May, 2012

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American Economic Review: Papers & Proceedings 2012, 102(3): 179–185
http://dx.doi.org/10.1257/aer.102.3.179

CURRENCY UNIONS AND MACROECONOMIC POLICIES[‡]

Real Exchange Rate Adjustment in and out of the Eurozone[†]

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In recent years, the viability of the eurozone as a currency union has been called into question, at least partly on the grounds that the use of a common currency throughout Europe leads to real exchange rates that are more misaligned than would occur under freely floating exchange rates. Many of the arguments refer back to the case for flexible exchange rates in Friedman (1953), based on the notion that nominal exchange rate flexibility will allow for efficient adjustment in terms of trade even when nominal goods prices are sticky. While there are many dimensions to the optimum currency area question, space considerations allow us to focus only on the question of whether countries in a currency union, and specifically the eurozone, have worse outcomes for real exchange rates than if they were to adopt freely floating exchange rates.

Friedman's argument in this dimension is based on two assumptions that are clearly violated in the world today, especially within Europe. The first is that final users of imported goods pay prices that are set and sticky in the exporter's currency, so that in the user's currency the price fluctuates constantly with changes in nominal exchange rates. Even if some traded goods prices are set in the exporter's currency, it is clear that many final users, especially consumers, face prices that are sticky in their own currency. If fluctuations in exchange rates do not affect the user currency price of imported goods, then the exchange rate no longer plays the allocative role in adjustment that was essential for Friedman's defense of flexible exchange rates.

The second assumption of Friedman's is the complete international immobility of capital. In Friedman's exposition, demand for foreign exchange arises only to pay for imported goods. Exchange rate movements in turn lead to terms-of-trade adjustment (because of his assumption that prices are set in producers' currencies), and equilibrium is achieved automatically when demand for imports equals the supply of exports. Complete capital immobility and balanced trade do not well characterize economies in the world today. On the contrary, financial capital flows display both a scale and volatility that dwarfs those of goods trade.

In Section I, we review briefly the recent literature that makes the case that freely floating exchange rates are not optimal. In Section II, we discuss a decomposition of the real exchange rate that illustrates how real exchange rates in a currency union might adjust more efficiently than under floating exchange rates. Section III uses a new source of data on consumer price levels to argue that indeed, real exchange rates within the eurozone adhere fairly closely to the efficient outcome. Section IV discusses these findings. A major caveat of our analysis is that we do not consider times of crisis, within either our model or our data.

I. Optimality of Flexible Exchange Rates

One of the key arguments in Friedman's case for flexible exchange rates is that nominal exchange rate movements can substitute for

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† To view additional materials, visit the article page at http://dx.doi.org/10.1257/aer.102.3.179.

nominal price adjustment when nominal prices are sticky, to achieve optimal terms-of-trade changes. Consider a world of two countries, Home and Foreign. Let an asterisk represent prices denominated in the Foreign currency (while no asterisk indicates prices set in Home currency), with an F subscript referring to the export good of the Foreign country and H being the export good of the Home country. The terms of trade are given by SP_F^*/P_H, where S is the nominal exchange rate, expressed as the Home currency price of Foreign currency.

In Friedman's world, all final buyers in both countries face a relative price of SP_F^*/P_H. He argues that if nominal price adjustment is sluggish, and prices are set in each producer's currency (so P_F^* and P_H do not adjust freely), a freely floating exchange rate will still allow instantaneous adjustment of the terms of trade. Also, in his world, foreign exchange is traded only to obtain imports, so the nominal foreign exchange rate is determined in the market for goods. In this case, S will be determined by the world supply and demand of Home and Foreign goods, and the terms of trade will adjust efficiently.

In the real world, there is much evidence that many final buyers face prices that are sticky in their own currencies, even for imported goods. This is especially true for consumer prices. The imported consumer good, when it reaches the dock, may have been priced in the exporter's currency. But a distributor inevitably reprices the good in the consumer's currency. The relative price of the Foreign good in the Home country is given by P_F/P_H. Both prices may be set in the Home currency when the good is sold in the Home market. Under local currency price stickiness, the relative price of the two goods does not adjust instantaneously when the exchange rate changes. In the Foreign country, both prices are set in the Foreign currency, and again the relative price—P_F^*/P_H^*—does not adjust automatically when exchange rates change. Exchange rate flexibility does not substitute for price flexibility.

Because capital markets are open among advanced countries, the price of foreign exchange is determined as an asset price, not simply as the price that satisfies supply and demand for traded goods. Expectations of the future, and risk premiums, for example, influence nominal exchange rates. When final prices are set in the buyer's currency, nominal exchange rate fluctuations by themselves contribute to deviations from price equality across countries. Expressed in the local currency, Home buyers pay P_F and P_H for Foreign and Home goods, while Foreign buyers pay SP_F^* and SP_H^*. Deviations from price equality that are not driven by differences in costs of delivering the goods to different locations lead to inefficient resource allocation. This deviation from the "law of one price" impedes efficient real exchange rate adjustment. We present evidence that this factor is much more important in the floating exchange rate countries of Europe than within the eurozone itself.

For example, consider a depreciation of the Home currency (an increase in S), caused perhaps by a change in expectations of future monetary policy, and not by any real factor that determines the relative productivity of Home and Foreign firms. In the short run, when prices are set in the buyers' currency, the Home firm finds that its profitability on Foreign sales increases with an increase in S, while the Foreign firm's margins on sales in the Home country are reduced. Owners of Home firms become wealthier, and owners of Foreign firms lose out. Likewise, Foreign lenders of debt denominated in Home currency lose while Home lenders of debt set in Foreign currency win. These changes in wealth do not reward gains in productivity, but instead are capricious reallocations that result from floating exchange rates. The recent New Keynesian open-economy literature has emphasized the desirability of controlling exchange rates as a goal of monetary policy.[1]

II. The Real Exchange Rate Decomposition

The real exchange rate is influenced both by structural differences across countries and shocks that cause relative prices to move over time. Following Engel (1999), we conduct the following decomposition. Let q_t be the log of the consumer based real exchange rate. Define

$$(1) \qquad q_t = (1 - \rho)q_{n,t} + q_{T,t},$$

[1] See, for example, Devereux and Engel (2003); Corsetti and Pesenti (2005); Corsetti, Dedola, and Leduc (2011); and Engel (2011).

TABLE 1—DESCRIPTIVE STATISTICS

EZ	BE	GER	GRE	SPA	FRA	IRE	ITA	LUX	NET	AUS	POR	FIN
Mean	1	1.01	0.87	0.87	1.02	1.07	0.97	1.02	0.97	1.03	0.86	1.16
Standard deviation	0.02	0.03	0.04	0.03	0.03	0.06	0.04	0.02	0.02	0.04	0.02	0.02
Float	DEN	SWE	UK	ICE	NOR	SWI						
Mean	1.3	1.17	1.04	1.3	1.4	1.23						
Standard deviation	0.01	0.05	0.09	0.12	0.05	0.06						

where $q_{n,t}$ is the cross-country difference of the log relative price of nontraded to traded goods within countries, $q_{T,t}$ is the log of the relative price of traded goods across countries, and ρ is the share of traded goods in the CPI. Due to distribution costs in retail, $q_{T,t}$ should also be affected by the relative price of nontraded goods.[2] We may further decompose the second expression as

$$(2)\quad q_{T,t} = ((1-\kappa)/\kappa)q_{n,t} + (\nu - 1)\tau_t + \Delta_t,$$

where κ is the share of wholesale traded goods in the retail traded goods bundle, τ_t is the terms of trade of the home country, and Δ_t represents the deviation from the law of one price in home traded goods. If there is home bias in preferences for traded goods, the preference parameter, ν, is greater than one.

The exchange rate directly enters the real exchange rate decomposition explicitly only to the extent that there are deviations from the law of one price. When prices are preset, and there is local currency pricing, deviations from the law of one price will be associated with unexpected movements in the nominal exchange rate. Thus, in comparing real exchange rate determination within and outside the eurozone, we should expect to see a closer connection between the $q_{T,t}$ and the $q_{n,t}$ in the former than in the latter.

While this decomposition stresses the time series movement in the real exchange rate, we want to emphasize that a similar decomposition can be done in terms of the *level* of the real exchange rate between any two countries. In our data, we see persistent differentials in relative prices among eurozone members as well as in the floating exchange rate group. Again, however, our aim is to determine to what extent the exchange rate regime itself can facilitate the attainment of an efficient real exchange rate, either in levels or in movements over time.

The decomposition above tells us what the channels of real exchange determination will be, but it is silent on the underlying determinants of real exchange rates. Standard theory tells us that in most circumstances, a rise in productivity in a country's traded goods sector will generate a real exchange rate appreciation. Thus, we can also investigate the relationship between q_t and relative productivity in the traded goods sector, compared across countries.

III. Features of European Real Exchange Rates: In and out of the Eurozone

We describe the features of European real exchange rates. The data are constructed by Eurostat, based on the Eurostat PPP project. The frequency is annual, over 1995–2009, and the data are expressed as a ratio of the European average price of each good. Hence, the prices are in levels, so that both cross-section and time-series real exchange rate variation can be examined.[3] Some descriptive statistics for prices are reported in Table 1. The first panel illustrates the average relative price over the sample for each country in the eurozone. A higher number in this table refers to a higher relative price (an appreciated real exchange rate). The standard deviation of the (log) of the real exchange rate for the floaters is considerably higher than that of the eurozone countries.[4]

We explore the behavior of European real exchange rates through the lens of the real

[2] See Berka, Devereux, and Engel (2012) for a full description of this decomposition.

[3] See Berka and Devereux (2011) for a more complete description of the data.

[4] The exception is Denmark, which has the lowest standard deviation of all countries, in or out of the eurozone.

Table 2

		q	q_n	q_T
Panel A. Real exchange rate bilateral pairs				
EZ	Standard deviation	0.13	0.16	0.1
	Correlation matrix	1.0	—	—
		0.77	1.0	—
		0.95	0.53	1.0
Float	Standard deviation	0.17	0.14	0.18
	Correlation matrix	1.0	—	—
		−0.14	1.0	—
		0.96	−0.39	1.0
Mix	Standard deviation	0.18	0.15	0.17
	Correlation matrix	1.0	—	—
		0.3	1.0	—
		0.97	0.04	1.0
		Estimate	p-value	t-statistic
Panel B. Real exchange and productivity				
EZ	constant	0.87	0.02	34.3
	β	0.12	0.02	5.16
	R^2	0.14		
Float	constant	1.11	0.05	21.2
	β	0.08	0.04	2.4
	R^2	0.07		

Notes: Table 2 panel B is a panel regression of the real exchange rate on relative productivity in the traded goods sector to the nontraded goods sector over the 1995–2009 sample. Eurozone countries are Belgium, Germany, Spain, France, Ireland, Italy, Luxembourg, Netherlands, Austria, Portugal, and Finland. Floating rate countries are Denmark, Sweden, the United Kingdom, Norway, and Switzerland.

exchange rate decomposition presented above. Accordingly, we construct values for $q_{n,t}$ and $q_{T,t}$ for each bilateral pair of countries at each time period. Table 2, panel 1 presents some features of bilateral real exchange rates for these decompositions. The table reports the standard deviation for each component of the real exchange rate. This is done separately for the eurozone countries, the floating exchange rate countries, and the group of bilateral pairs in which one of the country pairs contains a floating exchange rate country.[5] The time pattern of real exchange rate variability is determined by differences in country inflation rates and by movements in nominal exchange rates. Here we see a clear difference between the eurozone members and the floating exchange rate countries (or the eurozone-floating combination). The overall real exchange rate and each component is substantially more volatile for the floaters and the eurozone-float combination than for the eurozone members.

How do the separate components of the real exchange rate facilitate equilibrium adjustment of the exchange rate? Under fully flexible prices, there should be no deviations from the law of one price across countries associated with nominal exchange rate volatility. In this case, the traded-goods component of the real exchange rate should principally reflect movement in the bilateral ratio of relative nontraded goods prices, and thus, there should be a high correlation between q_t and $q_{n,t}$, and also between $q_{T,t}$ and $q_{n,t}$. Table 2, panel 1 indicates that these features are observed for the eurozone, but not for the floating exchange rate countries, and not very strongly for the eurozone-float combination. In particular, there is a correlation of 0.77 between q_t and $q_{n,t}$, and 0.53 between $q_{T,t}$ and $q_{n,t}$ for eurozone countries. But for floating countries, the analogous correlations are −0.14 and −0.39, respectively. Thus, for the floating countries, there is scant evidence that real exchange rates are driven by internal relative prices, via

[5] Note that this is a standard deviation both over time and across countries.

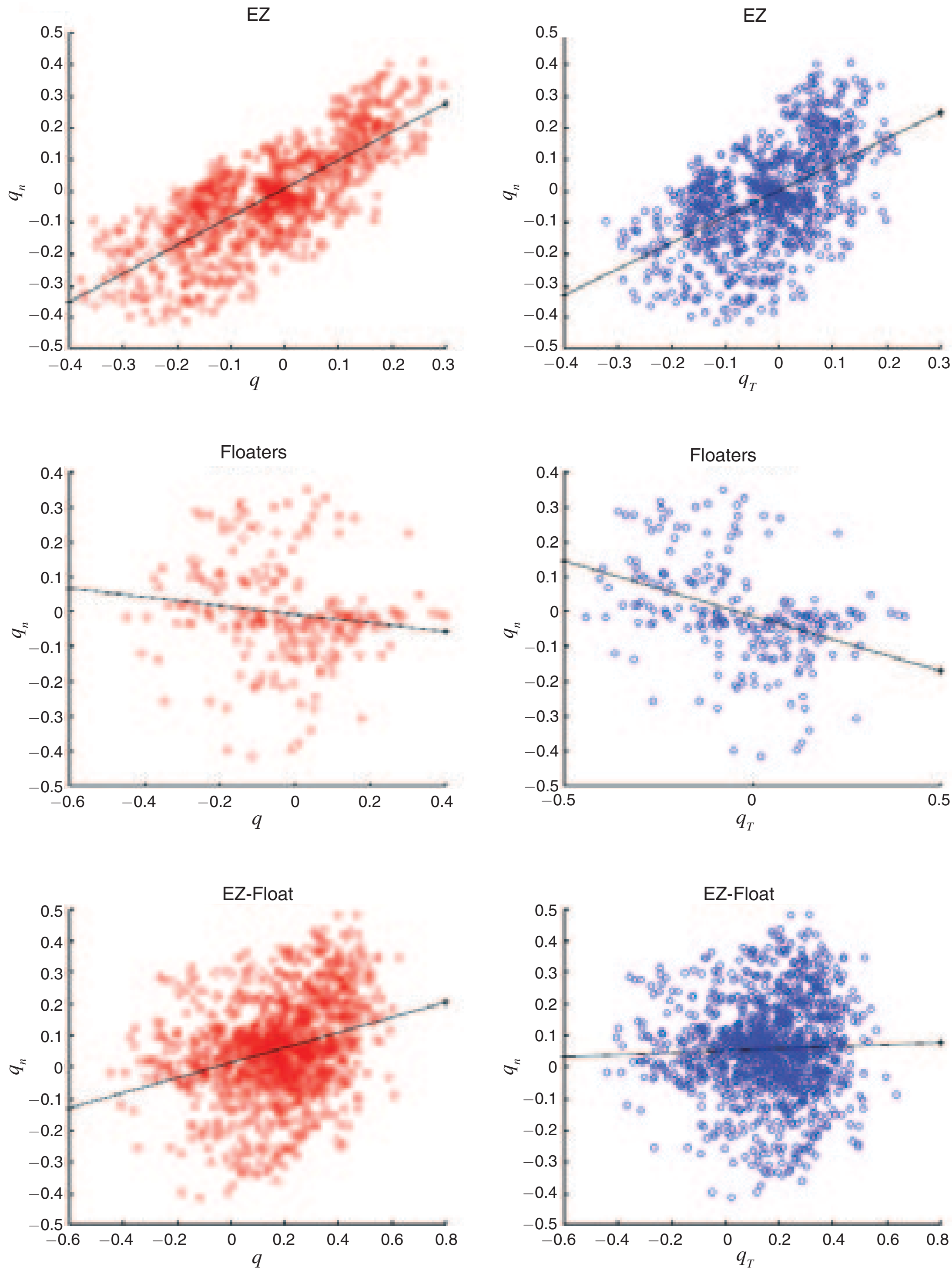

Figure 1. Real Exchange Rate: Eurozone and Floaters

the distribution channel. This is the reason we argue that fixed exchange rates may facilitate better real exchange rates.[6]

The argument is seen more clearly using Figure 1. This shows the scatter plots of q_t and $q_{n,t}$, and $q_{T,t}$ and $q_{n,t}$, respectively, for each grouping of countries. For the eurozone, we see a tight upward-sloping relationship between the real exchange rate and internal relative prices, and also between the traded-goods real exchange rate and internal relative prices. For the floating countries, the relationship is negative, but also much less tight. For the eurozone floating combination, there is a positive relationship, but again much less tight than for the eurozone.

A. *Productivity and Real Exchange Rates*

To see the link between productivity and real exchange rates, we obtained data on sectoral productivity from the Organisation for Economic Cooperation and Development's Structural Analysis STAN database. We constructed measures of labor productivity in each sector, and from this derived a measure of relative productivity in the traded to nontraded goods sector, denoted A_T.

Table 2, panel 2 shows the relationship between real exchange rates and relative productivity in traded goods, for the eurozone countries as well as for the floating exchange rate countries. The table reports results of panel regression for all the eurozone countries over the whole sample (except Greece, which does not have productivity data prior to 2000) of the real exchange rate on relative productivity in traded goods. We see that there is a significant positive coefficient equal to 0.12.

For the floating exchange rate countries (without Iceland) we report the analogous regression. Again here, there is a positive relationship. But the relationship is only half as big as in the eurozone sample, and it is only marginally significant. Moreover, the R^2 is half that in the eurozone. The implication is that, based on these observations, we cannot easily make the case that the eurozone impeded efficient real exchange rate adjustment necessitated by productivity differentials across eurozone countries.

IV. Discussion

Berka, Devereux, and Engel (2012) build a two-sector, two-country dynamic New Keynesian model with local currency pricing (LCP). The model is simulated under three different assumptions: flexible prices; LCP and a currency union; and LCP and flexible exchange rates. The model simulations accord very closely to the relationships in Figure 1 and Table 2. Moreover, prices in the model's efficient, flexible price regime behave very much like those in the model's currency-union regime. On the other hand, the model's flexible exchange rate regime produces real exchange rate outcomes that are far from efficient, but which match our data for the flexible exchange rate countries well. We can conclude that actual real exchange rate patterns within the eurozone are similar to the efficient patterns predicted by the model.

Intuitively, there are three main reasons why the real exchange rates in the currency union are so nearly in line with the real exchange rates under flexible prices. First, the initial accession rates in the eurozone were set in effect to minimize deviations in traded goods prices across countries. Second, relative productivity shocks over time within the eurozone are simply not that big. That is, the equilibrium or flexible-price real exchange rate within the eurozone does not change very much over time. If the initial real exchange rates are near the equilibrium level, then even with no further adjustment of the actual real exchange rates, they will not differ too much from the equilibrium rates simply because the equilibrium rates do not stray very far from the initial levels. Third, nominal prices do adjust over time, so even in a currency union there is real exchange rate adjustment. It is worth emphasizing that the choice of exchange rate regime only matters for real exchange rate adjustment because nominal prices are sticky. The speed of adjustment of real exchange rates is limited only by the speed of adjustment of nominal prices.

In the end, we have not presented a full-blown welfare analysis of currency unions versus floating exchange rates. Our point is that real exchange rate adjustment in a currency union might be superior to that under floating rates.

[6] An important caveat about this comparison is that our sample of floating exchange rate countries is small and contains some special cases, such as Iceland and Norway.

There is no evidence that real exchange rates under floating rates adjust in a desirable way. A currency union might deliver superior performance because it reduces the deviations from price equality for traded goods that occurs under a floating regime. The Friedman argument that floating rates allow efficient real exchange rate adjustment is not supported by the data or by models that are appropriate for the economies of the twenty-first century.

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