

Five Years of Research on Globalization and Monetary Policy: What Have We Learned?

By Mark Wynne



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Five years ago the Federal Reserve Bank of Dallas created the Globalization and Monetary Policy Institute to promote research that would help us better understand the implications of globalization for the conduct of monetary policy in the United States. We are now half a decade into this research program, and the institute's 2012 annual report is a fitting place to assess what has been accomplished over the past five years. The 2007–09 global financial crisis, from which the world economy is still recovering, shifted a lot of attention from the broad topic of globalization to thinking about the causes and consequences of the financial crisis.¹ However, the excesses (or imbalances) that facilitated the global financial crisis were a manifestation of financial globalization, and real globalization (in the form of trade linkages) was pivotal in the transmission of the crisis from the advanced economies to the emerging-market economies. Likewise, the contours of the policy response to the crisis were dictated by globalization. Never before have central banks had to create such extensive foreign exchange swap lines to stabilize the financial sector.

Globalization has not gone away, and the policy challenges it presents remain. In this essay, I will summarize some key research themes that have emerged in the institute's work. When globalization began to attract attention, there was a widespread perception that its impact on inflation in advanced economies was in one direction only—downward. Yet the first paper we released as part of this

research program, Evans (2007), argued to the contrary, namely that greater openness to international trade could be associated with higher equilibrium inflation. While Evans' result reflects in part the details of his modeling strategy, what now seems clear is that the impact of globalization on inflation is more subtle than first thought. The “tailwinds” of lower prices of manufactured goods produced in the rapidly growing emerging-market economies are offset by the “headwinds” these countries generate on commodity prices as a result of their voracious demand for raw materials.²

It has long been known that free trade contributes to higher standards of living over time. But the form that free trade takes may matter also. International trade flows made up primarily of durable goods have very different implications for how the world economy responds to shocks than do trade flows of nondurable goods. The channels through which globalization affects U.S. living standards are many and varied. For example, Cavallo and Landry (2010) show that imports of capital goods have been an important contributor to U.S. growth since 1967, contributing between 20 and 30 percent to growth in U.S. output per hour.

Before proceeding, it is worth highlighting some of what we have learned over the past five years. When Federal Reserve Bank of Dallas President Richard Fisher delivered the Warren and Anita Manshel Lecture in Foreign Policy at Harvard University in November 2005, he posed the questions: “How can economists quantify with such precision what the U.S. can produce with existing labor and capital when we don't know the full extent of the global labor pool we can access? Or the totality of the financial and intellectual



capital that can be drawn on to produce what we produce? As long as we are able to hold back the devil of protectionism and keep open international capital markets and remain an open economy, how can we calculate an ‘output gap’ without knowing the present capacity of, say, the Chinese and Indian economies? How can we fashion a Phillips curve without imputing the behavioral patterns of foreign labor pools?”

Put differently, is the concept of slack that is relevant for short-term inflation dynamics in an open economy domestic or global? When we began developing this line of argument, we met with some skepticism. However, our work over the past five years has shown that it has substantive content, even if the empirical evidence has been fragile.³

A second key thing we have learned is the importance of the international financial system in propagating and amplifying shocks. We also know that the form financial integration takes (whether through debt or equity market integration) matters for the extent to which economic activity comoves across countries. Global dynamics do not necessarily emerge from common shocks but could result from the international transmission of country-specific shocks. This has major practical implications—not just for business-cycle synchronization, but also for the conduct of optimal monetary policy. After all, we cannot insure against common shocks, but country-specific shocks, in principle, could be insured against. The main policy debate in that regard is whether “insuring against them” can be attained in a competitive environment where each country sets policy for itself or whether it requires some degree of policy coordination at a supranational level.

We have developed a more nuanced understanding of exchange rates and exchange rate mechanisms. We understand now that flexible exchange rates per se will not insulate a country from foreign conditions, and we have a better grasp of the important role that international pricing behavior has on the macro effects of country-

specific shocks and their transmission across countries.

At a more general level, we have a better understanding that in many circumstances it is misleading to look at the global economy as the sum of its constituent parts. We know that economic conditions and policy actions in one country could be amplified (or dampened) depending on the feedback from their impact on the global economy. And that, in turn, depends on the linkages (financial as well as through trade, immigration, information, etc.) across countries.

Globalization of the U.S. Economy

The basic facts about globalization are well known.⁴ Over the past six decades, the share of imports in U.S. gross domestic product (GDP) has increased from just over 4 percent for much of the 1950s and 1960s, to around 10 percent for much of the 1980s and early 1990s, to an average of 16.5 percent during the years 2005–11. Over the same period, exports as a share of GDP have grown by a comparable order of magnitude. Chart 1 shows the evolution of the international trade sector relative to the size of the U.S. economy. Perhaps

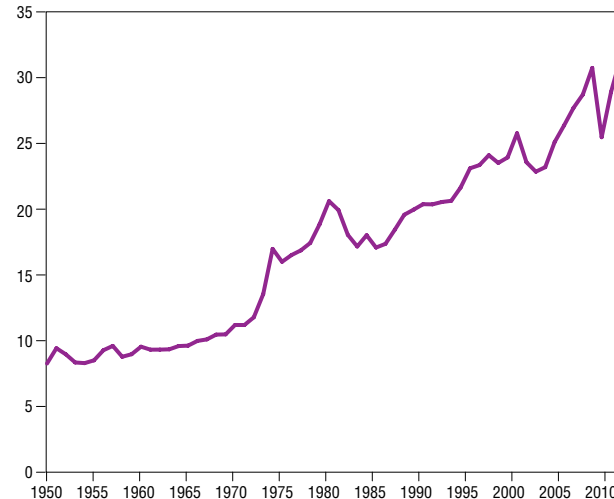
the single greatest manifestation of international trade’s increased importance for the U.S. economy is the ubiquity of the “made in China” label on many of the manufactured goods we now buy. Accounting for less than 1 percent of U.S. imports in the 1970s, imports from China alone now make up almost one quarter of U.S. imports. Over the past two decades, China has become the workshop of the world, stripping the U.S. in 2010 of its mantle as the world’s largest manufacturing country.⁵ Meanwhile, China’s economy has grown at such a rapid pace that it is now the world’s second-largest economy and will, in all likelihood, overtake the U.S. economy in size sometime in the next decade.⁶

The flood of cheap manufactured goods from China and other emerging-market economies is far from the only or even the most important aspect of globalization. As trade volumes grew in recent decades, so did international flows of capital. The United States’ total foreign assets increased from \$961 billion in 1982 to \$21 trillion in 2011; as a share of GDP, our foreign assets increased from 29.5 percent in 1982 to 139 percent in 2011. At the same time that we were investing overseas, we

Chart 1

Evolution of International Trade in the U.S.

Total U.S. trade (percent of GDP)



SOURCE: Bureau of Economic Analysis.

were borrowing comparably large amounts: Our foreign liabilities increased from \$722 billion in 1982 to \$25.8 trillion in 2011, or from 22.2 percent of GDP to 171 percent of GDP. In 1989 the U.S. went from being a net creditor to the rest of the world to being a net debtor.

And finally, both actual and virtual flows of labor have been important to the U.S. economy in recent decades. The so-called second great migration saw the foreign-born share of the U.S. population increase from just under 3.5 percent in 1970 to 12.9 percent in 2010; in absolute numbers, there are now more foreign-born in the U.S. than during the great migrations of the late 19th and early 20th centuries. Virtual migration—through outsourcing of certain tasks previously performed in the U.S.—has become important also, although the exact number of U.S. jobs outsourced to other countries is difficult to measure.

Measuring globalization is tricky. Traditionally, we look to trade or financial flows to quantify the degree to which a country is globalized. However, as O'Rourke and Williamson (1999) point out, a better approach is to focus on prices and the extent to which prices paid within a country deviate from world prices. In the absence of barriers to trade—whether natural or man-made—the law of one price should hold. In a seminal paper, Engel and Rogers (1996) document deviations from the law of one price in consumer prices in U.S. and Canadian cities and reveal a significant border effect. That is, there are greater price differences between two cities located in different countries than between two equidistant cities located in the same country.

Other researchers have looked at the prices of standardized commodities to measure deviations from the law of one price or market segmentation. The Big Mac hamburger sold by McDonald's is one such product. For many years, *The Economist* newspaper has tracked the prices of Big Macs in different countries to provide a rough guide to exchange rate overvaluation or undervaluation. Landry (2011) uses the data from

The Economist to assess price variations across cities within countries as well as across national borders. He shows that price differences across the U.S. are greater than those observed across international borders. Crucini and Yilmazkuday (2009) develop a model of international cities to quantify the relative importance of trade costs and distribution (retail) margins in accounting for deviations from the law of one price in *The Economist* data. They find that for the median good in their sample, trade costs account for 50 percent of the variance of long-run deviations from the law of one price, while distribution costs account for only 10 percent.⁷ The importance of nontraded goods such as retail inputs in accounting for deviations from the law of one price for final goods is explored further by Crucini and Landry (2012). Crucini and Davis (2013) show that frictions in distribution can make the import demand elasticity time-varying. Imports and domestic goods may be close substitutes, implying a high import demand elasticity, but if inputs used in distribution are slow to adjust, then the actual import quantities may be slow to change following a change in international relative prices like a change in the nominal exchange rate.

Another apparent deviation from the law of one price is the positive correlation that some researchers have documented between the prices of tradable consumption goods and per capita incomes. That is, identical products sell for higher prices in rich countries than in poor countries. Simonovska (2010) proposes an explanation for this based on price discrimination by monopolistically competitive firms selling to consumers with variable price elasticities of demand. Berka and Devereux (2010) also find substantial and persistent deviations from the law of one price in Europe, even among the countries of the euro zone, and find that the deviations are very closely tied to relative per capita GDP levels.

But using price data to quantify the extent of market integration is not without its problems, as Mutreja et al. (2012) point out. They show that



even when prices are equalized across countries, significant barriers to trade may exist, and they argue that information on actual trade flows is also needed to infer whether markets are integrated.

International Pricing

Assessing the degree of globalization by looking at prices leads naturally to thinking about how globalization impacts firms' pricing decisions. Auer and Fischer (2008) look at how international trade with labor-abundant nations such as China, India, Indonesia and Brazil affect the pricing behavior of U.S. firms. They look at the period from 1997 to 2006 and show that when exporters from these countries capture a 1.0 percent market share in the U.S., producer prices decline by 3.1 percent. Most of the decline is accounted for by a 2.4 percent increase in productivity and a 0.4 percent decline in markups. Auer, Degen and Fischer (2010) look at the same issue from a European perspective and show that import competition from low-wage countries has strong price effects there as well, especially in the more-advanced countries of western Europe.⁸ For example, when Chinese exporters capture a 1 percent share of a European market, producer prices in that market decline by about 2 percent. Moreover, they find that the effect is greatest for imports from China: Import competition from low-wage countries in central and eastern Europe does not appear to have a negative effect on western European producer prices. De Blas and Russ (2010) develop a theoretical model to illustrate the mechanism that causes markups to fall in the wake of trade liberalizations.

Competition from imports limits the pricing power of domestic producers and thereby affects inflation dynamics. Imports also have a more direct effect on overall price developments as imports make up a larger share of the consumption basket. Firms selling into foreign markets where a different currency is used need to factor exchange rate developments into their pricing decisions. When exchange rates change, import prices or profit margins change also. Exchange

rate pass-through to import prices and final goods prices is one of the most important questions in international macroeconomics. From a theoretical perspective, the work of Martínez-García (2007) shows that the endogenous dynamics of flexible exchange rates as well as the exchange rate pass-through on prices will be different depending, among other things, on the pricing behavior of firms.

Amstad and Fischer (2009) look at the question of pass-through of exchange rate changes from import prices to consumer prices but use a novel (event-study) approach to come up with estimates. They find that the monthly pass-through ratio is about 0.3; that is, for each percentage point change in the exchange rate, about 0.3 percent is passed through to consumer prices within a month. Auer (2011) focuses on the appreciation of the renminbi between 2005 and 2008 to derive estimates of pass-through and finds pass-through estimates of exchange rate movements to import prices of about 0.8. Pass-through to U.S. consumer prices is lower, at 0.56. Auer also finds that exchange rate movements of other U.S. trade partners have much smaller effects on U.S. import prices and hardly any effect on U.S. producer prices. Based on his findings, he simulates the effect of a 25 percent appreciation of the renminbi over 10 months and shows that it would be equivalent to a temporary increase in the U.S. Producer Price Index (PPI) inflation rate of about 5 percentage points.

Kim et al. (2013) use microdata on U.S. import prices to examine pass-through during the renminbi's 2005–08 appreciation. An and Wang (2011) use a vector autoregression model with sign restrictions to identify exchange rate shocks to examine pass-through rates to import, consumer and producer prices in nine member countries of the Organization for Economic Cooperation and Development (OECD). They find that pass-through is incomplete at both short and long horizons and that pass-through is greatest for import prices and smallest for consumer prices.

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They also show that pass-through rates depend on other features of an economy. Specifically, pass-through rates are higher the smaller the economy, the greater the share of imports, the more persistent are exchange rate movements, the more volatile is monetary policy and the higher the inflation rate.

Auer, Chaney and Sauré (2012) show that, in the European car market, exchange rate pass-through is larger for low-quality cars than it is for high-quality cars and develop a model to account for this observation. Auer and Schoenle (2012) further explore the role of market structure in accounting for incomplete exchange rate pass-through and show—using microdata on U.S. import prices—that pass-through following movements in the U.S. dollar is up to four times greater than pass-through following movements in the currency of U.S. trade partners. They also show that pass-through following movements in the currency of a U.S. trade partner is greater, the greater the trade partner's sector-specific market share. Baxter and Landry (2012) use a novel dataset of prices set by IKEA to examine pass-through and find that pass-through rates are low (of the order of 0.14 to 0.30) but higher for new goods than for goods already in the catalogs. IKEA is, of course, the quintessential example of a multiproduct firm operating in many different international markets.

Bhattarai and Schoenle (2011) document some stylized facts about how multiproduct firms set prices using microdata from the U.S. PPI. One of their key findings is that firms that sell more

goods tend to adjust their prices more frequently than firms that sell fewer goods. However, the firms that sell more

goods also tend to adjust their prices on average by smaller amounts. Furthermore, price changes tend to be very synchronized in multiproduct firms, and this synchronization tends to increase as the number of goods sold by a firm increases.

These findings on pass-through raise the question of how we might account for them. Auer and Chaney (2009) develop a model of quality pricing to show why exchange rate pass-through might not be complete. In their model, exporters sell goods of different qualities to consumers who have different preferences for quality. The issue of pricing and pass-through is also addressed by Landry (2009) using a two-country version of the state-dependent pricing model of Dotsey, King and Wolman (1999). He shows that the assumption of state-dependent pricing—as opposed to the more widely used assumption of time-dependent pricing—allows the model to better match important features of the aggregate data.

The Global Slack Hypothesis

The debate about globalization and monetary policy—and specifically, about how globalization might impact inflation dynamics—received a major boost from the working paper by Borio and Filardo (2007), which showed that in addition to depending on domestic slack, inflation in many advanced countries seemed to be responsive to measures of global slack as well. Subsequent research by Ihrig et al. (2007) raised questions about the empirical robustness of Borio and Filardo's findings, and some questioned whether the notion of domestic inflation depending on foreign resource utilization even made sense from a theoretical perspective. Milani (2009b) examines the empirical content of the global slack idea for the U.S. and finds that globalization can only explain a small portion of the decline in the slope of the U.S. Phillips curve. He also finds that the sensitivity of U.S. inflation to global output is small. Milani (2009a) also investigates the global slack hypothesis for the G-7 countries and finds little evidence in favor of Phillips curve specifica-



tions that include measures of global slack as a driving variable. However, he does find some evidence that global output has a significant effect on aggregate demand in most countries he looks at and, through this channel, on domestic inflation dynamics. Calza (2008) also finds little evidence in favor of the global slack hypothesis using quarterly data for the euro area from 1973 through 2003.

Guilloux and Kharroubi (2008) examine globalization's impact on inflation in a panel of OECD countries from 1980 to 2005. They show that the extent to which domestic consumer price index (CPI) inflation depends on the domestic output gap declines as intra-industry trade becomes more important. Martínez-García and Wynne (2012) present some evidence in favor of the global slack hypothesis for the U.S. They find that U.S. inflation at an annual frequency has become less responsive to domestic slack (measured as the cyclical component of U.S. GDP) since 1990. From 1979 through 2010, there is a more significant relationship between U.S. inflation and slack in the rest of the world than between U.S. inflation and slack in the U.S. But they also document a puzzle—the relationship between measures of foreign slack and U.S. inflation seems to be weaker since globalization kicked into high gear (that is, post 1990) than in the period before.

Martínez-García and Wynne (2010) seek to shed some light on these debates. Working with the somewhat more general (albeit still very stylized) version developed in Martínez-García (2008) of the benchmark open-economy New Keynesian model that is widely used in central banks around the world, they derive four important results. First, in theory at least, CPI inflation in an open economy does depend on the foreign output gap as well as the domestic output gap. Second, the importance of the foreign output gap as a driver of domestic CPI inflation increases the more the domestic country imports. Third, under producer currency pricing, one can write the Phillips curve for domestic CPI inflation either in terms of the domestic and foreign output gaps or

with a domestic output gap and a terms-of-trade variable. That is, at least under certain assumptions about how firms set prices internationally, the terms of trade ought to fully capture all foreign influences on domestic inflation. Finally, the concept of the output gap that is consistent with New Keynesian theory bears little or no relationship to the output gaps as conventionally measured using statistical approaches. These four key findings in Martínez-García and Wynne (2010) have important implications for the empirical literature on globalization and inflation and how foreign activity should be captured in empirical Phillips curve relationships. Martínez-García, Vilán and Wynne (2012) explore how one might take a fully articulated general equilibrium model to the data that would allow an examination of the role of a theory-consistent measure of the (global) output gap as a driver of inflation dynamics.

International Transmission and Business Cycles

With greater economic integration, it is

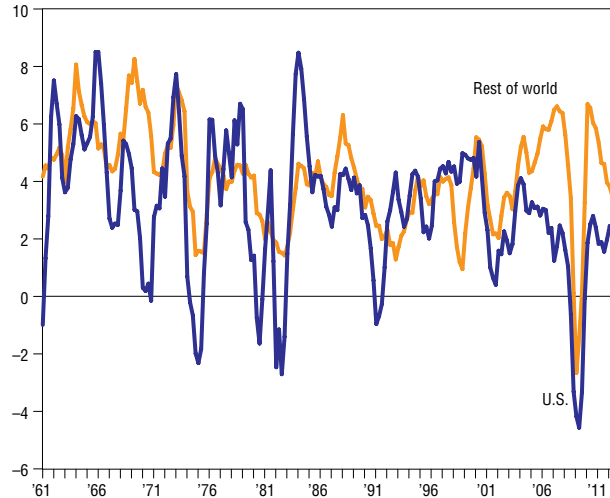
inevitable that what happens in one part of the world will have implications for the rest of the world through financial, trade and other linkages. Chart 2 shows how economic activity in the U.S. and the rest of the world tends to move together over the business cycle. In the recent financial crisis, economic activity contracted in the U.S. and around the world. However, after the crisis, economic activity has tended to recover a lot more rapidly in the emerging-market economies than in the advanced economies.

López (2007) examines the role that production sharing through the Mexican maquiladora industry plays in the synchronization of business cycles between Mexico and the U.S. manufacturing sector. He shows how a standard, two-sector, open-economy, real business-cycle model can match key features of the data for the Mexican maquiladora sector. Arkolakis and Ramanarayanan (2008) look at the impact of vertical specialization—that is, trade in goods across multiple stages of production—on business-cycle synchronization across countries. Intuitively, one might expect that

Chart 2

Synchronization of Business Cycles

Real GDP growth (percent, year/year)



SOURCES: Bureau of Economic Analysis; International Monetary Fund; Organization for Economic Cooperation and Development; national sources; author's calculations.



Globalization also increases the global impact of domestic policy actions in response to a crisis.

greater trade volumes between countries would lead to greater synchronization of business cycles, but Arkolakis and Ramanarayanan find that additional features are needed to fully account for the degree of synchronization observed in the data. Martínez-García and Sondergaard (2008) investigate the role of capital accumulation in smoothing consumption and buffering a country from external shocks. They argue that the costs of building new capital and the nature of foreign shocks can affect to what extent this channel can help insulate a country and lead to more synchronized cycles. Davis and Huang (2010) highlight the importance of strategic pricing by firms selling in domestic and foreign markets in generating comovement of production and investment in different countries.

Of particular interest in the wake of the financial crisis of 2007–09 is the role the international financial system plays in transmitting shocks across national borders. Devereux and Yetman (2010) show how the presence of binding leverage constraints (that is, limits on the ability of households and firms to borrow) can create important new channels for the international transmission of shocks through the financial sector. Importantly, they show that the interaction of these constraints with diversified portfolios creates a powerful financial transmission mechanism for shocks that is independent of the size of linkages through international trade channels. Martínez-García (2011) highlights the importance of the persistence of shocks in assessing the role of international asset market incompleteness. His research suggests that asset market incompleteness has more sizeable wealth effects on the equilibrium allocation whenever the cycle is driven by persistent investment-specific technology shocks (that is, shocks that affect the shadow price of productive capital). Ueda (2010) examines the role of global banks that engage in cross-border borrowing and lending in the international transmission of shocks. In Ueda's model, business-cycle synchronization increases as financial globalization intensifies.

Globalization also increases the global

impact of domestic policy actions in response to a crisis. Davis (2011) shows that the form of international financial integration matters for the degree of business-cycle comovement. Specifically, he shows that cross-border credit market integration through debt markets has a positive effect on business-cycle comovement, while cross-border capital market integration through debt markets has a negative effect. The role of global banks in transmitting shocks across national borders in the recent financial crisis is also investigated in Kollmann, Enders and Müller (2011). They find that while bank capital requirements have little effect on the international transmission of shocks and that loan defaults have a negligible contribution to business-cycle fluctuations under normal circumstances, an exceptionally large loan loss in one country will induce contractions in economic activity in all countries. This issue is explored further in Kollmann (2012), who shows that during the Great Recession, banking shocks accounted for about 20 percent of the decline in real economic activity in the U.S. and the euro area.

The issue of the international transmission of shocks during the recent financial crises (the global financial crisis in 2007–09 and the European sovereign debt crisis in 2010–11) is examined at length in Chudik and Fratzscher (2012). They study the transmission of liquidity shocks and risk shocks and find that emerging-market economies were much more adversely affected during the global financial crisis than during the European sovereign debt crisis.

Yet another potential channel for transmission of shocks across national borders is the operations of multinational firms. Kleinart, Martin and Toubal (2012) use microdata on firms operating in France to show that the presence of foreign affiliates increases the comovement of economic activity between the region of the affiliate and the affiliate's country of ownership.

Migration

One of the more interesting channels

through which economic developments in one country are transmitted to other countries is through emigrants' remittances. An estimated 11.7 million Mexican nationals live in the U.S., and each year this community sends between \$20 billion and \$25 billion in remittances back to Mexico.⁹ Similar flows occur between many other pairs of countries with large immigrant populations (for example, Germany and Turkey). Coronado (2009) looks at how these remittance flows change over the course of the business cycle, focusing on the flows from the U.S. to Mexico and El Salvador, and from Germany to Turkey. He shows that remittances tend to go up when economic conditions in the immigrants' home country deteriorate. Interesting, remittances from the U.S. to Mexico seem to also go up when the U.S. economy contracts, while the remittance flow from the U.S. to El Salvador and from Germany to Turkey declines when economic activity in the U.S. and Germany declines.

Fischer (2009) looks at a different aspect of immigrants' interaction with their host country—their currency use. Contrary to what might be expected, he finds that demand for high-denomination Swiss banknotes is actually lower in cities with large immigrant-to-native ratios, and he attributes the use of large-denomination banknotes to tax avoidance by natives. Fischer (2011) looks at yet another dimension of how immigrants interact with their host countries, namely via the housing market. Other things being equal, one would expect an inflow of immigrants to put upward pressure on housing prices. Fischer asks if it matters whether the immigrants come from a country that uses the same language as the host country, the idea being that immigrants from a non-common-language country are less price sensitive than immigrants from a common-language country. Using Swiss data, he finds that an immigrant inflow from a non-common-language country equal to 1 percent of an area's population is associated with a 4.9 percent increase in the price of single-family homes, whereas an immigrant inflow from

a common-language country appears to have no statistically significant effect on house prices.

Optimal Monetary Policy

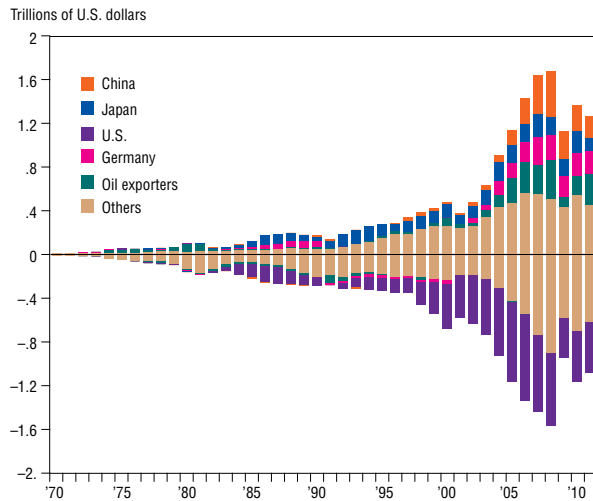
The traditional specification of the Taylor rule has central banks setting monetary policy as a function of the domestic output gap and the deviation of domestic inflation from target. However, it might be argued that in a more open economy the central bank should respond to more variables, such as the exchange rate.

Engel (2009) argues that there is a case for policy to stabilize exchange rates, as large fluctuations in exchange rates lead to inefficient allocation of resources. The essence of his argument is that changes in exchange rates that cause relative prices to deviate from relative costs of production are undesirable from a welfare point of view. Noting that policymakers cannot always be relied upon to intervene in foreign exchange markets in a benign way, he argues that exchange rate management is best achieved via international cooperation among policymakers.¹⁰

Wang (2010) evaluates the question of how central banks should adjust interest rates in response to real exchange rate movements in a standard two-country dynamic stochastic general equilibrium (DSGE) model. He finds that when monetary policy is set to maximize the welfare of the representative agent, the central bank should not seek to stabilize exchange rate movements. Furthermore, he finds that contrary to what other researchers have argued, there is little to be gained from international coordination of monetary policies. By way of contrast, Faia and Iliopoulos (2010) argue that optimal monetary policy in a financially globalized environment calls for central banks to stabilize the exchange rate as well as output and the price level.

Evans (2007) examines how the welfare-maximizing inflation rate changes as economies become more open. He finds that greater openness is associated with higher inflation rates rather than lower inflation rates. Central to his finding

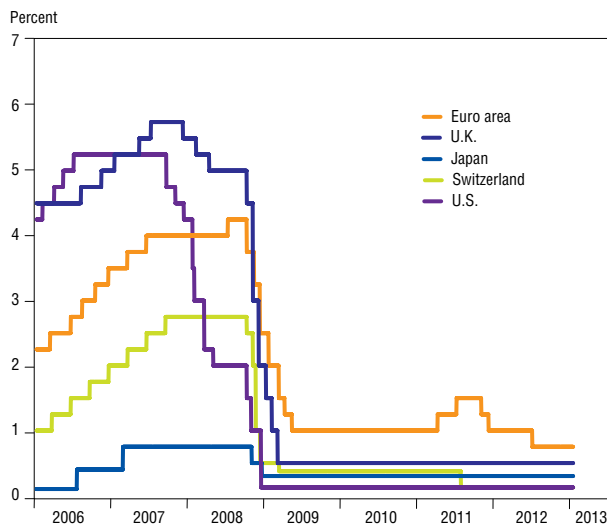
Chart 3
Global Current Account Balances



NOTES: Oil-exporting countries are Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Oman, Qatar, Saudi Arabia and Venezuela. Sixteen countries are excluded due to data limitations (Andorra, Cuba, Democratic Republic of the Congo, Kiribati, Liechtenstein, Marshall Islands, Micronesia, Monaco, Nauru, Palau, North Korea, San Marino, Tuvalu, United Arab Emirates, Uzbekistan and South Sudan). The remaining 162 United Nations members compose "Others."

SOURCE: International Monetary Fund.

Chart 4
Monetary Policy Rates



SOURCE: National central banks.

is his modeling assumption that foreign consumers need to hold domestic currency to be able to consume domestically produced goods, and the domestic monetary authority has an incentive to generate a higher inflation rate as a result to impose the inflation tax on these foreign holdings. Cooke (2012) also explores the issue of optimal monetary policy in a two-country setting and also finds that greater economic integration is associated with higher long-run inflation. Furthermore, in Cooke's model environment, there are increased gains from international cooperation in the conduct of monetary policy as countries become more closely integrated.

The issue of how best to conduct monetary policy in a globalized environment is also addressed at some length in Moutot and Vitale (2009).

The Financial Crisis

The global financial crisis that began in late summer 2007 and saw the world teetering on the brink of a second Great Depression by fall 2008 generated a host of research questions that will keep the economics profession occupied for years to come.¹¹ Chart 3 illustrates the extent of international global capital flows over the past four decades. Among the factors facilitating the buildup of excesses that ultimately culminated in the crisis were the massive global imbalances that prevailed (and to some extent still do). Ca' Zorzi, Chudik and Dieppe (2011) argue that the chances were minimal that current accounts in the U.S., U.K., Japan and China were aligned with fundamentals before the crisis. The role of capital flows in driving the housing boom(s) that preceded the crisis is also explored by Sá and Wieladek (2011) and Sá, Towbin and Wieladek (2011). Sá and Wieladek find that shocks to capital inflows to the U.S. driven by foreign savings have a positive and persistent effect on residential investment and house prices in the U.S., while monetary policy has a limited effect on the housing market. Sá, Towbin and Wieladek do a similar analysis for a broader

group of OECD countries and find that both types of shocks matter.

Financial crises are commonly characterized by adverse feedback loops that seem to make the associated downturns in economic activity more severe and the subsequent recoveries weaker than might otherwise be expected.¹² The pace of recovery from the 2007–09 crisis has been very weak by historical standards. Davis (2010) develops a model with financial frictions to quantify the impact of adverse feedback loops where falling profits and asset values in the real economy lead to increased loan defaults, which translate into increased loan losses in the banking sector. This in turn makes it more difficult for the banking sector to raise funds, which leads to fewer loans to firms. Davis finds that adverse feedback loops of this sort may add as much as 20 percent to the volatility of economic activity.

Hirakata, Sudo and Ueda (2011) explore the importance of shocks to the banking sector in a standard DSGE model of the U.S. economy. They find that shocks to the net worth of financial intermediaries in their model are important for understanding the dynamics of investment, accounting for 17 percent of investment variation on average. However, during the Great Recession, they find that such shocks were more important, accounting for 36 percent of the variation in investment between 2007 and 2010.

The financial crisis saw interest rates in most advanced countries fall to historic lows and once again raised the question of the appropriate policy response to a global liquidity trap. Chart 4 shows monetary policy rates in the advanced economies since 2006. Devereux (2010) examines the policy options in a closed-economy environment when interest rates have fallen to zero and conventional monetary policy is no longer an option. He shows that in such an environment, deficit-financed increases in government spending may be a lot more expansionary than spending increases financed by higher taxes. He also shows that a monetary policy that aims at increasing monetary

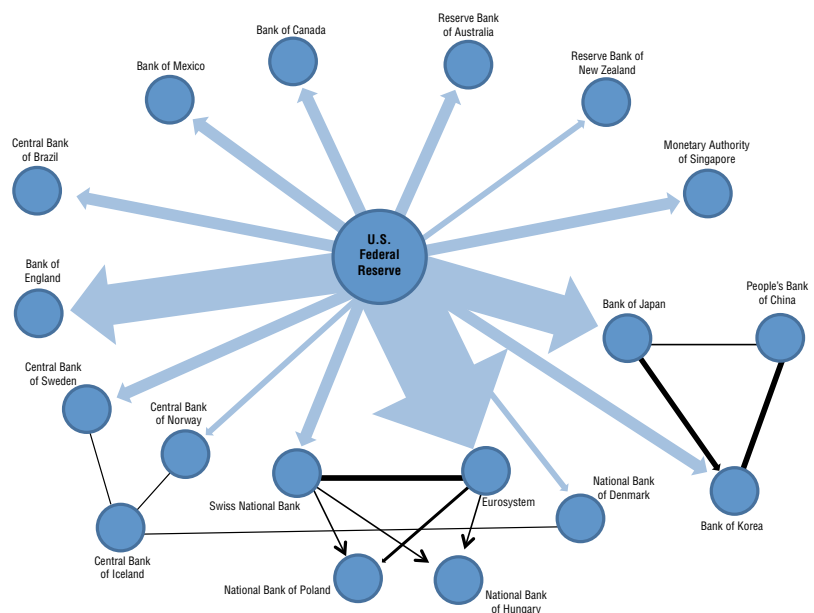
aggregates directly may also be effective, even with fixed interest rates.

Fujiwara et al. (2010) explore the appropriate policy response in a standard two-country model where both countries are caught in a liquidity trap. One of their findings is that it is better from a welfare point of view to target the price level rather than the inflation rate (as is standard practice in most countries now) and that monetary policy in each country should respond not only to the domestic price level and output gap, but also to the price level and output gap in the rest of the world. Cook and Devereux (2011) also investigate policy options in a global liquidity trap where the natural real interest rate is below zero in all countries as a result of a collapse in aggregate demand in the home country. They find that the optimal cooperative policy response in such an environment consists of a domestic fiscal expansion combined with tight monetary policy in the foreign country. Fujiwara and Ueda (2010) find that fiscal multipli-

ers can exceed 1 when countries are confronted with a global liquidity trap.

One of the unique features of the recent crisis was the extent to which central banks had to provide liquidity not just to domestic financial institutions but also to international institutions. At the height of the crisis, a significant portion of the Federal Reserve's balance sheet consisted of loans made under swap arrangements with foreign central banks to provide dollar liquidity to banks overseas. And it was not just the Federal Reserve System that made such loans. Chart 5 (which is adopted from McGuire and von Peter 2009) shows the network of international swap arrangements created during the crisis to alleviate foreign currency liquidity crises in different countries. Auer and Kraenzlin (2011) document how these liquidity programs worked from the Swiss perspective. During the financial crisis, 80 percent of the Swiss franc liquidity provided by the Swiss National Bank was provided to banks domiciled

Chart 5
Central Bank Network of Swap Lines



NOTE: The arrows indicate the direction of flows (where known). Light shaded arrows represent U.S. dollars provided to other central banks; dark arrows represent other currencies (evaluated at average 2008:Q4 exchange rate). Line thickness is proportional to the size of the swap line.

SOURCE: McGuire and von Peter (2009).

outside Switzerland. Alberola, Erce and Serena (2012) look at the stabilizing role of international reserves during periods of global financial stress and show how they facilitate disinvestment by domestic residents.

Davis and Huang (2011) consider the more general question of whether financial sector conditions should factor into monetary policy decisions over and above any impact such conditions might have on inflation or the output gap. They find that it is optimal for central banks to respond to fluctuations in the interbank lending spread that are driven by exogenous financial shocks and, specifically, that the policy rate should be reduced by about 66 basis points in response to a 1 percentage point increase in the interbank lending spread.

What determines how well policymakers will respond to a downturn in economic activity? It may be too early to pronounce the policy response to the Great Recession a success. (A full evaluation of the success of the fiscal and monetary policies adopted in response to the downturn will depend on whether those policy responses come with significant long-term costs.) However, Calderón,

Duncan and Schmidt-Hebbel (2012) show that institutional quality seems to be an important determinant of a country's ability to adopt countercyclical macroeconomic policies.

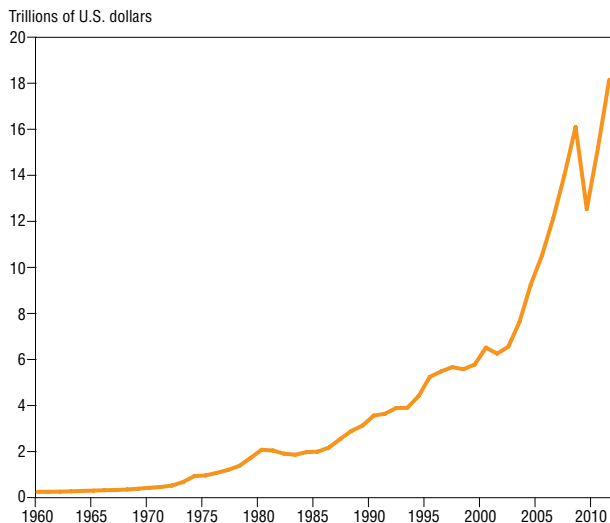
The ultimate recourse of countries facing financial crisis is to default on their public debt. Of course, when governments default, they often discriminate between different creditors, for example, defaulting on domestically held but not foreign-held debt, or vice versa. Erce (2012) looks at the factors that may lead government to treat different classes of creditors differently and finds that factors such as the business sector's reliance on foreign capital markets, the soundness of the domestic banking system and the source of the liquidity pressures (whether due to a need to meet external obligations or a need to roll over domestic debt) all play a role.

The policy response to the global crisis is unprecedented, with official interest rates in many countries at or near historic lows (essentially zero) and central bank balance sheets at record levels relative to the size of national economies. White (2012) characterizes the stance of many advanced-economy monetary policies as "ultra easy" and raises concerns about the potential unintended consequences of such policies if pursued for too long.

One of the enduring legacies of the crisis in many countries will be extraordinarily high levels of public debt, which many fear that central banks will be pressured to monetize at some point. Bhattarai, Lee and Park (2012) investigate the relative contributions of fiscal and monetary policy to inflation dynamics under different assumptions about the nature of the regimes governing both. Under an active monetary and passive fiscal policy regime, inflation follows closely the path of the inflation target. However, under an active fiscal and passive monetary regime, inflation moves in the opposite direction of the inflation target.

The scale of the collapse in international trade that accompanied the Great Recession has attracted much attention, prompting some to talk

Chart 6
Evolution of Global Exports



SOURCE: World Bank.

about deglobalization. Chart 6 plots the evolution of global exports (measured in dollar terms) since 1960. The unprecedented nature of the collapse in 2008–09 stands out.¹³ Bussière, Chudik and Sestieri (2012) use a global vector autoregression to explore the dynamics of global trade flows between 21 advanced and emerging-market economies. One of their key findings is that shocks to domestic or foreign demand have much stronger effects on trade flows than shocks to relative prices. Petropoulou and Soo (2011) develop a simple analytical model that highlights the importance of product durability as a mechanism driving trade collapses in response to shocks. Auer and Sauré (2011) examine why Swiss exports seem to be so insensitive to movements in the Swiss franc. They find that Swiss exports are heavily concentrated in products that are relatively insensitive to movements in the exchange rate, such as machinery and pharmaceuticals.

Data

Good data are essential for any research program. The Globalization Institute has sponsored the development of three new databases that will advance our understanding of how the global economy works. Booms and busts in housing markets were central to the 2007–09 financial crisis in the U.S. and the ongoing debt crisis in the euro area. Mack and Martínez-García (2011) constructed an international database on house prices at a quarterly frequency that covers 21 (mainly advanced) countries starting in 1975. The database is updated on a regular basis and available to the public (www.dallasfed.org/institute/houseprice/index.cfm). One of their main contributions is to report measures of house prices and household disposable income that are comparable across countries.

Policymakers have to make decisions in real time with flawed and incomplete data that are often revised, and accurate evaluation of forecasting models and policy rules needs to take account of this fact. Models and rules that are evaluated using

final revised data that were not available to policymakers at the time policy decisions were made often perform quite differently when evaluated using the data available in real time. Fernandez, Koenig and Nikolsko-Rzhevskyy (2011) have made available a real-time database of 13 major macroeconomic aggregates for the OECD countries (www.dallasfed.org/institute/oecd/index.cfm). Their data complement the current OECD real-time database that starts with 1999, extending the coverage back to 1962.

Perhaps the most ambitious data creation project undertaken by the institute over the past few years has been the database of prices of products the Swedish retailer IKEA sells in many countries around the world. Baxter and Landry (2012) provide detail on the richness of the dataset and explore its implications for some central questions relating to the pricing of goods in international markets.

Conclusions

While economists have been thinking about the implications of international trade and finance—“globalization”—since the emergence of economics as a separate field of scientific inquiry in the late 18th and early 19th centuries, the passage of time and the progress of technology have posed new questions and facilitated the development of new tools to address these questions. When David Ricardo sought to illustrate the gains from international trade between Britain and Portugal, he used a simple example of trade in cloth and wine; 200 years ago, almost all international trade was trade in final goods. Today, most international trade is trade in intermediate goods, with the same good crossing international borders many times on its way to the final consumer.¹⁴ In the early 19th century, most countries relied on some form of commodity money, and the ideal of using monetary (or fiscal) policy to stabilize economic activity was unheard of. Under today’s fiat money standards, the optimal conduct of monetary policy takes on a new urgency.

We launched this research program during the period known as the Great Moderation. At the time, there were some concerns about “global imbalances,” but few anticipated the scale of the crisis that would lead to the Great Recession. Prior to the financial crisis, the broad consensus in the central banking community was that inflation targeting represented the best practice in terms of monetary policy strategy. The crisis has prompted some rethinking of that view, and Issing (2011) argues for broader perspective that includes monetary factors in making central bank decisions. White (2009) addresses the question of whether monetary policy should lean against asset price booms to prevent asset prices from becoming too elevated or should, instead, simply let asset prices evolve as they will and clean up the aftermath of an asset price bust. Both views had their proponents in the central banking community: Policymakers in Europe favored a greater response of policy to asset price developments, while U.S. policymakers seemed to prefer the clean-up-the-mess-afterward approach.

More generally, while we thought we had a good sense of what globalization might mean for the conduct of monetary policy in the U.S. (see, for example, the essay by Wynne 2009), the Great Recession has thrown up a whole new set of issues that will be front and center in our future work. Foremost among these will of course be the interaction between the financial sector and the real economy. But we will continue to work on the central issues related to international pricing, inflation dynamics, business-cycle synchronization and the optimal conduct of monetary policy in a more integrated global economy.

Notes

¹ Dating the onset and (more importantly) the ending of the global financial crisis is somewhat arbitrary. Strains in the financial system first emerged in late summer 2007. According to the National Bureau of Economic Research, economic activity in the U.S. peaked in December 2007 and the U.S. entered a recession. The most intense phase of the financial

crisis occurred around the time of the Lehman Brothers failure in September 2008. Global GDP growth slowed from 5.4 percent in 2007 to 2.8 percent in 2008. In 2009, global GDP contracted by 0.6 percent, the first absolute decline in global GDP since at least the 1970s. (International Monetary Fund data on global GDP do not go back any further.)

² Davis (2012) highlights the importance of central bank credibility in anchoring inflation expectations when commodity prices are subject to large shocks.

³ Martínez-García (2008) elaborated an international version of the widely used New Keynesian model to begin to address this issue.

⁴ This discussion focuses on just the economic dimensions of globalization, although it has important political and cultural dimensions as well.

⁵ Measured in current dollars. Source: National Accounts Main Aggregates Database, United Nations Statistics Division, <http://unstats.un.org/unsd/snaama/dnllist.asp>.

⁶ The date at which the Chinese economy will become bigger than the U.S. economy depends on which measure of the relative size of economies one uses: In purchasing-power-parity terms, the transition will occur sooner. Wynne (2011b) addresses the question of whether China will ever be as rich as the U.S. in terms of average living standards.

⁷ Crucini, Shintani and Tsuruga (2008) use a model with sticky information to account for deviations from the law of one price in U.S. and Canadian data.

⁸ Specifically, Germany, France, Italy, Sweden and the U.K.

⁹ For the number of Mexican nationals living in the United States, see Grieco et al. (2012). Data on remittances are from HAVER, series N273BW@EMERGELA.

¹⁰ The argument is developed in more (technical) detail in Engel (2011).

¹¹ Given that the profession continues to study the causes of the Great Depression of the 1930s, we may expect the issues raised by the Great Recession of 2008–09 to be with us for many years indeed.

¹² See, for example, the discussion in Wynne (2011a).

¹³ Wynne and Kersting (2009) explore the potential role of the drying up of trade finance as a contributor to the collapse.

¹⁴ Perhaps the iconic example is the Apple iPhone; see Xing and Detert (2010).

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