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Inflation Targeting and Regional Inflation Persistence: Evidence from Korea

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Inflation Targeting and Regional Inflation Persistence: Evidence from Korea

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Abstract: The adoption of a credible monetary policy regime such as inflation targeting is known to reduce the persistence of inflation fluctuations. This conclusion, however, is derived from aggregate inflation or sectoral inflation rates, not from regional inflation data. This paper studies the regional dimension of inflation targeting, i.e. the consequences of inflation targeting for regional inflation persistence. Based on data for Korean cities and provinces it is shown that the adoption of inflation targeting leads (i) to a fall in inflation persistence at the regional level and (ii) to a reduction in the cross-regional heterogeneity in inflation persistence. A common factor model lends further support to the role of the common component, and hence monetary policy, for regional inflation persistence.

Keywords: inflation targeting, inflation persistence, monetary policy regime, regional inflation, factor model

JEL classification: E31, E52, R11

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1 Introduction

Over the last two decades, inflation targeting (IT) has become the dominant monetary policy regime both for developed and emerging economies. In Asia, countries such as Korea, Thailand, the Philippines and Indonesia adopted IT following the Asian crisis of 1997/98, while others, most notably Hong Kong, Singapore, Taiwan and Malaysia decided against IT and instead adopted alternative policy frameworks.[2]

To evaluate the performance of IT, it seems natural to assess the evolution of average inflation and its variance since the adoption of the inflation target.[3] However, it is possible for the average inflation rate to be close to target, but deviations of inflation may nevertheless be large and protracted. We therefore use an alternative metric of success and study how persistent shocks to inflation are. The intuition is straightforward: deviations of inflation from target will be temporary if the central bank is effective in stablising inflation.

The persistence properties of inflation and their response to the adoption of a new monetary policy regime are subject of a large literature. It is well established that a new and credible monetary policy regime directed towards price stability, e.g. inflation targeting, leads to a reduction in inflation persistence. This line of research, however, is based on either cross-country aggregate evidence or sectoral evidence.

At an aggregate level, Levin, Natalucci and Piger (2004), Levin and Piger (2006) and Benati (2008) provide evidence on the fall in persistence in the aftermath of a monetary policy regime change for industrial economies. Altissimo et al. (2006) and Benigno and Lopez-Salido (2006) document the heterogeneity of inflation persistence across members of the European Monetary Union. Gerlach and Tillmann (2010) show that inflation became significantly less persistent in Asian economies that adopted IT, but not in economies that adopted an alternative monetary policy framework.

Lünnemann and Mathä (2004) provide evidence using a European cross-country data set containing disaggregate CPI inflation rates. For the U.S. economy, the results presented by Clark (2006) suggest that the persistence of the aggregate

[2] See Ito and Hayashi (2004) and Filardo and Genberg (2009) for a survey of IT in Asia.

[3] The literature has not yet reached a consensus about the effects of IT in emerging market economies. Goncalves and Salles (2008) find that developing countries adopting IT experience a significant decline of inflation and growth volatility. Lin and Ye (2009) and Lin (2010) are able to show that the level of inflation and its volatility fall after the adoption of IT. Brito (2010) and Brito and Bystedt (2010), in contrast, find that IT has no effect on the level and the variance of inflation in emerging countries.

lies above the persistence estimates of the CPI subcomponent. Altissimo, Mojon and Zaffaroni (2009) use a large data set of components of the French CPI to show that aggregation can explain the discrepancy between micro evidence suggesting a low level of inflation persistence and macro evidence consistent with a highly persistent inflation process. Boivin, Giannoni and Mihov (2009) show that disaggregate inflation data responds sluggishly to aggregate shocks despite sector prices being less sticky than the aggregate price level. Sectoral inflation appears to be much less persistent than aggregate inflation. Tillmann (2011) provides the first evidence on the behavior of sectoral inflation in an emerging market economy after the adoption of IT. Based on sectoral Korean CPI data he shows that persistence falls across sectors.

This paper evaluates the regional dimension of IT, i.e. the impact of a monetary regime change on regional inflation dynamics. Previous research focuses on regional inflation differentials for a *given* monetary policy regime (Beck, Hubrich and Marcellino 2009) or the persistence of regional inflation for a *given* policy regime (Vaona and Ascari 2010).[4] We study the case of Korea, which introduced IT after the Asian financial crisis in 1999, and use a data set on Korean metropolitan cities, provinces and smaller cities that covers both the pre-IT and a post-IT period.

Our results are twofold: First, we show that the adoption of inflation targeting leads to a fall in inflation persistence at the regional level. In most regions, inflation persistence is much lower under the new monetary policy regime. Second, IT also leads to a reduction in the cross-regional heterogeneity in inflation persistence. A common factor model lends further support to the role of the common component, and hence monetary policy, for regional inflation persistence.

A monetary union with heterogeneity in inflation persistence has important consequences for optimal monetary policy. This is the central result of Benigno (2004) and Benigno and Lopez-Salido (2006). These authors use a New-Keynesian framework to show that optimal IT should place more weight on regions where nominal rigidities are largest. Although originally derived for the case of European Monetary Union with cross-country heterogeneity, this results can also be applied to the design of monetary policy in the presence of regional heterogeneity. In light of these theoretical implications, the empirical evidence presented here supports the notion that IT is effective in stabilizing inflation

[4] Another literature studies CPI convergence across cities and regions; see Cecchetti, Mark and Sonora (2002) for an important contribution. Baba (2007) is the only paper dealing with regional Korean price level data. He studies the degree of price level convergence, but does not analyze the effect of the regime change in 1999.

fluctuations, both at an aggregate and a regional level.
This paper is organized as follows: section two presents the data set and section three introduces the measurement of inflation persistence. The major results are discussed in section four. Section five investigates the nature of breaks in inflation persistence across regions. In section six, a common factor model is used to interpret the findings. Section seven draws some tentative conclusions.

2 The data

We use quarterly CPI data for South-Korean regions spanning 1990Q1 to 2011Q1, which is taken from the website of Statistics Korea. The Republic of Korea is divided into one special city (Seoul), six metropolitan cities and nine provinces (including the Jeju-do region that enjoys a special status). A map, see figure (1), documents the geographical location as well as the different sizes of these regions. We also use a finer level of disaggregation and employ data for 23 cities located within the nine provinces.
The annual inflation rate in region i, which could be a city or province, is measured as

$$\pi_{i,t} = 100 \times \frac{P_{i,t} - P_{i,t-4}}{P_{i,t-4}} \quad (1)$$

where P_{it} denotes the consumer price index (CPI) in region i at time t. We focus on CPI inflation rather than inflation derived from other price indices such as GDP deflators because the monetary policy strategy of the Bank of Korea explicitly refers to a target rate of inflation in terms of the annual change of the CPI.
Figure (2) plots the inflation rates for Seoul, the metropolitan cities and Korean provinces. Two characteristics an be derived by visual inspection First, there is break in mean inflation for all regions around 1998. Second, the differences in the level of inflation across regions declines after 1999. The reduction in regional inflation differentials coincides with the adoption of the new monetary policy regime in January 1999. This latter point is illustrated further in figure (3), which depicts the cross-sectional standard deviation of inflation over time. The regional dispersion of inflation, both across metropolitan cities and provinces as well as across smaller cities, falls over time. The following sections evaluate the extent to which also the persistence of inflation across regions, which cannot be analyzed by visual inspection alone, changed after the adoption of IT.

3 Measuring inflation persistence

Following O'Reilly and Whelan (2005a) and Levin and Piger (2006), among others, our preferred measure of persistence, i.e. a measure of serial correlation of inflation, is the sum of the autoregressive coefficients in a univariate process of inflation. Let π_t^i be the inflation measure, α an intercept term, and ε_t be a serially uncorrelated error term. The AR(q) process is

$$\pi_{i,t} = \alpha_i + \sum_{k=1}^{q_i} \beta_{ik}\pi_{i,t-k} + \varepsilon_{i,t} \tag{2}$$

The sum of the autoregressive coefficients is $\rho_i = \sum_{k=1}^{q} \beta_{ik}$. According to Andrews and Chen (1994), ρ is the best scalar measure of persistence in $\pi_{i,t}$, since a monotonic relationship exists between ρ_i and the cumulative impulse response function (CIRF) of $\pi_{i,t+j}$ to $\varepsilon_{i,t}$. Rewrite expression (2) as

$$\pi_{i,t} = \alpha_i + \rho_i\pi_{i,t-1} + \sum_{k=1}^{q_i-1} \gamma_{ik}\Delta\pi_{i,t-k} + \varepsilon_{i,t} \tag{3}$$

where $\Delta\pi_{i,t} = \pi_{i,t} - \pi_{i,t-1}$. If $\rho_i = 1$, the inflation process contains a unit root. If $|\rho_i| < 1$, the process is stationary. In the empirical application below, the appropriate lag length $q_i \leq q^{\max}$ is chosen according to the Akaike information criterion (AIC) with a maximum lag length of $q^{\max} = 6$.

We start the measurement of persistence by testing for a unit-root in a panel of regional inflation rates with $i = 1, ..., N$. Let us transform (3) into the conventional ADF specification

$$\Delta\pi_{i,t} = \alpha_i + \widetilde{\rho}_i\pi_{i,t-1} + \sum_{k=1}^{q_i-1} \gamma_{ik}\Delta\pi_{i,t-k} + \varepsilon_{i,t} \tag{4}$$

with $\widetilde{\rho}_i = \rho_i - 1$. The panel unit-root test proposed by Levin, Lin and Chu (2002) assumes a common unit-root process and tests the null hypothesis of $\widetilde{\rho}_i = \widetilde{\rho} = 0$ for all i against $\widetilde{\rho}_i = \widetilde{\rho} < 0$ for all i. The test of Im, Pesaran and Shin (2003), in contrast, allows for cross-sectional variation in $\widetilde{\rho}_i$. The test assesses the null of $\widetilde{\rho}_i = 0$ for all i against the alternative $\widetilde{\rho}_i < 0$ for $i = 1, ..., N_1$ and $\widetilde{\rho}_i = 0$ for $i = N_1 + 1, ..., N$, where the cross-sectional elements are reordered.

In a second step, we estimate the degree of persistence for each inflation rate $\pi_{i,t}$ using single-equation techniques. Estimates of ρ_i obtained from least squares estimation, however, suffer from a bias as ρ_i approaches unity. Furthermore, confidence bands based on a normally distributed ρ_i do not have the correct coverage. Therefore, we follow the literature and resort to Hansen's (1999) median unbiased estimator of ρ_i. His grid bootstrap approach is used to construct confidence bands for ρ_i with correct coverage. The bootstrap calculations are based on 999 draws and 101 grid points over a range spanned by the sample persistence surrounded by four OLS standard errors.

To assess the impact of the new monetary policy regime on inflation persistence, we compare persistence for a pre-IT subsample with a post-IT subsample. However, a structural break in the mean of the inflation process, which in the case of Korea coincides with the transition period towards the adoption of IT, is known to hamper the estimation of inflation persistence. According to Perron (1989), the failure to account for such breaks could result in an upward bias of the persistence parameter. As a consequence, our pre-IT regime ends in 1997Q2, i.e. at the onset of the Asian financial crisis. Put differently, we skip the six quarters between 1997q3 and 1998q4, that represent an exceptionally turbulent transition period, in most parts of the paper. For completeness, the tables reporting the persistence estimates also contain results for a pre-1998Q4 sample.

4 Estimates of regional inflation persistence

We first test whether regional inflation rates contain a unit-root. Table (1) shows that the LLC test cannot reject the unit-root in the pre-IT subsample, but can clearly reject the unit-root in the latter sample. This holds both for metropolitan cities and provinces and the panel of smaller cities. The results of the IPS test point in a similar direction, but are less clear-cut. These findings suggest that inflation at a regional level became better anchored under the new regime. These tests, however, cannot detect changes in persistence of stationary series. Therefore, we now turn to our main measure of persistence, which is the sum of the autoregressive coefficients in a univariate inflation process.

The persistence of the aggregate inflation rate is a natural benchmark against which the persistence properties of the regional components can be contrasted. Table (2) reveals that the overall inflation rate becomes significantly less persistent after the adoption of IT. The sum of the autoregressive coefficients drops from 0.88 in the pre-1997 period to 0.22 in the post-1999 subsample. The impact of this drastic reduction becomes apparent once we translate this measure into half-lifes for deviations from mean inflation according to $t_{half} = \ln(0.5)/\ln(\hat{\rho})$.[5] Our results correspond to a half-life of over five years prior to the adoption of IT

[5] Note that this formula is correct only if the inflation rate would follow an AR(1) process (see Rossi 2005). Therefore, we use it here as an illustration only and refrain from it afterwards.

and a half-life of only six months thereafter.

A similar decline can be observed for Seoul and the six metropolitan cities, see table (3). While the unit root case, i.e. an estimate of ρ_i above unity, cannot be ruled out for most cities and regions in the pre-IT period, the confidence bands do no longer cover this case in the post-IT period. Likewise, persistence falls in most but not all Korean provinces. Consider e.g. the Gyeonggi-do province. Inflation persistence drops from 0.69, which is statistically indistinguishable from unity, to only 0.20, which in contrast is indistinguishable from white noise. At a city level, see table (4), we observe a similar tendency, although the variety of persistence estimates is much larger than at the provincial level.

To summarize the findings, we compute the mean and the standard deviation, among other descriptive statistics, of ρ_i across regions. As shown in table (5), the mean persistence falls from 0.80 (metropolitan cities) and 0.62 (provinces) to 0.25 and 0.30, respectively. Thus, the adoption of IT had not only an effect on the persistence of the aggregate inflation process, but is also reflected in significantly less persistent inflation dynamics at the regional level. A second new result concerns the distribution of ρ_i around the mean. Table (5) shows that for metropolitan cities and provinces the cross-regional standard deviation of ρ_i falls from 0.30 to 0.08. Likewise, the difference between the maximum and the minimum estimates of ρ_i shrinks drastically. The adoption of IT not only led to a less persistent inflation process, but also to a much more homogeneous inflation process across regions.

5 Structural breaks in inflation persistence

The previous section documented that inflation persistence is lower in a post-IT subsample. This is true for almost all regions. In principle, however, this does not necessarily imply that the break in inflation persistence occurred simultaneously across regions. To gain information about the timing of the break and the stability of (3) over time, we apply a sequential F-test over an admissible range $[\tau_{\min}, \tau_{\max}]$ that includes the central 70% of the available observations. Andrews and Chen (1996) and O'Reilly and Whelan (2005b) show that the size distortion of this statistic is substantial at high levels of persistence. Therefore, we cannot rely on the asymptotic critical values provided by Andrews (1993). Here we perform a bootstrap and estimate an AR(q) model by OLS over the sample size T, draw residuals and generate, based on the estimated coefficients, a set of N artificial series for $t = 1, ..., T$ consistent with the no-break model. For each of these generated series, we perform the break test. The α-th percentile of the resulting distribution is used as the $1-\alpha$ percent critical value for each region. Figure (4) plots the sequential test statistic $W_T(\tau_j)\,|\tau_j \in [\tau_{\min}, \tau_{\max}]$ for the null hypothesis of no structural change at time τ_j. Each test statistic is normalized by the the 5% critical value based on $N = 1000$ bootstrap replications such that a positive value of the test statistics signal a rejection of the null hypothesis of no change in persistence.

The results corroborate our earlier findings. For most regions, there is clear evidence for a break in inflation persistence following the adoption of IT. Moreover, the timing of the break is highly synchronized across regions.

6 A common factor model

It is plausible to assume that inflation at a regional level is driven by two components. One component is common to all regions and reflects monetary policy and aggregate economic conditions such as aggregate demand or technology shocks. A second component reflects idiosyncratic shocks that are specific to each region. A fall in inflation persistence in a particular region could then result from changes in either of these components or a combination of them. To disentangle regional inflation into a common and a region-specific component, we utilize a simple common factor model (see Stock and Watson 2002 a,b). Technically, we represent the common factor by the first principal component of our regional inflation rates. For each region, the inflation rate is driven by this common component F_t plus an idiosyncratic component

$$\pi_{i,t} = \lambda_i F_t + e_{it} \tag{5}$$

where the factor loading is given by λ_i. The main advantage of this representation is that the factors can be extracted using principal components analysis.

In a first step, we estimate (5) by OLS to analyze how important the common component is for a given regional inflation rate. Our hypothesis is that the adoption of IT has led to a larger role for the common component and a smaller role for idiosyncratic dynamics. Table (6) and (7) report the estimated factor loadings and the R^2 from this regression over the pre-1997:2 and the post-1999:1 subsamples. A clear pattern emerges: under the IT regime the common factor plays a much larger role for the determination of inflation across regions than in the early part of the sample. In the Gyeonggi-do province, for example, the explanatory power of the common factor increases from 0.73 to 0.92. For some regions or cities the share of inflation fluctuations explained by the common factor more than doubles under the new regime.

The region-specific component of each inflation series, e_{it}, is the residual from regressing sectoral inflation on the common factor. In a second step, we apply our measure of persistence from the previous sections for both the resulting common factor F_t and each series of idiosyncratic components e_{it}. Table (6) shows that the persistence of the common factor drops from 0.74 to 0.48. At the same time, the persistence of the idiosyncratic components of regional inflation do not show an unambiguous tendency to decline. In most regions, the region-specific component of inflation exhibits a larger degree of persistence than in the pre-1997 period. Take again the example of Gyeonggi-do: in the post-1999 subsample the persistence of region-specific inflation is 0.86, while in the pre-IT sample persistence was significantly lower at 0.56.

These results indicate that the source of the decline in inflation persistence is the common factor. Less persistent fluctuations of the common component together with a larger explanatory power of the common component translate into a large drop in regional inflation rates. This outweighs the increase in persistence of most idiosyncratic inflation rates. Furthermore, the break in common factor persistence reflects the new monetary policy regime that became effective in 1999.

7 Conclusions

This paper used data on Korean metropolitan cities, provinces and smaller cities to analyze the persistence of the regional inflation process. It was shown that the adoption of IT by the Bank of Korea in 1999 has lead (i) to a fall in inflation persistence at the regional level and (ii) to a reduction in the cross-regional heterogeneity in inflation persistence. A common factor model corroborates the notion that the common factor, i.e. monetary policy, is the driving force behind both findings.

This paper provides additional evidence on the success of IT. Adopting IT not only stabilizes aggregate and regional inflation at a lower level of persistence, but also contributes to a reduction in the degree of heterogeneity in regional inflation persistence. This regional dimension of IT, which is the key contribution of this paper, suggests that IT is an attractive monetary policy strategy also for those economies that are characterized by a large regional dispersion of nominal rigidities and, hence, inflation persistence.

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Table 1: Results from panel unit-root tests

test	regions	pre 1997:2		post 1999:1	
		test statistic	p value	test statistic	p value
LLC	metrop. cities and provinces	0.40	0.65	-2.94	0.00
	small cities	-0.56	0.29	-3.98	0.00
IPS	metrop. cities and provinces	-1.10	0.13	-10.78	0.00
	small cities	-2.50	0.01	-13.13	0.00

Notes: LLC refers to the unit-root test of Levin, Lin and Chu (2002). IPS refers to the test of Im, Pesaran and Shin (2003). The lag order is chosen according to the (modified) AIC.

Table 2: The persistence of aggregate Korean inflation

	pre 1997:2		pre 1998:4		post 1999:1	
	ρ	[5%,95%]	ρ	[5%,95%]	ρ	[5%,95%]
aggregate inflation	0.88	[0.55,1.17]	0.54	[0.26,0.85]	0.22	[-0.03,0.49]

Notes: The table reports Hansen's (1999) mean unbiased estimator of the sum of autoregressive coefficients ρ and the bootstrapped 90% confidence bands based on 101 grid points and 999 replications. The lag order is chosen according to the AIC.

Table 3: The persistence of inflation across Korean metropolian cities and provinces

	pre 1997:2		pre 1998:4		post 1999:1	
	ρ_i	[5%,95%]	ρ_i	[5%,95%]	ρ_i	[5%,95%]
special city						
Seoul	0.99	[0.60,1.19]	0.64	[0.39,1.94]	0.41	[0.18,0.65]
metropolitan cities						
Busan	0.71	[0.41,1.11]	0.58	[0.33,0.86]	0.29	[0.03,0.54]
Daegu	1.07	[0.60,1.24]	0.60	[0.29,0.95]	0.20	[-0.05,0.49]
Incheon	0.52	[0.21,0.85]	0.37	[0.08,0.67]	0.23	[-0.05,0.51]
Gwangju	0.78	[0.40,1.18]	0.42	[0.13,0.76]	0.22	[-0.02,0.47]
Daejeon	1.15	[0.84,1.33]	0.59	[0.33,0.88]	0.15	[-0.14,0.46]
Ulsan	0.41	[0.15,0.67]	0.67	[0.45,0.93]	0.22	[-0.02,0.47]
provinces						
Gyeonggi-do	0.69	[0.45,1.07]	0.43	[0.10,0.71]	0.20	[-0.08,0.50]
Gangwon-do	0.85	[0.46,1.21]	0.57	[0.22,1.06]	0.26	[0.04,0.48]
Chungcheongbuk-do	0.66	[0.41,1.03]	0.45	[0.08,0.83]	0.26	[-0.00,0.54]
Chungcheongnam-do	0.18	[-0.20,0.48]	0.13	[-0.25,0.45]	0.44	[0.23,0.70]
Jeollabuk-do	0.75	[0.38,1.18]	0.46	[0.21,0.73]	0.24	[-0.02,0.51]
Jeollanam-do	0.79	[0.40,1.17]	0.34	[-0.01,0.67]	0.24	[0.00,0.49]
Gyeongsangbuk-do	0.32	[0.06,0.61]	0.22	[-0.13,0.56]	0.31	[0.05,0.59]
Gyeongsangnam-do	0.25	[0.03,0.48]	0.65	[0.44,0.94]	0.34	[0.08,0.58]
Jeju-do	1.06	[0.63,1.18]	0.61	[0.31,1.02]	0.40	[0.18,0.63]

Notes: The table reports Hansen's (1999) mean unbiased estimator of the sum of autoregressive coefficients ρ and the bootstrapped 90% confidence bands based on 101 grid points and 999 replications. The lag order is chosen according to the AIC.

Table 4: The persistence of inflation across Korean cities

city	pre 1997:2		pre 1998:4		post 1999:1	
	ρ_i	[5%,95%]	ρ_i	[5%,95%]	ρ_i	[5%,95%]
Suwon	0.74	[0.51,1.06]	0.52	[0.25,0.81]	0.28	[0.01,0.56]
Seongnam	0.32	[0.03,0.59]	0.40	[0.13,0.68]	0.30	[0.06,0.55]
Uijeongbu	0.61	[0.26,1.12]	0.21	[-0.11,0.55]	0.49	[0.24,0.76]
Bucheon	0.69	[0.45,1.07]	0.47	[0.21,0.75]	0.06	[-0.24,0.37]
Chuncheon	0.91	[0.45,1.22]	0.63	[0.32,1.08]	0.34	[0.11,0.58]
Wonju	0.52	[0.17,1.00]	0.45	[0.13,0.83]	0.25	[0.06,0.47]
Gangneung	0.81	[0.48,1.14]	0.67	[0.11,1.09]	0.26	[0.03,0.49]
Cheongju	0.68	[0.39,1.08]	0.43	[0.07,0.79]	0.29	[0.02,0.57]
Chungju	0.54	[0.28,0.84]	0.50	[0.13,0.84]	0.31	[0.07,0.57]
Cheonan	0.12	[-0.25,0.49]	0.09	[-0.29,0.41]	0.45	[0.22,0.69]
Boryeong	0.35	[0.03,0.69]	0.26	[-0.07,0.57]	0.44	[0.24,0.67]
Jeonju	0.83	[0.41,1.19]	0.47	[0.21,0.78]	0.31	[0.05,0.58]
Gunsan	0.26	[-0.11,0.64]	0.41	[0.14,0.67]	0.17	[-0.12,0.47]
Namwon	0.75	[0.44,1.15]	0.63	[0.28,1.09]	0.37	[0.14,0.61]
Mokpo	0.33	[-0.02,0.71]	0.05	[-0.30,0.38]	0.21	[-0.03,0.48]
Yeosu	0.21	[-0.16,0.58]	0.40	[0.07,0.77]	0.29	[0.08,0.51]
Suncheon	0.89	[0.49,1.16]	0.26	[-0.07,0.61]	0.24	[-0.02,0.51]
Pohang	0.60	[0.25,1.08]	0.29	[-0.06,0.63]	0.37	[0.10,0.64]
Gyeongju	0.37	[0.03,0.79]	0.19	[-0.11,0.47]	0.38	[0.11,0.67]
Andong	0.44	[0.12,0.81]	0.27	[-0.06,0.62]	0.43	[0.19,0.69]
Gumi	0.37	[0.02,0.76]	0.52	[0.25,0.84]	0.24	[-0.03,0.52]
Jinju	0.40	[0.19,0.64]	0.66	[0.49,0.89]	0.29	[0.04,0.55]
Jeju	1.06	[0.63,1.19]	0.60	[0.30,1.00]	0.41	[0.19,0.64]

Notes: The table reports Hansen's (1999) mean unbiased estimator of the sum of autoregressive coefficients ρ and the bootstrapped 90% confidence bands based on 101 grid points and 999 replications. The lag order is chosen according to the AIC.

Table 5: Cross-sectional summary statistics on regional inflation persistence

	statistics on ρ_i		
	pre 1997:2	pre 1998:4	post 1999:1
Seoul and metropolitan cities			
mean	0.80	0.55	0.25
median	0.78	0.59	0.22
std. dev.	0.28	0.11	0.08
max.	1.15	0.67	0.41
min.	0.41	0.37	0.15
provinces			
mean	0.62	0.43	0.30
median	0.69	0.45	0.26
std. dev.	0.30	0.17	0.08
max.	1.06	0.65	0.44
min.	0.18	0.13	0.20
cities			
mean	0.55	0.41	0.31
median	0.53	0.43	0.31
std. dev.	0.26	0.18	0.10
max.	1.06	0.67	0.49
min.	0.12	0.09	0.06

Table 6: The role of the common factor for inflation across Korean metropolitan cities and provinces

	pre 1997:2		post 1999:1	
	factor loading	R^2	factor loading	R^2
special city				
Seoul	0.38*** (0.09)	0.53	0.42*** (0.04)	0.78
metropolitan cities				
Busan	0.64*** (0.06)	0.86	0.46*** (0.02)	0.89
Daegu	0.34*** (0.07)	0.56	0.55*** (0.02)	0.94
Incheon	0.37*** (0.06)	0.75	0.51*** (0.01)	0.92
Gwangju	0.54*** (0.06)	0.76	0.53*** (0.02)	0.92
Daejeon	0.60*** (0.12)	0.50	0.56*** (0.03)	0.95
Ulsan	0.52*** (0.12)	0.43	0.53*** (0.01)	0.94
provinces				
Gyeonggi-do	0.38*** (0.07)	0.73	0.47*** (0.02)	0.92
Gangwon-do	0.64*** (0.06)	0.81	0.57*** (0.03)	0.87
Chungcheongbuk-do	0.53*** (0.04)	0.90	0.55*** (0.02)	0.93
Chungcheongnam-do	0.81*** (0.05)	0.82	0.58*** (0.03)	0.89
Jeollabuk-do	0.65*** (0.05)	0.83	0.59*** (0.03)	0.94
Jeollanam-do	0.63*** (0.05)	0.89	0.47*** (0.02)	0.92
Gyeongsangbuk-do	0.54*** (0.08)	0.64	0.57*** (0.03)	0.91
Gyeongsangnam-do	0.46*** (0.08)	0.61	0.59*** (0.02)	0.95
Jeju-do	0.50*** (0.06)	0.79	0.52*** (0.04)	0.83

Notes: The factor loading is the estimated coefficient in the regression of the inflation rate in region i on the common factor. A significance level of 1% is indicated by ***. The R^2 indicates the share of inflation variation explained by fluctuations in the common factor.

Table 7: The role of the common factor for inflation across Korean cities

city	pre 1997:2		post 1999:1	
	factor loading	R^2	factor loading	R^2
Suwon	0.46*** (0.06)	0.74	0.53*** (0.02)	0.92
Seongnam	0.30*** (0.12)	0.32	0.49*** (0.03)	0.81
Uijeongbu	0.51*** (0.05)	0.72	0.50*** (0.02)	0.83
Bucheon	0.35*** (0.08)	0.59	0.44*** (0.03)	0.79
Chuncheon	0.51*** (0.12)	0.56	0.54*** (0.04)	0.85
Wonju	0.92*** (0.07)	0.69	0.51*** (0.03)	0.81
Gangneung	0.63*** (0.15)	0.57	0.66*** (0.04)	0.84
Cheongju	0.55*** (0.04)	0.87	0.56*** (0.02)	0.93
Chungju	0.45*** (0.07)	0.74	0.56*** (0.05)	0.83
Cheonan	0.85*** (0.08)	0.81	0.59*** (0.02)	0.89
Boryeong	0.80*** (0.11)	0.62	0.62*** (0.04)	0.82
Jeonju	0.65*** (0.06)	0.78	0.61*** (0.03)	0.93
Gunsan	0.71*** (0.06)	0.88	0.59*** (0.04)	0.83
Namwon	0.50*** (0.15)	0.50	0.51*** (0.04)	0.81
Mokpo	0.62*** (0.08)	0.74	0.47*** (0.02)	0.88
Yeosu	0.63*** (0.05)	0.79	0.49*** (0.03)	0.84
Suncheon	0.65*** (0.06)	0.85	0.47*** (0.01)	0.91
Pohang	0.56*** (0.11)	0.56	0.56*** (0.03)	0.85
Gyeongju	0.57*** (0.12)	0.52	0.55*** (0.04)	0.82
Andong	0.38*** (0.06)	0.49	0.58*** (0.04)	0.81
Gumi	0.54*** (0.10)	0.57	0.62*** (0.03)	0.92
Jinju	0.71*** (0.02)	0.41	0.55*** (0.03)	0.91
Jeju	0.50*** (0.06)	0.79	0.53*** (0.03)	0.83

Notes: The factor loading is the estimated coefficient in the regression of the inflation rate in region i on the common factor. A significance level of 1% is indicated by ***. The R^2 indicates the share of inflation variation explained by fluctuations in the common factor.

Table 8: The persistence of the common factor and the idiosyncratic inflation rates across Korean metropolian cities and provinces

	pre 1997:2		post 1999:1	
	ρ_i	[5%,95%]	ρ_i	[5%,95%]
common factor F_t	0.75	[0.43,1.16]	0.48	[0.23,0.75]
special city				
Seoul	0.89	[0.52,1.23]	0.83	[0.70,1.03]
metropolitan cities				
Busan	0.50	[0.16,0.98]	0.86	[0.50,1.17]
Daegu	1.14	[0.77,1.33]	0.62	[0.33,1.04]
Incheon	0.61	[0.31,1.07]	0.86	[0.72,1.04]
Gwangju	-0.09	[-0.44,0.26]	0.70	[0.47,1.04]
Daejeon	1.10	[0.85,1.24]	0.72	[0.52,0.96]
Ulsan	1.06	[0.80,1.20]	0.65	[0.37,1.05]
provinces				
Gyeonggi-do	0.56	[0.31,0.84]	0.86	[0.65,1.07]
Gangwon-do	0.24	[-0.10,0.62]	0.84	[0.63,1.08]
Chungcheongbuk-do	0.58	[0.23,1.11]	0.85	[0.58,1.11]
Chungcheongnam-do	0.78	[0.45,1.20]	0.87	[0.71,1.07]
Jeollabuk-do	0.62	[0.33,1.05]	0.48	[0.25,0.70]
Jeollanam-do	0.72	[0.32,1.14]	0.92	[0.61,1.13]
Gyeongsangbuk-do	1.03	[0.77,1.14]	1.01	[0.78,1.11]
Gyeongsangnam-do	1.19	[0.94,1.37]	0.90	[0.66,1.09]
Jeju-do	0.74	[0.35,1.17]	0.53	[0.20,0.95]

Notes: The table reports Hansen's (1999) mean unbiased estimator of the sum of autoregressive coefficients ρ and the bootstrapped 90% confidence bands based on 101 grid points and 999 replications. The lag order is chosen according to the AIC.

Table 9: The persistence of idiosyncratic inflation across Korean cities

city	pre 1997:2		post 1999:1	
	ρ_i	[5%,95%]	ρ_i	[5%,95%]
Suwon	0.90	[0.50,1.19]	0.74	[0.53,1.02]
Seongnam	0.69	[0.41,1.10]	0.68	[0.46,0.98]
Uijeongbu	0.32	[-0.03,0.71]	0.85	[0.60,1.09]
Bucheon	0.79	[0.55,1.08]	0.80	[0.61,1.06]
Chuncheon	0.80	[0.48,1.17]	0.71	[0.36,1.11]
Wonju	0.22	[-0.13,0.59]	0.65	[0.43,0.89]
Gangneung	0.64	[0.32,1.06]	0.78	[0.53,1.08]
Cheongju	0.61	[0.26,1.13]	0.58	[0.24,1.07]
Chungju	0.79	[0.38,1.19]	0.75	[0.54,1.04]
Cheonan	0.89	[0.52,1.25]	0.82	[0.62,1.06]
Boryeong	0.70	[0.38,1.11]	0.82	[0.54,1.10]
Jeonju	0.66	[0.31,1.11]	0.66	[0.35,1.08]
Gunsan	0.13	[-0.20,0.52]	0.58	[0.39,0.77]
Namwon	0.60	[0.25,1.11]	0.67	[0.45,0.99]
Mokpo	0.56	[0.16,1.04]	0.71	[0.45,1.05]
Yeosu	-0.50	[-0.85,-0.15]	0.58	[0.31,0.91]
Suncheon	0.55	[0.20,1.05]	1.11	[0.86,1.23]
Pohang	1.10	[0.89,1.24]	0.93	[0.77,1.07]
Gyeongju	0.80	[0.52,1.10]	0.78	[0.61,1.01]
Andong	0.59	[0.37,0.86]	0.86	[0.68,1.07]
Gumi	0.98	[0.59,1.19]	0.53	[0.18,1.04]
Jinju	1.14	[0.83,1.31]	0.85	[0.56,1.13]
Jeju	0.74	[0.35,1.17]	0.58	[0.29,0.96]

Notes: The table reports Hansen's (1999) mean unbiased estimator of the sum of autoregressive coefficients ρ and the bootstrapped 90% confidence bands based on 101 grid points and 999 replications. The lag order is chosen according to the AIC.

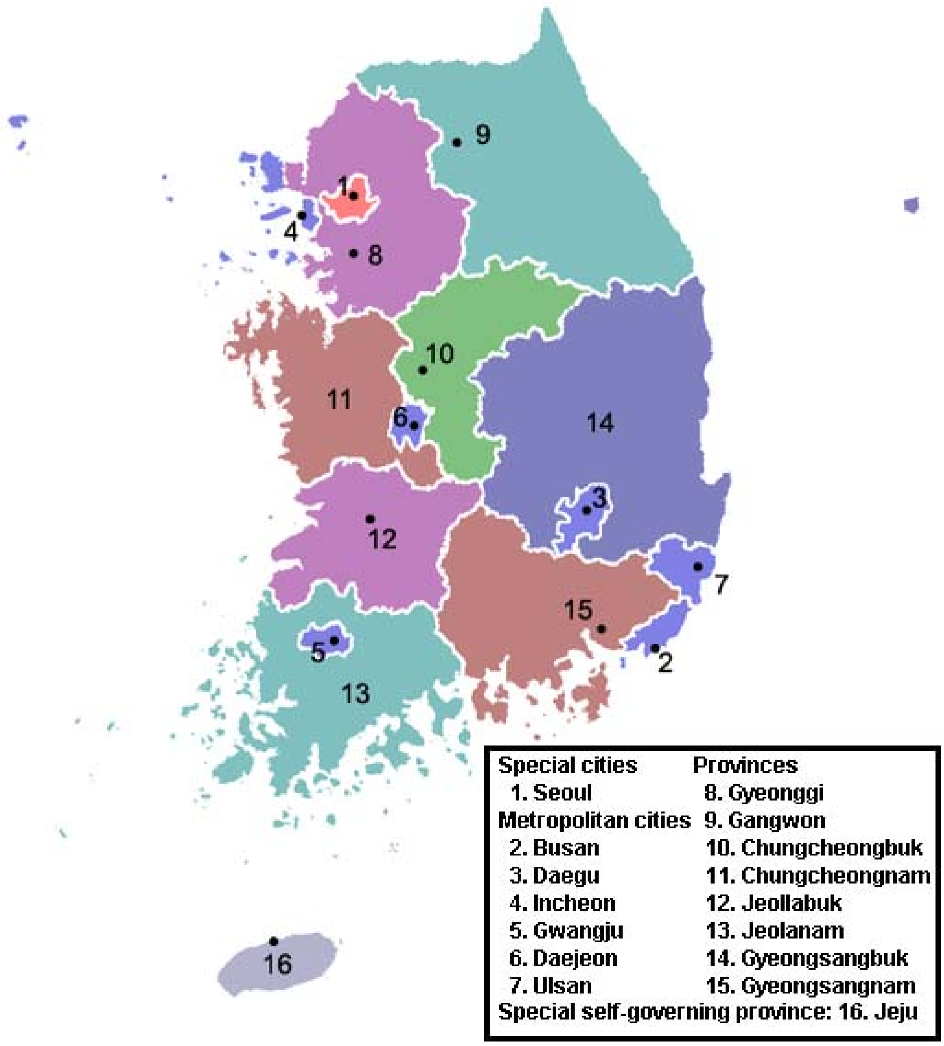

Figure 1: Administrative divisions of South Korea (source: Wikipedia)

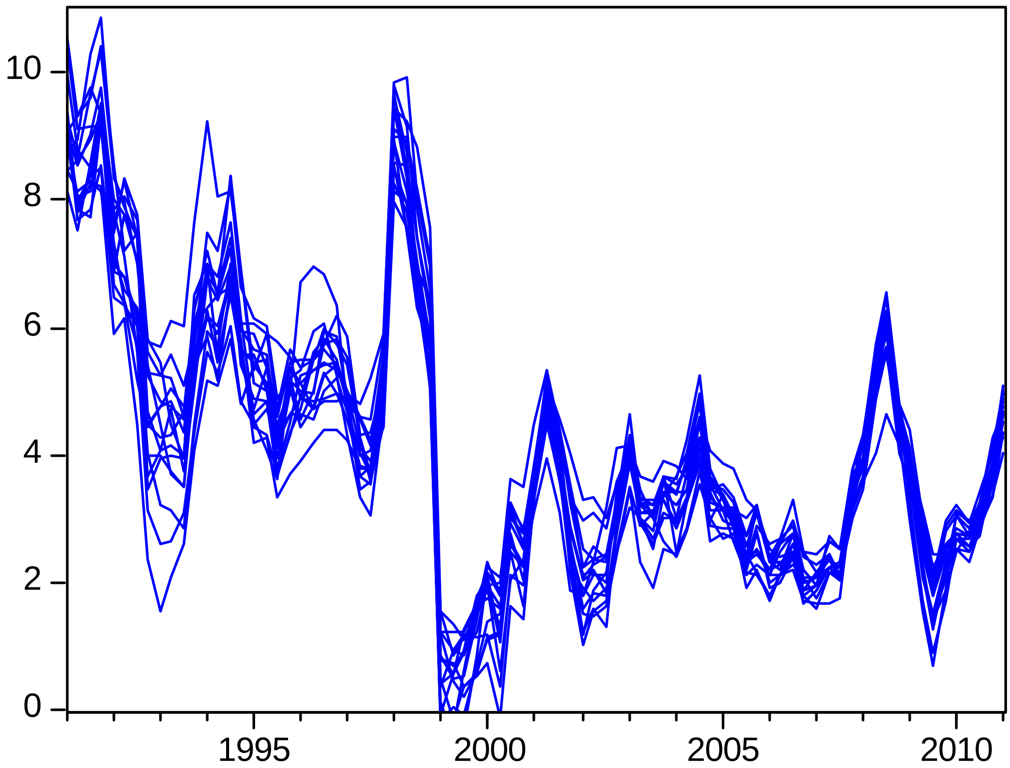

Figure 2: Annual inflation (in %) for Seoul, the six metropolitan cities and the nine Korean provinces

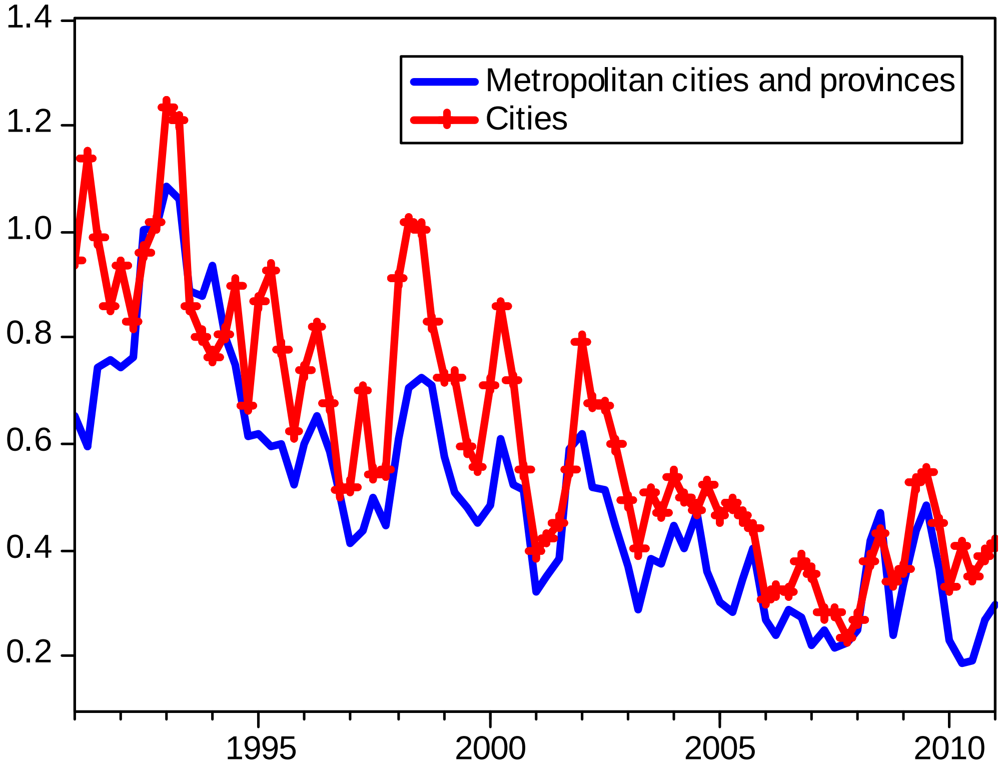

Figure 3: Cross-sectional standard deviation of regional inflation rates

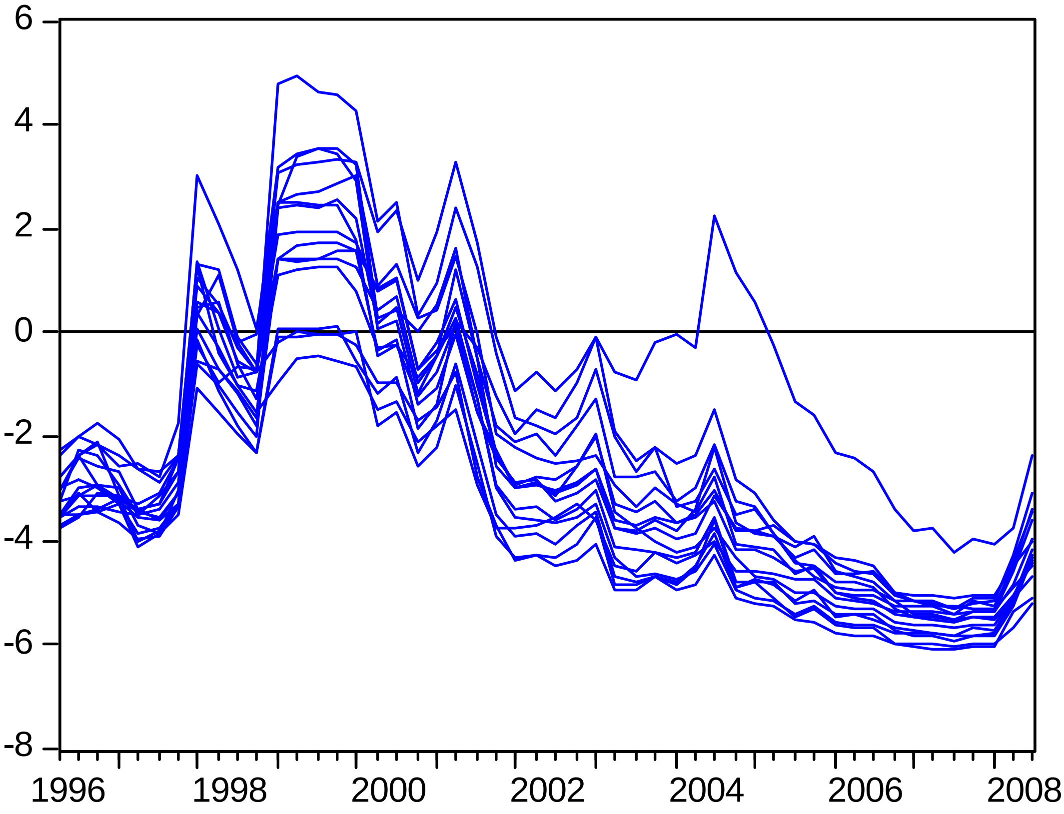

Figure 4: Sequence of F-test statistics for a break in the sum of the autoregressive coefficients (standardized by bootstrapped 5% critical value) for Korean cities and provinces