As the Nation's Economy Goes, So Goes Minnesota's

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As the latest U.S. recession began last year, economic activity seemed to fall off even more sharply in Minnesota than in the nation as a whole. By some accounts, this relatively weak performance was out of character for Minnesota. Many people believed the state's economy had special features—including a large farm sector and a balanced nonfarm sector—which historically had more or less buffered it from the extreme swings in the national economy.[1]

To some economists, though, Minnesota's 1981 economic performance was very consistent with the composition and history of the state's economy. Dr. Sung Won Son of Northwestern National Bank of Minneapolis said, "it was a myth, that our economy inherently is more stable" (Clark 1981), and Dr. Wilbur R. Maki and his associates at the University of Minnesota concluded that Minnesota's economy has actually been more sensitive to business fluctuations than the national economy has been (see, for example, Maki, del Ninno, and Stenberg 1982, p. 8).

Our contribution to this debate is to present fairly simple numerical and graphical evidence that, for nearly the last 25 years, most of Minnesota's economy has closely resembled the nation's in composition and in sensitivity to recessions and expansions. Our evidence is derived from quarterly data on labor and proprietors' personal income by place of work, what we'll call *earned income*. This is probably the best single indicator of economic activity available for individual sectors of states.[2] Based on the computations described below, we conclude that, between 1958 and the third quarter of 1981, the distribution of earned income across sectors has been very similar in Minnesota and the United States and earned income in most sectors of Minnesota's economy has tended to fluctuate around its long-run trend at about the same time and to the same degree as income in the corresponding national sectors. The biggest difference between Minnesota's economy and the nation's has been Minnesota's relatively large and unstable farming sector. It seems to have caused the total Minnesota economy to be slightly less stable than the national economy.

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[1] We have not found a single precise and comprehensive statement of this view but have encountered it in discussions with economists, business analysts, and reporters. Variants and components of this position, such as that Minnesota is relatively recession-proof or that Minnesota's farm sector has moderated the effect on the state of national economic fluctuations, appear in many accounts of Minnesota's recent economic performance (Brandt 1981, Carideo 1981, Chucker 1981, Clark 1981, Dawson 1981, Eklund 1980, FRB 1980, Inskip 1982, Lundquist 1980, Marcotty 1982, Ragsdale 1982). Formal empirical evidence that Minnesota's nonfarm economy is more stable than the nation's has been presented by Bretzfelder (1973) and Friedenberg and Bretzfelder (1980).

[2] The data on personal income by place of work include all wage and salary earnings plus proprietors' business incomes. They omit personal income received as a government transfer payment or as payment for the ownership of capital (rents, dividends, interest). Including data on these sources of income in our analysis would have been difficult, because they are not available for individual sectors. It could also have been misleading, because on a quarterly basis these data are not considered as reliable as data on wages and salaries, which account for most of labor and proprietors' income (Friedenberg and Bretzfelder 1980, p.15). Furthermore, since many government transfer payments either are intended to offset fluctuations in income or are made regardless of the level of economic activity, omitting them should give a better indication of the underlying stability of economic output in Minnesota and the United States. Omitting earnings from ownership of capital should not influence our results too much, for Minnesotans can and presumably do invest in approximately the same types of assets as residents of the rest of the nation. Finally, preliminary analysis of total personal income, which includes these sources of income, suggested that including them would not significantly change our results.

Similar Composition

Methodology

Since economic activity tends to fluctuate to different degrees in different sectors of an economy, a state could be either more or less stable than the nation as a whole if it had much larger shares of the more stable or more volatile sectors. To see if the sectoral composition of Minnesota's economy has differed significantly from the nation's, we devised a simple measure of each sector's share of earned income.

The basic idea behind our measure is to determine what percentages of the state's and the nation's total income are earned in each sector. One way to compute these percentages would be to use the most recent data on earned income. However, since these unadjusted quarterly data are very sensitive to temporary economic disturbances, calculating a sector's income share based on any particular quarter's data can give a misleading indication of the sector's typical importance in the overall economy. For example, the farming sector's share of Minnesota's earned income hit a cyclical peak of almost 8 percent in the fourth quarter of 1977, but in the first quarter of 1980, a downturn in farm product prices helped cut that share in half, down to an abnormally small 4 percent.

We devised a way to get a more stable measure of each sector's share of earned income. We first used a common statistical procedure [ordinary least squares (OLS) regression on a constant and linear trend] to determine the trend of each sector's quarterly share of income between 1958 and the third quarter of 1981. Then, for each sector and each quarter, we selected the value of the trend as our measure of the sector's share of total earned income. The statistical procedure insures that the sum of these values for all sectors in any period is always 100 percent, just as the sum of the raw quarterly data shares is.[3] Calculation of the underlying trend averages out fluctuations in the raw data, however, so our measure of each sector's importance is not as affected by temporary swings in economic activity.

Results

Trend values for earned income shares by sector show that for nearly the last 25 years earned income has been distributed among sectors in very much the same way in Minnesota as in the United States as a whole. The degree of similarity has not changed greatly since 1958 and was very clear in our most recent data period, the third quarter of 1981 (see Chart 1). For almost every sector, the difference between the share of income in Minnesota and the share of income in the nation was less than two percentage points. For roughly half the sectors, the difference was less than half a percentage point. Overall, that is, the composition of Minnesota's economy looked very much like the nation's.

In only three sectors in the last 25 years has the difference between Minnesota and U.S. income shares been great enough to potentially cause a difference in overall stability. Twenty-five years ago, there was a fairly large difference between manufacturing sectors: Minnesota's was .6 percentage points smaller than the nation's. This gap has been shrinking gradually over the years and by the mid-1970s was insignificant. By the third quarter of 1981, it had virtually disappeared. Longer-lasting, however, were two other fairly large gaps. The larger seems to have been in the farm sector. Although this sector's importance has declined somewhat in both Minnesota and the nation since 1958, farming has remained about 4 percentage points, or from two to three times, more important in Minnesota. Accompanying this difference has been a consistently smaller share of income earned by federal government employees in Minnesota.

Similar Fluctuations

Methodology

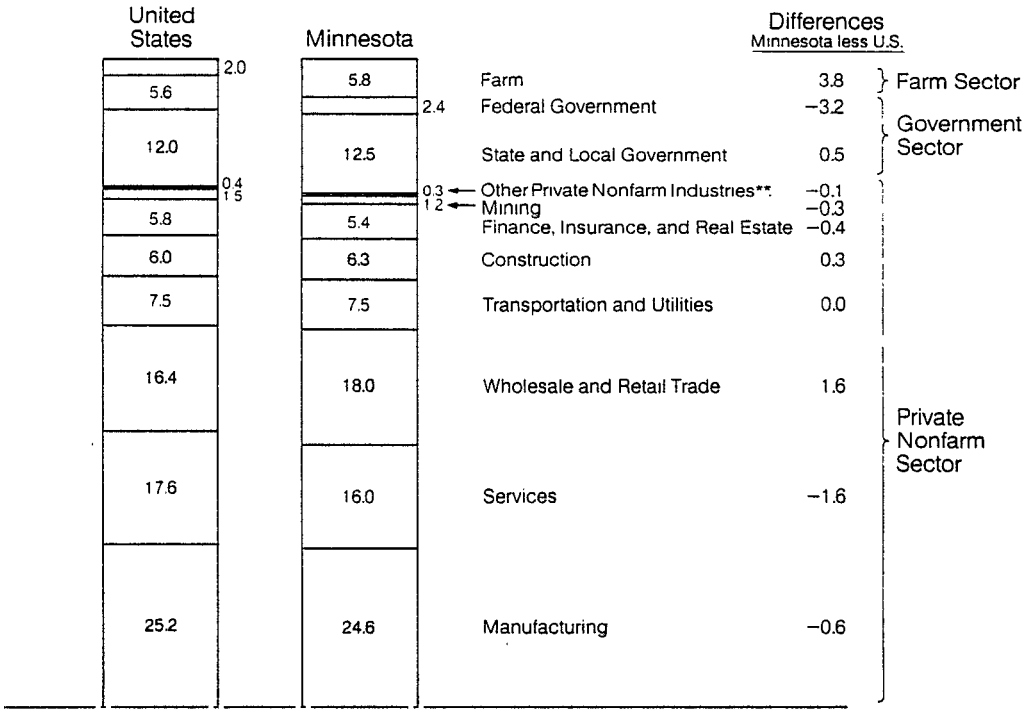
Again, these few sectoral differences could have made Minnesota's overall economy more stable or more volatile than the nation's if these sectors were noticeably more or less stable than other sectors. But even if they weren't, the otherwise very similar composition of the Minnesota and U.S. economies does not guarantee similar fluctuations in overall economic activity. If any Minnesota sectors, individually or collectively, have for some reason been more stable or volatile than their national counterparts, economic activity in Minnesota might have fluctuated more or less than activity in the nation as a whole. For example, regardless of its relative size over the last two decades or so, the Minnesota manufacturing sector might have been more stable than the national manufacturing sector because Minnesota had relatively more

[3] Let Y_i denote a $T \times 1$ vector of the data on the ith sector's percentage share of personal income. Then $\Sigma_i Y_i$ is a $T \times 1$ vector of 100s, which we will denote by A. Let F be the transformation that results from fitting Y_i to a $T \times k$ matrix X by OLS. That is, $F(Y_i) = X[(X'X)^{-1}X'Y_i]$. Since F is a linear transformation, $\Sigma_i F(Y_i) = F(\Sigma_i Y_i) = F(A)$. As long as the matrix X includes (or spans) a column vector equal to a constant, such as a column of ones, $F(A) = A$, a column vector of 100s.

Chart 1

Minnesota's economy has closely resembled the nation's

Distribution of Earned Income by Sector*



*3rd quarter 1981 value of each sector's trend (since 1958) in its percentage share of total labor and proprietors' personal income by place of work

**Agricultural services, forestry, fisheries, miscellaneous

Basic data source: U.S. Department of Commerce, Bureau of Economic Analysis

firms engaged in a supposedly stable type of manufacturing such as food processing. With enough of these sorts of differences, overall activity could have been more stable in Minnesota. To check for differences in stability, we needed a way to measure fluctuations in economic activity, in total and by sectors.

We rejected several commonly used methods. First we rejected approaches based on data other than earned income. Some analysts attempting to compare Minnesota's economic performance to the nation's have examined, for example, data on employment, unemployment, and retail sales. While these data series can no doubt provide many additional insights, none of them is as comprehensive or as convenient as the data on labor and proprietors' personal income. These data cover all Minnesota wage and salary earners and business owners and reflect changes in both of the basic types of economic indicators, quantities (here, for example, the numbers of workers employed and hours worked) and prices (for example, wages and salaries). They are also available for all the sectors shown in Chart 1 on a quarterly, seasonally adjusted basis for over 20 years. We could have used

other data series along with the earned income data, but we decided not to in order to keep things simple.[4]

Having chosen the data to analyze, our first instinct was to calculate their annualized rates of growth for each sector. This transformation of time series data is quite common and often very useful, but after examining some growth rates, we decided that it was not appropriate in this case. Just like the percentage shares of raw income data, the growth rates were very volatile, bouncing way up and down from one quarter to the next. The growth bounces made identifying the kinds of persistent swings associated with business cycle fluctuations very difficult. Furthermore, while growth rates tell where a sector is heading and how fast it's going, they don't give the sector's current position. The growth of earned income in Minnesota, for example, fell rapidly after the peak of the commodity price boom in 1973–74 even though the level of earned income in the state remained high. Finally, standard statistical procedures cannot be conveniently applied to summarize a series of annualized growth rates in a single number that measures stability.

We also rejected some other approaches. A simple technique which Nelson (1981) has used—expressing Minnesota's total earned income as a percentage of the nation's and each Minnesota sector's earned income as a percentage of Minnesota's total—does not clearly show the effects of well-known recessions and allows special circumstances in one sector (for example, the commodity price boom in farming in 1973–74) to affect the measured performance of all the other sectors. Bretzfelder's cyclical swing measure imposes the timing of U.S. recessions and expansions on Minnesota and all individual sectors of the U.S. and Minnesota economies.[5]

The procedure we settled on, though a little difficult to describe, amounts to calculating the percentage deviation of each sector's real earned income from its long-run trend. Raw data on nominal earned income in Minnesota and the United States, even adjusted for population, were dominated by the long-run effects of inflation and growth and revealed little about the timing and size of business fluctuations. Thus, we began by dividing earned income by the personal consumption deflator in order to remove the veil of inflation. To focus more clearly on the fluctuations in each sector's quarterly data, we then calculated the sectors' long-run growth trends (by logging the deflated income data and fitting the logged data to a constant, time, and time squared by OLS regression), subtracted the trends from the actual quarterly data, and divided each of the remainders by its corresponding trend. The last step, subtracting 1 and multiplying by 100, converted these ratios to percentage deviations of earned income from trend.[6] For example, in Chart 2, the plot for total Minnesota earned income in the third quarter of 1981 indicates that the level of total earned income in Minnesota had fallen about 4.5 percent below its long-run trend at that time.

Our percentage-deviation-from-trend procedure has some attractive properties while it satisfies most of our objections to the other procedures for transforming the earned income numbers into indicators of stability. It eliminates the effects of inflation and long-run growth rates so that business cycle–length fluctuations are revealed. As Chart 2 shows, the procedure lets the data clearly reflect the downward economic swings associated with national recessions. Nonetheless, it lets the performance of each sector of the Minnesota and national economies be measured independently; with this procedure, one sector's performance does not automatically inflate or depress the measure of any other's, and the tendency for Minnesota or any sector to turn up or down earlier or later than the total national economy turns is not suppressed. The time series graph of each sector's deviations from trend can be used to compare the relative positions as well as rates and directions of change of

[4]We checked our decision to reject other data series by analyzing data on total employment in Minnesota and the United States with the same techniques we used to analyze the earned income data. The results were very similar to those on income, indicating that our conclusions are not based merely on special characteristics of the income data.

[5]Bretzfelder uses deseasonalized nonfarm wage and salary data to calculate the cyclical swing. He subtracts the arithmetic average of the annualized rates of growth during recessionary quarters from the arithmetic average of the annualized rates of growth during expansionary quarters. He dates expansions and recessions by peaks and troughs in real quarterly gross national product (Bretzfelder 1973, Friedenberg and Bretzfelder 1980).

If, as Maki, del Ninno, and Stenberg (1982, p. 17) suggest, the Minnesota economy turns up from one to two quarters after the national economy, the cyclical swing measure could misjudge the stability of Minnesota's economy. This may partly account for the differences between Bretzfelder's measure and our measure of Minnesota's instability.

[6]We analyzed each data series, Y, as though it were the product of a long-run trend factor, T, and a fluctuating factor, R, or $Y = TR$. Taking logs gives $\ln Y = \ln T + \ln R$. Defining $\ln T$ to be the regression of $\ln Y$ on a constant, time, and time squared, the deviations from trend are the regression residuals, $\ln R = \ln Y - \ln T = \ln(Y/T)$. To get (Y/T), exponentiate $\ln R = \ln(Y/T)$. The final step is to subtract 1 and multiply by 100.

A potential weakness in our procedure is that the regression of $\ln Y$ on a constant, time, and time squared may not define a reasonable long-run growth trend. There are no precise principles for defining a long-run trend, but we duplicated our basic results about the stability of total earned income in Minnesota and the nation under five alternative definitions.

various Minnesota and national sectors at any point. Finally, a well-known statistic, the standard error, can be used to summarize in a single number all the historical percentage deviations from trend. Since the standard error indicates the average size of the percentage deviations of actual earned income from its long-run trend, this summary statistic can be used to judge the relative stability of the Minnesota economy, the U.S. economy, or any of their sectors.

Results

Charts 2 through 13 compare the percentage deviations of earned income from trend in various sectors and groups of sectors of the Minnesota and national economies. The overall picture that emerges from even a quick glance through these graphs is of a strong similarity in the fluctuations of both these economies. Chart 2, for example, shows that, for nearly the last 25 years, total earned income has swung above or below its long-run trend at about the same time in Minnesota as in the United States. Minnesota's percentage deviation from trend has sometimes exceeded and sometimes fallen short of the nation's, but the discrepancies have usually been small.[7] A careful examination of Chart 2 reveals a few episodes of fairly large discrepancy—notably, in 1973–74—and suggests that, on average, Minnesota's total earned income may have been a bit less stable than the nation's.

The rest of the charts suggest some explanations for the overall similarity as well as the occasional differences. Chart 4 shows that income fluctuations in the nonfarm sectors in Minnesota and the United States have been strikingly similar in both timing and size. Since the nonfarm sector has on average accounted for over 90 percent of all earned income in both Minnesota and the United States for at least the last two decades, the similarities in this sector explain much of the overall similarity. Charts 5–13 provide further detail. They show that similarity in timing and size of fluctuations between Minnesota and the United States has generally been the rule throughout the nonfarm sector. One or two components seem to have been mild exceptions (mining and federal government), and some show one or two episodes of large discrepancy between Minnesota and the nation (for example, services in the mid-1960s and construction and trade in 1972–74), but the overall pattern appears to have been one of similar movements up and down.

Charts 5–13 also suggest that two differences in composition—Minnesota's lesser dependence on the federal government sector and, in earlier years, on the manufacturing sector—probably have not been important sources of either stability or instability. Although fluctuations in the federal government sector in Minnesota and the United States appear to have been somewhat smaller than those in the other sectors for most of the 1958–81 period, they weren't very much smaller. For that reason, and because the federal government sector has itself been small in both economies, this difference in composition could not have had much effect on the relative stability of the state's economy. Fluctuations in a larger sector, manufacturing, appear somewhat larger than those in sectors of similar size (services and trade, for example), so Minnesota's lesser dependence on this sector from 1958 through the mid-1970s may have been a stabilizing influence. However, as we have already seen in Chart 4, the effect, if any, was not strong enough to make Minnesota's nonfarm sector (which includes manufacturing) noticeably more stable than the nation's.

The close resemblance between Minnesota and the United States in the nonfarm sector suggests that the other difference in composition—Minnesota's larger farm sector—has accounted for much of the discrepancy between fluctuations in Minnesota and the nation, and Chart 3 supports this view. It shows that farm income has been more volatile in Minnesota than in the United States and, when compared to Chart 4, that farm income has been much more volatile than nonfarm income in both economies. Adding to that the fact we discovered earlier, that farming has been from two to three times more important in Minnesota than in the nation as a whole, it is not surprising that Chart 2's largest discrepancies between fluctuations in Minnesota and U.S. total earned income coincide with Chart 3's agricultural booms and busts.

Note that the farm sector's destabilizing effects on the total Minnesota economy have been upward as well as downward. For example, extremely high farm prices in 1973–74 caused earned income in Minnesota's farm sector to rise more than 160 percent above its trend at that time. As a result, total earned income in Minnesota soared more than twice as far above trend as earned

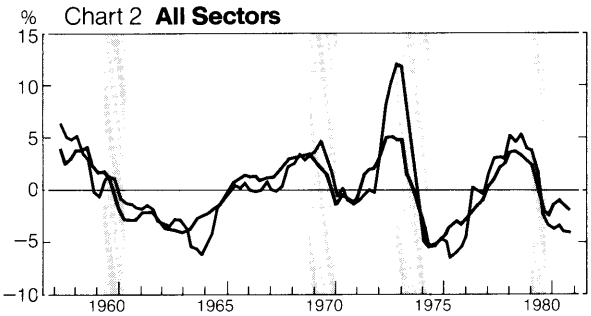
[7]Chart 2 does support the view that the Minnesota economy was weaker than the national economy in 1981. Minnesota's total earned income was around 4 percent below its trend in 1981 while U.S. earned income was around 2 percent below its trend.

Charts 2–13

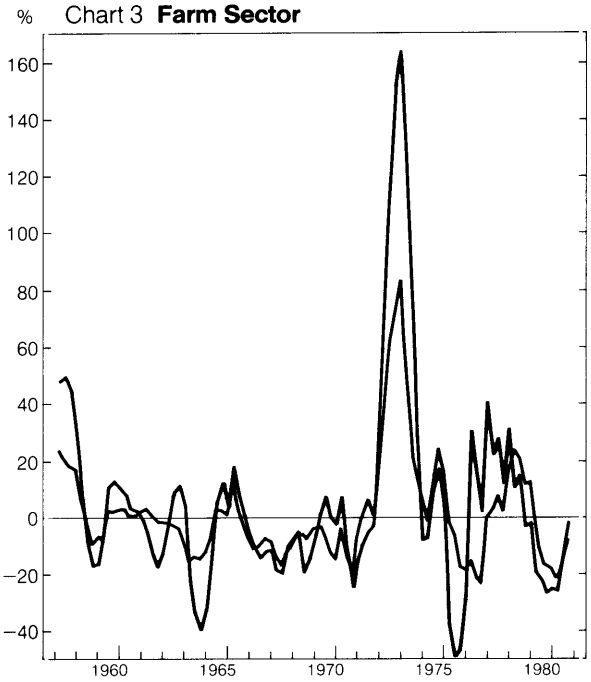
Fluctuations in Economic Activity

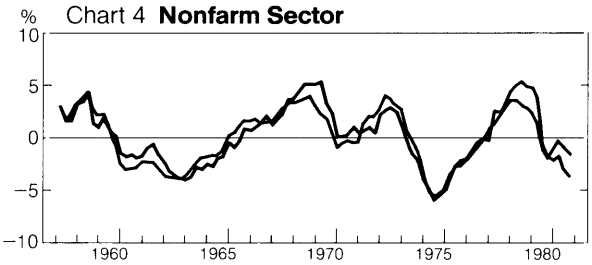
Difference Between Actual and Trend Real Earned Income*
as a Percentage of Trend, 1st Quarter 1958–3rd Quarter 1981

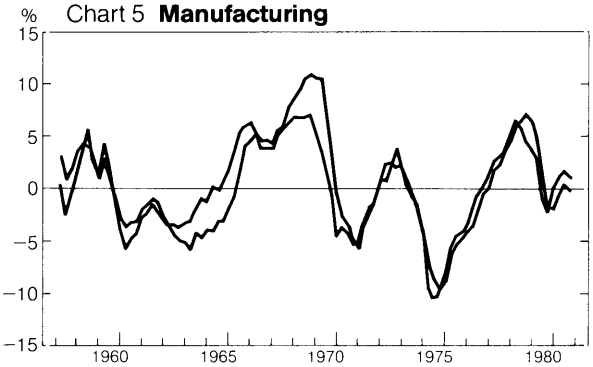
Minnesota — United States

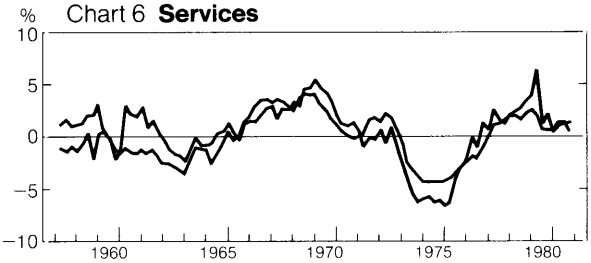


Note: Shaded areas indicate the four U.S. recessions between 1958 and 1980.









*Total labor and proprietors' personal income by place of work
Basic data source: U.S. Department of Commerce, Bureau of Economic Analysis

Chart 7 **Wholesale and Retail Trade**

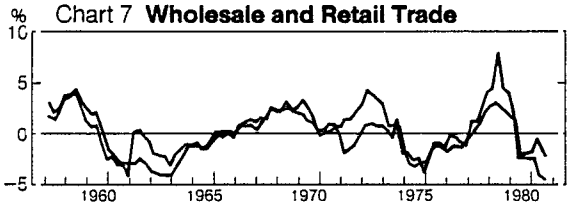


Chart 8 **Transportation and Utilities**

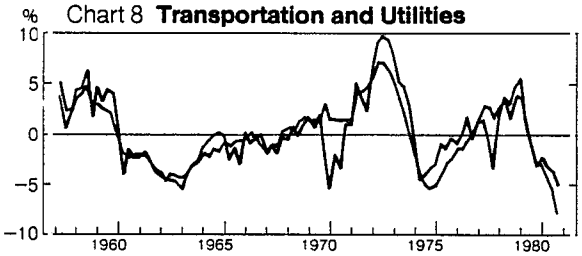


Chart 9 **Construction**

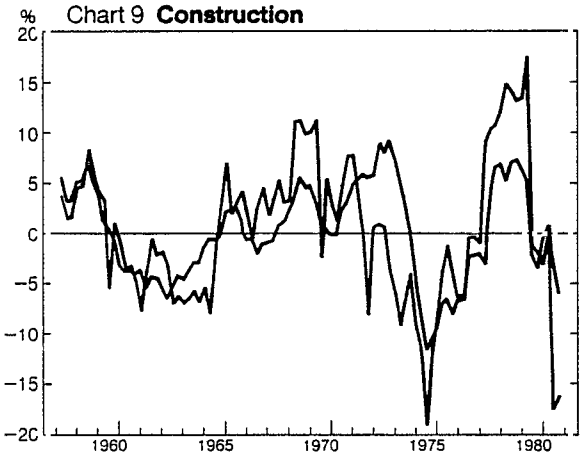


Chart 10 **Finance, Insurance, and Real Estate**

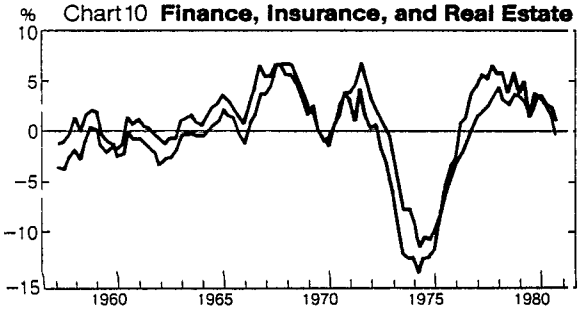


Chart 11 **Mining**

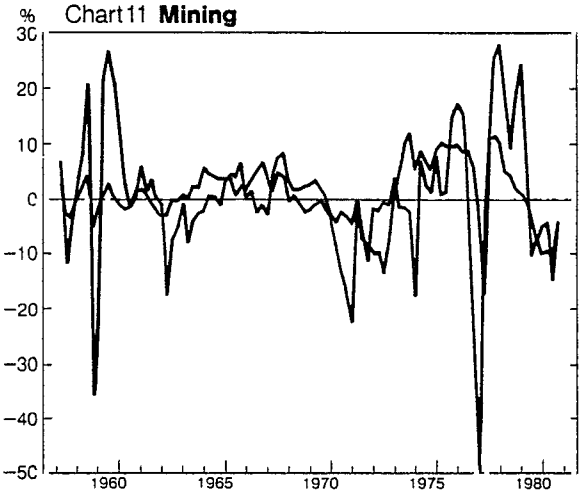


Chart 12 **State and Local Government**

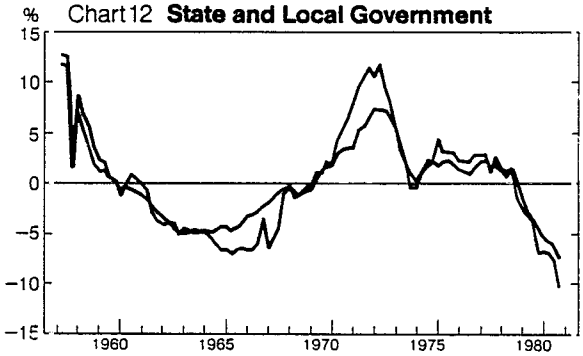
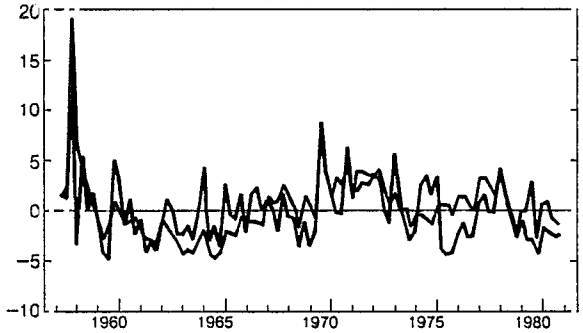


Chart 13 **Federal Government**



income in the nation did during those years, even though Minnesota and U.S. nonfarm income moved approximately in unison.

The summary measures of stability shown in the accompanying table confirm the visual impressions of Charts 2–13. The table shows the average size of percentage deviations from trend of total and sectoral real earned income in Minnesota and the United States from 1958 through the third quarter of 1981. By this measure of stability as well as that on the charts, activity in Minnesota's nonfarm sector has been strikingly similar to activity in the nation's. This high degree of similarity has held for several large components of the nonfarm sector, notably, manufacturing, services, and trade. The table also confirms that Minnesota's farm sector has been much less stable than the nation's farm sector and dramatically less stable than the Minnesota and national nonfarm sectors. The effect on Minnesota's total earned income of this volatility in the state's farm sector has been somewhat moderated by the fact that farming has accounted for a fairly small share of all earned income. The volatility has apparently been strong enough, though, to make Minnesota's total earned income slightly less stable than the nation's.[8]

Overall, Minnesota's nonfarm sector has been just about as stable as the nation's

Average Percentage Deviation From Trend of Earned Income, 1st Quarter 1958–3rd Quarter 1981*

	Minnesota	United States
All Sectors	3.9%	2.7%
Farm	36.1	18.5
Nonfarm	2.9	2.6
Nonfarm Sectors Ranked by Stability		
Wholesale and Retail Trade	2.3%	2.3%
Services	2.8	2.3
Federal Government	3.1	3.2
Transportation and Utilities	3.6	3.0
Manufacturing	4.7	4.1
Finance, Insurance, and Real Estate	4.8	3.9
State and Local Government	5.3	3.9
Construction	7.3	4.8
Other Private Nonfarm Industries**	7.7	4.1
Mining	11.8	6.6

*Standard error of percentage deviations from trend of deflated labor and proprietors' personal income by place of work

**Agricultural services, forestry, fisheries, miscellaneous

Basic data source: U.S. Department of Commerce, Bureau of Economic Analysis

Conclusion

Our analysis of earned income in Minnesota and the nation since 1958 suggests that, except for the effects of Minnesota's larger and more volatile farm sector, the two economies have closely resembled each other in composition and in the timing and size of cyclical fluctuations. Government and private analysts attempting to forecast the Minnesota economy should therefore not count on Minnesota being more stable than the nation; it has not shown this tendency for nearly 25 years. Given our result, a better forecasting guideline would seem to be this: the slightly destabilizing effects of its large farming sector excepted, Minnesota's economy moves with the nation's.

[8]In one sense, finding that the average percentage deviation from trend in Minnesota or any individual state exceeds the average percentage deviation in the nation is not surprising. In any quarter, while some states are several percentage points away from trend in one direction, other states may be away from trend in the other direction, and still others are likely to be very close to trend. When deviations for the nation as a whole are calculated, therefore, some of the individual state deviations cancel each other. As a result, simply because of the canceling, state percentage deviations from trend tend to be larger than the nation's.

From this point of view, the assertion that Minnesota or any other state has been more stable than the nation amounts to saying that the state has overcome this tendency. And over the period we studied, the tendency appears to have been quite strong. When we applied our procedures to total earned income in each of the 50 states for the period from the first quarter of 1958 to the third quarter of 1981, we found that all but 3 states had been less stable than the nation as a whole.

Our conclusion that Minnesota's economy has not overcome the tendency for percentage deviations from trend to be larger in the states than in the nation as a whole is interesting because it directly contradicts the common assertion that Minnesota's economy has been more stable than the nation's. However, because most states were also less stable than the nation, this conclusion does not distinguish Minnesota from most other parts of the country. A thorough analysis of Minnesota's stability relative to the stability of other states or regions is beyond the scope of this paper, but we did make some preliminary calculations of this sort. Ranking states by their standard errors of percentage deviations of earned income from trend revealed that, over the 1958–81 period, 32 states were more stable than Minnesota. Among the 10 states closest to Minnesota in earned income, Minnesota was among the least stable, ranking 8th. Furthermore, Minnesota's standard error was larger than a weighted average of all states' standard errors (the weights determined by each state's share of earned income): this indicates that Minnesota's economy has been slightly less stable than the average state economy as well. These preliminary results suggest that Minnesota may be somewhat unstable when compared to other states as well as when compared to the nation as a whole.

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The views expressed herein are those of the author and not necessarily those of the Federal Reserve Bank of Minneapolis or the Federal Reserve System.