

FEDERAL RESERVE BANK OF DALLAS

Globalization and Monetary Policy Institute



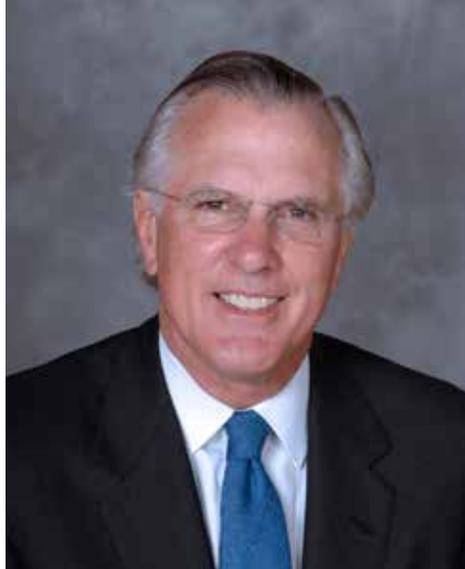
2014 ANNUAL REPORT



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Letter from the President

When I took office as president of the Federal Reserve Bank of Dallas in April 2005, I mandated that the Research Department make the study of globalization and its implications for monetary policy its top priority. Up to that point, the department had a strong emphasis on the study of Latin America, but I believed it important for the Reserve Banks to look beyond their immediate neighborhoods to think about economic developments on a global scale. We created the Globalization and Monetary Policy Institute to leverage our local efforts in Dallas.

As I prepare to step down as president of the Dallas Fed, I look back with great pride on all that the institute has accomplished.

There is no simple answer to the question of how globalization matters for U.S. monetary policy. When I began speaking about this issue, a lot of the emphasis was on the disinflationary impact of the integration of large trading economies such as China into the global trading system. We are now more confident that cheap imports of manufactured goods from China did play an important role in restraining headline inflation in the advanced economies for some time. But we also learned that the overall inflationary effect of the rise of China and other emerging market economies on inflation dynamics was more subtle due to the voracious demands of these countries for raw materials and commodities.

To some extent, the focus on the inflationary consequences of globalization was misplaced. Far more important—in light of subsequent developments—was the extraordinary growth of financial globalization. Prior to the recent global financial

crisis, many worried about the global imbalances that were one manifestation of the growth of financial globalization. Others argued that imbalances were not an important concern, that international financial flows reflected the optimizing decisions of individual investors that presumably knew a lot more about what they were doing than did policymakers. Further, a consensus had emerged in the academic and central banking communities that inflation targeting sufficed to ensure macroeconomic stability.

We now know that the consensus surrounding inflation targeting was mistaken or, at a minimum, incomplete. Cross-border capital flows are not always benign, but rather have the potential to fuel unsustainable asset price bubbles that create challenges for central banks seeking to deliver on their mandates. As I have noted on other occasions, the recent housing boom and bust in the United States would have ended sooner and with less dire consequences for the U.S. economy had it not been for our ability to borrow large amounts of money from foreigners.

Of course, while globalization has presented challenges for policymakers around the world, it has also brought enormous benefits to the citizens of the U.S. and every other country. Globalization has lifted hundreds of millions of people out of poverty and has done more to boost global living standards than any event since the Industrial Revolution of the late 18th and early 19th centuries. The challenge for policymakers worldwide will be to manage the process of globalization so as to cement these gains and limit the destabilizing effects of greater global integration.

Major revolutions in economic theory are

usually prompted by real world developments. The invention of macroeconomics as a field of study in the 1930s was prompted by the perceived inability of classical economics to account for the prolonged periods of high unemployment that many advanced economies experienced during the Great Depression. The emergence of monetarism and the rational expectations revolution of the 1970s were likewise prompted by the inability of the postwar neoclassical synthesis to explain the simultaneous existence of high inflation and high unemployment during the Great Inflation. It is my belief that the Great Recession will likewise precipitate a major shift in the way economists think about the macroeconomy, toward a paradigm where finance and global linkages play a greater role than they do now.

I am very proud of the achievements of our Globalization and Monetary Policy Institute in contributing to advancing our understanding of this important phenomenon through the hundreds of working papers that have been circulated through its working paper series over the past seven years. This year's institute annual report contains essays by three of the senior staff of the institute explaining how their individual research programs have helped advance our understanding of globalization, and I commend them to you highly.

Richard W. Fisher
President and CEO
Federal Reserve Bank of Dallas

Globalization: The Elephant in the Room That Is No More

By Enrique Martínez-García



Unlike what has been conventionally argued, the forces of globalization appear to be—if anything—a headwind to the conduct of monetary policy for the purpose of macroeconomic stabilization.

Several decades of increasing global economic integration—or globalization—have left their mark. Whether this structural shift has altered the conduct of monetary policy or its ability to promote economic stability over the business cycle has long been debated.¹ Woodford (2010), among others, convincingly argued on theoretical grounds that globalization does not necessarily imply a weakening of the ability of national central banks to influence domestic output and inflation. However, the question of monetary policy effectiveness is only part of the story.

As Bernanke (2007) puts it, our current understanding is geared toward the view that “[a]t the broadest level, globalization influences the conduct of monetary policy through its powerful effects on the economic and financial environment in which monetary policy must operate.” Much of the literature—including my own work—has in fact focused on how globalization may have changed the economic environment and, thus, altered the trade-off between output and inflation volatility for monetary policy. It is known that the business-cycle volatility of the largest economies, including the U.S., has shifted significantly during the post-World War II period. The question, then, is to what extent those changes reflect globalization?

This essay draws heavily on the analysis of Martínez-García (2014b), which extensively reviews recent theory and the empirical evidence for the post-WWII period (starting in 1960) to shed light on the role of globalization. Based on data for eight major advanced economies (U.S., U.K., Germany, France, Italy, Spain, Japan and Canada), Martínez-García (2014b) shows a pattern of shifting business cycles partly linked to globalization. While a review of all plausible explanations to account for changes in the business cycle is beyond

the scope of this review, the main takeaway is that no single hypothesis—including globalization—can quantitatively explain the volatility shifts observed since the 1960s.

Globalization, nonetheless, matters for policymaking. To the extent that more open markets have contributed to changes in business-cycle volatility, globalization has also played a role in shifting the trade-offs of monetary policy over time. Furthermore, unlike what has been conventionally argued, the forces of globalization appear to be—if anything—a headwind to the conduct of monetary policy for the purpose of macroeconomic stabilization. They may have even raised the costs of conducting monetary policy. That is not to say that globalization should be viewed negatively, but rather that its impact on the relevant policy trade-offs must be recognized when designing a successful monetary policy.

International Business Cycles: What Has Changed and Why It Matters

Business-cycle volatility is often described with the standard deviation that reflects how spread out data are around the average. Over time, how dispersed the data appear (the volatility) may change, but so can the averages. Martínez-García's (2014b) estimates of volatility (conditional standard deviations) are based on the robust model specification proposed by Stock and Watson (2003a, b) to identify volatility shifts whenever the central tendency (conditional mean) is also changing.² I reproduce those conditional standard deviation estimates of quarterly real gross domestic product (GDP) growth in Chart 1 and of quarterly inflation—derived from the GDP deflator—in Chart 2 to illustrate changes in business-cycle volatility in the U.S. and the other seven major advanced economies.

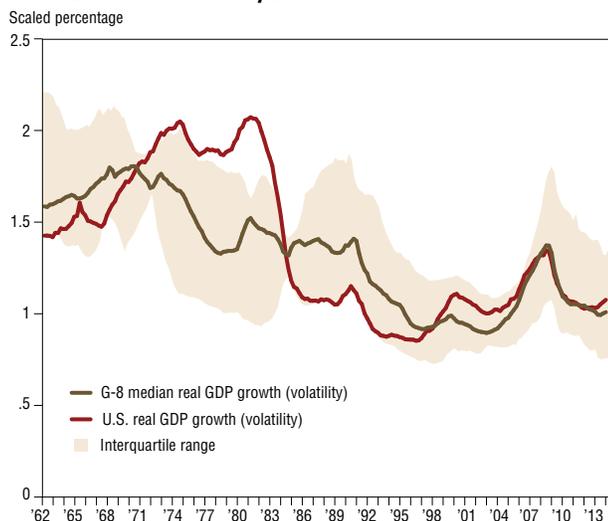
Bernanke (2004) notes that “[o]ne of the most striking features of the economic landscape over the past twenty years or so has been a substantial decline in macroeconomic volatility.” The empirical evidence presented in Chart 1 shows a widespread decline in output volatility since the early 1970s. For the median advanced economy, the 1960s was a decade of rising output growth volatility, followed by a secular (and gradual) decline starting in the early 1970s. The downward trend stopped just before the 2008 global recession. That period of declining output volatility is known as the Great Moderation.

The Great Moderation in the U.S.—unlike for the median advanced economy—is characterized by a sharp decline in the conditional standard deviation of GDP growth around 1984 (Kim and Nelson 1999; McConnell and Pérez-Quirós 2000; and Stock and Watson 2003a, b). The U.S. also experienced a marked phase of elevated volatility during the 1970s coinciding with the collapse of the post-WWII Bretton Woods international monetary system and the high inflation and low growth (stagflation) that followed.

Inflation volatility rose in the late 1960s and early 1970s as the strains of the Bretton Woods system became more apparent and its collapse all but inevitable (see Chart 2). Interestingly, the data show a dramatic and widespread decline in inflation volatility between the mid-1970s and the mid-1990s, followed by an equally sizable—but uneven—rise afterward. For the median advanced economy, inflation volatility surpassed its previous historical peak in the mid-2000s. European countries in the years leading up to the adoption of the euro were most affected by this rise in inflation volatility. By comparison, inflation volatility remained fairly low in the U.S.

Output and inflation volatility breaks also occurred as other features of the international business cycle of the post-WWII period changed—notably, the cyclical and cross-country correlation of inflation and the price level and the forecastability of growth and inflation, as discussed by Martínez-García (2014b). Interestingly, the most significant changes in business-cycle features for real variables—other than the secular decline in output volatility—appear at the onset of the 2008 global recession.

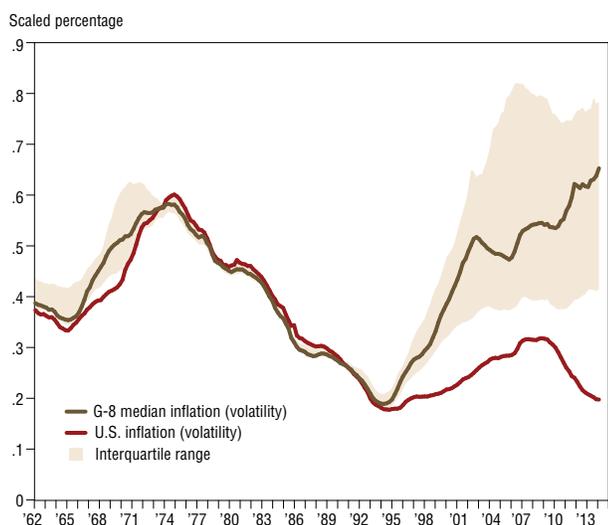
Chart 1
Real GDP Growth Volatility Declines



NOTE: Median and interquartile range includes U.S., U.K., Canada, France, Germany, Japan, Spain and Italy. The median measures the central tendency, while the interquartile range reflects the dispersion around the median of the countries in the sample. Volatility refers to the estimated time-varying standard deviation of real GDP growth.

SOURCES: Organization for Economic Cooperation and Development; author's calculations.

Chart 2
Inflation Volatility in G-8, U.S. Diverge
(GDP deflator)



NOTES: Median and interquartile range includes U.S., U.K., Canada, France, Germany, Japan, Spain and Italy. The median measures the central tendency, while the interquartile range reflects the dispersion around the median of the countries in the sample. Volatility refers to the estimated time-varying standard deviation of inflation calculated with the GDP deflator.

SOURCES: Organization for Economic Cooperation and Development; author's calculations.

Martínez-García (2014b) finds no evidence of an increase in output growth synchronization for the period leading up to the 2008 global recession, suggesting weak empirical support for the hypothesis that globalization has altered international business-cycle synchronization. Consumption-smoothing motives, in theory, should imply a high correlation of consumption across countries regardless of the cross-country output correlation—at least if complete international risk-sharing were possible. Martínez-García (2014b) also documents that at least since the 1960s, cross-country output correlations tend to be consistently higher than cross-country consumption correlations. Backus et al. (1992) call this observation “the most striking discrepancy ... between theory and data.”

The international literature has retained the idea that resolving this puzzle does not mean abandoning the view that asset markets are complete to the extent that they allow efficient risk-sharing across countries. Obstfeld and Rogoff (2001) suggest that “a (significant but plausible) level of international trade costs in goods markets” suffices to account for the comovement observed in the data.

Trade costs refer to transport costs and tariffs but may also include nontariff barriers and other structural distortions that impede intra-temporal consumption smoothing through trade. What matters for bilateral trade, however, are not the trade barriers between any two countries by themselves but how they relate to the barriers with respect to all their other trading partners. Martínez-García and Martínez-García (2014) show empirically that factors such as language, legal traditions, culture and historical ties—which generally change very slowly—can have major effects as relative barriers to trade. They find that the effect of nontariff trade barriers has remained largely invariant since the Great Moderation in spite of greater economic integration.

A number of other explanations have also been proposed—especially in the presence of distortions in goods and capital markets. Martínez-García and Sondergaard (2009) show, in particular, how comovement of consumption across countries depends crucially on the degree of international risk-sharing that can be attained and supported by trade.³ Hence, from the perspec-

tive of theory, globalization—and financial globalization in particular—has an ambiguous effect on the comovement of output and consumption. While the debate is far from settled, globalization remains an important part of the discussion in regard to these business-cycle features.

How the Economic Environment Changed with Globalization

Much of the debate about the role of globalization has revolved around the perceived flattening of the short-run Phillips curve.⁴ In fact, inflation seems to have become less responsive to fluctuations in output relative to its potential over time.⁵ This has been documented for the U.S. by Roberts (2006), among others, who identified the flattening of the Phillips curve around 1984—at the start of the Great Moderation in the U.S. Borio and Filardo (2007) indicate that a similar phenomenon can be detected in a number of other countries. Their findings suggest a decline in the sensitivity of inflation to the domestic output gap—deviations of domestic output from its potential—among Organization for Economic Cooperation and Development countries, but a greater role for global slack—deviations of global output from its potential.

As in Martínez-García (2014b), a standard Phillips curve-based model can be estimated that relates current inflation to four past data points, or lags, and the previous quarter’s domestic output gap (measured with Hodrick–Prescott [1997] filtered domestic real GDP). The coefficient on the domestic output gap in this model indicates the sensitivity of inflation to changes in domestic resource utilization, or slack. Chart 3, taken from Martínez-García (2014b), illustrates estimates of the coefficient on the domestic output gap.⁶ Over time, the estimates have indeed declined, indicating decreased sensitivity of inflation to the domestic output gap.

The flattening has been more gradual in the U.S. than for the median advanced economy. The estimated coefficient increased temporarily during the 1980s. The major break occurred in the early 1990s when the estimate dropped below historical precedent. In the U.S., the coefficient has remained at approximately half of its pre-1990 peak. For the median advanced economy, the co-

efficient stayed below the U.S. value until catching up in the early 2000s. Interestingly, the estimates seem little changed in the aftermath of the 2008 global recession.

A number of empirical studies have challenged the notion that this evidence on the flattening of the Phillips curve is in fact related to globalization—see the arguments of Ball (2006) and Ihrig et al. (2007), which at least partially refute those of Borio and Filardo (2007). Martínez-García and Wynne (2010), however, suggest that the mixed empirical evidence to a degree reflects data limitations and mismeasurement.

Martínez-García and Wynne's (2010) arguments also fit into a much larger debate about whether the short-run Phillips curve has become flatter or, in turn, potential has shifted over time (see the views of Borio et al. 2013 on the role of financial factors in measuring the output gap). Martínez-García and Wynne's (2010) key insight is that changes in the slope of the Phillips curve cannot be estimated independently of the assumptions made about output potential (which is inherently unobservable). If potential output and thus the output gap are misspecified, one cannot conclude much about a possible structural change in the slope of the Phillips curve or simply negate the role of globalization from this evidence.

A more structural approach seems warranted, but Martínez-García, Vilán and Wynne (2012) and Martínez-García and Wynne (2014) show in controlled experiments with simulated data that there are significant challenges to identification and model selection that limit the practical usefulness of standard econometric techniques to reveal empirically the exact role of greater economic integration. In any event, even within a structural framework, estimating slack and the sensitivity of inflation to slack still requires that we take a stand on the specification of the unobservable potential output.

Another approach to investigate the plausibility of the theory—on the role of globalization—consists of identifying key empirical predictions that can help distinguish between competing explanations. Kabukçuoglu and Martínez-García (2014) show that Phillips curve-based forecasting models relying on the domestic output gap appear to have lost ground over time against simpler sta-

tistical models that aren't dependent on measures of slack—especially during the period of declining inflation volatility until the mid-1990s, as seen in Chart 2.⁷

More encouragingly, Kabukçuoglu and Martínez-García (2014) also suggest a number of indirect measures of global slack consistent with the open-economy Phillips curve (Clarida, Galí and Gertler 2002; Martínez-García and Wynne 2010). These are generally better measured than global output and more readily available and, in theory, should capture the relevant external economic forces. According to Kabukçuoglu and Martínez-García (2014), the most useful variables to restore—at least to some extent—the predictive ability of Phillips curve-based forecasts for inflation include terms of trade and global money growth.

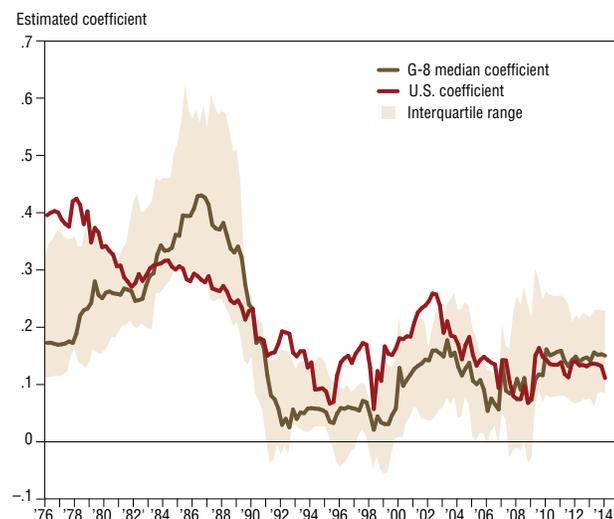
The evidence of Kabukçuoglu and Martínez-García (2014) is consistent with the view that globalization has altered the trade-off implied by standard closed-economy Phillips curves, linking domestic inflation to global (rather than local) slack. It also appears consistent with a flattening

of the empirical Phillips curve as global forces come to dominate domestic ones. Thus, the global slack hypothesis articulated by Martínez-García and Wynne (2010, 2013) appears to offer an empirically plausible way to characterize inflation without abandoning altogether the idea of a short-run trade-off between inflation and real economic activity embedded in the Phillips curve.

It is also important to further consider how changes in inflation and the Phillips curve trade-off with real economic activity can in turn be linked to globalization. There are in fact a number of theoretical explanations for why structural changes in the slope of the Phillips curve through globalization may not necessarily linearly correlate with measures of greater openness and for why domestic inflation would be affected by global rather than local factors:

- Martínez-García and Wynne (2010) show that stronger bilateral ties through trade increase the direct contribution of import prices to measured domestic inflation. Greater openness is consistent with a decline in the Phillips curve slope on the domestic output gap and an increase

Chart 3
Estimated Coefficient on Domestic Output Gap Declines
(Sensitivity of inflation to domestic output gap decreases)*



*Reduced-form Phillips curve model.

NOTES: Median and interquartile range includes U.S., U.K., Canada, France, Germany, Japan, Spain and Italy. Output gaps calculated with the Hodrick–Prescott (1997) filter on real GDP. The median measures the central tendency, while the interquartile range reflects the dispersion around the median of the countries in the sample. The coefficient estimates reported are based on a rolling window of 15 years of quarterly data.

SOURCES: Organization for Economic Cooperation and Development; author's calculations.

in the slope on the foreign gap. However, a more complex, nonlinear relationship may arise when countries differ in how open they are and how much more open they have become than the rest. This may explain at least qualitatively why measures of openness do not always appear to linearly correlate with the estimates of the slope of the Phillips curve.

- Imported goods may also affect inflation indirectly through their impact on the marginal costs faced by domestic producers and on their pricing power. Arguably, greater openness to trade and the resulting increase in competitive pressures may lead to reduced markups. These competitive pressures can also enhance productivity growth, as less productive firms get pushed out of the market, facilitating the goal of attaining lower inflation.

- The build-up of domestic slack makes it more difficult for firms to increase prices and for workers to negotiate higher wages, which keeps inflation at bay. However, in an increas-

ingly integrated world economy, reduced global slack can increase domestic inflation even when domestic slack remains invariant (a theoretical point argued by Martínez-García and Wynne 2010, 2013). As the economy becomes more open, it tends to matter more for domestic inflation that domestic firms can charge more for their goods in the domestic market when they face increases in world demand.

For all these reasons, it would appear too much of a stretch to refute the global slack hypothesis on the basis of the existing evidence (as can be seen in the arguments of Bernanke 2007 and Martínez-García and Wynne 2010, 2013, among others). A significant role for globalization is both theoretically plausible and not empirically inconsistent with nonlinear shifts in the slope of the Phillips curve, even if the question of how quantitatively important it ultimately is remains open to debate.

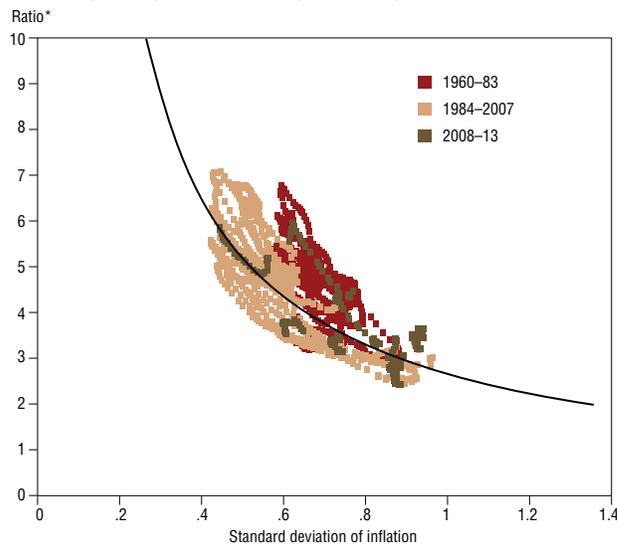
Globalization and Monetary Policy: Lessons Learned

Following Martínez-García (2014b), I consider the open-economy Phillips curve of Martínez-García and Wynne (2010) to be a valid framework to investigate the trade-off between inflation and real economic activity. I assume the economic structure and the distribution of shocks to be invariant. Under these baseline assumptions, New Keynesian economic models—which have featured prominently in policy analysis over the past two decades—imply that, over the long run, monetary policy makers operating under a Taylor rule framework (Taylor 1993) can reduce the volatility of inflation only by allowing greater relative volatility in output, and vice versa.

In other words, theory suggests a policy trade-off between the volatility in inflation and the ratio of output volatility over inflation volatility—similar to the well-known Taylor curve (for example, Taylor 1979, 2014). Chart 4, taken from Martínez-García (2014b), illustrates this variability trade-off with a model simulation based on Martínez-García and Wynne (2010, 2013). The model simulation aims to represent the trade-offs resulting from Taylor rules with different responses to inflation based on the experience of the major advanced economies during the Great

Chart 4

Monetary Policy and Variability (Volatility) Trade-Off



*Standard deviation of output/standard deviation of inflation.

NOTES: Includes U.S., U.K., Canada, France, Germany, Japan, Spain and Italy. Volatility is measured with estimates of the conditional standard deviations, that is the squared root of the variance. The curved black line is the simulated policy frontier under a policy framework based on the Taylor (1993) rule. This policy frontier is derived from simulations of the open-economy model of Martínez-García and Wynne (2010, 2013) for the period 1984–2007.

SOURCES: Organization for Economic Cooperation and Development; author's calculations.

Moderation (between 1984 and 2007).

In a purely mechanical sense, output fluctuations are expected to increase (output becoming more volatile) as the Phillips curve flattens if the fluctuations of inflation and output potential remain invariant. Hence, it is no surprise that Martínez-García (2014b) finds that the variability trade-offs between output and inflation faced by policymakers—if anything—may have shifted away from the origin as the Phillips curve leveled off down and the world economy became more integrated during the Great Moderation.⁸

Martínez-García (2014b) indicates that such a shift in the attainable policy trade-offs frontier under a Taylor rule can occur under the assumption of coordinated monetary policy. When de facto unilateral changes in monetary policy are considered, globalization appears to contribute also to a further widening of the distance in the policy frontier across countries and to greater divergence in policy performance.

While much more research is needed to fully understand the different aspects of globalization and how they interact with monetary policy, this analysis shows that the degree to which economies have become intertwined cannot be ignored in policymaking. Policymakers should be mindful that globalization has the potential to alter the volatility frontier that can be reached and make domestic stabilization policies increasingly dependent on the policies of other countries.

Conclusion

Ongoing global economic integration is a transformative phenomenon that has shaped the world economy for decades and will likely continue to do so. Globalization has not negated central banks' ability to influence domestic conditions. Nonetheless, globalization has had, and potentially will continue to have, an impact on inflation, the trade-off between inflation and real economic activity confronting policymakers, and the nature of the monetary transmission mechanism as suggested by the workhorse open-economy models of Clarida et al. (2002) and Martínez-García and Wynne (2010).

As Federal Reserve Bank of Dallas President Richard Fisher (2006) noted, "The literature on globalization is large. The literature on mon-

etary policy is vast. But literature examining the combination of the two is surprisingly small."

Effective monetary policymaking requires more than ever before in the post-WWII period taking into account a diverse set of global factors, some of them not yet fully understood or even clearly identified. Scholars and policymakers must continue to further our understanding of the effects of globalization in general and on the conduct and international transmission of monetary policy in particular.

Notes

This document has greatly benefited from the research assistance of Valerie Grossman and the contributions of Bradley Graves, and from my ongoing work with Ayse Kabukcuoglu and María Teresa Martínez-García. I dedicate this essay to the memory of my father, Valentín Martínez Mira, whose inspiration and unwavering support over the years made it all possible.

¹ See, for example, Fisher (2005, 2006), International Monetary Fund (2006), Rogoff (2006), Yellen (2006), Bernanke (2007), Mishkin (2007), Weber (2007), González-Páramo (2008) and Papademos (2010).

² Shifts in the conditional mean have occurred and can presumably be related to globalization as well. This essay does not further pursue the issue.

³ Other potential explanations to reconcile theory with data on consumption and output cross-correlations include: a) Frictions impeding the accumulation of capital (or affecting the relative price of investment), which can influence the economy's ability to absorb domestic and external shocks (see, for example, Martínez-García 2011 and Martínez-García and Søndergaard 2013); b) Incomplete asset markets in which there are not enough assets to attain perfect risk-sharing (Martínez-García 2011); c) Asymmetric information in the formation of expectations affecting the consumption–investment decision margin—particularly, with regard to foreign shocks (Martínez-García 2010)—or the pricing behavior of firms; d) The amplification/dampening effects of financial frictions on innovations to the mean or the volatility of the shocks (Martínez-García 2014a; Balke, Martínez-García and Zeng 2014).

⁴ Phillips (1958) is credited with identifying the empirical inverse relationship between nominal wage changes and unemployment that bears his name and is regarded as the conceptual precursor of the New Keynesian Phillips curve used in this essay's arguments (Martínez-García and Wynne 2010). However, the idea behind the Phillips curve has a much earlier precedent in Fisher (1926) that should be duly noted.

⁵ Output potential in this sense refers to the counterfactual level of output that could be attained given the same realization of the shocks to the economy if distortions preventing the full and instantaneous adjustment of prices could be

removed. The output gap, or slack of the economy, tracks the fluctuations in output around its potential. It measures the extent to which resources are underutilized/overutilized in production, and in the context of the New Keynesian Phillips curve, it can signal inflationary pressures.

⁶ Chart 3 is based on a rolling window regression of the Phillips curve model for inflation based on four lags of itself and the previous quarter domestic output gap using 15 years of quarterly data. A rolling window regression involves running multiple regressions of a fixed sample size with a different window of observation at a time. In this case, the first regression is done on an initial window with the first 60 quarterly observations in the data. The second regression is performed with another 60 observations, starting from the second to the 61st observation. Similarly, the third window goes from the third to the 62nd observation, and so on. Using rolling window regressions produces varying estimates of the coefficient on the domestic output gap over time instead of a constant estimate for the entire period. In that sense, it reveals the changing properties of the regression—providing evidence of the flattening of the Phillips curve.

⁷ Atkeson and Ohanian (2001), for instance, also show that backward-looking Phillips curve forecasts of U.S. inflation based on output gaps are often found to be inferior against a naïve forecast.

⁸ The sacrifice ratio measures the reduction in output required for a given reduction in inflation. A flattening of the Phillips curve, therefore, may imply that the sacrifice ratio may have changed as well. This essay does not further explore this issue or its connection to globalization.

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Understanding Trade, Exchange Rates and International Capital Flows

By Jian Wang



Global trade collapsed following the financial crisis in 2008–09. Imports and exports plunged in major trade countries, and global trade suffered the biggest contraction since World War II.

The U.S. has embraced rapid globalization since the 1970s, with the trade share of gross domestic product (GDP) increasing from less than 6 percent in 1970 to over 15 percent in 2013. Financial integration is even more phenomenal: The GDP share of foreign assets invested in the U.S. increased more than tenfold from around 10 percent in 1970 to over 150 percent in 2013. U.S. financial assets invested abroad grew at a similar pace over the period.

The rapid real and financial globalization in the past 30 years poses many challenges to policymakers in the U.S. and around the globe. When making decisions at home, they can no longer ignore changes abroad. Policymakers must better understand the interaction among domestic and foreign economies as they seek to maximize their nation's welfare.

My research has primarily focused on understanding the interactions of economies through international trade and financial markets. Globalization has made countries more integrated than ever, and countries are no longer insulated from shocks that originate from abroad. Policymaking requires an understanding of how real and monetary changes are transmitted across countries through international trade and financial markets.

International Trade and Exchange Rate Pass-Through

Engel and Wang (2011) found that standard open-economy models significantly understate the importance of trade in economic fluctuations. International trade growth varies substantially more than a nation's total output growth over time, data show. For instance, imports and exports are about three times more volatile than GDP in the U.S. and in most other countries, but they are less volatile than GDP in standard open-economy models used to investigate the spillovers of shocks originating in one country. These standard models substantially

underestimate foreign country influence through international trade on a domestic economy and may provide misleading policy suggestions.

Why is international trade more volatile than GDP in the data? Examining the properties of traded goods across countries helps answer the question. Most international trade for Organization for Economic Cooperation and Development (OECD) countries involves durable goods, which include durable consumption goods (such as automobiles and personal computers) and capital investment (such as machinery). Durable goods purchases fluctuate more over business cycles than nondurable goods. Families can postpone replacing automobiles during a downturn more easily than they can defer nondurable purchases of food and gasoline. Because a large share of GDP is nondurable goods and international trade is mainly in durable goods, international trade volume varies substantially more than GDP in the data. We find that including durable goods trade in an otherwise standard model, which doesn't distinguish between durable and nondurable goods, can broadly improve the model's ability to match trade sector data.

Global trade collapsed following the financial crisis in 2008–09. Imports and exports plunged in major trade countries, and global trade suffered the biggest contraction since World War II. Various policies have been proposed in response to this decline. Based on research with Charles Engel, I discussed the collapse of global trade in a Federal Reserve Bank of Dallas *Economic Letter* (Wang 2010), which argues that the drop in international trade was generally consistent with cyclical trade movements over the past 35 years. Empirical findings and a theoretical model in Engel and Wang (2011) predict a large drop in the volume of trade when markets experience a steep recession, especially if a prolonged downturn is expected. Several subsequent studies confirm that the collapse of global trade in the recent financial crisis was main-

ly attributable to a collapse of worldwide demand for durable goods (*Chart 1*), though other factors, such as trade finance, may have played a role.

The exchange rate is a focal point of international economic activities. Exchange rate fluctuations alter the relative prices of goods and services between countries and, thus, substantially impact international trade.

An important channel through which the exchange rate affects the real economy is aggregate price levels. The extent that exchange rate changes are passed through to prices is referred to as exchange rate pass-through (ERPT). Import price ERPT declined sharply after the 1990s (see Marazzi and Sheets 2007 for an example involving the U.S.). An and Wang (2012) and Mumtaz, Oomen and Wang (2011) document that greater economic stability after the 1980s—especially involving monetary policy and inflation—contributed to reduced ERPT.

The findings suggest that ERPT decline is related to more disciplined monetary policy after the 1980s. Several factors may contribute to this during such a stable monetary regime. Shambaugh (2008) documents that ERPT is greater for nominal shocks (for example, monetary policy shocks) than for real shocks (for example, demand shocks). An economy experiences fewer nominal shocks in a regime with more stable monetary policy and inflation, and thus its ERPT is lower. The research shows that low ERPT is not independent of monetary policy. Therefore, it is misleading to argue that central banks can afford looser policy when inflation is less responsive to exchange rate movements.

Another problem found in previous studies of ERPT is that aggregate price indexes may underestimate the impact of exchange rates on U.S. import prices. In goods-level data underlying U.S. trade price indexes, Nakamura and Steinsson (2012) document that 40 percent of products are replaced without a single price change. They argue that price adjustments for these goods are through product replacement rather than regular price changes: Firms replace existing products with new models and designs at a new price rather than changing current-item prices. Standard price indexes that focus on price changes for identical products cannot capture this type of adjustment and underestimate the extent of price changes in

the economy.

Kim et al. (2013) investigate the product-replacement bias involving trade between the U.S. and China and find that renminbi appreciation substantially affects prices of U.S. imports from China after taking into account price changes through product replacement. Following China's abandonment of its hard-currency peg to the U.S. dollar in June 2005, the renminbi appreciated more than 25 percent by September 2014. However, only a very small fraction of the Chinese currency gain was passed on to U.S. import prices when ERPT was estimated from aggregate price indexes. For instance, Auer (2012) finds that ERPT of renminbi appreciation from 2005 to 2008 into the U.S. import price index was only around 20 percent.

Why didn't Chinese exporters pass along production cost increases following renminbi appreciation, at least in the long run? One reason could be producers' voluntary reduction of profit margin, which would help them maintain market share. However, China's exports to the U.S. are mainly from labor-intensive industries, and it is unlikely that Chinese exporters have a large profit margin with which to absorb currency appreciation. A large share of imported inputs is another potential reason for the low ERPT observed in the data (see Amiti, Itskhoki and Konings 2014). China imported many of its inputs from other

countries, and the prices of imported materials decreased when the renminbi appreciated, imposing downward pressure on China's export prices to the U.S. However, this explanation conflicts with the fact that the Chinese currency did not appreciate much against countries providing a major source of inputs—such as Japan and South Korea—while it gained strongly against the U.S. dollar.

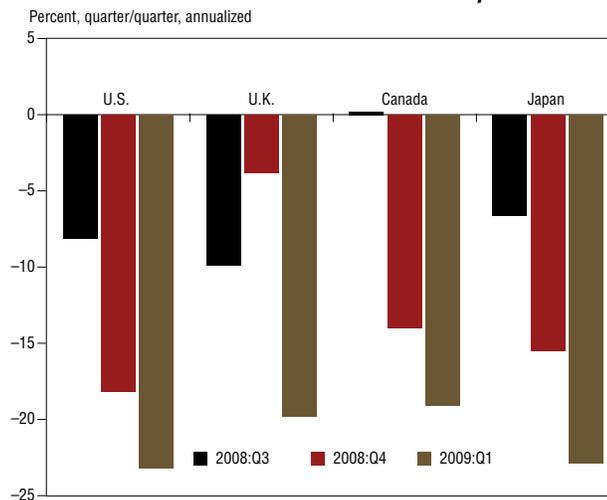
Kim et al. (2013) find that Chinese exports did not absorb as much renminbi appreciation as the aggregate import price index suggested. The authors found that for a large fraction of U.S. imported goods from China, prices never changed. Less than 50 percent of renminbi appreciation is passed through to U.S. import prices from China if these “no-price-change” goods are included in the estimation of ERPT. Pass-through increases to about 100 percent if goods with at least one price change are included. In other words, ERPT is much higher if goods that change prices through product replacement are excluded, suggesting that the conventional estimation of ERPT based on aggregate price indexes underestimates the effect of renminbi appreciation on U.S. import prices.

Exchange Rate Determination and Business Cycles

Besides international trade, the exchange rate plays an important role in international

Chart 1

Real Demand for Durable Goods Declines Globally



SOURCES: Bureau of Economic Analysis; author's calculations.

financial markets. The foreign exchange market is the largest and most liquid financial market in the world. Its average daily turnover exceeds \$5 trillion, according to a 2013 survey by the Bank for International Settlements. Currency trading is important for individuals, firms and governments that buy foreign goods and services, invest abroad and seek profit or protection through speculation.

Despite the significance of exchange rates in economic activity, researchers and policymakers still debate the factors driving their fluctuation and whether the central banks should consider exchange rate movements when conducting monetary policy.

Wang (2011) finds that the effect of including exchange rate stabilization in the Taylor rule depends on several key factors (the rule theorizes that an appropriate policy rate is based on an economy's performance relative to its capacity, the output gap and the rate of inflation). Those factors include the source of exchange rate fluctuation, the central bank's stance on inflation and a country's trade openness. If the central bank takes a strong stance on inflation, exchange rate stabilization can improve welfare by fine-tuning interest rates to alleviate international price distortions

caused by noisy exchange rate movements and sticky prices. Admittedly, welfare improvement from exchange rate stabilization is small in the model, especially if a country's consumption is biased toward home-produced goods and services, such as in the U.S.

For countries that do not appropriately anchor inflation, stabilizing the exchange rate through monetary policy will substantially increase macro instability and reduce overall welfare. In this case, when a central bank attempts to alter interest rates in response to exchange rate changes, it will tend to amplify the negative effect of exchange rate noise by destabilizing the inflation rate.

Following the 2008 financial crisis, the Federal Reserve instituted several rounds of quantitative easing (QE) to stabilize the financial markets and aid U.S. economic recovery. QE policy in the U.S. inevitably spilled over to other countries through exchange rates and interest rates. Wang (2011) suggests that the central banks in other countries should continue to focus on inflation stabilization and let exchange rate swings mostly run their course. Unfortunately, policymakers, particularly those in emerging markets, could not restrain themselves from loosening monetary policy to stabilize their currency's value. As my model predicted, countries focusing more on exchange rate stabilization during this period suffered higher inflation and less-stable domestic macroeconomic conditions (*Chart 2*).

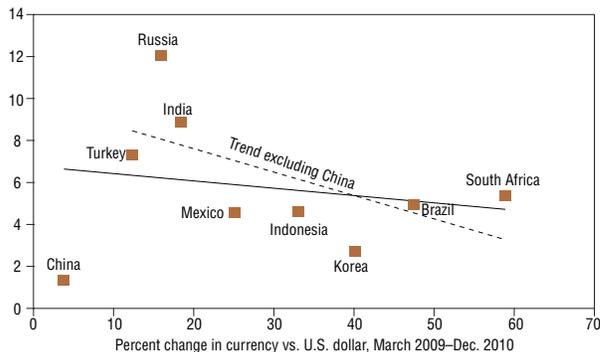
This paper assumes that the exchange rate was mainly driven by noise in financial markets. Although this is a useful way for theoretical models to match exchange rate behavior in the data, it remains highly debatable whether exchange rates are determined by economic fundamentals or by noise unrelated to economic fundamentals. Therefore, understanding the factors driving exchange rate movements remains an important research topic.

In a seminal paper, Meese and Rogoff (1983) find that economic fundamentals—such as money supply, balance of trade and national income—are of little use when forecasting out-of-sample exchange rates. This casts doubt on fundamental-based exchange rate models. Various combinations of economic variables and econometric methods have been used in attempts to over-

Chart 2

Inflation Lower in Countries Not Trying Exchange Rate Stabilization

Percent average monthly year/year inflation, March 2009–Dec. 2010



NOTE: The greater the percent change in currency vs. the U.S. dollar, the less likely the country's central bank attempted to stabilize the exchange rate.

SOURCES: National statistics offices of each country; Haver Analytics; *Wall Street Journal*; author's calculations.

turn Meese and Rogoff's finding. Despite some progress on this front, the ability of economic fundamentals to forecast exchange rates remains fragile in most empirical studies, especially at short horizons.

Wang and Wu (2012) take a different approach to address the issue. Instead of estimating the levels of exchange rates in the future, this study provides an interval in which the exchange rate may reside with a certain probability, given predictors available at the time of the forecast. The authors find that economic fundamentals are useful in narrowing forecast intervals for exchange rates, though they are not useful in predicting the future average level.

Engel and West (2005) argue that current economic fundamentals cannot forecast exchange rates because exchange rates, like other asset prices, are determined by expectations of future economic fundamentals rather than the current reality. Engel, Wang and Wu (2010) reconcile the Engel–West theorem with empirical findings that economic fundamentals better forecast exchange rates at longer horizons.

From these studies, we learn that exchange rates are related to expectations regarding economic fundamentals rather than to financial market noise. However, it remains unclear which fundamentals play an important role in driving exchange rates and whether expectations are followed by actual economic fundamental changes. Answers to these questions provide guidance for exchange rate modeling that can be used to analyze international macroeconomic issues.

Nam and Wang (forthcoming) investigate the role that expectations of future productivity play in driving the U.S. exchange rate. The study was inspired by empirical findings that changes in expectations regarding future productivity, measured by total factor productivity (TFP), account for a large fraction of U.S. business cycles. Beaudry and Portier (2006) document that a shock resembling favorable news about future productivity explains more than half of business-cycle fluctuations of U.S. consumption and labor input. Beaudry, Nam and Wang (2011) extend this finding to models with more macroeconomic variables, using alternative econometric methods to identify the shock. They find that bouts of op-

timism and pessimism drive many U.S. business cycles and that increasing optimism is followed by subsequent TFP increases, suggesting a close link between optimism and economic fundamentals.

Two scenarios are consistent with these empirical findings. First, bouts of optimism reflect advance information that agents have about future TFP. In response to good news about future productivity, households increase current consumption and firms raise investment, though current TFP remains constant. In another scenario, agents' exogenous mood swings may cause an economic boom and subsequent productivity increase. Households and firms become optimistic about the future for some unknown reasons, resulting in immediate increases in consumption and investment. The economic boom today can increase future productivity through different channels such as promoting firms' research and development and/or relaxing the financial constraints of small but more productive firms.

Although these empirical findings show the importance of optimism shocks in driving U.S. business cycles, they cannot separate the above two scenarios as underlying mechanisms. It is important to investigate the empirical relevance of these two competing views because they carry totally different policy implications. If optimism shocks reflect advance news about future productivity, there is no need to have policies designed to stabilize such expectation-driven business cycles because the optimism-driven booms are already the optimal behavior of households and firms. However, if economic booms and busts are driven by exogenous bouts of optimism, the economic outcome may be suboptimal and policymakers may want to fight excessive business-cycle fluctuations if they can correctly identify excessive optimism/pessimism.

Nam and Wang (forthcoming) extend the study on optimism-driven business cycles to multicountry settings and examine how expected changes in productivity affect exchange rate fluctuations and international trade. Previous studies in the literature focus on surprise changes in productivity that drive such fluctuations. These empirical and theoretical studies usually underestimate the importance of productivity changes on exchange rate movements and international spill-

overs of technology changes. For instance, previous empirical studies usually find that productivity changes explain only a small fraction (10 percent or less) of exchange rate fluctuations during business cycles (for example, Juvenal 2011). However, Nam and Wang (forthcoming) document that after taking into account both surprise changes and expected future changes, productivity can explain over a third of U.S. exchange rate fluctuations.

Exchange rates are more volatile than economic fundamentals—such as total output—and standard theoretical models fail to replicate this feature in the data. The empirical findings suggest that the inclusion of expected productivity change may help the standard model better reflect the data by more closely matching asset prices (such as exchange rate behaviors). Matsumoto et al. (2011) show that, under certain conditions, incorporating news about future productivity and monetary policy helps standard theoretical models match stock price volatility.

These empirical studies point out challenges for future theoretical modeling of exchange rates. Nam and Wang (forthcoming) document that the U.S. real exchange rate exhibits substantially different dynamics in response to surprise and expected changes in U.S. TFP. Following an expected TFP increase, the real exchange rate appreciates strongly on impact and continues to appreciate for a few quarters before it begins converging back to its initial level. Under the authors' definition of the real exchange rate, a decrease indicates appreciation of the dollar. The response of the real exchange rate to an expected increase in TFP resembles a horizontal J-curve. By comparison, the real exchange rate exhibits a hump-shaped response to a favorable contemporaneous TFP shock: It stays around its initial level on impact of the shock, quickly increases above zero (depreciates) and remains significantly depreciated for more than 12 quarters before converging back to its initial level.

However, standard international macroeconomic models cannot replicate these documented exchange rate behaviors following surprise and expected productivity changes. The authors discuss challenges and potential solutions that would allow standard models to match these empirical findings. They also show that such a model will

There is no strong evidence that foreign ownership can induce productivity gains for target firms relative to domestic-acquired firms.

better match other dimensions of the data such as the negative correlation between cross-country relative consumption and the real exchange rate. These studies have generated better understanding of exchange rate determination and lay the groundwork for theoretical international macroeconomic models that provide more reliable policy analysis involving open economic issues.

International Capital Flows

Recent research (Wang and Wang 2014) considers international capital flows and their impact on host countries' productivity, income and financial conditions, using firm-level data. Conventional wisdom holds that foreign direct investment (FDI) can increase host countries' productivity, both directly by introducing new technologies and indirectly by technology spillovers from FDI firms to domestic ones. As a result, many emerging markets provide tax and other incentives to attract FDI, which has dramatically increased in these countries over the past three decades.

However, the authors find that FDI can be driven by foreign investors' easy access to financial markets rather than their technological advantages. Although numerous empirical studies document the superior productivity performance of FDI-involved plants and firms relative to their domestic counterparts, the positive correlation cannot be simply interpreted as a causal relationship. Instead, it may just reflect endogenous FDI decisions: Foreign investors choose to acquire or start business with more productive domestic firms. For instance, Fons-Rosen et al. (2013) find that FDI has a very small effect on target firms' productivity in their sample of advanced European economies, after controlling for unobservable factors that influence acquisition decisions.

Even after controlling for endogenous choice of FDI firms, a second issue remains for identifying performance gains from foreign ownership. Previous studies found that foreign acquisition can improve target firm performance. However, numerous empirical studies document that domestic mergers and acquisitions are also followed by substantial change in the performance of target firms. See Maksimovic and Phillips (2001) for a study on productivity and McGuckin and Nguyen (2001) for a study on labor input and wages. In particular,

Fons-Rosen et al. (2013) find that negative changes in foreign ownership are also associated with firm productivity improvement, consistent with greater productivity arising from the ownership change. Even though previous studies documented performance gains following foreign acquisitions, it remains unclear whether foreign ownership per se is crucial for the gains. If a domestic entity acquired the target firms, they might have exhibited a similar performance improvement.

Wang and Wang (2014) compare the post-acquisition performance changes for foreign- and domestic-acquired firms in China, which allows us to isolate the specific impact of foreign ownership relative to domestic acquisitions. Although the study uses Chinese data, the results likely apply to other countries, especially other emerging markets.

Several findings stand out. First, there is no strong evidence that foreign ownership can induce productivity gains for target firms relative to domestic-acquired firms. If we compare foreign-acquired firms with domestic firms that experienced no change in ownership, the result is significant productivity gains for foreign-acquired firms in the acquisition year and in subsequent years. These findings suggest that foreign acquisitions in China during the sample period did not differ from domestic acquisitions with regard to productivity, even though both induced productivity gains over companies whose ownership did not change.

Second, foreign ownership significantly improved the financial condition (as measured by leverage and liquidity ratios) of target firms relative to domestic acquisitions. These results show that following transactions, foreign-acquired firms rely less on external short-term debt and more on internal capital than domestic-acquired firms.

Although several empirical studies cast doubt on the productivity benefits of FDI to advanced economies, it may still be reasonable to believe the existence of such gains for FDI to emerging markets because these countries lag far behind in technology. However, the results suggest that even FDI to emerging markets could be mainly driven by financial advantages rather than productivity advantages, casting doubt on the efficacy of tax and financial-benefit policies intended to catch up to the technological frontier. The data also indicate that FDI improves target

firms' exports, supporting the financial channel of FDI in promoting international trade. Manova, Wei and Zhang (forthcoming) find that FDI firms' exports from China outperform domestic firms, a finding that is more pronounced in financially vulnerable sectors. Their results suggest that FDI can mitigate financial constraints of firms in the host countries, promoting exports and economic growth. However, they do not examine the effect of FDI on firm productivity. The results of Wang and Wang (2014) complement Manova, Wei and Zhang's (forthcoming) findings by showing that such a channel remains at work even after excluding the impact of domestic acquisition.

Foreign ownership is also found to increase output, employment and wages of target firms relative to domestic-acquired firms. This may result from improved financial conditions leading to increased sales and market share. The empirical results suggest foreign ownership benefits the host countries by strongly easing target firm financial constraints, promoting their participation in export activities, resulting in increases in output, employment and labor incomes. However, Wang and Wang (2014) do not find strong evidence that foreign ownership increases firm productivity.

Many developing countries provide tax and other incentives to attract FDI. The study shows that FDI acquisitions promote host-country international trade by improving the finances of target firms. Therefore, removing trade barriers through free-trade agreements and World Trade Organization membership is a more effective strategy to attract FDI. The results also suggest that FDI to emerging markets such as China may reflect the inefficiency of their financial markets. Government officials should not be overly concerned with increasing FDI. Instead, emerging-market leaders should reform financial markets rather than provide tax or policy incentives to maintain FDI.

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Toward a Better Understanding of Macroeconomic Interdependence

By Alexander Chudik



The concept of a representative foreign economy has no proper justification in the literature, and the consequences of aggregating the rest of the world into one representative economy are not fully understood.



The Globalization and Monetary Policy Institute's mission is promoting research that helps the public better understand how globalization affects the conduct of U.S. monetary policy. Determining the consequences of trade and financial globalization is challenging. Understanding macroeconomic interdependence is necessary to fully comprehend globalization's consequences. This touches on a number of fields, including theoretical open economy macroeconomic research, empirical data-driven applied research and development of new econometric tools to handle large international datasets.

This article examines how my work has contributed to the institute's mission, particularly to our understanding of macroeconomic interdependence. This essay is in three parts. The first reviews how theoretical open economy macroeconomic modeling helps assess interdependence. Specifically, it identifies shortcuts used in the literature that may be misleading. The second part summarizes contributions regarding development of new econometric tools for modeling interdependent economies, including use of the global vector autoregressive (GVAR) approach. In the final part, I review applications developed with the GVAR approach, a modeling technique widely used to measure how economic shocks affect interdependent economies.

These efforts would not be possible without my coauthors at the European Central Bank (ECB), Banque de France, International Monetary Fund (IMF) and various academic institutions.

Part 1: Theoretical Open Economy Macroeconomic Modeling

Economists strongly prefer simplicity and seek to develop models requiring minimal

structure to analyze a given question. This is understandable, since comprehending the inner-workings of a relatively uncomplicated economic model is easier than working with something overly complex. Because of this desire for simplicity, mainstream open economy macroeconomic models typically feature just two economies—a domestic economy and a representative foreign economy—rather than a multilateral setting of many economies.

However, the concept of a representative foreign economy has no proper justification in the literature, and the consequences of aggregating the rest of the world into one representative economy are not fully understood. In an institute working paper (Chudik and Straub 2011), we sought to fill this gap. We developed a multicountry general equilibrium model that helps investigate conditions under which aggregating foreign economies into a single representative foreign economy would be reasonable.¹ The findings are quite surprising, but intuitive.

We found that the concept of a representative single economy could produce misleading conclusions. For instance, an increase in trade openness in two-country models is commonly associated with an increase in dependence of the domestic economy on foreign idiosyncratic shocks. In contrast, we found that in a multicountry model, the degree of macroeconomic interdependence is not necessarily connected to the notion of trade openness, as usually contemplated. Instead, we found that the degree of foreign trade diversification is key.

Specifically, diversification of foreign trade can help reduce the impact on the domestic economy from idiosyncratic shocks in foreign economies. The main intuition for this result is quite simple: We can draw analogies with finance

literature on portfolio diversification. It is understood that idiosyncratic risk is irrelevant for a well-diversified portfolio; only systemic risk matters. The same applies in a multicountry macro model, where the dependence of a domestic economy on foreign idiosyncratic shocks is mitigated by diversifying trade flows. However, it is clear that diversification of trade and financial flows would not insulate a country from global systemic events.

Second, we found that the concept of a representative foreign economy can result in a sizable bias due to aggregation of rest-of-the-world economies. This is perhaps less surprising, since there are large heterogeneities across individual economies in the world. The two-country approximation in the literature is especially poor when trade and financial flows are not well diversified across economies. This suggests that the two-country framework is consequently not a good approximation for many small open economies with a sizable exposure to the U.S. or to another large economy. In another institute working paper, Ca' Zorzi and Chudik (2013) documented the size of this type of aggregation bias in the question of international price convergence (an issue that has puzzled economists for many decades). We found that, depending on how the foreign economies are aggregated in a single representative rest-of-the-world economy, the estimates of the speed of price convergence may be biased by a very large degree. This bias could overshadow all the others identified in the literature.

Last, two-country models are insufficient for studying how real or financial shocks transmit across economies in a globalized world.

Taken together, these arguments suggest abandoning the restrictive two-country frame-

work to more fully comprehend the consequences of globalization. In particular, estimating the impact of U.S. monetary policy on the rest of the world and the repercussions in the U.S. should be based on a multicountry model.

Theoretical multicountry DSGE models (for example, the EAGLE model at the ECB, or the SIGMA model at the Federal Reserve Board) are quite useful in solving important policy questions, including welfare analysis. But moving to more than two economies comes at a great cost in terms of model transparency. This weighs heavily on the usefulness of large theoretical models for policy analysis, since the role of individual assumptions becomes more difficult to ascertain, and the answers these models provide are effectively hardwired in the underlying assumptions. Furthermore, theoretical macroeconomic multicountry models impose many restrictions that the data may not support. Therefore, theoretical models should be accompanied by coherent and pragmatic empirical global models capable of handling interdependent economies. Empirical models could also help us better understand different features of large international datasets and could provide stylized facts and new empirical puzzles, which theory could then seek to explain.

Part 2: Empirical Global Macroeconomic Modeling

The main challenge faced when building empirical models of interdependent economies is the large number of variables involved. For example, one can focus on the 30 largest economies, accounting for more than 90 percent of world output. However, even with a few key macroeconomic variables per economy—short- and

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We have contributed a number of methodological breakthroughs involving large datasets. We provided new results on estimation and inference in panels featuring interdependent economies.

long-term interest rates, consumer price inflation, real gross domestic product (GDP), equity price index and exchange rate—the overall number of variables in the global model would require an overwhelmingly large dataset. The number of unknown parameters to be estimated in unrestricted empirical models—those models not based on theoretical relationships, that accurately describe the data—generally grows at a quadratic rate with the number of variables. Therefore, given that typical macro datasets do not cover more than three to five decades of quarterly data, empirical multicountry models cannot be estimated without imposing restrictions on a model's parameters. This problem is also known as the “curse of dimensionality.”²

The literature recognizes that the standard econometric tools are insufficient for large international datasets due to the curse of dimensionality. With increasing interest in the modeling of the global economy in addition to greater availability of large international datasets, research over the last decade has looked at developing new econometric tools that can handle interdependent economies. The key challenge is avoiding imposing restrictions that would be considered inappropriate in a globalized world, while, at the same time, being parsimonious so that individual parameters can be reliably estimated.

We have contributed a number of methodological breakthroughs involving large datasets. We provided new results on estimation and inference in panels featuring interdependent economies (Chudik et al. 2014; Chudik and Pesaran forthcoming). We studied the consequences of aggregation in a global context (Chudik and Pesaran 2014a; Chudik, Ca' Zorzi and Dieppe 2012) and provided a statistical characterization of the pattern of dependence across individual cross-sectional units (be they individual economies in the global economy or other types of units, such as households, firms, sectors or regions), which, unlike the time dimension, does not have any natural ordering (Chudik, Pesaran and Tosetti 2011). Additionally, we contributed to the methodological foundations of the GVAR approach in the literature (Chudik and Pesaran 2011, 2013; Chudik and Smith 2013).

Part 3: The GVAR Approach and Its Applications

The global VAR approach was originally proposed by Hashem Pesaran and his coauthors in the aftermath of the 1997 Asian financial crisis. It became clear that major financial institutions were exposed to risks from adverse global or regional macro shocks. Simulating these effects required a coherent and transparent global model. The original aim was to develop such a model to quantify the effects of macroeconomic developments on the losses of systemically important financial institutions.

The solution to the curse of dimensionality in this approach is quite simple and can be described in two steps. In the first, a small scale model for each country is estimated separately. These individual country models include domestic variables, globally dominant variables (such as the price of oil) and country-specific weighted cross-section averages of foreign variables. In the second step, all estimated models are stacked and solved in one large system (or GVAR) featuring all variables. The GVAR model is coherent and easy to use for scenario analysis and forecasting.

Although developed originally for credit risk analysis, the GVAR approach has numerous other applications. In an institute working paper, Chudik and Pesaran (2014b) survey the methodological foundations and empirical applications of the GVAR approach. We reviewed about 60 academic empirical papers that use GVAR. Institutions, including the IMF and the ECB, have used the approach as well.³ At the institute, we developed four applications of the GVAR approach.

In Bussière, Chudik and Mehl (2013), we used a GVAR model to uncover how shifts in risk appetite and other shocks influence real effective exchange rates. The Japanese yen, Swiss franc and U.S. dollar are familiar safe-haven currencies facing significant appreciation pressure when risk appetite declines. Such was the case following the Lehman Brothers failure in 2008, the 9/11 attacks, and the Russian and Long-Term Capital Management crises in 1998. We found that before the start of Economic and Monetary Union (EMU) in 1999, the Deutsche mark also played an important safe-haven role, which is not surprising. In contrast, we

learned that following the start of the EMU, the euro tended to depreciate in response to a decline in risk appetite. Another key finding from this empirical exercise is that the divergence in external competitiveness among euro-area countries over the last decade was more likely due to country-specific shocks, as opposed to global shocks with asymmetric effects on individual euro-area member states.

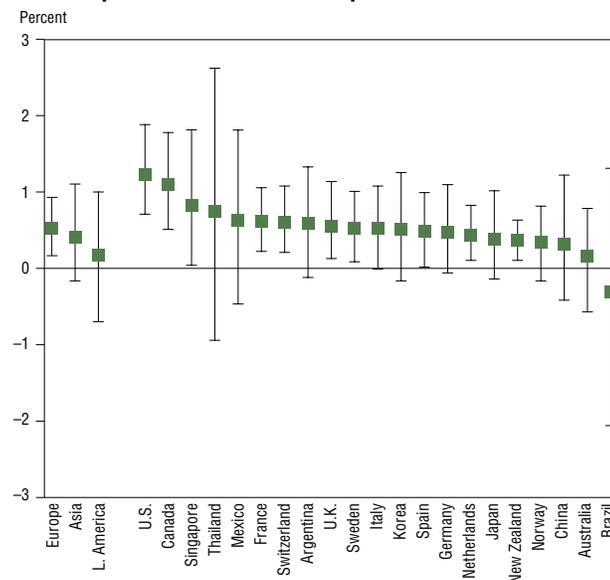
In Chudik and Fratzscher (2011, 2012), we employed weekly financial data on bonds, stocks and currencies to investigate how key shocks—to liquidity and risk—are transmitted across global financial markets. Additionally, we attempted to identify the determinants that explain differences in transmission of shocks across countries. In particular, we investigated to what extent external exposure (either through trade or financial linkages) or idiosyncratic, country-specific characteristics (such as countries' macroeconomic fundamentals and perceived riskiness) made countries vulnerable to different types of shocks. We found that transmission of liquidity and risk shocks is highly heterogeneous—across countries, across asset classes and over time. Moreover, we found that countries' sovereign credit ratings, quality of institutions and financial exposure are important determinants of cross-country transmission pattern differences.

In Bussière, Chudik and Sestieri (2012), we applied the GVAR approach to investigate the underlying factors of global trade flows using data on 21 advanced and emerging economies. The results suggest that relative demand terms, as opposed to relative prices (exchange rates), tend to have a much stronger effect on trade flows. This finding is in line with observations following the 2008 financial crisis—that the adjustment in global imbalances was not associated with a sharp depreciation of the dollar (contrary to what many observers expected). In the model, a positive shock to U.S. domestic output—for example, an unexpected rise in GDP—profoundly affected foreign countries' exports as well as their output expansion, which in turn positively affected U.S. exports (*Chart 1*).

By comparison, a positive shock to the U.S. real effective exchange rate, which immediately strengthens the dollar by about 2.5 percent, has an unambiguous negative effect on U.S. exports

The Japanese yen, Swiss franc and U.S. dollar are familiar safe-haven currencies facing significant appreciation pressure when risk appetite declines. Such was the case following the Lehman Brothers failure in 2008, the 9/11 attacks, and the Russian and Long-Term Capital Management crises in 1998.

Chart 1
Global Exports Increase as U.S. Output Rises



NOTE: This chart shows the impact of a positive U.S. output shock on exports after one year with 90 percent confidence bounds. The size of the shock is one standard error (a size considered statistically typical), which is equal to 0.6 percent of U.S. GDP at the time of impact. SOURCE: "Modeling Global Trade Flows: Results from a GVAR Model," by M. Bussière, A. Chudik and G. Sestieri, Globalization and Monetary Policy Institute Working Paper no. 119 (Federal Reserve Bank of Dallas, June 2012).

Macroeconomic interdependence is a challenging and active field of economics research with much more to discover.

(which fall 1.3 percent in the first year) and a strong positive effect on Japan and European countries' exports (*Chart 2*), Bussière, Chudik and Sestieri (2012) also argued.

We argued that the GVAR model is helpful for monitoring trade flows and can be used to understand the so-called Great Trade Collapse (GTC). World exports contracted more than 6 percent in fourth quarter 2008 and 10 percent in first quarter 2009, a drop that was sharp, sudden and synchronized. In the past few years, the GTC has stimulated a wealth of theoretical and empirical research. We compared the observed decline during the GTC with the model's prediction, conditioned on the observed values for real output and real exchange rates. We found that the observed fall in demand and the change in global foreign exchange rates alone could not explain the GTC, which suggests that other factors, such as trade credit and finance, may have played a role.

In an institute working paper by Chudik, Grossman and Pesaran (2014), we also used the GVAR approach to investigate the value of the

PMI (formally called the Purchasing Managers' Index) for forecasting global (48 countries) output growth. GDP data are available with a substantial release lag (one to three quarters, depending on an individual economy); PMIs are more timely. Moreover, there is great similarity between PMIs and quarterly output growth. However, PMI usefulness as a forecasting tool of output growth—over and above what past output growth data say about future performance—can only be ascertained using conditional models, with and without PMIs. We found that PMIs contribute a 15–20 percent improvement in forecasting performance for output growth projections in the current quarter.⁴ By comparison, when forecasting output growth in the next quarter or across longer horizons, PMIs aren't very helpful.

Researching Interdependence

Understanding macroeconomic interdependence is a difficult research problem and essential for assessing the consequences of globalization for the conduct of U.S. monetary policy. Since joining the institute in 2011, I have worked with a network of coauthors developing theoretical multicountry macroeconomic models, pioneering new econometric tools for large international datasets and applying these methods with the aim of better understanding the interdependence of individual economies in the global economy. Macroeconomic interdependence is a challenging and active field of economic research with much more to discover.

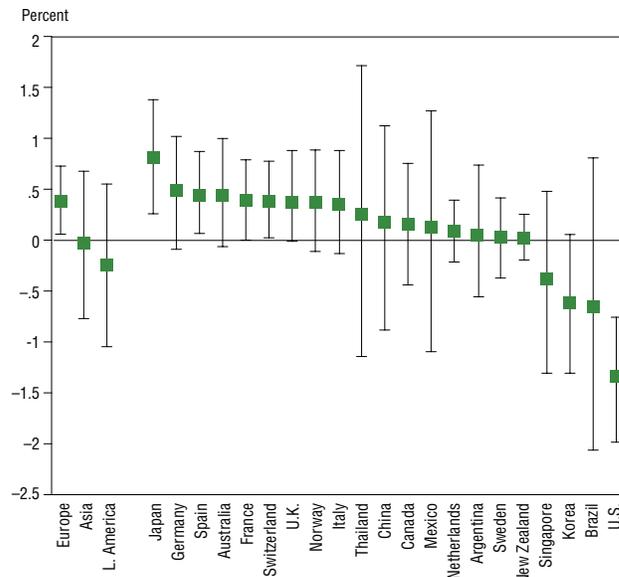
Notes

¹ In particular, we have developed a multicountry dynamic stochastic general equilibrium (DSGE) model. DSGE modeling is a branch of general equilibrium theory that is influential in contemporary macroeconomics.

² This expression was coined by Richard E. Bellman when considering problems in dynamic optimization.

³ See the following IMF policy publications for examples of use of the GVAR approach by IMF staff: 2011 and 2014 Spillover Reports; 2006 World Economic Outlook; October 2010 and April 2014 Regional Economic Outlook: Asia and Pacific Department; April 2014 Regional Economic Outlook: Western Hemisphere Department; November 2012 Regional Economic Outlook: Middle East and Central Asia Department; October 2008 Regional Economic Outlook: Europe; April and October 2012 Regional Economic Outlook: Sub-Saharan Africa; and IMF country reports for Algeria, India,

Chart 2
U.S. Dollar Appreciation Felt Most in Japan and Europe



NOTE: This chart shows the impact of a U.S. exchange rate shock on exports after one year with 90 percent confidence bounds. The size of the shock is one standard error (a size considered statistically typical), which is equal to 2.5 percent appreciation of the U.S. dollar at the time of impact.

SOURCE: "Modeling Global Trade Flows: Results from a GVAR Model," by M. Bussière, A. Chudik and G. Sestieri, Globalization and Monetary Policy Institute Working Paper no. 119 (Federal Reserve Bank of Dallas, June 2012).

Italy, Russia, Saudi Arabia, South Africa and Spain.

⁴ As measured by the GDP-weighted average mean square forecast error.

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Summary of Activities 2014

“The Federal Reserve’s Role in the Global Economy: A Historical Perspective” was the Bank’s flagship centennial conference.



The Globalization and Monetary Policy Institute passed an important milestone in 2014 with the publication of the 200th working paper in its dedicated working paper series. The paper—“The Federal Reserve in a Globalized World Economy”—was authored by the chairman of our advisory board, John Taylor. It was among the papers presented at a conference the institute organized as part of the Federal Reserve System’s centennial observances this past year. Indeed, 2014 was a bumper year for the institute’s working paper series, with 54 new papers circulated, bringing the total number in the series as of year-end to 220. Total downloads of the institute’s working papers increased from 2,207 in 2013 to 2,781 in 2014. Abstract views totaled 6,617 in 2014.

We made progress on other fronts as well, with institute staff presenting their work at a variety of research forums, moving papers through the publication process and initiating new projects.

Academic Research

Journal acceptances in 2014 were up from 2013, when one paper was accepted for publication. Seven papers were accepted for publication in 2014—in the *Journal of Monetary Economics*: Scott Davis’ “Financial Integration and International Business Cycle Co-Movement”; *Economics Letters*: Jian Wang’s “Are Predictable Improvements in TFP Contractionary or Expansionary: Implications from Sectoral TFP?” coauthored with Deokwoo Nam; *European Economic Review*: Michael Sposi’s “Price Equalization, Trade Flows, and Barriers to Trade,” coauthored with Piyusha Mutreja and B. Ravikumar; *Journal of Econometrics*: Alexander Chudik’s “Common Correlated Effects Estimation of Heterogeneous Dynamic Panel Data Models with Weakly Exogenous Regressors,” coauthored with Hashem Pesaran; *Advances in Econometrics* volume: Enrique Martínez-García and Mark Wynne’s “Assessing Bayesian Model Comparison in Small Samples”; *Journal of Economic Surveys*: Alexander Chudik’s “Theory and Practice of GVAR

Modeling,” coauthored with Hashem Pesaran; and *Journal of Economic and Social Measurement*: Enrique Martínez-García and Valerie Grossman’s “A New Database of Global Economic Indicators (DGEI),” coauthored with Adrienne Mack.

At year-end, staff had papers under review at the *Review of Economics and Statistics*, *Journal of Applied Econometrics*, *International Economic Review*, *Journal of Econometrics*, *Journal of International Economics*, *Journal of Monetary Economics*, *Journal of Money, Credit and Banking*, *Journal of International Money and Finance*, *Journal of Financial Economics*, *Journal of Real Estate Finance and Economics* and *Economic Inquiry*.

Conferences

The institute organized three conferences during 2014, one with Shanghai University of Finance and Economics (SHUFE), one with the Tower Center at Southern Methodist University and the conference held to mark the Federal Reserve System’s centennial. The first, “Micro-Foundations of International Trade, Global Imbalances and Implications on Monetary Policy,” was held in Shanghai in March and was cosponsored with SHUFE. This is the third such conference that we have organized in Shanghai in recent years (two with SHUFE, one with Fudan University). The 2014 conference featured presentations by researchers from the University of British Columbia, Johns Hopkins University, Dartmouth College, Chinese University of Hong Kong, SHUFE and the Dallas Fed.

The second conference, “The Political Economy of International Money: Common Currencies, Currency Wars and Exorbitant Privilege,” was held at the Dallas Fed on April 3–4. This conference was organized by institute Director Mark Wynne and Kathleen Cooper of the Tower Center at Southern Methodist University and was funded in part by the Jno. Owens Foundation. Keynote speeches were delivered by the late Ronald McKinnon of Stanford University (one of the fathers

of the theory of optimum currency areas) and Jeffrey Frieden of Harvard University.

The third conference, “The Federal Reserve’s Role in the Global Economy: A Historical Perspective,” was the Bank’s flagship centennial conference, held Sept. 18–19. The conference was organized by Institute Director Wynne and senior fellow Michael Bordo and featured senior policymakers and academics, including former Banco de México Governor Guillermo Ortiz, former Federal Reserve Vice Chair Donald Kohn and former Bank of England Deputy Governor Charles Bean. The inaugural Roosa Lecture was also part of the conference and was delivered by former Fed Chairman Paul Volcker. Summaries of all three conferences are included elsewhere in this report.

As in previous years, staff members were active presenting their work in external forums and conferences in 2014. These included the XVII Workshop in International Economics and Finance, the Association of Private Enterprise Education, the Tsinghua PBCSF Global Finance Forum, the Conference on Global Capital Flows and Financial Risk Management, the 2014 Spring Midwest Macro Meetings, the 2014 Western Economics Association International (WEAI) meetings and the International Conference on Financial Market Reform and Market Regulation.

Additionally, staff presented at the 10th Dynare Conference, the fall 2014 Midwest Macro Meeting, the 61st North American meetings of the Regional Science Association International, the Federal Reserve System Committee on International Economic Analysis and the Southern Economic Association 84th annual meetings.

Staff members also presented their work in seminars at the University of Houston, University of Winnipeg, Tsinghua University, Seoul National University, University of North Carolina at Charlotte, Texas A&M University, Beijing University, Southern University of Finance and Economics, Hong Kong Monetary Authority, Emory University, Bank of England, Bank for International Settlements and the Swiss National Bank.

Bank Publications

Institute staff contributed five articles to the Bank’s *Economic Letter* publication during the year: “Deindustrialization Redeploys Workers to Growing Service Sector,” by Michael Sposi and Valerie Grossman; “China’s Sputtering Housing Boom Poses Broad Economic Challenge,” by Janet Koech and Jian Wang; “Central Bank Transparency Anchors Inflation Expectations,” by J. Scott Davis, Adrienne Mack and Mark A. Wynne; “Consumer Price Differences Persist Among Eight Texas Cities,” by Alexander Chudik (and Michele Ca’ Zorzi of the European Central Bank and Chi-Young Choi of the University of Texas at Arlington); and “Current Account Surplus May Damp the Effects of China’s Credit Boom,” by J. Scott Davis and Adrienne Mack (and Wesley Phoa and Anne Vandenaabee of the Capital Group Cos.). The Bank’s *Economic Letter* and this annual report are intended to disseminate research to a broader audience than technical experts in economics.

People

Julieta Yung, a recent PhD graduate from the University of Notre Dame, joined the staff in July as a research economist. Bradley Graves, a 2014 graduate of SMU, joined the staff as a research assistant in June, and Kuhu Parasrampur, a 2013 graduate of the University of Rochester, joined the staff as a research assistant in July. Senior Research Analyst Adrienne Mack left the staff to take a position as an actuary with Mutual of Omaha. Scott Davis spent the month of July visiting the Hong Kong Institute for Monetary Research. In addition to regular visits over the year by Advisory Board member Finn Kydland and senior fellows Michael Bordo, Mario Crucini, Michael Devereux and Karen Lewis, we hosted research associate Ipppei Fujiwara for a week in Dallas.

This year, we added four research associates to our network: C.Y. Choi (University of Texas at Arlington), German Cubas (University of Houston), Piyusha Mutreja (Syracuse University) and Heiwai Tang (Johns Hopkins University).

Micro-Foundations of International Trade, Global Imbalances and Implications on Monetary Policy

By Jian Wang



Researchers from the U.S., Canada and China gathered in Shanghai to explore exchange rates, offshoring and trade policies. Research presented at the conference employed microdata of trade volumes and prices at the firm and product levels, which provide valuable information on crucial global economic issues such as trade imbalances, economic development and wage inequality.

Conference organizers were Jian Wang of the Federal Reserve Bank of Dallas and Zhi Yu of the Shanghai University of Finance and Economics (SHUFE). Presenters' institutions included the University of British Columbia, Johns Hopkins University, Dartmouth College, Chinese University of Hong Kong, SHUFE and the Dallas Fed.

Session One: Exchange Rates and Capital Goods

The first session considered exchange rate determination, the pass-through of exchange rate changes to prices and international trade in capital goods. Viktoria Hnatkovska, an associate professor at the University of British Columbia, presented "The Exchange Rate Response Puzzle," coauthored with Amartya Lahiri, a professor of economics at the University of British Columbia, and Carlos Vegh, a professor of economics at the University of Maryland. The authors investigated the effect of monetary tightening on the nominal exchange rate. Various theoretical models predict that the exchange rate appreciates following a rise in the policy rate, and that prediction has been widely confirmed in previous empirical studies that use the data from advanced countries. Hnatkovska, Lahiri and Vegh document that the exchange rate depreciates in developing countries following a monetary tightening, while it appreciates in industrial countries. The authors referred to these

empirical findings as the exchange rate response puzzle. It suggests that developing and advanced economies' transmission mechanisms may differ.

Furthermore, Hnatkovska, Lahiri and Vegh modify standard international macroeconomic models to introduce three impacts of monetary policy: the liquidity demand effect, fiscal effect and output effect. These three work in differing ways on the exchange rate following monetary tightening. The authors argue that the exchange rate response puzzle is attributable to the difference between developing and developed economies in the relative strength of these three effects.

Under the liquidity demand effect, an increase in the interest rate reduces the amount of the money in circulation, appreciating the exchange rate. However, under the fiscal and output effects, an increase in the current interest rate will raise the fiscal burden either through a higher interest rate on government debt or reduced government revenue in the future. The increase in the fiscal burden could be balanced by an increase in the inflation rate (inflation tax), which depreciates a country's currency. Hnatkovska, Lahiri and Vegh argue that the fiscal and output effects are stronger in developing countries than in industrial economies because emerging economies rely more on inflation tax—accounting for why the exchange rate responds differently to monetary tightening.

Xiang Gao, an assistant professor of economics at SHUFE, provided commentary, noting that reverse causality may exist in the data. Many central banks in emerging economies take action to stabilize their currencies. For instance, they often raise the interest rate when the exchange rate depreciates and vice versa. He recommended the authors consider alternative strategies to identify exogenous monetary shocks as robustness checks

2014 Conference Summary

When: March 15–16

Where: Shanghai University of Finance and Economics (SHUFE), Shanghai, China

Sponsors: Federal Reserve Bank of Dallas' Globalization and Monetary Policy Institute; School of International Business Administration at Shanghai University of Finance and Economics

of their empirical findings.

Wang of the Dallas Fed presented the session's second paper, "International Trade Price Stickiness and Exchange Rate Pass-Through in Micro Data: A Case Study on U.S.–China Trade," coauthored with Mina Kim, a research economist at the Bureau of Labor Statistics (BLS); Deokwoo Nam, an assistant professor at Hanyang University in Seoul, South Korea; and Jason Wu, a section chief at the Board of Governors of the Federal Reserve System. The paper examined the effect of the renminbi appreciation on trade prices between the U.S. and China. Using goods-level prices collected by the BLS, two empirical findings were proposed. First, firms changed prices more frequently after China abandoned its hard peg to the U.S. dollar in June 2005, allowing the Chinese currency to appreciate against the dollar. The duration of U.S.–China trade prices declined almost 30 percent after June 2005. A benchmark menu

cost model calibrated to the data can replicate the decrease in price stickiness.

Second, data on goods-level prices shed additional light on the manner in which renminbi appreciation has been passed on to U.S. import prices—exchange rate pass-through, or ERPT. Using goods-level price data, the paper documented that around 40 percent of U.S. imported goods from China were replaced without a single price change. These goods are more likely to change prices through product replacement rather than regular price adjustment. ERPT becomes much higher after exclusion of goods with no price change in the data, indicating that studies that do not consider product replacement bias may underestimate the effect of renminbi appreciation on U.S. import prices.

Shu Lin, a professor of economics at Fudan University, discussed the paper, finding the increase in the occurrence of price changes very

Most world capital goods production is concentrated in a small number of countries, and poor countries mainly rely on imported capital goods for their capital accumulation.



Participants in the micro-foundations conference

interesting and wondering if the frequency of product replacements also increased after China abandoned the hard currency peg. Lin also recommended that the authors investigate other potential reasons for low ERPT. For instance, China imports a large fraction of its inputs for producing final exports. When the Chinese currency appreciated, the prices of imported inputs became cheaper, reducing pressure on Chinese exporters to increase their prices.

Michael Sposi, a research economist at the Dallas Fed, presented “Capital Goods Trade and Economic Development,” coauthored with Piyusha Mutreja, an assistant professor of economics at Syracuse University, and B. Ravikumar, a vice president at the Federal Reserve Bank of St. Louis. Most world capital goods production is concentrated in a small number of countries, and poor countries mainly rely on imported capital goods for their capital accumulation. Mutreja, Ravikumar and Sposi argue that trade barriers will hinder developing countries from importing capital goods and slow their economic growth.

The authors introduce a multicountry, multisector Ricardian model of trade, in which one country has comparative advantage producing capital goods, into a neoclassical growth framework and calibrate the model to bilateral trade flows, prices and income per worker. Their model can match the data in multiple dimen-

sions such as the world distribution of capital goods production and the variation in capital per worker across countries. The model predicts that the cross-country income differences fall by more than 50 percent when distortions to capital goods trade are removed.

David Cook, a professor of economics at Hong Kong University of Science and Technology, noted during his discussion of the paper that the authors challenge the conventional view on the low investment rates in less-developed countries. It is believed that the high relative cost of capital goods contributes most to low investment in developing countries. Cook recommended that the authors empirically test their explanation based on trade barriers against an explanation based on high investment cost.

Session Two: Trade, Offshoring and Wage Inequality

The second session featured three papers on international trade and offshoring and their implications on wage inequality. Heiwai Tang, an assistant professor of economics at Johns Hopkins University, presented “Learning to Export from Neighbors,” coauthored with Ana Fernandes, a lecturer in economics at the University of Exeter. Tang and Fernandes noticed that uncertainty in the exporting business is large and self-experimentation is costly. Based on the belief that



Professor Emily Blanchard speaking to the conference

exporters gain knowledge about foreign demand from their neighbors, the researchers developed a statistical decision model to examine how learning shapes new exporters' dynamics and performance.

Using transaction-level data of all Chinese exporters, Tang and Fernandes studied how learning from neighbors affects new exporters' entry decisions, initial sales, survival rates and post-entry growth. The authors found that a firm's export entry decision and post-entry performance depend on several key factors predicted by their learning-from-neighbor model. For instance, the neighbors' export performance may serve as a signal when a firm makes its exporting decision. Tang and Fernandes document that a larger number of neighbor signals leads to more firm entries and better post-entry performance.

The paper was discussed by Tuan Luong, an assistant professor of economics at SHUFE. Luong noticed that there are two types of signals in Tang and Fernandes' model and noise from these signals independently appears. Luong suggested the authors consider a case with correlated noise in which the model will become more general but remain tractable.

The session's second paper, "Offshoring and Wage Inequality: Theory and Evidence from China," was presented by Liugang Sheng, an assistant professor of economics at Chinese University of Hong Kong. The paper's coauthor is Denis Tao Yang, a professor at the Darden School of Business at the University of Virginia. Trade in intermediate goods accounts for a large proportion of international trade. Sheng and Yang examine the effect of two forms of intermediate-goods trade—offshoring and arm's length transactions—on wage inequality. The authors argue that foreign direct investment (FDI) offshoring is more skill intensive than arm's length transactions and, thus, has a greater effect on upgrading skills in FDI-recipient developing countries.

Sheng and Yang tested their theory with China's data when it removed foreign ownership restrictions prior to membership in the World Trade Organization in 2001. Following the policy change, wholly foreign-owned firms began playing a more important role than joint ventures in China's FDI inflows and exports. The authors

found that increases in FDI offshoring significantly contributed to a greater wage premium for college graduates after 2001.

Zhiyuan Li, an associate professor of economics at SHUFE, discussed the paper, noting that it remains puzzling that the wage premium of college graduates increased among wholly foreign-owned firms, but not with joint ventures, if both types of FDI offshoring are skill intensive. Li proposed that processing trade may be the answer. In processing trade, firms import all or part of their inputs to produce final goods that will be exported to foreign countries. It is well-documented that processing trade is usually labor intensive and requires few skills. The situation the authors document is consistent with the reality that joint ventures mainly focus on processing trade, while wholly foreign-owned FDI firms do not. Li recommended that the authors take into account processing trade in their theoretical model and empirical exercises.

Bo Chen, an associate professor of economics at SHUFE, presented the session's last paper, "Wage Inequality and Input Trade Liberalization: Firm-Level Evidence from China," coauthored with Miaojie Yu, a professor of economics at Beijing University, and Zhihao Yu, a professor of economics at Carleton University. Chen, Yu and Yu studied the effect of input tariff reductions on wage inequality within a firm. Using Chinese firm-level data, the authors found that input tariff reductions widened within-firm wage inequality because high-skill labor enjoys a larger proportion of the incremental profit than low-skill labor.

Yifan Zhang, an associate professor of economics at Lingnan University, discussed the paper, arguing that the profit increase following a tariff reduction is unrelated to worker productivity. Thus, it is unclear whether skilled labor will enjoy a larger share of additional profit than unskilled labor. He suggested the authors also consider other factors, such as bargaining power, in their tests.

Session Three: Trade Policy, Offshoring and FDI

The last conference session featured papers on international market access, tariff reduction and international organization of production. Emily Blanchard, an assistant professor of business

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If a foreign country exports intermediate inputs to China that are then used to produce final export goods sold to the same foreign country, the foreign country may have a strong incentive to reduce tariffs on China's finished goods.

administration at Dartmouth College, presented “U.S. Multinationals and Preferential Market Access,” coauthored with Xenia Matschke, a professor of economics at Universität Trier.

Blanchard and Matschke examined the relation between U.S. multinational companies' offshoring and U.S. preferential trade agreements, using data covering 84 industries and 184 U.S. trading partners over 10 years. The authors found that industries and countries with greater U.S. foreign affiliate exports to the U.S. enjoy more preferential duty-free access to the U.S. The findings hold even after controlling for the endogeneity issue of U.S. multinational companies' choice of offshoring activity, suggesting that the pattern of international investment by U.S. firms may play a key role in shaping U.S. trade policy preferences.

Wei-Chih Chen, an assistant professor of economics at SHUFE, commented on the paper, noting that the authors may want to check the robustness of their empirical findings. Blanchard and Matschke note that the positive relation between U.S. foreign affiliate exports and preferential trade agreements may simply reflect market-seeking investment by U.S. companies: The multinationals will invest and sell in countries with preferential trade agreements with the U.S. To control for this issue, the authors used U.S. affiliates' sales to the local markets as an instrumental variable that helps identify the causal effect of U.S. foreign affiliate exports on preferential trade agreements. Chen argued that U.S. foreign affiliates' sales to the rest of the world may also correlate with U.S. preferential trade agreements, and the authors may also want to consider this factor in their empirical study.

The second paper, “Technology and Production Fragmentation: Domestic versus Foreign Sourcing,” was presented by Teresa Fort, an assistant professor of business administration at Dartmouth College. Fort empirically investigated the effect of changes in communication and information technology (CIT) on firms' production processes using firm-level data of the U.S. manufacturing entities. First, it has been shown that firms using more CIT outsource production across more locations. Second, Fort provided causal evidence that CIT lowers the costs of outsourcing and the effect is stronger for domestic

outsourcing than foreign outsourcing.

Linke Zhu, an assistant professor of economics at SHUFE, discussed the paper. Zhu would like to see more empirical evidence of the author's implicit assumption that the cost of adopting CIT is mainly a fixed sunk cost.

Zhi Yu, an assistant professor of economics at SHUFE, presented “Input Export Promotion and Output Tariff Reduction,” coauthored with Rodney Ludema and Anna Maria Mayda, associate professors of economics at Georgetown University, and Miaojie Yu, a professor of economics at Beijing University. The authors, drawing on Chinese transaction-level trade data, investigate if the import of intermediate inputs from a foreign country helps reduce tariffs on home country exports of final goods to the foreign country. If a foreign country exports intermediate inputs to China that are then used to produce final export goods sold to the same foreign country, the foreign country may have a strong incentive to reduce tariffs on China's finished goods. The tariff reduction will benefit both countries since it encourages intermediate-goods imports from China.

Discussing the paper, Blanchard pointed out that the effect of vertical linkages between final-goods producers and intermediate-goods producers operates through prices. She suggested that, if the data are available, the authors investigate how a decrease in the final-goods tariff increases the price and profits of intermediate-goods producers in the foreign country.

Current Issues and Future Study

Participants of the 1½-day conference exchanged ideas about understanding international trade and related macroeconomic issues by using microlevel data. The discussions shed light on important current issues and also inspired future research topics.

First, the microlevel data provide a foundation to study important macro issues, such as monetary policy, inflation and trade imbalances. Wang and his coauthors found that exporting-firm behaviors change with exchange rate policy. Specifically, aggregate price indexes may underestimate the pass-through of the renminbi appreciation on U.S. import prices. Hnatkovska and her coauthors showed that developing and

advanced economies have different transmission mechanisms for monetary tightening through its effects on the exchange rate.

Second, the benefits of international trade may be underappreciated in trade models based on aggregate-level data. As Sposi and coauthors pointed out, international trade plays a much more important role in economic growth once trade in capital goods is carefully incorporated in models as microdata suggest. This line of research provides microeconomic evidence of the importance of free trade in promoting economic growth.

Third, microlevel data provide information on how firms engage in international trade and FDI and the effects of these activities on issues such as wage inequality. Tang and his coauthor's research shed light on how firms learn to export from their neighbors. Policies that facilitate information sharing may reduce learning costs and help promote exports. While international trade and capital flows usually benefit overall economic growth and reduce cross-country income inequality, trade and capital market liberalization could induce an increase in income inequality within a country, which deserves policymakers' attention. Sheng and Yang documented that the significant increase in FDI offshoring after 2001 contributed to the sharp increase in the wage premium of college graduates. Chen and coauthors argue that input tariff reductions may increase wage inequalities between skilled and unskilled labors within a firm.

Finally, multinational companies' offshoring and trade activities shaped the trade policy in the home country. Blanchard and her coauthor found that industries and countries that have more U.S. foreign affiliate exports to the U.S. receive more preferential duty-free access to the U.S. Yu and coauthors document that China faces a lower tariff on final exports to a foreign country if that country exports to China more intermediate inputs used in final export production.

While international trade and capital flows usually benefit overall economic growth and reduce cross-country income inequality, trade and capital market liberalization could induce an increase in income inequality within a country, which deserves policymakers' attention.

The Political Economy of International Money: Common Currencies, Currency Wars and Exorbitant Privilege

By J. Scott Davis



and Mark A. Wynne



2014 Conference Summary

When: April 3–4

Where: Southern Methodist University
Dallas, Texas

Sponsors: Owens Foundation and the
Federal Reserve Bank of Dallas' Globalization and
Monetary Policy Institute

The Political Economy of International Money: Common Currencies, Currency Wars and Exorbitant Privilege" conference was held at the John Goodwin Tower Center at Southern Methodist University on April 3–4. It was sponsored by the Owens Foundation and the Federal Reserve Bank of Dallas' Globalization and Monetary Policy Institute.

Kathleen Cooper of the Tower Center, SMU economics professor Thomas Osang, and Mark A. Wynne and Jian Wang of the Dallas Fed organized the conference, the third such gathering in which the Dallas Fed participated along with the Tower Center and the Owens Foundation. The first two, in 2010 and 2012, were immigration related.¹

The importance of international economic forces has increased significantly over the past three decades with the opening of China, the collapse of the Soviet bloc and liberalization of the Indian economy. The net effect of these developments has been to add about 3 billion consumers and producers to the global economy.

The extraordinary growth rates that some emerging-market economies have realized over the period meant that in 2007, for the first time, more economic activity occurred in emerging-market and developing economies than in the advanced economies, according to International Monetary Fund (IMF) estimates (*Chart 1*).²

The center of gravity of global economic activity is shifting inexorably from the North Atlantic to East Asia. By some estimates, China's economy is already as big as that of the United States.

The term "globalization" has been used to describe these changes. While some have tended to dismiss the expression as faddish, it remains useful shorthand. Of course globalization is not new. Students of history are familiar with the first era of globalization, prior to World War I. Then, interna-

tional monetary relations were governed by the widespread adherence to a commodity standard, and central banks played a role very different from what they do today. But goods, capital and people flowed across national borders as easily as now.

This year's conference examined a very different aspect of globalization. When planning for it began, the euro crisis was headline news. Financial globalization has remade the world in ways that few could have anticipated when the first steps were taken toward liberalizing capital flows four decades ago. It is fair to say that in the absence of international capital flows, the housing boom in the United States would have ended sooner and probably with less dire consequences than those the nation has confronted since 2008.

Likewise, it seems reasonable that housing booms in Ireland and Spain would have been less dramatic absent the cross-border lending facilitated by a common currency. The policy response to the financial crisis had an important international dimension that was unprecedented—from coordinated interest rate cuts in October 2008 to the creation of international currency swap lines that have since become semipermanent.

Advanced economies' highly accommodative actions led to claims that the Fed and other central banks were engaging in a currency war against emerging markets. When talk began in 2013 of tapering Fed asset purchases under quantitative easing, the central bank was again criticized for pursuing policies perceived as adversely affecting other countries. Thus, an examination of the economic and political economy dimensions of financial globalization seemed timely, and the conference brought together top scholars.

Improving Policy Coordination

Jeffrey Frieden, a professor of government at

Harvard University, addressed international cooperation in economic policy in his keynote remarks, characterizing proposals to improve the exchange of ideas as ranging from cynical to utopian. The recent financial crisis elicited an unprecedented degree of cooperation between the world's leading central banks, though even more frequent cooperation was probably needed. Frieden said he believes that from a political economy standpoint, greater policy coordination is likely in the future.

The challenges posed by international capital flows, especially the procyclical nature of such flows, are particularly relevant, he said. Previously, only emerging-market economies confronted this problem, but over the past 15 years advanced economies have also faced it. Such flows create an externality warranting a policy response, he said, with the case for action resembling macroprudential regulation of the banking system. Just as individual banks don't have an incentive to take into account how their lending activities impact the national financial system, national regulators don't have an incentive to gauge the impact of their actions on the international financial system. For this reason there is benefit to policy coordination to monitor and possibly restrict international capital flows. While nations are reluctant to surrender sovereignty, delegation of responsibility over some matters, if managed correctly, may be possible. The European Union provides an example in this regard.

Ronald McKinnon, an international economics professor at Stanford University, gave the second keynote address. McKinnon, now deceased, was one of the fathers of the theory of optimum currency areas, an idea that when it was proposed seemed far-fetched and of theoretical interest at best.³ From the 1960s through the 1990s, few envisioned sovereign nations agreeing to share a common currency. In 1999, the euro became a reality.

Some of the currency's recent problems were anticipated by the contributors to the theory of optimum currency areas; others, such as the need for a banking union, were not. McKinnon wrote on many other issues as well, perhaps most prolifically in recent years on the global dollar standard, which he characterized in a 2013 book as "unloved."⁴ Three decades ago, he called for harmonizing monetary policies among the world's leading central banks. He suggested fixing the

trend rate of growth of each country's monetary base to provide greater international monetary system stability.⁵ And he was an early proponent of taking a global rather than a domestic perspective on monetary developments to better ensure price stability.⁶ Many of the issues with which McKinnon wrestled during his career remain.

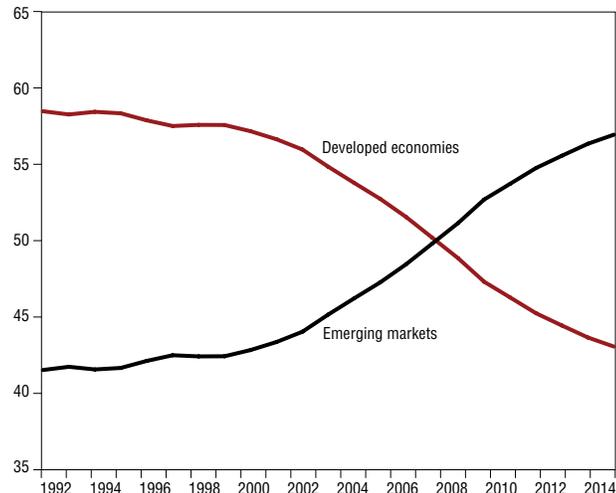
In his remarks, titled "The Unloved World Dollar Standard: Greenspan-Bernanke Bubbles in the Global Economy," McKinnon noted that the world has long operated on a dollar standard, with Federal Reserve monetary policy creating a first-order impact on global financial stability. Reiterating an observation he first made decades ago, McKinnon said that except at times of international financial crises, the Fed tends to be inward looking, focusing on domestic economic developments and ignoring potential international collateral damage from its monetary policies. In McKinnon's view, this makes the U.S. economy less stable. Since fall 2008, ultra-low interest rates on dollar assets have propelled waves of money into emerging markets by investors engaging in carry trades, which exploit differences in borrowing costs between nations. These investments have generated bubbles in international primary commodity prices and other assets. Quite apart from the detrimental effects that ultra-low interest rates in the

The recent financial crisis elicited an unprecedented degree of cooperation between the world's leading central banks, though even more frequent cooperation was probably needed.

Chart 1

Emerging-Market Share of World Output Passes 50 Percent

Share of world GDP (at purchasing power parity)



SOURCE: International Monetary Fund.

U.S. have on the rest of the world, near-zero interest rates also hold back investment in the American economy.⁷

Many of the issues that McKinnon raised in his opening remarks are addressed at greater length in his book, *The Unloved Dollar Standard: From Bretton Woods to the Rise of China*. Following his presentation, audience members questioned some elements of his thesis, such as how low interest rates might simultaneously boost commodity prices and not stimulate demand in advanced economies, or how a policy of low short-term interest rates detracted from the ability of banks to lend profitably.



Professor Ronald McKinnon of Stanford University

Volatility of Flows

Globalization is about international capital flows first and foremost, and the first panel addressed this issue from several different angles. The scale of U.S. capital outflows has exploded in the past few decades. The volatility of these capital flows during the recent financial crisis was unprecedented (*Chart 2*).

The first panelist, Carol Bertaut, the chief of the Global Financial Flows Section of the Federal Reserve System Board of Governors, built on issues McKinnon raised in his address, specifically the character and determinants of “hot money” flows

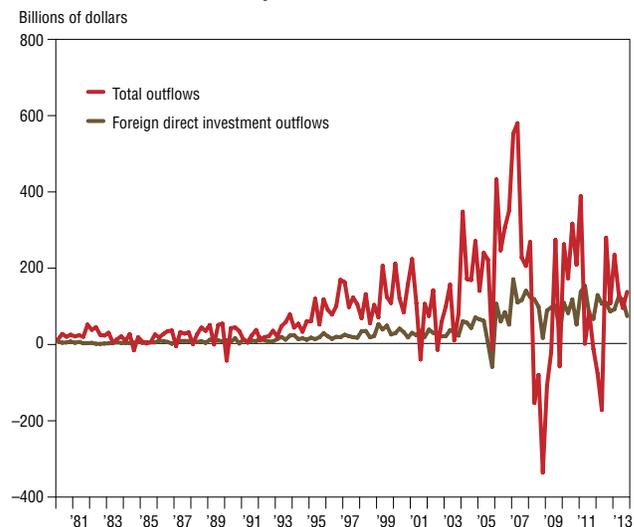
into emerging markets. As indicated in *Chart 2*, while U.S. long-term foreign direct investment outflows are fairly steady, the volatility in capital outflows in the past few years has been due to fluctuations in short-term, hot money flows. Bertaut sought to determine whether a “reach for yield” or possibly some other motivation drove these flows. She found that most U.S. investment in foreign bonds is in high-quality assets. While the share of U.S. investment into riskier emerging-market bonds rose in recent years, its 15 percent share of the total U.S. foreign bond portfolio remains small. A “search for safety,” not the “reach for yield,” remains the main driving factor behind U.S. investment in foreign bonds, Bertaut said, citing evidence that the trend is mainly driven by investment into high-grade financial corporate bonds. There is limited evidence that the reach for yield has driven U.S. investment in foreign government bonds since the global financial crisis in 2008.

Michael Klein, a professor of international economic affairs at Tufts University, opened his presentation with two quotes from John Maynard Keynes. The first was an oft-repeated excerpt from *The Economic Consequences of the Peace*, highlighting just how easy it was for an investor in pre-WWI London to “adventure his wealth in the natural resources and new enterprises of any quarter of the world, and share, without exertion or even trouble, in their prospective fruits and advantages.” The second was a less-well-known quote from Keynes’ inaugural Finlay Lecture at University College Dublin in 1933: “I sympathize ... with those who would minimize rather than those who would maximize economic entanglements among nations. ... Let goods be home-spun whenever it is reasonable and conveniently possible and, above all, let finance be national.”⁸

Klein used the quotes to open a discussion of how conventional wisdom regarding the desirability of controls on international capital flows has shifted, especially following the global financial crisis. Klein drew a distinction between controls that he characterized as “gates” (designed to regulate flows) and those he viewed as “walls” (designed to prevent flows). Too often, discussion of the desirability of gate-like controls was confused by likening them to wall-like controls, Klein said.

Gates have their problems (they may not shut

Chart 2
U.S. Capital Outflows Exhibit Volatility, U.S. Foreign Direct Investment Remains Steady



SOURCE: International Monetary Fund.

tightly, they may shut too late and they may have rusty hinges), but they may sometimes be employed usefully to support monetary autonomy and for macroprudential purposes. However, data on the experiences of Brazil and Korea, with gate-like controls in recent years, seem to suggest that they were of limited effectiveness unless broad based, he said.⁹

The third panelist, Frank Warnock, professor of business administration at the University of Virginia's Darden School (and also a senior fellow at the Globalization and Monetary Policy Institute), argued for more careful language when discussing capital flows, noting that they come in many forms and can be due to portfolio reallocation and portfolio growth.

Even after controlling for portfolio growth, it is important to distinguish between active and passive reallocation due to exchange rate changes, for example. These distinctions are important when assessing whether U.S. investors are underweight in foreign securities. U.S. investors appear to be becoming more underweight in emerging markets, investing less in these markets than simple benchmark models would suggest, Warnock said.

Discussions of global capital flows, especially over the past decade and a half, are often conditioned by what former Fed Chairman Ben Bernanke characterized as a global saving glut.¹⁰ In the discussion that followed the session, audience members asked whether the real problem associated with international capital flows prior to the crisis was a global banking glut as opposed to a global saving glut, as South Korean financial economist Hyun Shin has argued.¹¹

Shared Monetary Challenges

In the euro area, the sharing of the common currency amplifies the challenges international capital flows cause. Rutgers University economics professor Michael Bordo, a senior fellow of the Globalization and Monetary Policy Institute, opened the second panel on common currencies, asking whether the euro will survive.

He cited work with Lars Jonung that showed national monetary unions tend to work better than international unions. The euro crisis exposed flaws in the design of the single currency, he said. Moreover, the crisis response has been troubled. Bordo argued that the IMF and other members

of the so-called troika—the IMF, the European Central Bank (ECB) and the European Commission—would have done better by allowing Greece to default rather than restructuring its sovereign debt. In its crisis response, the ECB engaged in fiscal policy and exposed itself to credit risk. The euro's prospects for a crisis-free future are limited, though it will likely survive as long as there is political will, Bordo said.

The architects of European Economic and Monetary Union were aware of the difficulties that arise when a diverse group of countries share a common currency. To that end, they installed an institutional framework, the Maastricht Treaty. What few seemed to appreciate prior to the launch of the single currency in 1999 was the need for a banking regulatory union to accompany monetary union. The absence of such oversight was key to crises in Ireland and Spain. (The crisis in Greece was due to a failure to follow Maastricht Treaty guidelines.)

Hubert Kempf, an economics professor at ENS Cachan in Paris, examined the progress toward building a banking union in the euro area. Only a partial banking union, covering the single market and the TARGET2 payments system, exists, he said. Other aspects of a full union—a single set of regulations, bank supervisor, resolution mechanism and deposit insurance protection—are missing. While there has been progress, problems remain related to risk sharing and ceding of national sovereignty.

David Malpass, president of Encima Global, a New York economic research and consulting firm, examined changes in balance sheets of the Federal Reserve and the ECB as a result of their responses to the financial crises. Despite Fed balance sheet growth, the U.S. central bank faces less risk than the ECB. At the time of the conference, the ECB had not engaged in a quantitative easing (QE) program comparable to what the Fed began in 2008. A challenge to ECB efforts could be European asset-backed (mortgage) securities, which differ greatly from such debt in the U.S. In Europe, almost all mortgages are floating rate rather than fixed rate. Further, if a QE type program is to succeed in the euro area, it must work through the banking system rather than through portfolio rebalancing, as in the U.S.

In the subsequent question-and-answer session, audience members asked about renationalization of the euro-area banking system postcrisis.

The architects of European Economic and Monetary Union were aware of the difficulties that arise when a diverse group of countries share a common currency.

China's surplus with the rest of the world and the U.S. has declined by a substantial amount in recent years, due in no small part to appreciation of the renminbi.

Banks that were active in cross-border lending before the crisis seem to have retreated to their home markets. This might weaken the case for a robust euro-area banking union. Others inquired about the new fiscal compact designed to provide a more rigorous framework for responsible management of public finances in the euro area, and whether it can be viewed as a meaningful step toward fiscal union.

Still others questioned whether the fiscal compact will prove any more binding than the Stability and Growth Pact that it replaces. One presenter noted that real progress toward the creation of a fiscal union and the issuance of a euro bond, neither of which seem likely imminently.

Jeffrey Frankel, professor of capital formation and growth at Harvard University's Kennedy School, presented the third and final keynote speech. Frankel's presentation ranged over a variety of issues that arose during conference discussions. Frankel, responding to McKinnon's argument that U.S. monetary policy lies at the heart of the global dollar standard, said that targeting nominal gross domestic product would be superior to the current practice of a formal inflation target (or numerical price objective) and informal employment target. In the international arena, he argued that providing emerging market economies a greater say in the management of the global economy is long overdue.

The creation of the Group of 20 (as an alternative to the G7) is an important step, but others are needed, for example, altering the distribution of votes in international institutions such as the IMF, Frankel said. He also proposed an unorthodox solution to problems facing the Fed and the ECB. The Fed is holding large quantities of U.S. Treasuries that it will need to dispose of at some point, while the ECB needs to boost activity in the euro area, or at a minimum prevent an entrenched Japan-style deflation. An ECB purchase of the Treasuries could remedy both problems, Frankel said. This would allow the Fed to dispose of its holdings of Treasuries while allowing the ECB to add liquidity without violating the Maastricht Treaty prohibition of monetary financing.

Assessing Currency Wars

The final session of the conference was devoted to a discussion of currency wars. Brad Setser, deputy

assistant secretary for international economic analysis at the U.S. Treasury Department, opened by suggesting that martial language (such as references to currency wars) doesn't aid resolution of these issues. Such talk is probably better suited to the 19th century than to contemporary international relations, Setser said. He noted that significant progress has been made in eliminating international imbalances, though more needs to be done.

China's surplus with the rest of the world and the U.S. has declined by a substantial amount in recent years, due in no small part to appreciation of the renminbi, he said. Additionally, the IMF entered the financial crisis with fewer resources than some emerging-market economies hold in foreign exchange reserves. Even after a recent increase in the resources available to the IMF, it still falls short of what the best-resourced emerging-market economies have at their disposal, Setser said. Finally, Setser addressed the issue of adverse spillovers from U.S. monetary policy to the rest of the world, noting that the world generally benefits from U.S. demand expansion.

Benjamin Cohen, professor of international political economy at the University of California at Santa Barbara, discussed attempts to manage exchange rates between the world's currencies. He argued that the notion of currency wars had its origins in the experiences of countries with floating exchange rates during the 1930s. This shared experience prompted the post-World War II consensus in favor of managed exchange rates. However, such attempts have not proven effective because national governments have been reluctant to cede authority to supranational institutions such as the IMF. Dirty floats are prevalent, and talk of currency wars is not exaggerated, he said.

Conflicts about currency values are ultimately conflicts about trade, and specifically about countries seeking to gain an unfair advantage for their exporters internationally. Lawrence Broz, a political science professor at the University of California at San Diego, examined the interaction between real exchange rate appreciation (that is, exchange rate appreciation correcting for differences in price levels) and calls for trade protection in the United States. Such demands in the U.S. increased significantly in the first half of the 1980s as the real value of the dollar soared (especially against Japan) and

again in the 2000s as the value of the renminbi was prevented from gaining against the dollar.

Yet movements in real exchange rates have very different effects at the level of individual industries and sectors. The extent to which exchange rate movements pass through to final goods prices will influence how strongly an industry or sector will lobby for trade protection. Commodity producers with limited pricing power will tend to be more sensitive to exchange rate movement, while companies with extensive global supply chains that import a lot of their inputs will be less sensitive.

Benn Steil, a senior fellow at the Council on Foreign Relations, offered the conference's last formal presentation. He focused on how Fed policy impacts emerging markets, opening with a hypothesis about the impact of tapering on political developments in Ukraine: The Fed's reduction of bond purchases pushed up interest rates and reduced financing available to many emerging-market economies; in Ukraine this lack of foreign funds drove then-President Viktor Yanukovich to seek support from Moscow, igniting protests in late 2013 that sparked the crisis.

Transcripts of Federal Open Market Committee (FOMC) meetings held during 2008 were released in early 2013, and Steil called attention to the discussion of extending U.S. dollar swap lines to emerging-market economies. Not all countries requesting such swap lines received them. Rather, priority was given to those countries perceived as posing systemic risk to the U.S. financial system if forced to liquidate their holdings of dollar-denominated securities to meet liquidity needs. Thus, Fed policy in deciding which countries would receive swap lines directly impacted financial conditions in emerging markets by determining availability of dollar-denominated liquidity.

'Exorbitant Privilege'

The conference ended with a question posed by an audience member echoing the title of the conference: "Is exorbitant privilege intact?" This question effectively summarizes much of what was discussed. Among the conclusions, the dollar's position as the international reserve currency is safe, largely because there are no obvious candidates to take its place, and the euro is beset by serious structural flaws requiring resolution before it can be



Conference presenters

anything more than a regional currency. The renminbi is not freely traded, and capital control "walls" in China will continue preventing any internationalization of the currency. Increasing financial integration will mean that the U.S. economy becomes ever more entangled with the economies in the rest of the world, and the dollar's position as the world's reserve currency means that U.S. monetary policy and the actions of the Fed will continue affecting economic conditions far beyond U.S. borders.

Notes

¹The Owens Foundation was established by the widow of John E. Owens in memory of her husband, a prominent Texas banker. During his lifetime, Mr. Owens was intensely interested in international relations and he sought to establish a foundation that would memorialize this interest. The broad objective of the conferences sponsored by the Owens Foundation is to deepen public understanding of international economic forces in the philosophical context of free trade.

²Developed economies refers to the IMF classification of advanced economies and includes the Group of 7 countries: the U.S., the U.K., Japan, France, Italy, Germany and Canada. Emerging markets refers to the IMF classification of emerging markets and developing countries and includes BRICS countries: Brazil, Russia, India, China and South Africa.

³See "Optimum Currency Areas," by Ronald I. McKinnon, *American Economic Review*, vol. 53, no. 4, 1963, pp. 717–25.

⁴See *The Unloved Dollar Standard: From Bretton Woods to the Rise of China*, by Ronald I. McKinnon, Oxford, U.K.: Oxford University Press, 2013.

⁵See "Why U.S. Monetary Policy Should Be Internationalized," by Ronald I. McKinnon, in *To Promote Peace: U.S. Foreign Policy in the Mid-1980s*, Dennis Bark, ed., Palo Alto, Calif.: Hoover Press, 1984, pp. 57–68.

⁶See "Currency Substitution and Instability in the World Dollar Standard," by Ronald I. McKinnon, *American Economic Review*, vol. 72, no. 3, 1982, pp. 320–33.

⁷McKinnon argued that ultra-low interest rates in the U.S. encourage large U.S. corporations to turn to financial markets instead of banks for financing. The loss of some of their larger and safer customers makes the balance sheets of many smaller banks riskier, so they may be forced to cut their overall loan portfolio, including reducing lending to many small and medium-sized corporations that cannot turn to financial markets for financing.

⁸See "National Self-Sufficiency," by John Maynard Keynes, *Studies: An Irish Quarterly Review*, vol. 22, no. 86, 1933, pp. 177–93.

⁹See also Klein's VoxEU article "Capital Controls: Gates versus Walls," Jan. 17, 2013, www.voxeu.org/article/capital-controls-gates-versus-walls.

¹⁰See "The Global Saving Glut and the U.S. Current Account Deficit," speech by Ben Bernanke at the Sandridge Lecture, Virginia Association of Economists, Richmond, Va., March 10, 2005.

¹¹See "Global Banking Glut and Loan Risk Premium," by Hyun Song Shin, paper presented at the 12th Jacques Polak Annual Research Conference, International Monetary Fund, Washington, D.C., Nov. 10–11, 2011.

The Federal Reserve's Role in the Global Economy: A Historical Perspective

By Michael Weiss



The Globalization and Monetary Policy Institute at the Federal Reserve Bank of Dallas sponsored the Bank's centennial conference analyzing the evolution of the U.S. central bank, from its beginnings 100 years ago to its future influencing global monetary policy. The gathering, held Sept. 18–19 at the Dallas Fed, included the inaugural Robert V. Roosa Memorial Lecture, a conversation with former Federal Reserve Chairman Paul A. Volcker. The conference was organized by Dallas Fed Vice President and Globalization Institute Director Mark A. Wynne and institute senior fellow Michael D. Bordo, a professor of economics at Rutgers University.

The conference program was divided into three sessions: "Beginnings: The Gold Standard, Global Conflict and the Great Depression," "Coming of Age: From Bretton Woods to the Great Inflation to the Great Moderation" and "Globalization 2.0: Monetary Policy in a Global Context: Past, Present and Future."

The first session featured two presentations. Barry Eichengreen, professor of economics and political science at the University of California, Berkeley, began his discussion of "Doctrinal Determinants, Domestic and International, of Federal Reserve Policy, 1914–1933" by arguing that international considerations made up only a part of the factors—though not negligible—intermittently shaping the Federal Reserve's outlook and policies during an initial era that ended in 1933.

Monetary Policy Doctrines

Eichengreen said the period was characterized by a series of doctrines. The Gold Standard Doctrine predominated at the time the Federal Reserve System was created. Gold inflows and outflows often signaled changes in central bank policy. Still, there wasn't a rigid rule. Rather, the gold standard was not

just a statutory requirement but also a way of thinking. "The gold standard was not a mechanical set of rules," Eichengreen said. The Real Bills Doctrine, mirroring central bank thinking of the late 19th and early 20th centuries, stressed the notion that the central bank should provide an "elastic currency"—as much money and credit as needed for business purposes (as opposed to speculative ones).

The Reifler–Burgess Doctrine, which followed, closely resembled Real Bills and proposed that the Federal Reserve had "multiple instruments to intervene." Reifler–Burgess, however, concluded that the level of interest rates—whether achieved through discount-window borrowing or open market operations—was the only adequate way to summarize the stance of monetary policy. The subsequent Warburg Doctrine, named for German-American banker Paul Warburg, accompanied the U.S.'s ascension as an emerging market of the 20th century. The doctrine, which carried "a distinctive foreign policy element," sought to "enhance the international role of the dollar" as a means of promoting U.S. economic competitiveness. Warburg, a Fed Board member at the institution's 1914 founding, argued that the central bank as a market maker for trade acceptances could regulate interest rate movements. The Warburg Doctrine, however, was ill-equipped to deal with the integration of monetary and fiscal policy, Eichengreen said.

The Strong Doctrine, named after Federal Reserve Bank of New York Governor Benjamin Strong, countered the Real Bills Doctrine, suggesting that rather than interest rates, the central bank should focus on money and credit aggregates. Strong, an ally of Bank of England Governor Montagu Norman and a pragmatist, "believed in discretionary policy" absent specific rules and thought stable exchange rates encouraged U.S. commodity exports. The subsequent Harrison Doctrine represented a tempera-

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mental rather than a doctrinal departure: George Harrison served as Strong's deputy for almost nine years before taking over at the New York Fed.

Greater Fed Latitude

The Glass–Steagall Doctrine epitomized in the Glass–Steagall Act of 1932 relaxed collateral requirements on Federal Reserve notes, providing a bit of distance from the Gold Standard Doctrine, and allowed a greater range of securities against which the Fed could lend, thus countering Real Bills. Conceptually, Glass–Steagall provided an incremental step toward the policies of Franklin Roosevelt and the Roosevelt Doctrine. A reflationary period in the wake of the Great Depression, it is characterized as a time of inconsistent policy and wavering from the gold standard.

Eichengreen traced the doctrines from the post-World War I recession through central bank open market purchases in 1932. Following WWI, preservation of the gold standard in the U.S. set the stage for the gold standard's international restoration. "The dollar was the lynchpin of the international system," Eichengreen said. During 1924 and 1927, the U.S. experienced gold inflows, with international considerations "playing a subsidiary role." During the great crash and its aftermath, 1929–30, the Fed loosened and provided emergency liquidity but subsequently, in accordance with the interest-rate-driven Reifler–Burgess Doctrine, mistakenly believed its work was over in 1931 and tightened monetary policy in the first of "its critical errors." The Fed, amid congressional pressure as unemployment exceeded 20 percent, engaged in expansionary open market operations in April to August 1932, even as the gold reserve ratio of the New York Fed declined to nearly 50 percent at the end of June 1932. Some have suggested that the Fed retreated in July because of the possibility of a gold standard crisis.

Discussant Harold James, a Princeton University professor of history and international affairs, noted that the Paul Warburg Doctrine sought to define the Federal Reserve along the lines of foreign central banks of the period. Warburg's brother, with whom he was in regular contact, was an adviser to Kaiser Wilhelm II and was working to reform the German financial system. So in essence, the Warburg approach was being applied in two places simultaneously. The use of the word "reserves" in the

title of the U.S. central bank has in its essence "a distinctly foreign and security dimension to it," James said. Warburg makes frequent analogies to armies and defense.

Absence of International, Political Pressure

The session's second paper, "Navigating Constraints: The Evolution of Federal Reserve Monetary Policy, 1935–1959," examined Federal Reserve policy during the 1950s, when the central bank's efforts appeared effective, and how the Fed evolved following the disastrous Depression era. The paper, written by David C. Wheelock, deputy director of research at the Federal Reserve Bank of St. Louis, and Mark A. Carlson, a senior economist at the Board of Governors of the Federal Reserve System, was presented by Wheelock.

The paper proposed that a significant portion of the Fed's success in the 1950s owed to the absence of political and international pressures of the prior periods. The Fed of the 1950s didn't confront policy limitations of the 1930s, when gold inflows inhibited its open market operations, and the 1940s, when the central bank was called upon to maintain low interest rates for Treasury debt amid World War II. After the war, the Fed sought to control inflation

After World War II, the Fed sought to control inflation while still maintaining low interest rates.



Richard Fisher, Guillermo Ortiz and John Taylor

The Fed's focus on the real U.S. economy and unemployment while viewing balance of payments objectives as a lesser concern represented the shift that assigned the U.S. Treasury greater responsibility for managing international affairs.

while still maintaining low interest rates. Two 1930s reforms were significant to later events—the Gold Reserve Act of 1934, allowing the Treasury to intervene in gold and foreign exchange markets, and the Banking Act of 1935, providing the Federal Reserve Board of Governors greater powers relative to the regional Fed Banks and reconstituting the Federal Open Market Committee to seven governors and five Reserve Bank presidents.

Drawing on a statistical analysis of expected measures of inflation and the output gap (the difference between the economy's actual output and its capacity), the authors concluded that the Fed responded to macroeconomic conditions by adjusting the reserves they required banks to hold beginning in the mid-1930s—increasing reserve requirements to damp credit availability. Fed policy was constrained through WWII and in the immediate postwar years by a need to keep interest rates low in support of Treasury funding operations. The Defense Production Act in 1950 provided the Fed powers to directly regulate consumer and real estate credit markets and influence lending activity.

In March 1951, the Fed and Treasury reached an agreement freeing the Fed of the responsibility to limit government debt yields, which could become more responsive to market forces. Changes in reserve requirements remained a basic Fed tool of monetary policy in the 1950s even as gold outflows drained \$1.5 billion in reserves from the banking system during the first half of 1958 and the balance of payments deficit reached \$4 billion in 1959. Political pressures re-emerged in the 1960s, marking an end of a decade in which enlightened policymakers and a stable environment produced “one of the Fed's better decades.”

Discussant Gary Richardson, the Federal Reserve System historian, said Fed inaction during the 1930s reflected institutional constraints and legal limitations on open market intervention and operation of the discount lending window through which banks could borrow funds. Additionally, the presence of the gold standard carried intellectual limits on actions the Fed was willing to take.

Bretton Woods and the Dollar Peg

The conference's second session, “Coming of Age: From Bretton Woods to the Great Inflation to the Great Moderation,” picked up the Fed timeline

with the 1944 Bretton Woods Agreement of managed exchange rates and continued to the period of relative business-cycle tranquility of the mid-1990s. The session's first paper was “Federal Reserve Policy and Bretton Woods,” by Bordo and Owen Humpage, a senior economic advisor at the Federal Reserve Bank of Cleveland. Bretton Woods sought to install a currency adjustment system that would avoid the problems of the 1920s, Bordo said. However, just as the agreement was becoming fully operational, dollar convertibility concerns weighed on U.S. actions, forcing policymakers to sometimes reluctantly consider global implications of U.S. economic policy as the dollar became the key international reserve currency. At the same time, some abroad resented what was viewed as the dollar's “privileged” standing. The dollar initially was pegged to gold at \$35 per ounce, with developed nations' currencies pegged to the dollar.

The Fed's focus on the real U.S. economy and unemployment while viewing balance of payments objectives as a lesser concern represented the shift that assigned the U.S. Treasury greater responsibility for managing international affairs. It also had the consequence of eliminating the constraint of foreign policy on domestic inflation, ultimately dooming Bretton Woods, Bordo said.

By 1960, total external dollar liabilities exceeded gold holdings, Humpage said. They rose by \$5.5 billion in 1960 and by \$55.4 billion from December 1969 to March 1973—indicative of the so-called Triffin dilemma (named after Belgian economist Robert Triffin) of rising international demand for dollars enabling large U.S. current account deficits. Amid U.S. inflation that remained high relative to modest price growth before 1965, Bretton Woods unwound from 1971 to 1973, when floating exchange rates replaced the pegged rates of the Bretton Woods era.

Bordo and Humpage concluded that once Fed policies after 1960 began focusing on domestic objectives—employment and maintaining growth—often at the exclusion of international issues, Bretton Woods' days were numbered. Moreover, the removal of international constraints loosened some of the restrictions on U.S. monetary policy, setting the stage for the “Great Inflation,” beginning in the 1970s.

Discussant James Boughton, a senior fellow at the Center for International Governance Innovation, said he held a more positive view of the Bretton

Woods era. It paved the way for an era of world prosperity and relative peace. Its collapse was the product of internal contradictions and U.S. policy shortcomings. The system that emerged in the years after Bretton Woods, rather than relying on a single economy such as the U.S., assumed prosperity in multiple countries. The system replaced a single creditor economy in the world with 17 creditor economies, many only decades removed from the devastation of WWII.

Boughton questioned whether Bretton Woods' demise is lamentable. Inflation became a byproduct of the Fed's responsibility to promote employment (and with it growth). Even in the absence of Bretton Woods, the U.S. dollar's global primacy remains. And finally, he observed, the aftermath of Bretton Woods hasn't been as successful as it should've been. Leaders at times have lost sight of the goal of high employment and growth rates within a broad framework of monetary and fiscal policy.

In the question-and-answer session, Bordo said it is unclear whether Bretton Woods was the reason for successful economic results in the immediate postwar period or if some of the success represented catch-up from WWII.

Increasing International Stature

Edwin Truman, nonresident senior fellow at the Peterson Institute for International Economics, presented his paper "The Federal Reserve Engages the World (1970–2000): An Insider's Narrative of the Transition to Managed Floating and Financial Turbulence," which argued that U.S. monetary policy has come to dominate global monetary policy to a far greater extent than before. During the last three decades of the 20th century, the Fed emerged as the closest thing to a world central bank in an increasingly globalized economic and financial system.

Truman cited four areas where he devoted particular attention to the Federal Reserve's role. First was U.S. external accounts, which predominated in 1970 and by 2000 had eased, only to reemerge in subsequent years. It was an example of the global economy's impact on Federal Reserve actions. Early on, amid the 1973–74 rapid increase of global oil prices, U.S. international economic policy was aimed at restoring "a sufficient current account surplus to support U.S. net private cash outflows."

Second, Fed attention to the dollar's value in

foreign exchange markets predominated in the early years only to decline later. The basic view loosely linked the dollar to the current account. The depreciating dollar was widely viewed as an exogenous source of inflation (aided by rising commodity prices, especially oil). The early Reagan administration adopted a "minimalist" approach to the currency.

As the dollar rebounded following the U.S. domestic fight against inflation during the Volcker Fed, it wasn't until the second half of the Reagan administration (this time with little Fed involvement) that there was action to ease the dollar's value, which gained 45 percent between 1980 and 1985. After peaking in March 1985, it declined by 27 percent amid the Plaza Accord Group of Five finance ministers' declaration on Sept. 22, 1985, that "some further orderly appreciation of the main non-dollar currencies against the dollar is desirable." By the February 1986 Louvre Accord of the Group of Six countries, the dollar's depreciation had become worrisome, prompting agreement to seek stability.

In 1994, Fed Chairman Alan Greenspan, in collaboration with the Clinton Treasury, decried a weak dollar as "neither good for the international financial system nor good for the American

economy." The strong dollar policy of the next 20 years resulted.

The third example of key Fed involvement was the Great Inflation, belatedly recognized as a home-grown issue rather than the product of external forces. Though the ending date of the Great Inflation is difficult to pin down, it followed Volcker's high-interest-rate policies of the early 1980s.

The fourth example was Fed management and prevention of external financial crises, which tended to raise the profile of the U.S. central bank. Reflecting the openness of the U.S. economy relative to the 1960s, the 1990s were a period when the Fed went global. The on-again, off-again Fed participation in the currency swaps market illustrated policymakers' ambivalence during the 1990s. With the exception of arrangements involving Canada and Mexico, the swaps program was terminated in 1998 as the European Central Bank (ECB) was beginning operation and the euro came into being. But currency swaps quickly reappeared in preparation for possible market disruption in the Y2K millennium computer transition and then again following the 9/11 terror attacks. It was most extensively used in support of global financial stability efforts during the Great Recession.



Richard Fisher and Paul Volcker

The challenge for the Fed is initially toward domestic monetary policy objectives.



Michael Bordo and Harold James

On the broader international stage, the Fed's swap lines provided key support to Mexico during its 1994 peso devaluation as the central bank worked with the Treasury to gain approval of a \$40 billion Mexican debt restructuring. The 1997–98 Asian debt crisis brought about a second high-profile intervention. The Fed took on additional leadership roles during the Russian financial crisis in 1998 and the collapse of the Long-Term Capital Management hedge fund.

In all, Fed decision-making or direct intervention was involved 14 times in global interventions from the 1970s to the start of the new millennium. The cumulative impact was key to the emergence of the Fed as the global central bank.

Crisis Illustrates Integrated Markets

A policy panel, "Perspectives of the Fed's Role in International Crises," was the final segment of session II. Moderated by Dallas Fed President and CEO Richard Fisher, the panelists were: Donald Kohn, senior fellow in economic studies at the Brookings Institution and a member of the Federal Reserve Board of Governors from 2002 to 2010, the last four years as vice chairman; Charles Bean, who retired June 30, 2014, as deputy governor for monetary policy at the Bank of England; Guillermo Ortiz, chairman of Grupo Financiero Banorte and governor of the Banco de México from January 1998 until December 2009; and Stephen Cecchetti, professor of international economics at the Brandeis International Business School and former Bank for International Settlements economic adviser and head of the Monetary and Economic Department.

The Fed's central role in the Great Recession and global financial crisis reflected increasing international integration of markets and deep dollar-asset markets, Kohn said. As the U.S. subprime mortgage crisis was transmitted around the world, the U.S. central bank became a primary liquidity backstop and the crisis manager. The building crisis was a reflection of outsized spending in the U.S. that led to extensive borrowing abroad, Kohn said. Foreign banks' pursuit of presumably "very safe assets" led to the promotion of mortgage-backed securities that had received top grades from U.S. credit rating agencies. The securities conveyed the image of liquidity, which turned out to be illusory during the crisis, and spread risk to emerging markets.

Currency swaps between central banks providing liquidity to the global financial system were part of the crisis response, with 14 countries participating. Once market panic abated, the amount of the swaps lessened, indicating the correctness of the central bankers' response. "Did they work?" Kohn asked rhetorically. "I think they did." The emergence of the swaps raised a boundary problem, namely, which nations to include, specifically among emerging markets. Within that group, there were three criteria: 1) participants needed to have significant financial mass; 2) they required a prudent financial policy; 3) inclusion in the swaps program would be of benefit.

In dealing with such a massive financial crisis in the future, Kohn said, the lack of a lender of last resort globally could be a problem. The Fed participated in a coordinated rate reduction with the ECB in October 2008 that sought to bolster confidence in the banks through their joint efforts. The Fed has always played a leadership role, Kohn said, as evidenced by other central banks following the lead of U.S. policymakers.

Expansionary Policy Benefits All

Bean, reflecting on the international aspects of Fed crisis efforts, said the Group of 20 (G-20) finance ministers debated whether advanced economies had pursued unconventional monetary policies at the expense of emerging markets. The discussion may have reflected underlying concerns—specifically, that developed markets wouldn't stand behind emerging markets in the face of instability that could result from withdrawal of the expansionary policies. Emerging-market financial leaders, most notably in Brazil, have suggested that a byproduct of the measures may have been dollar depreciation as policy was eased and capital flight as the prospects for normalization increased, Bean said.

Terming such actions, where they occurred, as spillover effects, Bean said macroeconomic model simulations suggest that the crisis management's net effect globally was expansionary. "Given that the world economy was—and still is—suffering from insufficient aggregate demand, I conclude that the Fed's monetary policies were helpful not only domestically but also for the rest of the world," Bean said. Problems lay less with Fed-led actions and

more with “the unwillingness of some other countries to adjust their policies enough to restore and rebalance the pattern of global aggregate demand.” This would include consolidation in some advanced economies of unsustainable fiscal deficits, structural market and labor reforms in advanced and emerging markets, and moving the thrust of aggregate demand toward those countries incurring “chronic current account surpluses,” Bean said.

The challenge for the Fed is initially toward domestic monetary policy objectives. Only when those are satisfied can the Fed and the rest of the “central bank fraternity” turn toward risk mitigation. Those economies experiencing the side effects of major central bank policies would best serve their interests by not only avoiding excessive credit creation and risk concentration but also by putting “some sand in the wheels” of the processes that produce excessive currency inflows and subsequent outflows, Bean said.

U.S. Policy Spillover into Mexico

Ortiz discussed Fed spillover effects on Mexico. The U.S. central bank’s initial responsibility is domestic and becomes international to the extent that broader considerations affect domestic employment and inflation, Ortiz said. Still, speaking as a central banker during the last crisis and as the finance minister during Mexico’s so-called Tequila Crisis in 1993–94 that included peso devaluation, he said the Fed must consider the impact of its policies. Mexico’s gross domestic product (GDP) is highly correlated with U.S. industrial production. Thus, capital flows imply that Mexican monetary policy can’t long deviate from that of the U.S., Ortiz said.

During the Tequila Crisis, Fed currency swaps helped provide “window dressing” in efforts to stabilize the peso. The New York Fed established a trust fund secured by revenues from Mexico’s state-owned oil company, *Petróleos Mexicanos*, or Pemex, and the Fed’s support was crucial for establishment of a stabilization fund.

During the most recent global financial crisis, Mexico didn’t suffer a “severe financial dislocation,” Ortiz said. “We made financial stability an objective.” The Fed, acting as a lender of last resort, was able to offer a \$30 billion currency swaps line, of which Mexico drew \$3.2 billion to bolster liquidity.

Through the two crises, Ortiz pointed to three

lessons learned: 1) Fed policy leads Mexican policy; 2) the Fed’s orientation is domestic and spillovers are global, reflecting the dollar’s status as a reserve currency; 3) the International Monetary Fund (IMF) is the only institution with the responsibility for global financial stability. In the future, Fed actions must reflect a coordinated approach with the IMF.

Backstopping the Global Financial System

Cecchetti discussed the dual dollar-based financial system—international and offshore use (accounting for 80 percent of trade finance and 87 percent of currency transactions) versus domestic, where the U.S. banking system boasts total assets of \$11 trillion. The two came together during the financial crisis when foreign central banks borrowed U.S. dollars via the Federal Reserve’s liquidity facilities—30 countries in all, with borrowing peaking at \$553 billion in December 2008.

Although the program was a success, especially because it came together rapidly during a difficult period, it’s worth asking how best to manage risk on an ongoing basis, ensuring foreign currency liquidity without reliance on central banks. Cecchetti suggested five non-mutually exclusive possibilities. One option, banning intermediaries such as banks from offering foreign currency accounts, would be foolish and would lead to inventive countermeasures in order to maintain trade activities, Cecchetti said. A second option, making reinsurance the responsibility of authorities where the activity occurs, would lead to large, expensive reserves, he said, noting that aggregate foreign exchange reserves total \$14 trillion, roughly 20 percent of global GDP. The cost in loss of real return below the global marginal product of capital equals roughly 0.2 percent of global GDP each year.

A third option is a regional reinsurance through pools of foreign exchange reserves, in the form of multilateral agreements. This has the benefit of lessening the burden on any one nation’s resources. However, the size of such a fund suggests that overall reserve requirements wouldn’t significantly reduce an individual nation’s requirements. A fourth option, supranational organization involvement, would resemble the IMF’s flexible credit line created in 2009. It would have the tendency to shift decisions to politicians, might well stigmatize coun-

tries seeking to draw on the line and could prove insufficient during a liquidity crisis.

The final option is placing the reinsurance burden with the issuing central bank. In the case of dollar transactions, the Fed would take this responsibility on the assumption that a collapse of the foreign market for the reserve currency will ultimately harm the domestic market as well. “That is, the currency use itself is a globally systemic activity, whose collapse has an effect on everyone,” Cecchetti said. Moreover, the dollar’s reserve currency role conveys a financing benefit of 0.5 percent of GDP per year, providing a benefit for the U.S. to more formally take on the reinsurance burden. It would also prompt the Fed to act in its “enlightened self-interest” and to provide currency swap lines beyond the five it currently has established that primarily reflect its domestic interests. (Those lines are with the central banks of Canada, the U.K., Japan and Switzerland and with the ECB.) Moral hazard issues remain unresolved. Still, the financial crisis underscored the need for a lender of last resort, and that responsibility falls on the Fed, by virtue of the dollar’s role as a reserve currency.

Roosa Lecture: Volcker on Lessons Learned, Future Challenges

Former Fed Chairman Paul Volcker was interviewed by Dallas Fed President Fisher during the Roosa Lecture, a centerpiece of the two-day conference. Volcker discussed how inflation was broken in the early 1980s and the lessons of that period that can be applied to the most recent crisis when “a lot went wrong.” The ongoing U.S. balance of payments deficit is indicative of “a lack of discipline in financial markets and in policy” that led “to a massive financial collapse in the U.S. and elsewhere in the world,” Volcker said. An institutional system is needed that can provide a “warning signal” of future shocks, while supranational organizations such as the IMF lack the resources to tackle them alone.

Volcker said any rules-based monetary policy—such as that proposed by conference speaker and Stanford University economist John Taylor, linking policy rates to an economy’s output and inflation—must maintain an active role for central bankers. “I believe we would want to always leave room for discretion,” Volcker said, noting price stability as a prevailing central tenet.

Central banks, beginning in the late 19th century, lived in a world without systemically important financial institutions and a nonglobalized financial market.

Volcker reviewed the 1984 collapse of Continental Illinois Bank of Chicago, when the Federal Deposit Insurance Corp.'s bailout of the bank included guarantees to depositors as well as bondholders, a prelude to today's discussion of too-big-to-fail institutions. In the current context, the nation's banks resist downsizing, Volcker said. "My problem is that you can't break them up enough to make them go away." Shadow banks and derivatives markets pose an even greater threat than banks, which have become "less important than the rest of the market."

Looking to the future, the Federal Reserve remains a valuable institution. "It retains a respect and independence that is unique among regulatory agencies," Volcker said. "You can't have a strong regulatory system without the Federal Reserve."

In Support of Rules-Based Policy

The third and final conference session, "Globalization 2.0: Monetary Policy in a Global Context: Past, Present and Future," offered a forward view. Taylor, who also chairs the Globalization and Monetary Policy Institute's advisory board, presented his paper "The Federal Reserve in a Globalized World Economy." It argues that rules-based monetary

policy yields superior economic performance, especially relative to the 1970s immediately following Bretton Woods' demise when policy was "highly discretionary and unfocused." In subsequent years, reliance on rules-based policymaking broke down following the Great Moderation of the 1990s, including during the recent economic crisis, leading to tensions among advanced countries and with emerging economies, Taylor said.

Policy makers kept rates "too low, too long" during the 2000s, relative to what a rules-based approach (such as Taylor's namesake Taylor rule) would prescribe. Pointing to policy shortcomings that aren't confined to the U.S., he said various central banks' unconventional interventions, such as bond purchases, have the net effect of leaving the participants likely worse off than had they followed a rules-based approach. Increasingly, there is a trade-off in favor of output stability over price stability. In a two-country situation in which Country 1 seeks very low interest rates, Country 2 could well react with concern about exchange rate appreciation and keep its rate too low—relative to what a rules-based approach would suggest—ultimately causing increased price volatility and output instability.

In real life, Fed quantitative easing in response to the financial crisis prompted Japan's central bankers to employ a set of unconventional measures including large-scale asset purchases to offset currency appreciation against the dollar and to bolster economic output, Taylor said. Similarly, the ECB's moves toward asset purchases also reflect a response to Fed policy and its global repercussions. The cycle of policy action and reaction may seek to thwart competitive devaluation but could end up becoming an interest rate war or "an unconventional monetary policy war."

Taylor urged a return to a rules-based approach, suggesting Congress pass legislation requiring the Fed to report which rules it is following and the strategy employed. Such action would help diminish volatile capital flows reacting to "fear of free-falling exchange rates." The Fed as a global leader would push other central banks to return to greater rules-based policy, Taylor said.

Conference participants commenting on the Taylor paper suggested that imposition of rules may be inappropriate in some circumstances. Kohn said



The policymaker panel

that while the Fed was clear in its 2 percent inflation target, adherence to the Taylor rule amid the financial crisis would have pushed rates below the target, with effects spreading beyond the U.S. Discussant Richard Clarida, Columbia University professor of economics, said Taylor's logic was "impeccable" but doesn't account for a collection of central bank policies that, while reflecting cooperation among policymakers, may be misguided or the result of misreading a given situation—"cooperation is easy to implement—just don't make the policy mistake and revert to non-cooperative optimal," he said. More than three years later, Clarida said, it remains difficult to see whether global policymaker decisions—many following Taylor rule thinking initially—are more the result of a common problem or a common response that encountered a zero-bound constraint. The result is that "QE begets QE."

Unprecedented Actions Become the Norm

The conference's final paper was "Unprecedented Actions: The Federal Reserve's Response to the Global Financial Crisis in Historical Perspective," by Frederic Mishkin, a Fed governor from 2006 to 2008 and banking professor at Columbia University, and Eugene White, a Rutgers University economics professor. Their paper proposed that despite the "triumph of rules over discretion" during the Great Moderation, central bank implementation of unprecedented measures is more the norm than the exception and the product of reconciling central bank mandates for price stability and financial stability.

Central banks, beginning in the late 19th century, lived in a world without systemically important financial institutions and a nonglobalized financial market. Policymakers could simply follow English essayist Walter Bagehot's proposition that when fulfilling lender-of-last-resort responsibilities, central banks should lend freely, charge a premium and do business only with solvent institutions. Adherence to this doctrine has given way to contingent rules and preemptive actions to handle adversity. Reliance on a Bagehot-like rule during the banking panics of 1930–33 deepened the Depression and motivated the provisions of the Banking Act of 1935 providing the Fed with authority for "unprecedented discretionary" actions

in "unusual and exigent circumstances."

The provision was used when the Fed established liquidity facilities in the wake of the Penn Central bankruptcy in 1970 to ensure availability of short-term corporate funding after the commercial paper market seized up. Following the Continental Illinois Bank collapse of 1984, the Fed feared a resulting panic and installed full insurance for all creditors, making them whole—in the process raising moral hazard concerns in the context of too-big-to-fail institutions.

The 1987 stock market crash prompted concerns about the stability of the clearing and settlement system of the stock and futures markets. The Fed provided liquidity to banks, which, in turn, provided brokers with funds in the hope of averting a larger shock. Fed involvement proved short-lived, and a recession was averted. The central bank again took action during the Long-Term Capital Management collapse in 1999, helping form a 16-bank consortium that helped avoid a formal default. The crisis highlighted the ability of nonbanks such as hedge funds to create financial instability. Fed reductions of the fed funds rate in support of the rescue contributed to what was labeled the "Greenspan put"—named after then Fed Chairman Alan Greenspan—a form of moral hazard in which financial institutions expect monetary policy to help them recover from bad investments, Mishkin and White noted.

Mishkin and White argued that, rather than strictly following rules, central banks should follow contingent rules that limit moral hazard. Unprecedented Fed actions should be judged not by whether discretion was employed, but instead by whether their imposition adequately constrained moral hazard.

Discussant Steven Kamin of the Federal Reserve Board of Governors, said policymakers should avoid deviating from stability rules. The paper, he suggested, "didn't discuss implementing incentives aimed at avoiding liquidity risk."

Former Fed Chairman Volcker, responding to the paper, said the scope of future Fed crises could grow even larger with the dollar, as the global reserve currency, under attack. "Sooner or later, if the dollar ever comes into question, we will have a real problem in the world economic situation ... in the political situation," he said, suggesting that

thought be given to the dollar's replacement as a world currency.

At the Forefront of a Global Economy

Thus, the conference came full circle—beginning with the U.S. economy emerging on the world stage in the era of the gold standard and concluding on a note of concern about future implications of the dollar's role as the preeminent global reserve currency and the Fed's standing as *the* global central bank.

During the Federal Reserve System's first years, policymakers worked to establish a durable institutional framework and learned in the initial years of the Great Depression the extent of their powers, only to subsequently discover limitations when they tightened policy too quickly, lengthening and deepening the Depression.

Working with the U.S. Treasury to keep a lid on federal funding expenses during WWII and immediately afterward, the Fed in the 1950s oversaw a decade of economic expansion. It was a time when the Fed could concentrate on the domestic impacts of its policies as the Treasury took on international aspects. A mounting U.S. balance of payments deficit hastened the demise of the postwar Bretton Woods system of dollar-gold anchored exchange rates in the early 1970s, and less than a decade later, the Volcker-led Fed confronted double-digit U.S. inflation.

In an era of floating exchange rates in which the dollar stood as the world's reserve currency, 100 years after the Fed's founding, its policies carry increasingly broad implications. The recent financial crisis, with its roots in the U.S. mortgage market and its continuing reverberations in Europe and Japan, illustrates the globalization of finance and of Fed monetary policy.

As the Fed carries out its dual mandate of ensuring stable prices and maximum employment in the U.S., central bankers must increasingly weigh international responses that bear on the central bank's ability to achieve its goals. Still, conference participants suggested, a prudent domestically focused approach may offer the best opportunities for achieving success that extends beyond the U.S. and aids global growth.

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Research Assistant

Graves has been a research assistant for the
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 since June 2014. He graduated from Southern
 Methodist University in 2014 with a BS in
 economics and a BS in biological sciences. He is
 a native of Olathe, Kan.

**Kuhu Parasrampuria**

Research Assistant

Parasrampuria is a research assistant for the
 Globalization and Monetary Policy Institute.
 She graduated from the University of Rochester
 in 2013 with a BA in economics and business
 strategies and minors in classical civilizations and
 philosophy. Parasrampuria worked as an analyst
 at JP Morgan Chase before joining the Fed. She is
 from Philadelphia.

**Julieta Yung**

Research Economist

Yung joined the Research Department at the
 Dallas Fed in July 2014. Her primary research
 fields are financial economics, international
 economics and macroeconomics, with a focus
 on term structure models of interest rates and
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