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Letter from the President

I took office as the 13th president of the Federal Reserve Bank of Dallas in September 2015 following a career in banking and academia.

This is a complex time to be a central banker. In recent years, the Federal Reserve has pursued extraordinarily aggressive monetary policies to stabilize economic activity in response to the global financial crisis, first by cutting interest rates to their effective lower bound and then by expanding the size of its balance sheet through a series of large-scale asset purchase programs.

At its December 2015 meeting, the Federal Open Market Committee (FOMC) took a first step towards normalizing monetary policy by raising the target range for the federal funds rate from 0-to-25 basis points to 25-to-50 basis points. Even with this action, monetary policy remains accommodative. The Federal Reserve has said that any future removals of accommodation will be done gradually subject to our assessment of underlying economic conditions.

Looking outside the U.S., we have been lowering our estimates of 2016 global GDP growth, excluding the U.S. Beneath the headline growth rates, the underlying picture is very uneven. For example, emerging economies with high levels of exposure to commodities have had significant declines in growth rates. Brazil, Russia and Venezuela were in outright recession during 2015, and we expect negative GDP growth again in

these countries in 2016. On the other hand, India's GDP growth rate improved in 2015 and is expected to increase further in 2016.

While the Fed's mandate is U.S. price stability and maximum sustainable employment, assessing economic conditions outside the United States is critical because the world is becoming more and more interconnected. Companies increasingly think about their labor, products and services, and investment decisions with a global mindset. Additionally, global demographic trends, high levels of debt to GDP, and levels of capacity utilization impact demand for commodities as well as capital flows, and ultimately have the potential to spill over to economic conditions in the U.S.

For these reasons, I am excited to build on the work of my predecessor, Richard Fisher, by further developing the Globalization Institute of the Dallas Fed. We will pursue two key focuses in this effort. First, Mark Wynne, the director of the institute, will continue to emphasize creation of superb peer-reviewed research on policy-relevant topics as the foundation on which all of the other activities of the institute rest. Second, I am working closely with Mark and our team to build out the institute's public outreach activities. We have repurposed our public lecture series in a new program called *Global Perspectives*. The objective of this program will be to bring thought leaders from the worlds of academia, business and public policy to the Eleventh District to share their

insights on key global trends, challenges and overall global developments.

Through these and other programs, the Globalization Institute aims to continue to be on the forefront of thought leadership and to explore key considerations relating to global economic developments. The world will become more interconnected in the years ahead, and this interconnectedness will affect both the U.S. economy and how central bankers think about monetary policy. I look forward to having the Dallas Fed play a meaningful role in understanding how these links impact world economic conditions.

Robert S. Kaplan
President and CEO
Federal Reserve Bank of Dallas

The Trilemma in Practice: Monetary Policy Autonomy in an Economy with a Floating Exchange Rate

By J. Scott Davis



“For many emerging-market economies, swings in the global financial cycle make the trilemma more of a dilemma. Without restrictions on international capital flows, monetary independence is not possible, even for a country with a floating exchange rate.”

the most important concept in international macroeconomics may be the trilemma of international finance (also called the impossible trinity). The trilemma states that a country cannot simultaneously have an open capital account, a stable exchange rate and autonomous monetary policy (*Chart 1*).

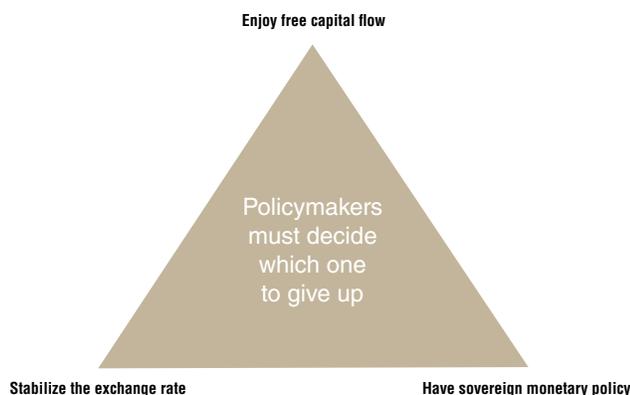
The trilemma is a constraint on monetary policymaking in any country. The United States has chosen to maintain an independent monetary policy and an open capital account, but as a result, the Federal Reserve must allow the value of the dollar to be market-determined. Countries in the euro zone have opted to stabilize their exchange rate, and they enjoy the free movement of capital. But as a result, individual nations no longer have an independent monetary policy.¹ Policymakers in China, on the other hand, have chosen to stabilize the exchange rate and maintain an independent monetary policy; but to make this work, they need to

impose restrictions on international capital flows.²

By the logic of the trilemma, if a central bank allows its exchange rate to float, it should have complete monetary autonomy. While this is certainly true in theory, some have begun to question whether it is actually true in practice. In a recent paper, Rey (2013) discusses the “global financial cycle,” which is the fact that large swings in capital flows into many emerging-market economies are driven by global factors such as risk and risk aversion in major developed markets. These swings in capital flows are exogenous from the point of view of the emerging market receiving the capital, the author argues. For many emerging-market economies, swings in the global financial cycle make the trilemma more of a dilemma. Without restrictions on international capital flows, monetary independence is not possible, even for a country with a floating exchange rate.

The fact that a country with open capital

Chart 1
The Trilemma of International Finance



markets loses monetary policy autonomy when it adopts a fixed exchange rate is purely mechanical. As discussed in Rey's article, swings in trade and capital flows increase or decrease demand for a currency, and a central bank that tries to maintain a stable exchange rate must adjust currency supply to ensure the exchange rate stays constant as demand fluctuates. Adjusting the supply of the currency means adjusting the size of the central bank's balance sheet and, thus, actions to hold down the value of the currency are indistinguishable from accommodative open-market operations.³

The loss of monetary autonomy when a central bank does not try to maintain a fixed exchange rate is less mechanical. Theoretically, without the constraint of trying to stabilize the value of the exchange rate, a central bank with a floating exchange rate can use its balance sheet however it likes. Nonetheless, as shown by Davis and Presno (2014), even when monetary policy is determined optimally to maximize a domestic objective function, optimal policy could still focus on managing volatile capital inflows and outflows. Calvo and Reinhart (2002) discuss a "fear of floating," where even central banks that profess to follow a floating exchange rate policy still actively intervene in foreign-exchange markets to manage the value of their currency.

This is especially true in an environment where a country is subject to large and volatile swings in capital flows. Even though, in theory, the central bank has complete monetary autonomy, in practice, its actions to stabilize the economy in the face of large and volatile swings in capital flows will mean

that the optimally chosen monetary policy is nearly indistinguishable from a policy of exchange rate stabilization.

To see how, in the face of large swings in international capital flows, central banks in countries with floating currencies can end up following policies that mirror exchange rate stabilization, we will examine the actions of some major emerging-market central banks during the global financial crisis and subsequent recovery. The rapidly changing fortunes of the emerging markets during this period can be summed up by examining the path of emerging-market exchange rates (*Chart 2*).

The chart plots the value of the exchange rate versus the U.S. dollar for a group of emerging-market economies and for two subgroups—one that actively attempts to stabilize exchange rates and the other that

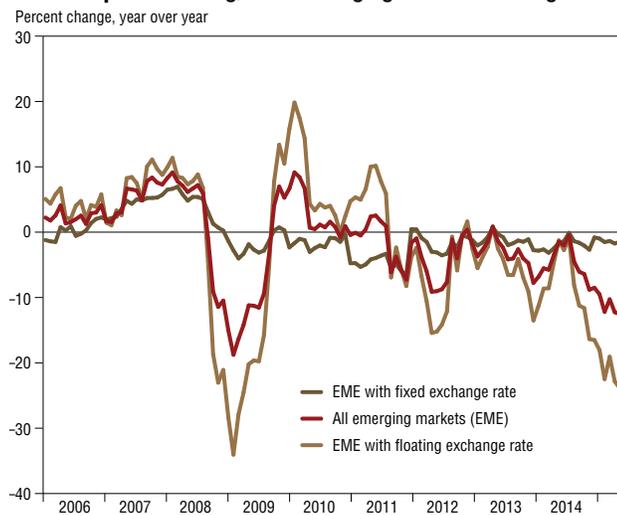
allows its currencies to float.⁴

Floating emerging-market currencies went on a wild ride between 2008 and 2011. The global financial crisis led to a global flight to quality in which capital flows to emerging markets dropped sharply, leading to exchange rate depreciation. However, as we shall see, during the crisis, emerging-market central banks with nominally floating currencies actively intervened in the foreign-exchange market to prevent further exchange rate declines. This intervention is akin to contractionary monetary policy.

The recovery from the financial crisis saw a return in those capital flows, and this led to a sharp appreciation in emerging-market currencies. It was during this period that the term "currency wars" was first used. It was initially coined by Brazilian Finance Minister Guido Mantega in September 2010.

Chart 2

Fed QE Impacts Floating, Fixed Emerging-Market Exchange Rates



SOURCES: International Monetary Fund; author's calculations.

“Many emerging-market policymakers worried that the ultra-accommodative monetary policies in the United States and throughout the developed world were leading to a sharp increase in capital flows into emerging markets.”

At the time, the Federal Reserve was about to embark on a second round of quantitative easing (QE).

Many emerging-market policymakers worried that the ultra-accommodative monetary policies in the United States and throughout the developed world were leading to a sharp increase in capital flows into emerging markets. Abundant liquidity released by programs such as quantitative easing streamed into emerging markets, chasing higher returns, which pushed up the value of their currencies.⁵ However, we shall see that central banks in countries with floating currencies intervened in the foreign-exchange market during this period to slow the appreciation of their currencies. This intervention by central banks with floating exchange rates was nearly indistinguishable from the intervention by central banks with fixed exchange rates.

Capital Flows, Balance of Payments and Exchange Rate Fluctuations

Dramatic capital flow swings into emerging-market economies accompanied the period surrounding the global financial

crisis. Net capital inflows (capital inflows minus capital outflows) into the major emerging-market economies are plotted in Chart 3.

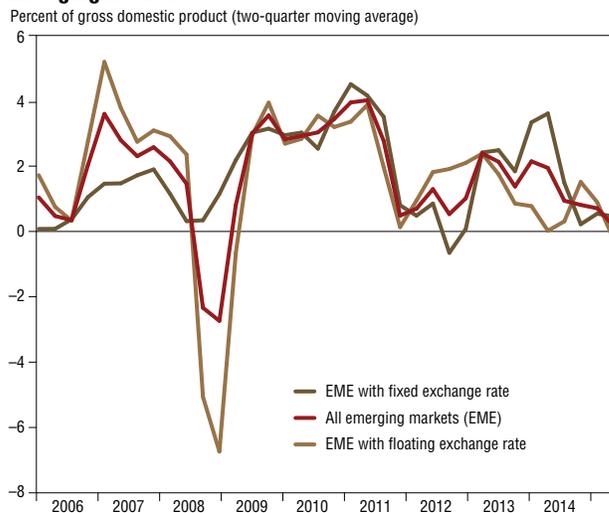
The chart shows a dramatic fall in emerging-market capital flows during the darkest days of the financial crisis in 2008. Just before the crisis, capital moved into emerging markets at a rate of 3 percent of gross domestic product (GDP). However, the chart shows that in late 2008, these capital flows reversed quickly. In late 2008, capital was flowing out of emerging markets at a rate of 3 percent of GDP, and for the subgroup of countries with a floating exchange rate, this rate of capital outflow exceeded 6 percent of GDP.

Emerging-market capital flows rebounded in the early days of the recovery, and capital flowed into all emerging markets at a rate of 3 percent of GDP from 2009 through the first half of 2011.

The fundamental balance of payments identity states that a country’s current account plus its capital and financial account must equal the net change in central-bank reserves. The current account measures the net flow of capital into a country because of currently produced goods and services. The current account includes the trade balance (exports minus imports) and the net income from investments held abroad and also some unilateral transfers such as remittances and foreign aid.⁶ The capital and financial account measures the net flow of capital into a country because of private capital transactions (purchase or sale of stocks, bonds, etc.). The sum of these two items measures the net flow of capital coming into a country. If this net flow is not equal to zero, it must end up as an increase or a decrease in foreign-exchange reserves held by the central bank.

The balance of payments identity encapsulates the forces of supply and demand that determine the fundamental value of the exchange rate. The supply is determined by the central bank and the accumulation of reserves on the central bank’s balance sheet; the demand comes from two sources, the current account and the capital and financial

Chart 3
Net Capital Inflows Volatile Among Floating-Rate Emerging Economies



SOURCES: International Monetary Fund; author’s calculations.

account (for simplicity, from here on, we will refer to the capital and financial account as the capital account).

When the sum of the current and capital accounts is greater than zero, there is excess demand for the currency. This is referred to as a balance of payments surplus, and it puts upward pressure on the value of the exchange rate. If the central bank does not try to actively manage the exchange rate and allows the currency to “float,” this upward pressure leads to exchange rate appreciation.

When the exchange rate appreciates, foreign goods and assets become cheaper to domestic residents, and domestic goods and assets become more expensive to foreign residents. This change in relative prices in the goods market causes the trade balance, and thus, the current account balance, to fall. This change in relative prices in the asset market causes the capital account balance to fall. The exchange rate will appreciate until the point where the balance of payments is no longer in surplus, the sum of the current and capital accounts is equal to zero and there is no excess demand that pressures the exchange rate.

If, on the other hand, a country’s central bank actively tries to manage the exchange rate, it may respond to this excess demand by increasing the supply of the currency. By increasing the supply of the currency, it expands the liabilities side of its balance sheet. The central bank releases this newly created currency into the market by buying foreign-exchange reserves (usually bonds denominated in U.S. dollars or some other major “reserve” currency). This expands the asset side of its balance sheet.

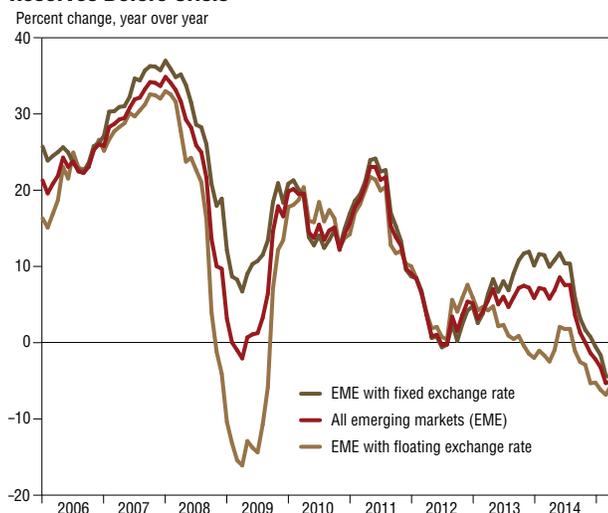
The path of emerging-market central bank reserves over the past 10 years is plotted in Chart 4. During the crisis, reserves fell sharply in countries that followed a policy of allowing their currencies to float. This fall in reserves is a sign that, during the crisis, central banks in these countries were actively engaging in the foreign-exchange market to support the value of their currencies by decreasing their supply in the market. In

response to the sharp drop in capital inflows plotted in Chart 2, these central banks could have allowed the exchange rate to fall further until equilibrium was reached, where the sum of the current and capital accounts was equal to zero. Instead, they chose to intervene by drawing down reserves.

Furthermore, Chart 3 shows that, during the recovery, these same central banks were actively accumulating reserves. We saw earlier how, during the recovery, there was a reversal in emerging-market capital flows and there were large positive net capital inflows into the emerging markets from the middle of 2009 through the middle of 2011. Central banks in all emerging markets—both those that follow a policy of exchange rate stabilization and those that allow their exchange rate to float—accumulated a massive amount of reserves, which grew at around 20 percent per year during the period.

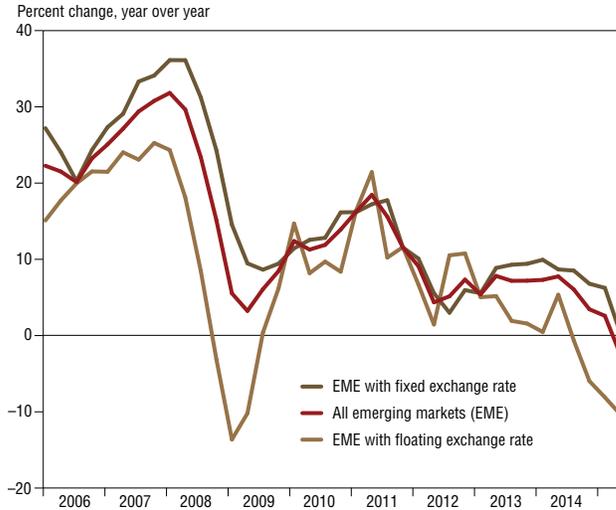
Capital inflows during the 2009 to 2011 period put upward pressure on the value of emerging-market currencies. Central banks that follow a policy of exchange rate stabilization were mechanically accumulating foreign-exchange reserves to relieve this

Chart 4
Emerging-Market Central Banks Accumulate Reserves Before Crisis



SOURCES: Haver Analytics; author's calculations.

Chart 5
Emerging-Market Central-Bank Balance Sheet Growth Slows



SOURCES: Haver Analytics; author's calculations.

upward pressure. The chart shows that, at the same time, central banks in countries that allow their exchange rates to float were also following a policy of accumulating reserves that was nearly indistinguishable from countries that fix their exchange rates.

Monetary Autonomy?

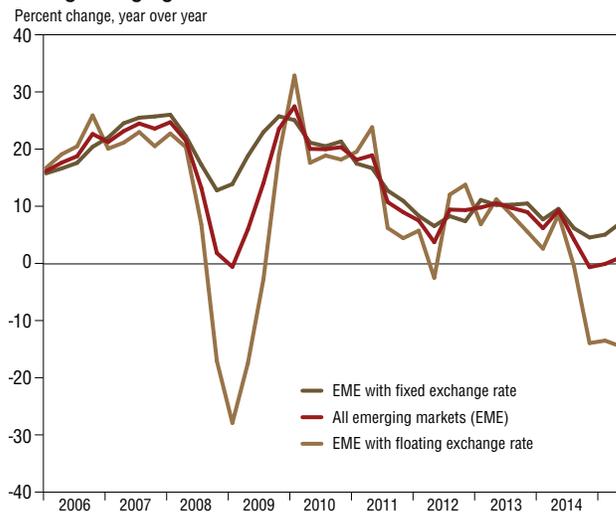
During the crisis, central banks in countries with a floating exchange rate intervened heavily in the foreign-exchange market and drew down reserves to stabilize their exchange rates. During the recovery, when capital inflows reversed, the same central banks accumulated reserves to relieve some of the upward pressure on their currencies. The effect of this on central-bank balance sheets is shown in Chart 5. The chart shows that emerging-market central-bank balance sheet growth slowed sharply during the 2008–09 period.

For countries that follow an exchange rate stabilization policy, balance sheet growth fell from 35 percent per year in early 2008 to 10 percent per year by 2009. To maintain a stable exchange rate in the face of a sharp drop in capital inflows, central banks in countries with a fixed exchange rate were forced to slow the growth in their balance sheets during the crisis. This is part of the mechanical monetary tightening that is required to maintain a stable exchange rate and is simply a consequence of the constraints on monetary policy autonomy imposed by the trilemma.

Countries that follow a policy of allowing the exchange rate to float should have been free to engage in monetary loosening during this period. However, the chart shows that, for this group of floaters, balance sheets went from a 20 percent expansion in early 2008 to a contraction of 15 percent in 2009. Therefore, countries that allowed their exchange rate to float and should have had complete monetary autonomy still engaged in sharp monetary tightening during the crisis.

Similarly, central banks in countries that float their currencies rapidly expanded their balance sheets during the 2010–11 recovery.

Chart 6
Post-Crisis M1 Money Supply Growth Similar
Among Emerging Markets



SOURCES: Haver Analytics; author's calculations.

Central-bank balance sheets grew 10 to 20 percent per year between 2009 and 2011. The rate of balance sheet expansion for central banks with a fixed exchange rate is nearly identical. At a time when policymakers were talking about currency wars and fears of overheating in many emerging markets, emerging-market central banks in countries with a floating exchange rate were following a highly accommodative monetary policy.

The effect of this central-bank balance sheet contraction and subsequent expansion on M1 money supply growth in the emerging-market economies is shown in Chart 6.⁷ It illustrates how, in emerging markets with a floating exchange rate, money growth slowed sharply during the global financial crisis in late 2008 and then increased sharply during the 2009–11 period. It is interesting to note that money growth has been nearly identical in the two subgroups of emerging markets since early 2010.

Regaining Lost Monetary Autonomy

It is important to note that a central bank in an economy with a fixed exchange rate has to intervene in the foreign-exchange market by selling reserves in response to a capital inflow decline and a balance of payments deficit, but a central bank with a floating exchange rate does not.

It is certainly true that a central bank with a floating exchange rate can respond to a drop in net capital inflows and retain monetary policy independence by allowing the exchange rate to depreciate to the point where the sum of the current and capital accounts is again zero. But in reality, the pain of this balance of payments adjustment may be too great, particularly in an environment of volatile shifts in capital flows. A sharp drop in capital inflows is also referred to as a “sudden stop” and usually entails a sharp tightening in credit in the economy. The central bank may sell reserves to fill the gap left by this drop in capital inflows. Even though this causes the central bank’s balance sheet to shrink and is, thus, contractionary monetary policy, it may be worth it to stave off the effects of a sudden

stop. Similarly, the central bank may respond with expansionary monetary policy in response to an increase, or a “surge,” in capital inflows. Without central bank action to accumulate foreign-exchange reserves, this surge could lead to unwanted credit expansion and an overheating economy. Knowing this, a central bank with a floating exchange rate may find it worthwhile to sacrifice monetary independence and use its balance sheet to “manage” this surge in capital inflows by accumulating foreign-exchange reserves.

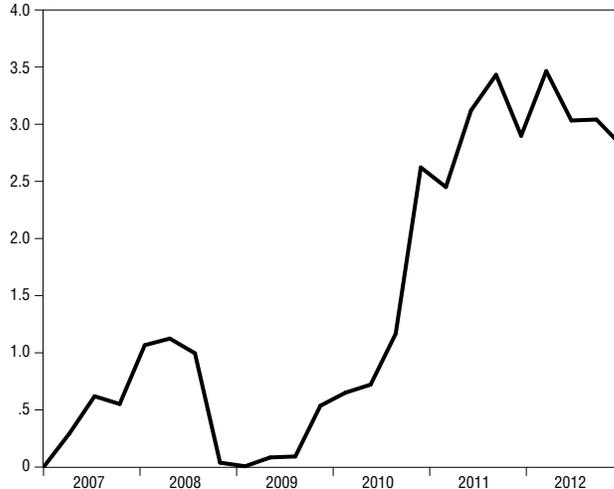
With the aim of managing volatile swings in capital inflows and retaining monetary policy autonomy, a number of emerging-market central banks have used capital-flow management measures (capital controls) to “manage” volatile capital flows while leaving the size of the central-bank balance sheet untouched, thereby retaining monetary policy autonomy. These are commonly described as “sterilized” foreign-exchange interventions. When discussing how a central bank will adjust its holdings of foreign-exchange reserves and the direct effect on balance sheet size, we are considering unsterilized intervention. If instead a central bank adjusts the size of its foreign-exchange holdings to keep the currency stable but at the same time performs the exact opposite open-market operation in the domestic bond market, it can then intervene in the foreign-exchange market without affecting the size of its balance sheet.

For instance, in response to an increase in capital inflows that would push up the value of the exchange rate, the central bank absorbs those capital inflows by buying foreign-exchange assets. In an unsterilized intervention, it would finance the purchase by expanding the liability side of its balance sheet (i.e., “printing money”). In a sterilized intervention, the central bank will instead finance the purchase of foreign-exchange assets by selling domestic-currency bonds on its balance sheet, replacing one central bank asset for another and leaving the overall size of its balance sheet unchanged (i.e., a foreign-exchange intervention without printing money).

“At a time when policymakers were talking about currency wars and fears of overheating in many emerging markets, emerging-market central banks in countries with a floating exchange rate were following a highly accommodative monetary policy.”

Chart 7
Capital Controls in Emerging Markets with a Floating Exchange Rate

Average number of capital control measures, normalized to 0 in first quarter 2007



SOURCE: "The Two Components of International Capital Flows," by Shaghil Ahmed, Stephanie Curcuru, Frank Warnock and Andrei Zlate (2015), mimeo.

But these two actions—buying foreign-currency-denominated bonds and selling domestic-currency-denominated bonds—cause the interest rate on foreign-currency-denominated bonds to fall and the interest rate on domestic-currency bonds to rise. If there are no capital account restrictions, private investors will simply buy domestic-currency bonds and finance them by selling foreign-currency bonds. This is the exact opposite of what the central bank is doing! Without capital account restrictions, private investors will act in a way to exactly offset any sterilized intervention by the central bank, rendering it ineffective. Consequently, absent capital account restrictions, the only way to effectively stabilize the value of the exchange rate is through an unsterilized intervention, which requires the central bank to adjust the size of its balance sheet and, therefore, entails the loss of monetary policy autonomy.

Chart 7 plots the GDP-weighted average of the number of capital flow management measures applied in the emerging-market countries with a floating exchange rate during the global financial crisis and subsequent

recovery. The chart shows that these measures were reduced in late 2008 in response to the crisis. Emerging-market central banks were trying to attract capital, not repel it. The number of capital controls increased significantly starting with the recovery in the second half of 2009. This was during the period when emerging markets were seeing large capital inflows, and many emerging markets responded by trying to block them by using legal restrictions.

The evidence for the effectiveness of capital controls is mixed. Klein (2012) and Klein and Shambaugh (2015) argue that permanent fixed capital controls (which Klein refers to as "walls") can be effective, but temporary capital controls (which Klein refers to as "gates") are less effective.

However, many emerging-market central banks with a floating exchange rate have attempted to impose capital flow management measures over the past few years, particularly during the recovery and surge of capital inflows into emerging markets in 2009 to 2011. The fact that so many emerging-market central banks turned to capital controls to "manage" capital flows is an indication that even though the exchange rate was allowed to float, these central banks were finding that their monetary autonomy was restricted. The theory of the trilemma states that a country with a floating exchange rate should have complete monetary independence. But the actions of many central banks over the past few years show that in practice, in an environment of volatile capital flows, monetary independence is limited, even when an exchange rate is allowed to float.

Notes

¹ The trilemma is a constraint on monetary policymaking not only at the national level, but at the subnational level. Texas has a stable exchange rate vis-à-vis the other 49 states, and there is free movement of capital within the United States. As a result, the Federal Reserve Bank of Dallas cannot set monetary policy independently of the rest of the Federal Reserve System.

² As Chinese policymakers begin to loosen these controls and allow greater international holding of the Chinese yuan, a feature of the recent decision to include the currency

in the Special Drawing Rights (SDR), they will be forced to either allow the currency to float or sacrifice monetary independence.

³ This describes an “unsterilized” foreign-exchange intervention by the central bank. In a “sterilized” intervention, the central bank intervenes in the foreign-exchange market without adjusting the size of its balance sheet. However, the sterilized intervention is only effective when sufficient capital flow restrictions are in place. This form of intervention is further explored later in this article as part of a discussion of how some emerging-market countries are resorting to capital controls to insulate themselves against swings in the global financial cycle.

⁴ Countries that fix their exchange rate are defined as ones that receive a score of 1–2 on the course classification scheme in Ilzetki et al. (2008). Countries that float are ones that receive a score of 3–4 on this course classification scheme.

⁵ Whether programs like quantitative easing had such an effect on emerging-market currencies and interest rates is a topic of much controversy. Rey (2013) argues that quantitative easing has had such an effect. In a recent lecture, former Federal Reserve Chairman Ben Bernanke (2015) disagrees with this assessment. Bernanke’s argument is based partially on recent research from economists at the Board of Governors that argues that quantitative easing had no more of an effect on emerging-market currencies and financial markets than normal monetary loosening in the United States (Bowman, Londono and Sapriza, 2014).

⁶ This article focuses on the financial aspects of the current account, where the current account measures the net flow of capital coming into a country because of currently produced goods and services. The trade balance is the largest component in the current account. For more discussion of trade and its effect on exchange rates, see the article by Michael Sposi in this report.

⁷ M1 is the most liquid definition of money and includes currency in circulation as well as demand deposits and checking account balances.

Davis, Scott, and Ignacio Presno (2014), “Capital Controls as an Instrument of Monetary Policy,” Globalization and Monetary Policy Institute Working Paper no. 171 (Federal Reserve Bank of Dallas, June).

Ilzetki, Ethan O., Carmen M. Reinhart and Kenneth S. Rogoff (2008), “Exchange Rate Arrangements Entering the 21st Century: Which Anchor Will Hold?” (mimeo).

Klein, Michael W. (2012), “Capital Controls: Gates vs. Walls,” NBER Working Paper no. 18526 (Cambridge, Massachusetts, National Bureau of Economic Research, November).

Klein, Michael W., and Jay C. Shambaugh (2015), “Rounding the Corners of the Policy Trilemma: Sources of Monetary Policy Autonomy,” *American Economic Journal: Macroeconomics* 7(4): 33–66.

Rey, Hélène (2013), “Dilemma Not Trilemma: The Global Financial Cycle and Monetary Policy Independence,” (paper prepared for the Jackson Hole Symposium, Aug. 23–25, 2013).

References

Bernanke, Ben S. (2015), “Mundell-Flemming Lecture: Federal Reserve Policy in an International Context,” (speech delivered at the 16th Jacques Polak Annual Research Conference, Nov. 5–6, 2015).

Bowman, David, Juan M. Londono and Horacio Sapriza (2014), “U.S. Unconventional Monetary Policy and Transmission to Emerging Market Economies,” *International Finance Discussion Paper no. 1109* (Washington, D.C., Federal Reserve Board, June).

Calvo, Guillermo A., and Carmen M. Reinhart (2002), “Fear of Floating,” *Quarterly Journal of Economics* 117(2): 379–408.

Navigating the Structure of the Global Economy

By Michael Sposi



The Globalization and Monetary Policy Institute's primary focus is developing a better understanding of how the process

of deepening economic integration among countries of the world, or globalization, alters the environment in which U.S. monetary policy decisions are made. In this article, I discuss how my research contributes to this mission. I emphasize the interaction between increased globalization and the changing structure of economic activity, and how these phenomena affect the ways economists evaluate key economic trade-offs.

Structural Changes in the Economy

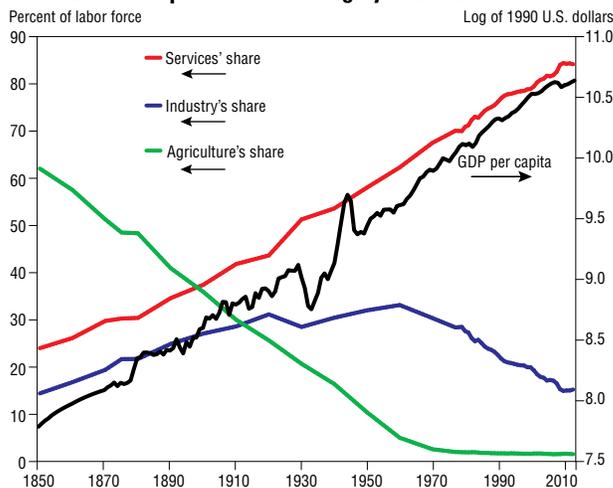
The composition of economic activity in the U.S. has changed markedly since the Industrial Revolution. In 1850, 62 percent of the workforce was engaged in agricultural

activities, 14 percent in industry and 24 percent in services; see also Sposi and Grossman (2014). As the country developed, workers moved out of agriculture and into the industrial and service sectors. By 1965, the share of employment in industry peaked at 32 percent and has since declined to 15 percent. Agriculture's share has continued to fall from more than 60 percent and now accounts for less than 1 percent of the workforce; services' share has steadily increased from roughly 25 percent to its current 85 percent (*Chart 1*). This structural transformation is not unique to the U.S. and has been experienced by almost every advanced economy.

There are many reasons why economists would like to understand what drives structural change. To begin with, in spite of the massive shift in the composition of economic activity, U.S. real gross domestic product (GDP) per capita has consistently grown by roughly 2 percent per annum since 1850. Researchers taking a historical and international perspective may better understand the engines of economic growth based on the composition of economic activity.

Citizens and policymakers have expressed concern over the decline of the industrial sector as well. In absolute terms, the total number of U.S. workers engaged in manufacturing—the largest component of the industrial sector—has decreased 37 percent, from a peak of 19.4 million workers in 1979 to 12.2 million workers by the end of 2014. During the same period, U.S. nonfarm employment grew 54 percent. To date, the decline in manufacturing employment has been attributed to globalization, outsourcing and automation of routine production tasks. Some analysts also consider structural change to be closely linked to rising income inequality; as such, heated political debate

Chart 1
U.S. Composition of Employment Changes,
Real GDP Per Capita Grows at Roughly Constant Rate



SOURCES: International Historical Statistics (2013); Organization for Economic Cooperation and Development; "Market Services Productivity Across Europe and the U.S. [with Discussion]" by Robert Inklaar, Marcel P. Timmer, Bart van Ark, Wendy Carlin and Jonathan Temple, *Economic Policy*, vol. 23, no. 53, 2008, pp. 139–94; "The First Update of the Maddison Project; Re-estimating Growth Before 1820," by Jutta Bolt and Jan Luiten van Zanden (2013), Maddison Project Working Paper no. 4 (The Maddison Project, Groningen, Netherlands, January); author's calculations.

and arguments for trade protection have occurred. Nonetheless, manufacturing-labor productivity growth increased from 2 percent pre-1980 to 3.1 percent post-1980. In addition, value added in the manufacturing sector shifted more toward the production of high-tech equipment; the share of high tech was 40 percent in 2012 compared with 30 percent in 1977.

From the perspective of monetary policy, structural change matters as well. The Fed's dual mandate is price stability and maximum employment. To achieve this, the Fed currently targets an inflation rate of 2 percent in the personal consumption expenditures (PCE) index. From a pure measurement perspective, weights in the PCE are based on expenditure shares across many goods and services. To the extent that expenditure shares change over time, the dynamics of PCE inflation will respond very differently to otherwise similar underlying shocks. Since the Fed aims to stabilize long-term inflation, the long-run evolution of the composition of expenditures is worthy of consideration. Volatility in aggregate employment depends on the composition of employment. Manufacturing employment is more volatile over the business cycle than services employment.

Aside from measurement issues, the underlying economic causes and consequences of structural change are of central importance. In particular, prices and employment in the manufacturing sector may be more susceptible to conditions in foreign economies than those in other sectors since manufactured goods are highly traded. Moreover, understanding the forces behind the changes in the composition of economic activity is crucial to determining the effectiveness of policy and the shaping of price and employment dynamics. Changes

in the composition of employment can be either growth reducing or growth enhancing, depending on whether resources shift toward sectors with higher or lower productivity. Finally, Stefanski (2014) argues that the size of the industrial sector in large economies plays a critical role in determining commodity prices; thus, structural change affects rates of inflation at the global level.

Uncovering the forces behind structural change requires the use of general equilibrium models. General equilibrium models are mathematical constructs that study the interaction between various economic agents, including firms, households and governments. They essentially act as mini-laboratories for studying how certain types of shocks affect market outcomes by accounting for how economic agents respond to the shocks. There has been a great deal of recent research along these lines. The literature has highlighted four key mechanisms: income effects, price ef-

fects, comparative advantage and sectoral linkages.¹

Income Effects

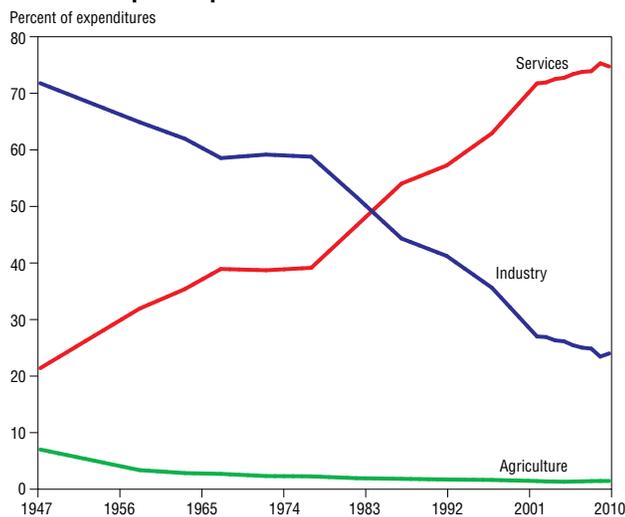
The first mechanism is income effects, first articulated by 19th-century economist Ernst Engel, in which income elasticities of demand for each good differ from one another (e.g., Laitner, 2000; Kongsamut, Rebelo and Xie, 2001). That is, as households become wealthier, a smaller share of income is allocated toward food and agricultural products. However, higher income and longer life expectancy are associated with increased demand for services such as health care, education and entertainment (*Chart 2*).

Price Effects

The second mechanism is price effects, in which the elasticity of substitution between goods is less than one (e.g., Baumol, 1967; Ngai and Pissarides, 2007). This means that if the relative price of one good increases

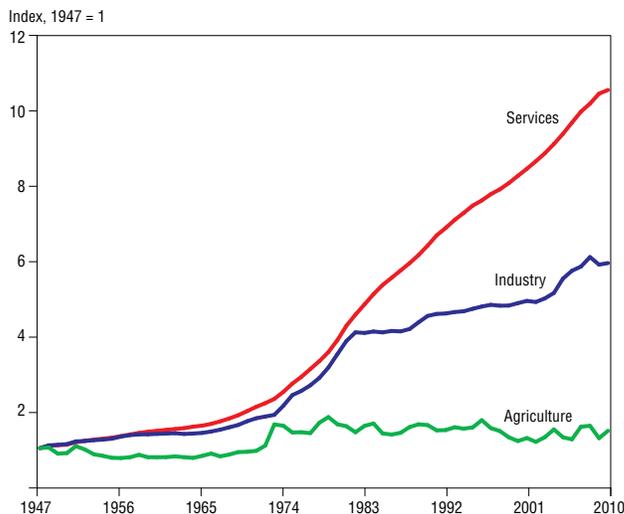
Chart 2

U.S. Consumption Expenditures Shift Toward Services



SOURCES: Bureau of Economic Analysis; "Two Perspectives on Preferences and Structural Transformation," by Berthold Herrendorf, Richard Rogerson and Ákos Valentinyi, *American Economic Review*, vol. 103, no. 7, 2013, pp. 2,752–89; author's calculations.

Chart 3
Services Prices in the U.S. Grow Faster than Agricultural and Industrial Prices



SOURCES: Bureau of Economic Analysis; "Two Perspectives on Preferences and Structural Transformation," by Berthold Herrendorf, Richard Rogerson and Ákos Valentinyi, *American Economic Review*, vol. 103, no. 7, 2013, pp. 2,752–89; author's calculations.

by 1 percent, the reduction in the quantity demanded of that good is less than 1 percent. That is, total expenditures on the good increase after an increase in that good's price. This has far-reaching implications in the long run. Consider a technological improvement in manufacturing processes that reduces the relative cost of producing manufactured goods. Then the share of expenditures allocated toward manufacturing will fall, reducing the number of workers employed in that sector.

Chart 3 illustrates the long-run change in relative prices in the U.S. The real (inflation-adjusted) price of services has increased 12-fold since 1947, while the real price of industrial products has increased six-fold, and the real price of agricultural products, less than two-fold. This reflects asymmetries in productivity growth. Productivity grew fastest in agriculture via increased use of sophisticated equipment and improved fertilizing techniques. Industrial productivity growth was next; advancements came from automation software. Productivity growth was slowest in the services sector.

Comparative Advantage

The third mechanism is changes in comparative advantage in an open economy (Uy, Yi and Zhang, 2013). As emerging economies become increasingly integrated into the global economy, they often realize productivity gains in the manufacturing sector. Thus, the global allocation of manufacturing production shifts toward these countries. International trade has been particularly important for the economic growth and development of East Asian economies.

In 1950, Japan accounted for 1 percent of U.S. imports, primarily involving low-tech goods—textiles, rubber and plastic. By 1985, Japan accounted for 20 percent of U.S. imports. Japan's exports initially relied on cheap labor and access to industrial goods from more-advanced economies such as the U.S. The proportion of labor employed in the industrial sector in Japan increased from 29 percent in 1950 to 36 percent in 1985, while that share of labor in the U.S. fell from 32 percent to 29 percent.

As the Japanese economy grew, wages rose and its competitive edge in exporting low-tech goods diminished as other emerging Asian economies began to industrialize. During the 1980s, Japan focused its production and exports on more high-tech goods (semiconductors and computer chips) and investment goods (automobiles and medical equipment). Simultaneously, the share of labor in Japan's industrial sector fell from 36 percent to 26 percent. Japan's real GDP growth began to taper to rates more similar to those of the U.S.

As the Japanese economy slowed down, industrialization and rapid growth began to take off in the Asian Tiger economies (Hong Kong, Singapore, South Korea and Taiwan). These economies took on much of the low-tech production and exporting Japan previously performed. As a result, Japan accounted for a declining share of U.S. imports—from 20 percent in 1985 to 6 percent in 2013 (*Chart 4A*). The Tigers experienced a rise in industry's share of employment, which peaked in the mid-1990s and coincided with

a rise in the Tiger's share of world imports (*Chart 4B*). After the mid-1990s, these shares began to fall as did real GDP growth. During the decline, the Tigers reallocated production toward more high-tech goods including semiconductors and automobiles. China began absorbing the low-tech work. China industrialized quickly, and economic growth was very high. China's share of world imports picked up rapidly: Its share of U.S. imports increased from 6 percent in 1995 to 20 percent in 2013.

In recent years, real GDP growth in China fell from double-digit rates to less than 7 percent per annum. Whether the current slowdown in China should be perceived as a threat to growth in the U.S. is, of course, debatable. However, this is not the first case in which an important U.S. trading partner experienced a growth slowdown. Each of the previous Asian growth miracles grew at unprecedented rates as they industrialized. However, after peaking, these economies' growth rates slowed as the "low-hanging fruit had already been picked," and each country shifted from adapting foreign technology and producing low-tech goods to building a service sector and developing technologies for producing high-tech goods.

In the past, the U.S. and other advanced economies have altered their trade shares in response to structural change in the rest of the world. It is unclear whether the Chinese transition should be any different. However, China is substantially larger today than Japan was in 1990, and the U.S. is more integrated with the rest of the world today than it was 25 years ago. Therefore, it is important to ask how the slowdown in emerging economies today impacts economic conditions across the world. Sposi (2015a) explores how changes in foreign productivity propagate throughout the world and impact the composition of employment. He finds that foreign productivity shocks have relatively little impact on the share of employment in the industrial sector in advanced economies, and domestic productivity shocks are far more important for generating employment composition changes.

Sectoral Linkages

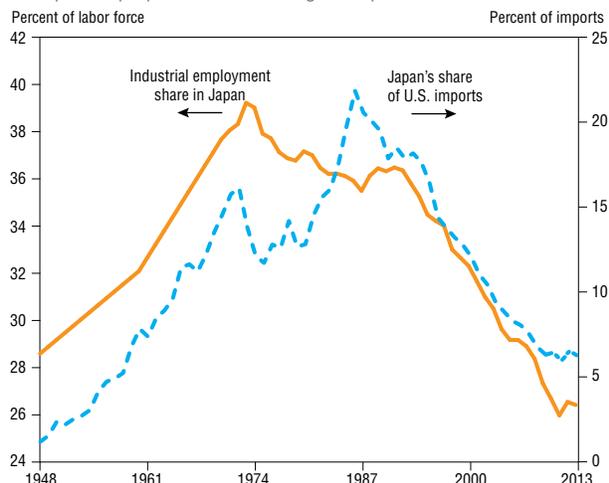
The fourth mechanism, which has received far less attention, is sectoral linkages in production. In the presence of sectoral linkages, 1) a productivity shock in one sector affects intermediate-goods prices and, hence, impacts relative prices of output across all

"Each of the previous Asian growth miracles grew at unprecedented rates as they industrialized."

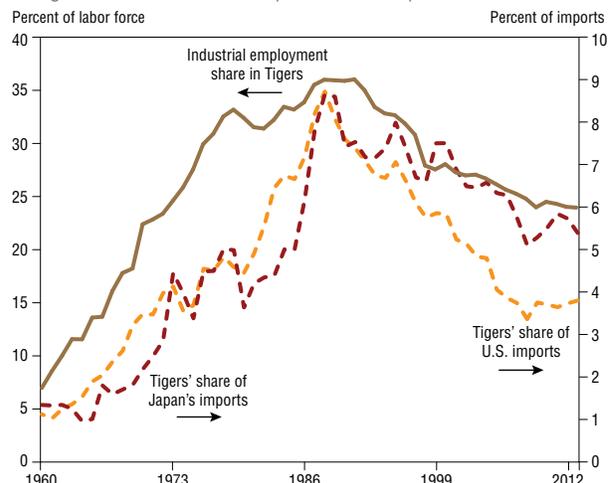
Chart 4

Import Expansion Reflects Industrial Cycles

A. Japan Employment Precedes Higher Import Share in U.S.



B. Tigers Industrial Growth Propels Greater Import Shares



SOURCES: Haver Analytics; International Historical Statistics, 2013; International Monetary Fund's Direction of Trade Statistics; "A Cross-Country Database for Sectoral Employment and Productivity in Asia and Latin America, 1950–2005," by Marcel P. Timmer and Gaaitzen J. de Vries, Groningen Growth and Development Center, Research Memorandum GD-98, 2007; author's calculations.

sectors by different proportions depending on the extent of the linkages, and 2) the extent that the composition of value added and employment responds to changes in the composition of final demand depends exclusively on the sectoral linkages. Using a partial equilibrium framework, Berlingieri (2014) shows that accounting for the intermediate use of “professional and business services” is important for explaining increased service sector employment in the U.S.

Chart 5 depicts the change in the composition of intermediate inputs employed by U.S. firms. In 1947, industrial inputs accounted for more than 50 percent of intermediate-input expenditures, and services amounted to less than 30 percent. By 2012, services accounted for more than 60 percent.

Sposi (2015b) argues that differences in sectoral linkages in production are crucial to accounting for the hump shape in industry’s share of employment. Much of the decline in industry’s share of employment at higher levels of development can be accounted for by changes in the structure of production. Services are increasingly more important in production in advanced economies. That

is, as final demand grows, more and more resources are employed in the service sector in order to deliver the intermediate inputs necessary for final goods production, leading to a tapering of industrial employment.

Sposi (2015b) also investigates the importance of sectoral linkages in explaining how prices respond to isolated productivity shocks. The nature of the global supply chains determines the channels through which shocks get transmitted. For example, consider technological advances in the manufacturing sector. If both the U.S. and emerging economies improve their technology, relative prices will adjust by different magnitudes. Specifically, the price of services will decrease by a larger magnitude in emerging economies than in the U.S., since in emerging economies, services production uses manufacturing inputs more intensively. The implication is that otherwise-identical shocks in various locations can have asymmetric impacts on aggregate price levels.

Sectoral linkages are also important for understanding the sources of sectoral productivity growth. For instance, advances in manufacturing productivity were brought about by inputs from the service sector, such as research and development and information technology.

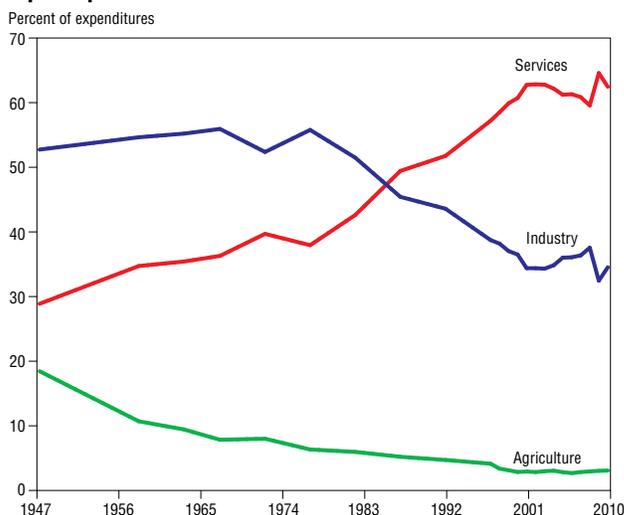
Bridgman, Duernecker and Herrendorf (2015) are currently exploring another channel. Their work examines factors that influence labor-force participation and the substitution from home-produced services to market-produced services.

Economic Integration, Prices and Real Exchange Rates

The degree of economic integration determines how developments in foreign economies impact prices and production at home. It also determines how domestic conditions and domestic policy propagate throughout the economy. The first challenge in quantifying the effects of globalization is constructing measures of the extent of integration between countries.

I focus on goods market integration via

Chart 5
U.S. Firms Increase Service-Based Intermediate Input Expenditures



SOURCES: Bureau of Economic Analysis; “Two Perspectives on Preferences and Structural Transformation,” by Berthold Herrendorf, Richard Rogerson and Ákos Valentinyi, *American Economic Review*, vol. 103, no. 7, 2013, pp. 2,752–89; author’s calculations.

international trade.

To measure goods market integration, one may directly measure tariffs and transport costs. However, these account for only a small portion of the overall impediments to trade. Moreover, there are literally thousands of goods, and each good potentially has its own tariff schedule. Beyond tariffs, countries also impose quotas. One is then confronted with the challenge of summarizing very different policies—that is, tariffs and quotas—into a single statistic, as attempted by Anderson and Neary (1994). Aside from trade policy barriers, there are geographical and economic barriers to trade.

Most international trade is in intermediate goods and, therefore, requires coordination for production processes and quality control to ensure components coming from various sources can be assembled correctly in a timely manner into the final good. Whether firms in different countries are able or willing to adhere to such standards poses one type of barrier. Another type of barrier, particularly in less-developed countries, is corruption and noncompetitive behavior among government officials and businesses. Such behavior can deter foreigners from selling output in a country. Yet another factor is cultural similarities: Goods that U.S. firms produce and sell in the U.S. may possess characteristics that U.S. consumers desire. The same characteristics may be less desirable in other countries, so U.S. firms may not export their products to such locations. In addition, different countries have different standards for goods, such as automobile emissions, health standards for processed foods and safety features of manufactured devices, making it costly for firms to tailor their products specifically to each location. These constitute just some of the potential barriers to trade that limit the extent of economic integration. Each is extremely difficult, if not impossible, to directly measure with any reasonable degree of accuracy.

To circumvent the complexities in measuring trade barriers, many economists use price differentials to gauge the extent to

which economies are integrated. One of the oldest theories in international economics is purchasing power parity (PPP). It states that if there are no costs to trading goods, then the price index constructed with similar goods should be the same everywhere when quoted in a common currency, usually U.S. dollars—that is, the real exchange rate should be one. If prices are different across borders, entrepreneurial individuals can arbitrage these opportunities for profit, eventually pushing prices toward parity. Economists have applied the reverse of this logic to infer trade barriers from prices. For instance, in the literature on economic development, observed dispersion in aggregate prices has been used to study differences in cross-country income and investment rates (see Restuccia and Urrutia, 2001; Hsieh and Kleiner, 2007; Armenter and Lahiri, 2012). In the international trade literature, the dispersion in prices is used to measure departures from “one world price,” and these departures are presumed to reflect trade barriers (see, for instance, Anderson and van Wincoop, 2004). Hence, price equalization across countries has led to the inference that trade barriers are absent. Mutreja, Ravikumar, Riezman and Sposi (2014) and Mutreja, Ravikumar, Riezman and Sposi (2015) show that such an inference may not be correct in the context of aggregate prices.

In particular, Mutreja, Ravikumar, Riezman and Sposi (2015) employ a model to argue that price equalization does not imply free trade. They show that there are many equilibria with price index equalization, even if there is not free trade. That is, multiple combinations of trade barriers exist that are consistent with equal prices; however, each combination has a different implication for trade flows. Hence, price equalization by itself does not guarantee zero trade barriers. Instead, information on trade flows is necessary to determine whether there are no barriers to trade.

Mutreja, Ravikumar, Riezman and Sposi (2014) show that the result is more than a theoretical one. The authors use data

“Price equalization by itself does not guarantee zero trade barriers. Instead, information on trade flows is necessary to determine whether there are no barriers to trade.”

“The extent of economic integration has direct implications for relative prices, aggregate productivity and capital accumulation.”

on capital goods prices and capital goods trade across 88 countries. Prices of capital goods are roughly similar across countries, which has led Hsieh and Klenow (2007) and Armenter and Lahiri (2012) to infer small barriers in capital goods trade. Using a general equilibrium model, Mutreja, Ravikumar, Riezman and Sposi (2014) find that trade barriers in capital goods must be substantial to reconcile the observed volume of trade; yet, their model predicts prices that are quantitatively consistent with the data.

There is one more popular metric for measuring integration: the ratio of total trade (imports plus exports) to GDP. Interpreting this measure requires care. For one, the composition of trade is different from that of GDP. Services are traded very little, yet account for the lion’s share of GDP in advanced countries. Second, imports and exports are measured in gross terms, while GDP is a value-added concept. Global supply chains have become ever more prevalent, and intermediate goods may cross many borders before being assembled into a final good. In the past couple of years, substantial progress has been made in getting around the second issue. It is even more crucial to distinguish between these concepts when one evaluates bilateral trade linkages. Sposi and Koech (2013) argue that the trade deficit between the U.S. and China is up to 50 percent larger when measured in gross terms than when measured in value-added terms.

Relative Prices, Investment Rates and Productivity

The extent of economic integration has direct implications for relative prices, aggregate productivity and capital accumulation.

Sposi (2015c) argues that productivity in the tradable-goods sector depends crucially on the magnitude of trade barriers. Specifically, trade barriers result in a misallocation of resources in which countries end up producing goods for which they are comparatively inefficient. This reduces aggregate wages and also leads to a lower price of nontraded services. The article argues that

trade barriers affect the prices of nontradable services more than the prices of tradable goods. This conclusion may appear counterintuitive at first.

The effect of trade barriers on relative prices has immediate implications for investment rates since trade barriers distort the trade-off between investment and consumption. Most consumption goods are nontradable services, while a large share of investment is in traded durable goods. Hsieh and Klenow (2007) and Restuccia and Urrutia (2001) show that almost all of the variation in real investment rates can be accounted for by variation in the relative prices of investment goods.

Mutreja, Ravikumar and Sposi (2014) study the effects of trade distortions in the investment-goods sector and in the noninvestment-goods sector. While the U.S. runs an aggregate trade deficit, the U.S. has a large comparative advantage in producing investment goods. Reducing trade barriers further would allow the U.S. to further specialize in producing investment goods. The increased capital stock would account for about 80 percent of the overall gains in terms of per capita income, while increases in productivity from improved specialization would account for the remaining 20 percent.

Future Directions

Given the surge in available data on international trade and the structure of production across countries and industries, many new facts about the nature of structural change and the factors driving it have been documented and explored empirically. However, there is still a lot to learn about what the driving forces are and the quantitative importance of various underlying mechanisms with regard to understanding economic growth and development. Much of the challenge of answering complex questions involving economic growth involves a lack of mathematical tools. Specifically, researchers confront the “curse of dimensionality” when exploring economic questions that involve both spatial and dynamic aspects—essen-

tially, the economic models are “too large” for existing software. As a result, researchers are working on developing new algorithms that can reduce the models’ dimensionality.

One area of particular interest is linking international trade across countries to the dynamics of capital accumulation and growth. Until now, two-country models have been the limit. It is well known that two-country models can yield misleading results since there is no possibility of trade diversion.

Aside from trade linkages, another very important feature of globalization is financial linkages. The two are not independent. For instance, trade imbalances account for almost all of the current account deficit in the U.S. Any deficit in the current account must be offset by an equal surplus in the capital account—the U.S. must borrow resources to consume more than it produces, e.g., to finance its trade deficit. Citizens and the media often view the trade deficit in a negative light. However, there is no reason to assume, *ex ante*, that it is detrimental to the economy. Going forward, developing new tools to study the connection between international trade and the dynamics of the current account can offer quantitative insight to such debates. Monetary policy also has a strong influence on the directions of capital flows and the terms of trade. Therefore, economists need models that can untangle the forces that drive changes in the current account in order to prescribe appropriate policy.

Note

¹There is a strand of literature that attempts to decompose the relative importance of each of the above mechanisms including Sposi (2012); Teignier (2012); Betts, Giri and Verma (2013); Herrendorf, Rogerson and Valentinyi (2013); Uy, Yi and Zhang (2013); Boppart (2014); Swiecki (2014); Comin, Lashkari and Mestieri (2015).

References

Anderson, James E., and Peter Neary (1994), “Measuring the Restrictiveness of Trade Policy,” *World Bank Economic Review* 8 (2): 151–69.

Anderson, James E., and Eric van Wincoop (2004), “Trade Costs,” *Journal of Economic Literature* 42 (3): 691–751.

Armenter, Roc, and Amartya Lahiri (2012), “Accounting for Development Through Investment Prices,” *Journal of Monetary Economics* 59 (6): 550–64.

Baumol, William J. (1967), “The Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis,” *American Economic Review* 57 (3): 415–26.

Berlingieri, Giuseppe (2014), “Outsourcing and the Rise in Services,” CEP Discussion Paper no. 1199 (London, UK, Centre for Economic Performance, London School of Economics).

Betts, Caroline M., Rahul Giri and Rubina Verma (2013), “Trade, Reform and Structural Transformation in South Korea,” Munich Personal RePEc Archive Paper no. 49540 (Munich, Germany, University Library of Munich, Germany).

Boppart, Timo (2014), “Structural Change and the Kaldor Facts in a Growth Model with Relative Price Effects and Non-Gorman Preferences,” *Econometrica* 82 (6): 2167–96.

Bridgman, Benjamin, Georg Duernecker and Berthold Herrendorf (2015), “Structural Transformation, Marketization and Household Production Around the World,” manuscript.

Comin, Diego, Dania Lashkari and Marti Mestieri (2015), “Structural Change with Long-Run Income and Price Effects,” NBER Working Paper no. 21595 (Cambridge, Massachusetts, National Bureau of Economic Research, September).

Herrendorf, Berthold, Richard Rogerson and Ákos Valentinyi (2013), “Two Perspectives on Preferences and Structural Transformation,” *American Economic Review* 103 (7): 2752–89.

Hsieh, Chang-Tai, and Peter J. Klenow (2007), “Relative Prices and Relative Prosperity,” *American Economic Review* 97 (3): 562–85.

Kongsamut, Piyabha, Sergio Rebelo and Danyang Xie (2001), “Beyond Balanced Growth,” *Review of Economic Studies* 68 (4): 869–82.

Laitner, John, 2000, “Structural Change and Economic Growth,” *Review of Economic Studies* 67 (3): 545–61.

Mutreja, Piyusha, B. Ravikumar, Raymond Riezman and Michael Sposi (2014), “Price Equalization, Trade Flows and Barriers to Trade,” *European Economic Review* 70 (C): 383–98.

Mutreja, Piyusha, B. Ravikumar, Raymond Riezman and Michael Sposi (2015), “Price Equalization Does Not Imply Free Trade,” Federal Reserve Bank of St. Louis *Review* 97 (4): 323–39.

Mutreja, Piyusha, B. Ravikumar and Michael Sposi (2014), “Capital Goods Trade and Economic Development,” Globalization and Monetary Policy Institute Working Paper no. 183 (Federal Reserve Bank of Dallas, May).

Ngai, Rachel L., and Christopher A. Pissarides (2007), “Structural Change in a Multisector Model of Growth,” *American Economic Review* 97 (1): 429–43.

Restuccia, Diego, and Carlos Urrutia (2001), “Relative Prices and Investment Rates,” *Journal of Monetary Economics* 47 (1): 93–121.

Sposi, Michael (2012), “Evolving Comparative Advantage, Structural Change and the Composition of Trade” (University of Iowa, manuscript).

Sposi, Michael (2015a), “Evolving Comparative Advantage, Sectoral Linkages and Structural Change,” Globalization and Monetary Policy Institute Working Paper no. 231 (Federal Reserve Bank of Dallas, May).

Sposi, Michael (2015b), “Evolving Comparative Advantage, Sectoral Linkages and Structural Change” (Federal Reserve Bank of Dallas, manuscript).

Sposi, Michael (2015c), “Trade Barriers and the Relative Price of Tradables,” *Journal of International Economics* 96 (2): 398–411.

Sposi, Michael, and Valerie Grossman (2014), “Deindustrialization Redeploys Workers to Growing Service Sector,” Federal Reserve Bank of Dallas *Economic Letter*, no. 11.

Sposi, Michael, and Janet Koech (2013), “Value-Added Data Recast the U.S.–China Trade Deficit,” Federal Reserve Bank of Dallas *Economic Letter*, no. 5.

Stefanski, Radoslaw (2014), “Structural Transformation and the Oil Price,” *Review of Economic Dynamics* 17 (3): 484–504.

Swiecki, Tomasz (2014), “Determinants of Structural Change” (Vancouver School of Economics, University of British Columbia, mimeo).

Teignier, Marc (2012), “The Role of Trade in Structural Transformation,” University of Barcelona (manuscript).

Uy, Timothy, Kei-Mu Yi and Jing Zhang (2013), “Structural Change in an Open Economy,” *Journal of Monetary Economics* 60 (6): 667–82.

Summary of Activities 2015

The institute hosted two major conferences, revived its public lecture series and continued to publish research in top peer-reviewed journals.



The Globalization and Monetary Policy Institute logged a number of achievements in 2015. The institute hosted two major conferences, revived its public lecture series and continued to publish research in top peer-reviewed journals.

By year-end, the institute had added 39 new papers to its working paper series, bringing the total to 259. This was slightly below the bumper number of papers (53) circulated in the series in 2014. Of the 39 new papers, permanent staff in Dallas contributed 11, with the remainder coming from institute research associates.

Academic Research

Journal acceptances ran at almost twice the 2014 rate, making 2015 the best year to date on this front. Thirteen papers were accepted for publication:

- *International Economic Review*: Alexander Chudik's "Size, Openness, and Macroeconomic Interdependence" (co-authored with Roland Straub).
- *Review of Economics and Statistics*: Chudik's "Is There a Debt-Threshold Effect on Output Growth?" (co-authored with Kamiar Mohaddes, M. Hashem Pesaran and Mehdi Raissi).
- *Advances in Econometrics*: Chudik's "Long-Run Effects in Large Heterogeneous Panel Data Models with Cross-Sectionally Correlated Errors" (co-authored with Mohaddes, Pesaran and Raissi).
- *Journal of International Money and Finance*: J. Scott Davis' "Credit Booms, Banking Crises, and the Current Account" (co-authored with Adrienne Mack, Wesley Phoa and Anne Vandenabeele).
- *Journal of Econometrics*: Chudik and Valerie M. Grossman's "A Multi-Country Approach to Forecasting Output Growth Using PMIs" (co-authored with Pesaran).

- *Journal of Macroeconomics*: Davis' "The Macroeconomic Effects of Debt- and Equity-Based Capital Inflows," and Enrique Martínez-García's "A Contribution to the Chronology of Turning Points in Global Economic Activity (1980–2012)" (co-authored with Grossman and Mack).
- *Economics Letters*: Davis' "The Asymmetric Effects of Deflation on Consumption Spending: Evidence from the Great Depression," and Martínez-García's "On the Sustainability of Exchange Rate Target Zones with Central Parity Realignment."
- *Journal of Real Estate Finance and Economics*: Martínez-García's "Episodes of Exuberance in Housing Markets: In Search of the Smoking Gun" (co-authored with Grossman, Mack, Efthymios Pavlidis, Ivan Paya, David Peel and Alisa Yusupova).
- *Journal of International Economics*: Michael Sposi's "Trade Barriers and the Relative Price of Tradables," and Jian Wang's "Benefits of Foreign Ownership: Evidence from Foreign Direct Investment in China" (co-authored with Xiao Wang) and "The Effects of Surprise and Anticipated Technology Changes on International Relative Prices and Trade" (co-authored with Deokwoo Nam).

In addition, Martínez-García's paper, "The Global Component of Local Inflation: Revisiting the Empirical Content of the Global Slack Hypothesis with Bayesian Methods," was published in the volume *Monetary Policy in the Context of Financial Crisis: New Challenges and Lessons*, edited by William Barnett and Fredj Jawadi and published by Emerald Group Publishing. Sposi's paper "Price Equalization Does Not Imply Free Trade" (co-authored with Piyusha Mutreja, B. Ravikumar and Raymond Riezman) was published in the Federal Reserve Bank of St. Louis *Review*. Finally, Mark A. Wynne's presentation on Federal Reserve policy in

the postcrisis period, delivered as a keynote address at the Western Hemispheric Trade Conference at Texas A&M International University, was published in the *International Trade Journal*.

At year-end, staff had papers under review at the *Journal of International Economics*, *Journal of Monetary Economics*, *Journal of Applied Econometrics* and *European Economic Review*.

Conferences

The institute organized two major research conferences in 2015—one with Swiss National Bank (SNB), the Bank for International Settlements (BIS) and the Center for Economic Policy Research (CEPR), and the other with the Hong Kong Monetary Authority (HKMA), the European Central Bank (ECB) and the Board of Governors of the Federal Reserve System.

The conference with SNB, BIS and CEPR, “Spillovers of Conventional and Unconventional Monetary Policy: The Role of Real and Financial Linkages,” was held July 9–10 in Zurich. This was the fourth conference the institute had co-organized with SNB since the launch of the Bank’s research program on globalization and monetary policy. The conference featured presentations from researchers at the Board of Governors, University of British Columbia, SNB, ECB, University of Wisconsin–Madison, University of Montreal and Graduate Institute, Geneva. A full conference summary is provided on page 22.

The conference with HKMA, ECB and the Board of Governors, “Diverging Monetary Policies, Global Capital Flows and Financial Stability,” was held Oct. 15–16 in Hong Kong. Peter Pang, deputy chief executive of HKMA, delivered opening remarks, and ECB Vice President Vítor Constâncio gave the keynote address. Stephen Cecchetti, international



Participants from across the globe listen to presentations at the “Diverging Monetary Policies, Global Capital Flows and Financial Stability” conference in Hong Kong. The event, co-sponsored by the Dallas Fed, was held in October 2015.

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economics professor at Brandeis University, gave the luncheon keynote address. The event featured presentations by researchers from the University of Virginia, SNB, HKMA, Seoul National University, Dallas Fed, Board of Governors, Federal Reserve Bank of Boston and ECB. A full conference summary is provided on page 28.

Staff also presented work at high-profile conferences and at university seminars. These included the 2015 International Association for Applied Econometrics conference in Thessaloniki, Greece; Hong Kong Institute for Monetary Research Conference on the Chinese Economy; Research Institute for Development, Growth and Economics (RIDGE) Workshop on Trade and Firm Dynamics; the Federal Reserve System Committee on International Economic Analysis; Midwest Trade meetings; Midwest Macroeconomics meetings; University of British Columbia Winter Finance Conference 2015; Southern Economic Association meetings; System Committee on Macroeconomics and Day-

Ahead Inflation meeting; and Australasian Finance and Banking Conference.

Staff gave seminar presentations at the Boston Fed, Federal Reserve Bank of San Francisco, Keio University, University of Tokyo, Vanderbilt University, University of Nebraska–Omaha and DePaul University.

Bank Publications

Institute staff contributed seven articles to the Bank's *Economic Letter* publication: "Current Account Surplus May Damp the Effects of China's Credit Boom," by Davis, Mack, Phoa and Vandenabeele; "International Migration Remains the Last Frontier of Globalization," by Wynne; "External Debt Sheds Light on Drivers of Exchange Rate Fluctuations," by Davis; "Investment Enhances Emerging Economies' Living Standards," by Martínez-García; "A Real Appreciation for Recent Exchange-Rate Movements," by Kuhu Parasrampuria and Sposi; "Foreign Direct Investment: Financial Benefits Could Surpass Gains in Technology," by Wang, Janet Koech and Xiao Wang; and "Cheaper Crude Oil Affects Consumer Prices Unevenly," by Chudik and Koech. *Economic Letter* is designed to disseminate research to a broad, nontechnical audience.

Public Lectures

Some years ago, the institute launched a public lecture series with a talk on the euro crisis by Jürgen Stark, then a member of the ECB's executive board. The institute revived the series in 2015 with public events featuring Danish global economist and author Lars Christensen and American financial journalist Roger Lowenstein. Christensen spoke on the topic "China May Never Be the World's Largest Economy," and Lowenstein discussed his recent book, *America's Bank: The Epic Struggle to Create the Federal Reserve*.

Both events attracted capacity crowds. Christensen's talk resonated with his audience as signs of slower growth in China increased in 2015, with potentially adverse implications for growth in the Asia–Pacific region and the rest of the world in 2016. The



Author Lars Christensen, a Danish economist, speaks before a capacity crowd at the Dallas Fed on the timely topic "China May Never Be the World's Largest Economy." He gave his remarks as part of the institute's newly revived public lecture series.



Roger Lowenstein, author of a book on the founding of the Federal Reserve, shares highlights of his work during one of the institute's public lecture series events in 2015.

thesis that China may never be the world's largest economy contradicts recent International Monetary Fund (IMF) estimates that China is already the world's biggest economy, at least when measured on a purchasing power parity basis, which attempts to control for price differences between rich and poor countries. Either way, China looms increasingly large in global economic developments.

Lowenstein's book on the founding of the Fed might seem an unusual topic for a globalization institute event, but as he points out in the book, one argument of U.S. central bank advocates in the early 20th century was promotion of an international role for the dollar. As noted by many speakers at the institute's centennial conference in 2014, the hopes of the Fed's founders have been realized on a scale that they could not have imagined, and the Fed is in many ways the world's de facto central bank.¹

People

Everett Grant, a recent PhD from the University of Virginia, joined the institute as a research economist in July 2015. Arthur Hinojosa arrived in June as a research assistant,

and Kelvinder Viridi joined in July as a research assistant. Hinojosa is a recent graduate of the University of Texas (MA, 2015) and the University of Arkansas (BA, 2014). Viridi is a recent graduate of the University of California, San Diego (BA, 2015). Hinojosa and Viridi replaced Bradley Graves and Parasrampurua, who left to attend medical school and law school, respectively.

Máximo Camacho (Universidad de Murcia), Michele Ca'Zorzi (ECB), Jaime Martínez-Martín (Bank of Spain), Kamiar Mohaddes (Cambridge University), Mehdi Raissi (IMF), Joaquin Vespignani (University of Tasmania) and Ariel Weinberger (University of Oklahoma) joined the institute's network of research associates.

Note

¹The proceedings of that conference were published in spring 2016 as *The Federal Reserve's Role in the Global Economy: A Historical Perspective*, ed. Michael D. Bordo and Mark A. Wynne, Cambridge, U.K.: Cambridge University Press.

The institute revived its public lecture series in 2015 with events featuring Danish global economist and author Lars Christensen and American financial journalist Roger Lowenstein.

Spillovers of Conventional and Unconventional Monetary Policy:

The Role of Real and Financial Linkages

By Mark A. Wynne



and Julieta Yung



Central banks around the world launched extraordinary monetary policy responses to the global financial crisis of 2007–09 and the European debt crises that began in 2010. Some were coordinated; all were directed at fulfilling domestic mandates for price and financial stability and supporting real economic activity.

Fears that the dramatic expansion of central bank balance sheets (*Chart 1*)—a concomitant of the unconventional part of the policy response—would lead to higher inflation at the consumer level have so far proven unfounded, whether due to still abundant slack in many countries or to well-anchored inflation expectations.

But it has been argued that an extended period of ultra-easy monetary policy is manifesting itself in excessive risk taking, bubbles in certain asset classes and price pressures in countries that are recipients of internationally mobile capital. This capital, in search of higher yields, could ultimately lead to higher inflation globally.

The experience of recent years has challenged our understanding of the transmission of monetary policy across national borders as well as the implications of financial interconnections and the global financial cycle for inflation spillovers and monetary control. Moreover, it has prompted us to reconsider the short- and long-run tradeoffs between structural reforms and monetary policy during international crises and the global implications of policy responses to the financial crisis.

To discuss these topics, the Federal Reserve Bank of Dallas Globalization and

Monetary Policy Institute, together with the Swiss National Bank (SNB), the Bank for International Settlements (BIS) and the Center for Economic Policy Research (CEPR), organized a one-and-a-half-day conference in Zurich, Switzerland, on July 9–10, 2015. The conference was the latest in a series that the institute and the SNB have held to discuss monetary policy in an international context since 2011.

The conference opened with a keynote speech from Thomas Jordan, chairman of the SNB governing board. Jordan noted the centrality of the issues to be discussed to monetary policy deliberations in a small open economy like Switzerland. The safe-haven status of the Swiss franc makes Switzerland even more susceptible to international spillovers in times of economic stress. Unconventional monetary policy in Switzerland took the form of a floor on the Swiss franc-euro exchange rate (at 1.20 CHF per euro), which was abandoned in early 2015 when it proved unsustainable. The deflation at the consumer level that Switzerland has experienced since the onset of the crisis is undesirable from a central bank perspective and is only sustainable as long as inflation expectations are anchored. The SNB would prefer a situation where the value of the Swiss franc was better aligned with economic fundamentals.

The New Normal

Having set the stage for the conference deliberations, Menzie D. Chinn, from University of Wisconsin–Madison, opened the conference by presenting joint work with Joshua Aizenman (University of Southern California) and Hiro Ito (Portland State University),

2015 Conference Summary

When: July 9–10

Where: Swiss National Bank, Zurich

Sponsors: Federal Reserve Bank of Dallas
Globalization and Monetary Policy Institute,
Swiss National Bank, Bank for International
Settlements, Center for Economic Policy
Research

“Monetary Policy Spillovers and the Trilemma in the New Normal: Periphery Country Sensitivity to Core Country Conditions.”

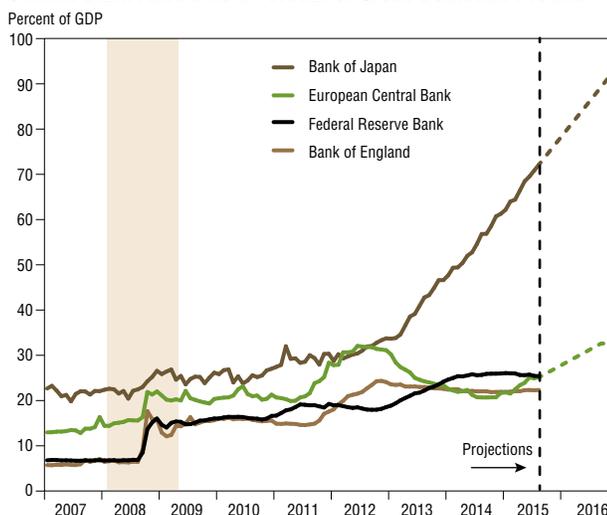
Monetary policy makers in countries around the globe routinely track developments in the major economies. In mid-2015, attention was focused on the long-awaited normalization of monetary policy in the United States, or “liftoff.” Small open economies are particularly sensitive to policy changes in countries such as the U.S., the euro area, Japan and China, the major global “economic centers.”

The extent of their sensitivity to core economies’ conditions, however, differs across policy regimes and also varies with economic structures. The main question Chinn and his co-authors addressed is how sensitivity to core economies’ conditions differs across countries and changes over time for different types of financial variables. More importantly, does the exchange rate regime play a significant role in determining the extent to which a country is linked to center economies?

Central to all of international macroeconomics is the idea of the “trilemma” or “impossible trinity,” which states that it is impossible to simultaneously have a fixed exchange rate, no controls on the cross-border movement of capital and an independent monetary policy. One of the three must be sacrificed. Chart 2 illustrates the concept and how some countries have positioned themselves.

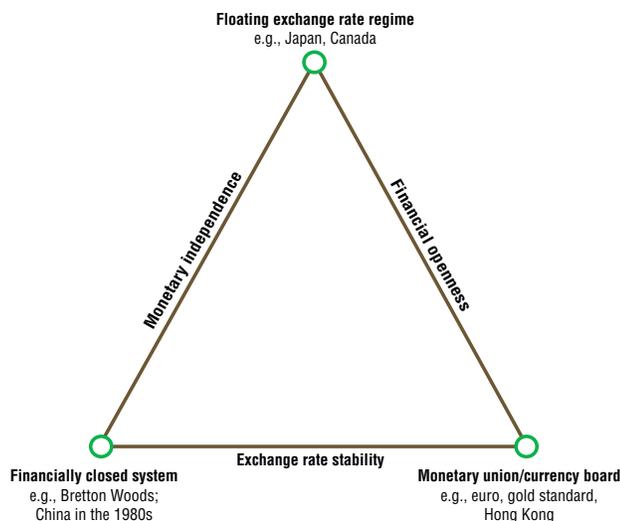
However, a widely cited paper by Hélène Rey (2015) argued that the global financial cycle in capital flows, asset prices and credit growth reduces the trilemma to a dilemma: Only by actively managing the capital account can periphery countries pursue a

Chart 1
Central Bank Assets as a Percent of Gross Domestic Product



NOTES: Shaded bar indicates global recession. Dashed lines represent projections based on current purchase programs.
SOURCES: National central banks; Organisation for Economic Cooperation and Development; Haver Analytics; authors’ calculations.

Chart 2
How Nations Align Along Trilemma of International Finance



“A debate is ongoing regarding whether, with free capital mobility, flexible exchange rates are sufficient to protect countries from external monetary and financial shocks.”

genuinely independent monetary policy.

As Chinn and participants said at the conference, there is at least some evidence that sensitivity of policy interest rates in periphery countries to a center country’s interest rate depends on: 1) the exchange rate regime, 2) the degree of financial openness and 3) the level of financial development of the periphery country. This is consistent with what we would expect based on the trilemma.

In the last two decades, for most financial variables in periphery (developing and emerging-market) countries, the strength of the links with the center economies has been the dominant factor. While certain macroeconomic and institutional variables are important, Chinn and his co-authors conclude that the arrangement of open-economy macro policies such as the exchange rate regime and the degree of financial openness also directly influence the sensitivity of financial conditions in periphery countries to economic developments in the center economies. An economy that pursues greater exchange rate stability and has greater financial openness faces a stronger link with the center economies.

Michael Devereux from University of British Columbia, along with co-authors

Ryan Banerjee and Giovanni Lombardo from the BIS, also studied the increasing importance of spillovers from advanced economies (particularly the U.S.) to emerging markets in their paper, “Self-Oriented Monetary Policy, Global Financial Markets and Excess Volatility of International Capital Flows.”

In his presentation, Devereux used estimates of U.S. monetary policy shocks as identified by Romer and Romer (2004) and updated by Coibion (2012) to quantify the spillovers of U.S. monetary policy to a panel of emerging-market economies (such as Brazil, China, Indonesia, India, Malaysia, Mexico, Russia and South Africa) using the local projection methods of Jordà (2005). Devereux showed that a U.S. monetary policy shock tends to depreciate the exchange rate, decrease gross domestic product, boost consumer price inflation and subsequently lower it in the long run, increase policy and long-term rates, and lower portfolio debt inflows and outflows.

Devereux then sketched out a two-country New Keynesian model augmented to include financial frictions and financial linkages to explain the patterns in the data and to examine potential policy responses. Devereux showed that in the context of his model, an optimal cooperative monetary policy can greatly reduce effects of financial shocks and reduce most spillovers to emerging markets from shocks in advanced economies. However, even in an environment with multiple frictions in global financial intermediation, a self-oriented, discretionary monetary policy may be a reasonable arrangement for the international monetary system as well.

Given the increased volatility associated with the U.S. monetary policy stance, a debate is ongoing regarding whether, with free capital mobility, flexible exchange rates are sufficient to protect countries from external monetary and financial shocks.

Structural reforms have become a crucial component of the policy menu at a time when the conventional tools of demand-side macroeconomic policy are constrained, and

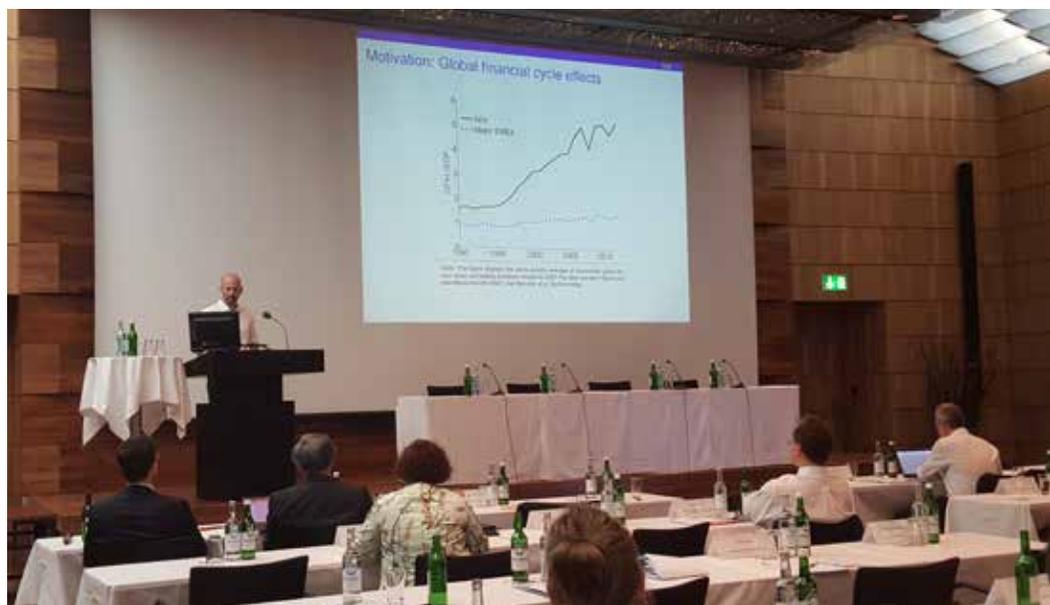


Mark A. Wynne, director of the Globalization and Monetary Policy Institute at the Federal Reserve Bank of Dallas, discusses the presentation, “If the Fed Sneezes, Who Catches a Cold?” by the European Central Bank’s Livio Stracca.

unconventional tools are being deployed without certainty of their effectiveness. (As former Fed Chairman Ben Bernanke noted in early 2014, referring to the quantitative easing programs that the Federal Open Market Committee implemented as part of its unconventional policy toolkit, “The problem with QE is that it works in practice, but not in theory.”) This was another topic of discussion, in which Matteo Cacciatore from HEC Montréal presented “Short-Term Pain for Long-Term Gain: Market Deregulation and Monetary Policy in Small Open Economies,” jointly with Romain Duval from the International Monetary Fund, Giuseppe Fiori from North Carolina State University and Fabio Ghironi from the University of Washington.

Cacciatore and his co-authors show that in the context of a New Keynesian small open-economy model, it takes time for reforms to pay off, typically at least a couple of years. This is because the benefits of reforms in their model materialize through firm entry and increased hiring, both of which are gradual processes that take time, while layoffs associated with reforms tend to happen immediately. All reforms considered in their work (individual reforms and simultaneous deregulation in product and labor markets) stimulate growth even in the short run, though some—such as reductions in employment protection—increase unemployment temporarily.

Overall, it seems that implementing a broad set of labor market reforms and product market reforms simultaneously helps minimize these transition costs. But, if monetary policy is constrained by the zero lower bound, comprehensive reforms may be less appealing to policymakers if they have significant deflationary effects. Cacciatore and his co-authors show that in the context of the model with which they work, reforms generally do not have significant deflationary effects. Thus, being up against the zero lower bound or being a member of a monetary union (without the possibility of setting a nationally oriented monetary policy) should not be an obstacle to adopting reforms.



Georgios Georgiadis of the European Central Bank gives his presentation on “Trilemma, Not Dilemma: Financial Globalisation and Monetary Policy Effectiveness.”

The Role of Banks

Recent research stresses the impact on funding conditions in periphery or non-center countries resulting from monetary and financial shocks in so-called monetary center countries, whose currencies are used in international lending. While the U.S. dollar clearly plays a central role in the international monetary system, banks also make substantial use of other foreign currencies in their lending and funding. The euro and the Swiss franc notably play important roles in the activity of banks in Europe. This raises the question of how monetary and financial shocks in the home countries of those currencies are transmitted across borders through bank balance sheets and whether this transmission depends on the specific foreign currency used in bank funding.

Cédric Tille from the Graduate Institute, Geneva, presented work on the role of banks as a channel for transmission of foreign and exchange rate shocks to domestic banking and the impact on financial stability and macroeconomic performance. His paper, “What Drives the Funding Currency Mix of Banks?,” jointly with Signe Krogstrup of SNB, assesses the determinants of foreign

currency funding, including monetary policy, exchange rate movements, risk and deposits in foreign currencies.

Their work suggests that these determinants vary across currencies as well as countries. Swiss franc use in emerging European countries is affected by the exchange rate and lending volumes in the Swiss franc—in line with the predictions of a simple model. By comparison, risk-related considerations, such as co-movements between various exchange rates, matter for financial centers in the euro area, while funding costs play a role for other euro-area countries.

Funding in currencies other than the Swiss franc is also affected by exchange rates and lending activity among emerging economies, but overall displays less sensitivity than Swiss franc funding to movements in the various factors.

Additionally, in response to the global financial crisis, international currency swap lines between central banks of advanced economies and their counterparts in emerging-market economies were introduced as a coordinated policy initiative. Swiss franc and other foreign currency loans to the nonbanking sector were extremely popular

in Central and Eastern Europe before the financial crisis.

Households and small firms increasingly borrowed in a lower-yielding foreign currency to finance their mortgages or business investments. As the financial crisis escalated, so did funding tensions in Swiss francs. In this context, the SNB entered into temporary swap line agreements with several central banks between 2008 and 2010. Their objective was to improve the Swiss franc's global liquidity. This unconventional form of liquidity aid affected a broad array of financial assets, involving interest-rate spreads, credit default swap rates and exchange rates.

Pinar Yesin from the SNB presented her work with Alin Marius Andries from the Alexandru Ioan Cuza University of Iasi (Romania) and Andreas Fischer of the SNB, "The Impact of International Swap Lines on Stock Returns of Banks in Emerging Markets." The authors studied the response of stock prices of banks in 15 Central and Eastern European countries to the presence of international swap lines between the SNB and other central banks, paying particular attention to swap lines with

the National Bank of Poland and the Central Bank of Hungary. This allowed the authors to examine the importance of bank characteristics, such as foreign currency exposure, funding structure, ownership and capital structure, in response to liquidity provision.

Among the key results, Yesin suggested that stock prices of Central and Eastern European banks responded strongly to Swiss franc swap lines provided by the SNB during the crisis. Moreover, banks with different characteristics responded differently to swap lines, since the effectiveness of swap lines is partially dependent on the structure of the banking system. The authors argue that their findings are consistent with the view that swap lines not only enhanced market liquidity, as intended, but also reduced risks associated with micro-prudential issues.

Global Effects

In the wake of the financial crisis, some of the world's largest central banks set their policy rates near zero and adopted unconventional monetary policies, such as forward guidance and large-scale asset purchases.

This new environment has led to a renewed interest in the role of monetary policy actions in the dynamics of asset prices, particularly interest rates and exchange rates and their global implications for financial contagion.

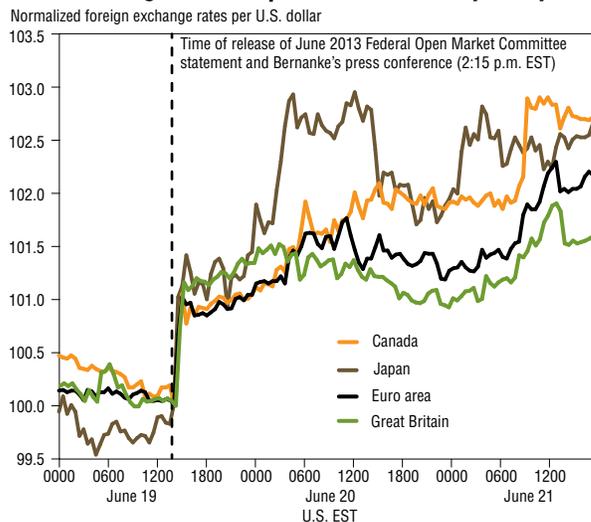
By affecting exchange rates and foreign interest rates, monetary policy shifts are a potential source of unintended spillovers onto other countries. Chart 3 shows how a U.S. monetary policy announcement can have significant cross-country effects through the exchange rate channel. The episode depicted was part of the so-called "taper tantrum," where the suggestion that the Federal Open Market Committee (FOMC) would at some point begin to taper its asset purchases precipitated large swings in asset prices.

John Rogers and Chiara Scotti of the Federal Reserve Board and Jonathan H. Wright from Johns Hopkins University explored the international effects of U.S. monetary policy shocks at the zero lower bound on U.S. and foreign interest rates at different horizons, exchange rates (Japanese yen, euro, British pound), financial market and foreign exchange risk premia, and a generalized carry-trade return (involving a portfolio that goes long on a foreign bond and short on a U.S. bond of the same maturity).

In their paper, "Unconventional Monetary Policy and International Risk Premia," the authors capture monetary policy shocks that lower five-year U.S. Treasury futures prices around a monetary policy announcement. Rogers suggested that U.S. monetary policy easing shocks lower domestic and foreign bond premia, lower interest rates globally and lead to dollar depreciation.

This was also a topic of discussion during Livio Stracca's presentation, "If the Fed Sneezes, Who Catches a Cold?" Stracca and Luca Dedola of the European Central Bank (ECB) and Giulia Rivolta from the University of Brescia find that U.S. monetary policy shocks, assumed to have standard domestic effects, impact advanced and emerging economies differently. In particular, U.S. monetary policy tightening brings about a contraction in economic activity and an increase in unemploy-

Chart 3
Dollar Exchange Rates Respond to U.S. Monetary Policy News



SOURCES: Discussion by Mark A. Wynne of the presentation, "If the Fed Sneezes, Who Catches a Cold?"; authors' calculations.

ment in both advanced and emerging countries. But only in emerging economies does this also result in capital outflows, a domestic credit crunch and falling housing prices.

This situation relates to the monetary policy trilemma discussed throughout the conference. Emerging economies with more flexible exchange rates and lower capital mobility are better insulated from some financial repercussions of U.S. monetary policy. A dollar peg resulting in low capital mobility or a floating regime with high capital mobility are not as helpful. This lends further support to the idea that for emerging economies, the dilemma suggested by Rey (2015) may be more relevant than the classic trilemma, at least when it comes to spillovers of U.S. monetary policy.

The final presentation of the conference focused on the effectiveness of monetary policy relative to global financial cycle effects and net foreign exchange exposure effects. Global financial cycle effects are at the heart of the trilemma since they reduce control of domestic interest rates. Net foreign exchange exposures have been rising across countries by holding foreign assets in foreign currency and issuing foreign liabilities in domestic currency. This can strengthen the impact of monetary policy due to valuation effects. If the domestic currency appreciates after monetary policy tightening, the domestic value of foreign assets falls while the value of foreign liabilities remains unchanged, creating negative wealth effects on the external balance sheet.

Georgios Georgiadis of the European Central Bank (ECB) presented “Trilemma, Not Dilemma: Financial Globalisation and Monetary Policy Effectiveness,” joint work with his ECB colleague Arnaud Mehl, focusing on how financial globalization has affected monetary policy effectiveness differently in emerging markets and advanced economies.

The authors find evidence for global financial cycle and net foreign exchange exposure effects, with financial globalization having noticeably strengthened monetary policy effectiveness in advanced economies

and in emerging markets since the 1990s.

In particular, while the traditional interest rate channel might lose significance due to the increasing influence of global financial markets on domestic financial conditions, the exchange rate channel may gain importance due to growing net foreign currency exposures of economies’ external balance sheets. As a result, the exchange rate channel matters not only because of its relevance for import/export prices and quantities but increasingly because of wealth effects.

Further Research and New Challenges

This latest in the series of conferences that the Dallas Fed’s Globalization and Monetary Policy Institute has held with the SNB highlighted themes that will continue to be at the fore of policy discussions. There is abundant evidence that monetary policy actions in advanced economies have spillover effects on emerging and developing economies. This seems to be true of both conventional and unconventional policy actions. In recent years, the conventional wisdom, based on the classic trilemma of international finance that a flexible exchange rate regime can insulate a country from monetary policy shocks beyond its borders, has been challenged. Since the global financial crisis of 2007–09, the stance of monetary policy in all of the advanced economies has been uniformly accommodative. But, the potential for diverging monetary policies between some of the world’s most important central banks will likely create new challenges for the global monetary system.

References

- Coibion, Olivier (2012), “Are the Effects of Monetary Policy Shocks Big or Small?” *American Economic Journal: Macroeconomics* 4 (2): 1–32.
- Jordà, Òscar (2005), “Estimation and Inference of Impulse Responses by Local Projections,” *American Economic Review* 95 (1): 161–82.
- Rey, H el ene (2015), “Dilemma Not Trilemma: The Global Financial Cycle and Monetary Policy Independence,” NBER Working Paper no. 21162 (Cambridge, Massachusetts, National Bureau of Economic Research, May).
- Romer, Christina D., and David H. Romer (2004), “A New Measure of Monetary Shocks: Derivation and Implications,” *American Economic Review* 94 (4): 1055–84.

Diverging Monetary Policies, Global Capital Flows and Financial Stability

By J. Scott Davis



and Mark A. Wynne



2015 Conference Summary

When: Oct. 15–16

Where: Hong Kong Monetary Authority, Hong Kong

Sponsors: Federal Reserve Bank of Dallas Globalization and Monetary Policy Institute, Hong Kong Monetary Authority, the European Central Bank and the Board of Governors of the Federal Reserve System

The Globalization and Monetary Policy Institute co-sponsored a conference, “Diverging Monetary Policies, Global Capital Flows and Financial Stability,” jointly with the Hong Kong Monetary Authority (HKMA), the European Central Bank (ECB) and the Board of Governors of the Federal Reserve System Oct. 15–16. Papers were selected by an organizing committee consisting of Stephen Cecchetti (Brandeis University), Hongyi Chen (HKMA), Luca Dedola (ECB), John Rogers (Board of Governors) and Mark A. Wynne (Federal Reserve Bank of Dallas).

Peter Pang, deputy chief executive of the HKMA, delivered the opening remarks, noting the timeliness of the conference as the Fed was poised to raise rates (which it subsequently did in December), and the ECB and Bank of Japan were very much in accommodative mode. While normalization in the United States was signaled well in advance, he said the concern in many emerging-market economies was macroeconomic imbalances that had developed in those economies in the exceptionally low-interest-rate environment that has prevailed since the end of 2008. How those imbalances would be resolved was also worrisome.

Stronger fundamentals and limited currency and maturity mismatch in foreign liabilities should make Asian emerging-market economies better able to deal with a reversal of capital flows. But the weaker global economy and the slowdown in China will present challenges, as will the greater globalization of the region’s financial markets.

The sharp divergence in developed-world monetary policies is best shown in the

paths of Fed and ECB shadow policy rates in 2015 (*Chart 1*).

Researchers Jing Cynthia Wu and Fan Dora Xia, of the University of Chicago Booth School of Business and Merrill Lynch, respectively, estimate a short-term shadow policy rate using a term structure model that takes into account longer-term interest rates. Thus, this shadow rate can be used as an indicator of monetary policy when the actual short-term rate is constrained by the zero lower bound. The goal of many nonconventional monetary policy actions, such as forward guidance and the bond-buying quantitative easing measures in recent years, has been to lower longer-term interest rates. By lowering these long-term rates, the central bank engages in monetary easing that could be represented by a reduction in the shadow policy rate. The chart shows that over the course of 2015, the shadow federal funds rate went from -3 percent to 0 percent, coinciding with the Fed’s interest rate increase in December. At the same time, the ECB began a quantitative easing policy, and during 2015, the ECB’s shadow policy rate went from 0 percent to -4 percent.

Pang’s remarks were followed by the opening keynote address, delivered by ECB Vice President Vítor Constâncio. Constâncio focused on monetary policy spillovers, specifically the medium-term impact of such spillovers, which he noted were not well understood. Spillovers from U.S. monetary policy are relatively large, he argued, due to the dominant role of the dollar in the global financial system.

Central banks have domestic mandates for price and financial stability, but they also have a role to play in stabilizing the global

financial system. While there is substantial literature that finds that by focusing on domestic mandates in a rules-based manner, central banks can best achieve global stability, Constâncio argued that simply keeping their own houses in order is no longer enough to ensure stability in our new, globalized world. He concluded by arguing that global challenges require both domestic and global responses and cautioned against complacency.

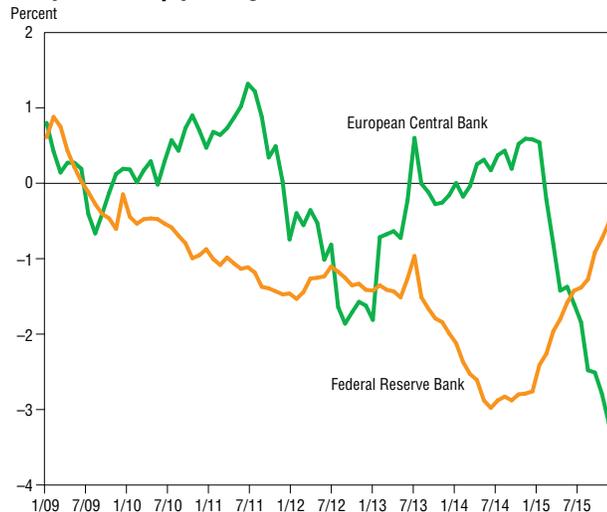
Expanding Capital Flows

Central to all stories about the spillovers of monetary policy are international capital flows that have grown at an extraordinary rate with the onset of financial globalization. In the first paper presentation of the conference, “The Two Components of International Portfolio Flows,” Frank Warnock of the University of Virginia, along with co-authors Shaghil Ahmed and Stephanie E. Curcuru from the Board of Governors and Andrei Zlate from the Federal Reserve Bank of Boston, showed that when it comes to international portfolio flows, there are two parts that must be distinguished: an active component and a passive component.

The active component is the one that reflects decisions made in the present, while the passive is capital flowing to destinations based on decisions made in the past. For example, the active component of a capital flow occurs when an investor actively sells one asset to purchase another. An example would be a U.S. investor selling Brazilian equities and using the proceeds to purchase Mexican equities. The passive component of capital flows is the new savings that are allocated based on preexisting portfolio weights. An example would be an investor who saves a given percentage of his income each month and allocates a fixed percentage of those savings to Brazilian and Mexican equities.

Warnock and his co-authors propose a measure to distinguish between the two components, the so-called normalized relative weight. They use this measure to see if the distinction between the two types of flows matters.

Chart 1
Shadow Fed Funds Rate and Shadow European Central Bank Policy Rate Sharply Diverge in 2015



SOURCE: Wu and Xia (2014).

Viewing the active and passive components together would suggest that emerging-market economies' (EMEs') capital flows massively increased after the global financial crisis of 2007–09; thus, the share of U.S. foreign portfolio investment in EMEs increased.

However, when Warnock and his co-authors isolate the active component of flows, this shift isn't apparent. They then use simple reduced-form regressions to examine the drivers of the two components of flows. They find that the Chicago Board Options Exchange (CBOE) Volatility Index, or VIX, matters for both types of flows but is less significant for portfolio reallocations, suggesting that the VIX is mainly capturing an income effect. They also find that capital controls (or capital flow management measures) are sometimes significant when considering total flows but are never significant when considering active flows, suggesting that capital controls do not affect active portfolio decisions but instead work through valuation changes.

During discussion of the paper, it was noted that a potential caveat accompanying the analysis is an implicit assumption that passive flows are completely on autopilot. While that

may be true to an extent, investors at least make a rational decision not to rebalance their portfolios. Thus, passive flows may be directed by decisions made in the past but are only passive because of a decision made now not to change previous allocation decisions.

The second paper in the capital flows session, “Capital Flows and Domestic Financial Market Structure,” was presented by Signe Krogstrup of the Swiss National Bank and co-authored with Linda Goldberg of the Federal Reserve Bank of New York. Krogstrup and Goldberg pose a pair of questions in their paper: How do capital flows respond to global risk, and what determines this response?

To answer those questions, they construct a Global Risk Response (GRR) index that measures the correlation between a country’s exchange rate pressure index (a weighted average of exchange rate depreciation and change in reserves over a period) and the VIX. A positive GRR means that a country’s currency appreciated during times of high risk and was the recipient of safe-haven capital flows. They then look at what factors drive a country’s GRR and find that

a country’s gross foreign asset position has a strong effect, particularly on gross foreign portfolio assets.

If a country has a large stock of foreign portfolio assets, its GRR is higher. Based on their findings, Krogstrup and Goldberg argue that capital flows by residents and changes in domestic financial market structures may play a more important role in a country’s capital flow response to a global risk shock than previously thought. However, as noted in the discussion of the paper, their findings rest on an empirical analysis of what happens with asset positions. A more complete picture would incorporate the response of international liabilities as well.

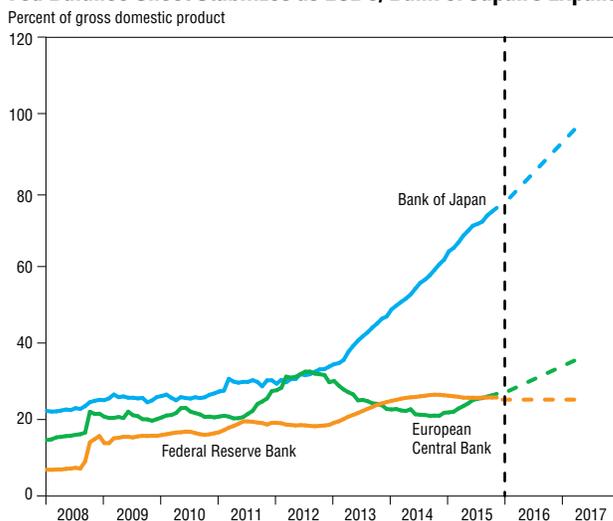
Global Liquidity and the Dollar

The second session addressed the issue of global liquidity. There has been a dramatic increase in U.S. dollar liquidity in the global financial system since the financial crisis, and there is keen interest in understanding what will happen to dollar credit as the Fed begins to remove monetary policy accommodation. Eric Wong of HKMA, along with co-authors Dong He of the International Monetary Fund (IMF) and Andrew Tsang and Kelvin Ho of HKMA, asked in their paper, “Asynchronous Monetary Policies and International Dollar Credit,” how a divergence of unconventional monetary policies in the U.S. relative to the euro area and Japan affected the supply of international dollar credit.

The sizes of central-bank balance sheets since the crisis—measured as a percentage of gross domestic product (GDP)—are shown in Chart 2. The Fed’s balance sheet stabilized in 2014. Meanwhile, the Bank of Japan’s balance sheet has increased rapidly since 2013, coinciding with the adoption of its new quantitative easing policy; the ECB’s balance sheet has been expanding since the beginning of 2015. The chart presents the forecasts for balance sheet expansion through March 2017, assuming that current quantitative easing policies by the ECB and the Bank of Japan remain unchanged.¹

Wong and his co-authors note that much

Chart 2
Fed Balance Sheet Stabilizes as ECB’s, Bank of Japan’s Expand



NOTE: Dashed lines indicate projected balance sheet positions.
SOURCE: National central banks; Organisation for Economic Cooperation and Development; Haver Analytics; authors’ calculations.

of the international lending in dollars is actually intermediated by European and Japanese banks. So while the Fed could tighten, if the ECB and the Bank of Japan continue to loosen, European and Japanese banks would be more likely to lend, mitigating some of the effect of Fed tightening on U.S.-dollar credit. They show in their empirical work that while the Fed's expansionary monetary policy was the primary driver of dollar credit growth in Japan and Europe in 2013, by 2015, the Fed's balance sheet alone should have led to a decline of international dollar credit. However, because of continued balance sheet expansion by the ECB and the Bank of Japan, dollar credit actually increased.

Foreign-currency-denominated bond issuance by corporations in EMEs surged in the wake of the global financial crisis as firms sought to take advantage of low interest rates in advanced economies. The scale of the bond issuance has given rise to concerns that these liabilities may become a source of problems for EMEs as monetary policy accommodation is removed. Two of the biggest issuers of foreign-currency-denominated bonds are Brazilian energy company Petrobras and Russian natural gas producer Gazprom. Both encountered difficulties in 2015. However, these problems were not due to a currency mismatch between their liabilities and revenues, as both companies were perfectly hedged in terms of their dollar exposure. Rather, they encountered difficulties due to the energy price collapse.

Soyoung Kim of Seoul National University and Hyun Song Shin of the Bank for International Settlements examined how global liquidity is transmitted to EMEs in their paper, "Offshore EME Bond Issuance and the Transmission Channels of Global Liquidity." They argue that we are seeing possible shifts in these transmission channels. According to their analysis, a U.S. credit shock has a positive effect on EME GDP and a negative effect on interest rates. This is consistent with what many others have found. They also find that the same shock has a positive effect on bond issuance in EMEs.

More importantly, the researchers find that bond issuance response has changed over time. Splitting their sample into precrisis (2000–06) and postcrisis (2010–14) periods, they find that a U.S. credit shock had a positive effect on onshore bond issuance in the precrisis period and no effect on offshore issuance. In the postcrisis period, the same shock had no effect on onshore issuance and a positive effect on offshore issuance. While the onshore/offshore distinction sheds some light on potential vulnerabilities, it does not get to the crucial question of the currency of denomination.

Before the global financial crisis, conventional wisdom on capital controls was that they were largely detrimental and ought to be avoided if at all possible. In the aftermath of the crisis, there has been a rethinking of the usefulness of capital controls, with the IMF noting that "... in certain circumstances, capital flow management measures can be useful."

Furthermore, in a widely cited paper, Hélène Rey (2015) argued that the classic trilemma of international finance had morphed into a dilemma, and that in an era of financial globalization, "...independent monetary policies are possible if and only if the capital account is managed."

In their paper, "Capital Controls and Monetary Policy Autonomy in a Small Open Economy," Scott Davis of the Dallas Fed and Ignacio Presno of the Universidad de Montevideo ask how the use of capital controls affects the conduct of optimal monetary policy in a small open economy that is subject to surges in capital inflows. In recent years, many EMEs, including many with formally floating currencies, have used monetary policy to manage the capital account. Davis and Presno study optimal monetary policy in a standard small open-economy dynamic stochastic general equilibrium (DSGE) model and show that using the domestic monetary policy instrument to manage the capital account can even be optimal under certain circumstances.

Measures to restrict capital flows (whether optimal or not) significantly im-

"Before the global financial crisis, conventional wisdom was that they were largely detrimental and ought to be avoided if at all possible."

“Cross-border investment positions have grown steadily over the past 15 years and did not diminish in any meaningful sense in the aftermath of the global financial crisis.”

prove the ability of the central bank to use its monetary policy instrument to satisfy domestic objectives, knowing that these capital controls limit the effect of destabilizing capital flows.² In his presentation, Davis was careful to note that the analysis in his paper is a positive, not normative analysis. The question is how using capital controls affects the conduct of optimal monetary policy, not whether capital controls are optimal or not. In the discussion that followed, several important avenues for future research were identified. For example, are capital controls simply addressing a symptom of a problem rather than the fundamental issue itself, which in the Davis–Presno model is a credit constraint? A related question is why some small open economies are more comfortable than others with letting the exchange rate handle the adjustment to capital flows.

The final paper for the first day was “International Capital Flows and Unconventional Monetary Policy,” by Curcuru, Chiara Scotti and Aaron Rosenblum of the Board of Governors. It was presented by Curcuru. Most studies of the effects of unconventional monetary policy examine the impact on asset prices, while relatively few focus on the effects on capital flows. Curcuru and her co-authors use an event study approach to document the response of international capital flows to an announcement of an unconventional monetary policy action such as a large-scale asset purchase program. An important innovation in the paper is the use of high-frequency data on capital flows from Emerging Portfolio Fund Research (EPFR). The primary finding is that unconventional monetary policy actions by advanced-economy central banks do not seem to result in excess capital flows to emerging-market economies.

Transmission Channels and the Trilemma

The second day of the conference began with a presentation of “Risk Taking and Interest Rates: Evidence from Decades in the Global Syndicated Loan Markets,” by Viktors

Stebunovs from the Board of Governors, co-authored with Seung Jung Lee from the Board and Lucy Q. Liu from the IMF. The idea of a risk-taking channel for monetary policy has gained currency in recent years as central banks pushed interest rates to their effective lower bound.

The idea behind this channel is that as the Fed cuts rates, banks have an incentive to make riskier loans in search of yield. Stebunovs and his co-authors argue that there are really two risk-taking channels—one that operates through a short-term cost of funds channel and the other that operates through a returns-on-safe-assets channel. They are primarily interested in how active a channel is internationally. When the Fed cuts rates, is there riskier lending to non-U.S. borrowers? If so, this means that a non-U.S. central bank may have limited controls on the credit cycle in its own country.

To capture the riskiness of lending, they proxy for average borrower riskiness by using the average lending spread over Libor (the London interbank offered rate). They then regress this spread on the federal funds rate as well as the 10-year Treasury bond rate to quantify the two channels. In the 1995–2007 period, they find that increases in the federal funds rate had a negative effect on the risk spread for syndicated loans to non-U.S. borrowers (evidence that this risk-taking channel is active internationally), but changes in the 10-year Treasury rate had no effect. In the post-2008 period, increases in the 10-year Treasury rate had a negative effect on spreads, evidence of the safe-returns risk-taking channel. Of course, the risk-taking channel is potentially operative for the actions of central banks other than the Fed, and the authors noted that in ongoing work, they are looking to document the effect in other currencies.

The penultimate paper of the program, “International Financial Spillovers to Emerging Market Economies: How Important Are Economic Fundamentals?” by Ahmed and Brahim Coulibaly of the Board and Zlate of the Federal Reserve Bank of Boston, was presented by Zlate. It is widely believed that

EMEs with stronger fundamentals (low debt, strong growth and sustainable public finances) are better placed to deal with financial market volatility in times of economic stress. Zlate and his co-authors ask whether the differing economic fundamentals of EMEs can explain their heterogeneous responses to the global financial crisis.

They construct a vulnerability index (which includes current account, external liabilities and foreign exchange reserves) and show that this index had an effect on financial performance during the 2013 taper-tantrum episode—the period of rapid Treasury yield increases that followed indications the Fed would end quantitative easing. Simply put, EMEs with better fundamentals saw less of a deterioration in their financial markets during this episode. They also found some evidence of a similar effect during earlier episodes. One caveat to their findings: They are based on a very small number of observations.

The conference concluded with a presentation of “Trilemma, Not Dilemma: Financial Globalisation and Monetary Policy Effectiveness,” by Georgios Georgiadis, co-authored with Arnaud Mehl, both of the ECB.³ Georgiadis and Mehl revisit the question posed by Rey (2015)—namely, does increasing financial globalization reduce the ability of a central bank to conduct monetary policy targeted at domestic objectives? Put differently, does financial globalization mean that a central bank no longer has control of long-term interest rates and that long rates are driven by global factors?

They point out that while monetary transmission is weakened by “global financial cycle effects,” it is simultaneously strengthened by net foreign currency exposure effects (the Fed tightens to cool the U.S. economy; the dollar appreciates; U.S. households with net positive foreign currency exposure in their assets are poorer, which creates a wealth effect that will reduce consumption spending in the U.S.).⁴ They find evidence that both these effects are active, so the impact of financial globalization on the monetary transmission mechanism will depend on the

relative strength of the two effects.

To assess the strength of the monetary transmission mechanism, they estimate impulse response functions. They then regress the trough response of GDP to a monetary policy shock on net foreign exchange exposure and gross external assets and liabilities as a share of GDP and show that the two variables are significant and with the expected signs. They calculate the strength of these two channels in the euro area, other advanced economies and EMEs and argue that the net effect is around zero in the euro area—perhaps some evidence that financial globalization has weakened the monetary transmission mechanism—but the effect has led to a stronger monetary transmission mechanism in both other advanced economies and EMEs.

Conclusions

Cross-border investment positions have grown steadily over the past 15 years and did not diminish in any meaningful sense in the aftermath of the global financial crisis. Flows to EMEs increased after the crisis as policy rates were reduced to their effective lower bound in the advanced economies and investors reached for yield. U.S. monetary policy, in particular, spills over to EMEs, with potential implications for macroeconomic and financial stability in those countries as U.S. policy normalizes.

As Stephen Cecchetti noted in his conference lunch remarks, the world effectively has two dollar-based financial systems—one based in the U.S. that is backed by the Fed, and another outside the U.S. that has effectively no central-bank backing. Cecchetti argued that global financial stability will require a global U.S. dollar safety net, and the semi-permanent swap lines that five foreign central banks have with the Fed go some of the way toward providing that safety net.⁵ How well those swap lines will work in practice remains an open question.

Notes

¹ Specifically, for the forecasts of the size of the balance sheet past 2015, we assume that the ECB will continue to expand the size of its balance sheet by 60 billion euros per month through March 2017, which is the stated end of the ECB’s quantitative easing measures. This is a balance sheet expansion of about 7 percent of GDP per year. The Bank of Japan will continue to expand its balance sheet by 80 trillion yen per month through at least March 2017. This is a balance sheet expansion of about 16 percent of GDP per year.

² Davis’ essay “The Trilemma in Practice: Monetary Policy Autonomy in an Economy with a Floating Exchange Rate,” which is on page 2 in this annual report, addresses this very same topic, especially the fact that in recent years, there is evidence that EME central banks with a floating currency still tend to use their domestic monetary policy to manage the capital account.

³ This paper was also presented at the conference that the institute co-sponsored with the Swiss National Bank in Zurich in July 2015, summarized elsewhere in this report.

⁴ For a formal model of this channel, see Meier (2013).

⁵ For more detail on the role of the swap lines during the global financial crisis, see the contributions by Stephen Cecchetti and Donald Kohn to the Bordo and Wynne (2016) volume.

References

- Bordo, Michael D., and Mark A. Wynne (2016), *The Federal Reserve’s Role in the Global Economy: A Historical Perspective* (Cambridge, U.K.: Cambridge University Press).
- Meier, Simone (2013), “Financial Globalization and Monetary Transmission,” Globalization and Monetary Policy Institute Working Paper no. 145 (Federal Reserve Bank of Dallas, April).
- Rey, Hélène (2015), “Dilemma Not Trilemma: The Global Financial Cycle and Monetary Policy Independence,” NBER Working Paper no. 21162 (Cambridge, Massachusetts, National Bureau of Economic Research, May).
- Wu, Jing Cynthia and Fan Dora Xia (2014), “Measuring the Macroeconomic Impact of Monetary Policy at the Zero Lower Bound,” NBER Working Paper no. 20117 (Cambridge, Massachusetts, National Bureau of Economic Research, May).

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