



# Globalization and Monetary Policy Institute

2011 Annual Report, Federal Reserve Bank of Dallas





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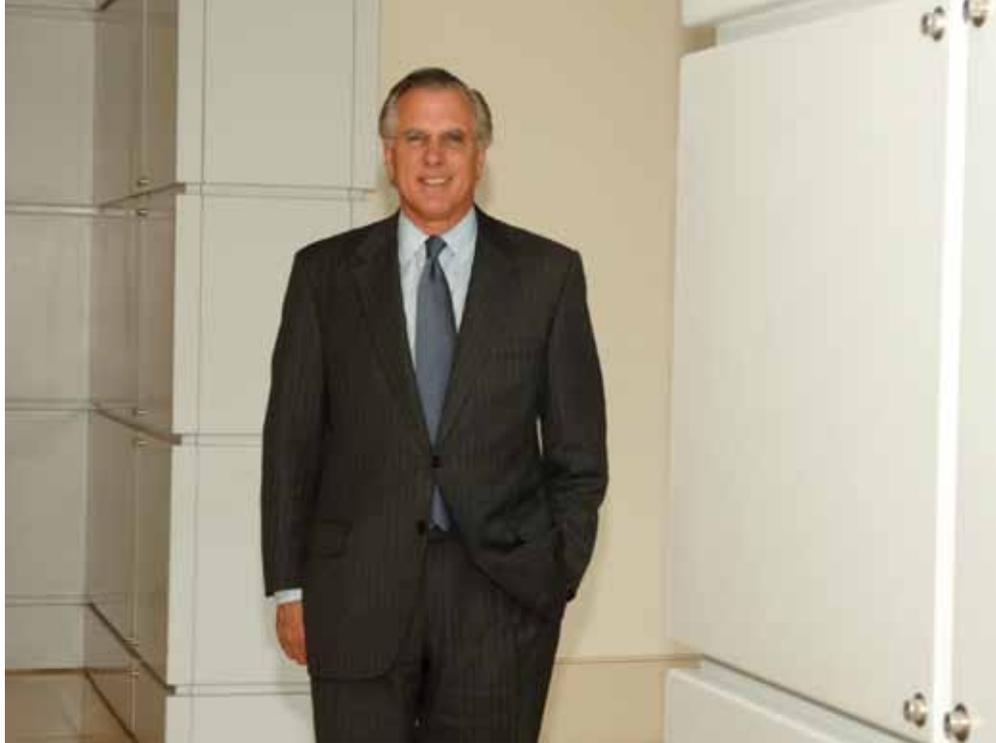
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On the cover: Copy of the 1602 Chinese map *Kunyu Wanguo Quantu*, or *Map of the Ten Thousand Countries of the Earth*, created by Italian Matteo Ricci for the Wanli emperor.

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## Letter from the President



With the public finances of so many countries in a parlous state, central bank independence has never been more important, ensuring that central bankers are able to deliver on their mandates. The Federal Reserve Bank of Dallas' Globalization and Monetary Policy Institute annual report for 2011 contains two articles that illustrate how crucial central bank independence is to monetary and price stability.

The first, by Janet Koech, documents how Zimbabwe became the first country to experience hyperinflation in the 21st century. It is a sad tale of how political pressure to monetize unsustainable government spending can be the undoing of a country and reverse decades of economic development. The second article, by Mark Wynne and Ed Skelton, looks at Mexico's experience over the past two decades and makes for happier reading. It shows that by embracing sound central banking practice—specifically, by enshrining the independence of the Banco de México in the Mexican constitution and adopting inflation targeting—Mexico was able to end the vicious cycle of financial instability that had plagued it from the 1970s. To be sure, Mexico still faces significant development challenges, but monetary instability is no longer the obstacle to growth that it once was.

The report also contains an article by Christian Winge on the factors that drive popular support for free trade and open borders. Few things make it harder to sustain political support for open markets than economic distress and uncertainty, making it all the more important that we return to vigorous growth and low unemployment.

2011 was another good year for our globalization research program. The institute issued the 100th working paper in a dedicated series dating back to 2007 and also hosted its inaugural public lecture, delivered by Jürgen Stark, then chief economist of the European Central Bank. We were fortunate to be able to launch this lecture series with such a distinguished public servant. A key message of his lecture was the importance of conducting monetary policy with an eye toward medium-term price stability—and the critical role central bank independence plays in ensuring such an outcome.

**Central bank independence has never been more important, ensuring that central bankers are able to deliver on their mandates.**

A handwritten signature in black ink that reads "Richard W. Fisher". The signature is written in a cursive, flowing style.

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

# Hyperinflation in Zimbabwe



The historic Zimbabwean \$100 trillion bill is now a novelty item.

One hundred trillion dollars—that’s 100,000,000,000,000—is the largest denomination of currency ever issued.<sup>1</sup> The Zimbabwean government issued the Z\$100 trillion bill in early 2009, among the last in a series of ever higher denominations distributed as inflation eroded purchasing power. When Zimbabwe attained independence in 1980, Z\$2, Z\$5, Z\$10 and Z\$20 denominations circulated, replaced three decades later by bills in the thousands and ultimately in the millions and trillions as the government sought to prop up a weakening economy amid spiraling inflation.

Shortly after the Z\$100 trillion note began circulating, the Zimbabwean dollar was officially abandoned in favor of foreign currencies. From 2007 to 2008, the local legal tender lost more than 99.9 percent of its value (Hanke 2008). This marked a reversal of fortune from independence, when the value of one Zimbabwe dollar equaled US\$1.54.

Zimbabwe’s extreme and uncontrollable inflation made it the first—and so far only—country in the 21st century to experience a hyperinflationary episode. Hyperinflation devastates people and

countries. Zimbabwe, once considered the breadbasket of Africa, was reduced to the continent’s beggar within a few years; its citizens were pushed into poverty and often forced to emigrate. The country’s experience shows how a relatively self-sustaining nation at independence fell victim to out-of-control inflation and the severe erosion of wealth. The causes of Zimbabwe’s hyperinflation, its effects and how it was stopped are particularly instructive.

In his seminal work, Phillip Cagan defined hyperinflation as beginning when monthly inflation rates initially exceed 50 percent. It ends in the month before the rate declines below 50 percent, where it must remain for at least a year (Cagan 1956). Zimbabwe entered the hyperinflationary era in March 2007; the period ended when the nation abandoned its currency in 2009 (*Chart 1*). The evolution of the Zimbabwean dollar in the post-independence period is shown in the timeline on page 10.

Bouts of hyperinflation are mostly accompanied by rapidly increasing money supply needed to finance large fiscal deficits arising from war, revolution, the end of empires and the establishment of new states. Hyperinflation, as Cagan defined it, initially appeared during the French Revolution, when the monthly rate peaked at 143 percent in December 1795. More than a century elapsed before hyperinflation appeared again. During the 20th century, hyperinflation occurred 28 times, often associated with the monetary chaos involving two world wars and the collapse of communism (Bernholz 2003). Zimbabwe’s hyperinflation of 2007–09 represents the world’s 30th occurrence as well as the continent’s second bout (after a 1991–94 episode in the Congo).<sup>2</sup>

## Zimbabwe’s History

Zimbabwe is located in the southern region of

the African continent and is bounded to the north by Zambia, to the east by Mozambique, to the south by South Africa and to the west by Botswana and the Caprivi Strip of Namibia. At 390,757 square kilometers (150,871 square miles), Zimbabwe is about the size of California, with a population the United Nations estimated at 12.7 million in 2011. Its capital is Harare. The nation's name is derived from historical structures called "Great Zimbabwe" (houses of stone), the largest stone sculptures in Africa after the pyramids of Egypt.

The country was settled by the British in 1890, when Cecil Rhodes, a businessman who made his fortune mining diamonds in South Africa, pushed northward in search of more bounty. Rhodes successfully persuaded the British to grant a royal charter to his British South Africa Co., which he used to promote the colonization of the region. The country was renamed Southern Rhodesia in 1895 in his honor. It became a self-governing British colony in October 1923, following a 1922 referendum. In 1953, in the face of African opposition, Britain consolidated the colonies of Rhodesia (Northern and Southern Rhodesia) with Nyasaland into the Federation of Rhodesia and Nyasaland. Growing African nationalism and dissent, particularly in Nyasaland, persuaded Britain to dissolve the union in 1963 and form three colonies—Northern Rhodesia, Southern Rhodesia and Nyasaland.

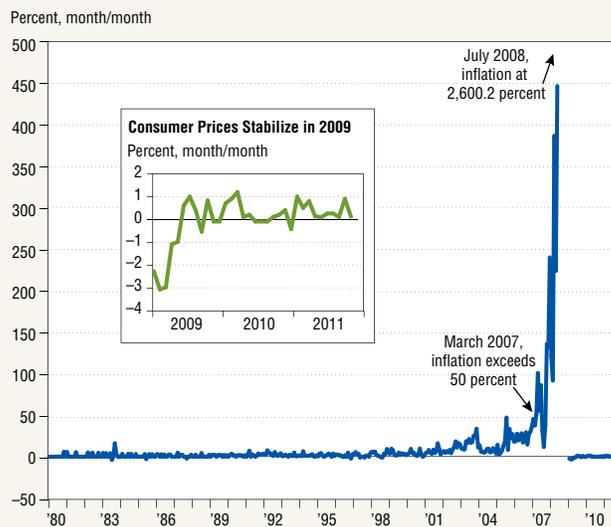
During much of the colonial period, from 1890 to 1979, blacks and whites fought over land and political involvement, as the local population resisted marginalization. Several uprisings were mostly quickly ended, the leaders imprisoned. Two political parties that formed in the 1960s proved resilient—the Zimbabwe African National Union (ZANU) under Robert Mugabe and the

Zimbabwe African Peoples Union (ZAPU) under Joshua Nkomo.

In the early 1960s, as colonial rule ended throughout the continent and as African-majority governments assumed control in neighboring Northern Rhodesia (now Zambia) and Nyasaland (now Malawi), the white-minority Southern Rhodesia government led by Ian Smith issued a Unilateral Declaration of Independence from the United Kingdom on Nov. 11, 1965. The move scuttled Britain's plan for a multiracial democracy, prompting sanctions from the former colonial power, which deemed the independence declaration illegal. Still, the white-minority government claimed nation status as the Republic of Rhodesia, or simply Rhodesia, in 1970.

A civil war ensued, with African guerrilla groups under ZAPU and ZANU leadership taking

**Chart 1**  
**Zimbabwe Consumer Price Inflation Soars Amid Hyperinflationary Period**



SOURCES: International Monetary Fund's International Financial Statistics database; Reserve Bank of Zimbabwe's *Monthly Economic Reviews*.

up arms from bases in Zambia and Mozambique. In 1979, an agreement on a new constitution, transitional arrangements and a ceasefire were reached at a conference convened in Lancaster House in London. Following elections the next February, Mugabe became the first prime minister and formed a coalition government that included former ZAPU leader Nkomo. Zimbabwe became a recognized independent nation on April 18, 1980. The Mugabe government has ruled ever since.<sup>3</sup>

### Before and During Hyperinflation

To trace the economy's deterioration and understand the causes of the extreme price changes, it helps to compare 1980 (when newly independent Zimbabwe left behind its identity as Rhodesia) with 2008–09, the height of hyperinflation.

At independence, annual inflation was 5.4 percent; month-to-month inflation averaged 0.5 percent. The largest currency denomination was Z\$20, and the Zimbabwean dollar was the most widely used currency—involved in more than 95 percent of transactions. Officially, US\$1 bought

Z\$0.647, and real GDP in 1980 grew 14.6 percent over 1979 levels (*Chart 2*). On a per capita basis, real GDP (purchasing-power-parity adjusted) in 2005 prices equaled US\$232; the unemployment rate was 10.8 percent in 1982.

By July 2008, when Zimbabwe's Central Statistical Office released its last inflation figures for that year, the month-over-month (nonannualized) rate had reached 2,600.2 percent—more than 231 million percent on a year-over-year basis. The International Monetary Fund (IMF) put the annual inflation rate in September 2008 at 489 billion percent, with some independent analysts estimating it much higher.<sup>4</sup> The largest currency denomination in 2009 was the Z\$100 trillion note. However, the most widely used currencies in almost all transactions were the U.S. dollar, South African rand and the Botswana pula. At the official exchange rate on Dec. 31, 2008, US\$1 traded for Z\$4 million, although parallel black-market rates were much greater. In 2008, real GDP contracted 17 percent (*Chart 2*), with per capita GDP at US\$136—41 percent below what it was at independence. The unemployment rate stood at 94 percent, according to a report by the U.N. Office for the Coordination of Humanitarian Affairs, and the country became the bread beggar of Africa (Makochekanwa 2009).<sup>5</sup>

### Zimbabwe's Inflation Nightmare

Zimbabwe's economic crisis and subsequent hyperinflation were preceded by several years of economic decline and mounting public debt. Weakening began in 1999, coinciding with periods of drought that adversely affected the agriculturally dependent nation. External debt as a share of GDP increased to 119 percent in 2008 from 11 percent in 1980. Land reallocation in 2000 and 2001, which redistributed large agricultural tracts, depressed commercial farming output. Output fell 50 percent between 2000 and 2009, led by a decline in the country's major foreign-exchange cash crop, tobacco, which slid 64 percent in 2008 from 2000 levels (*Chart 3*). Commercial production of maize,



Signs such as this one appeared in Zimbabwe during its hyperinflation episode.

Photo credit: Eugene Baron

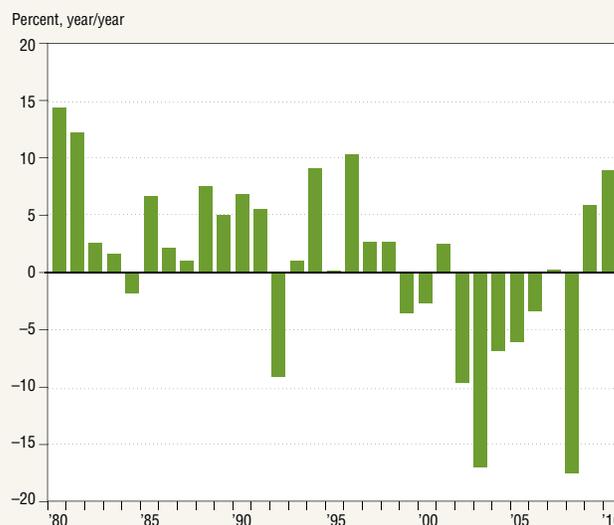
the national staple, dropped 76 percent during the same time (FAOSTAT Database 2011).

Uncontrolled government spending accompanied the weak economy. In 1997, authorities approved unbudgeted expenditures, amounting to almost 3 percent of GDP, for bonuses to approximately 60,000 independence war veterans. Efforts to cover the payment with tax increases failed after trade-union-led protests, prompting the government to begin monetization (printing additional money to “pay” for the expenditure). In 1998, the government spent another significant share of gross national product (GNP) for its involvement in Congo’s civil war. Additionally, authorities faced debt obligations to the IMF. In 2006, Zimbabwe still had substantial overdue obligations to the IMF’s Poverty Reduction and Growth Facility and Exogenous Shocks Facility Trust, totaling about US\$119 million.<sup>6</sup> These funds were intended to foster development and reduce poverty.

The dire economic conditions prompted a wave of emigration to neighboring countries, contributing to a population and labor force decline beginning in 2003 (*Chart 4*). Zimbabwe emigration totaled 761,226, about 6 percent of the population in 2005. This number increased to 1.25 million in 2010, representing 9.9 percent of the population (World Bank 2008 and 2011). With a shrinking tax base and revenue that could not support expenditures and obligations, the government printed yet more money. Currency lost value at exponential rates amid an imbalance between economic output and the increasing money supply (*Chart 5*).

Hyperinflation and economic troubles were so profound that by 2008, they wiped out the wealth of citizens and set the country back more than a half century. In 1954, the average GDP per capita for Southern Rhodesia was US\$151 per year (based on constant 2005 U.S.-dollar purchasing-power-parity rates). In 2008, that average declined to US\$136, eliminating gains over the preceding 53 years (*Chart 6*).

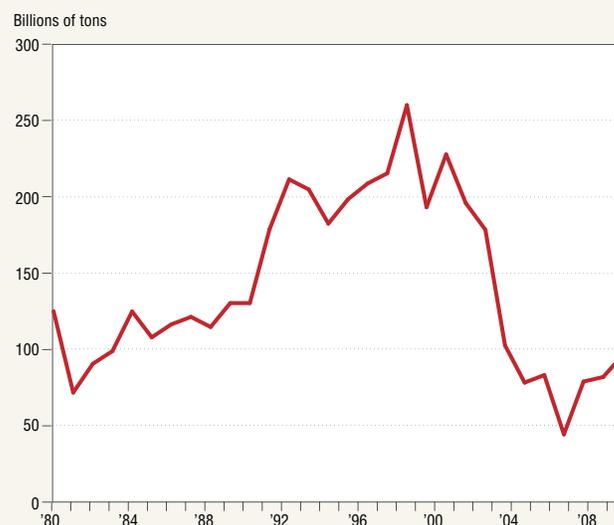
**Chart 2**  
**Zimbabwe Real GDP Contracts During Most of the Past Decade**



NOTE: Data plotted are the growth rates of GDP in constant 2000 U.S. prices.

SOURCE: World Bank's World Development Indicators database.

**Chart 3**  
**Zimbabwe's Tobacco Production Declines**



SOURCE: Food and Agriculture Organization of the United Nations.



As Zimbabwe printed money in higher and higher denominations, nearly everyone was a billionaire—of a worthless currency. *Photo credit: Howard Burditt/Reuters*

## Starving Billionaires—Effects of Hyperinflation

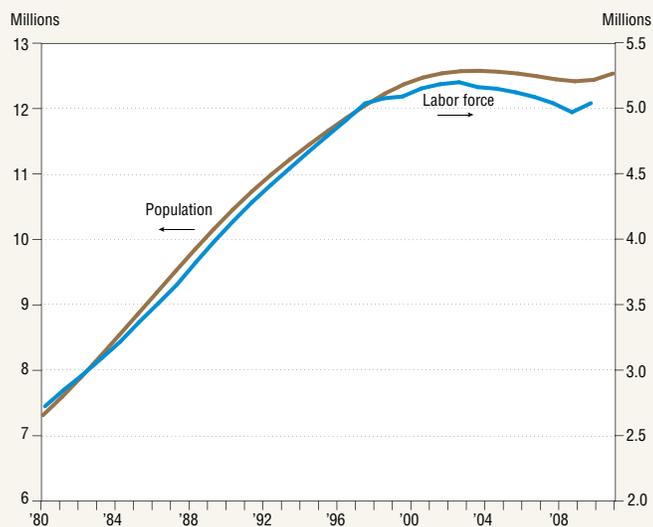
Zimbabwe's official annual rate of inflation exceeded 231 million percent in 2008, quickly eroding the currency's purchasing power. The *Economic Times* newspaper noted on June 13, 2008, that "a loaf of bread now costs what 12 new cars did a decade ago," and "a small pack of locally produced coffee beans costs just short of 1 billion Zimbabwe dollars. A decade ago, that sum would have bought 60 new cars."<sup>7</sup>

At the height of the hyperinflation, prices doubled every few days, and Zimbabweans struggled to keep their cash resources from evaporating. Businesses still quoted prices in local currency but revised them several times a day. A minibus driver taking commuters into Harare still charged passengers in local currency but at a higher price on the evening trip home. And he changed his local notes into hard currency three times a day.<sup>8</sup>

The government attempted to quell rampant inflation by controlling the prices of basic commodities and services in 2007 and 2008. Authorities forced merchants—sometimes with police force—to lower prices that exceeded set ceilings. This quickly produced food shortages because businesses couldn't earn a profit selling at government-mandated prices and producers of goods and services cut output to avoid incurring losses. People waited in long lines at fuel stations and stores. While supermarket shelves were empty, a thriving black market developed where goods traded at much higher prices. Underground markets for foreign exchange also sprang up in back offices and parking lots where local notes were converted to hard currencies at much more than the official central bank rate.

Some commodities, such as gasoline, were exclusively traded in U.S. dollars or the South African rand, and landlords often accepted groceries and food items as barter for rent. When currency is almost worthless, the use of foreign exchange or barter frequently occurs—a situation previously

**Chart 4**  
**Weak Economy Squeezes Zimbabwe Population, Labor Force Growth**



SOURCE: World Bank's World Development Indicators database.

experienced in Germany, Hungary and Argentina in the 20th century.

### Inflation Is a Monetary Phenomenon

Hyperinflation, which rapidly destroys a currency's value, is fundamentally a monetary phenomenon. Deprived of conventional means of raising revenue, such as taxation, governments borrow without limit from the central bank (*Chart 7*). Then, as inflation accelerates, fiscal policy makers begin administering monetary control.

Besides Zimbabwe, there have been 29 other bouts of hyperinflation (*Table 1*). Recent macroeconomic studies focusing on high and sustained levels of inflation offer evidence of a causal relationship between variations in money supply and variations in aggregate price levels.

In his study of hyperinflation, Cagan (1956) assessed the statistical relationship between money and price changes by looking at seven instances of hyperinflation from six European countries from 1920 to 1946. Assuming that inflation expectations played a primary role in the determination of hyperinflation, Cagan concluded that the demand for real money balances declined as inflation rates increased, contributing to the phenomenon.

Milton Friedman's monetarist view that "inflation is always and everywhere a monetary phenomenon" is based on the quantity theory of money that asserts aggregate prices  $P$  and total money supply  $M$  are related, according to the following equation, where  $Y$  is real output and  $V$  is velocity of money—the rate at which money turns over in the economy.

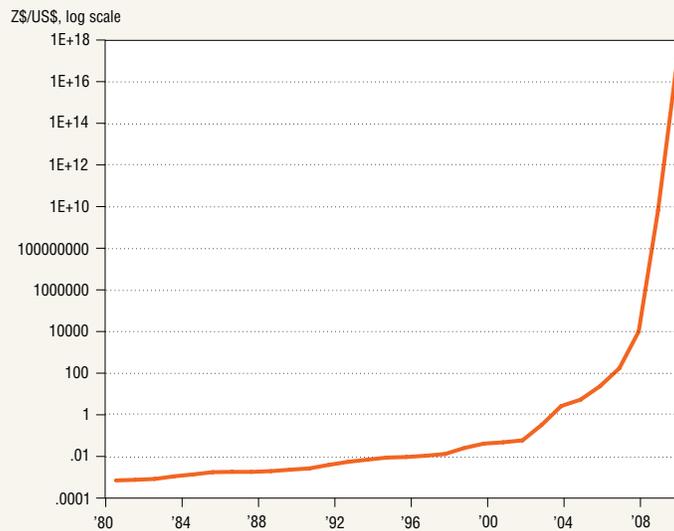
$$M \times V = P \times Y$$

Transforming each variable into a growth rate, with lowercase letters denoting percentage changes, the quantity theory of money can be expressed as:

$$p = v + m - y,$$

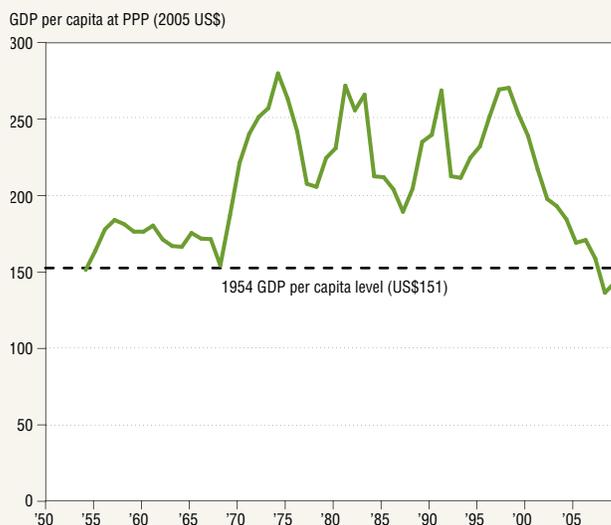
where  $p$  is the rate of inflation and  $v$ ,  $m$  and  $y$  are growth rates of velocity, money stock and output,

**Chart 5**  
**Zimbabwe Dollar Depreciates Sharply During Hyperinflation Era**



SOURCE: Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 7.0, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, May 2011.

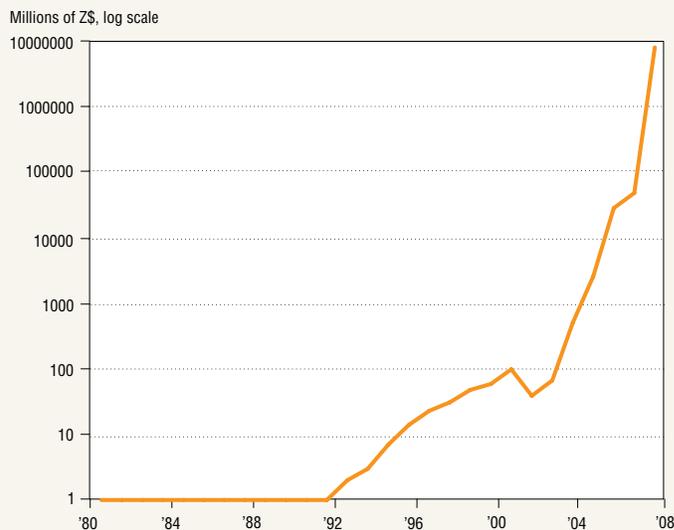
**Chart 6**  
**Economic Decline Wipes Out 53 Years of Income Growth in Zimbabwe**



NOTES: Data used are real GDP per capita (Laspeyres series) in 2005 constant prices. Data reporting started in 1954.

SOURCE: Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 7.0, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, May 2011.

### Chart 7 Zimbabwe Central Bank Government Debt Holdings Jump After 2003



NOTE: Central bank's holdings of government debt were zero or near zero between 1980 and 1989.  
SOURCE: International Monetary Fund's International Financial Statistics database.

respectively. The implication of this relationship is that inflation will increase when money supply growth exceeds the expansion of real economic activity, assuming that the velocity of money (the number of times it changes hands) remains unchanged.

In Zimbabwe, money supply and prices moved in tandem, as expected from the quantity theory of money. In addition, the velocity of money increased as people opted to spend immediately rather than hold on to depreciating cash. This rise in velocity as well as the increase in the stock of money through printing of new currency produced the exponential increase in prices, shown in Chart 8.

### Stopping Spiraling Inflation

Expectations play a major role in perpetuating higher prices during bouts of hyperinflation, and the effect of those expectations on money and inflation is amplified relative to other influences, such as the business cycle. To blunt exponential price increases, government finance must change in a credible way so the public believes there is real commitment to eliminating abuses that caused rapid inflation and currency devaluation.

Past chronic inflation episodes have been stabilized through the adoption of an independent central bank, an alteration in the fiscal regime and by instituting a credible exchange rate stabilization mechanism. In most cases, price stability was achieved virtually overnight following exchange rate stabilization. For example, Hungary and Germany experienced average monthly inflation rates in the 12 months prior to stabilization of 19,800 and 455.1 percent, respectively. After stabilization, the monthly rates over a year's time dropped to 1.3 and 0.3 percent, respectively (Vegh 1991). Table 2 shows the monthly averages for the rates of devaluation and inflation before and after the exchange rates were stabilized during eight hyperinflation episodes.

Fundamental fiscal policy changes are also needed to ensure the change in fiscal policy regime



Supermarket shelves emptied because of price controls.  
Photo credit: Eugene Baron

**Table 1**  
**Hyperinflation in History**

Country	Year(s)	Highest inflation per month (percent)
France	1789–96	143.26
Germany	1920–23	29,525.71
Austria	1921–22	124.27
Poland	1921–24	187.54
Soviet Union	1922–24	278.72
Hungary	1923–24	82.18
Greece	1942–45	11,288
Hungary	1945–46	1.295x10 <sup>16</sup>
Taiwan	1945–49	398.73
China	1947–49	4,208.73
Bolivia	1984–86	120.39
Nicaragua	1986–89	126.62
Peru	1988–90	114.12
Argentina	1989–90	196.6
Poland	1989–90	77.33
Brazil	1989–93	84.32
Yugoslavia	1990	58.82
Azerbaijan	1991–94	118.09
Congo (Zaire)	1991–94	225
Kyrgyzstan	1992	157
Serbia	1992–94	309,000,000
Ukraine	1992–94	249
Georgia	1993–94	196.72
Armenia	1993–94	438.04
Turkmenistan	1993–96	62.5
Belarus	1994	53.4
Kazakhstan	1994	57
Tajikistan	1995	78.1
Bulgaria	1997	242.7
Zimbabwe	2007–09	2,600.2*

\*Zimbabwe's last official month-to-month recording of inflation by the country's Central Statistics Office, July 2008, although estimates are much higher. The official annual rate recorded for July 2008 is 231 million percent, and the International Monetary Fund estimated the annual inflation rate for September 2008 at 489 billion percent.

SOURCE: *Monetary Regimes and Inflation: History, Economic and Political Relationships*, by Peter Bernholz, Northampton, Mass.: Edward Elgar Publishing, 2003, Table 2.1.

alters public expectation of future government actions, essential in ensuring continued disinflation.

In late 2008, the Zimbabwe dollar was replaced in transactions by widespread dollarization amid hyperinflation. The official demise of the currency occurred in February 2009, when authorities established a multicurrency system. Transactions in hard foreign currencies were authorized, and payment of taxes in foreign exchange was subsequently allowed.<sup>9</sup> While the South African rand, Botswana pula and the U.S. dollar were granted official status, the U.S. dollar became the principal currency. Budget revenue estimates and planned expenditures for 2009 were denominated in U.S. dollars, and

the subsequent budget for 2010 was also set in U.S. dollars. An estimated four-fifths of all transactions in 2010 took place in U.S. dollars, including most wage payments (Kramarenko et al. 2010).

Even after adopting U.S. monetary policy by dollarizing, post-hyperinflation Zimbabwe still faces challenges: rebuilding public finances, instituting and maintaining credible policies to control government spending, reducing poverty and promoting economic growth. Data for 2010 showed encouraging signs of recovery. Real GDP expanded 9 percent from 2009 levels, marking the second year of growth. Inflation subsided to single digits since dollarization and has remained at those levels. According to the Reserve Bank of Zimbabwe, the October 2011 consumer price inflation was 4.2 percent on a year-over-year basis, compared with 4.3 percent in September.<sup>10</sup> Real GDP per capita in 2009 increased 4.8 percent from 2008 levels, the second positive reading after nine years (since 1998) of mostly negative growth rates.

(continued on page 11)

**Chart 8**  
**Inflation, Money Supply Rise in Tandem in Zimbabwe**



SOURCE: Reserve Bank of Zimbabwe's *Monthly Economic Reviews*.

## Timeline of Currency Denominations and Inflation in Zimbabwe

### ▼ April 1980

The **(first) Zimbabwean dollar** replaces the Rhodesian dollar at par, which buys US\$1.54. A series of bank notes is issued, ranging from Z\$2 to Z\$20.

### ▼ From 1994 to 2006

The Reserve Bank issues a new series of notes, from Z\$2 to Z\$100. As inflation rises and erodes the currency's purchasing power, Z\$500 and Z\$1,000 banknotes are issued from 2001 to 2005. In the first half of 2006, new Z\$50,000 and Z\$100,000 denominations debut.

### ▼ Aug. 1, 2006

The first currency reform is implemented in an effort to contain spiraling inflation. The Zimbabwean dollar is redenominated by lopping off three zeros from the old currency. The **new (second) Zimbabwean dollar** is revalued at one new dollar = 1,000 old dollars.

### ▼ July 1, 2007

The Z\$500,000 note is introduced, valued at about US\$16 at the official exchange rate.

### ▼ Dec. 31, 2007

The Z\$750,000 (US\$25) note begins circulation.

### ▼ Jan 1, 2008

The Z\$1 million, Z\$5 million and Z\$10 million denominations debut.

### ▼ April 2, 2008

Z\$25 million and Z\$50 million bills are introduced. Prices of basic goods are in millions—a T-shirt costs Z\$276.5 million, pants Z\$2.75 billion. Tomatoes and other local produce are priced in millions. At a restaurant, two beers and water cost Z\$1.24 billion.

### ▼ May 2, 2008

The Z\$100 million, Z\$250 million and Z\$500 million notes debut. Annual inflation reaches more than 100,000 percent.

### ▼ May 15, 2008

Z\$5 billion, Z\$25 billion and Z\$50 billion notes are printed.

### ▼ July 1, 2008

A Z\$100 billion note is issued, about the price of three eggs at the time.

### ▼ Aug. 1, 2008

Another round of currency reforms is implemented. The government slashes 10 zeros from each second Zimbabwean dollar bill and the **third Zimbabwean dollar** is valued at 10 billion old dollars (second Zimbabwean dollars). Inflation continues rising.

### ▼ Sept. 29, 2008

New Z\$10,000 and Z\$20,000 notes are introduced.

### ▼ Oct. 13, 2008

The new Z\$50,000 bill is printed.

### ▼ Nov. 5, 2008

Z\$100,000 and Z\$500,000 notes are issued.

### ▼ Dec. 4, 2008

The Z\$1 million, Z\$10 million, Z\$50 million and Z\$100 million bills appear. Ten days later, the Z\$200 million and Z\$500 million banknotes debut, followed by the Z\$1 billion, Z\$5 billion and Z\$10 billion notes issued on Dec. 19, 2008.

### ▼ Jan. 12, 2009

The government issues two new denominations: Z\$20 billion and Z\$50 billion bills.

### ▼ Jan. 16, 2009

Even higher denominations are issued: Z\$10 trillion, Z\$20 trillion, Z\$50 trillion bills and the largest banknote ever—the Z\$100 trillion bill.

### ▼ Feb. 3, 2009

The Reserve Bank of Zimbabwe introduces the **fourth Zimbabwean dollar**, with 12 zeros removed from old bills, making 1 trillion old dollars equal to one new dollar. Denominations of the new currency are the Z\$1, 5, 10, 20, 50, 100 and 500 notes. However, loss of confidence quickly leads to abandonment of the Zimbabwean dollar in favor of foreign currencies, primarily the U.S. dollar and the South African rand.

SOURCES: Data on U.S. dollar equivalence are computed from International Monetary Fund exchange rate data. Dates of currency issuance are from Garry Craig New Zealand ([www.garrysue.net](http://www.garrysue.net)).

## Hyperinflation Consequences

Zimbabwe is the first country to experience a hyperinflationary episode in the 21st century. Hyperinflation is rare and often associated with wars, regime change and unstable political and economic environments where revenues are insufficient to cover government expenditures and printing more currency becomes a solution. Excess money supply not backed by economic growth leads to a loss of confidence in the currency, which ultimately can result in abandonment of the local currency in favor of foreign ones.

Hyperinflation produces adverse impacts—wealth and savings are wiped out within months, and prices of basic commodities become out of reach to many, especially those on fixed incomes. Governments often implement price controls in an attempt to control inflation. This frequently leads to shortages, as producers opt for alternative markets to avoid the mandated price ceilings that don't cover production costs. A thriving black market ensues, where basic goods and foreign currencies are traded at premium prices. Economies also resort to barter and trade in foreign currencies when the home currency has lost its value.

In Zimbabwe, the printing presses worked overtime, delivering ever-increasing currency denominations that lost value faster than they could be printed. The Z\$100 trillion bill, issued in January 2009, was the largest denomination in the history of money. At the time of issuance, this note was worth US\$300,<sup>11</sup> and its value diminished by the hour as the inflation rate soared in the millions.

Recently, this historic Z\$100 trillion bill has become a hot commodity among collectors and novelty buyers, selling for about US\$5 on eBay. This historical keepsake is a stark reminder of what happens to a currency when inflation and fiscal balances go unchecked.

—Janet Koech

**Table 2**  
**Devaluation, Inflation and Money Growth in Hyperinflations (in percent per month)**

Country	Devaluation rates	Inflation rates	Money growth
<b>Austria</b> (October 1922)			
October 1921–September 1922	32.6	46.0	35.7
October 1922–September 1923	–0.4	0.4	8.7
<b>Poland</b> (February 1924)			
February 1923–January 1924	63.7	66.2	62.7
February 1924–November 1924	0.8	1.2	11.1
<b>Greece</b> (February 1946)			
February 1945–January 1946	—	27.0	31.6
February 1946–December 1946	—	–0.8	13.4
<b>Taiwan</b> (June 1949)			
January 1948–May 1949	—	30.7	23.7
June 1949–December 1950	—	6.7	11.4
<b>Germany</b> (January 1924)			
January 1923–December 1923	409.8	455.1	419.7
January 1924–December 1924	–3.9	0.3	12.0
<b>Hungary</b> (April 1924)			
April 1923–March 1924	28.0	33.3	28.1
April 1924–March 1925	0.0	0.2	8.5
<b>Hungary</b> (August 1946)			
August 1945–July 1946	—	19,800	12,200
August 1946–July 1947	—	1.3	14.2
<b>Bolivia</b> (October 1985)			
October 1984–September 1985	44.0	57.6	48.5
October 1985–September 1986	4.9	5.7	8.3

NOTES: The date in parentheses following the country name indicates the month in which the exchange rate stabilized. Money refers to notes in circulation, except in Bolivia and Taiwan where it indicates M1—notes in circulation plus demand deposits.

SOURCE: "Stopping High Inflation: An Analytical Overview," by Carlos A. Vegh, International Monetary Fund, IMF Working Paper no. 91/107, November 1991.

## Notes

<sup>1</sup> The Z\$100 trillion note was issued after two currency reforms—in 2006 and 2008—where a total of 13 zeros were slashed from currency, making the 100 trillion ( $10^{14}$ ) note technically equivalent to  $10^{27}$  pre-2006 Zimbabwean dollars. By this measure, the Z\$100 trillion takes the lead as the largest currency ever issued. The 100 million Hungarian B-pengo ( $10^{20}$  pengo) put into circulation in 1946 is historically recognized as the world's largest currency—but comes in second when Zimbabwe's currency revaluations are considered.

<sup>2</sup> Hungary maintains the top spot for the highest hyperinflation rate, with its monthly rate peaking at  $1.3 \times 10^{16}$  percent in July 1946.

<sup>3</sup> Mugabe served as prime minister from 1980 to 1987 and has been president since 1987.

<sup>4</sup> Hanke and Kwok (2009) estimated the inflation rate as of December 2008 at 6.5 quinquicillion novemdecillion percent (that is, 65 followed by 107 zeros).



A Zimbabwean \$100 billion note was needed to purchase three eggs in July 2008.

Photo credit: Philimon Bulawayo/Reuters

<sup>5</sup> Zimbabwe's 94 percent unemployment rate is mentioned by IRIN—a humanitarian news and analysis service of the United Nations—in its article "Zimbabwe: Poverty for a Few Dollars More," Jan. 30, 2009, [www.irinnews.org/report.aspx?reportid=82674](http://www.irinnews.org/report.aspx?reportid=82674).

<sup>6</sup> International Monetary Fund press release no. 06/33, Feb. 15, 2006, [www.imf.org/external/np/sec/pr/2006/pr0633.htm](http://www.imf.org/external/np/sec/pr/2006/pr0633.htm).

<sup>7</sup> "Zimbabwe Inflation Now over 1 Million Percent," *Economic Times*, June 13, 2008, [http://articles.economictimes.indiatimes.com/2008-06-13/news/27696937\\_1\\_zimbabwe-inflation-zimbabwe-dollars-harare](http://articles.economictimes.indiatimes.com/2008-06-13/news/27696937_1_zimbabwe-inflation-zimbabwe-dollars-harare).

<sup>8</sup> "A Worthless Currency: The Local Dollar Is Fast Shriveling Away," *The Economist*, July 17, 2008, [www.economist.com/node/11751346](http://www.economist.com/node/11751346).

<sup>9</sup> "Taxes to Be Paid in Foreign Currency," by Bernard Mpofu, *Zimbabwe Independent*, Jan. 30, 2009, [www.theindependent.co.zw/business/21900-tax-to-be-paid-in-foreign-currency.pdf](http://www.theindependent.co.zw/business/21900-tax-to-be-paid-in-foreign-currency.pdf).

<sup>10</sup> *Monthly Economic Review*, Reserve Bank of Zimbabwe, October 2011, [www.rbz.co.zw/pdfs/Monthly/Monthly%20Economic%20Review%20October%202011.pdf](http://www.rbz.co.zw/pdfs/Monthly/Monthly%20Economic%20Review%20October%202011.pdf).

<sup>11</sup> "Zimbabwe to Print First \$100 Trillion Note," CNN, Jan. 16, 2009, [http://articles.cnn.com/2009-01-16/world/zimbabwe.currency\\_1\\_zimbabwe-dollar-south-african-rand-dollar-note?\\_s=PM:WORLD](http://articles.cnn.com/2009-01-16/world/zimbabwe.currency_1_zimbabwe-dollar-south-african-rand-dollar-note?_s=PM:WORLD).

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# The Conquest of Mexican Inflation

From the 1970s through the mid-1990s, Mexico lurched from one crisis to another, its monetary and fiscal framework a source of instability that impeded long-term growth. By adopting best practices in central banking in the latter 1990s—granting the Banco de México independence and mandating price stability as the central bank’s primary goal—Mexico began installing a framework that has proven remarkably successful.

Additional fiscal and financial system reforms of the 1990s and 2000s have eliminated macroeconomic policy as a source of instability, although more remains to be done to bolster economic development. Still, Mexico’s experience provides an instructive view of how a nation, by providing independence and a clear mandate to its central bank, can create relative macroeconomic stability and enhance economic opportunity.

## A Record of Crisis and Instability

The monthly change in the nominal exchange rate of the Mexican peso against the U.S. dollar since 1970 is plotted in Chart 1. Big swings correspond to periods of financial turbulence. Large downward spikes, in particular, indicate massive peso devaluations; shaded bars denote years of Mexican presidential elections.

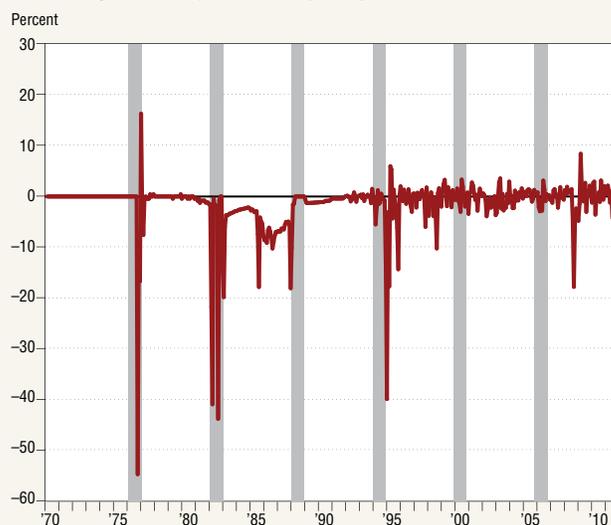
The first big devaluation occurred during the 1976 election year amid excessive inflation that ended Mexico’s 22-year defense of its fixed exchange rate. Profligate spending and money creation resumed as the 1982 election year approached. Again, Mexico couldn’t maintain its fixed exchange rate, and making matters worse, it couldn’t meet its debt obligations.

The subsequent default triggered the Latin American debt crisis. Although the 1988 election does not stand out as a crisis period quite

like 1982, it was preceded by at least three years of near-continuous financial turmoil, caused by a series of shocks to the price of oil, which in the early 1980s accounted for roughly 70 percent of the nation’s exports.

Mexico subsequently improved its policy record sufficiently to regain access to financial markets, leading to anticipation that the 1994 election year would be uneventful. But as the election approached, the government’s resolve to combat inflation and contain spending weakened yet again, and short-term debt piled up. The peso was devalued sharply in December 1994, and the recently privatized banking sector entered a prolonged crisis, setting back financial system development for more than a decade. Painful as it was, the so-called Tequila Crisis of 1994–95 finally prompted officials to commit once (and hopefully,

**Chart 1**  
**Elections Brought Peso Instability**  
(U.S. dollar/peso exchange rate, monthly change)



NOTE: Shaded bars denote election years.

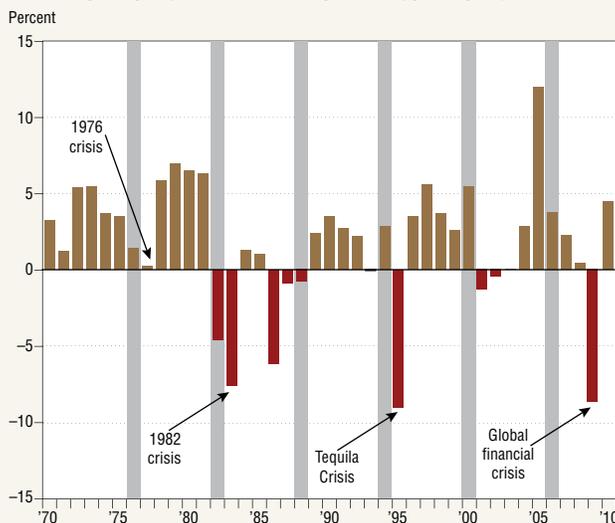
SOURCES: Banco de México; authors’ calculations.

**Chart 2**  
**Mexico's Inflation Peaked in 1988**  
 (12-month inflation rate)



Note: Shaded bars denote election years.  
 SOURCE: Instituto Nacional de Estadística y Geografía.

**Chart 3**  
**Crises Lower Mexico's Output**  
 (Real GDP per capita growth, adjusted for purchasing power parity)



NOTE: Shaded bars denote election years.  
 SOURCES: Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 7.0, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, May 2011; authors' calculations.

for all) to macroeconomic discipline.

The peso has since freely floated, remaining within reasonable bounds except during the Asian crisis (1997–98) and the more recent global financial crisis. In 2000, for the first time in more than 70 years, the country underwent a political transition involving a changing of the party in power, while at the same time the economy was hit by a U.S. manufacturing recession. Yet, there was no crisis. And in 2006, despite much political uncertainty and social unrest, once again, there was no crisis.

Mexico's periodic financial turbulence has been accompanied by bouts of inflation, shown in Chart 2, from the 1970s through the 1990s, with shaded bars again signifying election years.

Inflation peaked at 180 percent in February 1988, not quite hyperinflation, but still high enough to do real economic damage. The spike associated with the Tequila Crisis (rates of around 50 percent in late 1995 and early 1996) has been followed by a steady decline. In recent years, inflation has been comparable to—or a little bit better than—what was experienced in the early 1970s. Inflation now approaches the rates found in developed countries.

The crises were accompanied by sharply declining output. While 1976 represented but a brief pause along the country's postwar economic miracle, the 1982 crisis brought the miracle period to a complete halt (*Chart 3*). It triggered the deepest recession since the Great Depression and was followed by a decade of economic stagnation. The impact of the Tequila Crisis was somewhat shorter-lived; nevertheless, in 1995 real gross domestic product (GDP) per capita fell by almost 10 percent, a postwar record.

### Roots of Reform

The first major innovation in Mexico's macroeconomic policy framework roughly coincided with the Tequila Crisis. Economists had begun reaching a consensus about what constituted best practices in central banking. First, there was grow-

ing agreement that independence from short-term political pressure was vital for central bankers to deliver price stability. Second, there was an emerging belief that inflation targeting was the best way for independent central banks to conduct policy and to be held accountable for its outcomes. The Reserve Bank of New Zealand pioneered inflation targeting as a monetary policy framework in the early 1990s, and in the two decades since then, it has been adopted by numerous central banks in both developed and emerging-market economies.

The scatter plot of data shown in Chart 4, from a widely cited paper by Alberto Alesina and Lawrence H. Summers,<sup>1</sup> helped sway many governments to allow greater freedom for monetary policy makers. The chart shows the relationship between a measure of central bank independence on the horizontal axis and long-run inflation outcomes on the vertical axis for a group of developed countries over three decades. Countries with more-independent central banks (on a scale of 1 to 5, with 5 signifying the most independent) tended to have lower inflation over the long run, the data indicated. Furthermore, Alesina and Summers showed that these better inflation outcomes came at no apparent cost in terms of real economic activity. The original Alesina and Summers finding has since been replicated by many researchers.

Mexico learned the importance of central bank independence in a particularly painful way. Until 1982, the central bank operated as a state-owned corporation—separately, but without complete independence from the federal government. During the 1982 financial crisis, then-President José López Portillo changed the Banco de México's charter at the same time he nationalized the banking system and devalued the peso. Portillo moved the central bank into the Treasury Ministry, placing it under the control of the executive branch.

Consequently, during the 1980s, the central bank became a powerful tool to manipulate the economy for short-term political ends. Mexican governments freely printed money to finance



federal deficits and compelled the central bank to lend the government money to finance populist programs. Predictably, the results were a stagnation of private credit and triple-digit inflation.

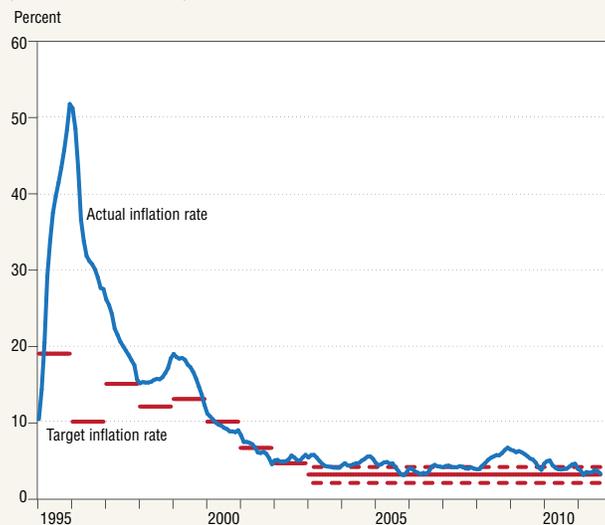
Mexico amended its constitution on Aug. 20, 1993; Article 28 made the central bank independent, effective Jan. 1, 1994. Price stability became the bank's primary objective. Article 28's wording is a particularly strong statement of independence, especially given the Banco de México's history.

#### Article 28 of the Constitution of the Mexican United States

"El Estado tendrá un banco central que será autónomo en el ejercicio de sus funciones y en su administración. Su objetivo prioritario será procurar la estabilidad del poder adquisitivo de la moneda nacional, fortaleciendo con ello la rectoría del desarrollo nacional que corresponde al Estado. Ninguna autoridad podrá ordenar al banco conceder financiamiento."

"The State shall have a central bank, which shall be autonomous in exercising its function and management. Its main goal will be to foster the stability of the national currency's purchasing power, therefore strengthening the State's role in guiding the country's development. No authority shall order the central bank to grant financing."

**Chart 5**  
**Monetary Policy Evolves**  
**A. Initial Inflation Targets Missed**  
 (12-month inflation rate)



**B. Mexico Inflation Reaches Target Range**  
 (12-month inflation rate)



SOURCES: Instituto Nacional de Estadística y Geografía; Banco de México.

The creation of money is explicitly separated from other tasks of state, and the wording eliminates the possibility of the government forcing the central bank to provide it financing. Although the Mexican president appoints the central bank board (with legislative approval), board members have staggered terms to prevent the president from replacing all members at the same time.

Thus, the Banco de México enjoys a level of independence superior to that of most other central banks. Still, the first few years of central bank independence were extremely difficult.

### Inflation Targeting—the Early Years

The central bank initially faced widespread uncertainty about its commitment and ability to achieve financial and price stability. Within a year of receiving independence, the Banco de México confronted the Tequila Crisis: a twin balance-of-payments and financial crisis. That tumult prompted a peso devaluation, causing inflation to spike to 52 percent in 1995 from 7 percent the year before, badly damaging central bank credibility. Policymakers missed the bank's first two inflation targets, in 1995 and 1996, by wide margins. An initial inflation target of 19 percent in 1995 was increased to 42 percent as the peso became unstable.

The policy, however, could not be described as full inflation targeting. The initial strategy was to adopt a monetary growth target—specifically, a growth ceiling on net domestic credit. Since the monetary policy objective limited the expansion of net domestic credit and aimed for an increase in international reserves, it was not considered a true inflation-targeting regime. The central bank instead established borrowed reserves as its instrument of monetary policy, allowing markets to determine both the exchange rate and the interest rate.

Actual inflation since 1995, along with the inflation target, is depicted in Chart 5A. The central bank essentially met its 15 percent target in 1997 (official inflation was 15.5 percent) and in 1998 began a gradual transition to full inflation target-

ing and an emphasis on policy transparency. The central bank badly missed the 1998 target of 12 percent; inflation was 18.4 percent amid peso weakness caused by contagion from the Asian and Russian crises of 1997–98.

In 1999, the Banco de México announced a series of inflation targets, with the stated goal of reducing inflation in Mexico to that of its primary trading partners by 2003. In 2000, the central bank began publishing its *Quarterly Inflation Reports (Informe Sobre la Inflación)*, which detail the inflation environment, the conduct of monetary policy and the balance of risks for future inflation.<sup>2</sup> The introduction of intermediate-term inflation targets and increased information for the public were important steps toward the adoption of full inflation targeting.

### Full Inflation Targeting

Mexico installed the necessary components for full-fledged inflation targeting by 2001. The Banco de México dropped the other two elements of its monetary policy strategy—net domestic credit and international reserves—leaving an inflation target as the single, explicit monetary policy goal. The policy framework included a floating exchange rate, an independent monetary authority with price stability as its main policy goal, the absence of other nominal policy strategy anchors and implementation of monetary policy within a transparent framework in which communication with the public became key. Since 2003, the Banco de México has maintained an inflation target of 3 percent, with a tolerance range of plus or minus 1 percentage point.

The central bank's performance vis-à-vis the inflation target since fully implementing inflation targeting is highlighted in Chart 5B. Concentrating on the period since the formal adoption of full inflation targeting, we see that the Banco de México has done an impressive job at delivering on its price stability mandate. Admittedly, inflation has been closer to the upper limit of its targeted range

than to the middle, and there have been some notable misses, although these have been mainly associated with swings in relatively volatile food and energy prices.<sup>3</sup> Most recently, inflation peaked at more than 6 percent toward the end of 2008 but has since been on a steady downward trajectory, lately running at around 3.25 to 3.5 percent.

A formal comparison of some key statistics before and after central bank independence confirms what should be apparent from these charts—the average level and volatility of inflation have significantly declined since the Banco de México's independence (*Table 1*).

### Complementary Fiscal Reforms

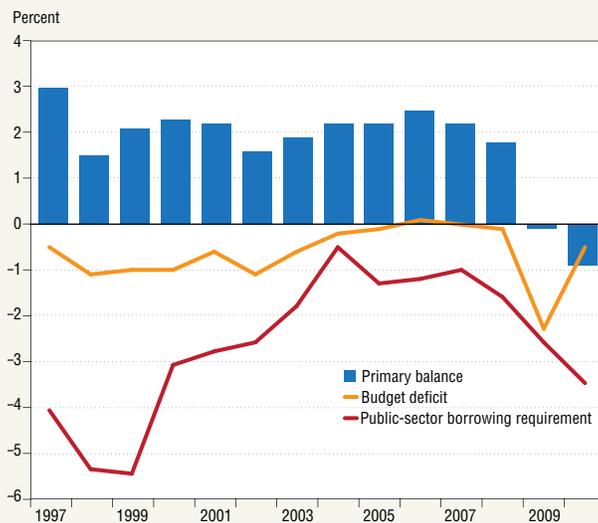
Most bouts of high inflation involve pressure from fiscal authorities to finance chronic budget deficits or monetize the national debt. Central bank independence makes it easier for central banks to resist this pressure if it conflicts with their mandate for price stability. It would be even better if fiscal authorities could be somehow induced to maintain a sustainable profile for public finances so that the pressure to monetize deficits—printing extra money to “pay” what the government owes—would not arise in the first place. To this end, a second set of macroeconomic policy reforms in Mexico may further enhance the ability of the Banco de México to deliver price stability.

**Table 1**  
**Central Bank Independence Aids Price Stability in Mexico**

Period	Average annualized monthly inflation (percent)	Standard deviation
Prior to independence (1970–94)	43.3	42.9
Since independence (1994–current)	11.1	15.5
Since inflation targeting (2001–current)	4.4	2.4
1995–2000	22.1	21.0

SOURCES: Instituto Nacional de Estadística y Geografía; authors' calculations.

**Chart 6**  
**Fiscal Policy Remains Disciplined**  
 (Deficit as a share of GDP)



SOURCE: Secretaría de Hacienda y Crédito Público.

Four major pieces of legislation have been enacted in the past five years that significantly strengthened Mexico's fiscal policy framework—the most important is the Budget and Fiscal Responsibility Law of 2006, which includes among its provisions a balanced-budget rule.<sup>4</sup>

This rule applies to the traditional budget deficit; therefore, it excludes some off-budget operations such as long-term development projects. There is also an exception allowing the federal government to run a deficit during exigent circumstances. If a budget deficit is proposed, the legislative branch must provide explicit justification for the shortfall and a plan for returning to a zero balance. If, over the course of a fiscal year, expected revenue doesn't meet projections, the government must cut expenditures to balance the budget. Unfortunately, the balanced budget is done on a year-by-year basis and lacks both a broader, medium-term outlook of three to five years and a longer-term estimate of 20 to 30 years. Still, the balanced-budget rule has kept public debt relatively low and helped maintain fiscal policy discipline.

Figuring out the true state of Mexico's public finances is complicated by the important role that oil—and the national oil company, Pemex—plays in the national economy and the government's finances. Oil-related revenue accounts for 30–40 percent of total revenue, so oil-price changes can significantly affect the government's fiscal position. Therefore, the most important factor in the budget is how expected oil revenue is included in the budget calculation.

The formula used to calculate anticipated oil prices over the next fiscal year is based on past and future oil prices.<sup>5</sup> Then, that expected oil price is used in budget projections and for oil revenue stabilization funds.

Even without the boon to public finances from recent years' oil-price run-up, Mexico made real progress getting on a sounder financial footing. Along with the official budget deficit, Mexico's government routinely reports two additional measures of budget balance (*Chart 6*). The primary balance is the budget deficit less net interest payments. The other measure, the public-sector borrowing requirement, is the broadest measure and includes the government's long-term investment projects and off-balance-sheet spending. The off-balance-sheet spending includes the net costs of PIDIREGAS (Mexican public-private partnerships), inflation adjustments to indexed bonds, financing costs of the programs for bank restructuring and debt support, and financial commitments to development banks.

Until the onset of the recent financial crisis, Mexico ran primary surpluses, something that the U.S. has not managed for more than a decade. Indeed, the fiscal capacity created by the recent reforms created a new phenomenon in Mexico's fiscal policy—the ability to set countercyclical policy. During earlier downturns, the country couldn't implement any type of stimulus and, instead, had to cut spending. During the latest recession, Mexico passed a stimulus package, albeit a modest one. Still, even in the face of a 6 percent decline

in output, the country's budget deficit (as measured by the financial balance) remained below 3 percent of GDP (while the broader measure came in at 3.5 percent of GDP in 2010). Furthermore, the country's debt has remained relatively stable at below 30 percent of GDP through the recent crisis, in marked contrast to the U.S. and other advanced countries that have debt levels approaching or exceeding 100 percent of GDP.

### Reward Seen in Risk Premium

Perhaps the most striking evidence of Mexico's macroeconomic policy discipline can be found in the cost of public-sector financing. The interest rate spread, or difference, between the cost of Mexican government debt and U.S. Treasuries is shown in Chart 7. Both the U.S. financial crisis in 2008–09 and the more recent problems with European sovereign debt boosted interest rate spreads as measured in basis points (100 basis points equal 1 percentage point). Even though the Asian crisis was less intense than the current tumult, it affected Mexico more because it occurred at the beginning of Mexico's policy shift.

Overall, Mexico is regarded as a safe haven among emerging markets. Furthermore, compared with all but Germany, France and the United Kingdom, Mexico's interest rate premium is lower than that of European countries. This is a striking example of the rewards of maintaining policy discipline and a jarring reminder of the perils of fiscal profligacy.

### Improved Financial Framework

Mexico has made very real and substantive progress in improving its macroeconomic policy framework in recent decades. Major innovations occurred in the middle 1990s, when the government codified the independence of the Banco de México in the constitution, with the bank going on to adopt a best-practices approach to monetary policy, pursuing its mandate for price stability through a strategy of inflation targeting.

More recently, the government passed a series of laws to improve fiscal policy, including a balanced-budget rule. Largely because of these reforms, Mexico fared surprisingly well in the recent global financial crisis. Indeed, Mexico is now viewed as a better credit risk than many peripheral European countries. But much more remains to be done. Monetary and fiscal policy are no longer the impediments to growth and development that they once were.

The broader challenges confronting Mexico are well known. Among Organization for Economic Cooperation and Development (OECD) countries, Mexico typically ranks close to the bottom, if not dead last, on various metrics of educational attainment. There are significant regulatory barriers to entry into key network industries such as telecommunications and electricity, and restrictions limit foreign direct investment in some sectors. Competition and investment are curtailed by a lack of legal certainty. And Pemex has presided over a decline in oil production in recent years, due in no small part to poor incentives. These fac-

**Chart 7**  
**Improved Policy Narrows Interest Premium**  
(Interest rate spread)



SOURCE: CTRB JP Morgan Chase Emerging Markets.

tors manifest themselves in a persistent gap in labor productivity relative to other OECD members. For Mexico to bridge that gap, it will need to be as creative in embracing structural change as it has been in embracing monetary and fiscal reforms.

—Mark Wynne and Edward C. Skelton

## Notes

<sup>1</sup> “Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence,” by Alberto Alesina and Lawrence H. Summers, *Journal of Money, Credit and Banking*, vol. 25, no. 2, 1993, pp. 151–62.

<sup>2</sup> *Quarterly Inflation Reports* can be found at [www.banxico.org.mx/publicaciones-y-discursos/publicaciones/informes-periodicos/trimestral-inflacion/index.html](http://www.banxico.org.mx/publicaciones-y-discursos/publicaciones/informes-periodicos/trimestral-inflacion/index.html).

<sup>3</sup> Core inflation in Mexico sometimes diverges dramatically from headline inflation, due to the importance of food prices to the consumer price index (CPI). Food and beverages account for almost 20 percent of the Mexican CPI, compared with about 8 percent of the U.S. CPI. Mexican economists sometimes refer to the “pico de gallo” effect on inflation, whereby movements in the prices of onions and tomatoes can disproportionately affect headline inflation.

<sup>4</sup> The other key pieces of legislation are the Integral Fiscal Reform, approved in September 2007, which had among its many objectives the improvement of tax collection and was expected to raise the collection of non-oil tax receipts by 2.1 percent of GDP over 2008–12; the 2007 New ISSTE Law, intended to create a more-sustainable public pension system over the long term by transitioning from a pay-as-you-go system to a system of individual savings accounts; and finally, the government accounting law, passed in 2008, which brought public-sector accounting standards more in line with generally accepted accounting principles.

<sup>5</sup> Specifically, the formula gives a weight of 25 percent to the average oil price for the past 10 years, a weight of 25 percent to the average futures price for the next three years and a weight of 50 percent for the futures prices for the next few months adjusted by a factor of 0.86.

# Public Perception of Globalization's Impact Shapes Trade Realities

History teaches us that perception often matters much more than reality in shaping public opinion. Accordingly, perception is crucial to understanding the outcomes of globalization, from increased free trade and the breakdown of political and economic barriers to technological integration, greater capital flows and worker migration. Ideally, the public's evaluations are sound and closely reflect reality. Polling data, however, indicate this is often not the case. Misplaced perceptions may profoundly affect the course of globalization policies.

## What the Polls Say

When viewed in the aggregate, surveys indicate that Americans have very mixed feelings about increasing global connectivity, or at least certain aspects of it.

An NBC poll by the Peter Hart and Bill McInturff polling organizations, taken in November 2010, asked Americans about the impact of free trade on the U.S. By a 47–23 percent margin, respondents said free trade “hurt” rather than “helped” the country.<sup>1</sup>

Another poll, conducted for CNN by Opinion Research Corp., also in November 2010, measured the contrasting views of import-driven risk versus export-based economic growth and yielded a much narrower gap between opponents and supporters. Half of those surveyed said threats posed by imports outweigh their benefit, while 41 percent believed that trade is mostly an opportunity.<sup>2</sup> CNN, which asked the same question in each of the previous three years, found opinion shifting between threat and opportunity every year between 2007 and 2010. To further muddle the discussion,

polls asking whether trade with other nations is good for the U.S. “economy”—as opposed to the “country”—received a substantial majority of positive responses.<sup>3</sup>

One might conclude that our attitudes toward globalization are at best fickle or that the survey findings are flawed. But it may be more prudent to view the seemingly mixed results as a reflection of the complexity of the underlying issue.

A majority of Americans actually agree on several aspects of globalization. Surveys consistently indicate that most people believe free trade and related commerce agreements have cost, rather than created, domestic jobs and that domestic wages have been suppressed, rather than enhanced, by these arrangements and integration efforts.<sup>4</sup> This is at odds with the professional consensus: Economists generally believe that the net effect of globalization on unemployment is minimal and that the drivers of wage differentials have been based on technology rather than trade.<sup>5</sup>

It is interesting to note that Americans tend to think free trade potentially poses more harm to their fellow citizens than to themselves. Some view such concern as altruism.<sup>6</sup> Regardless of the cause, the contrast in beliefs regarding “self” and “other” may be one reason the average American holds a more guarded perspective on globalization's effects than economists do. Furthermore, studies indicate that the perceived disutility of job loss can be enough to override even the prospect of new and better jobs.<sup>7</sup> In the context of globalization and free trade, this implies that if enough people believe their jobs will be at risk, even temporarily, they will oppose policies with a potential to expand labor demand. Thus, anxiety may further

contribute to a negative outlook on free-trade measures, even those that empirical evidence shows to be ultimately beneficial.

### Digging Deeper

There's an overwhelming consensus within the U.S. that trade agreements are good for developing countries—by a 6–1 margin, according to some surveys.<sup>8</sup> This raises the question of how these countries perceive globalization, specifically free trade. If the American public were correct in its assessment, we would expect largely positive responses in many developing nations. Indeed, this is the case. A March/April 2011 poll of developed and underdeveloped nations' citizens, conducted for the Pew Research Center by Princeton Survey Research Associates International, found that 84 percent of respondents from developing nations felt that their countries' trade and business ties were “very good” or “somewhat good.”<sup>9</sup>

Such positive responses alone do not demon-

strate whether developing countries show greater support for free trade than developed ones. In the same poll, Germany, the U.K. and France indicated approval for their own business and trade ties at similarly high rates of 95, 87 and 83 percent, respectively. The overall level of positive response for developed nations was 87.2 percent.<sup>10</sup> The surveys were conducted primarily by phone in developed countries and exclusively through face-to-face interviews in underdeveloped nations.

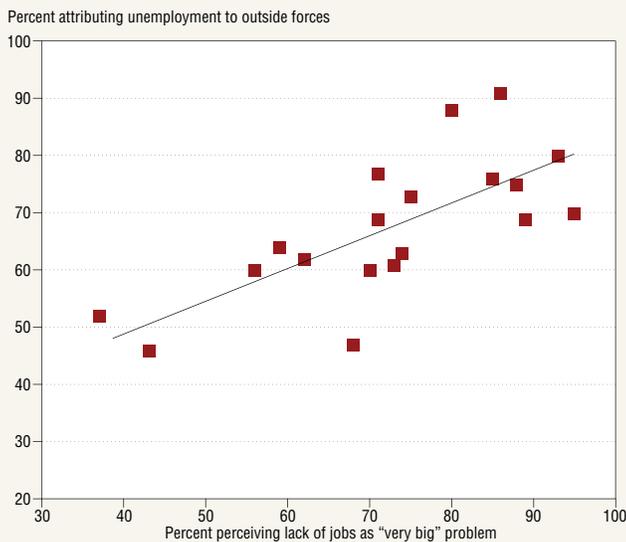
Despite receiving a substantial share of free-trade benefits—including an ever-increasing variety of inexpensive imports—Americans showed the lowest level of support for their own trade ties in the Pew poll, with a 67 percent positive response.

It's difficult to determine to what extent trade's perceived effect on jobs factored into the negative response and, thus, provided a possible explanation for Americans' lukewarm support of trade. As of March 2011, half of all American adults believed that finding a job was more difficult than in the prior year, and many attributed sluggish employment growth to free-trade effects such as outsourcing overseas.<sup>11</sup>

The perceived severity of unemployment within a country appears correlated with the degree its citizens attribute the problem to “outside forces” (*Chart 1*).<sup>12</sup> Interestingly, the correlation between actual unemployment rates and the severity of unemployment as perceived by the public appears modest at best.<sup>13</sup> These relationships suggest that an assessment of globalization depends more on perceived levels of joblessness or related factors than on actual levels. Perception, of course, is very much a function of expectation. In the U.S., expectations for employment levels are higher than in many other countries and may help explain why citizens view “outside forces” as the cause of higher-than-normal unemployment.

Similarly, in poll data two months before the U.S. recession began in December 2007, the perception of the economy appears correlated with

**Chart 1**  
**Unemployment Due to Outside Forces vs. Lack of Jobs as ‘Very Big’ Problem (2011)**



NOTE: India is removed from set as outlier (reason is perhaps recognition within the country that unemployment is primarily due to demographics).

SOURCE: Pew Research Center.

support for free trade. The more favorably people view their national economies, the more likely they are to back free trade (*Chart 2*).<sup>14</sup> The causal conclusion is that optimism in some areas begets greater optimism in others; policies, economic activities and other factors that increase approval of the economy also appear linked to the level of support for a nation's international trade ties.

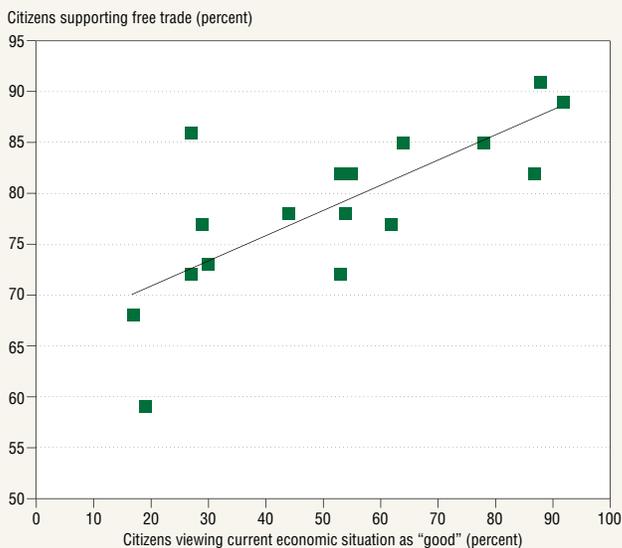
Yet in *Chart 3*, we see another relationship, one that seems counterintuitive. This scatterplot shows attitudes toward openness to trade against actual unemployment rates for a cross-section of countries in 2010 and indicates that even in countries with very high unemployment rates, support for trade can be quite high—so much, in fact, that there is even a weak positive correlation.<sup>15</sup> This result is likely attributable to the unequal employment expectations of developed and underdeveloped countries in the survey.

This relationship lends further credence to the notion that the degree of public approval for globalization and its associated attributes is more a function of perceived rather than actual unemployment and economic prosperity. For example, developed countries may attribute current relative employment instability to trade. Americans' tendency to blame "outside forces" and reject trade ties to a greater extent than other developed nations with equal or higher unemployment rates may have more to do with the limited social safety net or comparatively unsheltered nature of the U.S. economy. It is also possible that certain underdeveloped countries with high unemployment rates view trade more favorably because they believe that trade relations will mitigate their troubles or improve current circumstances.

### Complex U.S. Attitudes Toward Trade

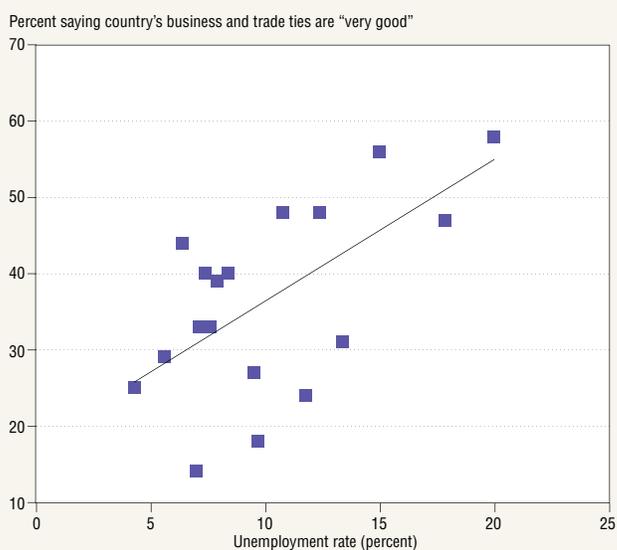
Attitudes toward trade also vary depending on the bilateral relationship of the parties involved, the surveys show. Overall public approval for free trade is more accurately described as a confluence of forces than as a single and independent variable

**Chart 2**  
**Support for Free Trade vs. Perception of Economy (2007)**



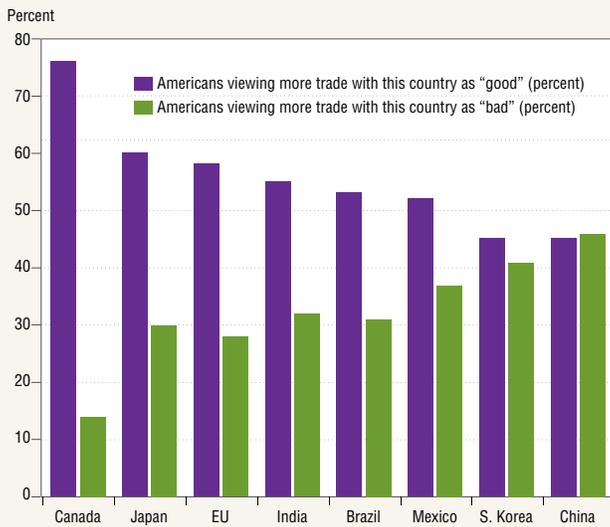
SOURCES: Ipsos; Pew Global.

**Chart 3**  
**Perception of Trade Ties (2011) vs. Unemployment Rate (2010)**



SOURCES: Pew Research Center; CIA World Factbook.

**Chart 4**  
**Opinion on Extending Specific Trade Ties**



SOURCE: Pew Research Center.

(*Chart 4*). The average American citizen is almost twice as likely to say that greater commerce with Canada is good as they are to say the same about China. Similarly, we are significantly more likely to support additional trade with Japan than with South Korea.<sup>16</sup>

Americans also view increasing trade with South Korea, a developed country, less favorably than extending ties with Mexico.<sup>17</sup> This seems to erode the reasonable belief that we are primarily concerned with the actual products traded or the quality of “human capital” invested in them. Instead, cultural ties, existing relationships or even geographic proximity may play a more significant role.

Many will reject the results of polls, claiming the responses show only what people think and not reality. Dismissing these findings ignores a fundamental fact about human nature: We don’t make decisions according to some universal set of facts; we make them based on “our” facts. In this respect, perception is reality, and nowhere is this truer than in the political process, which effectively governs how globalization unfolds.

## Prevailing Public Opinion

Attributing unemployment to outsourcing, regardless of the veracity of such linkage, can produce increased protectionism exactly because people vote based on perception. In turn, politicians pass laws and negotiate trade agreements based on voter sentiment. Thus, globalization, despite its positive net results, may confront setbacks in the face of prevailing negative opinion.

Futurist John Naisbitt once described globalization as a “bottom-up” phenomenon that is the totality of “all actions initiated by millions of individuals.”<sup>18</sup> Taking this idea to heart, it becomes much easier to see public opinion for what it is: a force that both affects and is itself affected by the choices that individuals make. The process of global integration has only just begun, but it is not happening to us. Rather, it is happening because of us. This underscores the fundamental importance of disseminating accurate information about globalization’s impact. Only then can policymakers take actions that maximize prosperity and most closely reflect society’s values.

—Christian Winge

## Notes

Winge was a 2011 intern in the Globalization and Monetary Policy Institute at the Federal Reserve Bank of Dallas. He is a student at Trinity University.

<sup>1</sup> "International Trade/Global Economy," Polling Report (2011), NBC News and *Wall Street Journal* (November 2010), [www.pollingreport.com/trade.htm](http://www.pollingreport.com/trade.htm). (Telephone survey of 1,000 respondents, with a margin of error of 3.1 percentage points.)

<sup>2</sup> "International Trade/Global Economy," Polling Report (2011), CNN/Opinion Research Corp. (November 2010), [www.pollingreport.com/trade.htm](http://www.pollingreport.com/trade.htm). (Telephone survey of 1,014 respondents, with a margin of error of 3 percentage points.)

<sup>3</sup> "International Trade/Global Economy," Polling Report (2011), CBS News and *New York Times* (April 2009), [www.pollingreport.com/trade.htm](http://www.pollingreport.com/trade.htm). (Survey of 998 respondents, with a margin of error of 3 percentage points.)

<sup>4</sup> "International Trade/Global Economy," Polling Report (2011), NBC News and *Wall Street Journal* (September 2010), [www.pollingreport.com/trade.htm](http://www.pollingreport.com/trade.htm). (Survey covered 1,000 respondents, with margin of error of 3.6 percentage points). Also, "Americans Are of Two Minds on Trade," Pew Research Center, Nov. 9, 2010, [www.pewresearch.org/pubs/1795/poll-free-trade-agreements-jobs-wages-economic-growth-china-japan-canada](http://www.pewresearch.org/pubs/1795/poll-free-trade-agreements-jobs-wages-economic-growth-china-japan-canada).

<sup>5</sup> See "Jobs on Another Shore," by David T. Coe, *Finance and Development*, International Monetary Fund, vol. 45, no. 1, 2008, pp. 48–51, [www.imf.org/external/pubs/ft/fandd/2008/03/pdf/coe.pdf](http://www.imf.org/external/pubs/ft/fandd/2008/03/pdf/coe.pdf), and *International Trade: Free, Fair and Open?* by Patrick Love and Ralph G. Lattimore, Paris: OECD Publishing, 2009, [www.oecd-ilibrary.org/trade/international-trade\\_9789264060265-en](http://www.oecd-ilibrary.org/trade/international-trade_9789264060265-en).

<sup>6</sup> "Free Trade: Why Are Economists and Noneconomists So Far Apart?" by William Poole, *Federal Reserve Bank of St. Louis Review*, vol. 86, no. 5, 2004, pp. 1–6, [www.research.stlouisfed.org/publications/review/04/09/Poole.pdf](http://www.research.stlouisfed.org/publications/review/04/09/Poole.pdf).

<sup>7</sup> See note 6.

<sup>8</sup> See "Americans Are of Two Minds on Trade," note 4.

<sup>9</sup> "China Seen Overtaking U.S. as Global Superpower," Pew Global Attitudes Project, Pew Research Center, July 13, 2011, [www.pewglobal.org/2011/07/13/china-seen-overtaking-us-as-global-superpower/6/](http://www.pewglobal.org/2011/07/13/china-seen-overtaking-us-as-global-superpower/6/). (Survey respondents were queried in face-to-face and telephone interviews; the margin of error varies from 2.5 to 5 percentage points, depending on the nation where the survey was conducted. Margins of error also reflect that certain types of households, such as those without phones, were not included in the surveys of some countries.)

<sup>10</sup> See note 9.

<sup>11</sup> "Half of Americans Report Job Hunting Is More Difficult than a Year Ago," RBC Consumer Outlook Index, Ipsos, March 31, 2011. Also see "Americans' Top Job-Creation Idea: Stop Sending Work Overseas," by Frank Newport, Gallup, March 31, 2011. Discrepancies with previous surveys are likely explained by the limited selection of answers available in this poll as well as invocation of country-specific "trade ties" as opposed to the open-ended expression "trade."

<sup>12</sup> See note 9.

<sup>13</sup> See note 9 and *CIA World Factbook 2011*, [www.cia.gov/library/publications/the-world-factbook/index.html](http://www.cia.gov/library/publications/the-world-factbook/index.html).

<sup>14</sup> "Ipsos Global Advisory: The Economic Pulse of the World," December 2010, and "World Publics Welcome Global Trade—But Not Immigration," Pew Research Center-Pew Global Attitudes Project, Oct. 4, 2007, [www.pewglobal.org/2007/10/04/world-publics-welcome-global-trade-but-not-immigration/](http://www.pewglobal.org/2007/10/04/world-publics-welcome-global-trade-but-not-immigration/).

<sup>15</sup> See note 13.

<sup>16</sup> See "Americans Are of Two Minds on Trade," note 4.

<sup>17</sup> See "Americans Are of Two Minds on Trade," note 4.

<sup>18</sup> See *Finest Quotes, Globalization Quotes* (John Naisbitt), 2011, [www.finestquotes.com/select\\_quote-category-globalization-page-0.htm](http://www.finestquotes.com/select_quote-category-globalization-page-0.htm).

# Summary of Activities 2011

The Globalization and Monetary Policy Institute continued to build strength in important research areas and contribute to the study of international economics during 2011. The institute marked a milestone with the issuance of the 100th paper in its working paper series, the institute's core business product. Submissions originate from permanent staff in Dallas as well as from a global network of research associates and senior fellows. A major initiative in 2011 was the creation of an annual public lecture on globalization and monetary policy. Jürgen Stark, an outgoing member of the executive board of the European Central Bank (ECB), delivered the inaugural lecture, "Globalization and Monetary Policy: From Virtue to Vice?" on Nov. 29.

## Academic Research

Jian Wang's paper "The Taylor Rule and Forecast Intervals for Exchange Rates" (with Jason J. Wu) was accepted for publication by the *Journal of Money, Credit and Banking*. Two papers by Alexander Chudik were accepted. "Econometric Analysis of High Dimensional VARs Featuring a Dominant Unit" (coauthored with M. Hashem Pesaran) will appear in *Econometric Reviews*. "And Then Current Accounts (Over)Adjusted" (with Michele Ca' Zorzi and Alistair Dieppe) was published in *Empirical Economics*. Scott Davis' paper "International Real Business Cycles with Endogenous Markup Variability" was published in the *Journal of International Economics*. At year-end, institute staff had papers under review at the *American Economic Journal: Macroeconomics*, the *Journal of Economic Dynamics and Control*, the *Journal of International Economics*, the *Journal of International Money and Finance*, the *Journal of Econometrics*, *Economics Letters*, the *Journal of Applied Econo-*

*metrics*, the *Review of Economics and Statistics* and the *Journal of Money, Credit and Banking*.

## Conferences

The institute sponsored three conferences during the year. The main research conference—"Microeconomic Aspects of the Globalization of Inflation"—was cosponsored with the Swiss National Bank and held Aug. 19–20 in Zurich. It featured presentations by researchers from the Paris School of Economics, the U.S. Bureau of Labor Statistics, the Graduate Institute Geneva, Brandeis University, Pennsylvania State University, Central European University, the Federal Reserve Bank of New York and the Board of Governors of the Federal Reserve System.

The institute also cosponsored the 10th annual "Advances in Econometrics Conference: Dynamic Stochastic General-Equilibrium Modeling" with the economics department at Southern Methodist University. Held Nov. 4–6 on the SMU campus in Dallas, the conference featured presentations by researchers from the Federal Reserve Banks of Dallas and Kansas City, Chiba Keizai University, the University of Padova, the University of Kiel, the University of California at Irvine and Boston University. A third conference, "Immigration Policy in an Era of Globalization," was cosponsored with SMU's Tower Center for Political Studies and included migration scholars from the University of Sydney, Oxford University, the University of Toronto, Stockholm University, the University of California, the University of Texas at Austin, SMU and the Dallas Fed, among others. Synopses of the three conference proceedings follow this summary.

As in previous years, institute staff presented work in a variety of external forums. In 2011, staff

members gave seminars before the Fed's Board of Governors and at Bowling Green State University, the Federal Reserve Bank of Cleveland, the European University Institute, Banque de France, Fudan University, the Hong Kong Institute for Monetary Research, the University of Kansas, Université Laval, Shanghai University of Finance and Economics, Shanghai Institute of Law and Finance, Sveriges Riksbank and Texas A&M University.

Staff members also presented their work at major professional conferences, including the American Economic Association annual meeting, the Canadian Macroeconomics Study Group, the Seventh Dynare Conference, the Econometric Society North American summer meeting, European Economic Association and Econometric Society meetings, the International Economic Association World Congress, the Midwest Macroeconomics Meetings, the Shanghai Macroeconomics Workshop, the Society for Computational Economics meeting, Southern Economic Association meetings, the Spanish Economic Association annual meeting and Western Economic Association meetings. Davis organized a session at the Midwest Macroeconomics Meetings on "Trade and Real Exchange Rates." Enrique Martínez-García chaired sessions at the Western Economic Association and European Economic Association meetings.

In addition to gatherings of major professional societies, staff members participated in a variety of one-off conferences. Simona Cociuba presented her paper, "Financial Intermediation, Risk Taking and Monetary Policy," at the second Bank for International Settlements Consultative Council for the Americas Conference in May. Davis presented "Financial Integration and International Business Cycle Co-Movement: The Role of Balance Sheets" at an October conference in Paris that was jointly

sponsored by Banque de France, the Centre for Economic Policy Research, the *American Economic Journal: Macroeconomics*, the Paris School of Economics and the European Center for Advanced Research in Economics and Statistics.

Anthony Landry discussed a paper on exchange rate pass-through at the Price Dynamics Conference at the University of Chicago's Milton Friedman Institute in February. Ananth Ramanarayanan presented "Imported Inputs and International Trade Dynamics" at the University of Warwick's International Trade Research Day in February and a second paper, "Default and the Maturity Structure in Sovereign Bonds," at the Wharton School of Business conference on "Sovereign Debt Risk" in April. Wang presented "The Effects of News About Future Productivity on International Relative Prices: An Empirical Investigation" at the ECB-Bank of Canada conference on "Exchange Rates and Macroeconomic Adjustment" in June.

### Bank Publications

Institute staff contributed seven articles to the Dallas Fed's *Economic Letter* publication in 2011: "With Reforms in China, Time May Correct U.S. Current Account Imbalance" (Wang), "Upstream Capital Flows: Why Emerging Markets Send Savings to Advanced Economies" (Cociuba), "Will China Ever Become as Rich as the U.S.?" (Mark Wynne), "Distance and the Impact of 'Gravity' Help Explain Patterns of International Trade" (Ramanarayanan), "The Sluggish Recovery from the Great Recession: Why There Is No 'V' Rebound This Time" (Wynne), "How the U.S. Tax System Stacks Up Against Other G-7 Economies" (Landry) and "Relating Commodity Prices to Underlying Inflation: The Role of Expectations" (Davis). Wang contributed a paper on "Exchange Rate

Pass-Through into U.K. Import Prices: Evidence from Disaggregated Data” to the Dallas Fed’s *Staff Papers* series.

In addition, Martínez-García and Adrienne Mack created a database on international house prices ([www.dallasfed.org/institute/houseprice/index.cfm](http://www.dallasfed.org/institute/houseprice/index.cfm)), accessible to researchers and updated on a regular basis. (See “A Cross-Country Quarterly Database of Real House Prices: A Methodological Note,” by Martínez-García and Mack, institute Working Paper no. 99, 2011.)

### People

Horst Köhler, president of the Federal Republic of Germany from 2004 to 2010 and head of the International Monetary Fund from 2000 to 2004, became a member of the institute’s advisory board effective May 24. Michael Bordo, professor of economics at Rutgers University, joined as a senior fellow.

The institute added 11 new research associates: Saroj Bhattacharai (Pennsylvania State University), Peter Egger (Swiss Federal Institute of

Technology Zurich), Mina Kim (Bureau of Labor Statistics), Julien Martin (Paris School of Economics), Dimitra Petropoulou (University of Oxford), Attila Rátfai (Central European University), Kim Ruhl (New York University), Filipa Sá (University of Cambridge), Tomasz Wieladek (London Business School), Hakan Yilmazkuday (Florida International University) and Jianfeng Yu (University of Minnesota).

Staff members Cociuba and Ramanarayanan left the Dallas Fed to become assistant professors in the economics department at the University of Western Ontario. Chudik, who earned a PhD from Cambridge University in 2008 and previously worked at the ECB, arrived in late November.

Landry won a prestigious Fernand Braudel Senior Fellowship for spring 2011 to the European University Institute in Florence, Italy. The Braudel Fellowship is highly competitive and provides a framework for established academics with an international reputation to pursue their research in this world-class program.

# Annual Public Lecture

Jürgen Stark, then-member of the executive board of the European Central Bank (ECB), delivered the Globalization Institute's inaugural public lecture on Nov. 29, 2011.

The purpose of this new lecture series is to present prominent policymakers who address an aspect of the relationship between globalization and monetary policy. Stark's lecture, "Globalization and Monetary Policy: From Virtue to Vice?" explored the many ways that globalization has both simplified and complicated the work of central bankers.

Stark warned that some of the measures implemented in response to the financial crisis pose dangers to the process of globalization and stressed the importance of having in place what he termed "robust" monetary policy frameworks. A critical component of such frameworks will be a commitment to price stability as the primary deliverable of central banks, as will central bank

independence and a medium-term orientation for monetary policy.

## About Jürgen Stark

Jürgen Stark was a member of the executive board and governing council of the ECB before stepping down at the end of 2011. Prior to joining the ECB, he was vice president of Deutsche Bundesbank, responsible for European and international affairs. He has held numerous positions in the German Ministry of Economics and Ministry of Finance and has represented Germany at the G-7 and G-8 Economic Summits and in various trade talks. He serves as a member of the Economic and Financial Committee of the European Union. In 2005, he was named honorary professor at Eberhard Karls University in Tübingen, Germany. Stark studied economics at both the University of Hohenheim and Eberhard Karls, where he received his doctorate in economics in 1975.



Jürgen Stark



Jürgen Stark of the European Central Bank gave the Dallas Fed's inaugural public lecture in November. He was joined by Mark Wynne (left), head of the Globalization and Monetary Policy Institute, and Dallas Fed President Richard Fisher.

# Microeconomic Aspects of the Globalization of Inflation:

*A Joint Conference with the Swiss National Bank*

The Globalization and Monetary Policy Institute hosted “Microeconomic Aspects of the Globalization of Inflation,” a joint conference with the Swiss National Bank on Aug. 19–20 in Zurich. The conference brought together researchers to examine how globalization affects pricing, exploring in greater detail some of the issues raised by Auer and Fischer (2010), as well as to increase understanding of how price dynamics unleashed by globalization affect the measurement of fundamental determinants of improved living standards over time.

Organizers were Raphael Auer and Andreas Fischer of the Swiss National Bank, Peter Egger of the Swiss Federal Institute of Technology and Mark Wynne of the Federal Reserve Bank of Dallas. Presenters included researchers from the Paris School of Economics; the U.S. Bureau of Labor Statistics; The Graduate Institute, Geneva; Brandeis University; Pennsylvania State University; Central European University; the Federal Reserve Bank of New York; and the Board of Governors of the Federal Reserve System. Paper discussants were drawn from a similarly diverse set of institutions, including the University of Warwick, the University of Zurich, the Federal Reserve Banks of Dallas and Atlanta, the University of Frankfurt and New York University.

The extent to which changes in exchange rates pass through to import prices—and from import prices to final goods prices—is a key determinant of the international transmission of inflation. Furthermore, the extent of pass-through is critically important to the conduct of monetary policy in an open economy. When pass-through is complete, optimal monetary policy entails focusing on the domestic output gap and domestic inflation. However,

when pass-through is incomplete, optimal monetary policy needs to take into account exchange rate misalignments.

Identifying the extent of pass-through is challenging econometrically. Several of the papers at the conference used novel approaches to produce improved estimates and found a greater degree of pass-through than in previous studies. One key determinant of this pass-through is the choice of currency in which imports are invoiced. If imports are priced in the currency of the supplier, (short run) pass-through will be higher than if they are priced in the currency of the importer.

A common theme of the papers presented was the use of detailed microdata to shed new light on important macro or aggregate questions. Indeed, all of the papers used microdata with varying degrees of fineness to address different questions. Two papers dealing with measurement issues used such data to construct alternatives to official price indexes to quantify the extent of the biases in these indexes due to globalization. And two papers that addressed questions from a general-equilibrium perspective illustrated how such a perspective can shed new light on old relationships.

## **The Extent and Determinants of Pass-Through**

Julien Martin of the Paris School of Economics began the conference with “Globalization of Inflation: Micro Evidence on the Imported Input Channel.” One of the most prominent aspects of globalization is the increased vertical specialization of production. Intermediate inputs once produced in-house or sourced domestically are increasingly

obtained from low-cost overseas suppliers. What happens when the prices of these imported intermediate inputs change? How are they transmitted to final goods prices? Is the pass-through one-for-one or smaller? Pass-through would be expected to be less than one-for-one to the extent that imported intermediate inputs are just a single cost among many (others include labor, capital and domestic inputs) and firms can substitute between imported and domestic inputs. Martin reported that he used a unique French dataset for some 500 French manufacturing firms that allowed him to match the cost of imported intermediate inputs with the price of the final product made by each firm from 2005 to 2010.

Martin's key finding was that the pass-through from imported intermediate inputs to final goods prices was only 0.12. When the cost of imported intermediate inputs rises 1 percent, the price of the final product made using these inputs (whether sold domestically or exported) rises 0.12 percent. But a significant amount of international trade is between related parties; that is, between domestic parents and foreign subsidiaries or affiliates. Interestingly, Martin found that the pass-through was lower for inputs purchased from related parties. He also found no evidence of asymmetry in pass-through: Import price declines were passed through at the same rate as import price increases.

The aspect of globalization that has perhaps attracted the most attention and generated the most concern in some quarters is China's increasingly important role in global trade. In 1974, U.S. imports from China amounted to just less than \$123 million. By 2010, such imports totaled \$383 billion, accounting for about one-fifth of all U.S. imports that year, and China had become the most important source of imports to the United States.

The conference's second paper, presented by Mina Kim of the U.S. Bureau of Labor Statistics (and coauthored with Deokwoo Nam of City University of Hong Kong, Jian Wang of the Federal Reserve Bank of Dallas and Jason Wu of the Federal Reserve's Board of Governors) was a case study of how change



Conference discussions continue over lunch.

in China's exchange rate policy in 2005 showed up in the prices of U.S. imports from China. Kim said she and her coauthors used a detailed, monthly goods-level dataset on the prices of U.S. imports from and exports to China between September 1993 and March 2011 to document aspects of trade between the two countries.

First, they found that growth in the volume of imports from China has come from a greater range or variety of products rather than simply more of an existing set of products. That is, most of the trade growth has occurred along the extensive rather than the intensive margin. Second, they noted that almost all imports from and exports to China are invoiced in dollars rather than yuan. For imports, the share invoiced in dollars increased from a low of about 97 percent around the turn of the century to 99 percent or more in recent years. All U.S. exports to China were invoiced in dollars until 2009, when the euro was used for a small share of exports. Third, the authors found significant stickiness in the prices of U.S. imports from China, with prices remaining unchanged for about 11 months on average. But there was some evidence that prices became less sticky after abandonment of the renminbi's peg to the dollar in 2005. Finally, they used the microdata to estimate pass-through from changes in the exchange rate to import prices and found that short-run pass-through was about 0.2, while long-run pass-through was about 0.8 (comparable to estimates reported by Auer 2010).

As noted earlier, the choice of currency in which to invoice imports is a key determinant of pass-through. This was the subject of the third paper, “Micro, Macro and Strategic Forces in International Trade Invoicing,” presented by Cédric Tille of the Geneva Graduate Institute for International and Development Studies. Tille and coauthor Linda Goldberg of the Federal Reserve Bank of New York used a highly disaggregated dataset on all Canadian imports between February 2002 and February 2009 to uncover a number of new stylized facts about the determinants or correlates of which currency is used to invoice imports. While most Canadian imports come from the U.S. and are invoiced in U.S. dollars, Tille and Goldberg found that larger transactions were more likely to be invoiced in the importer’s currency. They hypothesized that one possible implication is that a shift in the structure of importing from large numbers of small importers to small numbers of larger ones (such as Wal-Mart, for example) might lead to greater use of the importers’ currency for transactions and, thereby, to less exchange rate pass-through to import prices.

The fourth paper, “The Origin of Exchange Rate Shocks, Market Structure, and Pass Through,” presented by Raphael Schoenle of Brandeis University, investigates the importance of variation in firms’ markups as an explanation for incomplete long-run pass-through. Schoenle said he and coauthor Auer started by decomposing bilateral exchange-rate movements between the U.S. and its trading partners into two components, the first capturing the dollar against all currencies except that of the specific trading partner and the second capturing the currency of the specific trade partner against the rest of the world.

The authors showed that pass-through rates of exchange rate movements to import prices are much higher for broad changes in the value of the dollar than they are for changes in the currency of a specific trade partner. They also showed that it is not the overall economic importance of a trade partner that matters for pass-through but, rather, the

importance of a trade partner in a specific sector. The greater the market share of a trade partner, the higher the long-run pass-through. For the specific case of China, they showed that the pass-through rate to U.S. import prices from changes in the trade-partner-specific U.S. dollar–renminbi exchange rate is 0.81 at the six-month horizon and 1 at the 12-month horizon.

### Importance of a General-Equilibrium Perspective

Pass-through regressions can be controversial. Like all single-equation regressions, pass-through regressions are susceptible to omitted-variable bias. Specifically, failure to control for the types of shocks hitting the economy may cause pass-through estimates derived from standard regressions to be upwardly or downwardly biased.

For example, suppose that the domestic economy is hit by an expansionary nominal (monetary) shock. This will typically cause the domestic currency to depreciate and drive up nominal wages, increasing the prices of domestic goods. A pass-through regression that fails to control for such shocks would yield downwardly biased estimates of the pass-through coefficient. Alternatively, suppose that the domestic economy is hit by a favorable technology shock. Such a shock will cause wages—and, thus, domestic prices—to fall. At the same time, for low values of the intertemporal elasticity of substitution, the currency will tend to depreciate and the standard pass-through regression will generate upwardly biased estimates of pass-through.

Saroj Bhattacharai’s presentation, “Exchange Rate Pass-Through in General Equilibrium,” examined the extent to which standard pass-through regressions are susceptible to bias by writing down a standard general-equilibrium model of a small open economy. Estimating the model using data for three small open economies (Australia, Canada and New Zealand), he found in all three cases that long-run pass-through is complete, in contrast to findings in the regression literature.

“The Geography of Consumer Prices,” presented by Attila Rátfai (and coauthored with Ádám Reiff of Magyar Nemzeti Bank), also used a general-equilibrium model to shed new light on existing statistical studies. A seminal paper by Engel and Rogers (1996) estimates that the effective width of the U.S.–Canada border is 75,000 miles, based on a comparison of prices for the same goods in the U.S. and in Canada. Rátfai said he and Reiff first used data on the prices for 46 goods and services sold in both Hungary and Slovakia to estimate the effective width of the border between the two countries with the Engel and Rogers method and arrived at an estimate of 4,236 miles. They then calibrated a multiregion general-equilibrium model to the same data (with the feature that shopping at more distant locations is costlier to the consumer) and found that the implied width of the border fell to just 89 miles, or about 2.1 percent of what is estimated in the reduced-form regression. The paper argues that part of the reason the reduced-form estimate of the border effect is so distorted is that it “confounds the underlying border friction with the effect of lumpy and staggered price-setting.”

### Implications for Measurement

The last two papers examined potential implications of globalization for the measurement of macroeconomic aggregates. Accurate measurement of the macroeconomy is challenging in the best of times. These challenges are amplified when prices for individual goods and services rapidly change, and when there is a lot of churning of products (arrival of new models or varieties, disappearance of older ones).

The U.S. economy experienced a surge in productivity growth in the late 1990s (the so-called New Economy)—much of it attributed to innovation in the information technology sector. Benjamin Mandel’s paper, “Effects of Terms of Trade Gains and Tariff Changes on the Measurement of U.S. Productivity Growth” (Feenstra et. al 2011, coauthored with Robert Feenstra, Marshall Reinsdorf and Matthew Slaughter) argues that the Information Technology



Conference participants hear how globalization affects pricing.

Agreement (ITA) of the World Trade Organization caused the globalization of the IT sector to greatly increase after 1995. (The ITA eliminated all tariffs on IT goods globally in four stages between 1997 and 2000. The pact was signed by more than 50 countries, accounting for over 95 percent of world trade in ITA-covered products.)

With the extensive use of cross-border production networks in IT, these tariff reductions had an amplified effect on final prices. The concomitant of this was rapid declines in the prices of imported IT goods, which are not well-captured by the conventional import and export price indexes. Specifically, the conventional indexes overstate the true rate of price change because they fail to take proper account of substitution possibilities, changes in tariffs and, most importantly, increases in the variety of imports and exports over time. The failure to fully capture these price declines also has implications for the measurement of productivity. Mandel noted that, when properly measured, improvements in U.S. terms of trade can account for about one-eighth of the pickup in labor productivity growth that the U.S. experienced between 1996 and 2006, or one-fifth of the increase in total factor productivity growth over the same period.

Christopher Kurz presented the final paper,

“Offshoring Bias in U.S. Manufacturing: Implications for Productivity and Value Added” (Houseman et al. 2010, coauthored with Susan Houseman, Paul Lengermann and Mandel). It highlights a different bias in the official statistics associated with globalization—this one due to a shift of inputs to U.S. manufacturers from (relatively high-cost) domestic suppliers to (relatively low-cost) foreign ones. Price declines associated with this change were not captured by the official price indexes, with the result that import prices were overstated, Kurz said. The authors estimated that as a result of this bias in the official import price statistics, multifactor productivity growth in manufacturing was overstated by 0.1 to 0.2 percentage points from 1997 to 2007, while the growth of real value added was overstated by 0.2 to 0.5 percentage points.

### Conclusions

As with all research programs, progress made in addressing the questions posed at the conference raised more questions.

On the question of pass-through, the newer research using detailed price data suggests that long-run pass-through is a lot higher than previously estimated, although the empirical regularity between transaction size and choice of invoicing currency uncovered by Tille and Goldberg in the Canadian data suggests that pass-through may vary over time as market structures change. Given the critical importance of pass-through elasticity for the international transmission of inflation, further research on its determinants and magnitude is clearly warranted.

In the measurement area, while there has been a significant amount of work documenting problems with measures of consumer price inflation (see, for example, Wynne and Sigalla 1996, and Wynne and Rodriguez-Palenzuela 2004), relatively little is known about the extent of biases in measures of import and export prices. Yet official measures of such prices are known to be subject to the same sorts of biases that affect measures of consumer price inflation.

While the work of Houseman et al. (2010)

highlights the biases associated with sourcing intermediate goods overseas, it leaves for future research the potential biases associated with imported capital inputs and services. Cavallo and Landry (2010) point out the important role that imports of capital goods have played in U.S. productivity growth in recent decades but do not address the question of potential biases associated with shifting to low-cost producers of those goods. The limited information available on the prices of internationally traded services suggests the possibility of significant biases associated with the growth of services offshoring. Likewise, the biases associated with substitution possibilities and increased variety that Feenstra et al. (2011) investigate in the context of IT may also arise in other traded-goods sectors.

—Mark Wynne

### Note

Susanna Bosshard of the Swiss National Bank provided expert logistical support for the conference.

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# Immigration Policy in an Era of Globalization:

## *A Joint Conference with Southern Methodist University*

Migration is sometimes termed the “last frontier” of globalization. While markets such as those for goods and financial exchange are highly globalized, labor markets remain largely domestic. Only 3 percent of the world’s population have migrated from their country of birth. The paucity of migration means that large cross-country wage differentials persist, exacerbating global inequality. It also suggests that large gains from enhanced labor mobility remain possible.

In free societies, these advances largely accrue to migrants. And while natives typically benefit from migration, gains are distributed unequally.

Immigration policy can improve matters, though it often falls short. The inability of such policies in many cases to regulate migration, such as in the U.S., and to integrate migrants, which is the perception in much of Europe, has produced a divergence between desired and actual outcomes. In some cases, gaps have formed when a welcoming labor market, operating apart from the government, has employed foreigners and thus spurred illegal immigration. In other cases, immigrants have entered legally but failed to fully integrate, according to natives, decades after becoming permanent residents or naturalized citizens.

The evolving migration and integration experiences and policy gaps in a number of advanced industrial democracies were subjects of a 2011 Federal Reserve Bank of Dallas conference co-sponsored with the John Goodwin Tower Center for Political Studies at Southern Methodist University. The May 19–20 meeting convened academics in political science, sociology and economics from around the world.

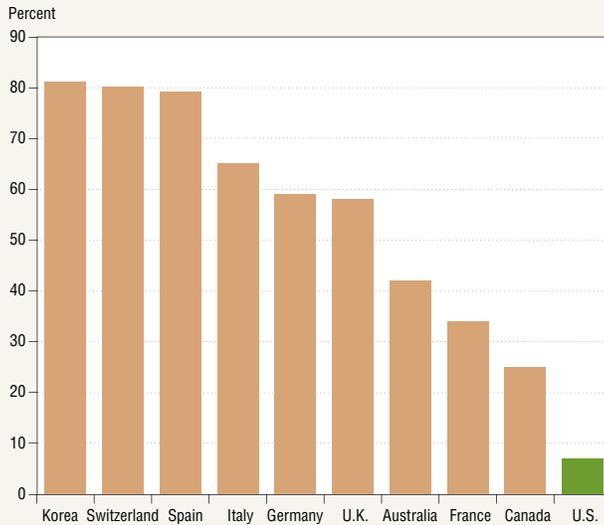
For the discussion, three groupings were identified: nations of immigrants, such as the U.S. and

Canada, which accept immigration as a founding ideal; countries of immigration, such as Germany and the United Kingdom, which host large, well-established immigrant populations; and latecomers, such as Japan and Korea, which are slowly opening up to migrants and coming to terms with an increasing need for foreign workers and policies governing such flows.<sup>1</sup>

### **Nations of Immigrants**

The U.S. is a “nation of immigrants” and prides itself on the idea that an enterprising individual can come to its shores and realize the American dream. Despite this ideal, there are relatively few visas available today for work-based immigrants. In their keynote address, Pia Orrenius, assistant vice president and senior economist at the Federal Reserve Bank of Dallas, and Madeline Zavodny, an economics professor at Agnes Scott College, explained how only 7 percent of permanent resident visas (“green cards”) go to employment-based applicants. The U.S. lets in a significantly smaller share of work-based permanent migrants than other Organization for Economic Cooperation and Development (OECD) developed countries (*Chart 1*), reserving the great majority of green cards for family and humanitarian migrants. Employment-based migration is managed through a complex system of temporary visas for high-skilled workers (such as H-1B, L-1 and TN visas) and low-skilled, seasonal workers (H-2A, H-2B visas), Orrenius and Zavodny noted. The system is limited by fixed visa quotas that are not responsive to the business cycle, do not prioritize high-skilled immigrants and are allocated on a first-come, first-served basis. In a typical year, thousands of would-be immigrants with high skills are turned

**Chart 1**  
**U.S. an OECD Outlier in Share of Permanent Work-Based Visas**



SOURCE: Organization for Economic Cooperation and Development, *International Migration Outlook 2011*.

away as the government runs out of visas; meanwhile, many of those with low skills simply enter the country illegally.

The U.S. population of unauthorized immigrants exceeded 11 million in 2010, according to speaker Philip L. Martin, a professor in the Agricultural and Resource Economics Department at the University of California, Davis.<sup>2</sup> In a 2010 poll, 73 percent of the U.S. public surveyed said they were dissatisfied with the immigration system, he said.<sup>3</sup> The financial crisis raised anti-immigrant sentiment, and recent immigration laws focus on enforcement, including expulsion of unauthorized entrants, rather than providing a path to legalized status or granting admission to more high-skilled immigrants.

In stark contrast to the U.S., Canada favors high-skilled individuals for admission under a point-based system, with public opinion supporting continued high levels of immigration, said another participant, Jeffrey G. Reitz, a sociology professor at the University of Toronto. In fact,

Canadians are more likely to view immigration as an opportunity, not a problem, than are members of the public in other OECD countries (*Chart 2*). Canadians also have a strong commitment to multiculturalism over traditional models of integration, Reitz said.

However, there may be cracks in the Canadian model. Despite having high education levels, more recent immigrants have lower employment rates than those from prior immigration waves and require more government assistance.

As a result, some observers have questioned the multiculturalist model and argued that immigrants must become more integrated. To better match immigrants to labor market opportunities, Reitz noted, the government has changed the point system to give greater preference to young immigrants with knowledge of official languages and experience in “shortage” occupations. The provincial nomination program gives provinces a say in immigrant selection, and the new “Canada experience class” allows temporary work-based migrants and foreign students to eventually seek permanent residence.

Australian immigration contains elements of the U.S. and Canadian experiences, said Stephen Castles, a research professor of sociology at the University of Sydney. Like the U.S., Australia has a long history of immigration, and like Canada, it has sought immigrants to help populate its vast nation. By using a points system geared toward skilled workers, Australia has brought in immigrants to permanently settle and quickly become citizens.

However, like the U.S., Australia has faced increasing security concerns following 9/11 and the Bali bombing in 2002. According to Castles, the media and politicians have raised public fears that Australia is about to be swamped by Indo-Chinese “boat people,” who arrive illegally. Many believe these migrants are trying to take advantage of asylum laws to receive government benefits. The opposition party has vowed, if elected, to decrease benefits to asylum seekers to help stem the flow.

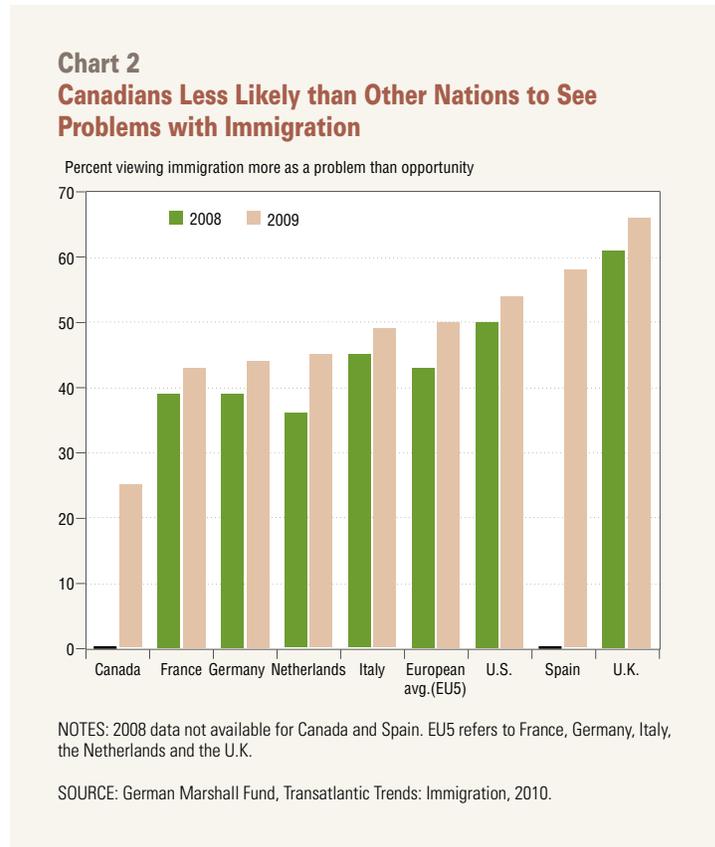
More recent migration policies focus on economically motivated temporary migrants rather than new groups of permanent settlers.

### Countries of Immigration

In her discussion of German immigration, Terri E. Givens, associate professor of government at the University of Texas at Austin, highlighted striking changes that have occurred over the past 50 years. In the 1960s, the German government implemented guest-worker programs to bring in temporary foreign labor to help fuel a booming economy. Many workers settled permanently but with mixed success. Decades later, for example, Turkish immigrants and their descendants still have relatively high rates of unemployment and welfare dependency.

More recently, German policy has focused on addressing two main policy gaps: integrating migrants and attracting more skilled immigrants, Givens said. In a landmark change, a 2000 naturalization law granted citizenship to the German-born children of legal immigrants. Meanwhile, a new visa targeted information technology workers from India and other skilled workers from outside the European Union. Both initiatives have had limited success. Muslim immigrants' purported failed integration has provoked criticism from high-level authorities such as Chancellor Angela Merkel, and an ensuing controversy over the multicultural model has kept in place a perception that Germany remains a reluctant immigration state. Meanwhile, admissions under the high-skilled work visa program have remained low.

Another country of immigration, the U.K., has also undergone dramatic change since the late 1990s, as described by Randall Hansen, who holds the Canada Research Chair in Immigration and Governance in the political science department at the University of Toronto. In the late '90s, the New Labour government made four decisions that marked a fundamental break with previous regimes and contributed to a massive increase in immigra-



tion. These were sharply increasing work permits issued; adding new, temporary labor migration programs and expanding existing ones; opening borders to newly added EU member states; and adopting an Australian-style points system.

Hansen argued the search for high-skilled labor had its analogues in the EU, but the U.K. was otherwise in a policy league of its own in Europe. Notably, there was no gap between intent and outcomes as the government deliberately sought out migrant labor. A divide later emerged as the recession-weary public became disenchanted with the meteoric rise in immigration and the new government, elected in 2010, promoted restrictive measures.

### Latecomers

The immigration experience in Japan and Korea is far removed from that of other developed countries, according to Erin Aeran Chung, the Charles D. Miller Assistant Professor of East Asian Politics at Johns Hopkins University. Both are

racially homogenous countries with low fertility rates, which creates tension between the need for workers and the desire to preserve national identity and culture. Governments in both nations put off formulating official immigration policies until very recently but left loopholes for coethnics and an industrial trainee program.

Operating without an official policy led to unintended consequences, as legal and illegal immigrants entered without laws to manage the flow. Industrial trainee programs were rife with employer abuse of migrants, and both countries experienced pro-immigrant backlashes as the plight of migrant workers came to light.

In Korea, the government passed workplace protections and new laws for naturalizing family-based migrants, particularly women who married Korean citizens. In Japan, the effort to protect immigrant rights was more decentralized, with many assistance programs and protections for immigrants championed at the local level through grassroots organizations. Local action produced a dramatic increase in the number of foreigners granted permanent residence, but few immigrants were given the opportunity to become citizens.

### Conclusion

Getting immigration policy right may be an elusive goal. With the possible exception of Cana-

da, the policy gaps and unintended consequences of immigration have produced a public opinion backlash. The impact of 9/11 and other terrorist attacks, combined with recent economic weakness, has heightened calls for strengthened national security, eroding faith in the multicultural model and pressuring governments to curb immigration. Yet not all immigrant-receiving nations have had the same experiences, and with economic growth increasingly concentrated outside traditional receiving countries, the future immigration debate may be more like the one in Japan and Korea than the familiar story playing out in Western Europe and North America.

—Pia Orrenius and Christina Daly

### Notes

<sup>1</sup> Other places covered by conference contributors but not summarized here included France, Italy, the Netherlands, Sweden, Denmark, Norway, Switzerland and the European Union. Conference papers will be published in the third edition of “Controlling Immigration: A Global Perspective,” Palo Alto, Calif.: Stanford University Press, forthcoming.

<sup>2</sup> Estimates of the unauthorized population are based on “Unauthorized Immigrant Population: National and State Trends, 2010,” by Jeffrey Passel and D’Vera Cohn, Pew Hispanic Center, Washington, D.C., 2011.

<sup>3</sup> “Poll Shows Most in U.S. Want Overhaul of Immigration Laws,” by Randal Archibold and Megan Thee-Brenan, *New York Times*, May 3, 2010. Data from *New York Times*/CBS News poll.

# Dynamic Stochastic General-Equilibrium Modeling:

## *10th Annual Advances in Econometrics Conference*

The Globalization and Monetary Policy Institute and economics department at Southern Methodist University cosponsored the 10th annual Advances in Econometrics Conference in 2011. The conference highlighted progress made in the development of dynamic stochastic general-equilibrium (DSGE) models for use in monetary policy analysis.

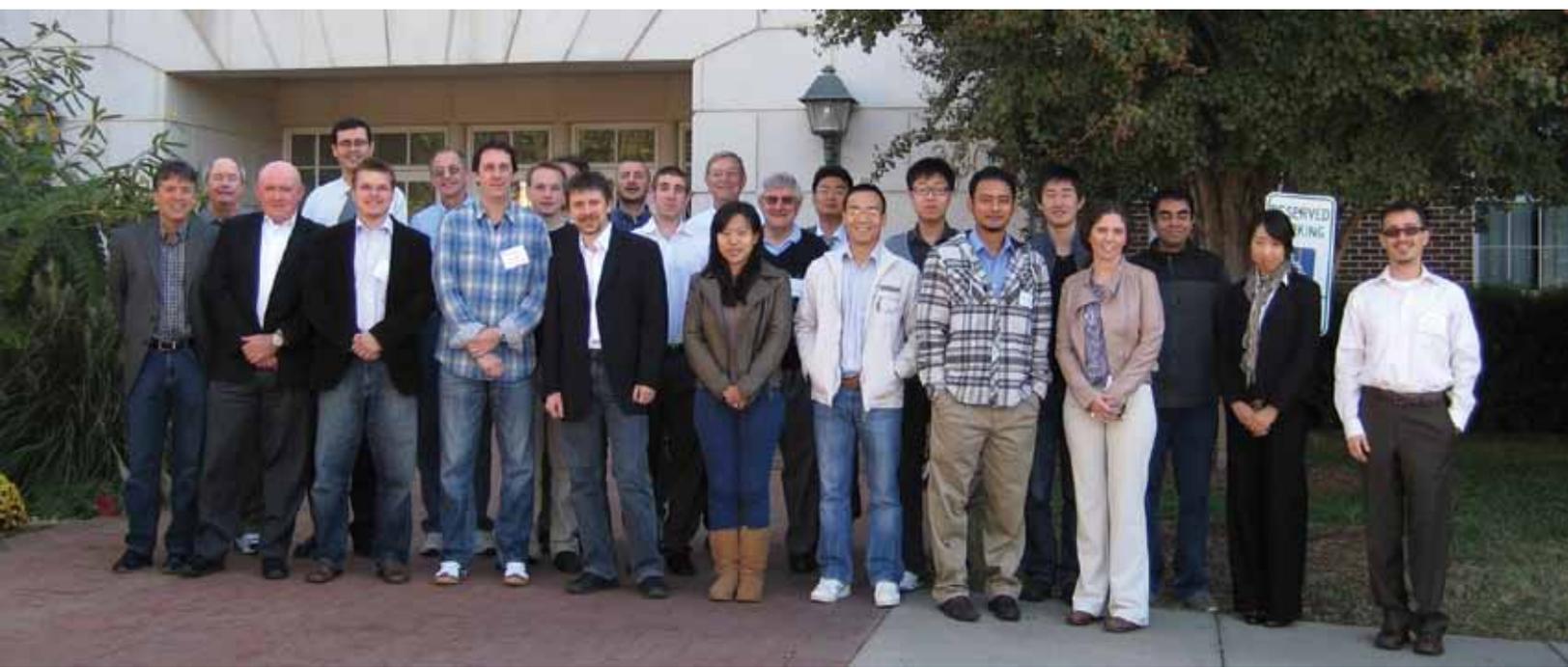
Held Nov. 4–6 on the SMU campus in Dallas, the event was organized by Nathan Balke and Tom Fomby of SMU and Mark Wynne of the Federal Reserve Bank of Dallas. It featured presentations by researchers from the Federal Reserve Banks of Dallas and Kansas City, Chiba Keizai University, the University of Padova, the University of Kiel, the University of California at Irvine and Boston University.

DSGE models have become an essential part of economists' empirical toolkit in recent years.

These models have their origins in the seminal contributions of Kydland and Prescott (1982) and Long and Plosser (1983), which revolutionized empirical macroeconomics.

Early models in what was first known as the “real business cycle” literature were driven by real shocks and did not feature the kinds of frictions that seem essential to understanding the role of monetary policy. Goodfriend and King (1997) and Clarida, Galí and Gertler (1999) showed how the basic real business-cycle framework could be augmented with imperfectly competitive product markets and Calvo price-setting to allow meaningful analysis of monetary policy within this class of general-equilibrium models.

Subsequent work by Christiano, Eichenbaum and Evans (2005) and Smets and Wouters (2007) laid the foundations for these models to become



Attendees at the conference, held on the SMU campus, reviewed progress made in development of DSGE models for monetary policy analysis.



Enrique Martínez-García of the Dallas Fed discusses NOEM models and Bayesian estimation.

the workhorse frameworks for policy analysis in most central banks.

### The Papers

The conference started with a presentation by Enrique Martínez-García on “NOEM Models and Bayesian Estimation: The Challenges that Lie Ahead?” (coauthored with Diego Vilán and Mark Wynne). This paper is part of a long-standing project of Martínez-García and Wynne that seeks to understand the potential role of global slack as a determinant of U.S. inflation dynamics.

In an earlier paper, Martínez-García and Wynne (2010) showed there is analytical content to the so-called global slack hypothesis, at least within the context of the widely used New Keynesian model. However, empirical support for the idea is fragile at best. Simple reduced-form regressions provide some support, but it would be preferable to evaluate the idea by taking a full structural model to the data.

In recent years, Bayesian techniques have become increasingly popular as a means of estimating structural DSGE models. In his presentation, Martínez-García examined how well such techniques estimate key model parameters by using the simple, stripped-down, two-country model in Martínez-García and Wynne (2010) to

generate artificial data and then applying the standard Bayesian techniques to assess how well they recover the (known) structural parameters.

The program’s second paper, “Inflation Rate and Nominal Exchange Rate Volatility Brought About by Optimal Monetary Policy Under Local Currency Pricing,” was presented by Eiji Okano of Chiba Keizai University in Japan. It sought to characterize the nature of optimal monetary policy in a globalized environment when firms engage in local currency pricing. Under producer currency pricing—that is, when firms set prices in the currency of the country in which production occurs—the prices of imported goods fully reflect exchange-rate movements. Under such circumstances, stabilizing domestic (or producer price index) inflation is the optimal monetary policy. However, when firms engage in local currency pricing, the law of one price no longer holds, and Okano showed that it is then optimal for central banks to stabilize consumer price inflation (which is closer to actual central bank practice).

U.S. inflation, as measured by annualized quarterly changes in the gross domestic product deflator, has ranged from lows of less than 1 percent in the late 1990s to highs exceeding 12 percent in the 1970s as the Great Moderation of the 1980s, 1990s and 2000s followed the Great Inflation of the 1960s and 1970s.

In “Fitting U.S. Trend Inflation: A Rolling-Window Approach,” the program’s third paper, Efram Castelnovo of the University of Padova in Italy examined how much of the variation in inflation was due to shocks to the long-run or trend inflation rate post-World War II. Castelnovo, using a closed-economy variant of the standard New Keynesian model Martínez-García and Okano employed in their presentations, decomposes inflation movements into components attributable to cost-push shocks, demand shocks, policy shocks and, finally, shocks to the monetary authority’s inflation target or trend inflation rate. His main finding is that shocks to trend inflation account for a significant

amount of the variation in inflation and the federal funds rate over the period studied.

All models are imperfect approximations of reality, with varying degrees of success in accounting for observed data series. When economists have two alternative models that can account for what is observed in reality, is there a way to choose between them? The fourth paper, “Model Comparison in Market Behaviors: A Formal Test to New Keynesian Three-Equations and Structural Stochastic Volatility Models,” by Tae-Seok Jang of the University of Kiel in Germany, illustrated the model comparison developed by Hnatkovska, Marmer and Tang (2011) to test alternative specifications of the basic New Keynesian model and alternative models of structural stochastic volatility. Jang shows that while the hybrid New Keynesian model (i.e., the model augmented to include price indexation) fits U.S. data better during both the Great Inflation and Great Moderation periods than a purely forward-looking version of the model, the Hnatkovska, Marmer and Tang test finds the differences are not statistically significant.

One of the most important drivers of progress in economic research has been the revolution in computing power over the past two decades. Economists can build ever-more detailed mod-

els that are subsequently evaluated numerically on computers. Many steps in this process have been automated, thanks to the development of sophisticated software packages. However, a crucial first step in many cases is making a model stationary, a step still dependent on old-fashioned pencil-and-paper techniques. In his presentation “(Log) Linear Approximation of Stochastic Growth Models: Why Scratch the Right Ear with the Left Hand?” Martin Fukac of the Federal Reserve Bank of Kansas City (coauthor with Jaromír Beneš of the International Monetary Fund) argued that this initial step is in many cases unnecessary if the model exhibits the balanced growth property.

Fabio Milani of the University of California at Irvine presented “Expectations Formation and Monetary DSGE Models: Beyond the Rational Expectations Paradigm,” coauthored with Ashish Rajbhondari, also of UC-Irvine. The paper explored the consequences of departing from the strong form of the rational expectations hypothesis (wherein economic agents incorporate all available information in forming their expectations and are certain about the model’s structure) in the standard New Keynesian model. Milani showed how allowing for news shocks, learning and using direct measures of expectations from surveys can improve the fit and



Participants heard that new models are needed to explain the financial system’s impact on the real economy and to better define international trade and financial linkages.

forecasting performance of the model.

The final presentation, “Frequency Domain Analysis of Medium Scale DSGE Models with Applications to Smets and Wouters (2007),” by Denis Tkachenko (coauthor with Zhongjun Qu of Boston University) examined the issues of parameter identification, estimation and inference in DSGE models.

In a related paper, Qu and Tkachenko (2010) provide necessary and sufficient conditions for local identification of the parameters of medium-scale DSGE models, and in his presentation, Tkachenko illustrated the method with the widely used and cited Smets–Wouters model. Echoing some of the key points of Martínez-García’s presentation that opened the conference, the paper derived the nonidentification curves for the Smets–Wouters model and showed which parameters must be fixed or calibrated to achieve local identification.

Tkachenko also showed how parameter estimates and impulse-response functions can differ significantly when the model is estimated using data at business-cycle frequencies as opposed to the full spectrum. To the extent that most DSGE models are designed to understand the business cycle, omitting data at low and very high frequencies when estimating the model might be desirable.

### Conclusions

The conference confirmed that New Keynesian DSGE models are useful tools for understanding business fluctuations in closed and open economies and also for thinking about important monetary policy questions. However, the current models have nothing to say about how the financial system impacts the real economy; given the events of the past few years, that must now be a top priority for research. Also, to date, there have been relatively few attempts to develop open-economy versions of these models (Erceg, Guerrieri and Gust 2006 being a notable exception). With globalization defining the environment in which

monetary policy is now made, models that take seriously international trade and financial linkages will be crucial to the policy process.

—Mark Wynne

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### Tomasz Wieladek

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### Hakan Yilmazkuday

Florida International University

### Jianfeng Yu

University of Minnesota

## New Economist



### Alexander Chudik

is a PhD graduate of the University of Cambridge, where he did research under the supervision of Professor Hashem Pesaran. His main research interests lie in open-

economy macroeconomics, international finance and econometrics. He has worked on a variety of topics, including macroeconomic modeling with a global perspective, transmission of shocks in high-dimensional systems, cross-section dependence, aggregation, global imbalances and exchange rate determination. Prior to joining the Globalization and Monetary Policy Institute in November 2011, Chudik was an economist in the international policy analysis division of the European Central Bank, where he focused on global systemic economic and financial issues. He also worked at the International Monetary Fund and ING Bank.

## New Colleagues

(continued)

### New Senior Fellow



**Michael Bordo** is professor of economics and director of the Center for Monetary and Financial History at Rutgers University. He has held previous academic positions at the University of

South Carolina and Carleton University in Ottawa, Canada. He has been a visiting professor at the University of California, Los Angeles; Carnegie Mellon University; Princeton University; Harvard University; and Cambridge University, where he was Pitt Professor of American History and Institutions.

Bordo has been a visiting scholar at the International Monetary Fund, Federal Reserve Banks of St. Louis and Cleveland, the Federal Reserve Board of Governors, the Bank of Canada, the Bank of England and the Bank for International Settlements. He also is a research associate of the National Bureau of Economic Research.

He has published many articles in leading journals and 10 books on monetary economics and monetary history. He is editor of a series of books for Cambridge University Press: *Studies in Macroeconomic History*.

He has a BA from McGill University, a MSc (economics) from the London School of Economics and a PhD from the University of Chicago.

### New Advisory Board Member



**Horst Köhler** served as the ninth president of the Federal Republic of Germany between 2004 and 2010. During his term, he not only was engaged in the domestic arena but also was committed to the field of foreign issues. He advocated a human dimension to globalization with clearly defined rules and was therefore a staunch

campaigner for poverty eradication and the African continent.

From 1976 until 1990, Köhler served in the Ministry of Economics, the State Chancellery, the Finance Ministry, the Policy Principles Directorate-General and the Finance and Credit Directorate-General. Appointed as state secretary in 1990, Köhler negotiated the German–German monetary union with the German Democratic Republic (GDR) leadership. Additionally, he achieved the agreement on the withdrawal of Soviet troops from the GDR. He was chief negotiator for the Maastricht Treaty on European Monetary Union, as well as the personal representative (sherpa) of Federal Chancellor Helmut Kohl for the World Economic Summits of the G-7.

In 1993, Köhler became president of the German Savings Bank Association and worked to create a modern image of the organization. He recognized the particular responsibility of the savings banks for small and medium-sized enterprises and for the social climate in the municipalities. He served as president of the European Bank for Reconstruction and Development in London from 1998 until 2000, when he was proposed as the new managing director of the International Monetary Fund in Washington, D.C. He acted in that position until his election as federal president in 2004.

Köhler obtained his doctorate from the University of Tübingen. His dissertation looked at the effect of technical advances on labor.

# Institute Staff, Advisory Board and Senior Fellows

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Recipient, 2004 Nobel Memorial Prize in Economic Sciences

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Thomas D. Cabot Professor of Public Policy, Harvard University

**Masaaki Shirakawa**

Governor, Bank of Japan

**William White**

Former Head of the Monetary and Economic Department, Bank for International Settlements

## **Senior Fellows**

**Marianne Baxter**

Professor of Economics at Boston University

**Michael Bordo**

Professor of Economics at Rutgers University

**W. Michael Cox**

Director of the O'Neil Center for Global Markets and Freedom at Southern Methodist University's Cox School of Business

**Mario Crucini**

Professor of Economics at Vanderbilt University

**Michael B. Devereux**

Professor of Economics at the University of British Columbia

**Charles Engel**

Professor of Economics at the University of Wisconsin–Madison

**Karen Lewis**

Joseph and Ida Sondheim Professor in International Economics and Finance at the University of Pennsylvania's Wharton School

**Francis E. Warnock**

Associate Professor of Business Administration at the Darden Graduate School of Business at the University of Virginia

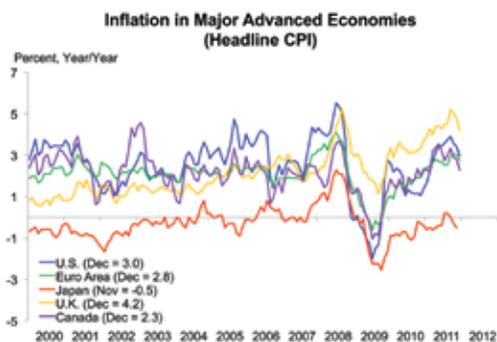
# Global Economic Data Resource Introduced in 2011

In February 2011, the Globalization and Monetary Policy Institute launched Global Economic Conditions, a weekly data presentation providing insight into world economic developments.

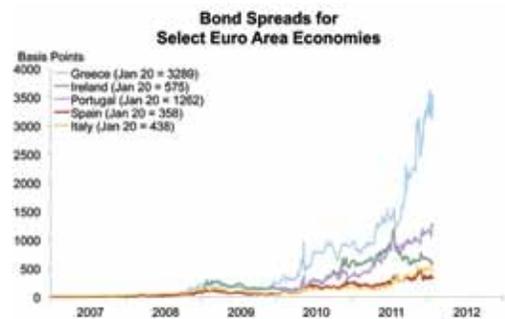
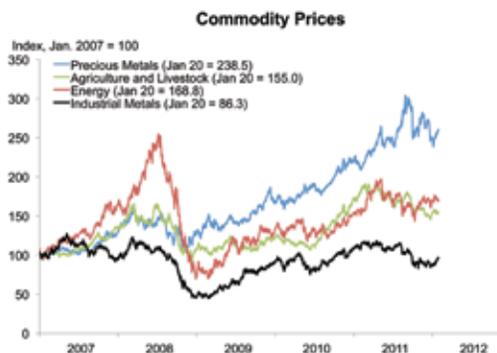
Global Economic Conditions provides broad-based and timely coverage of aggregate activity, including data on production, unemployment, inflation, international capital and commodity markets, public finances and monetary policy. It also examines current topics such as global current account balances and the euro-area sovereign debt crisis. The collection of charts (see examples below) tracks changes in key advanced and emerging markets and serves as a valuable resource for those seeking a comprehensive, data-driven assessment.

Global Economic Conditions is updated each Monday at 2 p.m. Central time and can be accessed through the institute's website: [www.dallasfed.org/institute/documents/global.pdf](http://www.dallasfed.org/institute/documents/global.pdf).

## Sampling of Charts in Global Economic Conditions



NOTE: This index measures purchasing managers' perspectives of current business conditions. An index value greater than 50 indicates economic expansion from the previous month, while a value below 50 indicates contraction.



NOTE: The chart shows the spread, or difference, in interest rates between 10-year government bonds for various countries and German 10-year government bonds.

