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What explains recent changes in international monetary policy attitudes toward inflation? Evidence from developed countries

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ABSTRACT

This paper identifies source(s) contributing to the recent international shift in monetary policy attitudes toward inflation. Data from 18 developed countries suggests that this shift is connected to the universal increase in policy responses to economic openness in the 1990s.

1. Introduction

Since Alogoskoufis and Smith (AER, 1991), several studies have stated that the shifts in international monetary policy attitudes toward inflation can be attributed to changes in exchange rate regimes.[1]

Contrary to this consensus, Burdekin and Siklos (1999) show that the identification on the timing of structural breaks in inflation persistence (a common proxy for monetary policy attitudes) is nowhere near the imposition of a floating exchange rate regime in all four countries (Canada, Sweden, the United Kingdom, and the United States) they studied. This paper provides an alternative explanation, unconnected to exchange rate regime changes, for the recent stylized international phenomena in monetary policy making. In particular, we argue that economic openness is a compelling source for recent international monetary policy changes.

Our argument follows a prominent line of literature initiated by Romer (1993) that uses economic openness to explain international differences in monetary policy making. This literature argues that economic openness raises the cost of inflation (Temple, 2002). Thus, monetary authorities in more open economies respond more aggressively to inflation shocks. This literature has documented cross-country evidence to support its argument. We assert that within a country policymakers can also be expected to (dynamically) adjust the aggressiveness of monetary responses to inflation shocks according to changes in the degree of economic openness. This paper provides empirical evidence that the recent stylized international shift in monetary policy making has been influenced by a universal increase in policy responses to economic openness.

2. Data, empirical procedures, and evidence

We use quarterly data obtained from the International Monetary Fund's International Financial Statistics. See Table 2 for a list of the 18 countries in the sample. Also, we use the maximum length of data (to be discussed below) available for each country in the analysis.

Throughout this paper, we characterize the aggressiveness of a monetary authority in counteracting inflation shocks with the following regression:[2]

$$\Delta\pi_t = c + d\pi_{t-1} + \sum_{j=1}^{h} e_j \Delta\pi_{t-j} + \varepsilon_t, \quad (1)$$

where Δ denotes the first difference operator, π_t is the inflation rate at period t, measured by the percentage change in the Consumer Price

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[1] For representative theoretical and empirical studies, see Alogoskoufis (1992) and Obstfeld (1995), respectively.

[2] Minford et al. (2002) caution that coefficients estimated from a Taylor rule cannot truly reveal monetary policy intentions unless there is a central bank statement confirming that a Taylor rule is used to conduct monetary policies. We do not use Taylor rule coefficients to estimate monetary policy aggressiveness.

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Table 1
Regressions for cross-country inflation shock die-out-rate and economic openness

Sample period	Whole sample:	Whole floating:	Earlier floating:	Post 1990s:
Explanatory variables	*1957:2–2004:2*	*1973:1–2004:2*	*1973:1–1989:4*	*1990:1–2004:2*
Regression	(1)	(2)	(3)	(4)
Constant	0.056 (0.708)	−0.071 (−1.326)	−0.152 (−1.407)	−0.129 (−0.886)
Openness	−0.009*** (−3.804)	−0.002 (−1.029)	−0.001 (−0.413)	−0.010** (−2.246)
No. of obs.	18	18	18	18
R^2	0.475	0.062	0.011	0.240

T-statistics are in parentheses. ***, and ** denote 1%, 5% significance levels in two-tailed tests, respectively.

Index (CPI), and ε_t is a stochastic term. Eq. (1) is similar to an augmented Dickey–Fuller regression. The size of coefficient d indicates the average "die- out-rate" of the inflation shock faced by a particular country. If policymakers act more aggressively to inflation shocks, d would be observed to be negative and larger in absolute value. It indicates a higher speed of mean-reversion in inflation and less persistent inflation shocks.

2.1. Evidence from cross-country analysis

Evidence on the cross-country pattern in more open economies provides a foundation for our subsequent analysis at the individual country level. We assess the cross-country relation by regressing 18 countries' inflation shock die-out-rate (see Eq. (1)) on their economic openness (measured as the ratio of imports of goods and services to Gross Domestic Product (GDP). For the whole sample period (1957:2–2004:2), regression (1) in Table 1 shows that inflation shocks are less persistent and die out faster in more open economies. The openness coefficient is negative (−0.009) and significant (t=−3.804) at the 1% level.

Does this result hold for different time periods? Using two widely mentioned international monetary regime shifts (1973 and 1990) as "break" points during the entire sample period, we rerun the regressions for these subsample periods.[3] Regressions (2), (3), and (4) in Table 1 report results showing that the coefficient on openness for the post 1990s period (1990:1–2004:2) is negative and significant but it is insignificant for either the whole floating (1973:1–2004:2) or earlier floating (1973:1–1989:4) periods. The robustness of these results are checked by first adding various independent variables for rival arguments to the regression and later excluding outliers from the regression. These regression results are available on request. These cross-country findings indicate that it is primarily in the post 1990s period that inflation shocks die out faster in more open economies.

2.2. Evidence from individual country's time series analysis

We now address the paper's main concern. Does the emerging negative cross-country relation between the die-out-rate and openness occur *within* the countries of our sample? We test and identify the timing of the structural breaks (if any) in the long-term relation between the die-out-rate and economic openness for each of the 18 sample countries. The rolling regression technique is used to generate both the die-out-rate and economic openness time series. We set the rolling regression window at 41 quarters and we move it forward one quarter each iteration. We generate the die-out-rate time series by running a regression on Eq. (1). On the other hand, estimates for the economic openness time series are based on an economic theory that is widely used in a number of macroeconomics studies (see Romer, 1993). The theory specifies the formation of general domestic price in open economies. We derive the formulation below. Note that all variables in the following equations of (2)–(7) are expressed in logarithms.

[3] The year 1973 is associated with the breakdown of the Bretton Woods system and the year 1990 is suggested by the inflation targeting literature.

In an open economy, where international trade takes place, the general price level in the domestic market is formed by the weighted average of the price levels of foreign (imported) and domestic goods:

$$p_t^G = wp_t^f + (1-w)p_t^d, \quad w \in [0,1), \tag{2}$$

where p_t^G is the general domestic price level, p_t^f (p_t^d) is the domestic price level of foreign (domestic) goods, and w is the share of domestic consumption of foreign goods.

When the Law of One Price holds, the domestic price of foreign goods is the same as the relative price in the foreign market, then:

$$p_t^f = e_t + p_t^*, \tag{3}$$

where e_t is the nominal exchange rate, defined in units of domestic currency per unit of foreign currency, and p_t* is the foreign price of foreign goods.

Further, macroeconomists believe that the price level in the domestic market can be represented by the quantity theory:

$$m_t + v_t = p_t^d + y_t, \tag{4}$$

where m_t is the domestic money supply, v_t is the velocity of money, and y_t is the real domestic output. Romer (1996) notes that the velocity of money (v_t) can be considered as the aggregate disturbance in countries without hyperinflation. For the purpose of simplifying estimating equation, we adopt his view on v_t. Thus, a reduced form of Eq. (4) can be expressed as:

$$p_t^d = m_t - y_t. \tag{5}$$

Substituting both Eqs. (3) and (5) into Eq. (2) yields:

$$p_t^G = w(e_t + p_t^*) + (1-w)(m_t - y_t). \tag{6}$$

In the literature, w is regarded as the degree of economic openness and for convenience researchers simply use the ratio of imports of goods and services to GDP as the proxy for w. To comply with the theory, we follow Eq. (6) and assess the relation among p_t^G, (e_t+p_t*), and (m_t−y_t) to generate the economic openness time series:[4]

$$p_t^G = \gamma + \alpha(e_t + p_t^*) + \beta(m_t - y_t). \tag{7}$$

For each country, we use the CPI for p_t^G; money plus quasi-money for m_t; and GDP at a constant price for y_t. We treat the largest trading partner as the base foreign country for the domestic economy. Consequently we use the price of the base foreign country's currency and CPI for e_t and p_t* respectively. To obtain the economic openness estimate of α in Eq. (7), we use Hansen's (1992) FMOLS (test statistics of Lc) to estimate the cointegrating relation among p_t^G, (e_t+p_t*), and (m_t−y_t) and we apply the rolling regression technique to generate the α time series.[5]

[4] Lo and Wong (2006) validate the theoretical prediction of Eq. (7) using 63 cross-country data.

[5] We perform the unit root test of DF-GLS proposed by Elliott et al. (1996) prior to the cointegration test. All test results are available on request.

Table 2
Bai and Perron (BP) structural break test results of Eq. (8) for each individual country and associated regression estimates

BP test statistics	Identified breaks (# of breaks; break points)	Identified subsample periods	Openness parameter: k
Australia			
WD max (5%) = 18.699***	2 breaks at	1966:1–1980:4	−0.019 (−1.402)
$\text{Sup}F_T$ (2|1) = 13.246**	1981:1	1981:1–1989:1	−0.019 (−0.225)
$\text{Sup}F_T$ (3|2) = 11.887	1989:2	1989:2–1992:1	−3.293*** (−4.399)
Belgium			
WD max (5%) = 29.036***	1 break at	1981:1–1983:4	−0.029 (−0.799)
$\text{Sup}F_T$ (2|1) = 4.464	1984:1	1984:1–1988:4	−4.621*** (−4.692)
Canada			
WD max (5%) = 27.351***	1 break at	1958:1–1980:4	0.030 (1.340)
$\text{Sup}F_T$ (2|1) = 8.488	1981:1	1981:1–1994:2	−0.093*** (−3.525)
Finland			
WD max (5%) = 641.921***	5 breaks at	1970:4–1973:2	−0.012 (−0.241)
$\text{Sup}F_T$ (5|4) = 16.807**	1973:3	1973:3–1976:1	0.010 (0.054)
$\text{Sup}F_T$ (6|5) = 2.726	1976:2	1976:2–1977:4	0.092 (0.410)
	1978:1	1978:1–1980:1	−0.009 (−1.232)
	1980:2	1980:2–1985:3	0.051 (1.042)
	1985:4	1985:4–1988:4	−0.263* (−1.776)
Italy			
WD max (5%) = 19.886***	2 breaks at	1979:4–1984:4	0.097** (2.100)
$\text{Sup}F_T$ (2|1) = 15.630***	1985:1	1985:1–1986:1	4.181 (0.614)
$\text{Sup}F_T$ (3|2) = 5.075	1986:2	1986:2–1988:3	−1.037*** (−4.066)
Japan			
WD max (5%) = 39.957***	3 breaks at	1958:1–1962:4	3.962 (3.075)
$\text{Sup}F_T$ (3|2) = 23.018***	1963:1	1963:1–1979:4	0.708 (7.116)
$\text{Sup}F_T$ (4|3) = 7.158	1980:1	1980:1–1989:3	3.784* (1.853)
	1989:4	1989:4–1994:2	−3.396* (−1.774)
Netherlands			
WD max (5%) = 54.221***	2 breaks at	1977:4–1981:2	0.325*** (5.189)
$\text{Sup}F_T$ (2|1) = 23.944***	1981:3	1981:3–1983:2	0.156 (0.065)
$\text{Sup}F_T$ (3|2) = 9.451	1983:3	1983:3–1987:4	−0.142* (1.900)
Norway			
WD max (5%) = 21.863***	3 breaks at	1961:4–1965:4	−0.060 (−0.575)
$\text{Sup}F_T$ (3|2) = 13.943**	1966:1	1966:1–1969:4	−0.012 (−0.768)
$\text{Sup}F_T$ (4|3) = 9.653	1970:1	1970:1–1980:2	−0.026 (−0.663)
	1980:3	1980:3–1988:4	−0.208*** (−4.089)
Portugal			
WD max (5%) = 40.628***	1 break at	1980:3–1985:1	0.021 (0.165)
$\text{Sup}F_T$ (2|1) = 9.229	1985:2	1985:2–1988:4	−0.335*** (−5.048)
Spain			
WD max (5%) = 21.532***	2 breaks at	1970:4–1974:1	−0.744 (−0.613)
$\text{Sup}F_T$ (2|1) = 22.724***	1974:2	1974:2–1986:2	−0.025 (−0.090)
$\text{Sup}F_T$ (3|2) = 10.336	1986:3	1986:3–1988:4	−22.304* (−2.001)
Sweden			
WD max (5%) = 1100.757***	2 breaks at	1980:4–1981:2	2.192* (9.211)
$\text{Sup}F_T$ (2|1) = 94.875***	1981:3	1981:3–1985:3	0.011 (0.852)
$\text{Sup}F_T$ (3|2) = 7.127	1985:4	1985:4–1988:4	−0.110* (−1.896)
US			
WD max (5%) = 383.132***	2 breaks at	1958:1–1979:4	0.007 (0.267)
$\text{Sup}F_T$ (2|1) = 15.805***	1980:1	1980:1–1988:4	−0.015 (−0.755)
$\text{Sup}F_T$ (3|2) = 7.582	1989:1	1989:1–1994:2	−0.133*** (−3.203)
France			
WD max (5%) = 3078.828***	4 breaks at	1978:3–1980:2	0.254 (1.287)
$\text{Sup}F_T$ (4|3) = 22.183***	1980:3	1980:3–1982:2	−0.435** (−2.649)
$\text{Sup}F_T$ (5|4) = 6.521	1982:3	1982:3–1985:1	0.901*** (6.345)
	1985:2	1985:2–1986:4	−0.227 (−1.046)
	1987:1	1987:1–1988:4	−0.789* (−1.804)
Germany			
WD max (5%) = 43.437***	5 breaks at	1969:4–1973:1	−0.167 (−1.724)
$\text{Sup}F_T$ (5|4) = 20.387***	1973:2	1973:2–1975:3	−0.076 (−1.100)
$\text{Sup}F_T$ (6|5) = 13.717	1975:4	1975:4–1980:4	0.121 (1.510)
	1981:1	1981:1–1982:3	−0.391* (−1.955)

(continued on next page)

Table 2 (*continued*)

BP test statistics	Identified breaks (# of breaks; break points)	Identified subsample periods	Openness parameter: k
Germany			
SupF_T (6|5) = 13.717			
	1982:4	1982:4–1986:1	0.005 (0.355)
	1986:2	1986:2–1988:4	−0.642** (−2.571)
Austria			
WD max (5%) = 23.266***	3 breaks at	1970:3–1980:4	−0.140 (−1.316)
SupF_T (3|2) = 14.589**	1981:1	1981:1–1983:4	−0.024 (−0.566)
SupF_T (4|3) = 12.949	1984:1	1984:1–1985:3	0.312 (0.425)
	1985:4	1985:4–1987:4	2.731** (3.190)
New Zealand			
WD max (5%) = 2026.642***	3 breaks at	1988:1–1988:4	0.033 (0.244)
SupF_T (3|2) = 80.881***	1989:1	1989:1–1989:3	−1.099 (−4.065)
SupF_T (4|3) = 10.814	1989:4	1989:4–1991:1	−0.920 (−0.996)
	1991:2	1991:2–1994:2	0.117 (0.202)
Switzerland			
WD max (5%) = 18.666***	1 break at	1970:4–1984:1	−0.190*** (3.182)
SupF_T (2|1) = 5.135	1984:2	1984:2–1988:2	0.079*** (3.288)
UK			
WD max (5%) = 312.615***	6 breaks at	1958:1–1960:3	0.319** (2.316)
SupF_T (6|5) = 24.640***	1960:4	1960:4–1963:3	−0.453** (−2.287)
SupF_T (7|6) = 2.205	1963:4	1963:4–1966:3	−0.066 (−0.482)
	1966:4	1966:4–1969:3	0.074 (0.754)
	1969:4	1969:4–1972:3	0.039 (1.095)
	1972:4	1972:4–1983:2	0.012 (0.687)
	1983:3	1983:3–1988:4	0.010 (0.289)

WD max (5%) gives Bai and Perron (BP) test statistics on the existence of no break versus unknown # of breaks, and SupF_T $(l+1|l)$ gives BP test statistics on the existence of l versus $l+1$ breaks. *T*-statistics are in parentheses. ***, **, and * denote 1%, 5% and 10% significance levels in two-tailed tests, respectively.

With the die-out-rate and economic openness time series generated for each of the 18 countries, we next apply Bai and Perron's (1998, 2003, henceforth BP) methodology, designed to formally test and date multiple structural breaks, to each individual country's regression of the die-out-rate ($\mathrm{DOR}_{i,\ t}$) and openness ($\mathrm{OPEN}_{i,\ t}$):

$$\boldsymbol{DOR}_{i,t} = h_{i,t} + k_{i,t}\boldsymbol{OPEN}_{i,t} + z_{i,t}. \tag{8}$$

Our focus is on the shifts in the openness parameter (k) in Eq. (8). Table 2 gives results on Bai and Perron (BP) test statistics (WD max and SupF_T $(l+1|l)$) showing that all 18 countries have at least one structural break in the relation between the die-out-rate and openness. Further, 15 out of 18 countries have their most recent break dated in the neighborhood of 1985–1990 (the exceptions are Canada, Norway, and the U.K.). Using these identified break points, we divide each country's sample period into regime periods and rerun Eq. (8). Comparing the estimate of the openness parameter (k) from various regime periods in a country, we find a trend that 14 out of 18 sample country's k shifts to a significantly negative sign in the "last" regime period (from the prior regime period where k is either insignificant or showing a positive sign). These 14 countries are Australia, Belgium, Canada, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, and the U.S. We arrange their results as the top 14 countries in Table 2. This universal shift is particularly striking in that the emerging negative die-out-rate-openness relation has no precedent in 12 of the 14 countries (except for France and Germany).

3. Conclusions

In this paper, we have documented that changes in the monetary policy attitudes toward inflation in recent years is a stylized international phenomena that has a coherent explanation: many (developed) countries in recent years (primarily in the 1990s) adjusted the aggressiveness of monetary responses according to changes in the degree of openness within their economies.

A relevant point to make is the timing of the estimated shifts correspond well with the 1990s global shift in setting low inflation as the primary target of macroeconomic policy. This policy attitude shift is largely driven by a global shift in beliefs from the Keynesian view of exploitable inflation-output tradeoffs to the view that high inflation hurts growth over the longer term. We note that issues on whether the paper's findings of the increased influence of openness (to monetary responses) contributes to long-term output growth and whether it alters the inflation-output tradeoffs are important directions for further research.[6]

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[6] We thank a referee for suggesting further research on the potential connection between the estimated shift results and a global shift in beliefs for monetary policy making.