (EU stands for the EU/NonEMU group). Effects on bilateral trade are calculated as the averages of percent change in exports and percent change in imports based on coefficients in log in tables 4 and 5. Rows (1), (2), (4), (5) and (7) refer to percent change relative to trade between NonEU countries. Rows in bold font show estimates for internal and external effects of the EU and the EMU. Row (3) refers to differences between the changes in row (2) and row (1) calculated as [(100+change in row (2))/(100+change in row (1))]-1. Row (6) refers to difference between changes in rows (5) and row (4), row 8 refers to difference between rows (7) and (4) while row (9) refers to the difference between rows (7) and (5)

	Table 4	Table 4	Table 5 (no monetary regime dummies)	Table 5 (Including monetary regimes dummies)
Calculated from				
Country coverage	IND	ALL	ALL	ALL
Period	1980-2007	1980-2007	1999-2007	1999-2007
(1) Non-EU to/from EU *(External EU-effect)*	**+18.4**	**-21.5**	**-13.6**	**-16.2**
(2) Non-EU to/from EMU *(External EU+EMU effect)*	+31.6	-9.2	-32.1	-26.3
(3) Implied *External EMU effect* as difference between (2) and (1)	**+11.1**	**+15.7**	**-21.4**	**-12.1**
(4) EU to/from EU *(Internal EU-effect)*	**+33**	**+84**	**+23**	**+2.1**
(5) EMU to/from EU *(Internal EU effect plus External EMU-effect relative to EU)*	+102	+72.7	-3	-14.3
(6) Implied *External EMU effect relative to EU* as difference between (5) and (4)	**+51.9**	**-6.1**	**-21.1**	**-16.1**
(7) EMU to/from EMU *(Internal EU+Internal EMU effect)*	+300	+267.3	+5.0	-2.9
(8) *Bilateral Internal EMU-effect* as difference between (7) and (4)	**+201**	**+99.6**	**-14.6**	**-4.9**
(9) *Unilateral Internal EMU effect* as difference between (7) and (5)	**+98**	**+113**	**+8.2**	**+13.2**
(9) RTA (free trade area effect)	+77	+107		

Table 8. Monetary Regime effects on exports plus imports in percent relative to trade between two countries classified as Other

Exporter ⌊ Importer τ	Inflation Targeting	Money	IMF	ER Anchor	Other	Average for importer regime
Inflation Targeting	**19.5**	13.4	11.8	11.6	8.6	**13**
Money	12.4	**6.2**	4.6	4.4	1.4	**5.8**
IMF	17.3	11.2	**9.6**	9.3	6.4	**10.5**
ER Anchor	18.5	12.3	10.7	**10.5**	7.5	**11.9**
Other	11	4.8	3.2	3	**0**	**4.4**
Average for exporter regime	**15.7**	**9.6**	**8**	**7.8**	**4.8**	**9.2**

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