



**An Industry Analysis of Inflation and the  
Markup in the United States**

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Friday 27 November 2009**

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# Markup and Inflation

1. **Assuming inflation is stationary (i.e. constant mean)**

**Galí and Gertler (1999), Batini, Jackson and Nickell (2000, 2005), Galí, Gertler and López-Salido (2001, 2005), Rudd and Whelan (2005, 2007), and Kiley (2007)**

**Richards and Stevens (1987), Franz and Gordon (1993), Cockerell and Russell (1995), and de Brouwer and Ericsson (1998)**

- ⇒ **implies only one long-run rate of inflation**
- ⇒ **can only be an approximation**

# Markup and Inflation

## 2. Assuming inflation is integrated

### Difference the data

Cogley and Sbordone (2005, 2006) and Ireland (2007)

### Long run cointegrating relationships

Banerjee, Mizen and Russell (2007), Russell and Banerjee (2006), Banerjee and Russell (2005), Banerjee and Russell (2004), Banerjee, Cockerell and Russell (2001), Banerjee and Russell (2001), Banerjee and Russell (2001)

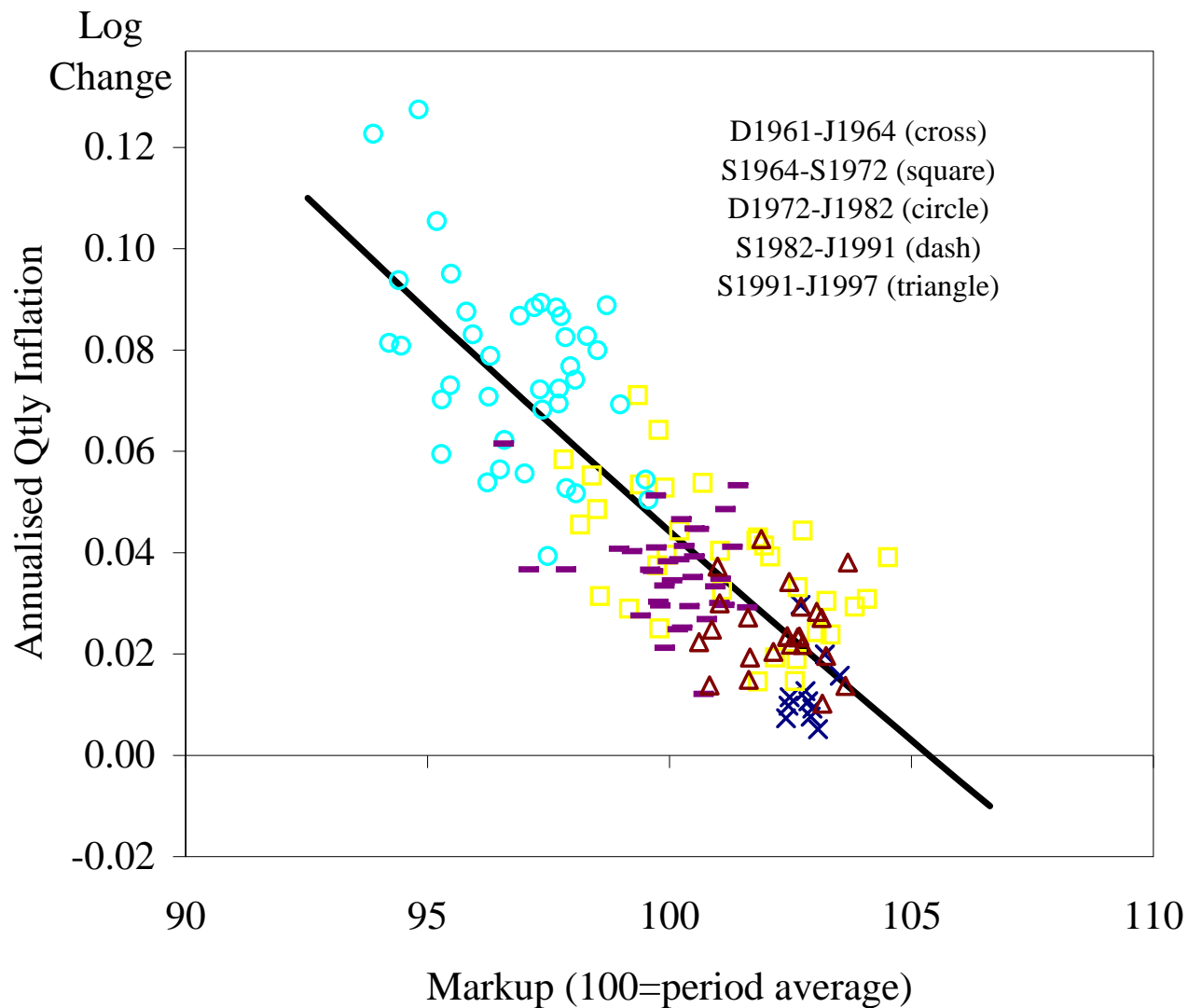
⇒ Inflation is bounded and so only an approximation

# **What is the ‘true’ statistical process of inflation?**

- 1. Shocks mean zero and no change to MP then inflation varies around the long-run rate of inflation**
  
  - 2. An increase in long-run rate requires a loosening in MP  $\Rightarrow$  inflation converges on new long-run rate**
- $\Rightarrow$  Implies inflation is stationary around shifting means**
- $\Rightarrow$  Russell, Banerjee and Malki (2009) show approximating as an integrated process valid**

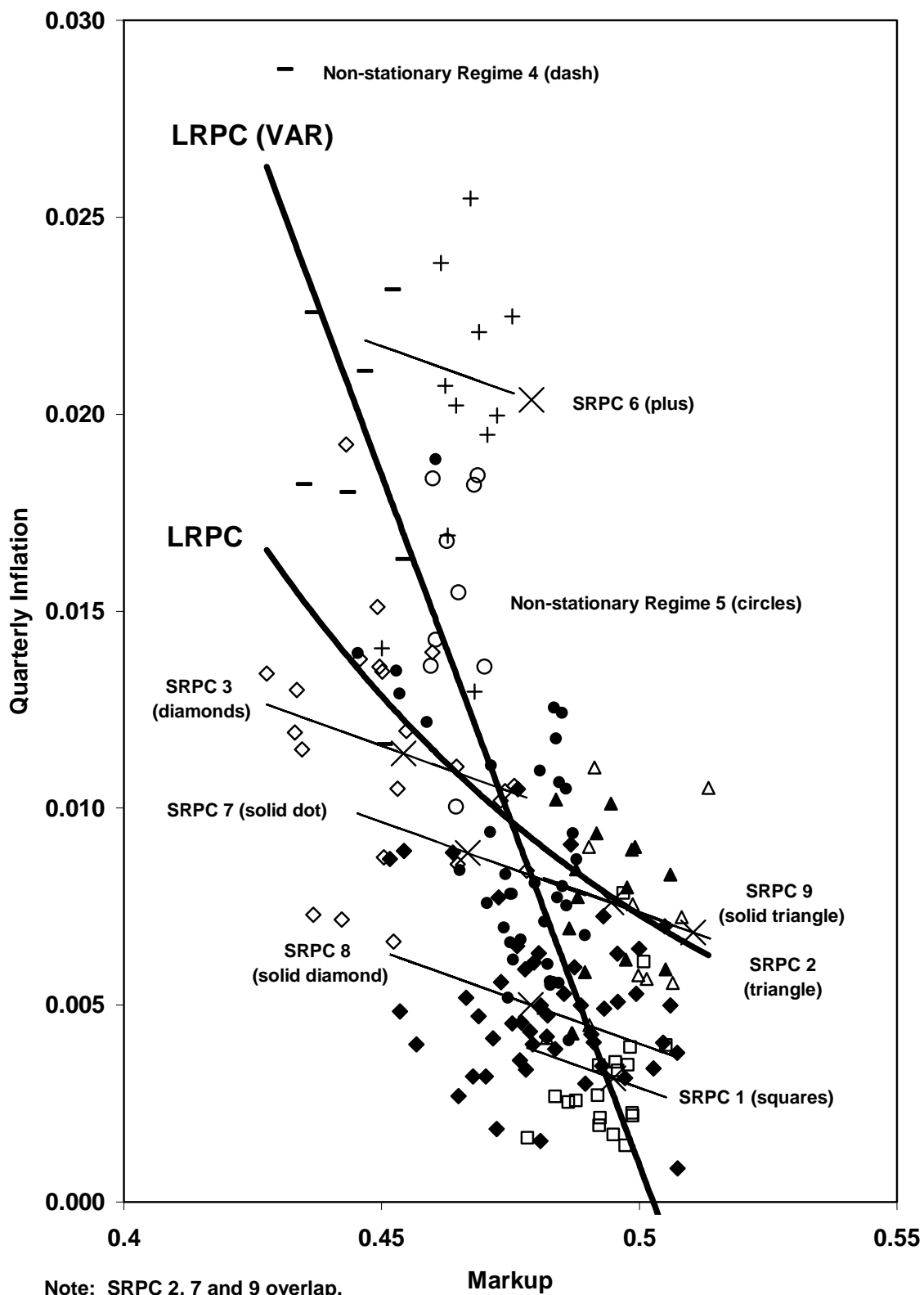
# UNITED STATES

## December 1961 - June 1997



**Banerjee, A. and B. Russell (2001). 'Inflation and the Markup in the G7 Economies and Australia', *Review of Economics and Statistics*, vol. 83, no. 2, May, pp. 377-87.**

# United States Inflation and the Markup



**Russell, Banerjee and Malki (2009)**

## **2 Questions**

- 1. Is the negative long-run inflation-markup relationship due to aggregation?**
  
- 2. Where does the relationship come from?**
  - (i) In terms of theory**
  
  - (ii) Component sub-sectors**

# Remainder of Presentation

**1. Statistical processes of inflation, markup and business cycle**

**2. Theories of inflation and the markup**

**3. Empirical model**

**4. Results**

**Panel**

**DOLS and FMOLS**

**Individual Industries**

**VAR-ECM and DOLS**

**5. Aggregate across industries**

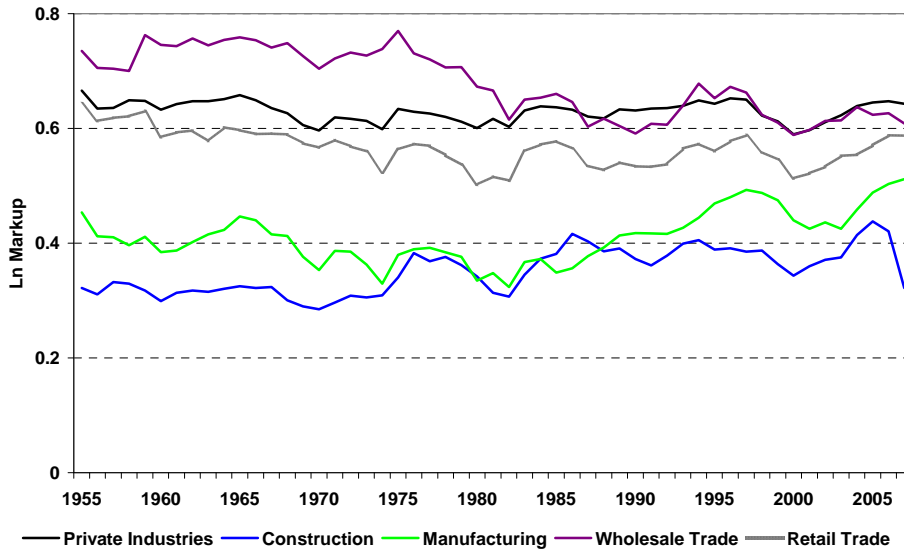
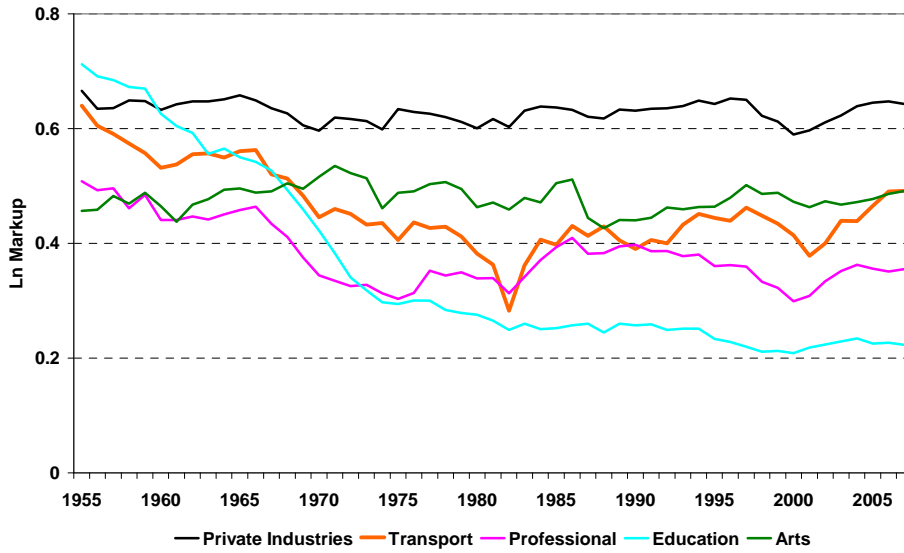
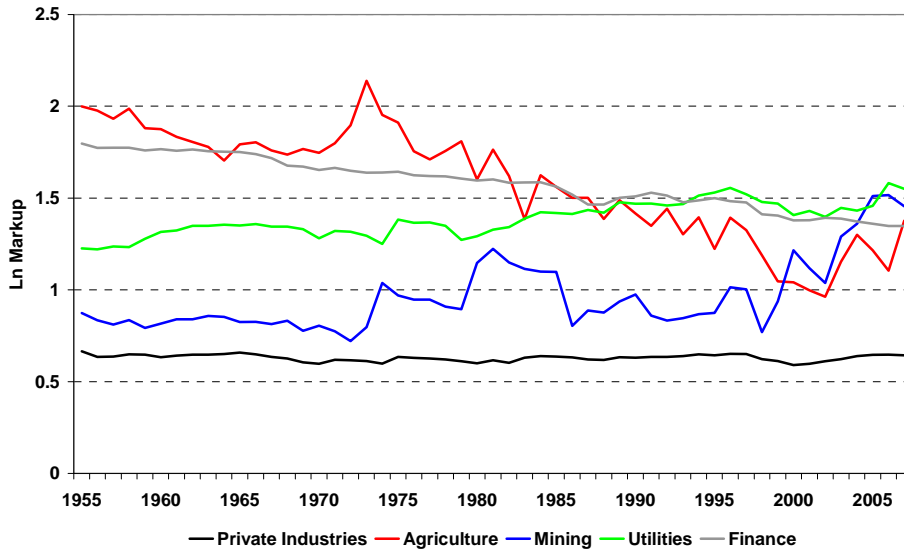


# **1. Statistical processes**

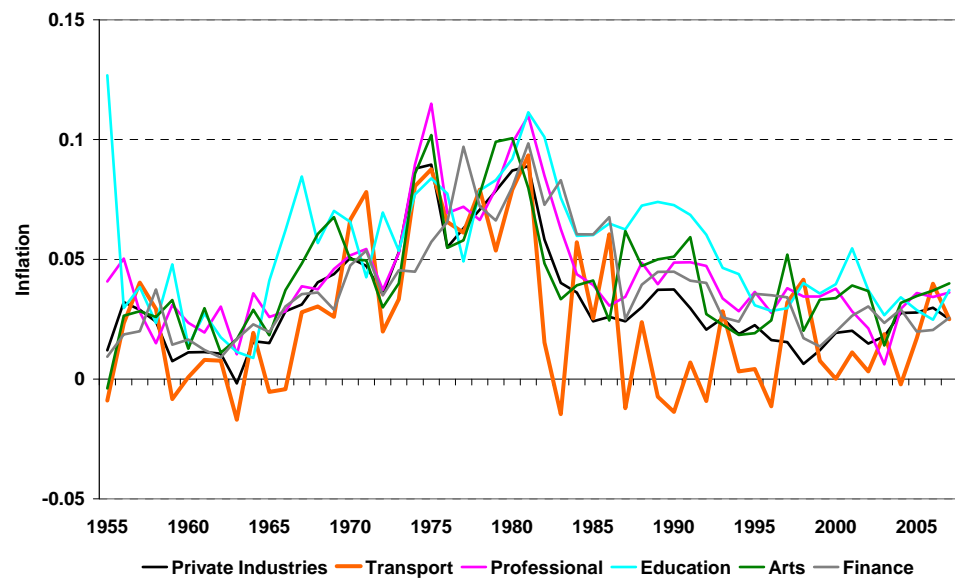
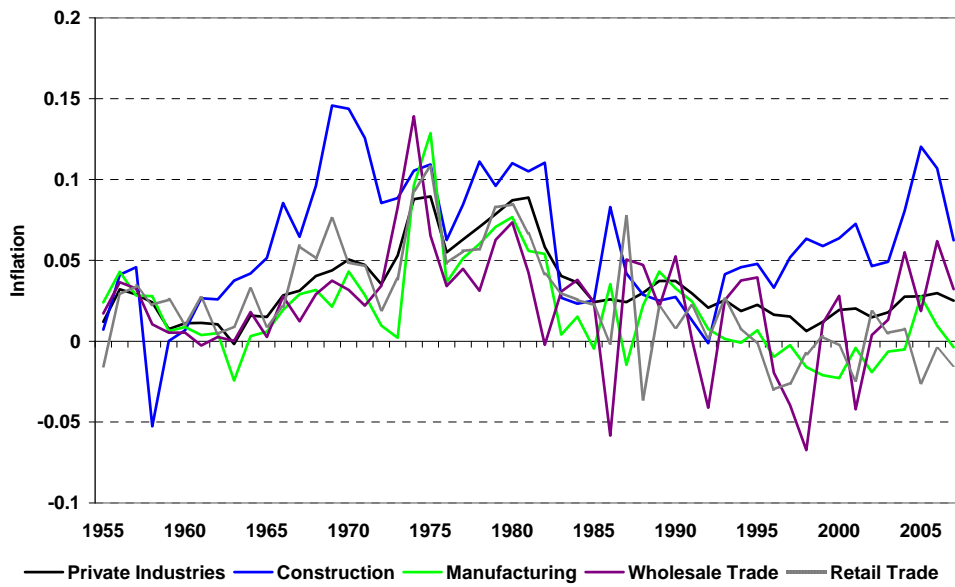
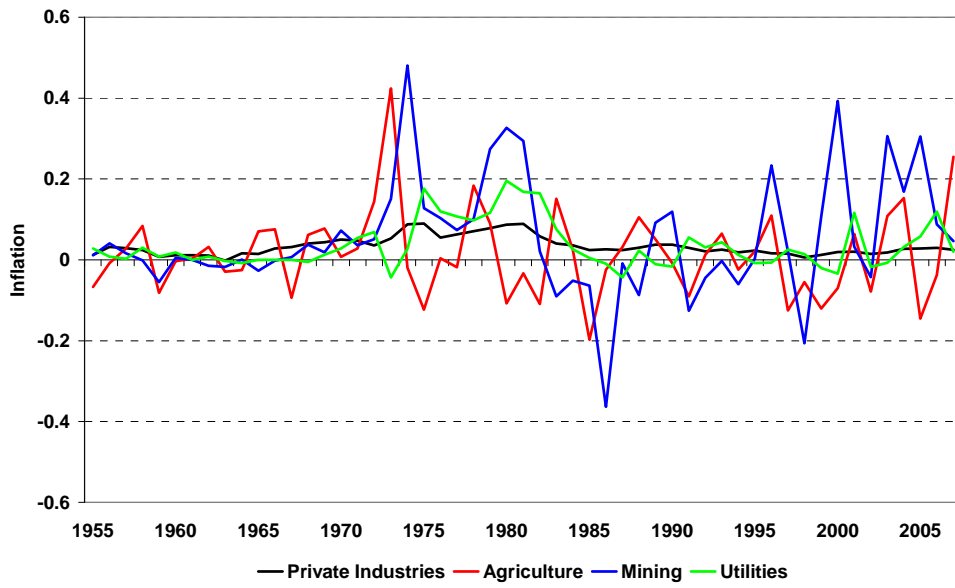
- 1. Data is annual United States 1955 – 2007 from GDP-by-Industry BEA**
- 2. 12 Industries and total private industries (i.e. no government)**
- 3. Inflation is log change in GDP ipd**
- 4. Markup is log (IPD / ULC)**
- 5. Business cycle is de-trend log GDP by HP filter (lambda = 10)**

|     | <b>INDUSTRY</b>  | <b>WEIGHT</b> |
|-----|--|---------------|
| 1.  | <b>Agriculture, forestry, fishing and hunting</b>                            | <b>0.012</b>  |
| 2.  | <b>Mining</b>  | <b>0.015</b>  |
| 3.  | <b>Utilities</b>   | <b>0.024</b>  |
| 4.  | <b>Construction</b>  | <b>0.055</b>  |
| 5.  | <b>Manufacturing</b>   | <b>0.180</b>  |
| 6.  | <b>Wholesale trade</b>   | <b>0.075</b>  |
| 7.  | <b>Retail trade</b>  | <b>0.084</b>  |
| 8.  | <b>Transportation and warehousing</b>  | <b>0.038</b>  |
| 9.  | <b>Professional and business services</b>                                    | <b>0.144</b>  |
| 10. | <b>Educational services, health care,<br/>and social assistance</b>          | <b>0.086</b>  |
| 11. | <b>Arts, entertainment, recreation,<br/>accommodation, and food services</b> | <b>0.044</b>  |

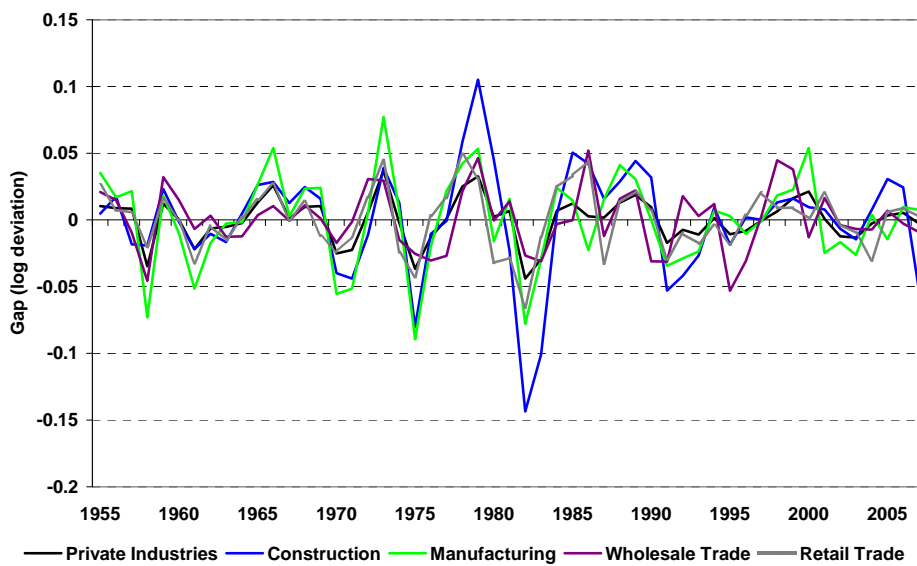
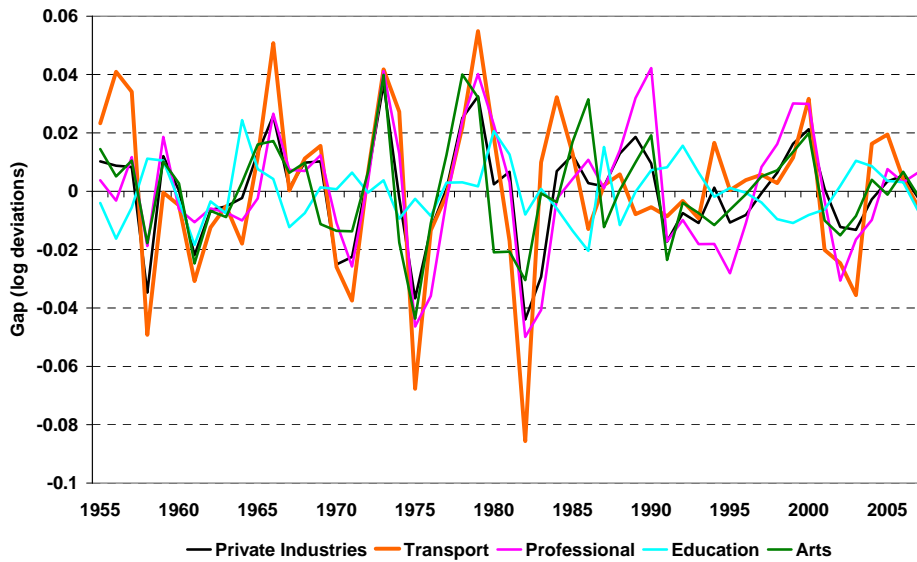
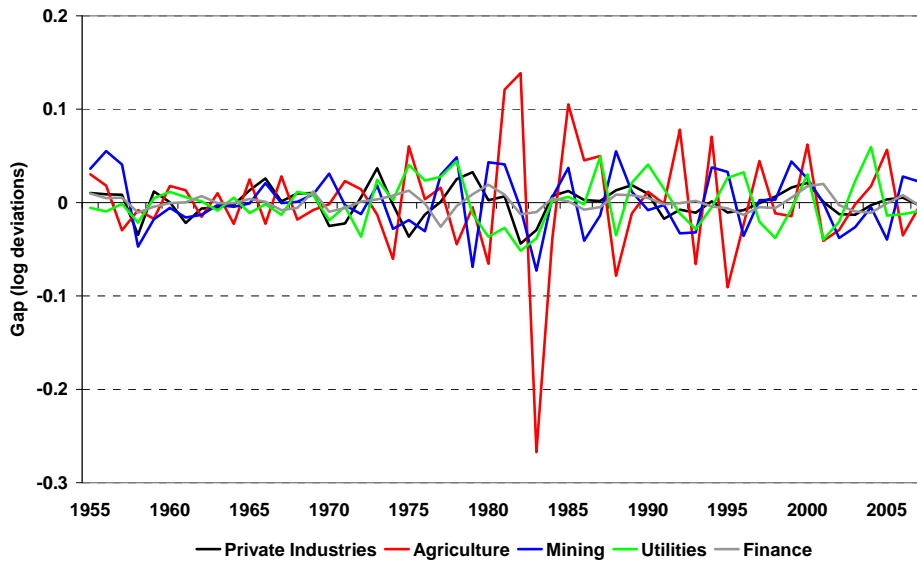
**Graph 2: The Markup– Annual 1955 to 2007**



**Graph 1: Inflation – Annual 1955 to 2007**



**Graph 3: Business Cycle – Annual 1955 to 2007**



## 2. Theories of inflation and the markup

### Assume

- (i) Constant returns to scale
- (ii) Labour only input and output indexed so that one worker produces one unit of output
- (iii) Therefore  $Y=N$
- (iv) If firms maximise profits then  $MC=UC=P$

$$P = \mu UC \quad \mu = 1 \quad \mu > 1$$

## **2. Theories of inflation and the markup**

- (i) Standard story markup is constant**
- (ii) But literature has theories of systematic influences on the markup**

$$\mu = f_{\mu} \left( e_{\Delta p}, \hat{y}, \Delta p, \sigma_{\Delta p}, \overline{\Delta p} \right)$$

- (iii) Stories fit some sectors better than others**

## 4. Empirical Model

1. **Banerjee, Cockerell and Russell (2001) set out imperfect competition model where firms impose ‘costs’ on the firm**

$$mu_{it} = q_i + \lambda_i \Delta p_{it} + \delta_i \hat{y}_{it} + e_{it}$$

2. **Gross markup**

$$q_i$$

3. **Long-run Inflation cost coefficient**

$$\lambda_i$$



## **4. Empirical Model**

**Estimate model with:**

- (i) Panel DOLS - Pedroni (1996)**
- (ii) Panel FMOLS - Pedroni (2001)**
- (iii) VAR-ECM - Johansen (1988, 1995)**
- (iv) DOLS - Stock and Watson (1993)**

| <b>ADF Unit Root Tests of Individual Industry and Aggregate Series</b>       |                  |            |                  |            |                  |            |                     |
|--|------------------|------------|------------------|------------|------------------|------------|---------------------|
|  | <b>Markup</b>    |            | <b>Inflation</b> |            | <b>BC</b>        |            | <b>Int</b>          |
|  | <b>C &amp; T</b> | <b>C</b>   | <b>C &amp; T</b> | <b>C</b>   | <b>C &amp; T</b> | <b>C</b>   |                     |
| <i>1. Agriculture, forestry, fishing and hunting</i>                         | - 3.23           |            |                  | - 6.69     |                  | - 6.71     | 1,0,0               |
| <i>2. Mining</i>   | - 2.32           |            |                  | - 4.81     |                  | - 4.77     | 1,0,0               |
| <i>3. Utilities</i>  | - 2.68           |            |                  | - 3.59     |                  | - 3.62     | 1,0,0               |
| <i>4. Construction</i>   | - 3.96           |            |                  | - 3.23     |                  | - 4.15     | 0,0,0               |
| <i>5. Manufacturing</i>  | - 2.14           |            |                  | - 3.36     |                  | - 4.79     | 1,0,0               |
| <i>6. Wholesale trade</i>  | - 2.40           |            |                  | - 4.57     |                  | - 4.14     | 1,0,0               |
| <i>7. Retail trade</i>   |                  | - 3.05     |                  | - 3.61     |                  | - 4.32     | 0,0,0               |
| <i>8. Transportation and warehousing</i>                                     |                  | - 2.59     |                  | - 4.11     |                  | - 4.41     | 1,0,0               |
| <i>9. Professional and business services</i>                                 |                  | - 2.40     |                  | - 2.03     |                  | - 3.66     | 1,1,0               |
| <i>10. Educational services, health care, and social assistance</i>          |                  | - 3.87     |                  | - 2.20     |                  | - 3.67     | 0,1,0               |
| <i>11. Arts, entertainment, recreation, accommodation, and food services</i> |                  | - 3.30     |                  | - 2.51     |                  | - 4.56     | 1,1,0               |
| <i>12. Finance, insurance, real estate, and leasing</i>                      | - 2.94           |            |                  | - 1.46     |                  | - 3.98     | 1,1,0               |
| <b>Total Private Industries</b>  |                  | - 3.25     |                  | - 2.03     |                  | - 6.30     | 1 <sup>#</sup> ,1,0 |
| <b>Panel Unit Root Tests</b>   |                  |            |                  |            |                  |            |                     |
|  | <b>Markup</b>    |            | <b>Inflation</b> |            | <b>BC</b>        |            | <b>I</b>            |
|  | <b>LL</b>        | <b>IPS</b> | <b>LL</b>        | <b>IPS</b> | <b>LL</b>        | <b>IPS</b> |                     |
| Constant only  | 0.64             | - 1.43     | 0.39             | 0.64       | -16.10           | -22.44     | 1,1,0               |
| Constant and trend   | - 1.09           | - 2.67     | - 0.56           | 0.23       | - 13.3           | -22.30     | ?,1,0               |

**Table 2: Panel Cointegration Tests**

| <i>Test</i>                | <b>Statistic</b> |
|----------------------------|------------------|
| <i>Panel pp- statistic</i> | 2.6504           |
| <i>Panel adf-statistic</i> | 2.8453           |
| <i>Group pp- statistic</i> | 2.5098           |
| <i>Group adf-statistic</i> | 2.5729           |

Notes: Pedroni (1999, 2004) test statistics computed using 60 periods of data for all 12 industries and distributed  $N(0,1)$  under the null of no cointegration. Test of no cointegration of the panel model that includes inflation, markup and the business cycle.

**Table 4: Individual Industry DOLS Estimates of the United States long-run Inflation-Markup relationship 1955 - 2007**

| <b>INDUSTRY</b>  | <b>W</b> | <b>Int</b> | <b>Dp</b>                            | <b>Trend</b>          | <b>BC</b>            |
|--|----------|------------|--------------------------------------|-----------------------|----------------------|
| <i>1. Agriculture, forestry, fishing and hunting</i>                         | 0.012    | 1,0,0      | 1.9028<br>(2.37)                     | - 0.0170<br>(- 6.40)  | 2.2370<br>(2.63)     |
| <i>2. Mining</i>   | 0.015    | 1,0,0      | 0.7298<br>(1.55)                     | 0.0074<br>(2.18)      | - 3.2639<br>(- 0.75) |
| <i>3. Utilities</i>  | 0.024    | 1,0,0      | - 0.5051<br>(- 2.37)                 | 0.0043<br>(6.00)      | 1.1199<br>(1.43)     |
| <i>4. Construction</i>   | 0.055    | 0,0,0      | - 0.2733<br>(- 1.89)                 | 0.0022<br>(6.46)      | 0.3343<br>(1.42)     |
| <i>5. Manufacturing</i>  | 0.180    | 1,0,0      | - 1.1580 <sup>(nt)</sup><br>(- 5.86) |                       | 0.3441<br>(0.95)     |
| <i>6. Wholesale trade</i>  | 0.075    | 1,0,0      | 0.2362<br>(1.27)                     | - 0.0036<br>(- 4.95)  | - 1.0174<br>(- 0.91) |
| <i>7. Retail trade</i>   | 0.084    | 0,0,0      | - 0.4823<br>(- 2.71)                 | - 0.0014<br>(- 3.88)  | - 0.1517<br>(- 0.40) |
| <i>8. Transportation and warehousing</i>                                     | 0.038    | 1,0,0      | - 1.2957<br>(- 5.50)                 | - 0.0028<br>(- 3.28)  | 0.7448<br>(1.38)     |
| <i>9. Professional and business services</i>                                 | 0.144    | 1,1,0      | - 1.3261<br>(- 2.71)                 | - 0.0020<br>(- 2.72)  | 0.1670<br>(0.17)     |
| <i>10. Educational services, health care, and social assistance</i>          | 0.086    | 0,1,0      | - 2.6402<br>(- 5.02)                 | - 0.0086<br>(- 10.45) | 1.9424<br>(0.92)     |
| <i>11. Arts, entertainment, recreation, accommodation, and food services</i> | 0.044    | 1,1,0      | 0.30903<br>(1.69)                    |                       | 0.0395<br>(0.08)     |
| <i>12. Finance, insurance, real estate, and leasing</i>                      | 0.244    | 1,1,0      | 0.0751<br>(0.34)                     | - 0.0090<br>(- 25.73) | - 1.6648<br>(- 1.36) |

**Table 3: Panel Industry Estimates of the United States long-run relationship between Inflation and the Markup, 1955 - 2007**

| INDUSTRY   | DOLS  |                        |                      | FMOLS                |                      |
|--|-------|------------------------|----------------------|----------------------|----------------------|
|  | W     | LR                     | Business Cycle       | LR                   | Business Cycle       |
| <i>1. Agriculture, forestry, fishing and hunting</i>                         | 0.012 | 2.2339<br>(0.96)       | 3.5077<br>(0.23)     | 0.2777<br>(0.34)     | - 0.5433<br>(- 0.36) |
| <i>2. Mining</i>   | 0.015 | 0.8499<br>(2.12)       | - 4.2320<br>(- 1.03) | 0.7952<br>(2.62)     | - 0.7968<br>(- 0.63) |
| <i>3. Utilities</i>  | 0.024 | - 0.3196<br>(- 0.47)   | 1.1526<br>(0.31)     | - 0.1162<br>(- 0.22) | - 0.0056<br>(- 0.00) |
| <i>4. Construction</i>   | 0.055 | - 0.1470<br>(- 0.63)   | 0.1907<br>(0.25)     | - 0.1610<br>(- 0.69) | 0.0400<br>(0.16)     |
| <i>5. Manufacturing</i>  | 0.180 | - 1.3121<br>(- 4.94)   | 0.8965<br>(1.55)     | - 1.1381<br>(- 3.50) | 0.1402<br>(0.52)     |
| <i>6. Wholesale trade</i>  | 0.075 | 0.8827<br>(1.27)       | - 2.9964<br>(- 1.01) | 0.5281<br>(1.20)     | - 0.6951<br>(- 1.03) |
| <i>7. Retail trade</i>   | 0.084 | - 0.2482<br>(- 0.66)   | - 0.6385<br>(- 0.42) | - 0.3477<br>(- 1.04) | 0.0527<br>(0.11)     |
| <i>8. Transportation and warehousing</i>                                     | 0.038 | - 1.3390<br>(- 1.29)   | 2.1480<br>(0.62)     | - 0.6541<br>(- 0.75) | 0.2754<br>(0.32)     |
| <i>9. Professional and business services</i>                                 | 0.144 | - 1.4167<br>(- 1.77)   | 0.1641<br>(0.07)     | - 1.2829<br>(- 1.86) | 0.2459<br>(0.33)     |
| <i>10. Educational services, health care, and social assistance</i>          | 0.086 | - 4.3147<br>(- 1.74)   | 6.7176<br>(0.48)     | - 2.9413<br>(- 1.55) | 1.6618<br>(0.30)     |
| <i>11. Arts, entertainment, recreation, accommodation, and food services</i> | 0.044 | 0.3382<br>(1.46)       | - 1.1331<br>(- 1.15) | 0.3240<br>(1.65)     | - 0.2478<br>(- 0.86) |
| <i>12. Finance, insurance, real estate, and leasing</i>                      | 0.244 | - 0.8171<br>(- 0.3860) | - 4.8338<br>(- 0.26) | - 0.2877<br>(- 0.15) | - 0.7188<br>(- 0.15) |
| <b>Panel Group Mean Estimate</b>   |       | - 0.4697<br>(- 1.75)   | 0.0786<br>(- 0.10)   | - 0.4170<br>(- 1.13) | - 0.0493<br>(- 0.38) |

**Table 5: Individual Industry VAR-ECM Estimates of the United States long-run Inflation-Markup relationship 1955 - 2007**

| INDUSTRY - Int  | Long-run |                       |                       | Short-run            |                      |                      |                  |
|---|----------|-----------------------|-----------------------|----------------------|----------------------|----------------------|------------------|
|   | C        | Dp                    | Trend                 | $\alpha_{MU}$        | $\alpha_{Dp}$        | $BC_{MU}$            | $BC_{Dp}$        |
| 1. Agriculture, forestry, fishing and hunting - 1,0,0                         | No       | - 8.0846<br>(- 2.18)  | - 0.0191<br>(- 2.28)  | - 0.0987<br>(- 2.88) | - 0.0986<br>(- 2.38) | - 1.7887<br>(- 5.48) | 0.5399<br>(1.37) |
| 2. Mining - 1,0,0   | Yes      | - 8.2243<br>(- 5.24)  |                       | 0.0127<br>(0.61)     | - 0.0399<br>(- 1.45) | - 0.2065<br>(- 0.43) | 0.6520<br>(1.01) |
| 3. Utilities - 1,0,0  | No       | - 0.5198<br>(- 2.03)  | 0.0050<br>(6.64)      | - 0.4127<br>(- 3.18) | - 0.3114<br>(- 2.7)  | - 0.4892<br>(- 2.48) | 1.1086<br>(5.8)  |
| 4. Construction - 0,0,0   | No       | - 1.5050<br>(- 3.05)  |                       | - 0.0818<br>(- 1.99) | - 0.1795<br>(- 3.2)  | - 0.2656<br>(-3.66)  | 0.3505<br>(3.49) |
| 5. Manufacturing - 1,0,0  | No       | - 1.4415<br>(- 3.89)  | 0.0013<br>(2.01)      | - 0.2177<br>(- 3.89) | - 0.1937<br>(- 2.71) | - 0.3993<br>(- 6.67) | 0.5001<br>(6.53) |
| 6. Wholesale trade - 1,0,0  | No       | - 0.4307<br>(- 1.02)  | - 0.0034<br>(- 5.07)  | - 0.2452<br>(- 3.24) | - 0.1080<br>(- 0.91) | - 0.4789<br>(- 4.32) | 0.9199<br>(5.28) |
| 7. Retail trade - 0,0,0   | Yes      | - 1.1086<br>(- 6.13)  | - 0.0023<br>(- 6.27)  | - 0.1802<br>(- 2.65) | - 0.5161<br>(- 5.46) | - 0.5486<br>(- 6.64) | 0.7013<br>(6.10) |
| 8. Transportation and warehousing - 1,0,0                                     | Yes      | - 3.2201<br>(- 5.95)  | - 0.0033<br>(- 3.01)  | - 0.1184<br>(- 3.64) | - 0.1788<br>(- 5.39) | - 0.4192<br>(- 3.79) | 0.5607<br>(4.97) |
| 9. Professional and business services - 1,1,0                                 | No       | - 2.2166<br>(- 5.39)  | - 0.0025<br>(- 3.88)  | - 0.0674<br>(- 1.21) | - 0.1647<br>(- 3.97) | - 0.4294<br>(- 4.2)  | 0.3491<br>(4.58) |
| 10. Educational services, health care, and social assistance - 0,1,0          | Yes      | - 3.3618<br>(- 14.28) | - 0.0097<br>(- 26.87) | - 0.1421<br>(- 3.26) | - 0.2946<br>(- 6.63) | - 0.3776<br>(- 2.24) | 0.6057<br>(3.53) |
| 11. Arts, entertainment, recreation, accommodation, and food services - 1,1,0 | No       | 2.2215<br>(3.38)      |                       | 0.0294<br>(0.59)     | 0.1173<br>(3.27)     | - 0.6876<br>(- 4.83) | 0.6081<br>(5.92) |
| 12. Finance, insurance, real estate, and leasing - 1,1,0                      | No       | 0.1012<br>(0.44)      | - 0.0087<br>(- 27.33) | - 0.4363<br>(- 3.74) | - 0.0086<br>(- 0.10) | 0.0313<br>(0.12)     | 0.6703<br>(3.46) |

# Group Mean Long-run Coefficients and $t$ -statistics

1. Mean versus weighted average

2. Appropriate  $t$ -statistics

**Pedroni (2001)**

$$t_P = \frac{1}{\sqrt{n}} \sum_{i=1}^n \left( \frac{\alpha_i t_i}{\sqrt{\sum_{i=1}^n \alpha_i^2}} \right)$$

## Group Mean Long-run Coefficients and $t$ -statistics

**Alternative is treat the estimated coefficients as random variables**

$$\text{Var} \left[ \sum_{i=1}^n \alpha_i \beta_i \right] = \sum_{i=1}^n \alpha_i^2 \text{Var} [\beta_i] + \sum_{j \neq k} \alpha_j \alpha_k \text{Cov} [\beta_j, \beta_k]$$

$$t_{HD} = \frac{\sum_{i=1}^n \alpha_i \beta_i}{\sqrt{\sum_{i=1}^n \alpha_i^2 \text{Var} [\beta_i] + \sum_{j \neq k} \alpha_j \alpha_k \text{Cov} [\beta_j, \beta_k]}}$$



**Table 6: Aggregate Estimates of the long-run Inflation Cost Coefficient  $\lambda$** 

|   | <b>Individual<br/>VAR-ECM</b> | <b>Individual<br/>DOLS</b> | <b>Panel<br/>DOLS</b> | <b>Panel<br/>FMOLS</b> |
|---|-------------------------------|----------------------------|-----------------------|------------------------|
| Total Private Industry                    | - 0.3087                      | - 0.4499 <sup>(t)</sup>    |                       |                        |
| <i>t</i> -statistic                       | - 2.58                        | - 5.04                     |                       |                        |
| <b>Mean Estimates</b>                     |                               |                            |                       |                        |
| Group Mean $\lambda$                      | - 2.3159                      | - 0.3690                   | - 0.4697              | - 0.4170               |
| Pedroni <i>t</i> -statistic               | - 13.09                       | - 5.44                     | - 1.75                | - 1.13                 |
| Mean <i>t</i> -statistic                  | -3.78                         | -1.57                      | -0.51                 | -0.33                  |
| Heaton/Dewhurst <i>t</i> -statistic       | - 6.57                        | -3.40                      | -1.28                 | -1.58                  |
| <b>Weighted Mean Estimates</b>            |                               |                            |                       |                        |
| Weighted Group Mean                       | - 1.3117                      | - 0.6576                   | - 0.9757              | - 0.7075               |
| Pedroni style <i>t</i> -statistic         | - 9.58                        | - 5.79                     | -3.57                 | -2.73                  |
| Weighted mean <i>t</i> -statistic         | - 3.58                        | -2.17                      | - 1.33                | -1.02                  |
| Heaton/Dewhurst style <i>t</i> -statistic | -10.06                        | -6.03                      | -1.69                 | -1.39                  |

Notes: Group mean is the mean value of the inflation cost coefficients across industries. Weighted group mean is the weighted mean where the weights are the industry share of total GDP in the year 2000.

**Table 7: Aggregate Estimates of the Business Cycle Coefficient**

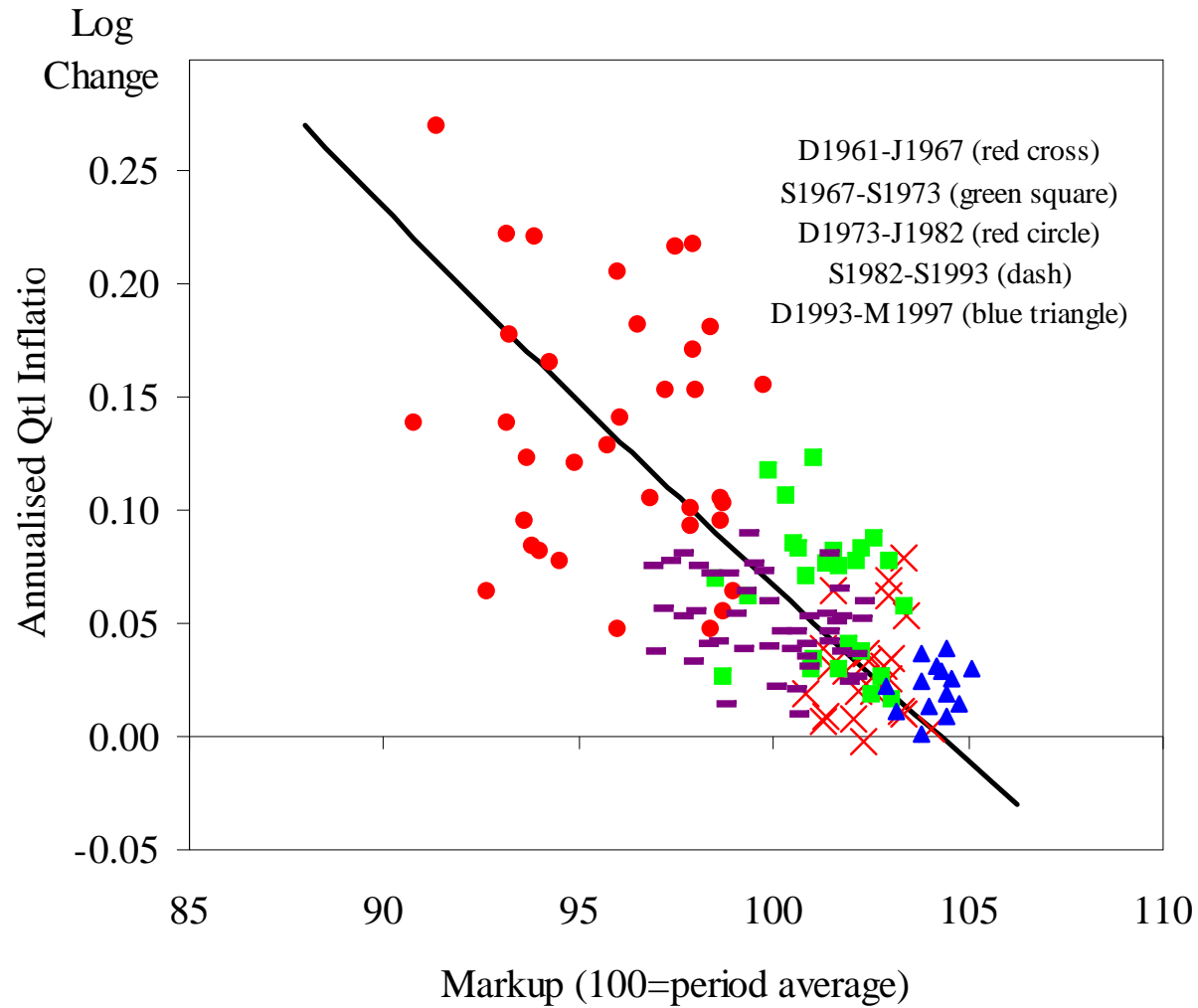
|   | <b>Individual<br/>VAR-ECM</b> |                  | <b>Individual<br/>DOLS</b> | <b>Panel<br/>DOLS</b> | <b>Panel<br/>FMOLS</b> |
|---|-------------------------------|------------------|----------------------------|-----------------------|------------------------|
|   | <b>MU</b>                     | <b>Inflation</b> | <b>MU</b>                  | <b>MU</b>             | <b>MU</b>              |
| Total Private Industry                    | - 0.4312                      | 0.2808           | - 0.6485                   |                       |                        |
| <i>t</i> -statistic                       | - 6.59                        | 4.12             | - 0.99                     |                       |                        |
| <b>Mean Estimates</b>                     |                               |                  |                            |                       |                        |
| Group Mean $\lambda$                      | - 0.5049                      | 0.6305           | 0.0693                     | 0.0786                | - 0.0493               |
| Pedroni <i>t</i> -statistic               | - 12.88                       | 15.02            | 1.61                       | - 0.10                | - 0.38                 |
| Mean <i>t</i> -statistic                  | -3.72                         | 4.34             | 0.46                       | -0.03                 | -0.11                  |
| Heaton/Dewhurst <i>t</i> -statistic       | -8.21                         | 8.66             | 0.15                       | 0.03                  | -0.076                 |
| <b>Weighted Mean Estimates</b>            |                               |                  |                            |                       |                        |
| Weighted Group Mean                       | - 0.3378                      | 0.5932           | - 0.1891                   | - 0.6463              | - 0.0371               |
| Pedroni style <i>t</i> -statistic         | - 9.46                        | 12.57            | 0.08                       | 0.37                  | 0.08                   |
| Weighted mean <i>t</i> -statistic         | - 3.53                        | 4.70             | 0.03                       | 0.18                  | - 0.09                 |
| Heaton/Dewhurst style <i>t</i> -statistic | -4.85                         | 10.47            | -0.46                      | -0.14                 | -0.03                  |

## Conclusions

- **Long-run inflation-markup not due to aggregation**
- **Industries that contribute depend on market structure and statistical process of data**
- **Relationship is between the markup and mean rates of inflation**
- **Potentially better estimates by modelling each industry and then aggregating**

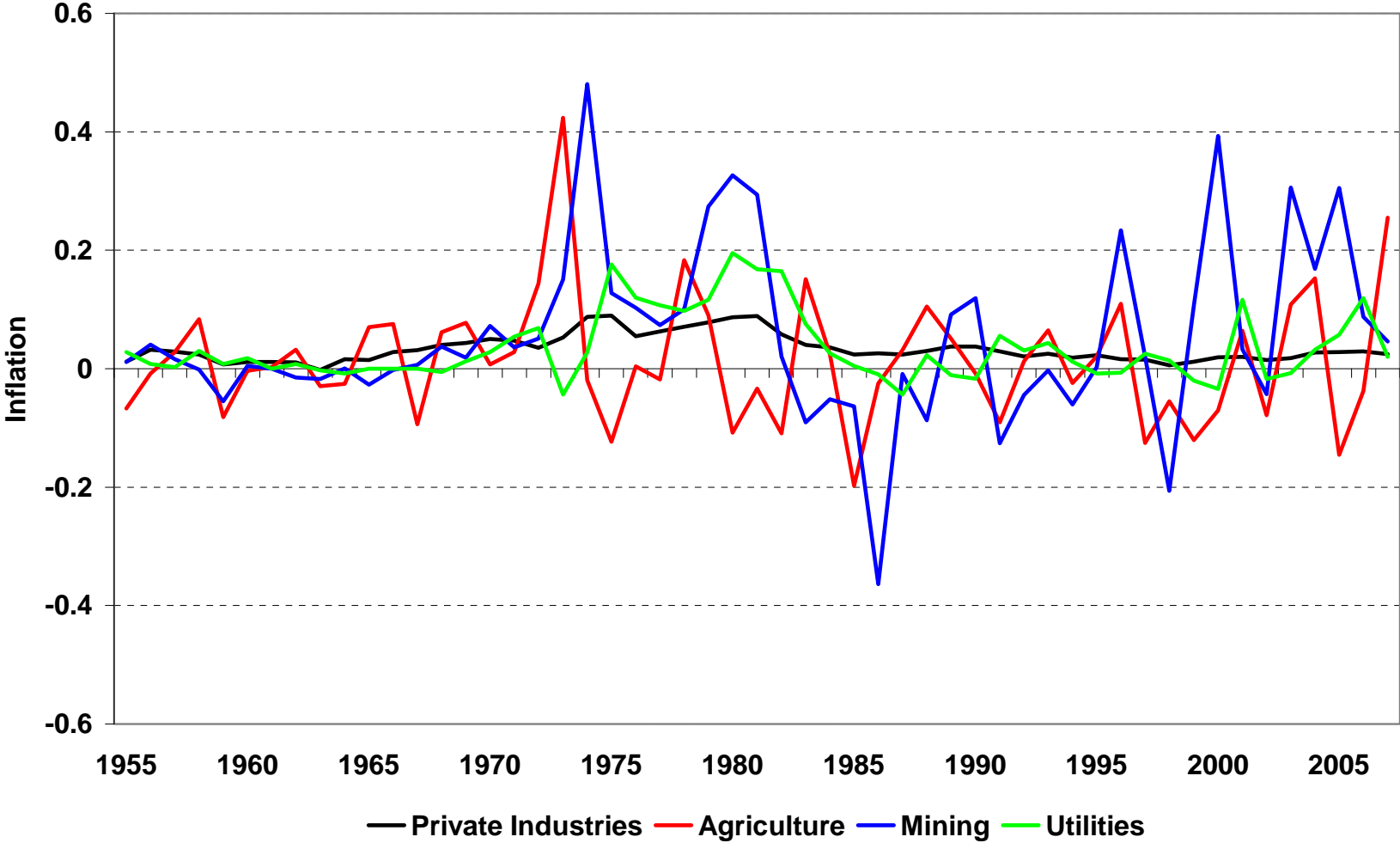
Spare slides from here

**UNITED KINGDOM**  
**December 1961 - March 1997**

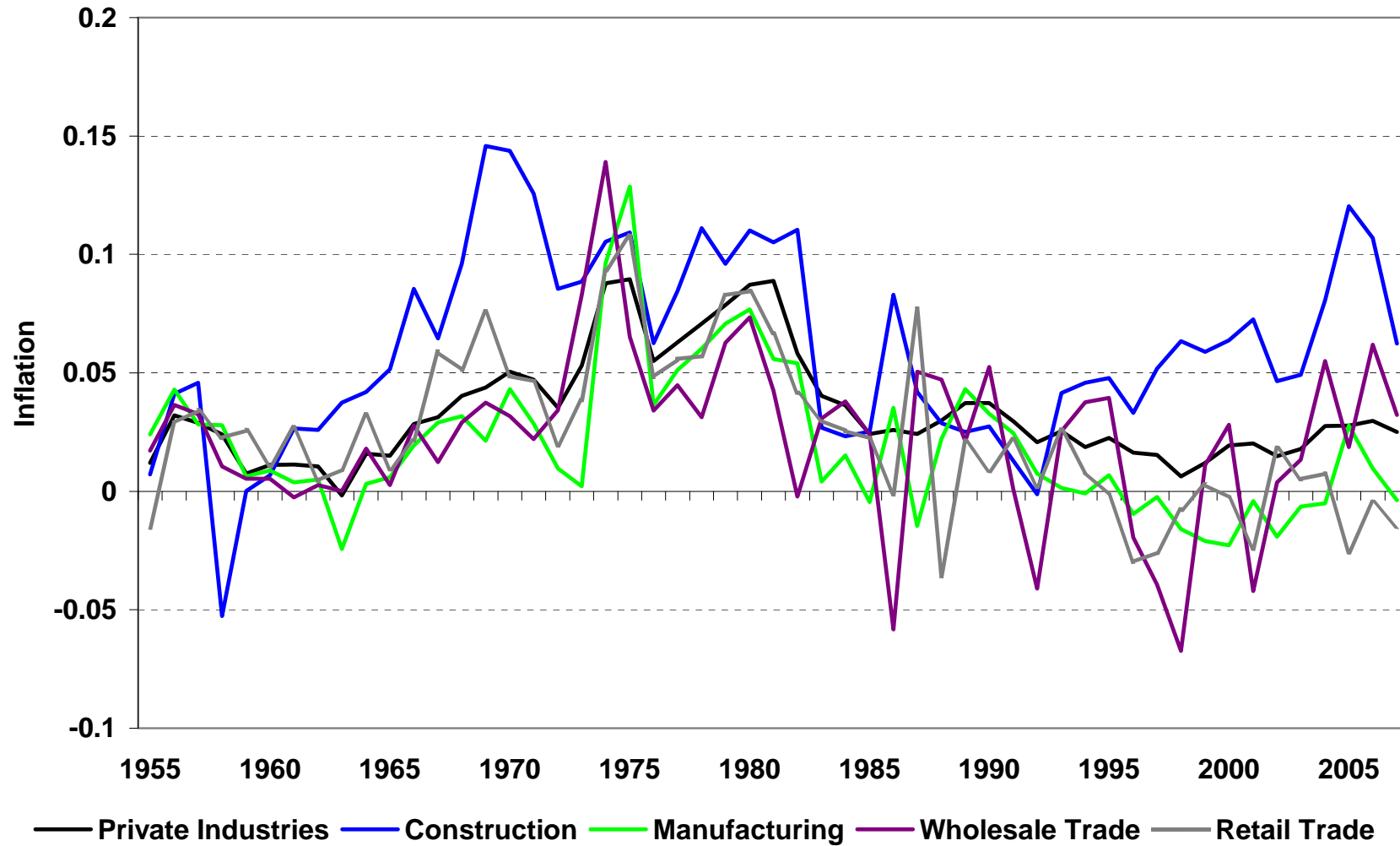


Banerjee, A. and B. Russell (2001). 'Inflation and the Markup in the G7 Economies and Australia', *Review of Economics and Statistics*, vol. 83, no. 2, May, pp. 377-87.

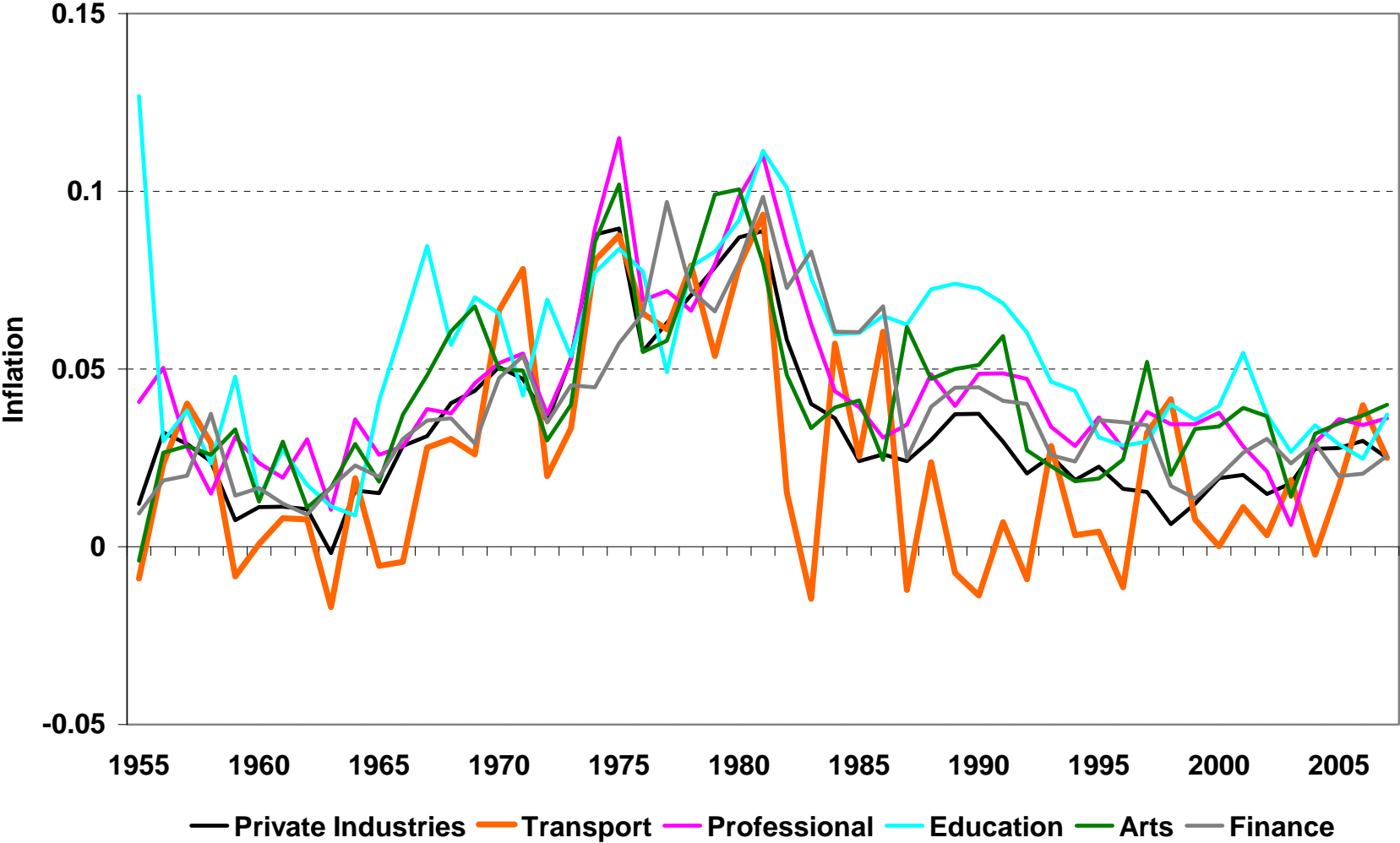
# Graph 1: Industry Inflation – Annual 1955 to 2007



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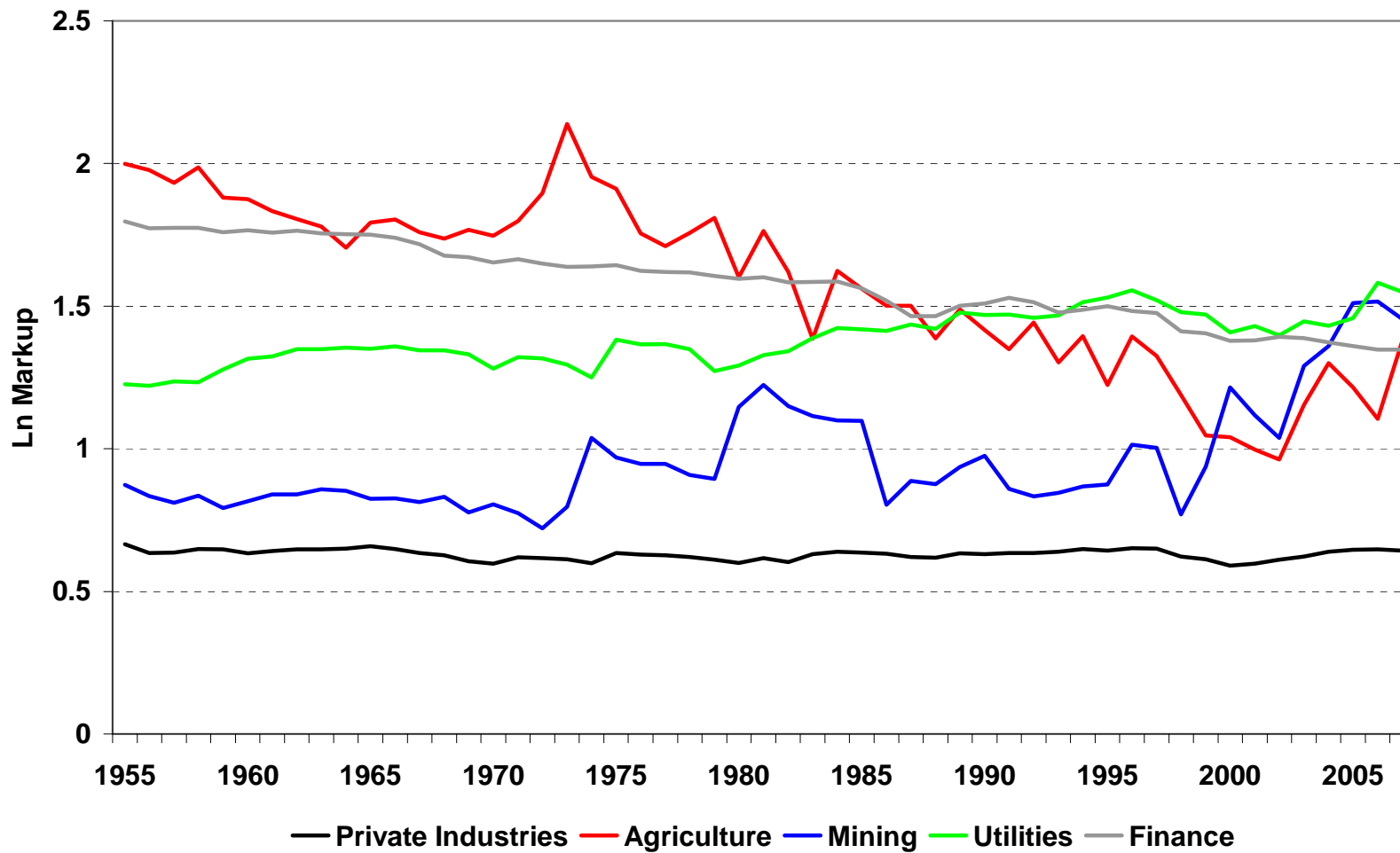


# Graph 1: Industry Inflation – Annual 1955 to 2007

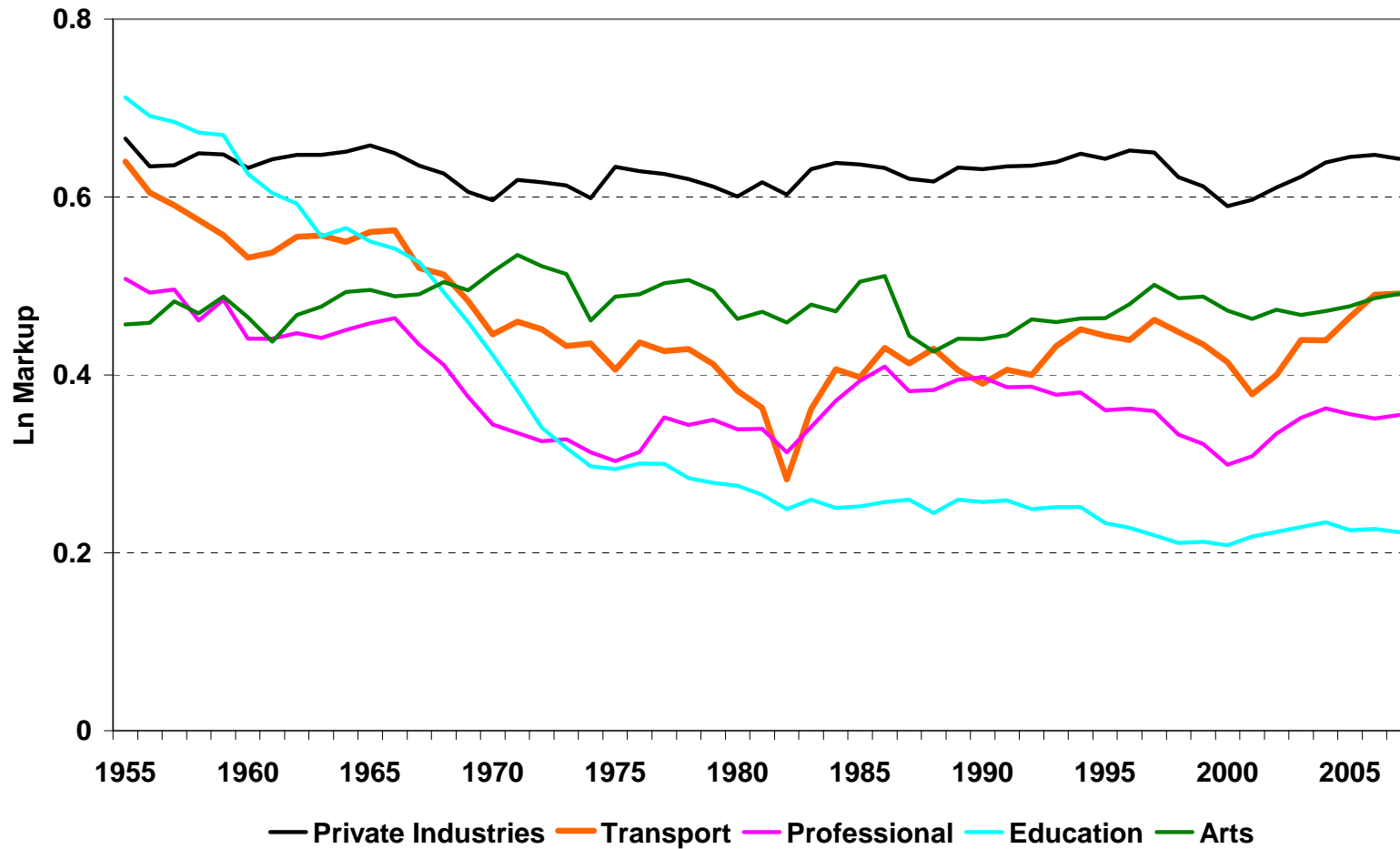




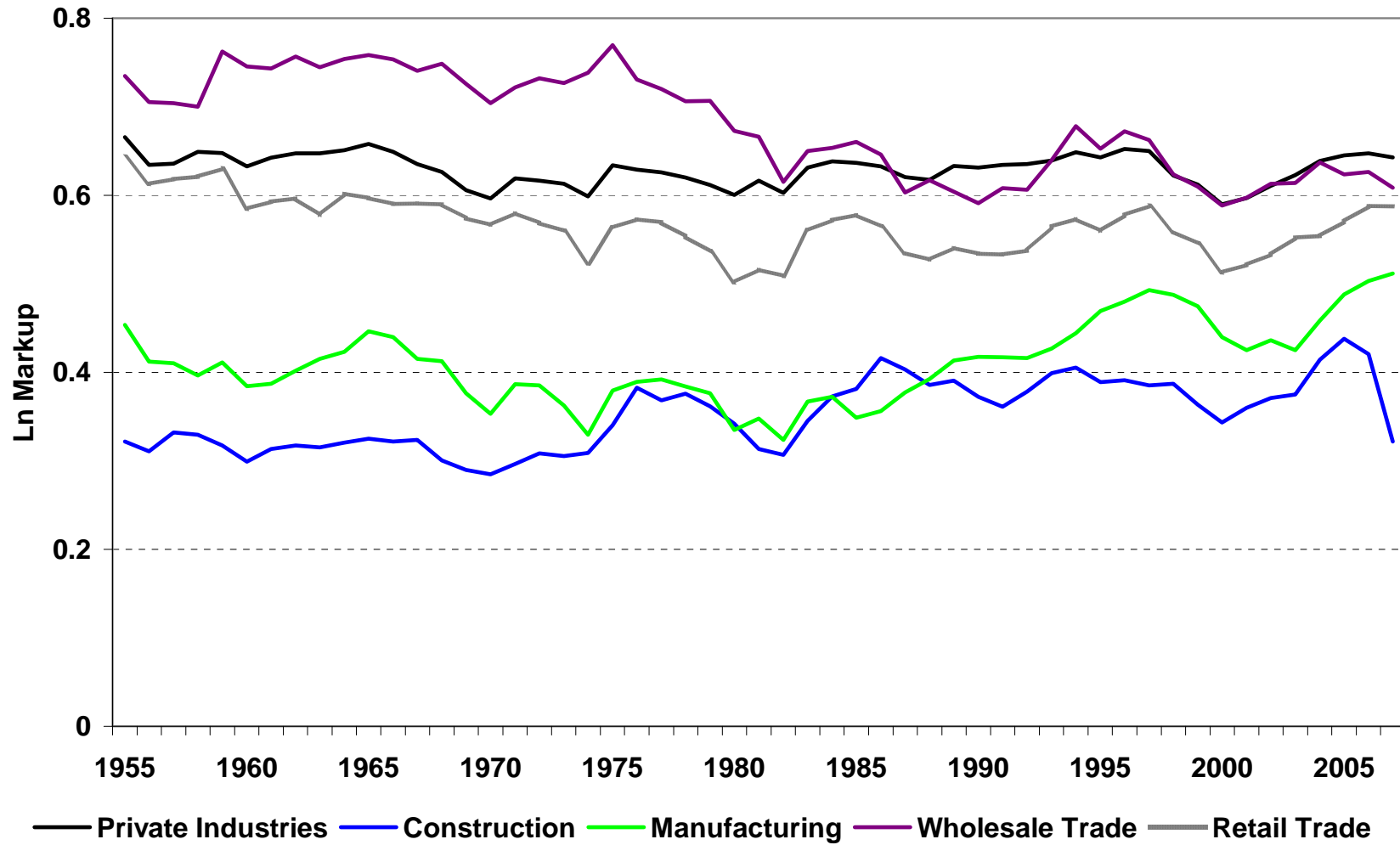
## Graph 2: The Industry Markup– Annual 1955 to 2007



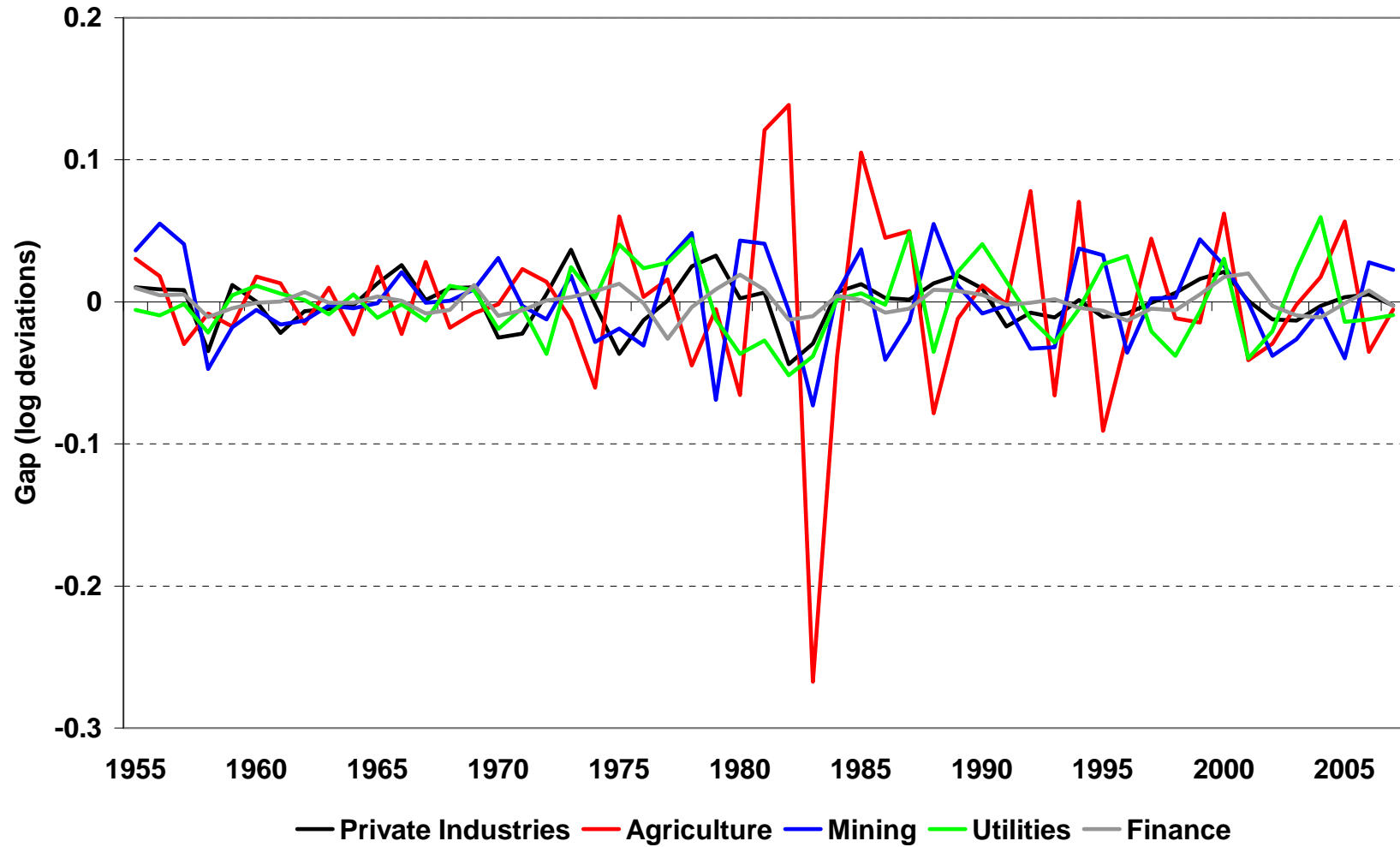
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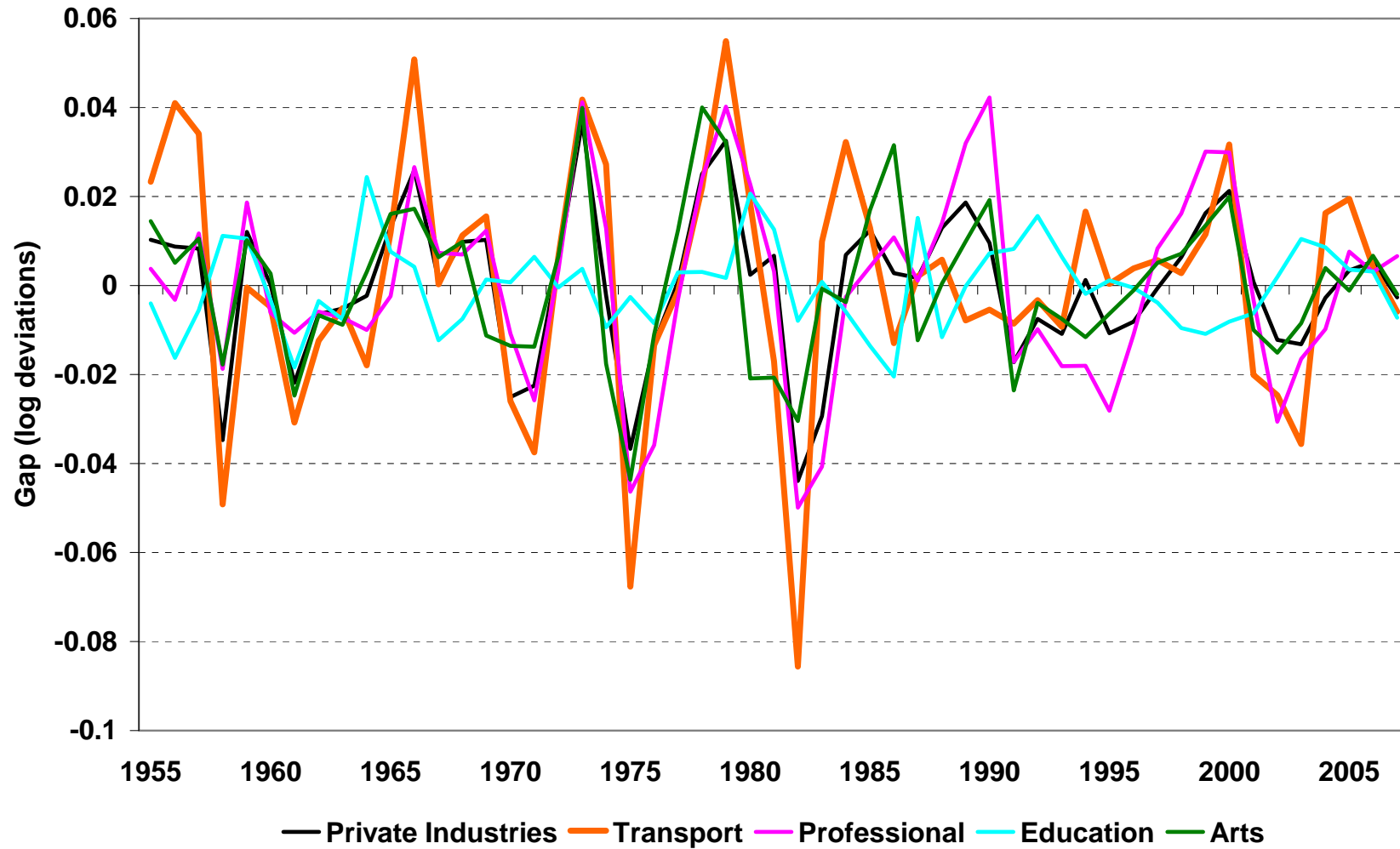
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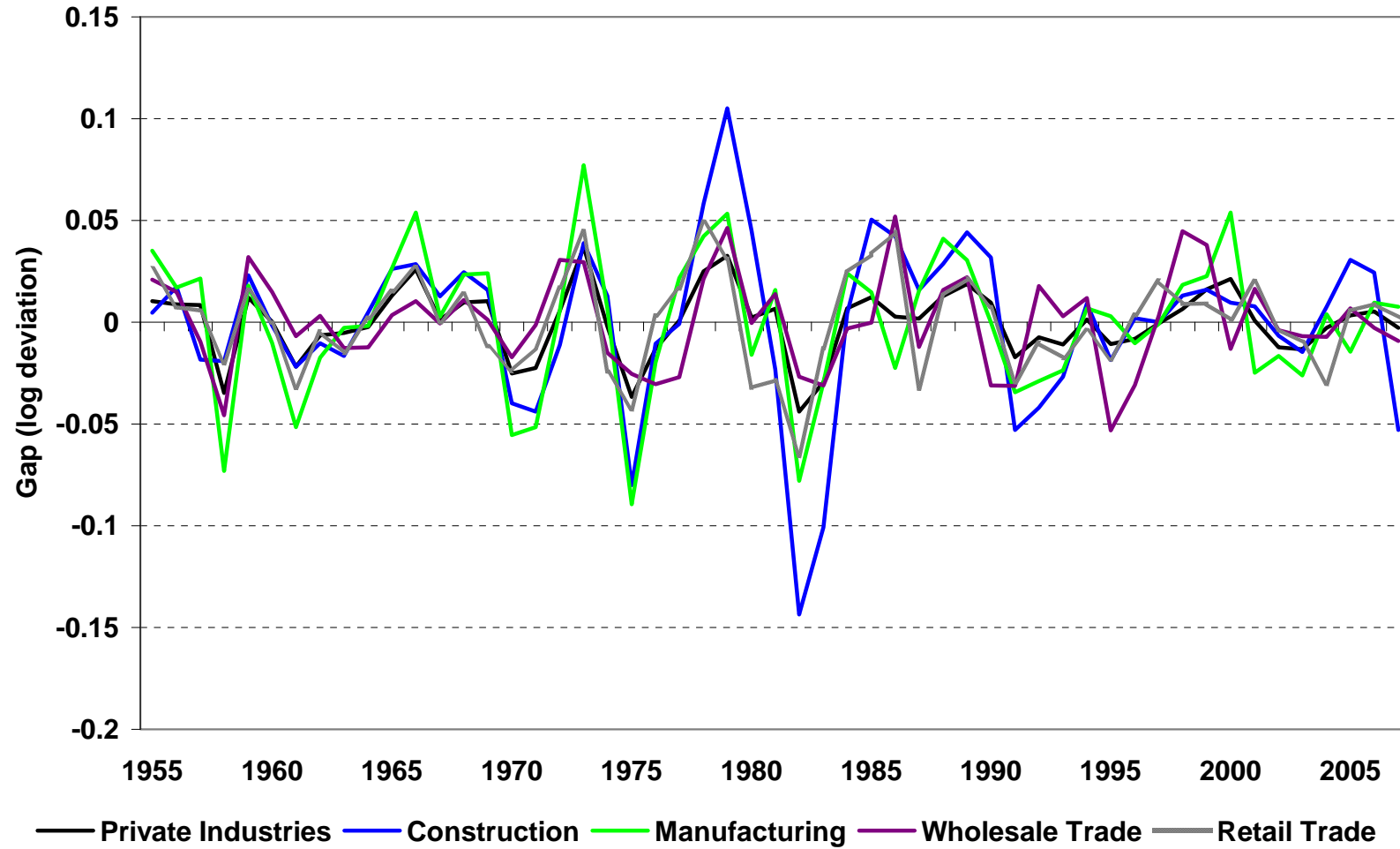
### Graph 3: Industry Business Cycle – Annual 1955 to 2007



### Graph 3: Industry Business Cycle – Annual 1955 to 2007



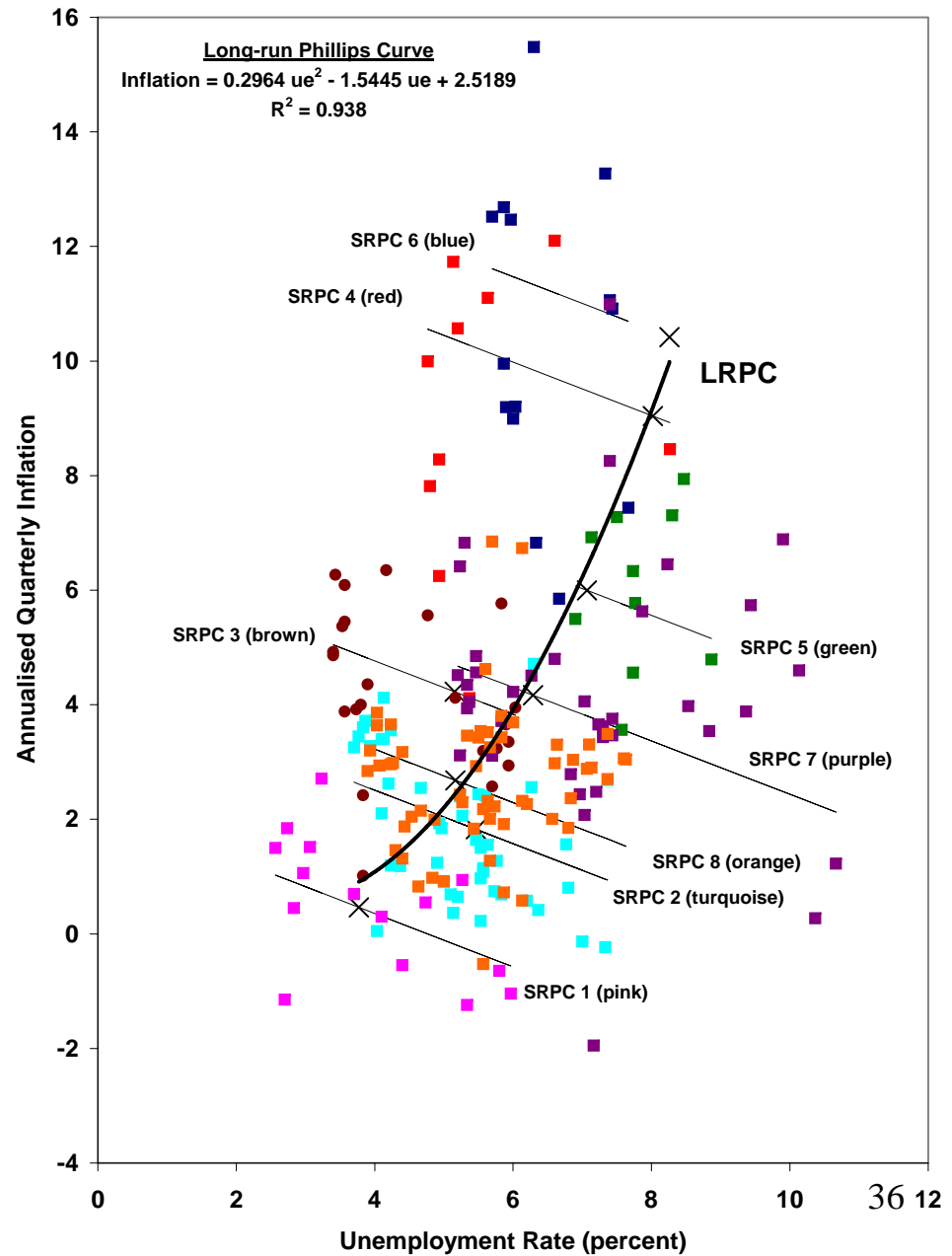
### Graph 3: Industry Business Cycle – Annual 1955 to 2007



## **2. Theories of inflation and the markup**

- (a) ‘Menu Cost’ focus is adjustment - Rotemberg (1983), Kuran (1986), Naish (1986), Danziger (1988), Konieczny (1990) and Bénabou and Konieczny (1994)**
- (b) ‘Menu cost’ but focus is search - Bénabou (1988, 1992) and Diamond (1993)**
- (c) Behavioural Equilibrium Models - Russell (1998), Russell, Evans and Preston (2001) and Chen and Russell (2001)**

## United States Phillips Curves



From Russell (2007). **Non-stationary Inflation and Panel Estimates of United States Short and Long-run Phillips Curves.**

Price index is all urban CPI.

Assumes inflation is stationary around shifting means.

Same data as Russell and Banerjee (2008).

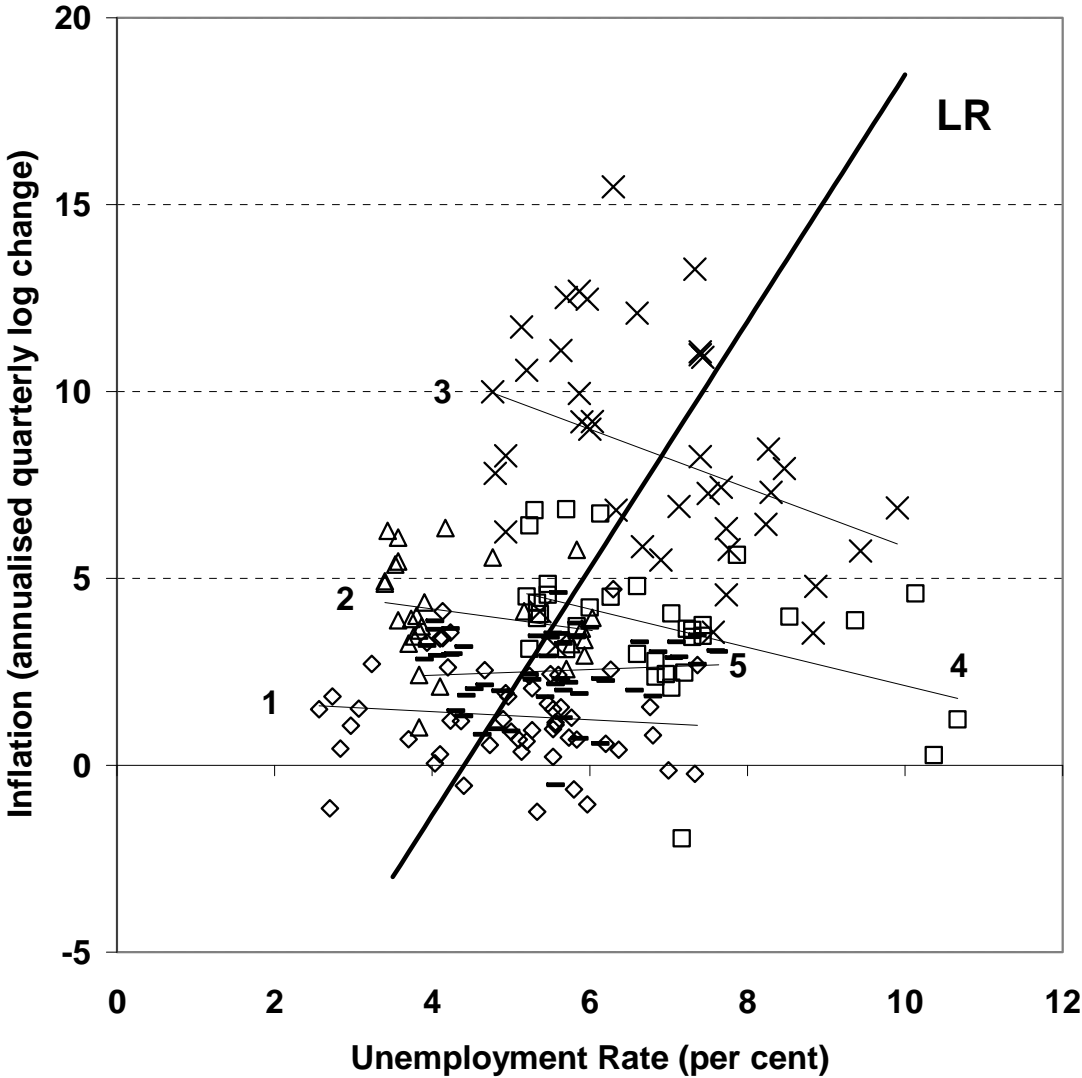


**Graph 9: United States Long-run Phillips Curve**

**From Russell and Banerjee (2008). The Long-run Phillips curve and Non-stationary Inflation, Journal of Macroeconomics, vol. 29, pp. 355-67.**

**Price index is all urban CPI.**

**Assumes inflation and markup are integrated.**



## **Issues: long-run Phillips curve has a positive slope**

- **Ross and Wachter (1973)**
- **Friedman's (1977) Nobel Lecture**
- **Akerlof, Dickens and Perry (2000)**
- **Markup and inflation are negatively related in the long-run**

Graph 4: United States Phillips Curves

