

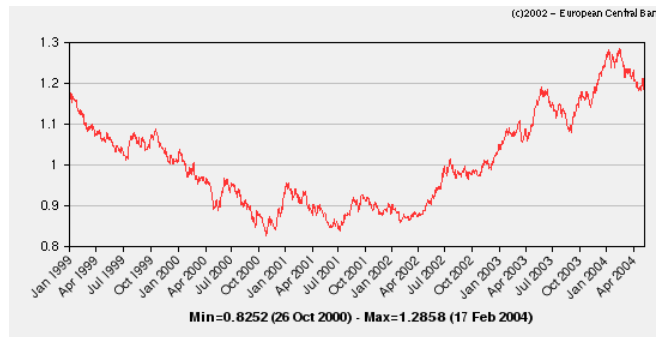
Productivity and the Euro-dollar Exchange Rate

Giancarlo Corsetti
(European University Institute and CEPR)
www.iue.it/Personal/corsetti

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The euro-dollar exchange rate

In the first five year of the European currency, we have already witnessed a sizeable exchange rate swing.



The size of the swing

- The minimum value of the euro-dollar exchange rate was 0.825 (October 2000); the maximum value was 1.285 (February 2004)
- Historically:
 - The D-mark fluctuated between (approximately) 0.60 and 1.40 dollars.
 - The value of the Japanese yen has fluctuated in the range 80-140 yen per dollar.

Questions

- The prolonged US boom in the 1990s has been associated with large productivity growth differentials, real dollar appreciation, trade deficits and the build up of large external stock of net liabilities vis-à-vis the rest of the world.
- The euro was born at the peak of this extraordinary period. According to many, its initial slide vis-à-vis the dollar was to a large extent a reflection of US economic strength.
- To what extent is the dollar depreciation since 2002 a reflection of less optimistic expectations about US productivity and growth relative to the rest of the world? (as opposed to US internal and external debt imbalances?)

In what follows

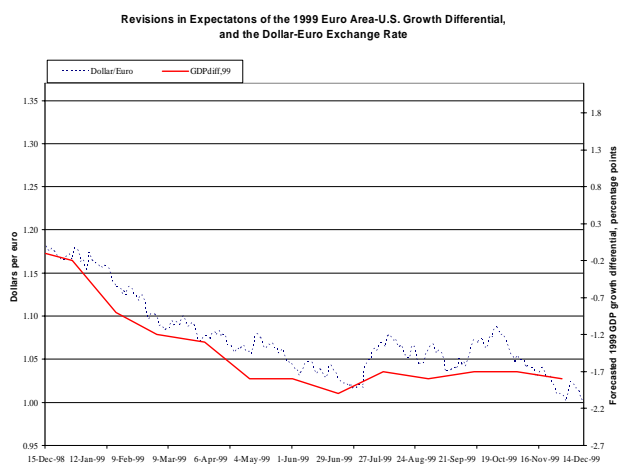
- I will reconsider the link between productivity and exchange rates, both empirically and according to our economic models.
- I will argue that the experience of the 1990s has unveiled surprising and important features of the international transmission mechanism.
- I will end with some considerations on the effect of swings in the dollar exchange rate within the euro area.

Growth and exchange rates a popular model in the 1990's

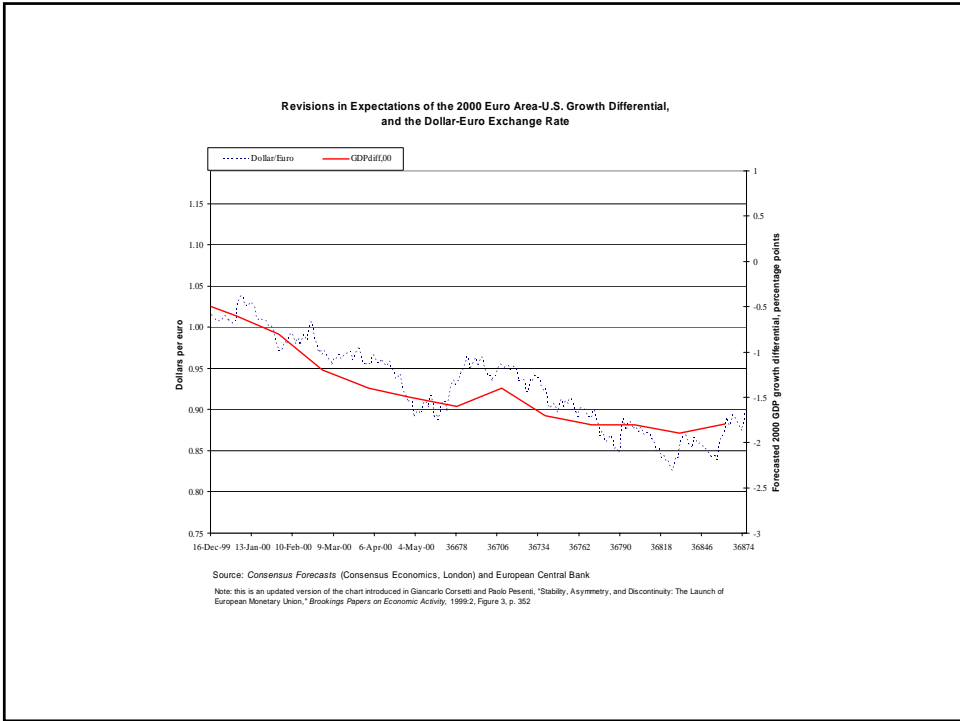
- Explaining exchange rates is a challenge for economists.
- At times 'popular' models emerge among policy makers and practitioners.
- In the second half of the 1990s, a popular model attributed the strength of the dollar to differences in (productivity) growth between the USA and the euro area.

Headline statistics

- Between 1995 and 1999, along with the strong acceleration of US productivity growth, the dollar appreciated 5.8 percent against the euro and 4.8 percent against the yen on a yearly basis.
- In 1999 and in 2000, the euro dollar exchange rate seems to track quite closely differences in revisions of growth expectations --- possibly linked to expectations of productivity growth.
- The following reproduces and updates a graph published in Corsetti and Pesenti (1999).



Source: Consensus Forecasts (Consensus Economics, London) and European Central Bank
 Note: this is an updated version of the chart introduced in Giancarlo Corsetti and Paolo Pesenti, "Stability, Asymmetry, and Discontinuity: The Launch of European Monetary Union," *Brookings Papers on Economic Activity*, 1999:2, Figure 3, p. 352



The 1999-2000 period

- In a period of repeated good news about growth in the US, the dollar appreciates with upward revision of the growth gap relative to the euro area.
- This has been interpreted in terms of ‘crowding out’ (to borrow the terminology of the Mundell-Fleming model):
 - Expectations of persistent productivity growth raise domestic consumption and investment more than domestic supply.
 - Higher international prices are needed to ‘crowd-out’ net export.
- But the bilateral link between the variables in the graph became less apparent in the following years.

A better look at the evidence

- Clearly, there is no “single factor” model of exchange rate determination. In general equilibrium, the exchange rate responds to many shocks --- including productivity.
- But what is the evidence on the response of the US exchange rate to productivity shocks? Let’s look at empirical studies that identify the specific effect of “productivity growth differentials.”

Productivity differentials and the real exchange rate (1)

- Consider the bilateral real exchange rate between the US and the euro area, defined as the ratio between the US CPI and the Euro-area CPI expressed in the same currency.
- Using data from 1985 to 2001, Alquist and Chinn estimate: a one percentage point increase in the US-euro area labor productivity differential results in between a four to five percent real appreciation in the dollar/euro exchange rate.
- Results are not driven by the data at the end of the period. I.e. it is not a feature of the 1990s.

Productivity differentials and the real exchange rate (2)

The following graph is from Alquist and Chinn (2002).
The variable x is the “euro area-US log productivity differentials” appropriately re-scaled.

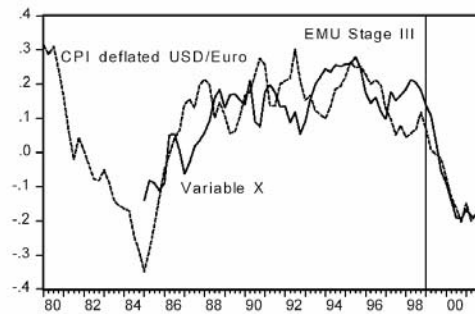


Figure 1: Real Dollar/Euro Exchange Rate and Variable X

Productivity differentials and the real exchange rate (3)

- Results are sensitive to the productivity measures.
- Schnatz et al. at the ECB use alternative measures: they confirms previous studies, but the elasticity of the exchange rate to productivity differentials is somewhat lower: 2.3 instead of 5.

What drives productivity-driven US real exchange rate appreciation?

If the US real exchange rate appreciates in response to productivity gains, to what extent real appreciation can be attributed to changes in

- the price of US nontraded goods?
- the price of US traded (manufacturing) goods, i.e., the US terms of trade?

According to the conventional wisdom, productivity gains in the US should raise the price of US nontraded goods, while a higher supply of tradable output should worsen the US terms of trade.

Is this what we observe in the data?

1. The relative price of nontraded goods

- According to the so-called Harrod-Balassa-Samuelson (HBS) Hypothesis, the real exchange rate does not respond to productivity differentials across borders; but to differences in the productivity gap between sectors producing tradables and nontradables.
- Tille et al. at the NYFed look into this issue. At most, this hypothesis can account for 2/3 of the dollar real appreciation in the 1990s.
 - but many studies find that nontraded goods prices explain a surprisingly little share of real exchange rate movements.
 - also, in the 1990s the US real appreciation appears to be driven mostly by an improvement of the US terms of trade, rather than by nontraded prices.

2. What about the relative price of traded goods?

- According to the ‘conventional view’, if a country becomes more productive, a higher world supply of its goods should reduce their relative prices. The country should experience a deterioration in its terms of trade.
- Notably, this view is implicit in the parameters adopted by theoretical models in both academic and policy institutions.
- Interestingly, there is empirical evidence showing that the US is at odds with this view.

Evidence on the US terms of trade

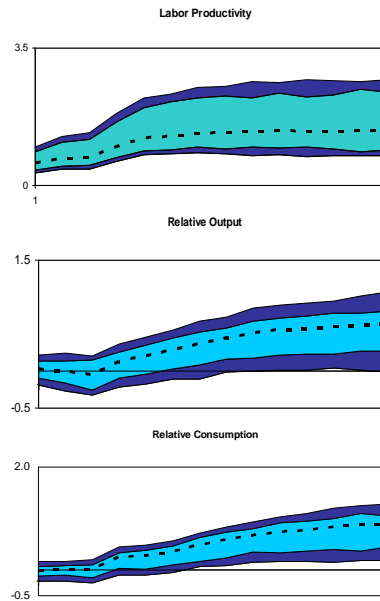
The evidence to follow shows that productivity growth differentials in favor of the US tend to raise the relative price of the US exports, i.e. they tend to improve the US terms of trade.

- Together with Dedola at the ECB and Leduc at the Philadelphia FED, I have analyzed the terms of trade, relative output, relative consumption, the trade balance current account and relative productivity in the tradable sector contrasting the US with the rest of the OECD countries. The sample period is 1970-2000.
- We identify a US productivity shock in the tradable sector using ‘long-run restrictions.’

Effects of US productivity shocks (1)

Consider a shock to US labor productivity in the tradable sector:

This shock raises US output and US consumption relative to other OECD countries

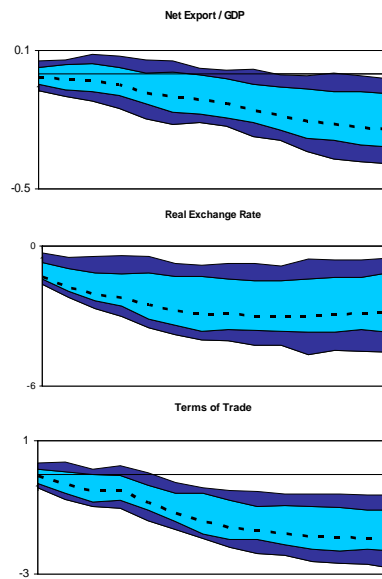


The effects of US productivity shocks (2)

... widens the trade deficit,

... improves the real exchange rate
(in the graph, lower=stronger)

... improves the terms of trade
i.e., the international price of US goods increases.



The effects of a US productivity shock (3)

The results shown do not depend on measures of productivity (Total factor productivity or labor productivity); results are also similar when we change our empirical model adding new variables, or change the way we enter variables (level vs. first-differences).

These results run against the ‘conventional view’: increasing productivity raises US output, without lowering its relative prices.

Possible explanations: quality improvements and differentiation of US exports

A possible explanation (e.g., Krugman) focuses on improvements of the terms of trade due to higher quality of export goods.

- Productivity growth translates into product innovation rather than process innovation.
- Measurement issue: statistics fail to account for quality improvements and product diversification.

These considerations clearly play a role.

But this effect is somehow difficult to derive in open macro macroeconomic models.

A second conjecture: strong wealth effects

A second explanation stresses “wealth effects” from price movements.

To get the intuition underlying these effects, think of national wealth as the present discounted value of national output net of investment, plus net foreign wealth.

- The wealth effect of a productivity improvement that raises physical production depends on the equilibrium effect on output prices.

An intuitive account of the second conjecture (1)

Consider a large country (Home) that consumes most of what it produces. The global demand for Home product is therefore dominated by its own (Home) demand.

Suppose that the price elasticity of Home exports is low. This means that it takes a large fall in its price to raise foreign demand for Home goods.

But a large fall in the international price of Home goods would also tend to reduce Home wealth and consumption.

An intuitive account of the second conjecture (2)

If the Home country produces more output, a fall in its international price may not be an equilibrium: because of the negative wealth effects, the Home demand would not rise enough to bring world demand in line with the increased supply.

In equilibrium, the terms of trade then must improve.

The role of financial markets

It may seem that the 'wealth effect' view would only consider real features of the economy (i.e., goods market characteristics), disregarding financial factors.

This impression is incorrect.

The interpretation above would not make sense if households could completely diversify risk in financial markets: shocks (including productivity shocks) would not alter relative wealth. A positive supply shock in one country would raise both domestic and foreign consumption. Financial market imperfections are therefore essential.

Most important, price movements have strong implications for the value of outstanding net foreign assets/liabilities.

Implications for the international transmission

- Appreciating terms of trade implies that the international transmission of positive productivity shocks is ‘negative’: the rest of the world does not benefit from gains in productivity at Home via lower prices.
- In this sense, terms of trade movements do not provide automatic insurance against ‘productivity risk.’
- But the international transmission may be positive as regards the level of foreign employment and output.
- A low price elasticity of imports/exports implies high volatility of real exchange rates with contained effects on output employment and consumption.

Extreme implications of wealth effects

When wealth effects are strong enough, we may also have ‘pathological’ cases.

Namely, there could be more than one equilibrium exchange rate.

It is possible to build simple examples of large symmetric economies whereas there exists one equilibrium in which the real exchange rate is equal to 1; another equilibrium in which the Home currency is strongly appreciated (up to 40 percent). In the latter equilibrium, differences in output and employment would however be much smaller (1 to 2 percent).

Swings in international prices would follow swings in optimism/pessimism. Crazy view?

A summary and further questions

We have reviewed evidence consistent with the view that productivity is empirically relevant for the euro-dollar exchange rate; unexpected productivity gains tends to appreciate the dollar.

This evidence is a challenge to traditional views of the international transmission. It may be consistent with strong wealth effects from relative price movements.

Unclear implication for 'adjustment': high international price volatility?

Are the US different than the euro area as regards the exchange rate implications of productivity gains?

Dollar depreciation and the euro area (1)

Let me conclude focusing on a different question.

What are the effects of exchange rate swings within the euro area?

European countries differ in terms of openness, composition of exports/imports and market structure.

Swings in the exchange rate may therefore have a different impact on national inflation rate, potentially raising concerns about monetary policy.

Dollar depreciation and the euro area (2)

Indeed Honohan and Lane (2003) have shown that the initial depreciation of the euro appears to be responsible for part of inflation dispersion within the euro area.

However Angeloni and Ehrmann (2004) have recently reconsidered this study, adding one year of data. The previous result is confirmed but seems to be no longer statistically significant.

Is this due to asymmetric effects of appreciation vs. depreciation on inflation? (i.e., a dollar appreciation creates inflation dispersion, a dollar depreciation has less of an impact on inflation?)

‘Polarization’

Yet a dollar depreciation may raise more general issues. As noted by many observers, in the 1980s and 1990s some currencies in Europe (for example, the Italian lira) would strengthen vis-à-vis the D-mark when the dollar was strong, and weaken otherwise.

This view is dubbed “dollar-D-mark polarization”. By reducing the tension in the exchange markets for say, Italian liras, pesetas, and escudos, a strong dollar arguably strengthened cohesion in the European currency area before and during the introduction of the euro.

In this sense, a strong dollar at the end of the 1990s was good news for the birth of the euro.

'Polarization' before/after the euro

But there is also the other side of the coin to consider.

With a weakening dollar, different countries experience different pressures. Before the euro, these led to exchange rate pressures. The European currency crisis in September 1992 followed a "dollar crisis" culminating in August that year. Many of the realignments in the Exchange Rate Mechanism of the European Monetary System were preceded by dollar swings.

If the factors underlying the polarization have not disappeared, sharp downward movements of the dollars are likely to bring about conflicts over the common monetary policy, or, most likely, over fiscal policy.

Implications for the euro area?

How would the euro area react to a sharp further fall of the dollar? Have the factors underlying the dollar-D-mark polarization disappeared with the single currency, or are they still active, potentially affecting real and financial markets?

Unfortunately, we never really understood 'polarization.' But there are potential reasons for concern.

The political balance in the EU and in the euro area is already under stress because of the accession process and the disagreement on a new constitution.

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