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Can Sectoral Re-allocation Explain the Jobless Growth? Empirical Evidence from Pakistan

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INTRODUCTION

The present paper discuss the nature of structural changes in employment to understand jobless growth in Pakistan for the period spanning over 1967–2008. In our work (elsewhere)[1] analysing Pakistan at sectoral level to find underlying factors generating jobless growth, we found that Jobless growth in manufacturing sector was anticipated. Industrial sector has a significant importance in any economy across the glob. Recent changes in the use of capital—based foreign technology has resulted in substitution of labour with non-labour inputs such as capital. Employment shifts between industrial sectors are often witnessed as indicators of Structural change in an economy. In this paper we are more interested in the nature of structural change that took place in Pakistan economy over 1967–2008. We set to analyse four commonly used measures of sectoral reallocation proposed by Lilien (1982), Groshen and Potter (2003), Rissman (1997), and Aaronson, Rissman and Sullivan (2004). Findings of our work are suggesting that the economy of Pakistan underwent structural change during periods of recession and recovery. However, it does appear that structural changes were more pronounced at the time of 1969 recession than that of 1991 recession. A plausible explanation for this result might be significant shifts in employment from agriculture towards services sectors. We conclude, based on the evidence from our study, that sectoral reallocation is one of the major causes of jobless growth in Pakistan.

The rest of the paper is as structured as follow: Section 1 discusses the structural shift in the Pakistan economy and also compares it with some developed and developing countries especially in term of employment by economic activity. Based on past literature four commonly measures of sectoral reallocation are identified in Section 2 provides a brief review of the relevant literature. Estimation methodology and results are reported in Section 3 while section four concludes the paper along with drawing some policy lessons.

1. STRUCTURAL SHIFTS IN THE ECONOMY

The structural adjustments across the growth trajectory have been studied at extent in literature documenting past experience of the industrial country over two centuries.

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[1]Unpublished work of the main author.

Generally, the growth patterns of today's industrial countries can be marked by three diverse stages: an initial stage with agriculture being the powerful sector of the economy, an intermediate stage dominated by industrial sector and a final stage with services sector leading the growth process. The timing and length of different stages of structural change are different across these countries. The industrial sector accounted for 50 percent of total output at the climax of structural change and in later stage this share declined to 25 percent for these countries.

Employment by Economic Activity

Things look clearer when put in comparison to each other. The dynamics of sector wise employment in Pakistan can be easily grasped when compared with other developed and developing countries. Tables 1(a) and 1(b), given below, depict the share of employment by economic activity of selected developed and developing countries respectively.

As is evident from the tables below, employment share by economic activity, share of employment in agriculture sector is very low in developed countries as compared to developing countries. In 1980 employment share of agriculture in developing world, on average, is above 50 percent almost in all countries and in 2005 it decreases to 40 percent. On the other hand, in developed countries, agriculture sector share of employment falls from less than 10 percent and below 5 percent from over the same period. Same patterns are registered for industry sector for developing and developed economies. While employment share of Services sector for developed countries increased from 55 percent above 70 percent during 25 years comprising 1980-2005.

Table1 (a)

Share of Employment by Economic Activity (%) (Year 1980 and 2005)
Developed Countries

	1980			2005		
Country	Agriculture	Industry	Service	Agriculture	Industry	Service
UK	2.6	37.2	58.9	1.4	22.0	76.6
USA	3.6	30.8	65.7	1.6	20.6	77.8
France	8.7	35.9	55.4	3.8	24.3	71.5
Japan	10.4	35.3	54.0	4.4	27.9	66.4
Germany	4.2	40.3	55.5	2.4	29.7	67.8
Italy	14.0	37.2	48.7	4.2	30.7	65.1
Australia	6.5	31.0	62.4	3.6	21.1	75.0
Canada	5.4	28.5	66.0	2.7	22.0	75.3
New Zealand	10.9	33.8	55.3	7.1	22.0	70.6
Spain	19.3	35.9	44.7	5.3	29.7	65.0

Source: World Development Indicators (WDI), 2008.

Data on Germany is for comparison is from 1991 and 2005, because reunification of Germany was in 1990.

On the contrary, service sector share in total employment is 30 percent and increased to 40 percent in 2005 in developing countries. As is evident from Table 1(b) agriculture sector contributes more than half of total employment for developing countries. Worth mention, however, is that countries with large share of employment in agriculture sector are prone to jobless growth.

Table1 (b)

Share of Employment by Economic Activity (%) (Year 1980 and 2005)
Emerging Economies

	1980			2005		
Country	Agriculture	Industry	Service	Agriculture	Industry	Service
China	68.7	18.2	11.7	44.1	25.5	28.7
Indonesia	56.4	13.1	30.4	42.1	18.6	39.3
Thailand	70.8	10.3	18.9	42.6	20.2	37.1
Philippines	51.8	15.4	32.8	37.0	14.9	48.1
Malaysia	37.2	24.1	38.7	14.8	30.1	55.1
Korea Rep.	34.0	29.0	37.0	7.9	26.8	65.1
Pakistan	52.7	20.3	26.8	43.0	20.3	36.6
India	69.1	13.6	17.3	57.0	21.0	22.0
Sri Lanka	45.9	18.6	29.3	33.5	22.8	36.8
South Africa	10.9	25.1	63.9	10.3	24.5	65.1
Bangladesh	64.8	11.0	24.2	51.7	13.7	34.6

Sources: 1. World Development Indicators (WDI), 2008.
2. Data for Indonesia is for 2006 as the most recent year given in WDI, 2008.
3. Data for China is for year 1980 and 2002, as the most recent year given in WDI.
4. Data for India's sectoral employment share is derived from various sources for1990 and 2002.
5. Data on South Africa is 1999 and 2003; Bangladesh is for1983- 2003 and Sri Lanka for 2004 as the most recent year given in WDI, 2008.

As we noted in Table 1 (a) that in developed countries, such as, Europe, North America and Oceania, the share (also in absolute term) of agriculture employment was continuously decreased. According to Fei and Renis (1976), this is an important turning point in the process of structural change and without any additional labour input, this agricultural productivity growth is sufficient to sustain the food supply of growing numbers of peoples. On the contrary, Table 1 (b) show the different pattern of agriculture employment in many developing countries and share of agriculture employment continuously declined, even though in absolute term the numbers of jobs has continued to increase in agriculture sector.[2]

On the other hand, developed and developing countries show the typical pattern of employment in industrial sector. Relative share of employment in industrial sector steadily increased in developing countries, whereas in developed countries this share reached its highest point. Whereas, on the last stage of structural change in the economy, as Kuznets (1965) said that "the shift of employment towards services can be stated as a

[2]*Source:* ILO, Economic active population, 1950–2010.

stylised fact of the post war economic development" shift of employment to services is a very diverse process. Firstly, in general services is a major contributor to economic growth, secondly, services can also arise as a result of the rise of the welfare state and finally, employment growth in the service sector can result from a lack of productivity growth in the rest of the economy. As one argument given by Baumol (1967) that "there are inherent problems of increasing productivity growth in services".

2. LITERATURE REVIEW

Structural change in the labour market, also called sectoral change or reallocation, is said to occur in a labour market when there are changes in the composition of aggregate demand for goods and services, or when there are changes in the productivity of labour, that result in an industrial shift in labour demand. When the labour market is undergoing structural change, workers may lose jobs because their current skills are no longer in demand. Hence, if an economic growth is accompanied by structural change, there is a potential for this growth to be jobless.

This possible explanation of jobless growth in the United States was first suggested by Aghion and Howitt (1994) and then later empirically studied by Rissman (1997), Groshen and Potter (2003) and Aaronson, *et al.* (2004). They claimed that a substantial percentage of a dismissal of employees can be recognised to permanent rather than short-term. Permanent dismissals of employees are a feature of structural unemployment as industries fade away. They explained that indicative of structural change are industries that continue to lose jobs after having lost jobs during the last recession or industries that continue to gain jobs after having gained jobs during the last recession. Exactly what is driving the structural change, however, is not clearly established. One explanation might be the relative position of the US in the international economy. Indeed, Bernanke (2003) suggested that trade might be a factor that accounts for the change. When there is stronger structural change, as observed in the last decade and discussed above, labour market search and matching institutions become important in helping to match the supply of vacancies to the demand for labour through job searches by the unemployed [other labour market institutions, such as the type and length of labour contracts, are also important, see also Okun (1962)]. On the other hand when there is a weak structural change, economic agents should look to set up forward and backward linkages between various sectors of the economy.

Some studies have also examined the relationship between sectoral changes and business cycles. These studies, including Lilien (1982), Abraham and Katz (1986), Davis (1987), Loungani, Rush, and Tave (1990), Campbell and Kuttne (1996) and Baily, Bartelsman and Haltiwanger (1998), analyse the cyclical behaviour of both components of sectoral reallocation, within the plant and across the plant and found that changes in productivity are counter cyclical. On the other hand, Bar Levi (1998) looks at how incentives for workers to wait until recoveries to start looking for new jobs can impart a pro-cyclical bias to labour productivity. While Merz (1995), Andolfatto (1996), and Den Haan, Ramey, and Watson (2000) investigate that how reallocation can intensify and /or transmit aggregate shocks.

Lilien (1982), along with Rissman (1997) and Aaronson, *et al.* (2004), is prominent work on measure of sectoral reallocation. All these studies measure the

dispersion across industrial sectors. Groshen and Potter [Pakistan (2003)], another most cited study in the recent literature, measure GP statistic on the basis of cross correlation across sectors in the phases of business cycle and "identify sectoral reallocation as the cause of the recent jobless growth". But Aaronson, *et al.* (2004) criticised on the GP statistic that "the correlation between employment growth rates during and after recessions—is a particularly close proxy for sectoral reallocation".

3. MEASURES OF SECTORAL REALLOCATION: PAKISTAN'S ECONOMY

If economic growth is accompanied by structural changes in the economy, workers may have to retrain and update their skills. Hence, some unemployment may occur in the economy thereby weakening the relationship between employment and GDP growth rates. Structural change of an economy is often proxide by employment shifts between industrial sectors. An in-depth analysis of structural change in the economy requires disaggregated employment data within each of the seven sectors identified in Appendix Table A1. Unfortunately, such disaggregated data are not available. Hence, only some broad patterns of sectoral change are analysed for the present study.

Four measures of structural change in the economy are commonly used in the literature. These measures have been proposed by Lilien (1982), Groshen and Potter (2003), Rissman (1997), and Aaronson, Rissman and Sullivan (2004) and are discussed below. The measure proposed by Groshen and Potter (GP) is discussed first. Because of the similarities between the other three measures, they are discussed after the GP measure.

Groshen and Potter's (GP) Measure

Following Groshen and Potter (2003), industrial sectors that continue to experience slower than average employment growth during and after recession as well as the sectors that continue to experience faster than average employment growth during and after recession can be considered as undergoing structural change. The statistic suggested by these authors, the GP statistic, measures the percentage of such sectors in all sectors of the economy. In present study, we analyse Pakistan's economy at sectoral level divided into seven sectors.[3] Guided by data limitations annual data are used for each sector's employment, although it will be preferable to use monthly data but they are not available.

Employment growth rate in each sector is compared with the average employment growth rate during different phases of the business cycle as shown in Table 2.[4] The signs of sectoral changes concluded in columns (11) and (12) are for the start of recessionary and recovery periods as they are for one year after peak and trough. To account for any randomness in employment fluctuations that could affect employment growth in these years, employment changes in peak and trough are also compared (over an entire half cycle) and signs of sectoral change concluded in columns (9) and (10). To help the intuition of the reader, an example is provided in the notes below Table 2.

[3]See Appendix Table A1.

[4]When monthly data are used, GP's measure is based on a recession period that starts one month after the business cycle peak and an 11-month post-recession period that begins the month after the business cycle trough.

Table 2

From Table 2 it can be seen that when one compares employment growth rates from one year into recession to one year into recovery (one year after peak and one year after trough as reported in columns 11 and 12), the effect of structural change in the economy appears somewhat less pronounced in the 1969-70 recession than it was in the 1991-92 recession. During the 1969-70 recession, a sectoral employment change was observed in four sectors while this was the case in five sectors during the next recession. Electricity, water and sanitary sectors did not experience any structural shift, collectively. If one considers employment growth rates over the half business cycle (in peak and trough as reported in Columns 9 and 10), then the structural shifts are found to be even less pronounced during 1969-70 as this occurred only in three sectors. However, the electricity, water and sanitary sector does show structural shift under this method. Only the transport and communication sector is found to have experienced structural shifts under both methods during both recessions. All other sectors show mixed results.[5]

While one weakness of the above analysis is its use of aggregated data, another weakness is that it is based on only four data points which may not capture full fluctuations in employment during the period. Other measures such as those provided by Lilien (1982), Rissman (1997) and Aaronson, *et al.* (2004) are improvements over the GP measure. All three measures consider deviations of annual employment from a standard level, but differ in the measurement of this deviation. These methods are discussed next, followed by their results.

Lilien's Measure

Lilien (1982) holds that in the absence of structural change, employment in all sectors will grow at the same rate. By contrast, "when labour is being reallocated across industries, expanding industries will grow faster than average and contracting industries will grow slower". Lilien proposed a measure of structural change based on the standard deviation of employment growth rates across industrial sectors calculated as follows:

$$\sigma_t^L = \left[\sum_{i=1}^{n} S_{it} (GE_{it} - GE_t)^2 \right]^{\frac{1}{2}}$$

Where GE_{it} is employment growth in sector *i* at time *t*, GE_t is the combined employment growth rate for all sectors or it is the national average growth rate in employment, and Sit is the share of total employment in sector i at time t.[6] If all sectors grow at the same rate, Lilien's measure would be zero. The measure is always positive and larger, the more an individual sector's employment growth rate exceeds the average. The variable σ_t^L is called the Lilien measure of structural change.

[5]Groshen and Potter (2003) also provided a descriptive statistic based on the correlations between the difference of employment growth rate in each sector from the national average before and after recession. This statistic will not be meaningful for present study due to small number of observations (only seven).

[6]A sector's employment growth is related to its share of employment by the following mathematical relationship: $\Delta Ln\,(S_{it}) = \Delta Ln\,(E_{it} / E_t) = GE_{it} - GE_t$.

Some economists, such as Abraham and Katz (1986) have criticised the Lilien measure.[7] They note that employment growth in some sectors, such as the commodity-producing sectors, typically declines faster during economic downturns than employment growth in service-producing sectors, even if there is no actual impact of this change on aggregate employment. Consequently, sectoral change as measured by Lilien captures both the process of sectoral change and the normal employment flows of the business cycle. The measure does not tell us which sector is positively or negatively affected by recession or recovery.

Rissman Measure

Rissman (1997) tried to incorporate Abraham and Katz's criticism of the Lilien's measure. The Rissman measure is based on a decomposition of the time series of sectoral employment share growth rates into three components. The first component reflects the long-term growth trend of employment in each sector. The second component, as noted by Abraham and Katz (1986), is the predictable movement of employment into and out of certain industries over the business cycle. The third component is the unexpected movement (which Rissman calls idiosyncratic shocks) of workers across sectors or industries, i.e., changes across sectors that occur for reasons distinct to business cycles or long-term secular reasons.

Similar to Lilien (1982), Rissman proposed a measure of sectoral change based on the estimates of idiosyncratic shocks, $\hat{U}_{it}$. Specifically,

$$\sigma_t^R = \left[\sum_{i=1}^{n} \hat{S}_{it-1} (\hat{U}_{it})^2 \right]^{\frac{1}{2}}$$

The term $\hat{S}_{it-1}$ is sector *i*'s acyclic employment share at time *t*–1. This employment share is hypothetically what the sector's employment share would have been if the national employment cycle were held constant at a value of zero, i.e., national employment was stagnant. The acyclic employment share would depend only on the sector's long-term trend and i.e., random, idiosyncratic shocks. The $\hat{U}_{it}$'s are estimates of the idiosyncratic shocks for each sector obtained from the H.P filter estimation exercise.

Aaronson, Rissman and Sullivan Measure

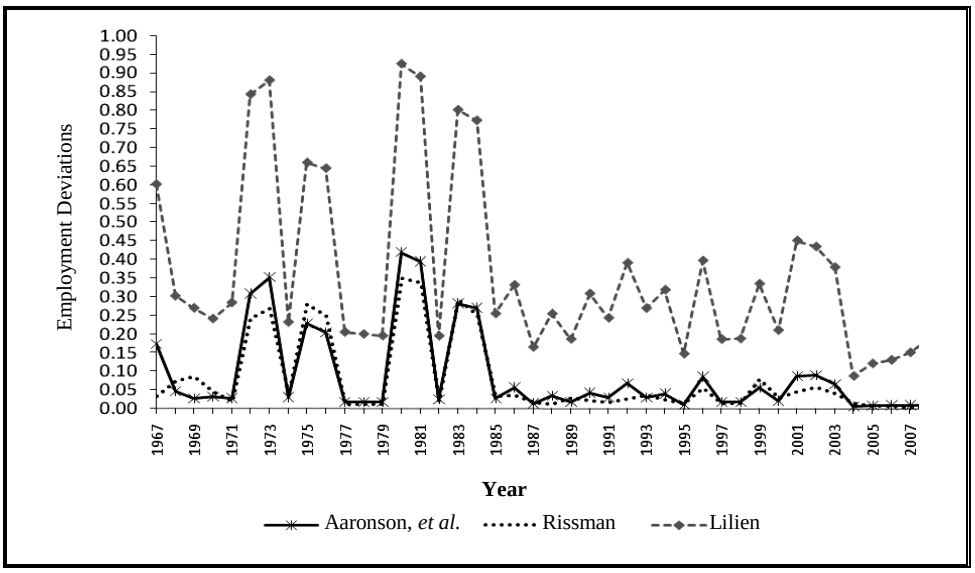
Aaronson, Rissman and Sullivan (2004) provide a broader measure of sectoral change that includes long-term change in a sector employment share $\hat{T}_i$ separately as a sectoral shift. Their measure is given by:

[7]The findings of Abraham and Katz (1986), Loungani, Rush, and Tave (1990) and Rissman (1993, 1997) contrast with Davis and Haltiwanger (1992) who find that 99 percent of reallocation is within 2-digit industries and 88 percent within 4-digit industries. Davis and Haltiwanger emphasise the importance of within-sector reallocation to avoid Abraham and Katz's (1986) criticism of Lilien (1982). By definition, differential responses of sectors to common shocks cannot be responsible for the correlation of within sector reallocation with the cycle. The difference between the Davis and Haltiwanger measures of across-industry reallocation and the results presented here owe to temporary reallocation. Davis and Haltiwanger compute reallocation as the sum of job creation and job destruction, and this includes many short-term job flows. Thus, while temporary reallocation is overwhelmingly a within-sector phenomenon, permanent reallocation is not.

$$\sigma_t^A = \left[\sum_{i=1}^{n} \hat{S}_{it-1} (\hat{T}_i + \hat{U}_{it})^2 \right]^{\frac{1}{2}}$$

The above measure calculates variations in the composition of sectoral employment growth that are unrelated to the normal shifts that occur as the result of business cycle. Figure 1 plots the above three measures of structural change obtained for Pakistan's economy. The data are provided in Appendix Table A2.

Annual dispersions in sectoral employment, using the above three measures, are provided in Figure 1. Lilien's method shows that sectoral employment growth deviations around the national growth have been positive in all years indicating that Pakistan's economy has been experiencing structural changes in all years. However, the measure did not show a systematic pattern until 2003. It dropped during the 1969-70 recession while it rose during the 1991-92 recession indicating more pronounced structural changes during the later recession.



Source: Based on own calculations presented in Appendix Table A2. Lilien's measure is based on sectoral employment growth deviation from the national employment growth. Rissman's measure is based on shifts in the employment composition that are unrelated to the business cycle. Finally, the Aaronson, *et al*. measure is similar to that of Rissman, but it also includes long-term change in sector employment as a sectoral shift.

Fig. 2. Lilien, Rissman and Aaronson, *et al.* Measures of Sectoral Variations in Employment, Pakistan (1967-2008)

The other two measures of employment dispersion are lower because of the way they are measured. These two measures also indicate an overall structural change in the economy, although the evidence is weak in recent years. Hence, it may be concluded that structural changes did take place during the two recovery periods in Pakistan. Finally, the data plotted in Figure 1 show that all three measures of structural shift are sensitive to business cycles.

A summary of the three measures of sectoral change is provided in Table 3. On average, more employment shifts took place between sectors during the ten years of first recession as was also true for the first recovery period.

Table 3

Comparison of Three Measures of Sectoral Allocation in Recoveries and Recessions

	Average Dispersion of Employment Growth			
	Recession		Recovery	
Sectoral Change Measure	1969-70 to 1978-79	1991-92 to 2001-02	1979-80 to 1990-91	2002-03 to 2007-08
Aaronson, *et al.*	0.123	0.047	0.134	0.017
Rissman	0.117	0.035	0.117	0.011
Lilien	0.438	0.302	0.444	0.175

Source: Based on own calculation presented in Appendix Table A2.

The above discussion mostly focused on periods of recession. The three measures also exhibit similar trends during periods of recovery.

4. CONCLUSION

In the present study, three measures of sectoral reallocation show identical results in recession and recovery. The 1969-70 recession and recovery was very much affected by sectoral reallocation as compared to the 1991-92 recession and recovery. An examination of employment by industrial sectors in Pakistan shows that the structural change taking place in the Pakistani economy is not necessarily benefiting the bulk of workers who lack decent employment.[8] This evidence indicates significant sectoral reallocations in Pakistan.

In conclusion, the analysis of structural change based on aggregated employment data for seven sectors of the economy yields some mixed results. This result is largely due to significant shifts in employment from agriculture towards services sector as recorded in GP method. The GP method also recorded significant changes in the transport sector. The "Yellow Cab" scheme introduced in the mid-1990s by the regime of former Prime Minister Nawaz Sharif, which made it easier for investors in transport sector to import vehicles from abroad, may have caused an expansion of this sector.

Some policy lessons can be drawn from the findings of our study. Expansion of industrial sector and a gradual shift of workforce from agriculture sector to industrial sector can reduce jobless growth vulnerability for Pakistan. Well coordinated labour policy based on market driven demand of skills with a focus on targeted areas of economy as leading growth sector can be identified. The areas having greater absorption

[8]Some estimates suggest that employment in the informal economy increased from 66 per cent of non-agricultural employment in 1999-2000 to 72 per cent in 2007. During the same period, wage and salaried employment increased by not more than 1.7 percentage points of the employed, while the number of self employed workers decreased by more than seven percentage points. The percentage of the employed working excessive hours declined slightly, but only because the percentage of females in total employment had increased. The percentage of male workers working excessive hours rose to more than 47 percent (Pakistan Employment Trends, No. 2, 2007).

capacity can lead the path to avoid or minimise jobless growth. A continuous skill enhancement, trainings of labour force, especially involved in traditional sectors of economy, matching with market driven skill demand minimises the fluctuations in employment status hence lessens chances for jobless growth. Labour intensive sector lead growth recoveries can avoid jobless growth remarkably and this is especially relevant for countries like of Pakistan with surplus labour-especially so in agricultural sector.

In summary, the different measures show that the economy of Pakistan underwent structural change during periods of recession and recovery. However, there is an indication of stronger structural changes in the 1970s than in other periods. In conclusion, there is sufficient evidence to suggest that sectoral reallocation in Pakistan during 1968-1985 was a main cause of the jobless growth during that period. When more disaggregated data are available, one can perform an in-depth analysis of employment shifts within each of the seven sectors to investigate if these shifts caused production in each sector to become more or less capital intensive.

APPENDIX

Table A1

Sectoral Compositions of Pakistan Economy

1. Agriculture
- i. Major Crops
- ii. Minor Crops
- iii. Livestock
- iv. Fishing
- v. Forestry

2. Industry

2.1. Manufacturing
- i. Mining and Quarrying
- ii. Manufacturing
  - (a) Large-Scale
  - (b) Small-Scale

2.2. Construction

2.3. Electricity and Gas Distribution

3. Services

3.1. Transport, Storage and Com.

3.2. Trade and Finance
- i. Wholesale and Retail Trade
- ii. Finance and Insurance

3.3. All others Services
- i. Ownership of Dwellings
- ii. Public Administration and Defence
- iii. Community, S and P Services

Table A2

Measures of Sectoral Change

Year	Aaronson, *et al.*	Rissman	Lilien
1967	0.1727	0.0337	0.6017
1968	0.0461	0.0745	0.3019
1969	0.0271	0.0860	0.2695
1970	0.0309	0.0449	0.2408
1971	0.0275	0.0183	0.2841
1972	0.3075	0.2412	0.8429
1973	0.3519	0.2686	0.8806
1974	0.0301	0.0380	0.2316
1975	0.2280	0.2809	0.6595
1976	0.2042	0.2486	0.6444
1977	0.0175	0.0106	0.2050
1978	0.0168	0.0104	0.1996
1979	0.0170	0.0110	0.1951
1980	0.4189	0.3503	0.9245
1981	0.3947	0.3389	0.8907
1982	0.0237	0.0172	0.1947
1983	0.2818	0.2928	0.8011
1984	0.2692	0.2520	0.7726
1985	0.0266	0.0325	0.2543
1986	0.0567	0.0343	0.3311
1987	0.0132	0.0147	0.1645
1988	0.0334	0.0117	0.2542
1989	0.0174	0.0282	0.1860
1990	0.0417	0.0204	0.3082
1991	0.0290	0.0148	0.2428
1992	0.0670	0.0259	0.3905
1993	0.0283	0.0352	0.2690
1994	0.0401	0.0224	0.3184
1995	0.0092	0.0131	0.1465
1996	0.0855	0.0546	0.3968
1997	0.0172	0.0125	0.1856
1998	0.0176	0.0143	0.1872
1999	0.0558	0.0795	0.3346
2000	0.0205	0.0277	0.2098
2001	0.0862	0.0453	0.4504
2002	0.0895	0.0557	0.4342
2003	0.0645	0.0390	0.3787
2004	0.0055	0.0123	0.0868
2005	0.0077	0.0072	0.1205
2006	0.0085	0.0052	0.1300
2007	0.0084	0.0013	0.1501
2008	0.0098	0.0031	0.1863

Source: Based on author's own calculations.

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