Exchange Rate Regimes and Economic Linkages*

Jong-Wha Lee**
Korea University and
The Australian National University

and

Kwanho Shin***
Korea University and
Claremont Mckenna College

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Abstract

We investigate how the exchange rate regime influences economic linkages across countries. We divide the exchange rate regime into three classifications: currency union, peg and floating exchange rates. Unlike most studies solely focusing on the relationship between anchor and client countries, the exchange rate regime between any two countries is inferred based on their relationship to the common anchor currency. Then we empirically explore how the various exchange rate regimes impact on bilateral trade, output co-movement and financial integration. Financial integration is measured by the degree of risk sharing reflected in consumption co-movement relative to output co-movement. We find that, while currency union has the greatest effect, the peg regime also significantly boosts trade. We also find that, while the peg regime contributes to both output and consumption co-movements, the currency union strengthens only consumption co-movement and possibly lowers output co-movement. These findings are interpreted that the currency union, the strictest form of pegged regimes, leads to higher industry specialization and better risk sharing opportunities than the less strict peg regime.

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* Department of Economics, Korea University; jongwha@korea.ac.kr
** Department of Economics, Korea University and Department of Economics, Claremont Mckenna College; khshin@korea.ac.kr

1. Introduction

One of the most important issues in international economics is to understand how a choice of exchange rate regimes affects on macroeconomic performance of an economy.[1] As Mussa (1986) and many others emphasize, a significant difference arises that the real exchange rate as well as the nominal exchange rate is much more volatile under the floating regime.[2] Since then, however, no consensus is established about other differences. Notably, Baxter and Stockman (1989) and Flood and Rose (1995) find that no other macro variables including growth, inflation, business cycles and trade are significantly different across regimes.

Occasionally, however, actual practices of exchange rate policies differ from what the countries publicly commit to behave. A different view emerges, then, as studies distinguish between *de jure* regimes based on the publicly stated commitment and *de facto* regimes based on the actual behavior of the exchange rate. For example, Ghosh et al. (2002), by employing both *de jure* and *de facto* classifications, find stronger evidence from *de facto* classifications that inflation is both lower and stable but the real output is more volatile under the fixed exchange regime. Levy-Yeyati and Sturzengger (2004) also use the *de facto* classification, which is constructed by statistical techniques, and find that fixed exchange rate regimes are associated with slower growth and higher output volatility. Reinhart and Rogoff (2004) advance one step further and emphasize the importance of the market based parallel exchange rates instead of the official exchange rates. When there are multiple exchange rates operating, exchange rates in the parallel market tend to more closely reflect market-determined exchange rates. By focusing on the actual behavior in the parallel market, they suggest that different exchange regimes lead to different economic performances.

While a number of studies focus on performance of a single economy, more emphasis has recently been put on understanding the influences of exchange rate regimes on the linkages between two economies. In fact, different performance of a single

[1] Analysis of this issue traces back to Friedman (1953), who argued for the flexible exchange rate regime over the fixed exchange rate regime on the grounds that the former provides greater insulation from foreign shocks. Later, Mundell has produced a series of papers (1960, 1961) investigating the same issue.
[2] Mussa (1986) finds that the real exchange rate is between three and six times more variable under floating than under fixed rates independently of the underlying shocks.

economy may be due to different economic linkages implicated by different exchange rate regimes. For example, different exchange regimes generate a different degree of trade integration and thus in turn lead to different growth performance and business cycle co-movement. Especially the currency union, the extreme case of fixed exchange rate regimes, is extensively analyzed in this regard. Rose (2000) pioneered empirical research on currency unions by finding a huge impact of currency unions on trade.[3] Subsequently, there have been a vast number of studies made to check robustness of his finding.[4] Frankel and Rose (2002) also show that currency unions, by increasing trade, contribute significantly to output growth of member countries. In addition, Frankel and Rose (1998) argue that increased trade is a major channel by which business cycles are more synchronized across countries.[5]

Rose and Engle (2002) extend the previous analyses to show how currency unions have influences on other bilateral integrations. They show that members of currency unions are more integrated in other aspects as well: the real exchange rates are less volatile and business cycles are more synchronized across currency union member countries than across countries with sovereign monies.

This line of empirical studies that investigate the economic effects of exchange rate regimes encounters standard endogeneity problems. The choice of exchange rate regimes itself may not be exogenous to the outcome variable under investigation. For example, a country is more likely to join a currency union when it expects an increase in trade with other member countries. In this case, the causality runs in the opposite direction: more trade leads to stricter exchange rate regimes. It is also plausible that the choice of exchange rate regime reflects any omitted characteristics that influence the economic outcome. Then, the OLS estimates may not reveal the true effect of exchange rate regimes on economic outcomes.

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3 According to his empirical analysis, membership in a currency union, ceteris paribus, more than triples bilateral trade among member countries.

4 In general, however, the subsequent studies made by Rose and his co-authors continue to show that the impact of currency unions on the volume of trade is significantly large. See Rose (2004) for the review.

5 Theoretically, increased trade per se can lead either to more or to less synchronization depending on whether it strengthens industry specialization or not. Recently Shin and Wang (2004) find that intra-industry trade is the major channel by which the business cycle of Asian countries become synchronized , although increased trade itself does not necessarily lead to more synchronization.

Alesina, Barro, and Tenreyno (2002) and Tenreyro and Barro (2003) try to get around the endogeineity issue by developing a new instrumental-variable (IV) approach in estimating the effects of currency unions. They construct an IV by exploiting the independent decisions of a pair of countries to peg their currencies to a third currency. They estimate the joint probability that two countries use the same currency of a main anchor country. This likelihood, which is independent of the bilateral links between two client countries, is used as an instrument for the currency union dummy in the regressions. Their IV results confirm the previous findings that currency unions significantly increase bilateral trade and price co-movement, but, unlike the finding of Rose and Engle, decrease the extent of output co-movement.

In this paper we investigate how the choice of exchange rate regimes influences on the economic linkages between countries by extending the instrumental variable methodology to avoid the endogeneity problem. Differently from the previous studies, we broaden our analyses to cover not just currency unions but also other exchange regimes.[6] Specifically we divide the exchange regimes into three classifications: currency unions, peg and floating exchange rates. Then we analyze how the various exchange rate regimes impact on the bilateral trade, real GDP co-movement and financial integration. Especially the financial integration is measured by the extent of risk sharing reflected in consumption co-movement relative to output co-movement.

We find that after two countries peg their currencies to the same anchor currency, irrespective of the particular form of pegging, their bilateral trade increases considerably. Especially, currency union, the strictest form of pegged exchange rates, has the largest trade-creation effect. The empirical results suggest that low exchange rate variability between two countries with pegged exchange rate arrangements helps them trade more. They further suggest that the complete elimination of the exchange rate variability under currency union works better than just low variability under the peg regime.

On output co-movement, however, only the peg regime leads to a significantly positive impact. Currency unions may even make output co-movement lower.[7] We also

[6] Recently Klein and Shambaugh (2004) also extend the analyses to the role fixed exchange rates on trade and find a large and significant effect on bilateral trade between an anchor country and a country that pegs to it.

[7] Baxter and Kouparitsas (2004) also show that countries belonging to a currency union do not have

find that the peg regime strengthens consumption co-movement in a similar magnitude. In contrast, currency union always enhances consumption co-movement more than output co-movement.

Given that risk sharing is enhanced only when the extent of consumption co-movement is more strengthened than that of output co-movement, only currency union shows evidence of enhanced risk sharing. Since both output and consumption co-movements increase by about the same magnitude under the peg regime, we conclude that the peg regime does not enhance risk sharing. This suggests that financial integration is not likely further deepened even if two countries form a peg relationship. Financial integration is likely to be reinforced only under currency union.[8] Since financial integration promotes industry specialization, currency union may also lead low output co-movement across countries.[9]

The remainder of the paper follows in five sections. In section 2, we illustrate classification of exchange rate regimes and the data used in the empirical analyses. Section 3 discusses the endogeneity issue with respect to the choice of the regimes and introduces ways to get around the problem. Sections 4 and 5 present and discuss the main empirical estimation results on the effects of the exchange rate regimes on the bilateral trade and on output and consumption co-movements respectively. Concluding remarks follow in Section 6.

2. The Classification of Exchange Rate Regimes and Other Data

To investigate the impact of exchange rate regimes on economic linkages, we should make a decision in advance on how we classify the exchange rate regimes. A

significantly more highly correlated business cycles than countries that do not share a common currency.

[8] Blanchard and Giavazzi (2002) show that correlations between current account positions and per capita incomes increase more for future European Monetary Union (EMU) countries in 1990s, suggesting that monetary integration enhanced financial integration. Spiegel (2004) also argues that overall international borrowing is facilitated by the creation of monetary union based on the evidence from Portugal's Accession to the EMU.

[9] The impact of financial integration on industry specialization is well documented in the literature. Kalemli-Ozcan, Sorenson and Yosha (2003) show that risk sharing significantly promotes industry specialization. Heathcote and Perri (2002) also argue that the U.S. business cycle has become increasingly idiosyncratic over the past 30 years due to the increasing share of international assets held in the U.S. However Imbs (2004) shows that, while financial integration enhances specialization, it may lead to more synchronization of outputs across countries due to correlated capital flows.

number of previous studies have relied on the official IMF classifications of exchange rate regimes published in the IMF's *Annual Report on Exchange Rate Arrangements and Exchange Restrictions.* The IMF classifications rely exclusively on each government's own declaration of its exchange rate regime. But, there exist conflicts between the exchange rate regime that often prevails *de jure* and the way that exchange rate policy is conducted *de facto*. For example, a regime that was classified as floating (independently or managed) were often a *de facto* peg or crawling peg, displaying so-called 'fear of floating'(Calvo and Reinhart, 2002).

A number of recent studies have attempted to construct *de facto* classifications of exchange rate regimes. Levy-Yeyati and Sturzengger (2004) use statistical method based on data on the volatility of nominal exchange rates and the volatility of international reserves. They classify exchange rate regimes for all IMF member countries over the period of 1974-2000 into four categories— flexible, dirty float, crawling peg, and fixed. Reinhart and Rogoff (2004) advance one step further and use a new database on parallel market exchange rates as well as chronologies of the exchange rate history to construct a *de facto* classification.

The *de facto* classification has a clear advantage that it reflects the actual behavior of the exchange rate, but a possibility still remains that the observed behavior of exchange rates is misleading. For example, stable nominal exchange rates may result from an absence of shocks, not from active offsetting policy actions. However, increasing evidence of inconsistencies between actual policies and the commitment suggests that the *de jure* classification should warrant economically more meaningful analyses. Henceforth, for our paper, we follow the *de facto* classification of exchange rate regimes made by Reinhart and Rogoff (2004).

Based on a broad variety of descriptive statistics and chronologies, Reinhart and Rogoff (2004) assess the way countries actually conduct exchange rate policy, and reclassify exchange rate regimes for 153 countries at 14 fine categories. They also divide regimes in five "coarse grid"— peg, limited flexibility, managed floating, freely floating, and freely falling. The "freely falling" is a category that includes countries whose twelve-month rate of inflation is above 40 percent. We aggregate the 14 fine categories into three broad groups: currency union, peg (exclusive of currency union), and floating. A

currency union regime includes the countries that have no separate legal tender.[10] A floating regime includes managed floating, freely floating and freely falling. A 'peg' includes diverse forms of pegging systems, ranging from a currency board arrangement to a moving band system.[11]

We infer the exchange rate regime between any two countries based on their relationship with an anchor currency. If the two countries have their currencies pegged simultaneously to the same anchor currency, we classify their exchange rate arrangement as a peg. If one country pegs its currency and the other floats, their relationship is classified as a float. Hence, this classification method tends to increase the cases of floating exchange rate regimes.

Most other data comes from Glick and Rose (2002), which cover 186 countries from 1948 to 1997. These include the bilateral trade data and other control variables related to various measures of distance and size used in a standard gravity equation. Since the Bretton Woods System constrained most countries to maintain the fixed exchange rate until the early 1970s, our data set starts from 1974. Just simply juxtaposing the fixed exchange rate era under the Bretton Woods System with the floating exchange rate regimes thereafter can be misleading because different exchange rate regimes could behave differently because they faced different shocks. We have added output and consumption data to the Glick-Rose data set. We have first used the Penn World Table[12] and complement the missing data using the World Development Indicator[13].

[10] We extend the Reinhart and Rogoff data to include all currency union observations defined in Glick and Rose (2002).

[11] In the preliminary draft, we have used four-regimes classifications- currency union, strong peg (exclusive of currency union), weak peg, and floating- by dividing 'peg' regimes into two sub-groups. We have classified the exchange rate arrangements as a strong-peg regime in which a country defends its exchange rate within a narrow margin of 2% around a fixed rate. This approach is also pursued in Shin and Lee (2004) that focus on East Asian countries. We do not find much significant differences between strong peg and weak peg regimes in terms of our empirical results. Anyway, the dividing line between a strong-peg and a week peg is not unambiguous.

[12] Penn World Table Version 6.1 is developed by Alan Heston, Robert Summers and Bettina Aten, , Center for International Comparisons at the University of Pennsylvania (CICUP), October 2002.

[13] Real output and consumption are based on constant local currency unit. For the Penn World Data, we have summed up consumption, investment, government expenditure and exports and subtracted imports using the national account.

The estimations will use annual data consisting of 119,677 country pairs in total.[14] The data set has a feature of panel structure consisting of 119,677 annual observations clustered by 8,580 country pair groups over time. The number of observations varies per year. Summary statistics for the data used in estimation is presented in Table 1 (a). Of all observations, 1,037 country-pairs (about 0.9 percent) belong to a currency union, 19,101 country pairs (about 16.0 percent) belong to a peg. Thus, roughly 17 percent of all observations belong to various types of pegging exchange rate arrangements, and the rest belong to a float.

3. Endogeneity of Exchange Rate Regime Choice

The implicit assumption in most empirical approaches is that the choice of exchange rate regimes is exogenous. But, countries may expect an increase in trade between them, and thereby simply adopt a peg system to facilitate this. Countries that have a higher degree of business cycle synchronizations are more likely to adopt pegging regime because the loss of independent monetary policy would become less costly. Then, the positive effect of pegs on trade or output co-movements may reflect reverse causality.

This paper attempts to control for the endogeneity problem in two ways. First, we have inferred the exchange rate regime between two countries based on their relationship to a common anchor currency. By utilizing this triangular relationship of two countries to a common anchor, we can lessen the endogeneity problem. Focusing on the bilateral relationship between only these non-anchor pairs allows the severity of the endogeneity problem to be substantially lowered because the peg relationship between these pairs is a byproduct of each country's decision to peg to a common anchor. While each country's decision to peg to the common anchor can reflect the endogeneity nature, this is less so for the relationship between these non-anchor pairs.[15]

[14] This data set is based on trade regression in section 4 that also has instrumental variables. The regressions on output and consumption co-movements lose some observations due to the lack of consumption and output data.

[15] This argument suffers from criticism made by Meissner and Oomes (2004) that emphasize the network externality: the benefits of using a particular anchor increase with the amount of trade with countries that use the same anchor.

Summary statistics for this subsample exclusive of anchor countries is presented in Table 1 (b). This data set has a feature of panel structure consisting of 106,165 annual observations clustered by 7,882 country pair groups over time. Of all observations, 950 country-pairs (about 0.9 percent) belong to a currency union, 17,072 country pairs (about 16.1 percent) belong to a peg.

Second, we follow the instrumental variable (IV) approach in Alesina, Barro, and Tenreyno (2002) and Tenreyro and Barro (2003). The instrumental variables used in these studies also exploit the triangular relationship of pairs, but utilize all their relationships with any potential anchor country. As an example, consider two countries that peg their currencies to a currency of an anchor country. The factors driving the decision of a client country to peg its currency to the anchor can be considered as independent of the bilateral links between the two clients. Thus, the idea is that by exploiting the relation with the anchor, we can construct an instrument that eliminates the endogeneity bias.

In order to separate out the relation with the anchor, we construct the probability that a client country pegs its currency to a potential anchor. We consider five potential anchors including France, Germany, South Africa, the United Kingdom, and the United States. According to Reinhart and Rogoff's classification, these five countries' currencies have served as main nominal anchors to other countries' currencies.[16]

Let's denote the estimated probability that client *i* pegs its currency to that of anchor *k* (among the five candidates) at time *t* by *p(i,k,t)*. Then, the probability that two clients *i* and *j*, independently, adopt a same anchor currency is calculated by the sum of the joint probabilities over the support of potential anchors.

$$P(i,\, j,t) = \sum_{k=1}^{5} p(i,k,t) \cdot p(j,k,t) \qquad (1)$$

The variable *P(i,j,t)* can be used as an instrument for a peg regime dummy.

[16] Other anchor currencies include Australian dollar for some of the Pacific islands countries, and Indian rupee for Bhutan. These observations are not in our sample.

In order to construct the estimated probability, Alesina, Barro, and Tenreyro (2002), Tenreyro and Barro (2003), and Tenreyro (2003) use a logit regression assuming that a country's decision is binary outcomes- adopts as its legal tender (or pegs its currency to) an anchor's currency or not. We extend the logit model for binary outcomes to the multinomial logit model in which the country can choose one exchange rate regime among three alternatives such as currency union, peg, and float.

The multinomial logit regression includes the income and sizes of potential clients and anchors, as well as various measures of distance between them as determinants of the choice of exchange rate regime. These variables are implied as the main determinants of regime choice by the theory of optimum currency areas (OCA). Modern discussions of exchange regime choice also identify other important factors such as the extent of real shocks, the degree of commitment to monetary stability, and the level of foreign-denominated liabilities (see the discussions in Levy-Yeyati, Sturzenegger, and Reggio, 2002 and Rogoff et al., 2004). We have also tried to add some of these measures as explanatory variables. But, the inclusion of these additional variables makes the sample size shrink substantially, so for the purpose of IV construction, we stick to the OCA characteristics variables only.[17]

The results of the multinomial logit regressions are in the Appendix Table. The magnitudes of the estimated coefficients should be interpreted as the effect of each explanatory variable on the probability of adopting each peg regime over the floating regime. For example, the estimated coefficient on log of distance (-4.96, s.e.=1.13) implies that an increase in distance between a client and an anchor by one unit reduces the 'log-odds' between currency union and floating by 4.96.

The result is broadly consistent with the finding of Tenreyro and Barro (2003) on currency unions: the probability of a country's using the currency of one of the main anchors or adopting other forms of pegs increases when i) the client is geographically closer to the anchor, ii) the client was a former colony of the anchor country, iii) the anchor is richer, iv) the anchor and client belong to a common regional trade arrangement, and v) they speak the same language. Interestingly, an increase in the client's per capita

[17] Our main results of the IV regressions for bilateral trade, output and consumption co-movements do not change qualitatively when we use IVs constructed from the specifications that include the additional variables.

income tends to decrease the propensity to form currency unions, but raise the probability of pegs. A client is more likely to use the currency of an anchor country that has a larger population, but it is less likely to peg its currency to the currency of the more populous anchor country.

From the estimated probabilities in the multinomial logit regressions, we use equation (1) to compute the probabilities that a pair of countries have their currencies pegged to the same currency as in the form of either currency union or peg.
These probabilities are used as instrument variables for the currency union, or peg dummy variable in the regressions.

4. The Effects of Exchange Rate Regimes on Trade

We set up a conventional gravity model of international trade. We adopt Glick and Rose (2002) for the empirical specification. The dependent variable is the logarithm of bilateral trade. The various measures of size and distance are added as control variables that are standard in the gravity equation. We extend the model by adding two dummy variables for pegged exchange rate regimes—currency union and peg. The regression uses annual data for 186 countries from 1974 to 1997.

The data set has a feature of panel structure. We apply two different estimation techniques: random effects and fixed effects. We also control for year effects by adding year dummy variables. The equation estimated is as follows:

$$\begin{aligned}\ln(Trade_{ijt}) = {} & \beta_0 + \beta_1 \ln(GDP_i GDP_j)_t + \beta_2 \ln(GDP_i GDP_j / Pop_i Pop_j)_t \\ & + \beta_3 \ln Dist_{ij} + \beta_4 \ln(Area_i Area_j) + \beta_5 Border_{ij} + \beta_6 Language_{ijt} \\ & + \beta_7 Landlock + \beta_8 Island + \beta_9 ExComColony_{ij} + \beta_{10} ExColony_{ij} \\ & + \beta_{11} CurColony_{ij} + \gamma_1 CuUnion + \gamma_2 Peg_{ijt} + \delta YEAR_t + \varepsilon_{ijt}\end{aligned} \quad (2)$$

where *i* and *j* denote countries, t denotes time, $Trade_{ijt}$ denotes the average value of real bilateral trade between *i* and *j* at time *t*, *GDP* is real GDP, *Pop* is Population, *Dist* is the distance between *i* and *j*, *Area* is the land mass of the country, *Border* is a binary variable which is unity if *i* and *j* share a land border, *Language* is a binary variable which is unity

if *i* and *j* have a common language, *Landlock* is the number of landlocked countries in the country-pair (0, 1, or 2), *Island* is the number of island nations in the pair ((0, 1, or 2), *ExComColony* is a binary variable which is unity if i and j were ever colonies after 1945 with the same colonizer, *ExColony* is a binary variable which is unity if *i* ever colonized *j* or *vice versa*, *CurColony* is a binary variable which is unity if *i* and *j* are colonies at time *t*, *CuUnion* is a binary variable which is unity if *i* and *j* join a currency union at time *t*, *Peg* is a binary variable which is unity if *i* and *j* peg their currencies to a same anchor currency at time *t*, and *Year* denotes a set of binary variables which are unity in the specific year *t*.

Table 2, columns (1) and (2), presents the estimation results for the whole sample including pairs containing the anchor countries. Column 1 shows the results from the random effects estimation. The gravity model fits the data well, explaining a major part of the variation in bilateral trade flows. As predicted by the model, log of GDP in pair, log of per capita GDP in pair, common land border dummy, common language dummy, islands dummy, ex-common colonizer dummy, current-colony-colonizer dummy, and ex-colony-colonizer dummy all turn out to have positive relationship with the volume of trade between two countries. The estimated coefficients on all explanatory variables except islands dummy and current colony dummy are statistically significant at the conventional 5% level. Bilateral distance, log of area in pair, and land locked dummy enter significantly negatively.

Our primary interest is in the impact of exchange rate pegs on bilateral trade volume. The estimated coefficient on the currency union dummy variable is positive and statistically significant. The estimate (0.485, s.e.=0.110) implies that a pair of countries that belong to a same currency union tends to trade more by about 62 percent than a random pair of countries with a floating exchange rate arrangement, holding other things constant.[18] The estimated coefficient on the peg dummy variable is also positive and statistically significant (0.134, s.e.=0.016). The estimated effects of these pegging arrangements on bilateral trade become smaller than that of currency unions: a pair of

[18] Since $e^{0.485}=1.624$, joining a currency union, which implies an increase from 0 (no currency union) to 1, raises bilateral trade by about 62%. This estimate is far smaller than the number found by the seminal Rose (2000) paper, which is based on cross-section data, but close to the panel estimate reported by Glick and Rose (2002) .

pegging countries tends to trade more by about 14 percent than a random pair of floating countries.

Column 2 of Table 2 presents the fixed effect "within" estimates. This method can provide more consistent estimates by controlling for the influences from unobserved country-specific factors. For example, Anderson and van Wincoop (2003) shows that the typical gravity model does not incorporate the 'relative distance effect', i.e. the likelihood that more distant a country pair is located from the world market, they trade more than otherwise. The fixed-effect estimation can provide consistent-estimates by controlling for the missing (time-invariant) relative distance term. In addition, this estimate from time-series variation is useful in answering the question of "what would happen to two countries' trade after they peg their currencies to a same anchor currency?" One drawback of this fixed-effect approach is that since the fixed effect estimator exploits variation over time, we cannot obtain the estimates for time-invariant factors such as distance, area, land border, and ex-colonial relationship.

The estimation result in column 2 is in general similar to that of the random-effects estimation in column 1. The estimated coefficient of the currency union variable is slightly reduced in magnitude (0.339, s.e.= 0.126), which implies joining a currency union raises bilateral trade by 40%. On the contrary, the fixed effects estimate of the peg variable (0.162, s.e.= 0.016) is slightly larger in magnitude than the random effects estimate.

Table 2, columns (3) and (4), reports the same estimation results for the sample exclusive of the anchor countries. The estimation results are remarkably similar. The estimated coefficients of the currency union and the peg dummy are all statistically significant at 1 percent. [19] As emphasized, the estimation results are less vulnerable to the endogeneity problem.

In sum, the empirical results show that after two countries peg their currencies to a same anchor currency, their bilateral trade increases considerably. The empirical results

[19] This result contrasts to the finding by Klein and Shambaugh (2004) in which the 'indirect' fixed exchange rate arrangements between the client countries pegging to a common anchor do not have a significant effect on bilateral trade, whereas the 'direct' peg regimes between the anchor and the client countries have a significantly positive effect on trade. The interpretation of their finding is, however, not clear because their specification controls for the effect of exchange rate volatility on trade separately and thereby ignores the possible effect of peg regime on trade through lowering exchange rate volatility.

imply that low exchange rate variability between two countries with pegged exchange rate arrangements helps them trade more. Currency union, the strictest form of peg, has the largest trade-creation effect.

In order to control for endogeneity bias, we also implement the IV regressions. The instruments are generated by the probability that two countries share a common anchor currency estimated from the multilogit regression, as explained in Section 3.The results of IV regressions is shown in columns (5) and (6) in Table 2, which can be compared to the OLS results in columns (1) and (2) in Table 2. The IV regression results in columns (5) and (6) confirm the OLS estimation results that both the currency unions and pegged exchange rate arrangements increase bilateral trade significantly. Hence, the positive effects of pegged regimes on trade in OLS estimation do not reflect the reverse causality that runs from trade to the choice of pegged regimes, or the influence of any omitted characteristics. In the instrument-variable estimation, the estimated coefficients on currency union and pegged regime dummy variables go up substantially. The random-effect IV estimates are 1.481 (s.e.=0.716) and 0.845 (s.e.=0.228) for currency unions and pegged regime respectively. The estimates become even larger in the fixed-effect IV estimation. The larger IV estimates for the effect of currency unions on bilateral trade are consistent with Tenreyro and Barro (2003). They offer possible explanations of the underestimation bias with OLS. For example, economies with higher degrees of monopoly distortions tend to have smaller trade, while they more likely join currency unions to eliminate the inflation bias generating from the high distortion.

5. The Effects of Exchange Rate Regimes on Output and Consumption Co-movements

By altering the exchange rate regime, the business cycle dynamics of output and consumption are also affected. Especially we will investigate how the choice of the exchange rate regime influences co-movements of output and consumption across countries. In the literature at least three distinct channels have been emphasized through which the exchange rate regime influences output and consumption co-movements. First, as shown in the previous section, if trade integration can be enhanced by currency union

or the peg regime, this can also affect output co-movement. It is, however, ambiguous if more trade would increase or decrease the extent of output co-movement. The positive spillover effect of aggregate demand shocks through trade tends to make business cycles more correlated across countries. Deeper trade integration can also stimulate the spread of technology shocks internationally, contributing positive co-movement. On the other hand, as Eichengreen (1992), Kenen (1969) and Krugman (1993) argued, an increase in trade linkages may encourage greater specialization of production, resulting in less synchronization of business cycles. However, Frankel and Rose (1998) and Shin and Wang (2004) countered the above argument, insisting that if intra-industry trade was more pronounced than inter-industry trade, business cycles would become more positively correlated as trade integration strengthens. While the theoretical predictions are varied and conflicting to each other, most empirical studies find that business cycles are more synchronized as trade integration deepens.

Second, reduced currency risk due to strict exchange rate regimes such as currency union may lead to enhanced financial integration, affecting business cycles co-movement as well. As suggested by Kalemli-Ozcam, Sorensen and Yosha (2001), better income insurance attained through greater capital market integration may induce higher specialization of production and hence larger asymmetric shocks across countries. Through this channel the extent of output co-movement is lowered. Due to increased risk sharing, however, consumption co-movement may increase or at least not decrease as much as output co-movement does. As argued by Imbs (2004), however, if capital flows are correlated internationally, financial integration may synchronize output co-movement.

Third, with a tightly integrated capital market, if a country adopts a hard peg regime, autonomy of monetary policy is forsaken and hence monetary policy shocks become common to member countries.[20] This will contribute to greater co-movement of output. However, arguments may run in the opposite direction. That is, since idiosyncratic internal shocks are not dampened by independent monetary policy and external shocks are transmitted across countries without being mitigated by exchange rate movements, outputs can move in more asymmetric way with a pegged regime.

[20] Shambaugh (2004) show that pegged countries move interest rates more closely with anchor country's interest rates than nonpegs do.

In sum theoretical predictions on the influence of the exchange rate regime on output and consumption co-movements are varied and conflicting to each other. However, the fact that patterns of business cycle co-movement alter after adopting a particular exchange regime alarms the traditional approach to gauge the choice of exchange regimes based on past data. This is what Frankel and Rose (1998) emphasized as the endogenous nature of a decision to join a monetary union. In other words, since the economic structure is likely to change as a result of a monetary union, even a country that is not eligible for entry into a monetary union *ex ante* can justify its decision *ex post* after adopting a monetary union. Hence it is crucially important to understand in advance how the patterns of co-movement vary under the various exchange rate regimes.

To compute output co-movement, we follow a similar approach to Alesina, Barro and Tenreyro (2002) and Tenreyro and Barro (2003). Relative output movements between countries *i* and *j* are measured by subtracting output growth for country j from that for country i: $\Delta \ln(Y_{it}) - \Delta \ln(Y_{jt})$. Then for every pair of countries, (i, j), we compute the second-order auto-regression of the annual time series for each country:

$$\Delta \ln(Y_{it}) - \Delta \ln(Y_{jt}) = c_0 + c_1(\Delta \ln(Y_{it-1}) - \Delta \ln(Y_{jt-1})) + c_2(\Delta \ln(Y_{it-2}) - \Delta \ln(Y_{jt-2})) + u_{ijt}^{\ Y} \quad (3)$$

The estimated residual, u_{ijt}, measures the part of the relative output movements that could not be predicted from the two prior values of relative output movements. The extent of output co-movement at each point of time is then measured as the negative of the absolute value of the estimated residual multiplied by 100:

$$CoY_{ijt} = -|u_{ijt}^{\ Y}| \times 100 \quad (4)$$

The extent of co-movement for the entire sample period is also measured by the negative of the root-mean-squared error multiplied by 100:

$$CoY\_SE_{ij} = \sqrt{\frac{\sum_{t=1}^{T} (u_{ijt}^{Y})^2}{T-3}} \times 100 \qquad (5)$$

While most other approaches rely on a simple correlation of output to measure co-movement, Alesina et al. claim that this measure of co-movement is more relevant from the perspective of monetary policy and the choice of the exchange rate regimes. The reason is because output movements can be highly correlated to each other despite substantially different variabilities across countries. In this case, the monetary policy response desired for a low variability country will be insufficient for a high variability country. Thus a higher correlation, for example, does not warrant that two countries can peg the exchange rate to each other and share the same monetary policy.

To investigate the determinants of output co-movement, we employ the same control variables used for the gravity equation for trade.[21] To identify the impact of the exchange rate regimes, we also add the three dummy variables of the exchange rate regimes as regressors. We employ two types of estimation based on the panel regression and cross-section regression respectively. The first type of equation for the panel analyses is as follows:

$$\begin{aligned} Co\_Y_{ijt} &= Other\ Control\ Variables_t \\ &+ \gamma_1 CuUnion + \gamma_2 HardPeg_{ijt} + \gamma_3 SofPeg_{ijt} + \delta YEAR_t + \varepsilon_{ijt} \end{aligned} \qquad (6)$$

The second type of equation for the cross section regression is as follows:

$$\begin{aligned} Co\_Y\_SE_{ij} &= Mean\ of\ Other\ Control\ Variables_{ij} \\ &+ \gamma_1 \overline{CuUninon}_{ij} + \gamma_2 \overline{HardPeg}_{ij} + \gamma_3 \overline{SoftPeg}_{ij} + \varepsilon_{ij} \end{aligned} \qquad (7)$$

[21] While the theoretical basis for the gravity equation in explaining trade flows is well documented, to our knowledge, there is no theoretical justification in using the gravity equation to explain either output or consumption co-movement, and it is at best considered as a reduced form equation. Therefore, to verify the role of the exchange rate regimes, it is important to develop the instrumental variables for them.

where $\overline{CuUninon_{ij}}$, $\overline{HardPeg_{ij}}$ and $\overline{SoftPeg_{ij}}$ are the average of each dummy variable for the entire sample.

Despite the similarity with the approach made by Alesina et al., there are two main differences between our approach and theirs. First, they measure the relative output movements based on the level instead of the growth rate. While their measure captures both temporary and permanent components of output movements, they need the purchasing power parity (PPP) exchange rate to compare the levels of output across countries. Our measure instead relies on real output at the constant local currency unit that requires information about neither the official exchange rate nor the PPP exchange rate. However, by using the growth rate, the temporary movements of output are eliminated. Second, by focusing solely on equation (7), Alesina et al. are based on cross-section regression only. However we also utilize information in (6) at each time of the period, and hence can also adopt a panel regression approach, which allows us to eliminate unobserved country specific effects.

The estimated results for the whole sample including the anchor countries are reported in table 3. Since regression results with fixed-effects are similar, column 1 reports regression results with random effects only. The cross-section regression results are reported in column 2. In both regressions, the sign of the coefficient of the log distance is unexpectedly positive and statistically significant. On the other hand, the other coefficients lead to interesting interpretations. In both regressions, the higher the log of aggregate or per capita GDP in pair, the greater is output co-movement between pairs. This suggests that higher income countries tend to have higher co-movement of output. Interestingly, however, the log of area in pair has a negative impact on the extent of output co-movement. Further, the fact that the pair countries are colonized by a common country leads to lower output co-movement. The coefficients of other colony dummy variables are not statistically significant at 5 %. The RTA dummy variable also contributes to higher co-movement of output.

Our main concern is about the impact of exchange rate regimes on output co-movement. The estimated coefficient on the currency union dummy variable is not statistically significant. This suggests that, unlike the case for trade, currency union does not lead to higher output co-movement. On the other hand, the coefficient of the peg

dummy variable is positive and statistically significant in both regressions. Overall our regression results suggest that only the peg regime has a strong evidence of enhancing output co-movement.

Table 4, columns (3) and (4), also reports the regression results for the same equations using the sample exclusive of the anchor countries. Generally we find very consistent results as we find in columns (1) and (2). The estimated coefficients of other control variables are remarkably similar to the results for the sample including the anchor countries. The estimated coefficient on the currency union dummy variable is not statistically significant and even negative in the random effects regression. On the other hand the coefficient of the peg regime is positive and highly significant.

The columns (5) and (6) report the IV regression results. The IV regression results are distinctive from the OLS results in a number of aspects. First, the coefficient of log of distance is no longer significant. Second, the coefficient of log of area is less significant and shows the opposite sign in the cross section equation. Last and most importantly, while the coefficient of the pegged dummy is still positive and significant, the coefficient of the currency union dummy is negative and highly significant.

Overall our results suggest that only the peg regime contributes to higher co-movement of output and that the currency union, the strictest form of pegging, does not. The IV regression results suggest that the currency union makes output co-movement even lower. Since increased trade has been found to strengthen output co-movement in a number of empirical studies, the fact that the currency union that boosts trade most does not contribute to higher output co-movement looks puzzling. To shed light on this issue further, Table 4 reports additional regression results for the equation where, instead of all explanatory variables for the gravity equation of trade, we put the bilateral trade directly as a regressor. Again all the six regression results are reported in columns (1)-(6). As expected, the coefficient of trade is positive and highly significant. Interestingly the RTA dummy, after controlling trade, has no explanatory power except for one case. However the coefficient of the currency union dummy is negative and statistically very significant. On the other hand, the coefficient of the peg regime is positive and statistically very significant.

Our results strongly suggest that there exist other channels, in addition to an increase in bilateral trade, by which the currency union regime affects on output co-movement. As suggested at the beginning of this section, if currency union particularly leads to higher risk sharing through financial integration, the currency union regime, after controlling the trade effect, may lead to lower output co-movement by encouraging higher specialization in industries. The significantly positive coefficient of the peg regime also implies that, besides the trade channel, the peg regime influences output co-movement by additional channels which induce even more synchronization of business cycle across countries. For example, it is possible that the peg regime leads to more output co-movement due to common monetary shocks.[22] As explained, interest rates tend to move closely among the countries with hard peg exchange rate regimes.

While the above interpretation is suggestive, the argument on risk sharing is verified only after we compare the extent of output co-movement with that of consumption co-movement. We measure the extent of consumption co-movement in a similar way. That is, we calculate the relative consumption movement between countries i and j by subtracting consumption growth for country j from that for country i: $\Delta \ln(C_{it}) - \Delta \ln(C_{jt})$. Then we estimate the second order auto-regressive equation to generate the estimated residual series, u_{ijt}^{C}. The extent of consumption co-movement at each point of time is then measured as the negative of the absolute value of the estimated residual multiplied by 100:

$$CoC_{ijt} = -|u_{ijt}^{C}| \times 100 \qquad (8)$$

The extent of consumption co-movement for the entire sample period is also measured by the negative of the root-mean-squared error multiplied by 100:

[22] The monetary shocks are even more synchronized under currency union. However, this effect seems to be also dominated by the industry specialization effect that leads to lower co-movement of output.

$$CoC\_SE_{ij} = -\sqrt{\frac{\sum_{t=1}^{T}(u_{ijt}^{C})^2}{T-3}} \times 100. \qquad (9)$$

To investigate how the exchange rate regimes influence the extent of consumption co-movement, we run a similar panel regression as follows:

$$\begin{aligned} Co\_C_{ijt} &= Other\ Control\ Variables_t \\ &+\gamma_1 CuUnion + \gamma_2 HardPeg_{ijt} + \gamma_3 SofPeg_{ijt} + \delta YEAR_t + \varepsilon_{ijt} \end{aligned} \qquad (10)$$

Alternatively we estimate the following cross section regression as well:

$$\begin{aligned} Co\_C\_SE_{ij} &= Mean\ of\ Other\ Control\ Variables_{ij} \\ &+\gamma_1 \overline{CuUninon}_{ij} + \gamma_2 \overline{HardPeg}_{ij} + \gamma_3 \overline{SoftPeg}_{ij} + \varepsilon_{ij} \end{aligned} \qquad (11)$$

The regression results for the whole sample including the anchor countries are reported in Table 5. Again since regression results with fixed-effects are similar, we report only the regression results with random effects in column (1). The cross-section regression results are also reported in the next column. We also report the regression results for the sample excluding the anchor countries in columns (3) and (4), Table 5. These regression results are remarkably consistent with each other. In all the regressions, unlike the case for output co-movement, the sign of the coefficient of the log distance is negative but statistically insignificant. The coefficients of other control variables, however, have generally the same sign. In all the regressions, the higher the log of aggregate or per capita GDP in pair, the greater is consumption co-movement between pairs. The log of area in pair has again a negative impact on the extent of consumption co-movement. Further, the fact that the pair countries are colonized by a common country leads to lower consumption co-movement. There is also a weak evidence that the ex-colony-colonizer relationship and the RTA lead to lower consumption co-movement.

Our main focus is on the impact of exchange rate regimes on consumption co-movement. An important result is that, unlike the case of output co-movement, the OLS

regression results in columns (1)-(4), whether of all sample or of sample exclusive of anchor countries, show that the estimated coefficient of the currency union dummy variable is positive and statistically significant even at 1 percent level. This suggests that, unlike the case for output co-movement, currency union does lead to higher consumption co-movement. The coefficient of the peg dummy variable is also positive and statistically significant in all the regressions. Comparing the output co-movement regression results the extent of consumption co-movement is enhanced in a similar magnitude.

Generally if output co-movement increases, we can also expect that consumption co-movement increases as well. This happens, for example, even in the extreme case of autonomous economies where each country consumes its own output. Risk sharing is enhanced only when the extent of consumption co-movement is even more strengthened than that of output co-movement.[23] In this regard, only currency union shows evidence of enhanced risk sharing. Under currency union, even if output co-movement may get lowered due to possible specialization of output, consumption co-movement gets stronger, which is interpreted as strong evidence of risk sharing. Under the peg regime, while consumption co-movement increases, the extent of the increase in consumption co-movement is more or less similar to that for output co-movement, thereby providing little evidence of enhanced risk sharing.

In columns (5) and (6), Table 5, we also report the IV regression results. Generally the coefficients of other control variables are estimated very consistently with those in the OLS estimation. However the coefficient of the RTA dummy is negative and statistically significant. In addition, the coefficient of the currency union dummy changes the sign and becomes insignificant. However, if we just compare the IV regression results across output and consumption co-movements, while the coefficient of the currency union dummy in the output co-movement regression is negative and statistically significant, the coefficient of the currency union dummy in the consumption co-movement regression is negative but statistically insignificant. In other words, while output co-movement gets lowered, there is no statistically significant evidence that

[23] This simple approach of comparing output co-movement with consumption co-movement to measure the degree of risk sharing has been widely adopted in the literature. For example, see Backus , Keho and Kydland (1992) for *inter*national risk sharing and Hess and Shin (1998) for *intra*national risk sharing.

consumption co-movement is also lowered under the currency union regime. We interpret this as evidence of risk sharing under currency union because consumption co-movement is not aggravated as much as output co-movement is. On the other hand, the evidence on the peg regime is mixed. Comparing to the estimates in Table 3 for output co-movement, the coefficient of the peg regime dummy is higher in the random effects estimation, but it is lower in the cross section estimation. Hence, unlike in the currency union regime, there is no strong evidence that the peg regime enhances consumption co-movement more than output co-movement.

6. Conclusion

We have investigated how the exchange rate regime influences economic linkages across countries. We divide the exchange rate regime into three classifications: currency union, peg and floating exchange rates. Unlike most studies solely focusing on the relationship between anchor and client countries, the exchange rate regime between any two countries is inferred based on their relationship to the common anchor currency. Then we empirically explore how the various exchange rate regimes impact on bilateral trade, output co-movement and financial integration. Financial integration is measured by the degree of risk sharing reflected in consumption co-movement relative to output co-movement.

We find that, while currency union has the greatest effect, the peg regime also significantly boosts trade. We also find that, while the peg regime contributes to both output and consumption co-movements, the currency union strengthens only consumption co-movement and possibly lowers output co-movement. These findings are interpreted that the currency union, the strictest form of pegged regimes, leads to higher industry specialization and better risk sharing opportunities than the less strict peg regime.

Our findings suggest that the choice of exchange rate regimes significantly influences economic linkages across countries. It is an intriguing question why the currency union and the peg regimes show some similarities and differences as well. We conjecture that the strong commitment reflected in the currency union plays a role in

answering the question. A formal investigation in this venue is, however, left for future research.

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Table 1: Summary Statistics

(a) Whole Sample (N=119,677): 1974-1997

	Mean	Std. Dev
Log of trade	10.129	3.488
Log of distance	8.235	.775
Log of GDP in pairs	48.304	2.651
Log of per capita GDP in pairs	16.311	1.410
Log of area in pairs	24.122	3.213
Common land border dummy	.023	.149
Common language dummy	.202	.402
Landlocked dummy	.248	.467
Island dummy	.362	.547
Ex-common colonizer dummy	.085	.278
Ex-colony-colonizer dummy	.020	.140
Current colony dummy	.0004	.021
Regional trade agreement dummy	.016	.127
Currency Union dummy	.009	.093
Soft Peg dummy	.160	.366

Notes: This sample includes all country pairings from 1974to 1997.

(b) Sample without anchor countries (N.=87,644): 1974-1997

	Mean	Std. Dev
Log of trade	9.718	3.353
Log of distance	8.235	.784
Log of GDP in pairs	47.985	2.516
Log of per capita GDP in pairs	16.205	1.403
Log of area in pairs	23.962	3.230
Common land border dummy	.023	.151
Common language dummy	.197	.398
Landlocked dummy	.260	.477
Island dummy	.381	.560
Ex-common colonizer dummy	.095	.294
Ex-colony-colonizer dummy	.007	.084
Current colony dummy	.0001	.007
Regional trade agreement dummy	.015	.120
Currency Union dummy	.009	.094
Soft Peg dummy	.161	.367

Notes: This sample includes all country pairings from 1974 to 1997 that exclude pairs containing one of the five anchors considered in the study.

Table 2: Effects of Exchange Regimes on Trade Flows

	(1)	(2)	(3)	(4)	(5)	(6)
	All Sample		**Anchor Countries Excluded**		**IV estimates**	
	Random Effects	Fixed Effects	Random Effects	Fixed Effects	Random Effects	Fixed Effects
Log of distance	-1.378** (0.030)	--	-1.395** (0.031)	--	-1.344** (0.028)	
Log of GDP in pair	0.969** (0.012)	0.648** (0.036)	0.959** (0.013)	0.699** (0.040)	0.969** (0.012)	0.673** (0.038)
Log of per capita GDP in pair	0.256** (0.015)	0.284** (0.034)	0.284** (0.016)	0.280** (0.038)	0.273** (0.015)	0.217** (0.041)
Log of area in pair	-0.114** (0.010)	--	-0.120** (0.011)	--	-0.1138** (0.010)	
Common language	0.372** (0.060)	--	0.323** (0.064)	--	0.280** (0.057)	
Common land border	0.607** (0.153)	--	0.711** (0.161)	--	0.542** (0.136)	
Landlocked	-0.373** (0.042)	--	-0.328** (0.043)	--	-0.335** (0.037)	
Islands	0.056 (0.048)	--	0.040 (0.050)	--	0.065 (0.043)	
Ex-common colonizer	0.271** (0.079)	--	0.336** (0.082)	--	0.229** (0.082)	
Ex-colony-colonizer	1.871** (0.185)	--	1.608** (0.316)	--	1.866** (0.162)	
Current colony	-0.327 (0.242)	-0.348 (0.244)	0.372 (0.588)	0.444 (0.588)	-0.410 (0.257)	-0.562* (0.256)
Regional trade agreement	0.391** (0.059)	0.285** (0.062)	0.405** (0.068)	0.270** (0.071)	0.305** (0.070)	0.181* (0.075)
Currency union	0.485** (0.110)	0.339** (0.126)	0.546** (0.122)	0.402** (0.144)	1.481* (0.716)	2.295** (0.709)
Peg	0.134** (0.016)	0.162** (0.017)	0.131** (0.017)	0.159** (0.018)	0.845** (0.228)	1.008** (0.291)
No. Observations	119,677	119,677	106,165	106,165	119,677	119,677
R-squared	0.662	0.562	0.614	0.499	0.513	0.513

Notes: The dependent variable is the log of real bilateral trade. In columns (1) and (2), the panel data estimation techniques are applied to all samples of annual observations over the period from 1974 to 1997. Columns (3) and (4) are based on the sample that excludes the five potential anchor countries: France, Germany, South Africa, the United Kingdom, and the United States. The panel IV estimation techniques are applied to columns (5) and (6). Intercept and year dummy variables are included (not reported). Robust standard errors of the estimated coefficients are reported in parentheses. ** and * indicate that the estimated coefficients is statistically significant at 1 % and 5 % respectively.

Table 3: Effects of Exchange Regimes on Business Cycle Co-movements

	(1)	(2)	(3)	(4)	(5)	(6)
	All Sample		**Anchor Countries Excluded**		**IV estimates**	
	Random Effects	Cross Section	Random Effects	Cross Section	Random Effects	Cross Section
Log of distance	0.282**	0.314**	0.262**	0.329**	0.025	0.179
	(0.047)	(0.070)	(0.050)	(0.074)	(0.063)	(0.111)
Log of GDP in pair	0.278**	0.371**	0.239**	0.337**	0.202**	0.091
	(0.019)	(0.028)	(0.021)	(0.031)	(0.034)	(0.080)
Log of per capita GDP in pair	0.130**	0.408**	0.128**	0.409**	0.237**	0.603**
	(0.029)	(0.044)	(0.031)	(0.047)	(0.035)	(0.068)
Log of area in pair	-0.125**	-0.105**	-0.119**	-0.092**	-0.053*	0.046
	(0.016)	(0.022)	(0.017)	(0.022)	(0.022)	(0.050)
Common language	-0.023	-0.140	-0.036	-0.110	0.015	-0.340
	(0.083)	(0.119)	(0.090)	(0.130)	(0.118)	(0.181)
Common land border	0.121	0.392	0.030	0.292	0.066	0.410
	(0.201)	(0.288)	(0.214)	(0.306)	(0.250)	(0.379)
Landlocked	0.694**	0.728**	0.728**	0.775**	0.571**	1.093**
	(0.075)	(0.107)	(0.079)	(0.113)	(0.095)	(0.165)
Islands	0.440**	0.457**	0.409**	0.438**	0.358**	0.456**
	(0.072)	(0.104)	(0.075)	(0.109)	(0.084)	(0.129)
Ex-common colonizer	-0.467**	-0.607**	-0.497**	-0.642**	0.091	0.496
	(0.130)	(0.183)	(0.133)	(0.188)	(0.217)	(0.535)
Ex-colony-colonizer	-0.188	-0.207	-0.028	-0.056	-0.324	-0.221
	(0.209)	(0.303)	(0.361)	(0.563)	(0.248)	(0.383)
Current colony	0.359	0.836	1.571	8.554	1.453	3.151
	(0.961)	(2.961)	(2.146)	(34.738)	(0.997)	(3.638)
Regional trade agreement	0.423*	1.232**	0.394*	0.871*	-0.434	0.057
	(0.171)	(0.368)	(0.197)	(0.421)	(0.236)	(0.674)
Currency union	0.095	0.401	-0.055	0.345	-5.547**	-15.747**
	(0.263)	(0.463)	(0.283)	(0.489)	(1.980)	(6.139)
Peg	0.842**	1.683**	0.912**	1.906**	2.274**	6.452**
	(0.059)	(0.159)	(0.063)	(0.175)	(0.675)	(1.512)
No. Observations	91,431	91,431	73,813	73,813	80,820	80,820
R-squared	0.07	0.31	0.06	0.30	0.05	0.30

Notes: The dependent variable is a measure of output co-movement explained the main text. The panel data estimation techniques are applied to the entire sample of 91,431 observations in 4,592 country-pair groups over the period from 1974 to 1997. See also the notes to table 2.

Table 4: Effects of Trade and Exchange Regimes on Business Cycle Co-movements

	(1)	(2)	(3)	(4)	(5)	(6)
	All Sample		**Anchors Excluded**		**IV Estimates**	
	Random Effects	Cross Section	Random Effects	Cross Section	Random Effects	Cross Section
Log of bilateral trade	0.076** (0.010)	0.252** (0.017)	0.043** (0.011)	0.210** (0.019)	0.065** (0.015)	0.115** (0.033)
Regional trade agreement	0.079 (0.169)	0.076 (0.361)	-0.044 (0.194)	-0.552 (0.410)	-0.642** (0.238)	-0.862 (0.708)
Currency union	-1.163** (0.261)	-2.339** (0.460)	-1.341** (0.278)	-2.435** (0.483)	-6.127** (2.027)	-22.937** (6.974)
Peg	0.823** (0.059)	1.549** (0.164)	0.886** (0.064)	1.781** (0.179)	2.609** (0.690)	8.682** (2.081)
No. Observations	91,431	91,431	73,813	73,813	80,820	80,820
R-squared	0.04	0.23	0.04	0.22	0.05	0.04

Notes: The dependent variable is a measure of output co-movement explained the main text. The panel data estimation techniques are applied to the entire sample of 91,431 observations in 4,592 country-pair groups over the period from 1974 to 1997. See also the notes to table 2.

Table 5: Effects of Exchange Regimes on Consumption Co-movements

	(1)	(2)	(3)	(4)	(5)	(6)
	All Sample		**Anchor Countries Excluded**		**IV estimates**	
	Random Effects	Cross Section	Random Effects	Cross Section	Random Effects	Cross Section
Log of distance	-0.063	-0.035	-0.060	-0.043	-0.005	-0.154
	(0.063)	(0.090)	(0.066)	(0.095)	(0.083)	(0.132)
Log of GDP in pair	0.593**	0.747**	0.576**	0.728**	0.462**	0.556**
	(0.026)	(0.037)	(0.028)	(0.041)	(0.046)	(0.095)
Log of per capita GDP in pair	0.102**	0.137**	0.131**	0.172**	0.143**	0.172**
	(0.039)	(0.058)	(0.041)	(0.061)	(0.043)	(0.075)
Log of area in pair	-0.222**	-0.228**	-0.218**	-0.219**	-0.144**	-0.126*
	(0.021)	(0.029)	(0.022)	(0.030)	(0.316)	(0.060)
Common language	-0.174	-0.064	-0.193	-0.065	-0.506**	-0.441
	(0.110)	(0.154)	(0.118)	(0.167)	(0.154)	(0.231)
Common land border	-0.026	0.136	-0.090	0.102	0.144	0.235
	(0.273)	(0.384)	(0.289)	(0.407)	(0.316)	(0.466)
Landlocked	0.271**	0.260**	0.279**	0.265**	0.536**	0.626**
	(0.099)	(0.139)	(0.099)	(0.147)	(0.122)	(0.204)
Islands	0.608**	0.745**	0.574**	0.709**	0.541**	0.765**
	(0.094)	(0.133)	(0.099)	(0.139)	(0.104)	(0.153)
Ex-common colonizer	-0.851**	-1.074**	-0.872**	-1.154**	-0.568*	-0.099
	(0.274)	(0.237)	(0.175)	(0.242)	(0.287)	(0.560)
Ex-colony-colonizer	-0.626*	-0.849*	-0.819	-0.985	-0.519*	-0.773
	(0.274)	(0.390)	(0.472)	(0.720)	(0.303)	(0.455)
Current colony	-0.190	-0.017	-1.819	-47.083	-0.839	2.378
	(1.470)	(3.850)	(3.147)	(47.573)	(1.579)	(4.387)
Regional trade agreement	-0.374	-0.424	-0.502	-0.515	-1.247*	-1.528*
	(0.233)	(0.468)	(0.269)	(0.533)	(0.328)	(0.754)
Currency union	0.900*	1.466**	1.029**	1.580**	-3.791	-10.554
	(0.357)	(0.603)	(0.378)	(0.628)	(2.647)	(6.447)
Peg	1.017**	1.362**	1.072**	1.505**	4.485**	5.946**
	(0.080)	(0.201)	(0.085)	(0.220)	(0.977)	(1.882)
No. Observations	83,557	83,557	71,322	71,322	74,891	74,891
R-squared	0.07	0.30	0.06	0.29	0.04	0.10

Notes: The dependent variable is a measure of consumption co-movement explained the main text. The panel data estimation techniques are applied to the entire sample of 91,431 observations in 4,592 country-pair groups over the period from 1974 to 1997. See also the notes to table 2.

Appendix Table: Multinomial Logit Estimates of the Propensity of Adopting the Currency of Main Anchors

	Currency-Union (regime=1)	Peg (regime=2)
Log distance	-4.957**	-1.767**
	(1.128)	(0.265)
Common land border	-4.483**	-0.773
	(1.557)	(0.677)
Common language	0.828	1.305**
	(1.723)	(0.409)
Ex-colony-colonizer	6.315**	2.014**
	(2.238)	(0.483)
Regional trade agreement	4.102**	1.831**
	(0.721)	(0.558)
Log of anchor's GDP per capita	14.11	12.78**
	(8.68)	(1.78)
Log of anchor's population	21.41**	-4.154**
	(7.72)	(1.111)
Log of anchor's area	-5.775	1.696**
	(3.317)	(0.435)
Log of client's GDP per capita	-0.436	0.182*
	(0.237)	(0.092)
Log of client's population	-0.649	-0.012
	(0.381)	(0.147)
Log of client's area	0.416	-0.167
	(0.221)	(0.102)
Number of Observations	17,092	
Pseudo R^2	0.397	

Note: the sample consists of country-pairs that include five potential anchors: France. Germany, South Africa, United Kingdom, and the United States. The estimation is for annual data over the period from 1974 to 1997, and allows for clustering over time for country pairs. Intercept and year dummy variables are included (not reported). ** and * indicate that the estimated coefficients is statistically significant at 1 % and 5 % respectively.