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Why is Japan's Unemployment Rate So Low and So Stable?

Farmland Values: The Rise, the Fall, the Future

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Why is Japan's Unemployment Rate So Low and So Stable?

By Stuart E. Weiner

With the average European unemployment rate currently about 11 percent and the U.S. unemployment rate well over 6 percent, the Japanese unemployment rate stands at a very low 3 percent. Moreover, the Japanese unemployment rate has been exceptionally stable. It has remained within a narrow 1 to 3 percent range over the post-World War II period despite numerous disruptive shocks. The U.S. unemployment rate, in contrast, has experienced far greater variability, ranging from 3 percent to 10 percent over the period.

Why the disparity? What is it about Japan that allows it to record such extraordinarily low and stable unemployment rates? Could the United States improve its unemployment performance by adopting some features of Japanese labor markets? Or is the favorable Japanese performance in some sense artificial, concealing some negative aspects of Japanese labor markets?

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This article argues that the U.S. unemployment rate could be lowered and made more stable by adopting some features of Japanese labor markets. However, other features of Japanese labor markets, though they have contributed to the lower, more stable Japanese unemployment rate, should not be emulated.

The first section of the article compares U.S. and Japanese unemployment rates and other macroeconomic indicators over the past 20 years. The second section examines possible reasons for the lower Japanese unemployment rate. The third section examines possible reasons for the more stable Japanese unemployment rate. The last section discusses the desirability of adopting various features of Japanese labor markets.

U.S. and Japanese economic performance

Japan has been one of the principal success stories in the industrialized world over the past 20 years. In terms of real growth, inflation, employment, and unemployment, Japan has been among the top performers, if not the top performer.

Japan has excelled in terms of real economic growth. Chart 1 shows real GNP growth in Japan and the United States over the 1966-85 period. Over this period, the Japanese economy grew more than twice as fast as the U.S. economy, with real GNP growth averaging 6.2 percent compared with 2.7 percent for the United States. However, while Japan grew three times as fast over the 1965-75 period, it grew just 1.5 times as fast over the 1976-85 period. So the growth gap has narrowed.

Inflation in the two countries has been comparable over the past 20 years. Japan's inflation—as measured by the implicit price deflator—averaged 5.6 percent over the 1966-85 period, while the U.S. rate averaged 6.2 percent. But as indicated in Chart 2, more of Japan's inflation came between 1966 and 1975, particularly in 1974 following the first oil shock. Both countries have made progress against inflation in the last five years, with the United States registering a 5.4 percent average inflation rate and Japan a mere 1.7 percent average inflation rate.

Japan has fallen short of the United States in terms of employment growth. As shown in Chart 3, the United States saw twice the employment growth of Japan over the 1966-85 period.[1] However, the United States has also seen much stronger labor force growth, so the pool of unemployed (represented by the height of the shaded area) has not diminished.[2] As a result, the U.S. unemployment rate has remained far above the Japanese unemployment rate.

Chart 4 compares the unemployment rates in the two countries over the past 20 years. As indicated, the U.S. rate has been higher than the Japanese rate every year. The U.S. rate has averaged 6.2 percent. The Japanese rate has averaged 1.9 percent. In 1986, the U.S. rate was 6.9 percent, while the Japanese rate was only 2.8 percent.

The Japanese unemployment rate has also been more stable than the U.S. rate, as Chart 4 suggests and calculation of standard deviations for the respective series confirms. A measure of the extent to which individual values vary about their mean, the standard deviation for the U.S. unemployment rate series is 1.8 compared with 0.6 for the Japanese series.[3] So the Japanese unemployment rate has been both lower and more stable than the U.S. unemployment rate.

Other industrialized countries fare even worse in unemployment rate comparisons with Japan. Whereas the Japanese unemployment rate stood at 2.8 percent in 1986 and the U.S. rate stood at 6.9 percent, the German rate stood at 9.0 per-

[1] The U.S. employment/population ratio—total employment as a percentage of total working age population—was some seven percentage points below the Japanese ratio in 1966 (57.6 percent versus 64.9 percent) but had pulled nearly even by 1985 (60.5 percent versus 61.4 percent). Figures are derived from unpublished U.S. Department of Labor data, furnished by Joyanna Moy. Unless otherwise noted, all employment, unemployment, and labor force data cited throughout the text and notes refer to total labor force (civilian plus armed forces), for both Japan and the United States.

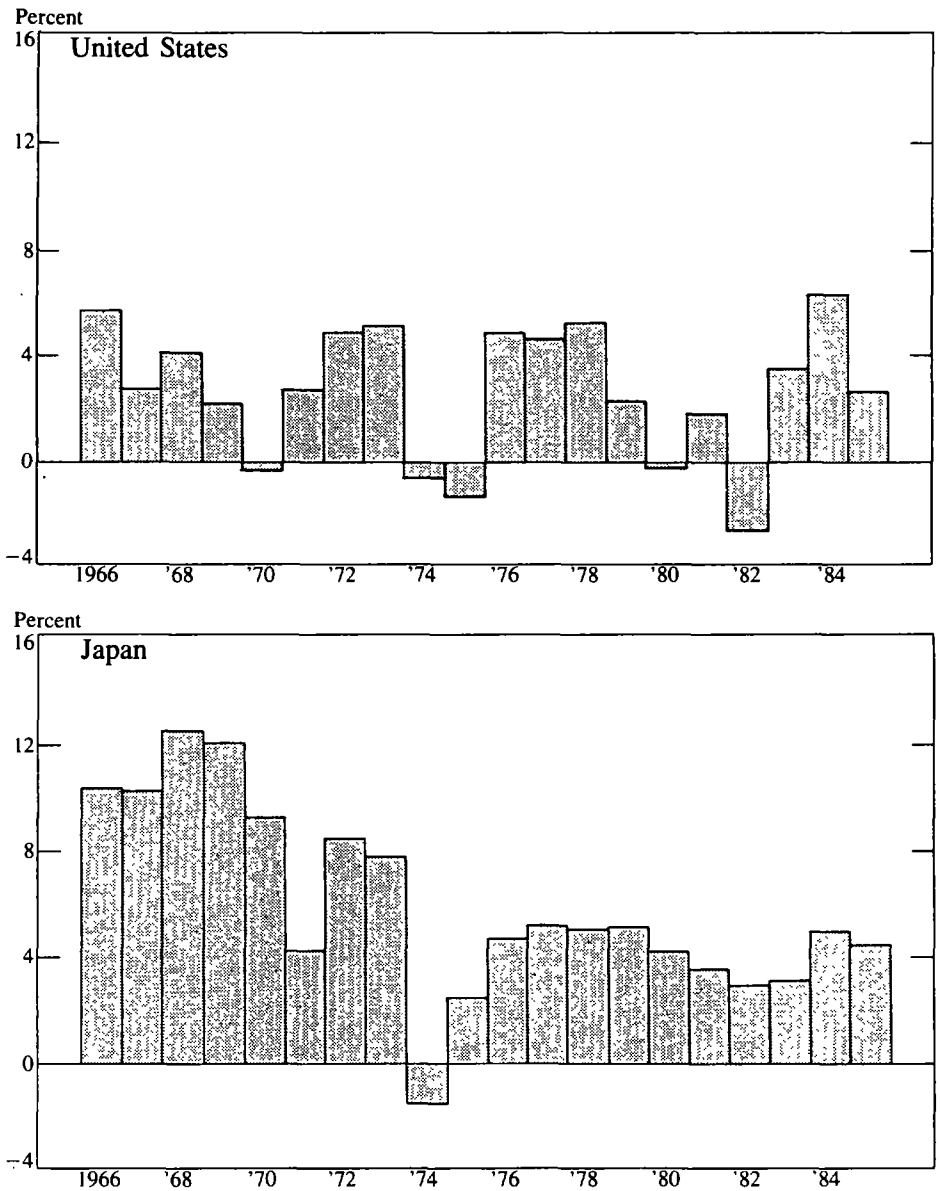
[2] In Japan, men and women showed the same labor force growth over the 1966-85 period, while in the United States, labor force growth for women was more than twice the growth for men. Overall, the Japanese labor force participation rate was essentially the same in 1985 as in 1966 (rising from 72.0 percent to 72.4 percent), with men showing a slight decline (88.6 percent to 87.8 percent) and women showing a slight rise (56.2 percent to 57.2 percent). The overall U.S. participation rate was seven percentage points higher in 1985 than in 1966 (rising from 68.7 percent to 75.2 percent), with a sharp decline for men (91.2 percent to 84.9 percent) and a sharp rise for women (46.8 percent to 65.5 percent). Data are taken from *Labour Force Statistics, 1964-1984*, Organization for Economic Co-operation and Development (OECD), 1986, pp. 470-473, and OECD data files.

[3] The standard deviation of a data series $x_t (t=1, \ldots, N)$ is defined as standard deviation $= \{[(1/(N-1)] \times \sum_{t=1}^{N} (x_t - \bar{x})^2\}^{1/2}$, where $\bar{x}$ is the mean of the series, $\bar{x} = (1/N) \times \sum_{t=1}^{N} x_t$.

CHART 1

Real GNP growth, United States and Japan, 1966-85

(Annual percentage changes)

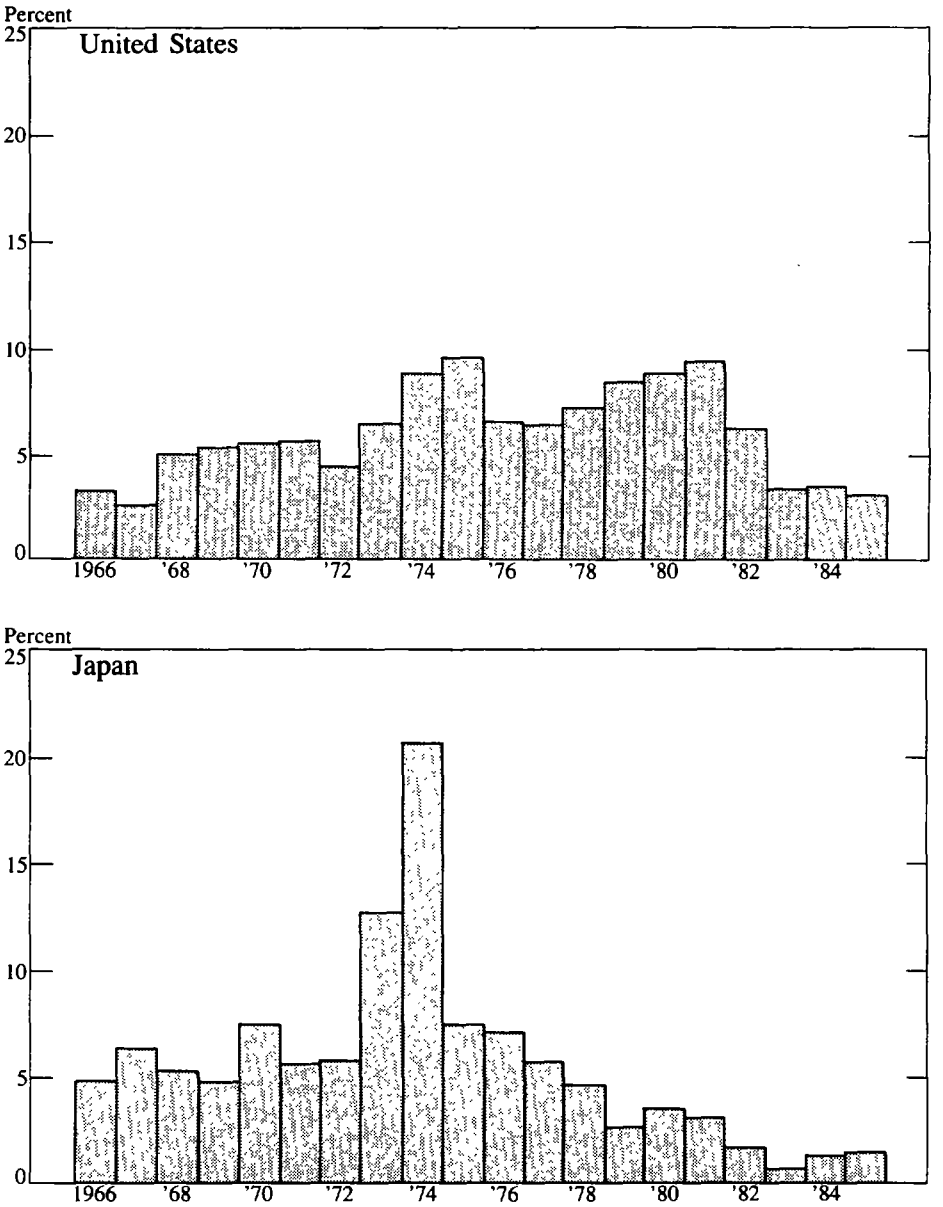


SOURCE: Organization for Economic Co-operation and Development

CHART 2

Inflation rates, United States and Japan, 1966-85

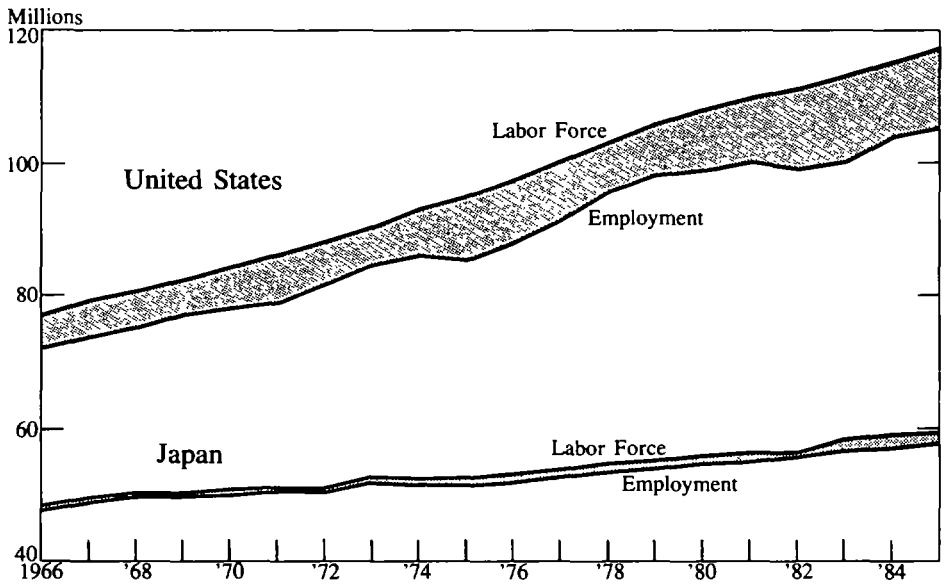
(Annual percentage changes)



Source: Organization for Economic Co-operation and Development

CHART 3

Employment and labor force levels, United States and Japan, 1966-85



Source: Organization for Economic Co-operation and Development

cent, the British rate at 11.9 percent, and the Dutch rate at 14.6 percent. Double-digit, or nearly double-digit, unemployment is not uncommon in much of the western world today.[4] In Japan, it is nowhere in sight.

Unemployment rate standardization

Given the wide divergence between U.S. and Japanese unemployment rates, a natural place to begin looking for an explanation is with survey and measurement techniques. Are the U.S. and Japanese unemployment rates constructed differently, with different survey and measurement techniques? And if so, do the differences in methodology account for the disparity?

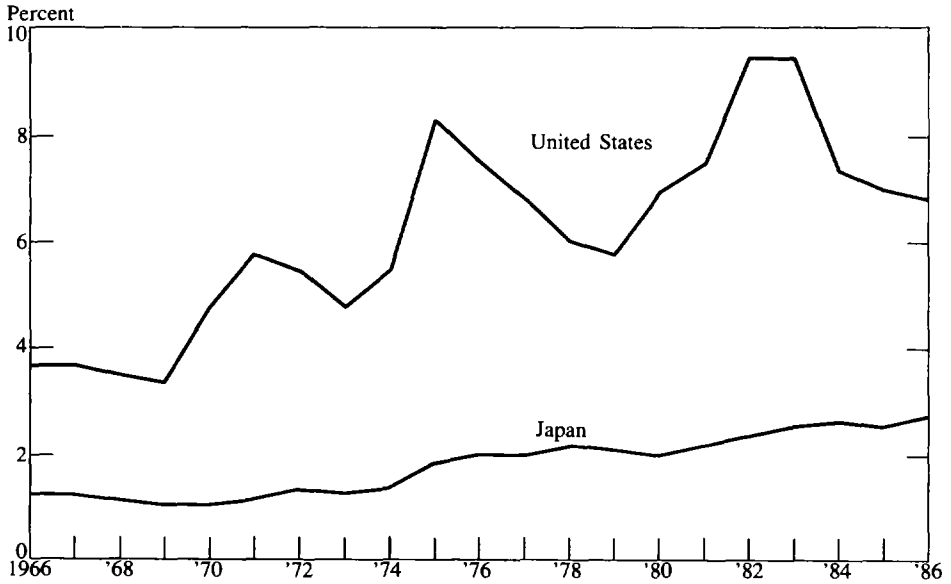
The answer to the first question is yes, the U.S. and Japanese methodologies do differ somewhat. But the answer to the second question is no, the differences in methodology do not account for the disparity. In examining this issue, the U.S. Department of Labor has adjusted the Japanese unemployment rate to U.S. standards.[5] The adjustment makes virtually no difference, adding

[4] Japan did not exhibit such marked superiority earlier in the post-World War II period. Annual unemployment rates from 1959 to 1969, for example, averaged 1.4 percent in Japan, 4.7 percent in the United States, 1.2 percent in Germany, 1.9 percent in Great Britain, and 1.1 percent in the Netherlands. Data are taken from unpublished U.S. Department of Labor data.

[5] The adjustment procedure is described in Constance Sorrentino, "Japan's Low Unemployment: An In-Depth Analysis," *Monthly Labor Review*, U.S. Department of Labor, Bureau of Labor Statistics, March 1984, pp. 18-27. The OECD has also constructed standardized series, adjusting Japanese and U.S. unemployment rates to international standards. Again, it makes little or no difference, for either country. See *Quarterly Labour Force Statistics*, OECD, November 3, 1986, p. 78.

CHART 4

Unemployment rates, United States and Japan, 1966-86



Sources: Organization for Economic Co-operation and Development; U.S. Department of Labor, Bureau of Labor Statistics.

only a tenth of a percentage point to the Japanese rate in a few years. Thus, even after standardization, the Japanese rate remains substantially lower and substantially more stable than the U.S. rate.

Japan's lower unemployment rate

If the lower, more stable Japanese unemployment rate is not due to differences in survey and measurement techniques, more fundamental factors must be at work. In this section, the factors contributing to the lower Japanese rate are examined. In the next section, the factors contributing to the more stable Japanese rate are discussed.

Demographic mix and the U.S. teen problem

Japan's lower overall unemployment rate relative to the U.S. rate extends to various age and sex categories. Columns 1 and 2 of Table 1 present Japanese and U.S. unemployment rates by age and sex for 1985. For all but one category (males 55 to 64), the unemployment rate was lower in Japan than in the United States. The unemployment rate for prime-age males (25 to 54), for example, was 5.4 percent in the United States but only 1.9 percent in Japan. Similarly, the unemployment rate for prime-age females was 6.5 percent in the United States but only 2.4 percent in Japan. Thus, it cannot be said that the poorer aggregate unemployment rate performance in the United States stems from poorer performance in a few isolated demographic categories. In fact, the poorer performance emanates from virtually all categories.

It is true, however, that Japan has much less of a teen unemployment problem than the United States, and this difference has contributed to Japan's lower overall unemployment rate. As

TABLE 1

Labor market indicators in the United States and Japan, 1985
(Unemployment rates, labor force participation rates, and unemployment shares, by age and sex)

	Unemployment Rate		Labor Force Participation Rate		Unemployment Share	
	U.S.	Japan	U.S.	Japan	U.S.	Japan
	(1)	(2)	(3)	(4)	(5)	(6)
Males and Females						
1. 16(15)-24*	13.0	4.8	69.5	42.9	38.6	22.4
2. 25+	5.6	2.3	76.8	80.2	61.4	78.2
3. Total	7.1	2.6	75.2	72.4	100.0	100.0
4. 16(15)-19*	n.a.	n.a.	n.a.	n.a.	17.6	7.1
Males						
5. 16(15)-19*	18.6	8.9	59.4	17.3	9.7	4.5
6. 20-24	10.4	3.8	86.4	70.1	11.4	7.1
7. 25-54	5.4	1.9	90.8	96.7	29.0	30.1
8. 55-64	4.3	5.0	59.7	83.0	4.4	17.9
9. 65+	3.1	2.1	10.3	37.0		
10. Total	6.8	2.6	84.9	87.8	54.4	59.6
11. 16(15)-24*	13.1	4.8	75.3	42.6	21.1	11.5
12. 20+	n.a.	n.a.	n.a.	n.a.	44.7	55.1
Females						
13. 16(15)-19*	17.5	5.6	52.0	16.6	8.0	2.6
14. 20-24	10.6	4.5	71.9	71.9	9.6	8.3
15. 25-54	6.5	2.4	69.5	60.3	25.1	25.6
16. 55-64	4.3	2.0	41.7	45.3	3.0	4.5
17. 65+	4.2	0.9	6.8	15.5		
18. Total	7.6	2.7	65.5	57.2	45.6	40.4
19. 16(15)-24*	12.9	4.7	63.7	43.2	17.5	10.9
20. 20+	n.a.	n.a.	n.a.	n.a.	37.7	38.5

*Age 16 in the United States, age 15 in Japan.

Sources: Columns 1-4: *Labour Force Statistics 1964-84*, Organization for Economic Co-operation and Development, 1986, pp. 470-473; columns 5-6: Derived from *Quarterly Labour Force Statistics*, Organization for Economic Co-operation and Development, No. 3, 1986, pp. 12, 16. All data are as published by domestic sources. Sums of components in columns 5 and 6 may not equal totals due to rounding.

shown in row 4, columns 5 and 6, teens—defined in the United States as ages 16 to 19 and in Japan as ages 15 to 19—accounted for 17.6 percent of the unemployment in the United States in 1985 but only 7.1 percent in Japan. This difference is not surprising given the unemployment rates and participation rates shown in rows 5 and 13. In the United States, 59.4 percent of male teenagers were in the labor force, facing an unemployment rate of 18.6 percent. In Japan, only 17.3 percent of male teenagers were in the labor force, facing an unemployment rate of only 8.9 percent. Likewise, U.S. female teenagers had a 52.0 percent participation rate and a 17.5 percent unemployment rate, while Japanese female teenagers had only a 16.6 percent participation rate and a 5.6 percent unemployment rate.

A rough calculation indicates that the aggregate U.S. unemployment rate would have been 6.3 percent instead of 7.1 percent in 1985 had U.S. teens had Japanese teens' unemployment rates and labor force participation rates.[6] So the teen problem in the United States is one reason for the higher aggregate U.S. unemployment rate. But, of course, it does not nearly explain it all.

Japanese teens have much lower participation rates than U.S. teens for at least two reasons. First, Japanese minimum wage laws vary by locality and are rarely enforced anyway, so the financial incentive to enter the labor market appears weak. But a second, more important explanation is the greater emphasis on education in Japan. High school students in Japan spend long hours at school and at home studying in the hope of getting into prestigious universities. Few are interested in part-time work. As a result, participation rates are low.

Answers to why Japanese teens have lower unemployment rates than U.S. teens are not as clearcut. The smaller size of the participating cohort might be a factor. So might differences in search intensity, skill mismatch, or locational mismatch. Whatever the reasons, the labor market experience of Japanese teens is markedly different from that of U.S. teens.[7]

Sectoral differences

Sectoral differences are another factor contributing to the lower Japanese unemployment rate. Japan has a larger agricultural sector than the United States and also has a larger self-employed sector. Both serve to reduce the Japanese unemployment rate relative to the U.S. unemployment rate.

Agriculture's share of employment in Japan in 1984 was 8.9 percent. Its share in the United States was 3.2 percent. Since agricultural workers almost always meet the requirement of "employed" in employment surveys—even though many may only be working a few hours a week—Japan's larger agricultural sector has tended to lower Japan's unemployment rate relative to the U.S. rate.[8]

[6] The hypothetical U.S. unemployment rate is calculated in three steps: (1) Japanese teen labor force participation rates are applied to U.S. teen populations to derive revised U.S. teen labor force, (2) Japanese teen unemployment rates are applied to revised U.S. teen labor force to derive revised U.S. teen pool of unemployed, and (3) revised U.S. teen labor force and revised U.S. teen pool of unemployed are combined with non-teen U.S. labor force and pool of unemployed to calculate revised U.S. aggregate unemployment rate. Takatoshi Ito calculates a similar teen-adjusted U.S. unemployment rate for 1982 in "Why is the Unemployment Rate So Much Lower in Japan Than in the U.S.?" Center for Economic Research, University of Minnesota, Discussion Paper No. 198, January 1984, pp. 12-13.

[7] For further discussion of the Japanese teen labor market experience, see Ito, "Why is the ...," pp. 10-13; and Toshiaki Tachibanaki, "Labour Market Flexibility in Japan in Comparison with Europe and the U.S.," Kyoto Institute of Economic Research, Kyoto University, p. 18.

[8] Data are derived from *Labour Force Statistics*, 1964-84,

Japan's larger self-employed sector has likely had a similar impact. The non-agricultural self-employed share of employment in Japan in 1984 was 13.0 percent. Its share in the United States was 7.6 percent. It is difficult for self-employed workers to be classified as unemployed. For this reason, Japan's larger self-employed sector has presumably further lowered Japan's unemployment rate relative to the U.S. rate.[9]

Other factors

A host of other factors could also contribute to the lower Japanese unemployment rate. It could be that there is less skill mismatch in Japan, reflecting in part a better educational system.[10] It could also be that the high degree of internal (intra-firm) mobility in Japan—a feature of Japan's lifetime employment system, discussed in the next section—is more effective in matching jobs to jobseekers than the high degree of external (between-firm) mobility in the United States. Perhaps there are fewer disincentives associated with the Japanese unemployment insurance program. Perhaps, as a more racially homogeneous nation, Japan enjoys a smaller incidence of racial discrimination. Perhaps locational mismatch is less of a problem. In all likelihood, some or all of these factors are at work. But definitive assessments are difficult.[11]

Japan's more stable unemployment rate

This section examines factors that have contributed to Japan's more stable unemployment rate. These factors may collectively be called shock-adjustment factors because they reflect differences in the way the U.S. and Japanese economies respond to adverse demand and supply shocks.

Demand and supply shocks

Japan's unemployment rate has been more stable than the U.S. unemployment rate in part because the Japanese economy has been more flexible in the face of adverse demand and supply shocks.[12] Before examining this greater flexibility, however, it is useful to review what is meant by adverse demand and supply shocks.

Consider first an adverse demand shock. Suppose an economy is initially in equilibrium, with labor demand equal to labor supply and workers

OECD, 1986, pp. 88-91, 104-107. For further discussion of the agricultural sector's role in lowering Japan's unemployment rate, see Sorrentino, "Japan's Low Unemployment ...," p. 26, and Ito, "Why is the ...," pp. 9-10.

[9] Data are taken from *OECD Employment Outlook*, September 1986, Table 13, p. 44. The data measure the proportion of self-employment to civilian employment in the non-agricultural sector, excluding unpaid family workers. For further discussion of the self-employed sector's role in lowering Japan's unemployment rate, see Sorrentino, "Japan's Low Unemployment ...," p. 26; and Tachibanaki, "Labour Market Flexibility ...," p. 2.

[10] The U.S. Department of Education recently evaluated the Japanese educational system and gave it very high marks. See *Japanese Education Today*, U.S. Department of Education, January 1987. The report is summarized in "The Brain Battle," *U.S. News and World Report*, January 19, 1987, pp. 58-65.

[11] Some of these possible factors are discussed in Koichi Hamada and Yoshio Kurosaka, "Trends in Unemployment, Wages, and Productivity: The Case of Japan," *Economica*, Vol. 5, No. 210(S), 1986, pp. S275-S296; *Flexibility in the Labour Market: The Current Debate*, OECD, Paris, 1986; Tachibanaki, "Labour Market Flexibility ...;" and Sorrentino, "Japan's Low Unemployment ...." For a general discussion of the determinants of a country's unemployment rate, see Stuart E. Weiner, "The Natural Rate of Unemployment: Concepts and Issues," *Economic Review*, Federal Reserve Bank of Kansas City, January 1986, pp. 11-24.

[12] The discussion that follows focuses on adverse shocks, defined here as shocks that cause the unemployment rate to rise in the short run. However, the argument is symmetric with respect to positive shocks, defined here as shocks that cause the unemployment rate to fall in the short run. That is, Japan's unemployment rate has been more stable than the U.S. rate in part because the Japanese economy has also been more flexible in the face

and firms expecting and getting a given inflation rate. Then suppose there is an unexpected decline in aggregate spending due, say, to a decline in consumer spending.[13] What happens?

Demand for firms' products declines, inventories rise, and pressure builds throughout the economy for prices to rise less rapidly (disinflation) or even to fall (deflation). If a firm can pay its workers lower nominal wages, real wages in terms of product prices remain the same. But if the firm cannot lower workers' wages, real wages in terms of product prices rise. As a result of this rise in labor costs, labor demand falls, employment falls, and unemployment rises.

Alternatively, consider an adverse supply shock, such as an oil embargo that forces the price of oil much higher.[14] What happens in this case? General price indexes will register gains and, if these gains are incorporated into nominal wages, workers will be no worse off. But firms will be worse off because, though their product prices have not risen, they are now paying their workers a higher nominal wage, so that real wages in terms of product prices rise. Labor is now more expensive and, as before, labor demand falls, employment falls, and unemployment rises. Without some kind of adjustment, both adverse demand shocks and adverse supply shocks will cause unemployment to rise.

This rise in unemployment can be avoided through three possible types of adjustment—wages, working hours, and labor force participation. Japan has exhibited all three types to a greater extent than the United States.

Wage adjustment

One way an economy can adjust to adverse demand and supply shocks is simply not to allow real wages to rise, so that labor does not become more expensive. In the case of adverse demand shocks, this means nominal wages fall with general prices, that is, nominal wages are flexible. In the case of adverse supply shocks, this means nominal wages do not rise as general prices rise, that is, real wages are flexible. The impact adverse shocks have on employment and unemployment can be minimized if the sources of these shocks are accurately identified and wages are adjusted accordingly.

How do the United States and Japan compare with respect to wage flexibility? Empirical studies suggest that Japan is somewhat more flexible. Regarding nominal wage flexibility, several studies indicate that Japan is more flexible in the manufacturing sector although at least one study indicates little difference in the non-manufacturing sector and the economy as a whole.[15] Regarding real wage flexibility, some studies suggest that

of positive demand and supply shocks. Examples of positive demand shocks include increases in consumer, investment, and government spending. Examples of positive supply shocks include oil price declines and the appreciation of a country's currency (i.e., improvement in the terms of trade).

[13] Other examples of adverse demand shocks include declines in investment spending and government spending.

[14] Other examples of adverse supply shocks include depreciation of a country's currency (i.e., deterioration in the terms of trade), crop failures, and real wage demands in excess of productivity gains.

[15] Studies suggesting greater Japanese nominal wage flexibility in manufacturing include Robert J. Gordon, "Why U.S. Wage and Employment Behavior Differs from that in Britain and Japan," *Economic Journal*, Vol. 92, No. 365, March 1982, pp. 13-44; Dennis Grubb, Richard Jackman, and Richard Layard, "Wage Rigidity and Unemployment in OECD Countries," *European Economic Review*, Vol. 21, March 1983, pp. 11-39; and Robert J. Gordon, "Productivity, Wages, and Prices Inside and Outside of Manufacturing in the U.S., Japan, and Europe," National Bureau of Economic Research Working Paper No. 2070, November 1986. A study suggesting greater Japanese nominal wage flexibility in the economy as a whole is David T. Coe, "Nominal Wages, the NAIRU, and Wage Flexibility," *OECD Economic Studies*, No. 5, Autumn 1985, pp. 87-126. A study suggesting little difference in Japanese and U.S. nominal wage flexibility in the economy as a whole and in non-manufacturing

Japan is more flexible while others show little difference.[16] Taken together, it is probably fair to say that Japanese wages are somewhat more flexible than U.S. wages. This greater flexibility has helped reduce fluctuations in employment in Japan and contributed to Japan's more stable unemployment rate performance.

Chart 5 shows that employment has varied less in Japan than in the United States.[17] The standard deviation for employment growth in the United States over the 1965-85 period was 1.54. The standard deviation for Japan was only 0.75. Partly because of its greater wage flexibility, Japan has been able to avoid employment "flexibility."

But why are wages more flexible in Japan than in the United States? At least three factors have contributed to more flexibility in Japan: a higher degree of synchronization in wage bargaining, a higher degree of cooperation between workers and firms, and a higher degree of payment through bonuses.

Turning first to the degree of synchronization, wages are set annually in Japan, on essentially an economywide basis. This is the so-called "Shunto" process. In the United States, in contrast, wage setting is far more decentralized and, in the case of most union agreements, conducted only every three years. This system of staggered multiyear contracts—with only incomplete wage indexation—generates a high degree of nominal wage rigidity in the U.S. wage adjustment process.[18]

Japanese workers and firms also share a heightened sense of cooperation. Japanese employees tend to be quite loyal to their employers, and employers, in turn, tend to be quite loyal to their employees. This sense of cooperation is due in part to the lifetime employment practice at large firms. It also reflects different union orientation. Although union participation is almost as large in Japan as in the United States, Japanese unions are organized along enterprise lines, not occupational lines.[19] Blue-collar and white-collar employees belong to the same union, strengthening firm identity and lending support to a more egalitarian workplace.

Finally, the Japanese wage-setting process is perhaps also more flexible because of the widespread use of semiannual bonus payments in Japan. These payments are made to almost all workers and are linked, at least in part, to a firm's revenues or profits. So part of a worker's pay automatically adjusts to the firm's performance,

is Robert J. Gordon, "Productivity, Wages ...." For a summary of some of these studies, see Charles Adams, Paul R. Fenton, and Flemming Larsen, "Differences in Employment Behavior Among Industrial Countries," *Staff Studies for the World Economic Outlook*, International Monetary Fund, July 1986, pp. 24-26.

[16] Studies suggesting greater Japanese real wage flexibility include Gordon, "Why U.S. Wage ...;" Grubb *et al.*, "Wage Rigidity ...;" and (in the long run) Coe, "Nominal Wages ...." Studies suggesting little difference in Japanese and U.S. real wage flexibility include Gordon, "Productivity, Wages ...," and (in the short run) Coe, "Nominal Wages ...." For a summary of some of these studies, see Adams *et al.*, "Differences in Employment ...," pp. 24-26.

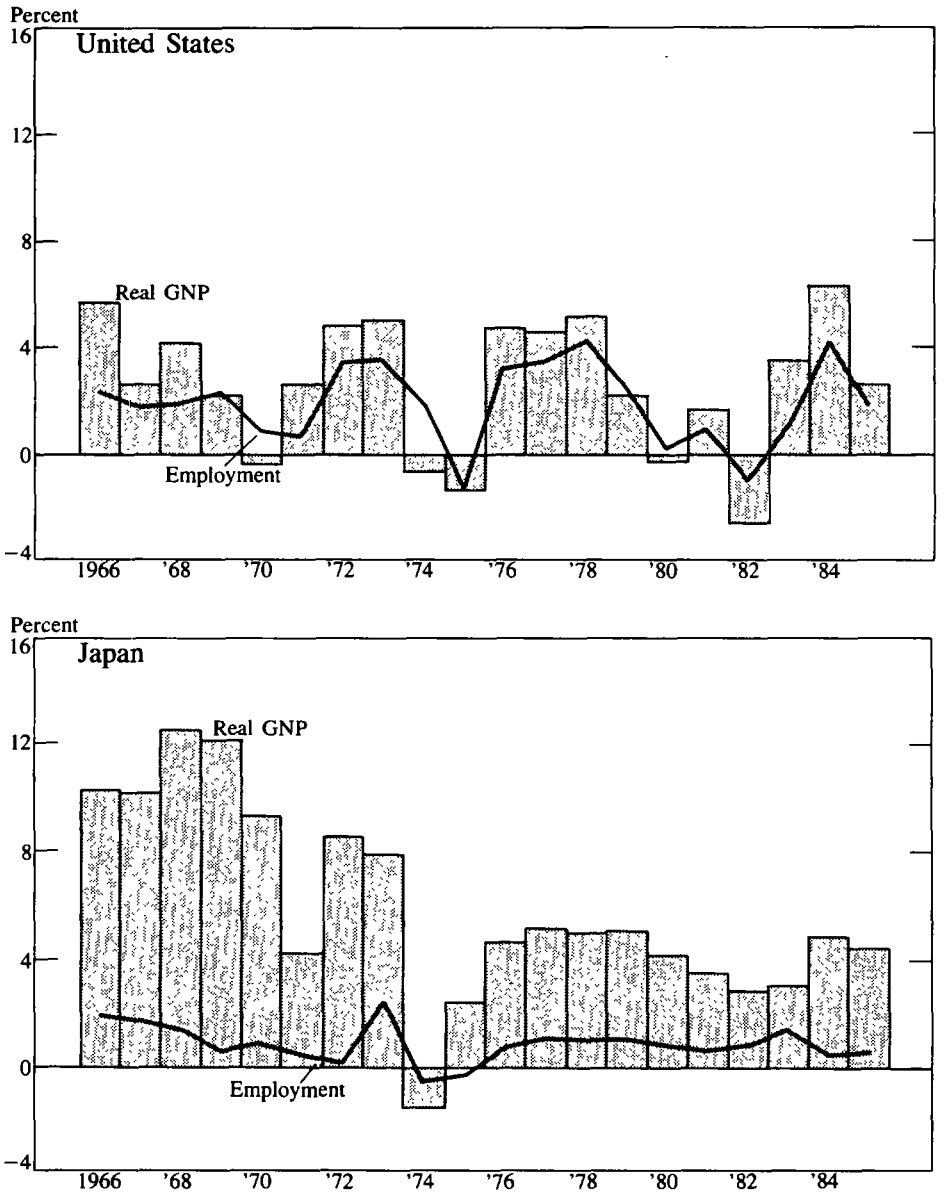
[17] Adams *et al.*, "Differences in Employment ...," present a similar chart adding data for European countries (Chart 2, p. 3).

[18] For further discussion of the Shunto process, see Hamada and Kurosaka, "Trends in ...," p. S288; and Gordon, "Why U.S. Wages ...," p. 37. For further discussion of the U.S. wage-setting process, see Gordon, "Why U.S. Wages . . . ," p. 40; and Jeffrey Sachs, "Wages, Profits, and Macroeconomic Adjustment: A Comparative Study," *Brookings Papers on Economic Activity*, 1979:2, pp. 301-311. Rigid nominal wages may actually have helped the United States adjust to the 1973 and 1979 oil shocks by generating lower real wages. On the other hand, rigid nominal wages likely exacerbated the early 1980s demand shocks.

[19] Michael Bruno and Jeffrey D. Sachs report that over the 1965-77 period, union membership as a percentage of all employees averaged 22.6 percent in Japan and 28.2 percent in the United States. See *Economics of Worldwide Stagflation*, Harvard University Press, 1985, Table 11.2, p. 225. For further discussion of unionization in Japan, see Tachibanaki, "Labour Market Flexibility ...," pp. 13-14; and Hamada and Kurosaka, "Trends in ...," pp. S286-S288.

CHART 5

Real GNP and employment growth, United States and Japan, 1966-85
(Annual percentage changes)



Source: Organization for Economic Co-operation and Development

providing some built-in wage flexibility and stability for employment and unemployment.

How important these bonus payments are in stabilizing employment is a matter of some debate. To the extent that the bonuses are linked to a firm's profits or revenues, as opposed to an individual's performance or a simple markup over normal salary, such bonuses could help stabilize employment in the face of adverse shocks. Thus, the Japanese economy would take on aspects of a "share economy," a theory developed in recent years by Martin Weitzman in his exploration of alternative compensation arrangements.[20] Evidence suggests, however, that the Japanese bonus system is probably not too important an explanation for Japanese wage flexibility and employment stability. Bonuses are not predominantly profit driven but are linked largely to individual performance or a markup over salary. Weitzman estimates that only 2.5 percent of a Japanese worker's total pay automatically responds directly to profits. Thus, a comparison of wage flexibility in the United States and Japan leads to the conclusion that the greater wage flexibility in Japan is due primarily to its higher degree of synchronization and cooperation.

Working hours adjustment

A second way an economy can adjust to adverse demand and supply shocks is through adjustments in hours worked per employee, or working hours. Suppose, for example, that an economy is hit by an adverse demand shock and nominal wages do not adjust enough to keep real wages from rising. Labor becomes more expensive, and firms react by reducing their demand for labor. This reduction can take the form of either fewer employees or the same number of employees working fewer hours. In the first case, working hours remain the same, employment falls, and unemployment rises. In the second case, working hours decline, employment remains the same, and unemployment remains the same.

How do the United States and Japan compare with respect to working hours flexibility? Empirical evidence suggests that Japan is more flexible in working hours. When standard deviations are calculated for annual percentage changes in working hours over the 1966-85 period, Japan is shown to exhibit more variability than the United States in both the total economy and the manufacturing sector alone.[21] So greater hours flexibility has apparently joined greater wage flexibility in helping Japan reduce its employment and unemployment fluctuations.

But why is Japan more flexible in working hours? For one thing, the average number of hours worked by employees tends to be higher in Japan than in the United States, so that cut-

[20] The Japanese bonus system is described in Richard B. Freeman and Martin L. Weitzman, "Bonuses and Employment in Japan," National Bureau of Economic Research Working Paper No. 1878, April 1986. The 2.5 percent figure cited in the text is reported on page 23. Tachibanaki, "Labour Market Flexibility ...," provides further valuable discussion, pp. 10-11. Weitzman's "share economy" theory is presented in Martin L. Weitzman, *The Share Economy*, Harvard University Press, 1984, and commented on by Lawrence Summers and Alan Blinder in "On the Share Economy," *Challenge*, November/December 1986, pp. 47-52.

[21] For the total economy, the standard deviations are 1.11 for Japan and 0.85 for the United States. For manufacturing, the standard deviations are 1.56 for Japan and 1.13 for the United States. The underlying total economy data are taken from Table L, "Average Annual Hours Worked Per Person in Employment," *OECD Employment Outlook*, September 1986, p. 142, for 1976-85 and from comparable unpublished OECD data for 1966-75 and 1986. John Evans furnished the latter. The underlying manufacturing data are taken from unpublished U.S. Department of Labor data, "Average Weekly Hours in Manufacturing, Twelve Countries," furnished by Christopher Kask. Gordon ("Why U.S. Wages ...," Table 1, p. 19) and Tachibanaki ("Labour Market Flexibility ...," Table 1) also report more variability in Japanese working hours. See them and Hamada and Kurosaka, "Trends in ...," p. S285, for further discussion.

backs in hours worked often entail cutbacks in overtime hours, not cutbacks in base-week hours.[22] But more fundamentally, large Japanese firms are simply reluctant to lay off their workers. This reluctance is due largely to the much publicized "lifetime employment" agreements.

About 30 percent of employees in Japan are covered by implicit lifetime employment agreements with their firms.[23] Hired directly out of school, these employees work for the same employer virtually their entire working life. Though no formal commitments are made by either the employee or employer, it is understood that employment will be stable, with few or no periods of layoff, and it is through this long-term relationship that firm-specific skills and firm-specific loyalty are bred.

Lifetime employment is granted almost exclusively to men. Women are rarely included. Lifetime employment is also concentrated almost exclusively among the largest firms. So, contrary to popular western beliefs, lifetime employment is not all encompassing in Japan.[24] It is important enough, however, to contribute to Japan's reduced employment "flexibility" and greater hours flexibility.

Also contributing to Japan's hours flexibility is its substantial reliance on part-time and temporary workers. About 30 percent or so of the total non-agricultural labor force in Japan works part-time or on a temporary basis.[25] For them, almost by definition, hours variability is assured.

Two points need to be made about these part-time workers. First, there is evidence that many part-time workers in Japan would prefer to work full time. Second, two-thirds or more of these involuntary part-time workers are women. The picture that emerges is one of a large pool of involuntary part-time women workers.[26] So hours flexibility in this case does not come without a cost.

Labor force participation adjustment

The third way an economy can adjust to adverse demand and supply shocks is through adjustments in labor force participation. Suppose, again, that an adverse demand shock or supply shock hits an economy, labor becomes more expensive, and

[22] Tachibanaki makes this point in "Labour Market Flexibility ...," pp. 7-9.

[23] This figure is taken from Tachibanaki, "Labour Market Flexibility ...," p. 25.

[24] For further discussion of Japanese life-time employment practices and layoff practices, see Tachibanaki, "Labour Market Flexibility ...;" Sorrentino, "Japan's Low Unemployment ...;" Hamada and Kurosaka, "Trends in ...;" Ito, "Why is the ...;" and Joyanna Moy and Constance Sorrentino, "Unemployment, Labor Force Trends, and Layoff Practices in 10 Countries," *Monthly Labor Review*, U.S. Department of Labor, Bureau of Labor Statistics, December 1981, pp. 3-13.

[25] This figure is taken from Tachibanaki, "Labour Market Flexibility ...," p. 2. For further discussion of these "non-regular" workers and the role they play in the Japanese economy, see Tachibanaki, pp. 3-6; and Sorrentino, "Japan's Low Unemployment ...," pp. 25-26. Women's share of part-time employment in Japan was 70.7 percent in 1983. See *OECD Employment Outlook*, September 1985, Table 10, p. 26.

[26] According to a recent report to the Japanese Ministry of Labor (authored in Japanese by A. Wakisaka), women on average accounted for 66 percent of involuntary part-time workers in Japan over the 1979-84 period, with the figure at 72 percent in 1984. See Tachibanaki, "Labour Market Flexibility ...," Table 3 and pp. 22-25. U.S. Department of Labor estimates indicate a similar percentage: of the 1,530,000 Japanese workers in March 1980 who reportedly usually worked part time but wanted more work, 64 percent were women. This figure, provided by Constance Sorrentino, is an unpublished component of Sorrentino, "Japan's Low Unemployment ...," Table 5, p. 25. In comparing part-time workers (male plus female) in the United States and Japan, Sorrentino estimates that the civilian U.S. unemployment rate would have been some 30 percent higher but the (BLS-adjusted) Japanese rate some 74 percent higher if, in 1980, the unemployment concept had been expanded to include involuntary part-time workers. See Sorrentino, "Japan's Low Unemployment ...," pp. 25-26; figures were derived by author from Table 5, p. 25.

firms react by laying off workers. But suppose that instead of joining the pool of unemployed, these newly disemployed workers simply leave the labor force. Though employment declines, unemployment does not rise. What adjusts is the pool of nonparticipants.

How do the United States and Japan compare with respect to labor force flexibility? Empirical evidence suggests that Japan is more flexible, with women much more flexible. When standard deviations for labor force growth are calculated on annual data over the 1966-85 period, Japan is shown to be more variable. When the calculations are performed for women alone, Japan is shown to be much more variable.[27] Japanese women have seen considerably more labor force variability than their U.S. counterparts over the past two decades.

Other evidence suggests that these fluctuations in Japanese women's labor force growth have helped smooth out Japanese unemployment. In the two years following the 1973 oil shock, for example, 600,000 women left the Japanese work force, the participation rate among women falling from 54.1 percent to 51.7 percent.[28] More formal econometric work shows Japanese women's participation rate to be more cyclically sensitive than Japanese men's participation rate. In contrast, participation rates for men and women in the United States show similar cyclical patterns. So it appears that Japanese women have helped smooth out the overall Japanese unemployment rate by leaving the labor force when conditions have soured.[29]

Whether Japanese women have left voluntarily or involuntarily is a key question. Evidence suggests that much female nonparticipation is involuntary.[30] This would accord well with the "semi-discriminatory" status that some observers have attributed to Japanese women.[31] Whatever the reason, Japanese women—in terms of both their part-time work experience and their labor force participation experience—seem to exhibit more flexibility than Japanese men. Willingly or unwillingly, Japanese women are an important source of flexibility in Japanese labor markets.

Thus, while the United States has seen more employment adjustments in the face of demand and supply shocks over the past 20 years, Japan has seen more wage, hours, and labor force adjustments. This greater flexibility has contributed to Japan's more stable unemployment rate over the period.

[27] For men and women combined, the standard deviations are 0.69 for Japan and 0.54 for the United States. For women alone, the standard deviations are 1.52 for Japan and 0.90 for the United States. For men alone, the standard deviations are 0.53 for Japan and 0.46 for the United States. Underlying data are taken from OECD data files.

[28] Data are taken from *Labour Force Statistics, 1964-84*, OECD, 1986, pp. 104, 472. Hamada and Kurosaka draw attention to this outflow in "Trends in ...," p. S286.

[29] See *OECD Employment Outlook*, September 1986, pp. 22-28, especially Chart 3; and Haruo Shimada and Yoshio Higuchi, "An Analysis of Trends in Female Labor Force Participation in Japan," *Journal of Labor Economics*, Vol. 3, No. 1, part 2, January 1985, pp. S355-S374.

[30] U.S. Department of Labor estimates indicate that 1.4 million non-participating Japanese women desired jobs in March 1980 but were out of the labor force because they believed they were not likely to find work. The comparable number for men was 230,000. These figures, provided by Constance Sorrentino, are revised, unpublished components of Sorrentino, "Japan's Low Unemployment . . . ," Table 5, p. 25, and will be reported in a forthcoming *Monthly Labor Review* article. For a discussion of "discouraged" workers in Japan and the United States, see Sorrentino, pp. 25-26; and Tachibanaki, "Labour Market Flexibility . . . ," pp. 20-25.

[31] Hamada and Kurosaka wonder whether "behind harmonious and homogeneous [Japanese] behavior patterns ... sacrifices arising from the semi-discriminatory treatment of women may be concealed," in "Trends in ...," p. S294. See also Alice H. Cook and Hiroko Hayashi, *Working Women in Japan: Discrimination, Resistance, and Reform*, Cornell International Industrial and Labor Relations Report Number 10, Cornell University, 1980.

Summary

The Japanese unemployment rate has been well below the U.S. unemployment rate for the past 20 years. Several factors have contributed to the lower, more stable Japanese rate. A larger agricultural sector, a larger self-employed sector, and the lack of a teen unemployment problem have contributed to the lower rate. Greater wage flexibility, hours flexibility, and labor force participation flexibility have contributed to the more stable rate. Working in tandem, these factors have allowed Japan to post an impressive unemployment record.

Given Japan's better unemployment rate performance over the past 20 years, a natural question to ask is, How might the United States emulate Japan in order to lower its unemployment rate? More specifically, what features of Japanese labor markets might the United States adopt?

Japanese labor markets have several desirable features. A high degree of wage flexibility and a high degree of cooperation between unions and firms allow the Japanese economy to react quickly to adverse demand and supply shocks. A high degree of intra-firm mobility—a by-product of the lifetime employment system—allows Japanese workers to build and utilize general and firm-specific skills. A superior educational system turns out a highly productive and highly motivated work force.

Clearly, the United States could improve in these areas. Although cooperation between unions and firms appears to be on the increase in the United States, particularly in distressed industries, it rarely approaches the levels common in Japan.[32] This and multi-year contracts contribute to the lower nominal wage flexibility in U.S. manufacturing. Regarding intra-firm mobility, U.S. firms and workers do not appear to be as flexible as their Japanese counterparts, possibly to the detriment of long-term skill accumulation. And the U.S. primary and secondary educational system may fall short of Japan's.

But Japanese labor markets also have undesirable features. Chief among them is the standing of women. Women are rarely made a part of the lifetime employment system and, more than men, often find themselves involuntarily employed part time or involuntarily out of the labor force. Societal and cultural factors appear to erect many barriers for women in the workplace. So Japan is not without its problems.

In sum, neither Japan nor the United States can claim to have perfectly operating labor markets. Improvements could be made in both countries.

[32] For a discussion of recent union settlements in the United States, see Daniel J.B. Mitchell, "Shifting Norms in Wage Determination," *Brookings Papers on Economic Activity*, 1985:2, pp. 575-608; and Stuart E. Weiner, "Union COLA's on the Decline," *Economic Review*, Federal Reserve Bank of Kansas City, June 1986, pp. 10-25.

Farmland Values: The Rise, the Fall, the Future

By Alan D. Barkema

After nearly 40 years of generally steady appreciation, U.S. farmland values increased fourfold from 1971 to 1981 and then plummeted 30 percent during the next five years. Adjusted for inflation, farmland values now average about what they did when this extraordinary cycle began 15 years ago.

What is the outlook for farmland values? This question is especially significant for farmland owners and farm mortgage lenders because farm real estate makes up approximately three-fourths of the value of all farm assets in the United States. Recent surveys by the Federal Reserve Bank of Kansas City and others show that the rate of decline in midwestern farmland values has slowed. But the question of whether values will continue to decline remains open and can never be fully answered because farmland values are influenced by expectations of future, unknown values of a number of variables.

This article shows, however, that understanding the interactions of a few important factors can provide an indication of the direction farmland values are likely to take. Based on factor values that seem reasonable under current conditions, the analysis suggests that much of the downward adjustment in farmland values is complete, provided that government commodity price supports remain at current levels. The first section of the article provides a brief history of the key variables influencing the value of farmland. The second section describes a conceptual model that ties these variables together. The third section applies the model to two types of farmland representative of land in the Tenth Federal Reserve District. A price is calculated for both types of land by use of a baseline value for each factor in the model, and then the sensitivity of these land prices to changes in the variables is examined. Results from the analysis provide the basis for making inferences about trends in Tenth District and U.S. farmland values.

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What factors influence farmland values?

Three main factors influence farmland values—the return received from the land, interest rates, and the expected rate of inflation. This sec-

CHART 1

Average value of non-irrigated farmland in the Tenth District and average U.S. farm real estate value

Source: Federal Reserve Bank of Kansas City and U.S. Department of Agriculture

tion briefly reviews recent trends in land values and uses data from the Tenth Federal Reserve District and the United States as a whole in reviewing the factors that affect these trends. The factors are linked in the next section.

Recent trends in farmland values

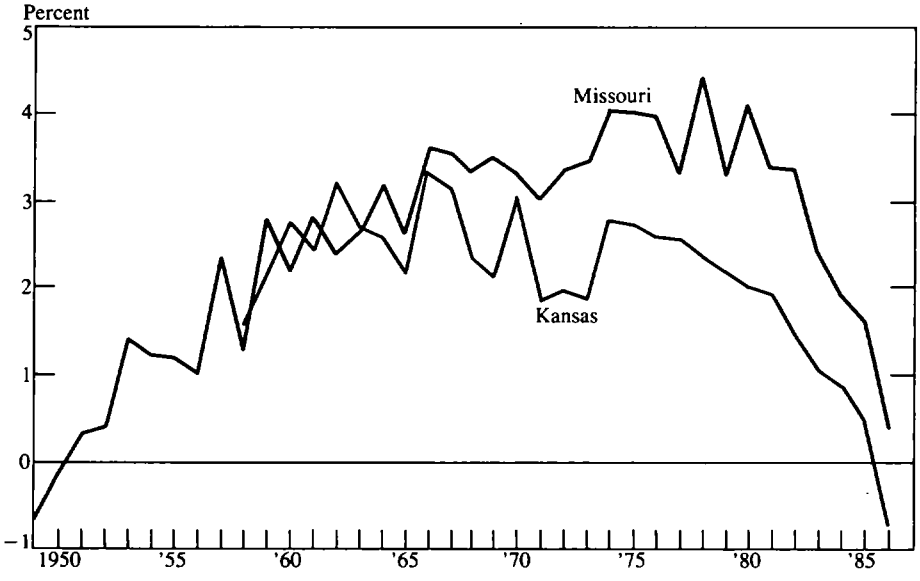
The recent cycle in the value of farmland has been similar in the district and the nation. The decline in farmland values has been more pronounced in the district, however, probably due to the predominant influence of sagging prices of the major crops grown in the district. Chart 1 shows that the value of nonirrigated farmland increased 70 percent in the district from 1976 to 1981, peaking at $844 an acre. After 1981, however, district farmland values plummeted more than 50 percent, a substantially greater proportionate decline than the drop in the national average value of farmland.

Income received from farmland

One of the principal factors affecting farmland values is the income accruing to landowners. One measure of the return from farmland is the cash rent paid to the landowner by a tenant farmer. Chart 2 shows the 20-year moving average annual rates of growth in real (inflation-adjusted) cash rent paid to farmland owners in Missouri and Kansas. In Missouri, the 20-year average rate of growth in real cash rents increased from about −1 percent in 1949 to about 4 percent in 1979. From 1981 to 1986, the growth rate declined sharply to a little more than zero. The pattern was similar in Kansas. The growth rate in Kansas peaked at about 3 percent and then fell sharply

CHART 2

Twenty-year moving average annual rate of growth in real cash rents in Missouri and Kansas



Source: U.S. Department of Agriculture

in the 1980s to less than zero by 1986. A comparison of Charts 1 and 2 shows that land values in the district rose to their peak when real cash rents were increasing rapidly. Land values fell sharply when growth in real cash rents declined in the 1980s.

Data for the nation as a whole show a similar positive association between land values and the real return to land. The measure of return used in the national aggregate data is the real return to farm production assets.[1] Chart 3 shows that the annual rate of return to farm production assets averaged nearly 9 percent during the dramatic increase in the average value of U.S. farmland in the 1970s. The value of farmland declined sharply as the annual rate of return to farm production assets fell to a −3.5 percent average in the 1980s.

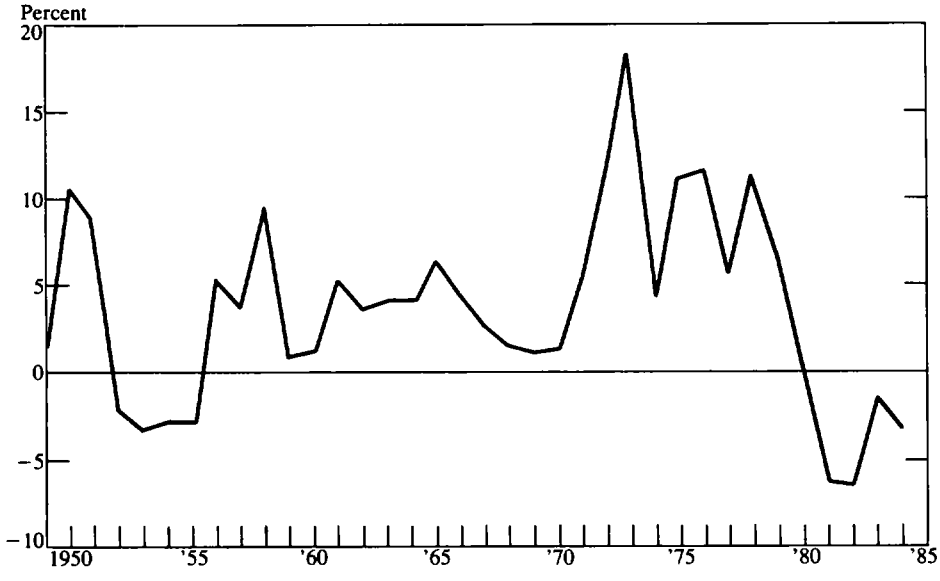
Interest rates and the expected rate of inflation

Another set of variables affecting farmland value is the nominal interest rate, the expected rate of inflation, and the expected real rate of interest. The interest rate used in this study is the

[1] A measure of average annual return to farmland at the national level is not available. Farmland makes up nearly three-fourths of the value of farm production assets, however, and for that reason return to farm production assets, rather than farmland alone, is a good substitute for return to farmland. The series of the total rate of return to farm production assets used in this discussion is an updated version of the series that appears in Emanuel Melichar, "Agricultural Finance Databook," Division of Research and Statistics, Board of Governors of the Federal Reserve System, Washington, D.C., July 1985.

CHART 3

Total rate of return to U.S. farm production assets



farm mortgage interest rate.[2] The expected real rate of interest is the farm mortgage rate less the expected inflation rate.[3] Chart 4 shows recent trends in each of these variables.

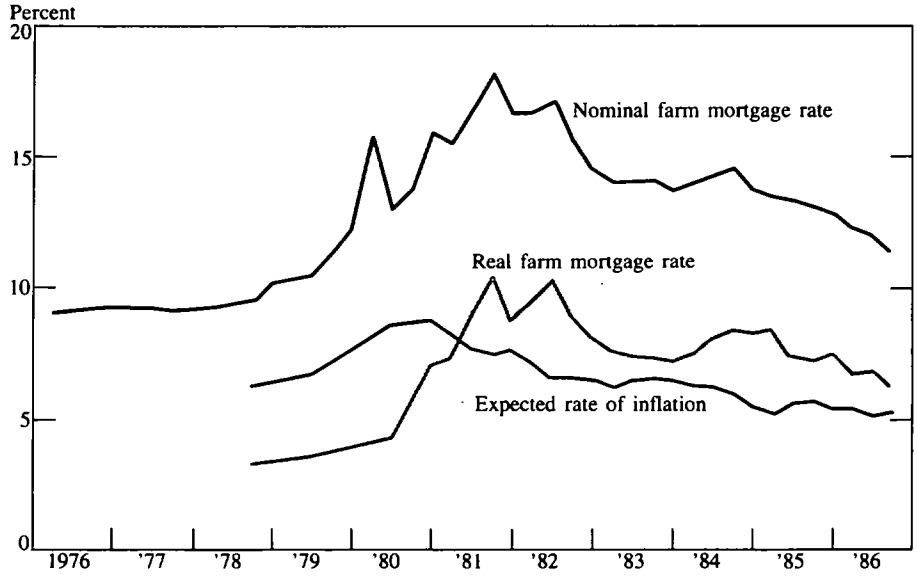
A comparison of Charts 1 and 4 provides a preliminary indication of how interest rates and expectations of inflation influence farmland values. Chart 4 shows that farm mortgage rates almost doubled at the turn of the decade, rising from just over 9 percent in the late 1970s to 18 percent in mid-1981. Rates then declined gradually to 11.6 percent in mid-1986. The real rate of interest followed a similar pattern. Real farm mortgage rates rose sharply to 10.5 percent in mid-1981 before beginning a gradual decline. By the third quarter of 1986, the real interest rate, at nearly 6.5 percent, was still much higher than in the late 1970s. Farmland values rose sharply in the late 1970s, when the real rate of interest ranged from 3 to 4 percent and the expected rate of inflation was peaking at 9 percent. Land values dropped precipitously in the 1980s as the real rate increased and the expected inflation rate declined.

[2] Use of the farm mortgage interest rate in this analysis has two advantages. First, the mortgage rate includes a premium to compensate the lender for the risk of default on the mortgage, a condition that meets the requirement that the discount rate and the return to land be of comparable risk. Second, the relative levels of debt and equity capital used in purchasing land do not affect the farmland bid price in the model developed in this article when the discount rate and the rate of interest charged on the farm mortgage are the same.

[3] The expected rate of inflation used in this discussion and the following analysis is the rate of inflation expected to prevail during the next ten years by financial analysts surveyed in Richard B. Hoey, "Decision-Makers Poll," Drexel Burnham Lambert, Incorporated.

CHART 4

The nominal and real farm mortgage interest rates in the Tenth District and the expected rate of inflation



Source: Federal Reserve Bank of Kansas City and Drexel Burnham Lambert, Incorporated

A bid-price model for farmland

This section brings together the variables reviewed in the previous section in a mathematical model of farmland value. A very simple model of farmland value is introduced and used as a framework for building a more detailed model of farmland value. The models are called "bid-price" models because they determine the highest price an investor would be willing to pay (bid) for farmland. The basic components of both models are the income expected from farmland and an interest or discount rate.[4]

Different motives exist for owning different types of farmland. The scope of this article, however, includes only land that is valued for its current and future use for farming purposes. The bid-price models developed in this section could be applied to more general cases, but this article does not consider land value derived from some activity other than farming, such as residential, industrial, or recreational uses, either now or in the future. Likewise, these bid-price models do not recognize value derived from nonpecuniary motives for owning farmland, such as the value often attributed to the ambiance of country living.

[4] Farmland bid-price models similar to the models developed in this section can be found in Alan D. Barkema, *Macroeconomic Policy and Farmland Value: A Dynamic Portfolio-Balance Approach*, unpublished dissertation, Iowa State University, Ames, 1986; Rick Klemmee, "Calculating a Bid Price for Farmland," University of Wisconsin Cooperative Extension Service Publication A3221, Madison; and Warren F. Lee and Norman Rask, "Inflation and Crop Profitability: How Much Can Farmers Pay for Land?" *American Journal of Agricultural Economics*, 1976, pp. 985-990.

A simple bid-price model for farmland

The basic premise of the farmland bid-price model is that farm real estate is valued according to the discounted future income or return that the owner of the land expects to receive. The return expected to accrue to the owner of farmland must be compared with the return the investor could expect from an investment in other assets. The simple bid-price model in Equation 1 shows that the bid price or value, V, of farmland is equal to the return, R, expected to accrue to the landowner discounted at rate d.

$$(1) \quad V = R * 1/d$$

The discount rate represents the opportunity cost of the investor's capital or the best rate of return the investor could receive by investing in an alternative asset. The rate of return represented by the discount rate should be of risk comparable to the risk associated with the income from farmland. Discounting the return to land at the rate of return on another investment of comparable risk represents a valid comparison of the returns expected from the alternative investment opportunities.

The decision whether to invest in farmland or an alternative asset is based on a comparison of the returns that can be expected from the two investments. The decision criterion can be illustrated by rewriting Equation 1 as shown in Equation 2. If the current return expected from investment in farmland exceeds the return available from investing an amount equal to the current price of farmland in the other asset at rate d, the prudent investor would choose to invest in land. Or, if the current return expected from investment in land is less than the return expected from the alternative asset, the investor would forego land ownership. The greater the expected return to land and the smaller the expected rate of return from other investments, the more likely the investor is to bid the price of farmland to a higher level.

(2) If $V * d < R$, then investor purchases farmland.
If $V * d = R$, then investor is indifferent between assets.
If $V * d > R$, then investor purchases alternative asset.

Expectations of an unknown future are crucial to this simple bid-price model. As shown in the appendix, the simple bid-price model in Equation 1 is based on the expectation that the landowner will receive a constant annual return from the time the land is purchased. Likewise, the discount rate is expected to remain constant. Investment in farmland is inherently speculative because these expectations of the future income stream and discount rate that are bid into the current price of land may not be realized. If investor expectations are not realized, the current farmland bid price will adjust as a new set of expectations is formed.

A more detailed bid-price model for farmland

The simple model shown in Equation 1 is useful for showing how the discount rate and the expected return to land affect an investor's bid price for farmland. However, that model excludes several factors that also affect the bid price by influencing either the expected return to land or the discount rate.

Expected net return to land. The flexibility of the simple bid-price model of Equation 1 can be improved by including several factors that affect the return the landowner expects. The return to land was assumed to be constant in the simple model, but in the more detailed model, the return is assumed to grow at a constant annual rate. The expected nominal rate of growth in the return is equal to the sum of the rate of general price inflation in the economy and a real growth rate that

represents any growth in the return greater than the rate of inflation. This more detailed model also includes an income tax on the farmland return. Thus, a growing, after-tax income stream replaces the constant return stream of the simple model.

The discount rate. The discount rate in the improved version of the bid-price model also takes into account the effects of inflation and income taxes. The nominal before-tax discount rate in this more detailed model is equal to the sum of the expected rate of inflation and the expected real rate of interest. After including the expected rate of inflation and the expected real rate of interest, the discount rate is expressed on an after-tax basis because the return that might be received from an investment in another asset, like the return received from farmland, is subject to income taxes. Thus, the discount rate of the simple model is replaced by an after-tax discount rate that includes the expected rate of inflation and the expected real rate of interest.

The expected holding period and the capital gains tax. The final step in refining the bid-price model is to consider the length of time the investor plans to own the land. As shown in the appendix, the length of the holding period does not affect the farmland bid price unless a tax is paid on the land capital gain during the holding period. A future sale price for the land must be specified in the model to determine capital gains taxes at resale. In this model, the future sale price is determined by increasing the initial bid price at the nominal rate of growth in the return to land during the holding period. Capital gains taxes at resale are then assessed on the difference between the sale price and the initial bid price.

A summary of the two bid-price models

The revised bid-price model presented in Equation 3, like the simple model of Equation 1, shows that the farmland bid price is found by multiplying the before-tax return to land by a return multiplier, X.[5] The important difference between this more detailed model and the simple model is the return multipliers in the two models. The features added to the simple model to improve its flexibility—expected growth in return, expected inflation, the expected real rate of interest, and taxes—make the return multiplier in Equation 3 more complex than the simple reciprocal of the discount rate in Equation 1.

$$(3) \quad V = R * X$$

where X is positively associated with the expected rate of growth in the real return to land, the expected rate of inflation, the ordinary income tax rate, and the length of the holding period, and X is negatively associated with the expected real rate of interest, and the capital gains tax rate.

Despite the complexity of the new return multiplier X, the effect of a change in any of its components on the farmland bid price can be discerned by recalling how the change would affect either the return to land or the discount rate of the simple model. An increase in the expected rate of growth in the real return to land represents an increase in the future inflation-adjusted return, an effect that raises the bid price. Conversely, an increase in the expected real rate of interest increases the discount rate and lowers the bid

[5] The formula for the return multiplier in the revised bid-price model of Equation 3 is:

$$X = \frac{(1-t)(1+g+p)}{(r+p)(1-t)-(g+p)} \cdot \frac{[(1+(r+p)(1-t))^n-(1+g+p)^n]}{[(1+(r+p)(1-t))^n-(1+g+p)^n] + T((1+g+p)^n-1)}$$

where g is the expected rate of growth in the real return to land, p is the expected rate of inflation, r is the expected real rate of interest, t is the ordinary income tax rate, T is the capital gains tax rate, and n is the length of the holding period.

The derivation of this return multiplier is explained in the appendix.

price. An increase in the expected rate of inflation, however, increases both the discount rate and the expected future nominal return. The two effects are nearly offsetting, but the net effect of an increase in the expected rate of inflation is to increase the bid price.[6] Each of these effects is illustrated more fully in the application of the model in the following section.[7]

Using the bid-price model

The bid-price model developed above is used in this section to determine the bid prices of two example farmland tracts. The first tract is representative of a central Missouri corn-soybean farm. The second tract is representative of a southcentral Kansas wheat-milo farm. The choices of baseline values of return to land and the components of the return multiplier are explained, and a baseline bid price is calculated for each tract. The baseline analysis is designed to approximate current market conditions and establishes bid prices to use as points of reference in the remainder of the analysis. The sensitivity of the bid prices to changes in the return to land and the return multiplier is then considered.[8]

Though the baseline returns to land used in this analysis are, in the strictest sense, unique to these two farmland tracts, the trends in return to land and in the components of the return multiplier are generally reflective of trends throughout much of the Tenth District and the United States. Therefore, the bid-price analysis of these specific farmland tracts is useful for drawing conclusions about trends in district and U.S. farmland values.

Baseline variables. Two measures of return to land are available. One is the actual rent a tenant pays the landowner. The rent can be paid in cash or as a share of the crop produced on the land. Chart 2, discussed earlier, was prepared from data on cash rents. The other measure is the residual income remaining after deducting costs of inputs other than land. Both measures are exclusive of the value of other factors of production or inputs associated with the use of the land, such as farm machinery and farm labor, to avoid capitalizing the costs of these factors into the value of land. Table 1 shows the calculation of the residual return to land for the two example land tracts.

Neither measure of return is perfect. Direct rental payments are contractual obligations that may be slow in adjusting to changes in market conditions, and the calculation of a residual return to land is sensitive to the accumulation of error in measuring actual input costs. In a well-functioning land rental market, however, shifts in these two measures of the exclusive return to farmland should be similar.

Both measures of return are used in this analysis. The residual return to farmland calculated in Table 1 is used to estimate the return from each of the example tracts during the first year of ownership. Cash rent data are used, however, to approximate the expected rate of growth in return to land because historical residual return data like those in Table 1 are not available.

Table 2 shows the values of the components of the return multiplier chosen for the baseline analysis. The baseline nominal discount rate, 10.6

[6] This point is developed more fully in the appendix.

[7] The effect of a change in the tax rate applied to ordinary income or capital gains also can be discerned. An increase in the income tax rate reduces both the after-tax expected return to land and the after-tax discount rate. The decrease in the after-tax return and the decrease in the after-tax discount rate are offsetting when the return to farmland is constant, and the tax increase does not affect the bid price. But when the expected return stream is increasing, an income-tax hike will actually result in a higher farmland bid price in this model. This seemingly anomalous result arises from the compounding of the reduction in the after-tax discount rate applied to future returns. An increase in the capital gains tax rate reduces the future sale value of the land and unambiguously lowers the current bid price. The role of taxes in the bid-price model is discussed further in the appendix.

[8] This analysis follows the form presented by Lee and Rask in the analysis of their earlier farmland bid-price model.

TABLE 1
Baseline residual returns per acre for the example Missouri and Kansas farmland tracts

Missouri Farmland		Kansas Farmland	
Gross Return:			
50 bu. Corn at $2.55:	$127.50	16 bu. Wheat at $3.55:	$ 56.80
17 bu. Soybeans at $4.60:	78.20	30 bu. Milo at $2.35:	70.50
Total	$205.70	Total	$127.30
Variable Costs:		Variable Costs:	
Labor	$ 21.25	Labor	12.30
Seed	14.50	Seed	3.98
Fertilizer and lime	28.00	Fertilizer and lime	13.70
Crop chemicals	21.00	Crop chemicals	9.30
Custom machine hire	2.50	Custom machine hire	4.25
Machinery fuel, oil, repairs	30.00	Machinery fuel, oil, repairs	22.75
Hauling and drying	9.20	Hauling and drying	3.00
Miscellaneous	5.25	Miscellaneous	6.00
Interest on variable costs	6.00	Interest on variable costs	4.00
Total	$137.70	Total	$ 79.28
Fixed Costs:		Fixed Costs:	
Real estate taxes	$ 6.50	Real estate taxes	$ 5.00
Machinery depreciation	23.75	Machinery depreciation	19.00
Machinery interest and insurance	10.00	Machinery interest and insurance	9.00
Total	$ 40.25	Total	$ 33.00
Total Costs	$177.95	Total Costs	$112.28
Baseline Net Return	$ 27.75	Baseline Net Return	$15.02

Sources: University of Missouri Cooperative Extension Service and Kansas State University Cooperative Extension Service

TABLE 2
Baseline values of the components of the return multiplier

Expected inflation rate	5.2 percent
Expected real interest rate	5.4 percent
Nominal discount rate	10.6 percent
Expected growth in real returns	0.0 percent
Holding period	50 years
Ordinary income tax rate	28 percent
Capital gains tax rate	28 percent

percent, is 100 basis points below the average rate of interest charged on farm mortgages at agricultural banks in the Tenth District in the third quarter of 1986. This baseline discount rate is consistent with a continuation of the downtrend in the farm mortgage rate shown in Chart 4. The baseline value chosen for the long-run estimate of the expected inflation rate is 5.2 percent, the rate of inflation expected over the next ten years by the financial analysts polled in the Hoey Survey in September 1986 (see footnote 3). The baseline expected real interest rate, 5.4 percent, is found by subtracting the baseline expected inflation rate from the baseline nominal discount rate.

The choice of the baseline value of the expected rate of growth in the real return to land is based on the assumption that expectations of future growth are derived from rates of growth observed in the past. Past growth rate data suggest that even though the average rate of growth in the real return to land has been consistently positive and increasing for most of the post-World War II period, the high rates of growth reached in the 1970s could not be sustained. Likewise, negative rates of annual growth attained during the depression of the 1930s and reflected in the early Missouri data of Chart 2 were not sustained in the long run. On balance, Chart 2 suggests a baseline expected growth rate between the negative values observed in the early years of the Missouri data and the strongly positive values observed in both Missouri and Kansas in the 1970s. The baseline expected growth rate of zero indicates that, in the long run, the nominal return to land is expected to increase at the rate of inflation in the general economy.

Baseline bid prices. Combining the baseline return to farmland and the baseline components of the return multiplier provides a baseline farmland bid price. The baseline value of the return multiplier, expression X in Equation 3, is approximately 28 for the component values shown in Table 2.[9] Multiplying the baseline return of $27.75 an acre for the Missouri farm (Table 1) by the baseline value of the return multiplier provides a baseline bid price of $771 an acre. Similarly, multiplying the baseline return of $15.02 an acre for the Kansas farm by the baseline return multiplier provides a baseline bid price of $418 an acre.

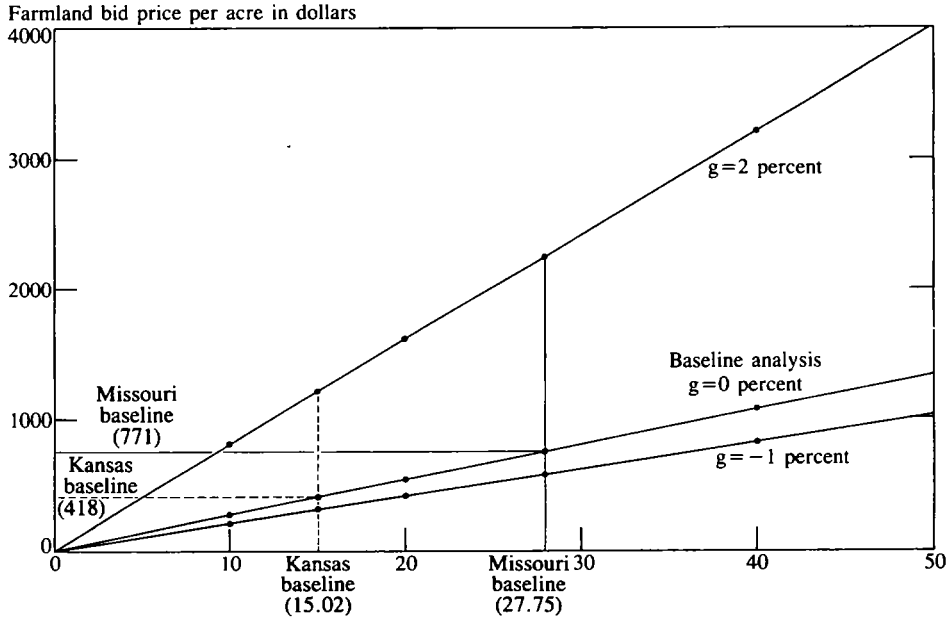
The baseline analysis is useful not only in determining an approximate bid price for farmland but also in checking the values chosen for the components of the model by comparing the calculated bid price against current farmland values. The baseline bid prices derived above are within the range of farmland prices currently observed in central Missouri and southcentral Kansas, respectively, but they should be considered unique to the specific returns and costs shown in the example budgets of Table 1.[10] Different bid prices

[9] The baseline return multiplier value of 27.8 is found by substituting the component values from Table 2 into the multiplier formula shown in footnote 5.

[10] Kevin Moore, extension economist at the University of Missouri, and Larry Langemeier, extension economist at Kansas State University, provided information on current land values in Missouri and Kansas and the data of Table 1.

CHART 5

Farmland bid prices calculated for three rates of expected growth (g) in real return and a range of current before-tax return



would be derived for farmland investors that realize either higher or lower net return than presented in this baseline analysis because of different efficiencies of production. Nevertheless, the results of the baseline analysis are consistent with the view that current farmland values are justified by current market conditions.

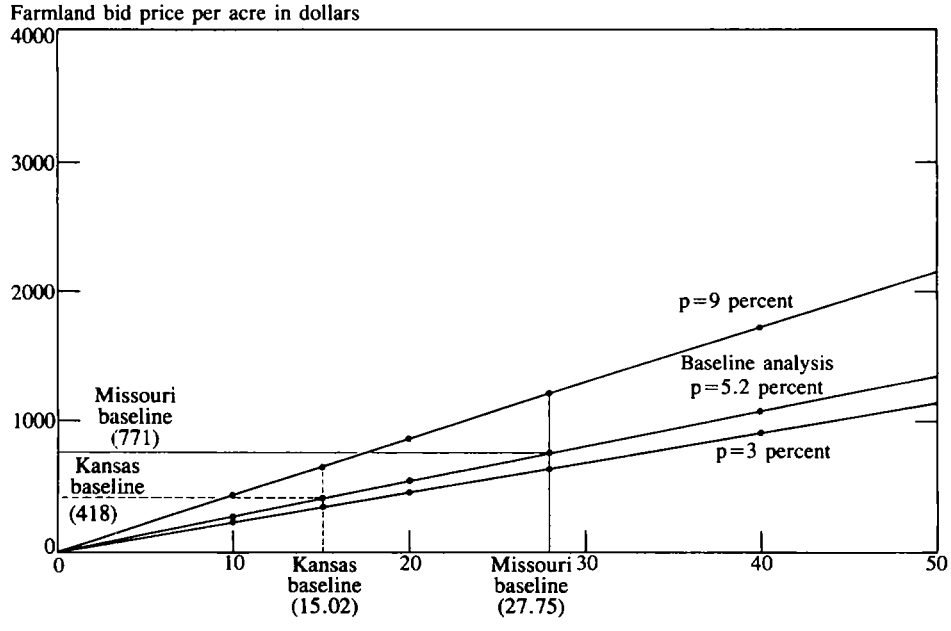
Bid-price sensitivity analysis

A technique known as sensitivity analysis provides the means of exploring the likely future direction of farmland values by studying the effect of a change in the value of each of the important components of the model on the farmland bid price. The analysis is summarized in Charts 5, 6, and 7 which show farmland bid prices plotted against the current before-tax return per acre. In each chart, the line labeled "baseline analysis" plots farmland bid prices against the current return to land for the baseline value of the return multiplier. Two additional lines in each chart are drawn for alternative values of the return multiplier found by changing the value of one of the multiplier's principal components, either the expected rate of growth in the real return (Chart 5), the expected rate of inflation (Chart 6), or the expected real rate of interest (Chart 7).

Expected net return. Any change in the initial net return calculated in Table 1 results in a proportionate change in the calculated farmland bid price, regardless of the value of the return multiplier. For example, if the net return for the Missouri tract fell 5 percent from the baseline $27.75 an acre to $26.33 an acre while all components of the return multiplier remained fixed

CHART 6

Farmland bid prices calculated for three rates of expected inflation (p) and a range of current before-tax return



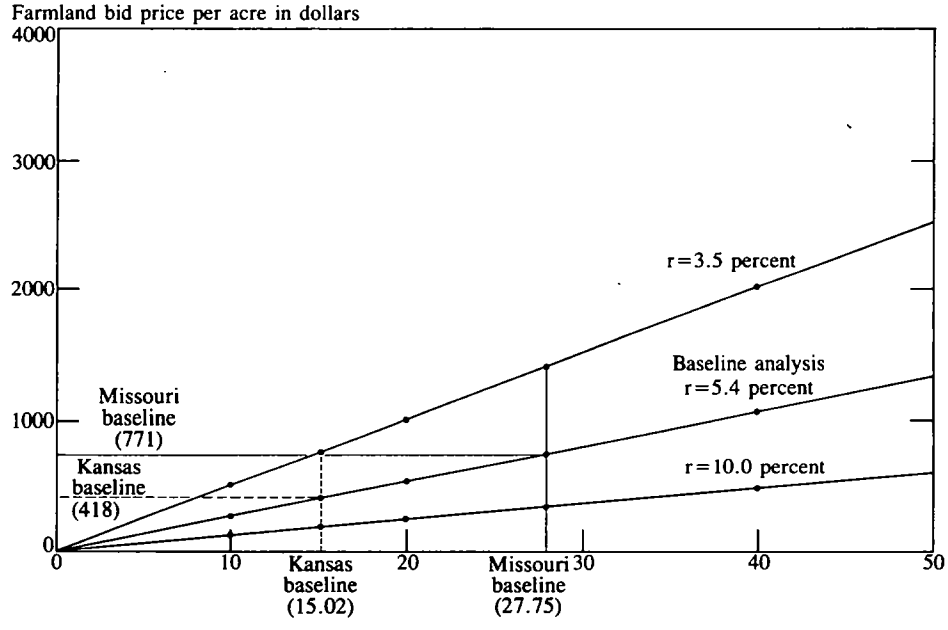
at the baseline values, the bid price for the Missouri tract would fall 5 percent from $771 an acre to $732 an acre. This simultaneous, proportionate decline in the return and the bid price can be seen as a slide toward the origin down the line labeled "baseline analysis" in Charts 5, 6, or 7.

The crop prices used in the baseline analysis of the two representative tracts of land are based on current government price support levels.[11] A 5 percent decline in the initial net return resulting from a reduction in government price support that was not fully offset by savings in input costs would be matched by a 5 percent decline in the farmland bid price. This analysis suggests that current midwestern farmland prices are built on expectations of a continuation of the current level of government subsidy and that a sharp reduction in commodity price support would contribute to further weakness in farmland prices. As the support furnished by government commodity pro-

[11] The prices of corn, wheat, and milo used in the baseline analysis are below the target prices specified in the Food Security Act of 1985 (FSA) due to the requirement that a producer who chooses to participate in the provisions of the FSA must hold some land out of production. The baseline grain prices reflect the approximate minimum price that the producer would have to receive from the open market to justify not participating in the FSA provisions. The baseline soybean price is reflective of current central Missouri cash prices and lies between the effective 1986 loan rate, reduced to $4.56 by the provisions of the Gramm-Rudman-Hollings Balanced Budget and Emergency Deficit Control Act of 1985 and the 1987 loan rate of $4.77.

CHART 7

Farmland bid prices calculated for three expected real interest rates (r) and a range of current before-tax return



grams declines under the growing pressure to reduce federal budget deficits, farmland values can be expected to edge lower.

Growth in real return. The effects of changes in the rate of growth in the real return to land on the farmland bid price are of special relevance in the sensitivity analysis because of the strong association between return growth and farmland values. The 20-year average rate of growth in the real return in Missouri and Kansas varies from −1 percent to 4 percent (Chart 2). This range of past growth rates is used in the sensitivity analysis as the relevant range of expected future return growth. The mathematical limitations of the model limit the ceiling value for expected growth in real return to 2 percent, however, rather than 4 percent.[12]

Chart 5 summarizes the sensitivity of the farmland bid price to a change in the expected rate of growth in real return. Reducing expectations of future growth from 2 percent to the baseline value of zero, for example, results in a 64 percent decline in the bid prices for the two representative tracts. At the baseline current return for the two farmland tracts, the bid price of the Missouri tract would fall from more than $2,200 an acre to the baseline value of $771 an acre, and the bid price of the Kansas tract would fall from over $1,200 an acre to the baseline value

[12] The mathematical condition that must be maintained in using this model is a slight modification of the condition, found in earlier bid-price models, that the rate of growth in the real return to land must be smaller than the real rate of interest. See the appendix for a more thorough development of the model.

of $418 an acre. The extreme sensitivity of the bid price to a shift in expectations of future growth in real return to land is consistent with the land price and return data reviewed earlier. The marked decline in the observed rate of growth in the real return to land in the 1980s contributes to reduced expectations of future return growth. A sharp correction in land prices would necessarily follow if participants in land markets had capitalized the strong average growth in real return observed during the 1970s into their farmland bid prices.[13]

Much of the uncertainty surrounding future trends in farmland values is captured in the sensitivity of the bid-price model to changing expectations of future growth in the real return to land. The large variation in past rates of return growth, including the strongly positive growth of the 1970s and the sharply lower growth of the 1980s, adds uncertainty to investor expectations of future return growth. Uncertain expectations of growth in the return to land lead, in turn, to uncertainty in predicting future farmland prices.

The expected rate of inflation. Another issue of relevance to the potential farmland investor is the positive association between the expected rate of inflation and farmland values. Chart 6 shows that, with the real interest rate and the other components of the return multiplier held constant, a threefold increase in the expected rate of inflation, from 3 percent to 9 percent, nearly doubles the bid prices of the two case farms. This result is consistent with the earlier comparison of Charts 1 and 4, which showed a positive association between the expected rate of inflation and farmland values. But the effect of a change in the expected rate of inflation in this bid-price model is small compared with the effect of a change in the expected rate of growth in the real return to land.[14]

The real rate of interest. The third issue to be considered in this sensitivity analysis of farmland bid prices is the relationship between the expected real rate of interest and farmland values. The range in the real rate considered in this analysis, 3.5 percent to 10 percent, is drawn from the data in Chart 4. Chart 7 shows that an increase in the real rate of interest results in a sharp decline in the farmland bid price. For example, increasing the real rate of interest from 3.5 percent, the approximate rate in the late 1970s, to the baseline value of 5.4 percent lowers the bid prices of the two example farms by nearly 50 percent. This strong negative association between the expected real interest rate and the calculated farmland bid price is consistent with the trends in farmland values and the expected real rate of interest described earlier.

Farmland bid prices derived with this model are more sensitive to a change in the expected real interest rate than they are to a change in the expected rate of inflation. The proportional decline in farmland bid prices caused by a shift in the expected real interest rate from 3.5 percent to 10 percent (Chart 7) is much more than the proportional increase in the bid price caused

[13] Some recent research suggests that farmland investors in the 1970s did not bid expectations of continued strongly positive growth in the real return to land into their farmland bid prices even though expectations of a growing real return stream were justifiable. Pongtanakorn and Tweeten were unable to reject the hypothesis that investors had maintained expectations of no growth in the real return to land, the growth scenario used in the baseline analysis of this study. See Chaipant Pongtanakorn and Luther Tweeten, "Determinants of Farmland Price and Ratio of Net Rent to Price," Oklahoma State University Agricultural Experiment Station Research Report P-878, Stillwater, May 1986, and Luther Tweeten, "A Note on Explaining Farmland Price Changes in the Seventies and Eighties," *Agricultural Economics Research*, Fall 1986, pp. 25-30.

[14] This result reflects one of the primary differences between the bid-price model developed in this article and the earlier model developed by Lee and Rask. Specifically, the Lee and Rask model does not explicitly recognize both nominal and real rates of growth and interest.

by a shift of approximately the same magnitude in the expected inflation rate (Chart 6). This analysis identifies the expected real rate of interest rather than the expected rate of inflation as a primary determinant of farmland values, a distinction that adds an important qualification to the view that higher inflation leads to higher land values. When nominal interest rates are free to adjust to a change in the expected rate of inflation, as is the case in today's deregulated financial markets, a change in the expected rate of inflation will have little effect on the expected real interest rate and farmland values.

Summary and conclusions

Based on farm return and interest rate data from the Tenth Federal Reserve District, the bid-price model developed in this article shows that the residual return to farmland, the expected rate of growth in the real return to land, the expected rate of inflation, and the expected real interest rate combine to determine the maximum price—the bid price—that an investor would be willing to pay for farmland. Sensitivity analysis of changes in these key variables reveals that the bid price increases in proportion to an increase in the current return to land. The bid price increases moderately with an increase in the expected rate of inflation. Of all of the components of the model, the bid price is most sensitive to shifts in the expected rate of growth in the real return and the expected real interest rate. An increase in the expected rate of growth in the real return causes the bid price to rise sharply. An increase in the expected real interest rate causes the bid price to decline precipitously.

Recent trends in the price of farmland in the Tenth District are consistent with the bid-price analysis presented here. The price of farmland rose rapidly in the district in the 1970s, when the rate of growth in the real return to land was high and the expected real rate of interest was low. Land values fell in the district in the 1980s, when the rate of growth in the real return to land was falling and the expected real interest rate was high. The analysis also suggests, however, that the downward adjustment of farmland values to an increase in the expected real rate of interest and a simultaneous decline in the expected rate of growth in the real return to land in the 1980s is nearly complete.

The current outlook for Tenth District and U.S. farmland values depends on the future course of the real interest rate and the return to land. Recent research suggests that high real interest rates in the 1980s were caused by a disciplined monetary policy and an expansionary fiscal policy.[15] A lower real interest rate resulting from a reduced federal budget deficit and greater balance between fiscal and monetary policy should help support farmland prices in the future, but a sharp decline in the real rate of interest to the levels of the late 1970s is not likely. Similarly, an imminent rebound in the rate of growth in the real return to land that could drive land values higher is not probable in view of burgeoning inventories of agricultural commodities around the world. Growing budgetary pressure to reduce government commodity program expenditures provides an outlook for continued downward pressure on commodity prices, return to farmland, and, therefore, farmland prices. On balance, until world supplies of grain fall more in line with demand—a development that would lend support to grain prices and return to farmland—farmland values are likely to edge lower, as the support furnished by government commodity programs declines.

[15] For a discussion of the factors affecting the real rate of interest, see Alan D. Barkema, "The Effects of Macroeconomic Policy on Farmland Value," Research Working Paper 86-11, Federal Reserve Bank of Kansas City, December 1986, and Stephen Cecchetti, "High Real Interest Rates: Can They Be Explained?" *Economic Review*, Federal Reserve Bank of Kansas City, September/October 1986, pp. 31-41.

Appendix

Derivation of the bid-price models

Derivation of the simple bid-price model

The current bid price of farmland is given by Equation A1 when the discount rate and the expected return to land are constant over the infinite useful life of the land. Equation A2 is an equivalent, simplified version of Equation A1 found by eliminating the summation notation.

$$(A1)\quad V = \sum_{i=1}^{\infty} \frac{R}{(1+d)^i} = \frac{R}{1+d} + \frac{R}{(1+d)^2} + \frac{R}{(1+d)^3} + \cdots$$

where V is the farmland bid price, R is the current return to land, d is the discount rate, and i is the index of time in years.

$$(A2)\quad V = \frac{R}{d}$$

Derivation of a more detailed bid-price model

Specific consideration of expected growth of the real return to land, the expected rate of inflation, the expected real rate of interest, and taxes on income and capital gains adds complexity to the simple bid-price formula shown in Equation A2. When all these additional factors are taken into account, the current farmland bid price can be expressed as the sum of two components. The first component is the present value of the growing, after-tax return stream received from land owned for only n years. The second component of the bid price is the present value of the proceeds from the future sale of the land, net of capital gains taxes, after the n-year period of ownership. Adding these two components together provides the bid-price formula shown in Equation A3. Inspection of Equation A3 shows that the use of this bid-price model is confined to cases where the term in square brackets is positive, the condition that restricted the upper bound on the rate of growth in the real return to farmland to 2 percent in the bid-price analysis discussed in the article.

$$(A3)\quad V = \frac{R(1-t)(1+g+p)}{(r+p)(1-t)-(g+p)} \cdot \frac{[(1+(r+p)(1-t))^n - (1+g+p)^n]}{[(1+(r+p)(1-t))^n - (1+g+p)^n] + T((1+g+p)^n - 1)}$$

where g is the expected rate of growth in the real return to land, p is the expected rate of inflation, r is the expected real rate of interest, t is the ordinary income tax rate, T is the capital gains tax rate, and n is the length of the holding period.

Taxes in the bid-price model

Two special cases designed to illustrate the effects of including income taxes and capital gains taxes in the bid-price model are shown in Equations A4 and A5. Neither the ordinary income tax rate nor the capital gains tax rate appears in the bid-price formula shown in Equation A4, the special case where the return to land is constant. Taxes play a part in the bid-price model only when the return stream is growing in nominal or real terms. Equation A5 shows that the length of the ownership period, n, has no effect on the farmland bid price when there is no capital gains tax. Equation A5 also shows that an increase in the ordinary income tax rate will raise the farmland bid price by reducing the value of the growth-adjusted discount rate in the denominator.

This positive effect of a tax hike on the farmland bid price also holds when the capital gains tax rate is greater than zero.

$$(A4)\quad V_{\substack{g=0\\p=0}} = \frac{R}{r}$$

$$(A5)\quad V_{T=0} = \frac{R(1+g+p)}{(r+p)-\frac{(g+p)}{(1-t)}}$$

Expectations of inflation in the bid-price model

The bid-price analysis presented in the article shows that the expected rate of inflation is not as important in determining the farmland bid price as the expected rate of growth in the real return to land and the expected real rate of interest. The effects of a change in the expected rate of inflation on the expected nominal return to land and the discount rate tend to cancel so that the net effect on the bid price is relatively small. Equation A6 shows that a change in the expected inflation rate has almost no effect on the bid price when the income and capital gains tax rates are reduced to zero. In this special case, the numerator represents the net return expected after the first year of ownership. Aside from the slight impact of inflation during the first year of ownership—an effect that declines to zero in the case of continuous rather than discrete compounding—the farmland bid price in the absence of either an income tax or a capital gains tax is not affected by a change in the expected rate of inflation.

$$(A6)\quad V_{\substack{T=0\\t=0}} = \frac{R(1+g+p)}{r-g} = \frac{R_1}{r-g}$$

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