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Cross-Country Variation in the Anchoring of Inflation Expectations

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Abstract

This paper develops a method for measuring the anchoring of long-run inflation expectations that does not require estimates of long-run inflation expectations. Such estimates exist for only a few developed economies, and even then only a short time series is available. By not requiring estimates of long-term inflation expectations, this method is able to measure the anchoring of inflation expectations in sixty-four different developed and developing countries. In addition, with rolling-window estimations we can measure the anchoring of expectations across time within a country, and thus we can observe how inflation expectations became unanchored in many countries during the 1970s. Then we can observe how, through means like inflation targeting and monetary unification, these expectations were re-anchored during the 1980s, 1990s, and 2000s.

JEL codes: E31, E50, F40
Keywords: inflation expectations; learning; central bank credibility

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"Inflation feeds in part on itself, so part of the job of returning to a more stable and more productive economy must be to break the grip of inflationary expectations."
- Federal Reserve Chairman Paul Volcker, 1979

A better understanding of the role of inflation expectations in the price-setting process was the major development in the theory and practice of central banking to come out of the last half of the twentieth century. When a business sets prices that will remain fixed for several periods, they must factor in not only input costs today, but the expectation of those costs in the future. Similarly, when a worker signs a labor contract that stipulates his wages over the next few periods, he must factor in not only the cost of living today, but the expected cost of living over the life of the contract.

This leads to an interesting phenomenon where the expectation of higher prices in the future actually leads to higher prices. If businesses expect that high inflation in the future will mean that their future costs will increase, then they will attempt to compensate by raising their prices now. When workers expect consumer prices to increase in the future, they will attempt to compensate by demanding higher wages now. Both of these actions cause prices to increase today, so (all else equal) the expectation of higher prices actually leads to higher prices.

Thus, for a central bank, controlling inflation expectations is key for controlling inflation. Factors outside of the control of the central bank can always cause temporary fluctuations in inflation, but when these transitory movements in prices feed into inflation expectations, even a temporary shock can lead to long-term inflation.

Williams (2006) and Stock and Watson (2007) find that U.S. inflation is less responsive to its own lags now than in the 1970s. They argue this is because inflation expectations are better anchored now than they were in the 1970s, and therefore transitory fluctuations in inflation do not affect inflation expectations. Similarly, Blanchard and Gali (2007), Blanchard and Riggi (2009), and Evans and Fisher (2011) argue that the reason oil price shocks in the 1970s had a large effect on inflation but shocks of similar magnitude in the 2000s did not is because improved central bank credibility has served to better anchor inflation expectations. Leduc, Sill, and Stark (2007), Mehra and Herrington (2008), and Clark and Davig (2011) find that U.S. inflation expectations are much less volatile and much less responsive to macroeconomic news and commodity prices now than they were in the 1970s. Goodfriend and King (2005) examine public statements by Federal Reserve policymakers and the transcripts of Federal Open Market Committee (FOMC) meetings during the Volcker disinflation in the early 1980s and show that the Fed saw regaining credibility as the key step toward anchoring inflation expectations.

Gürkaynak, Sack, and Swanson (2005) find that in the U.S., long-run inflation expectations, proxied by far-forward Treasury yields, respond to macroeconomic news. Long-forward rates, which they argue are mainly composed of inflation expectations, should not respond to macroeconomic news if long-run inflation expectations are truly anchored. Gürkaynak, Levin, and Swanson (2006) do a similar exercise but compare the response of far-forward rates in the U.S., the U.K., and Sweden to macroeconomic news. They find that far-forward rates respond very little to news in inflation-targeting Sweden and respond the most in the U.S. Their sample contains data from the U.K. from both before and after the independence of the Bank of England. They find that far-forward rates from pre-independence U.K. behave more like those from the U.S., but far-forward rates from post-independence U.K. behave more like Sweden. Similarly Beechey, Johannsen, and Levin (2011) use far-forward inflation expectations derived from inflation swaps and find that far-forward inflation expectations in the U.S. are more sensitive to current macroeconomic news than far-forward expectations in a number of European countries.

Since inflation expectations are incorporated into wage and price setting, which then affect the price level in the future, the unanchoring of inflation expectations is closely related to the persistence of inflation. Benati (2008) estimates inflation persistence in many different countries across many different monetary regimes. He finds that inflation persistence was near zero in many of the countries on the gold standard, while he cannot reject the hypothesis that in many developed countries inflation followed a random walk throughout much of the post-World War II period. He finds that in the post-Volcker United States, inflation does not follow a random walk but the persistence parameter is positive and significant, while persistence is near zero in many inflation-targeting countries.

This paper measures the anchoring of long-run inflation expectations for as many as sixty-four developed and developing countries. Actual estimates of long-run inflation expectations exist for only a few developed economies and so are not available for most countries in this sample. This paper shows that by imposing the structure of a New Keynesian Phillips curve and assuming that inflation expectations follow the Kalman

learning process common in the Learning literature (Lansing 2009), it is possible to estimate the anchoring of inflation expectations with nothing more than a measure of observed inflation and a measure of economic slack.

This method has the obvious advantage that it allows us to estimate the anchoring of inflation expectations for a wide range of countries where actual estimates of long-term inflation expectations don't exist. In addition, for many countries, this anchoring parameter can be estimated across time with rolling windows, and thus it is possible to examine how the anchoring of inflation expectations changes in one country across time. With this, it is possible to observe how inflation expectations in many countries became unanchored in the 1970s, particularly following the 1973 oil shock. We then observe how inflation expectations were re-anchored in the United States in the early 1980s with the Volcker disinflation and in many other countries following their adoption of inflation targeting beginning in the 1990s.

1. MEASURING THE ANCHORING OF INFLATION EXPECTATIONS WITH ESTIMATES OF LONG-RUN INFLATION EXPECTATIONS

The anchoring of inflation expectations refers to how much inflation expectations change following an unexpected increase in inflation. If expectations are perfectly anchored, an unexpected increase in inflation today shouldn't affect expectations about inflation in the future, but if inflation expectations aren't perfectly anchored, future inflation expectations will increase following an unexpected increase in inflation today. Thus the anchoring of inflation expectations can be measured in the following regression:

$$E_t\left(\pi_{t+5,t+10}\right) - E_{t-1}\left(\pi_{t+5,t+10}\right) = \delta + \theta\left[\pi_{t-1,t} - E_{t-1}\left(\pi_{t-1,t}\right)\right] + \varepsilon_t \quad (1)$$

where $\pi_{t,t+i}$ is the rate of change in consumer prices between period t and period $t+i$. $E_t\left(\pi_{t+5,t+10}\right)$ measures the expected change in consumer prices between five years from today and ten years from today. This is referred to as the five-year-five-year-forward expected inflation rate and is a common measure of long-term inflation expectations, the expected rate of change in consumer prices that should hold over the long term, after fluctuations due to transitory shocks have washed out. $E_{t-1}\left(\pi_{t+5,t+10}\right)$ is the expected inflation rate over this same period taken one year ago, and therefore the dependent variable in this regression, $E_t\left(\pi_{t+5,t+10}\right) - E_{t-1}\left(\pi_{t+5,t+10}\right)$, measures the change in long-term inflation expectations over the past year.

Similarly, $\pi_{t-1,t} - E_{t-1}\left(\pi_{t-1,t}\right)$ measures the difference between the observed inflation rate over the past year and the expected inflation rate over that same period, the unexpected component of inflation. Thus, if inflation over the past year is one percentage point higher than expected, long-term inflation expectations would increase by θ percentage points.

This anchoring of inflation expectations, θ, can be estimated for the U.S. using estimates of inflation expectations computed by the Federal Reserve Bank of Cleveland and described in Haubrich, Pennacchi, and Ritchken (2011). This dataset contains measures of n year ahead inflation expectations for the U.S. for $n = 1, ..., 30$. Expectations are observed monthly from January 1982 to the present.

Table 1: Estimated Anchoring of U.S. Inflation Expectations Using the Cleveland Fed Inflation Expectations Data

	$1983-2007$	$1983-1989$	$1990-1999$	$2000-2007$
θ	0.178	0.278	0.175	0.080
	(0.018)	(0.032)	(0.037)	(0.033)
R^2	0.244	0.479	0.161	0.059
obs.	300	84	120	96

Estimates of θ in the U.S. from the 1980s to the present are presented in Table 1. The regression results show that over the period 1983-2007, the anchoring parameter θ was about 0.18, implying that if inflation turned out to be 1 percentage point higher than expected, people would raise their expectations for future inflation by 0.18 percentage points.

Estimating θ with subsamples of the data shows how inflation expectations in the U.S. have become much better anchored in recent years. When estimated using data from the last decade, θ is about equal to 0.08. As recently as the 1980s, the estimated value of θ was nearly 0.28, implying that when short-run inflation was 1 percentage point higher than expected, people would raise their expectations of inflation in the long run by nearly 0.28 percentage points.

The problem with this analysis is that the estimates of long-run inflation expectations are only available for the United States starting in the early 1980s. This dataset cannot be used to measure the dramatic

unanchoring of inflation expectations that took place in the 1970s and led to the Great Inflation. The results in Table 1 are specifically found using the Cleveland Fed's measure of inflation expectations that begins in 1982, but this limited availability is true for all measures of long-run inflation expectations. The Survey of Professional Forecasters measure of ten-year-ahead inflation expectations begins in 1978, and measures based on the spread between nominal and inflation-indexed bonds only go back about ten years.

In addition, many of the estimates of long-term inflation expectations are only available for the United States. Some comparable data are available for the U.K. from the mid-1980s. Inflation expectations for a wider range of countries can be found using data on inflation swaps, but these are only available from the mid-2000s. Unfortunately the estimates of long-term inflation expectations are not available to calculate the anchoring of inflation expectations across multiple countries and multiple time periods using the regression equation in (1).

2. MEASURING THE ANCHORING OF INFLATION EXPECTATIONS WITH A PHILLIPS CURVE REGRESSION

Imposing some structure from economic theory allows us to calculate the anchoring of inflation expectations without actually needing estimates of inflation expectations. For this, all we need is a measure of observed inflation and a measure of economic slack.

Assume that inflation is described by a forward-looking Phillips curve:

$$\pi_{t-1,t} = E_t\left(\pi_{t,t+1}\right) + \lambda y_t, \tag{2}$$

where y_t is a measure of slack in the economy, and for this analysis we use the growth rate in industrial production. In this New Keynesian Phillips curve, inflation is purely forward looking. Inflation today depends on the expected value of inflation next period and a measure of current slack in the economy.

In addition, assume that inflation expectations evolve according to the following functional form:

$$E_t\left(\pi_{t,t+1}\right) = E_{t-1}\left(\pi_{t-1,t}\right) + \gamma\left[\pi_{t-1,t} - E_{t-1}\left(\pi_{t-1,t}\right)\right]. \tag{3}$$

This functional form is standard in the macroeconomics literature (see Lansing 2009), and specifically, γ measures the responsiveness of inflation expectations to a surprise in current inflation. If inflation turns out to be 1 percentage point higher than expected, people will raise their expectations for future inflation by γ percentage points, hence the γ parameter in (3) is very similar to the θ parameter in (1): both measure the anchoring of inflation expectations.

Repeated substitution of the functional form in (3) into the Phillips curve in (2) results in the following:

$$\pi_{t-1,t} = (1-\gamma)^{N-1} E_{t-N-1}\left(\pi_{t-N-1,t-N}\right) + \sum_{n=1}^{N} \gamma\,(1-\gamma)^{n-1}\,\pi_{t-n-1,t-n} + \frac{\lambda}{1-\gamma} y_t.$$

If $\gamma > 0$, then for high values of N, $(1-\gamma)^{N-1} E_{t-N-1}\left(\pi_{t-N-1,t-N}\right) \to 0$. If $\gamma = 0$ and expectations are perfectly anchored, $E_{t-N-1}\left(\pi_{t-N-1,t-N}\right)$ is a constant. Regardless of the value of γ, for high values of N we can ignore the expectations term in this regression and are left with a purely backward-looking Phillips curve:

$$\pi_{t-1,t} = \alpha + \sum_{n=1}^{N} \gamma\,(1-\gamma)^{n-1}\,\pi_{t-n-1,t-n} + \frac{\lambda}{1-\gamma} y_t + \varepsilon_t. \tag{4}$$

In this model, inflation is described by a purely forward-looking New Keynesian Phillips curve in (2) where current inflation should depend on the expectation of inflation in the future, not on lagged values of inflation. However, inflation expectations are formed through a backward-looking learning process in (3), where the anchoring term γ determines the extent to which expectations of inflation in the future depend on observations of inflation in the past. The combination of the purely forward-looking Phillips curve with the backward-looking learning process implies that inflation can be described by a purely backward-looking process, where the anchoring term γ determines the extent to which observations of inflation today depend on observations of inflation in the past.

Cross-Country Differences in the Anchoring of Inflation Expectations

Estimates of the anchoring of U.S. inflation expectations from the Phillips curve regression in (4) are presented in Table 2. The regression is estimated using monthly data, and the time windows are intended to

match with the time windows used to calculate the anchoring of inflation expectations from the Cleveland Fed inflation expectations in Table 1. The tables show that the estimates of the anchoring of inflation expectations from the two different methods give very similar results. During the 1980s, when actual inflation was 1 percentage point higher than expected, U.S. inflation expectations would increase by about 0.25 percentage points. However, during the last decade, the change in inflation expectations was around 0.05 percentage points following the same surprise in current inflation.

Table 2: Estimated Anchoring of U.S. Inflation Expectations Using a Phillips Curve Regression

	$1983-1989$	$1990-1999$	$2000-2007$
γ	0.246	0.088	0.050
	(0.058)	(0.034)	(0.034)

Estimates of the anchoring of inflation expectations for sixty-four different countries are presented in Table 3. These estimates of the anchoring of inflation expectations are the values of γ from the Phillips curve regression in (4), using monthly data from 1996 to 2013. Inflation is the month-over-month change in the headline consumer price index (CPI) and the measure of slack is growth rate in industrial production. We include a total of $N = 24$ lags of inflation in the estimation.

Table 3: Estimated Anchoring of Inflation Expectations, Found Using the Coefficients From a Phillips Curve Regression with Headline Inflation, 1996-2013

	γ Coeff.	Std. Error		γ Coeff.	Std. Error
Brazil	0.819	(0.087)	Trinidad & Tobago	0.034	(0.026)
Argentina	0.685	(0.080)	Greece	0.030	(0.014)
Romania	0.684	(0.080)	Finland	0.030	(0.022)
Paraguay	0.588	(0.075)	U.K.	0.029	(0.022)
Colombia	0.503	(0.073)	India	0.028	(0.021)
Indonesia	0.486	(0.071)	Malaysia	0.028	(0.020)
Mexico	0.474	(0.072)	Slovakia	0.024	(0.020)
Serbia	0.447	(0.069)	Algeria	0.020	(0.016)
Israel	0.421	(0.069)	Croatia	0.016	(0.021)
South Africa	0.420	(0.069)	Japan	0.013	(0.021)
Turkey	0.384	(0.066)	Spain	0.011	(0.016)
Latvia	0.360	(0.064)	Korea	0.010	(0.017)
Lithuania	0.357	(0.064)	France	0.010	(0.019)
Ecuador	0.354	(0.064)	Iran	0.009	(0.006)
Poland	0.339	(0.064)	Portugal	0.007	(0.018)
Sri Lanka	0.296	(0.097)	Russia	0.006	(0.007)
Philippines	0.280	(0.058)	Armenia	0.004	(0.004)
Chile	0.233	(0.057)	Italy	0.004	(0.007)
Thailand	0.230	(0.056)	Luxembourg	0.002	(0.018)
Hungary	0.227	(0.055)	Bangladesh	0.001	(0.017)
China, PR	0.214	(0.050)	Tunisia	−0.001	(0.014)
Czech Republic	0.208	(0.051)	Jordan	−0.002	(0.021)
Nicaragua	0.200	(0.083)	Austria	−0.003	(0.017)
Panama	0.165	(0.048)	Taiwan	−0.007	(0.016)
Saudi Arabia	0.152	(0.053)	Canada	−0.007	(0.020)
Singapore	0.111	(0.043)	Norway	−0.008	(0.020)
Ireland	0.108	(0.039)	Macedonia	−0.010	(0.006)
Slovenia	0.059	(0.024)	U.S.	−0.017	(0.013)
Sweden	0.058	(0.034)	Gabon	−0.019	(0.008)
Pakistan	0.050	(0.025)	Denmark	−0.019	(0.011)
Netherlands	0.040	(0.023)	Germany	−0.020	(0.015)
Estonia	0.035	(0.008)	Belgium	−0.026	(0.010)

The results in the table are consistent with prior intuition about the credibility of different national central banks and the anchoring of inflation expectations in different countries. The countries with the most-anchored inflation expectations are inflation-targeting countries like Canada and Norway. The anchoring coefficient γ is not significantly different from zero for ten of the original twelve euro-area countries. At the

other end of the spectrum, countries like Brazil, Argentina, Romania, and Paraguay, have the least-anchored expectations.

The estimates of the anchoring of inflation expectations in Table 3 are found using the month-over-month change in the headline CPI as the preferred measure of inflation. Table 4 presents estimates of the anchoring of inflation expectations where instead the preferred measure of inflation is the month-over-month change in the core CPI.

Table 4: Estimated Anchoring of Inflation Expectations, Found Using the Coefficients From a Phillips Curve Regression With Core Inflation, 1996-2013

	γ Coeff.	Std. Error		γ Coeff.	Std. Error
Argentina	0.929	(0.092)	Denmark	0.031	(0.024)
Brazil	0.907	(0.092)	Norway	0.029	(0.024)
Mexico	0.550	(0.081)	U.S.	0.023	(0.022)
Panama	0.537	(0.082)	Portugal	0.021	(0.021)
Turkey	0.489	(0.079)	U.K.	0.017	(0.021)
Hungary	0.452	(0.078)	Greece	0.014	(0.016)
Poland	0.444	(0.077)	Sweden	0.011	(0.018)
Israel	0.379	(0.071)	Japan	0.006	(0.009)
Latvia	0.351	(0.070)	Canada	0.005	(0.019)
Chile	0.341	(0.071)	Austria	0.005	(0.018)
Thailand	0.264	(0.062)	Italy	0.001	(0.023)
Ireland	0.175	(0.053)	Korea	−0.002	(0.012)
Russia	0.161	(0.052)	Belgium	−0.004	(0.016)
Slovakia	0.120	(0.042)	Taiwan	−0.011	(0.023)
Finland	0.107	(0.045)	Germany	−0.012	(0.016)
France	0.067	(0.035)	Luxembourg	−0.017	(0.018)
Netherlands	0.058	(0.030)	Spain	−0.018	(0.020)

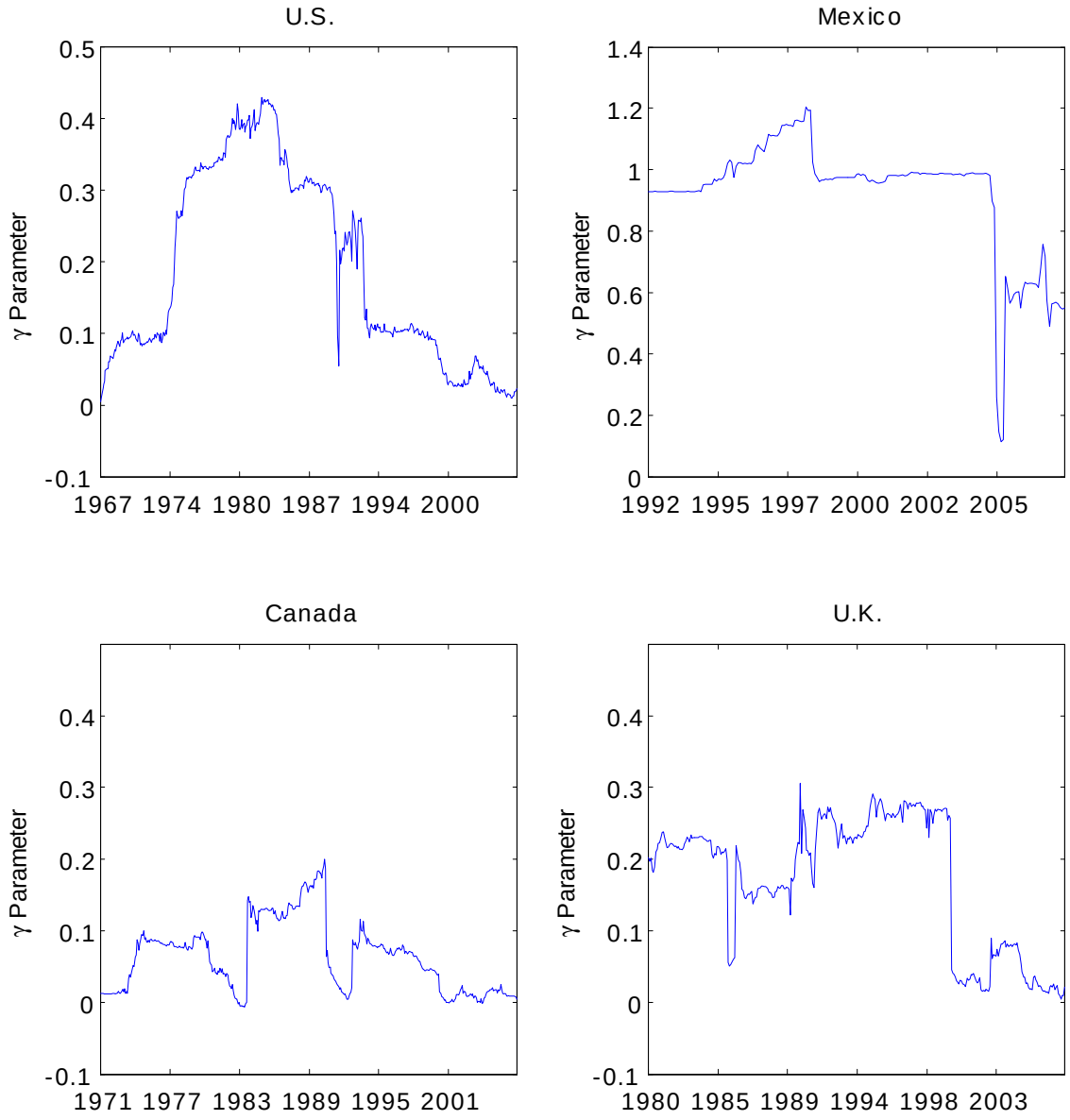
In a New Keynesian model with distinct headline and core inflation rates, the New Keynesian Phillips curve is derived in terms of core inflation, so there are theoretical reasons to believe that the regressions using core inflation yield a more accurate measure of the anchoring of inflation expectations. However, in practice the results are largely the same under both measures. Anchoring is best in inflation-targeting countries or euro-area countries (again, the anchoring coefficient is not significantly different from zero for ten of the original twelve euro members). The least-anchored expectations can be found in many Latin American countries.

Cross-Time Differences in the Anchoring of Inflation Expectations

Given a long enough time series of inflation and industrial production, we can chart how the anchoring of inflation expectations changes over time within a country. Figure 1 presents the estimated anchoring parameter γ from ten-year moving-window estimations of the Phillips curve regression of core inflation in (4). The figure presents the movement in the anchoring parameter γ for the United States, Mexico, Canada, and the U.K. Figures 2 and 3 present the same results for the first twelve euro-zone member countries. Figure 1 shows how inflation expectations became unanchored in the U.S. starting in the late 1960s. The anchoring parameter went from 0 in the mid-1960s to 0.1 by the early 1970s. Then following the 1973 oil shock and the resulting inflation, the γ parameter jumped from 0.1 to 0.3 in a little more than a year, from late 1973 to early 1975. Expectations continued to become unanchored throughout the 1970s, and the γ parameter peaked at nearly 0.5 in the early 1980s. Over the next twenty years, the γ parameter steadily fell and the parameter neared 0 again by the early 2000s.

For the remaining countries represented in Figure 1, inflation expectations became better anchored following the adoption of inflation targeting or the independence of the central bank. Inflation expectations in Mexico were perfectly unanchored and inflation had a unit root throughout the 1990s, but expectations became firmly anchored following the independence of the Banco de México in the early 2000s. The results for Canada show that inflation expectations became steadily unanchored during the 1970s and 1980s, and the γ parameter eventually reached a peak of about 0.25 in the early 1990s, but the γ parameter has steadily fallen since the adoption of inflation targeting in 1991, and Canadian inflation expectations are now perfectly anchored. Similarly, the results for the U.K. show how expectations were unanchored during the 1980s and early 1990s, but the γ parameter fell sharply following the independence of the Bank of England in 1997, and now inflation expectations in the U.K. are nearly perfectly anchored.

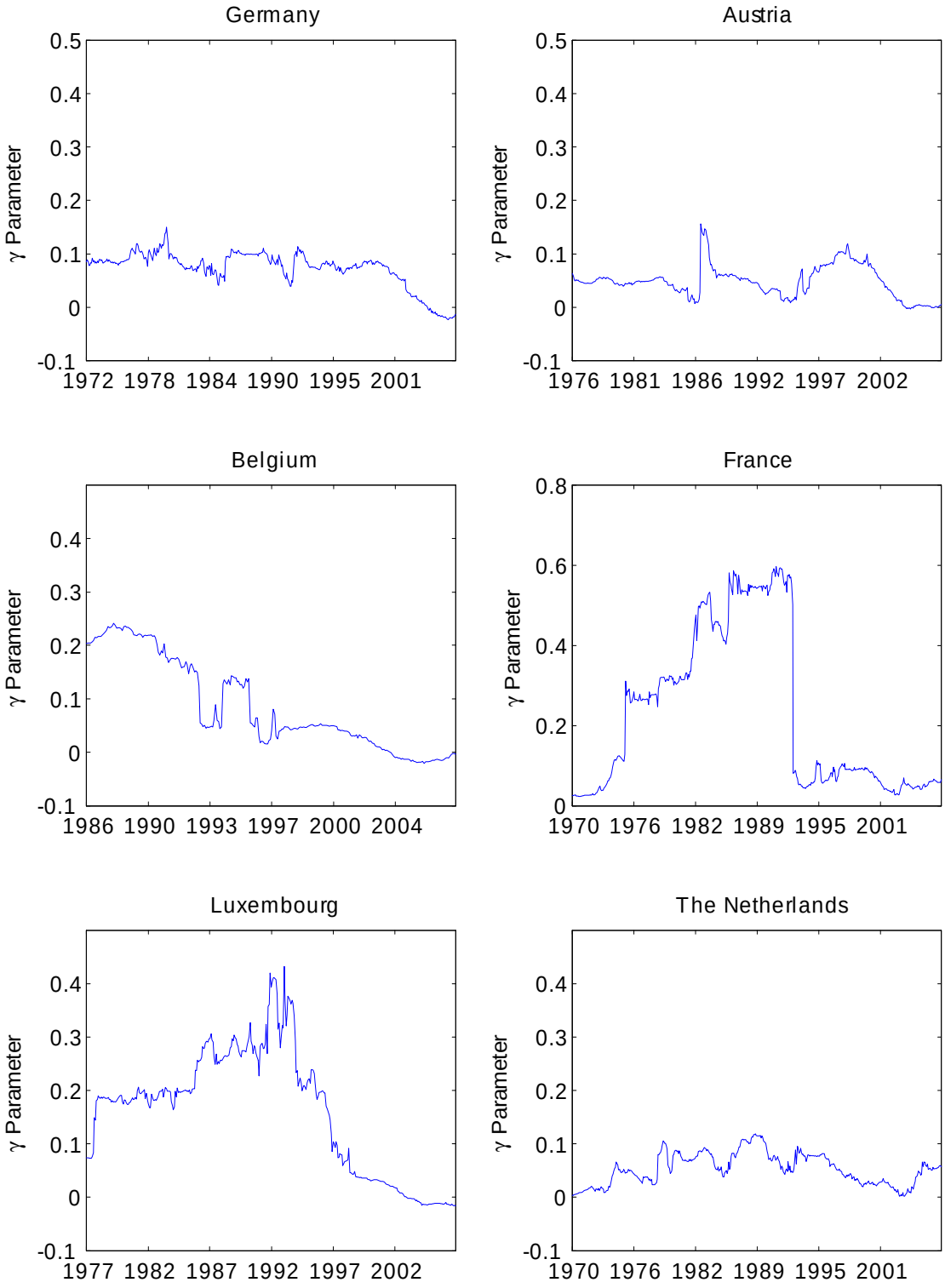
Figure 1: The γ Parameter From the Phillips Curve Regression, as Estimated in Ten-Year Moving-Window Regressions



Figures 2 and 3 present the γ parameter from ten-year moving-window Phillips curve regressions for the first twelve euro-zone members. As shown in Figure 2, inflation expectations remained well anchored in Germany throughout the 1970s and 1980s. Following the oil price shock in 1973, which caused the γ parameter in the U.S. to increase from 0.1 to 0.3, the same parameter in Germany barely rose above 0.1. In the late 1980s, γ peaked a little above 0.1, and it has fallen steadily since then. Now the parameter suggests that inflation expectations in Germany are perfectly anchored.

Inflation expectations in Belgium and Luxembourg became unanchored in the 1980s, and their γ parameters peaked at 0.25 and 0.40, respectively, following a series of devaluations within the European exchange rate mechanism (ERM) in the early 1980s. However, the anchoring parameter in both countries fell steadily throughout the 1990s, especially following 1996 and the movement to the "hard European monetary system"(hard-EMS), the immediate precursor of the common currency. (There were no devaluations relative to the German deutsche mark during the period of the hard-EMS from 1996 to 1999.) The same is true in France, where inflation expectations began to become unanchored following the 1973 oil shock and the French γ parameter peaked at nearly 0.60 in 1990. But the estimated value of γ fell sharply in 1992 and French inflation expectations are now perfectly anchored. Similarly, in Netherlands, the estimated γ parameter has fallen from a peak of about 0.15 to close to 0 today. Thus Figure 2 shows that Germany and Austria maintained anchored inflation expectations throughout the last thirty to forty years, but inflation

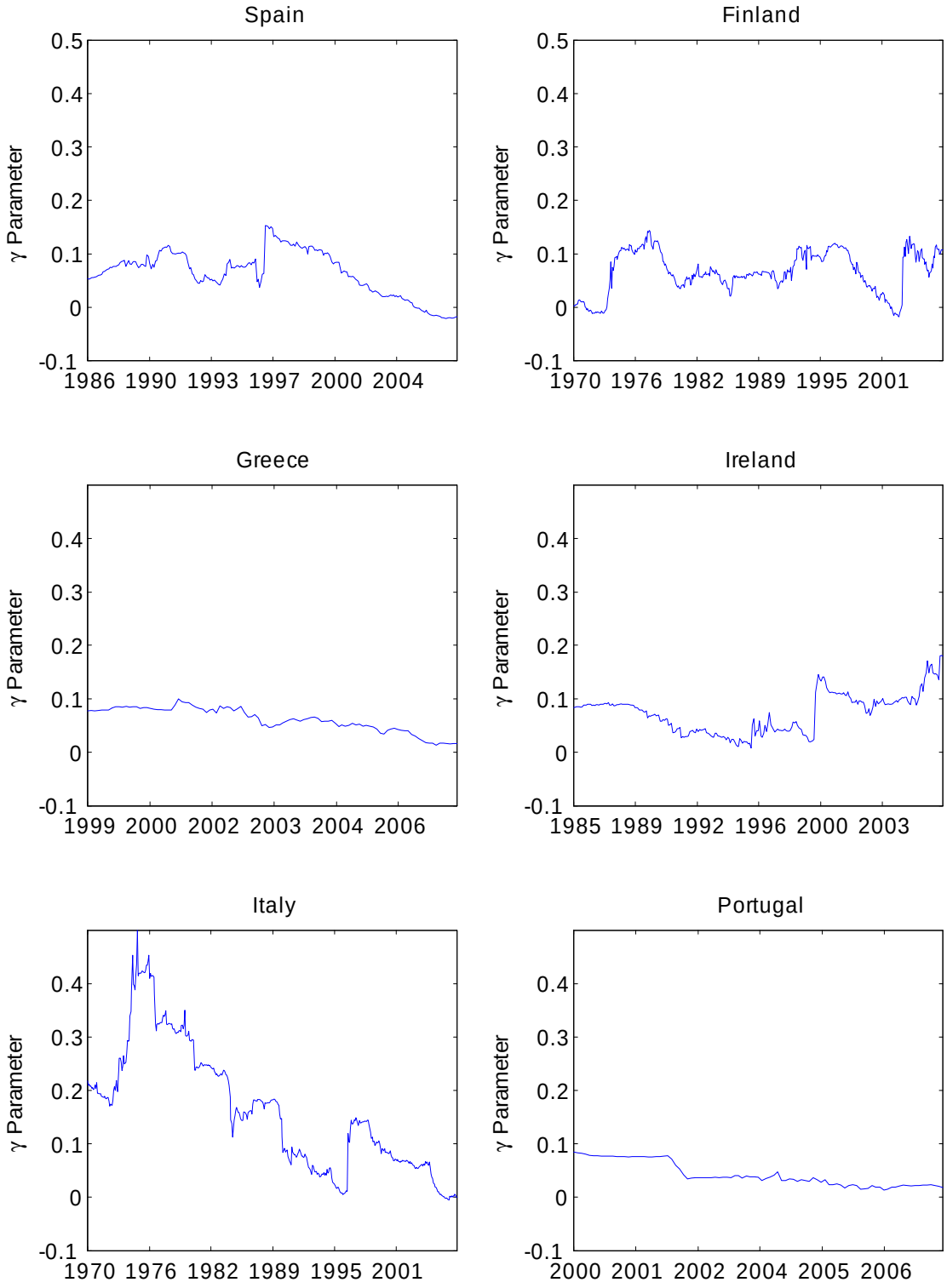
Figure 2: The γ Parameter From the Phillips Curve Regression, as Estimated in Ten-Year Moving-Window Regressions in Euro-Area Core Countries



expectations became unanchored throughout the 1970s and 1980s in most other euro-zone core countries. However, the figure shows that inflation expectations in these countries became better anchored throughout the 1990s and 2000s, the period of the ERM and the economic and monetary union (EMU), and inflation expectations are now perfectly anchored in these countries.

Figure 3 displays the results for the countries that, with the exception of Finland, would today be referred to as the euro-zone periphery. The figure shows an improvement in the anchoring of inflation expectations throughout the 1990s and into the 2000s. Many countries experienced a shift toward more-

Figure 3: The γ Parameter From the Phillips Curve Regression, as Estimated in Ten-Year Moving-Window Regressions in Euro-Area Periphery Countries



anchored inflation expectations right around the switch to the hard-EMS in 1996. By the beginning of the recent crisis in 2008, inflation expectations were nearly perfectly anchored in most of these periphery countries. The exception is Ireland, where long-term inflation expectations have become less anchored since 1999. Figures 2 and 3 suggest that as the countries of Europe drew into a closer monetary union, inflation expectations in most countries became better anchored as they imported the monetary policy credibility of the German Bundesbank.

3. SUMMARY AND CONCLUSION

The stated desire to maintain well-anchored inflation expectations is part of the lexicon of modern central banking. Theoretical work in monetary economics has taught us the importance of expectations in the price-setting process, and central bankers now realize that to control inflation, you must control inflation expectations. Many economist blame the unanchoring of inflation expectations for the Great Inflation of the 1970s, arguably the second most important macroeconomic event of the twentieth century. Given the central role of inflation expectations in the price-setting process and the inflation process, it is somewhat surprising that estimates of long-term inflation expectations are largely unavailable. In most countries, the data simply don't exist. In countries like the U.S. or the U.K., where estimates are available, they are only available since the 1980s, so it isn't possible to measure the unanchoring of expectations during the Great Inflation.

By imposing some structure, this paper attempts to get around this problem of data availability and measure the anchoring of inflation expectations in a number of developed and developing countries. The results show that expectations are nearly perfectly anchored in developed countries with a history of monetary credibility. This is especially true in countries where the central bank follows some form of inflation targeting. At the other extreme, countries with a history of monetary instability and an uncredible central bank have the least-anchored expectations.

Estimates from rolling-window regressions show just how quickly expectations became unanchored in the 1970s. Inflation expectations in the U.S. went from nearly perfectly anchored to nearly perfectly unanchored in a matter of years, centered around the oil price shocks of 1973 and 1979. Beginning in the early 1980s, U.S. inflation expectations went through a process of re-anchoring that took nearly thirty years. The international evidence shows that many countries regained lost credibility through the adoption of inflation targeting or the independence of the central bank, and the rolling-window estimates show that the anchoring of inflation expectations would dramatically improve after such an event. Rolling-window results from the euro area show that successive stages of European monetary integration led to a convergence in the anchoring of inflation expectations as central bank credibility and thus the anchoring of inflation expectations converged toward the level of the German Bundesbank.

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