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Abstract

Employing two widely used approaches to identify the impacts of monetary policy, this paper explores the differential impact of policy on the labor market outcomes of teenagers, minorities, out-of-school youth, and less-skilled individuals. Evidence from recursive VARs and ADL models that use information on contractionary initiatives by the Federal Reserve indicate that the employment-population ratio of minorities is more sensitive to contractionary monetary policy than that of whites, primarily falling due to an increase in unemployment and not a decline in labor force participation. Monetary policy appears to have a disproportionate effect on the unemployment rate of teenagers, particularly African American teenagers. Their employment-population ratios fall due to increased difficulty in obtaining employment. The larger responses are not due to their higher likelihood of being employed in industries and occupations that are more sensitive to contractionary monetary policy.

Key Words:

Monetary Policy
Federal Funds Rate
Labor Market Outcomes
Teenagers, African Americans, Hispanics, and Out-of-School Youth

I. Introduction

Over the post-war period, the ratio of black unemployment to white unemployment has averaged two to one.[1] There is a large and well-developed literature that studies the relationships among aggregate demand, macroeconomic policies, and socio-economic outcomes such as this unemployment gap. This paper examines the impact of contractionary monetary policy on different unemployment rates.[2]

The influence of monetary policy on socioeconomic outcomes is hardly a novel topic. For example, Romer and Romer (1998) find that expansionary monetary policy tends to lessen poverty, arguing that rapid economic growth associated with expansionary monetary policy results in lower poverty in the short run. In the long run, low inflation and steady growth in aggregate demand is associated with lower poverty. Romer and Romer conclude that since the effects of monetary policy are "inherently temporary," a strategy with the goals of low inflation and stable aggregate demand has the greatest chance to permanently lower poverty.

More recently, Thorbecke (2001) estimated differential impacts of monetary policy across racial and ethnic groups. The motivation for his inquiry is based on theoretical work in Blanchard (1995) who argues that an adverse aggregate demand shock such as a monetary contraction has "ladder effects," adversely affecting lower income individuals who are positioned at lower steps of the ladder. Blanchard and Katz (1997) assert that unskilled individuals have significantly higher labor supply elasticities than skilled individuals, and so a fall in the demand for labor as economic growth slows will have a larger impact on the employment prospects of less-skilled workers. As a result, the increase in unemployment following contractionary monetary policy is greater for low-skilled individuals than for high-skilled workers. Since African-American and Hispanic workers have on average less education and skills than whites, Thorbecke claims that contractionary monetary policy will have a more adverse impact on minorities than on whites.

Focusing solely on the unemployment rate, Thorbecke finds that from March 1973 to December 1996, impulse-response functions from recursive Vector Autoregressions (VARs) suggest that increases in the federal funds rate raised African-American and Hispanic unemployment rates by 50 to 90 percent more than whites. Then, by using the contractionary episodes identified in Romer and Romer (1989, 1994b, the so-called "Romer dates"), Thorbecke finds that following anti-inflationary policy shocks, unemployment among nonwhites rises more than twice as much as that among whites. Thorbecke concludes that the "Federal Reserve should take account of these effects when implementing disinflationary guiding principle."[3]

This paper uses VARs and Romer dates to explore whether contractionary policy lowers the employment-population ratio by acting primarily through raising the unemployment rate or reducing the labor force participation rate. As a result, we can infer whether the effect on labor market outcomes is primarily a result of the demand for or supply of labor. We estimate VARs and Autoregressive distributed lag (ADL) models that extend Thorbecke's monthly time series through September 2002. Extending the sample includes an extra contractionary episode, beginning in June 1999, and a subsequent easing cycle, this latter being far more rapid than had been typical.[4]

The results show that contractionary monetary policy, as measured by innovations to the federal funds rate, lowers the employment-population ratio primarily by raising the unemployment rate and not by reducing the labor force participation rate.[5] An increase in the federal funds rate lessens aggregate labor demand, leading to a decline in the probability of employment for any given individual, increasing unemployment. Labor force participation declines modestly.

To estimate the differential effect of contractionary monetary policy across demographic groups, we disaggregate the employment-population ratio, unemployment rate, and labor force participation rate by race and age, and later we examine out-of-school youth (ages 16 to 24). This latter group on average

has the least skills and has decided in the short-term to forgo further investments in their formal education. We test whether tighter monetary policy has a larger effect on the employment status for out-of-school teenagers, minorities, and less-educated men and women relative to the rest of the economy.

The findings can be summarized as follows. An increase in the federal funds rate typically lowers the employment-population ratios of minorities and less-skilled by increasing their unemployment rates and not by decreasing their labor force participation rates. African American unemployment rates, particularly those of teen African Americans, are more sensitive to changes in monetary policy than white unemployment rates. The unemployment rates for out-of-school teenagers and less educated out-of-school young men and women (ages 16 to 24) are the most sensitive to changes in monetary policy. The larger responses are not due to their higher likelihood of being employed in industries and occupations that are more sensitive to contractionary monetary policy.

The organization of this paper is as follows. Section II describes the methodology and Section III describes the data. Section IV describes the results. Section V concludes.

II. Methods

Estimation

VARs are a convenient and popular econometric modeling technique used in analyzing macroeconomics and the impact of monetary policy in particular. Consider a general linear model of the economy:

$$Y_t = \sum_{i=0}^{p} A_i Y_{t-i} + e_t$$

where Y_t is a vector of variables summarizing the state of the economy. Re-arranging the equation in reduced form yields only lagged values on the right hand side:

$$Y_t = \sum_{i=1}^{p} B_i Y_{t-i} + n_t$$

The system is estimated with OLS equation by equation. The federal funds rate is our measure of monetary policy, following Bernanke and Blinder (1992). While this measure is open to debate, we choose it because it is fairly standard and parsimonious relative to a more elaborate measure (see for instance Bernanke and Mihov (1999)). Although it was not the principal instrument of the Fed from 1979 to 1982 when reserves were targeted, it was the main instrument in the rest of the sample. Even when reserves were targeted, the funds rate was never ignored. While some studies have tried to isolate the best measure of monetary policy, for the current study, this more simple measure suffices.

In a VAR, it is presumed that all variables are endogenous. The OLS residuals represent unforecastable innovations to each of the variables in the system. Identification of exogenous shocks, such as a policy change we seek to examine here, typically comes from contemporaneous restrictions imposed on the system. Here, we impose a simple recursive structure on the system. The impulse response functions result from a Cholesky decomposition with the funds rate ordered last. This implies that actions by the Fed are informed by developments in the economy, but policy is only effective with a lag. Re-ordering the variables to place the federal funds rate first does not change any of the qualitative results. Moreover, we are only interested in identifying the effects of monetary policy on the rest of the economy so we omit a structural identification strategy.

The variables in the VAR are ordered as follows: industrial production growth, the percent change in the Consumer Price Index for Urban Consumers, the Commodity Research Board spot price index, a labor market outcome (e.g. unemployment rate), the federal funds rate, nonborrowed reserves, and total reserves. Industrial production growth, the percent change in the Consumer Price Index, the spot price index, and the labor market outcome describe the goods markets. The federal funds rate, nonborrowed reserves, and total reserves capture the Federal Reserve's policy instruments.[6]

To identify the differential labor market response to an increase in the federal funds rate, we estimate a VAR and impulse response functions for each demographic group (for example, 16 and over African Americans). The impulse response functions simulate the effect of an increase in the federal funds rate on the three major labor market outcomes: the employment- population ratio, the unemployment rate and labor force participation rate.[7] Using these results, we will be able to determine whether a decrease in a demographic group's employment-population ratio is due to an increase in the unemployment rate (increased length of job search) or to a reduction in the group's labor force participation rate (departure from the labor force).

The Impact of Contractionary Episodes on Labor Market Outcomes

Another approach to identifying the impact of monetary policy on labor markets is to examine episodes in which there was a distinct change in policy by the Federal Reserve. Romer and Romer (1989, 1994b) examine records of the Federal Open Market Committee (FOMC) policy deliberations through 1988 and identify times when "the Federal Reserve attempted to exert a contractionary influence on the economy in order to reduce inflation." This definition includes only those times when the FOMC could be construed to have intentionally changed policy to exert restraint on the economy in order to reduce current or expected inflation. Romer and Romer (1989, 1994b) identified 1947:10, 1955:09, 1968:12, 1974:04, 1978:08, 1979:10, and 1988:12 as meeting their criteria for a contractionary episode.

The minutes from FOMC meetings in February 1994 and June 1999 suggest that these two episodes also fit the criteria used by the Romers in their papers. From reading the minutes, it seems clear that the FOMC intentionally changed the stance of monetary policy towards a much less accommodative position in order to slow the economy and ward off inflation.

To identify the effect that these contractionary episodes have on a particular demographic group, we estimate:

4) $$y_t = A(L)y_{t-1} + B(L)p_{t-1} + C(L)D_{t-1},$$

where y_t denotes a labor market outcome for a given demographic group, A(L) and B(L) are unrestricted polynomials in the lag operator L, p_t denotes the percent change in the consumer price index for urban consumers, C(L) is estimated as a fourth-order polynomial distributed lag, and D_t represents dummy variables for the Romer dates plus the two that we identified. The A(L) and B(L) polynomials contain seven lags. The impact of the Romer and Romer dates on y_t are robust to changes in the order of A(L) and B(L). To maintain consistency with the VARs, C(L) has 48 lags.

III. Data

Published monthly employment-population ratios, unemployment rates, and labor force participation rates for ages 16 and over and teenagers come from the U.S. Bureau of Labor Statistics (BLS). The series span from January 1948 to September 2002; however, data disaggregated that explicitly identifies African Americans and Hispanics is first published in March 1973.

To obtain greater demographic detail for young adults, we use published data from BLS's October Supplement of the Current Population Survey. This Supplement, which is published each October, provides employment-population ratios, unemployment rates, and labor force participation rates of out-of-school 16 to 24 year olds by age, race, gender and educational attainment. Labor market outcomes disaggregated by age and race become available in October 1970. The tradeoff for this additional demographic detail is that the data is only available for October of each year, effectively reducing the frequency from a monthly to an annual time series. This decline in frequency may decrease our ability to make strong conclusions about monetary policy's effect on out-of-school youth. It also likely weakens the validity of the assumption implied by the recursive ordering that monetary policy innovations are contemporaneously uncorrelated with output and inflation. As a result, the conclusions drawn on annual data should be viewed as more suggestive than conclusive.

Monthly time series data for the federal funds rate, industrial production, total reserves, and nonborrowed reserves come from the Federal Reserve Board of Governors. Monthly values for the CPI-U come from the Bureau of Labor Statistics and the monthly spot price index comes from the Commodity Research Board. We used industrial production instead of GDP and the CPI-U instead of the GDP deflator. Industrial production and the CPI-U are available monthly while GDP and the GDP deflator are only available quarterly. In the VAR specifications for the 16 and over population, growth in industrial production, and changes in consumer prices are measured as month-to-month changes. In the VARs that focus on out-of-school youth, we use the October values of the macro data. Percent changes in industrial production and the CPI are calculated as October-to-October changes.[8, 9]

In general, the residuals from each equation of the VARs are relatively stable over this period, typically remaining within two-standard deviations. The only series that are less stable are nonborrowed and total reserve series. The residuals two months after September 11, 2001, are quite large, but quickly return to within 2 standard deviations. The response of the Federal Reserve to the extraordinary events of September 11th explain their size, as the Fed injected extremely large amounts of reserves into the federal funds market to maintain market liquidity.[10, 11, 12]

IV. Results

Figures 1, 2 and 3 plot the impulse response functions from the VARs, graphing the effect of a one-standard-deviation innovation to the federal funds rate on the racial and ethnic differences in employment-population ratios, unemployment and labor force participation rates.[13] An increase in the federal funds rate causes the African American employment-population ratio to fall more than the white employment-population ratio. The difference between the two responses reaches 0.11 percentage point after 31 months. The impulse response functions for the Hispanic-white differential do not indicate a

significant difference in these employment-population ratios.

For unemployment, an increase in the federal funds rates generates a maximum difference of 0.15 percentage point between the African American and white unemployment rates after 27 months. The lower bound of the 95 percent confidence interval implies that the differential is statistically significant. No significant differences exist between the impact of an increase in the federal funds rate on the Hispanic and white unemployment rates. The impulse response functions for labor force participation rates do not differ in a statistically significant way. On balance, this evidence suggests that the lower employment among African Americans following contractionary monetary policy is due to an increase in their unemployment rate.

To explore whether the employment status of less-skilled and less-educated Americans is more sensitive to innovations in the federal funds rate, we estimate separate VARs for African American and white 16 to 19 year olds. The advantage to estimating models for teenagers is that we can observe using monthly data whether African American youth labor market outcomes respond differently than white youth labor market outcomes or labor market outcomes of the population in general. However, a major drawback to using the published monthly data for 16 to 19 year olds is that it mixes labor market and schooling decisions. Using monthly data, we cannot identify the effects of monetary policy on out-of-school youth, such as high school dropouts, who have the least education and skills and have signaled in the short term, little intention to re-enroll in school. On the assumption that the differences between the skills of in-and out-of-school youth are not too large, the impulse response functions of all teenagers will provide a conservative estimate of the effect of monetary policy on out-of-school youth.

Figure 4 presents impulse response functions for teenage employment-population ratios, unemployment rates, and labor force participation rates. The employment situation for African American teenagers is more sensitive to increases in the federal funds rate than that of white teenagers. After 20

months, the teen African American employment-population ratio falls by 0.19 percentage point more than the teen white employment population ratio. The magnitude of the impact on teen outcomes exceeds that estimated impact for the general population.

The greater sensitivity of African American teenagers is due not only to a larger increase in their unemployment rate, but also a larger decline in their labor force participation rate. A one-standard deviation increase in the federal funds rates results in a statistically significant difference of 0.29 percentage point between the African American and white unemployment rate responses after 23 months. The difference in labor force participation rates for African American teens relative to white teens reaches a maximum of 0.14 percentage point after 20 months.

The impulse response functions suggest that contractionary monetary policy reduces teenage employment opportunities, raising unemployment and lowering labor force participation, particularly for African American teenagers. Since the impulse response functions do not return to their pre-shock levels, an interesting question that is beyond the scope of this paper is whether the reduced labor force participation leads to reenrollment in school or an increase in teen idleness (non-employed and non-enrolled in school).

Out-of-school Youth

This section presents tentative estimates of the link between contractionary monetary policy and the labor market outcomes of out-of-school youth, using October-to-October changes from 1973 to 2001. The VARs are restricted to two lags and the impulse response functions are estimated for eight periods. Even with this reduction in the time series frequency, the estimates are quite plausible.

The impulse response functions from the unemployment rate VARs for out-of-school youth by age are shown in Figure 5. The maximum increase in the unemployment rate of 20 to 24 year olds is one half that of 16 to 19 year olds. A one-standard deviation increase (1.51 percentage points) in the federal

funds rate increases the unemployment rate of out-of-school teenagers by 0.56 percentage point in year 2, compared to a 0.27 percentage point for 20 to 24 year olds. The confidence interval suggest that the two responses are indeed different from each other.

To make these estimates comparable to the monthly time series for the 16 years old and over population, we multiply the 16 to 19 year old estimates by 0.82 (the ratio of the standard deviations of the residual federal funds rate: 1.24/1.51), implying an increase in unemployment of 0.46 percentage point in response to a contractionary shock. For 20 to 24 year olds we multiply 0.27 by 0.765 (1.24/1.62), implying a 0.21 percentage point increase. The comparable figures for the change in unemployment for 16 and over white and African American population are 0.14 and 0.28 percentage point, respectively. For teen white and African American unemployment rates, the responses are 0.22 and 0.52 percentage point, respectively.[14]

Figure 6 presents the impulse response functions for young men and women disaggregated by educational attainment. The impulse response functions for out-of-school men and women have similar responses to contractionary policy. An increase in the funds rate results in an increase of 0.55 (with a 95 percent confidence interval of 0.17 to 0.93) percentage point in the unemployment rate of male high school dropouts. For women with no more than a high school degree, the increase in the federal funds rate raises unemployment by 0.50 percentage point, with a lower bound of 0.03 percentage point and an upper bound of 0.97 percentage point. When made comparable to the monthly series, the estimate translates into a 0.49 and 0.45 percentage point increases in the unemployment rates of male and female high school dropouts.

To summarize, even though the out-of-school youth estimates in this section are derived from annual data, they strongly suggest that the employment status of young men and women is more sensitive to monetary tightening than the general population. Since the VARs are symmetric, stimulative monetary

policy would be expected to yield disproportionate, albeit temporary, benefits to minorities and less-skilled individuals.[15]

Isolating Contractionary Episodes

Table 1 presents estimates of the response of the differences in the employment-population ratio, unemployment rate, labor force participation rate to contractionary episodes. The results suggest that a contractionary monetary policy episode causes the African American employment-population ratio to fall by 0.12 percentage point more than the drop in their employment-population ratio for whites. The estimate is measured with some precision (t-statistic = 2.23). The results for the Hispanic employment-population ratio is similar to the African American, however the estimate is imprecise.

An increase in the unemployment rate during a contractionary episode appears to be primary cause of the African American employment-population ratio falling more than the white employment-population ratio. The difference in the employment-population ratio peaks at 0.33 percentage points, with a t-statistic of 4.27. The racial difference in labor force participation peaks at 0.11, however the t-statistic of -1.90, implies low precision. Similar to the VAR models, increases in the unemployment rate and not reductions in labor force participation are the primary channel through which contractionary policy operates to widen the racial difference in employment-population ratios.

To conclude this section, we report the teenage racial difference's response to contractionary episodes. Table 1 contains these results. The difference between the responses of teen African American and white employment-population ratios peaks at 0.72 percentage points, at 48 months. The t-statistic of 1.67 implies that the estimate is measured with moderate precision. The difference in unemployment rates also peaks at 48 months at 2.01 percentage points, with a t-statistic of 2.66. The difference in the response of labor force participation rates of African Americans versus whites peaks at 2.10 percentage points after 31 months, and the t-statistic of 8.68 suggests this result is precisely estimated.

V. Do Sectoral Differences in Employment Explain the Differential Effects?

One intuitive explanation for the differential effect of monetary policy on labor market outcomes is that different sectors of the labor market are over- or under-represented by African Americans relative to the economy as a whole and, as a result, sectoral differences appear to be racial differences. The BLS publishes employment series disaggregated both by industry and by occupation. We pick a number of industries and occupations that are either over- or under-represented by our demographic groups (for example, African Americans), and examine the response of employment to a contraction. If the differential effects are due to employment patterns, over-represented industries or occupations should show a larger response and under-represented ones should show a smaller response.

Table 2 summarizes employment reactions to a federal funds shock for selected industries and occupations.[16] The log of total nonfarm employment falls by 0.0041 after 40 months. The construction industry is very sensitive to monetary policy shocks. Log employment in construction drops by 0.0096 after 47 months, a much larger change than aggregate employment. However, from 1998 BLS data, construction employed 6.5 percent of the aggregate labor force but only 3.6 percent of the African American labor force. Other industry differences are not capable of explaining the above results. For example, manufacturing employs 15.8 percent of the labor force and 15.0 percent of the African American labor force. Even separating between durables and non-durables, the differences are 9.6 percent and 6.2 percent versus 7.8 percent and 7.1 percent for the aggregate and African American labor forces respectively. The largest industry differential is in services. The aggregate employment in services is 35.9 percent whereas for African Americans it is 39.6 percent. The response of log employment in the service industry to a policy shock is 0.0027 after ten months, a much smaller response than aggregate employment. For industry employment differences to explain the differential, we would

have expected this response to be higher than the aggregate employment response. We conclude, therefore, that industry differences in employment are not generating the differential employment effects.

Examining occupation instead of industry yields larger employment pattern differences. In the aggregate labor force, 29.1 percent of workers are classified as "managerial and professional" as compared to 19.8 percent of the African American labor force. Log employment for this occupation falls by 0.0017 thirty-two months after a policy shock. The occupation "precision production" has an aggregate employment of 10.9 percent compared to 8.2 percent among African Americans. Here, the response of log employment to a policy shock is less than aggregate employment. After nine months, log employment falls by 0.0012. However, this occupation only accounts for a tenth of employment, and so cannot explain the entire story. Lastly, the occupation "operators, fabricators and laborers" has an aggregate employment of 14.2 percent but African American employment of 19.9 percent. Log employment in this industry shows a statistically insignificant smaller fall in employment than aggregate employment, again failing to explain the observed patterns.

Neither industry nor occupational racial differences yield a clear explanation for the differential response of unemployment. Most of these disaggregated employment series show a response similar to the aggregate. Only the occupation "precision production" gives a glimmer of explaining the puzzle. Construction, in which African American employment is relatively low, shows a greater response in employment, which should serve to reduce the impact on African American workers overall.

V. Summary

This paper utilizes macro time series models to estimate whether contractionary monetary policy has differential labor market impacts. Using VAR and ADL models, we find that innovations to the federal funds rate typically lower the employment-population ratios of minorities and less-skilled by increasing their unemployment rates and not by decreasing their labor force participation rates. African

American unemployment rates, particularly teen African American unemployment rates are more sensitive to contractionary monetary policy than whites. The unemployment rates of out-of-school teenagers and out-of-school men and women with no than a high school degree (ages 16 to 24) show the largest response to contractionary policy.

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Table 1: Racial and Ethnic Differences in Responses Following Contractionary Episodes (t-statistics in parentheses)

	African American minus White		Hispanic minus White		Teen African American minus White	
Response of:	**Max Effect**	**Month**	**Max Effect**	**Month**	**Max Effect**	**Month**
Employment-Population Ratio	-0.124	33	-0.118	48	-0.722	48
	(2.230)		(0.732)		(1.673)	
Unemployment Rate	0.329	38	0.150	48	2.009	48
	(4.270)		(1.010)		(2.656)	
Labor Force Participation Ratio	-0.107	18	-0.062	16	-2.098	31
	(1.900)		(0.820)		(8.682)	

Notes: The table shows the results from the racial differences in the labor market outcomes of 16 and over whites and African Americans on seven own lags, seven lags for the percent change in the CPI-U, and 48 lags on the beginning of contractionary episodes. Each are fourth order polynomials. For the Teenagers, column (3) shows the results from the difference in the labor market outcomes of 16 to 19 year old whites and African Americans on seven own lags, seven lags for the percent change in the CPI-U, and 52 lags on the beginning of contractionary episodes. Each are fourth order polynomials.

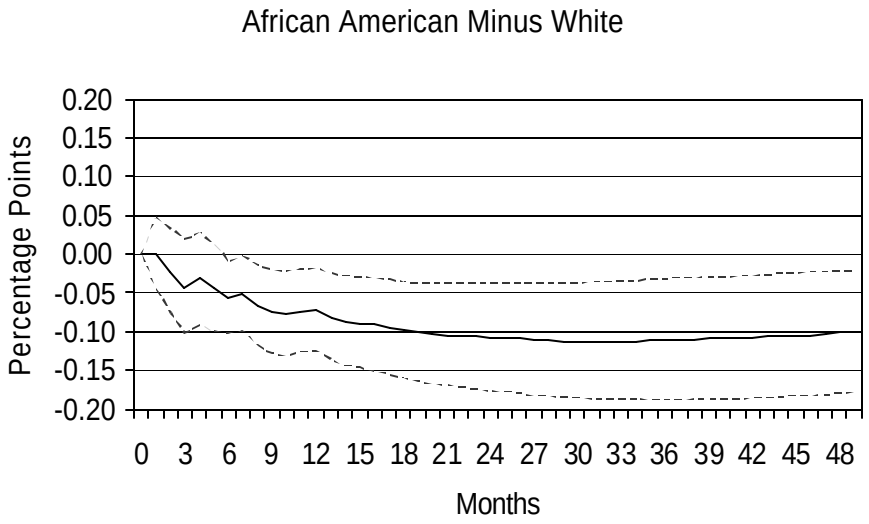
Table 2: Industry and Occupation Responses: Responses of log employment to a federal funds rate shock
(95% Confidence Intervals in Parentheses)

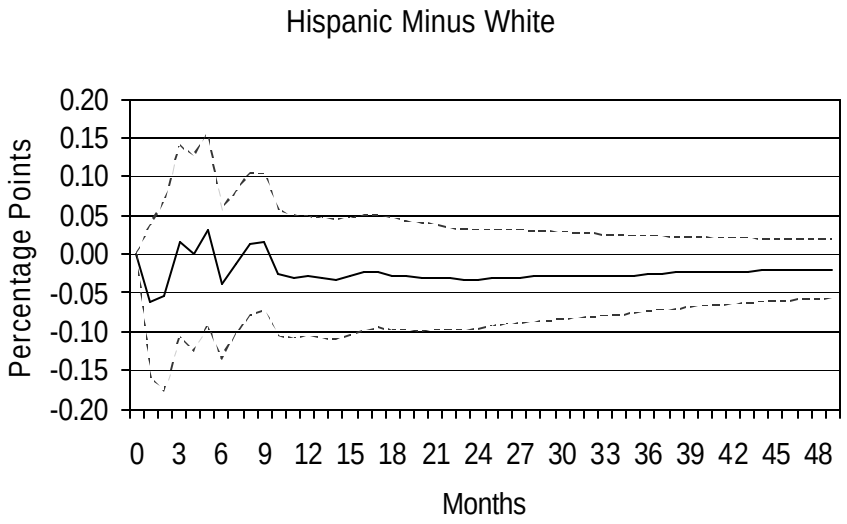
Table 5: Industry and Occupation Responses: Response of log employment to a federal funds rate shock

	%Aggregate Labor Force	% of Black Labor Force	Trough	Months
Industry				
Total Nonfarm	-	-	-0.0041	40
			(-0.0066, -0.0016)	
Construction	6.5	3.6	-0.0096	47
			(-0.0180, -0.0022)	
Services	35.9	39.6	-0.0027	43
			(-0.0047, -0.0008)	
Occupation				
Managerial and Professional	29.1	19.8	-0.0017	32
			(-0.0034, -0.00005)	
Precision Production	10.9	8.2	-0.0015	33
			(-0.0027, -0.0003)	
Operators, Fabricator and Laborers	14.2	19.9	-0.0012	9
			(-0.0026, -0.0004)	

Notes: The entries in the third and fourth columns report the maximum response from impulse response functions of the impact of a 1 standard deviation increase in the federal funds rate has on a industry or occupation's employment. The VAR ordering is a follows: industrial production growth, the percent change in the Consumer Price Index for Urban Consumers, the log of the Commodity Research Board spot price index, the labor market outcome, the Federal Funds Rate, change in log nonborrowed reserves, and change in log total reserves. The system for the industry models use 6 lags and estimation starts in September 1973 with the sample extending to September 2002. The system for the occupation models also uses 6 lags, but the series runs from September 1973 to December 1998. At the end of the 1990s, BLS changed the industry and occupation codes. At the aggregate level, industry series can be extended, but not the occupation series. The figures in the parentheses are lower and upper bounds of 95% Confidence Intervals based on bootstrapped standard errors. The asymptotic standard errors yield similar confidence intervals.

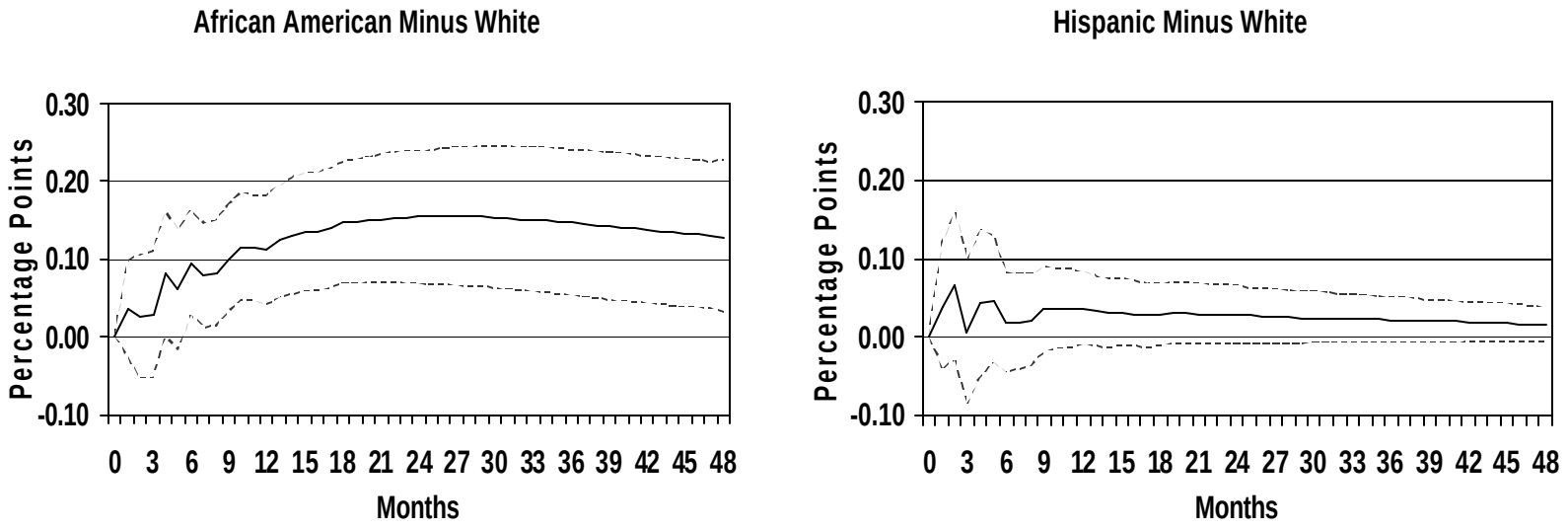
Figure 1: The Effect of Positive Innovations in the Federal Funds Rate on the Racial and Ethnic Differences in the Employment-Population Ratio





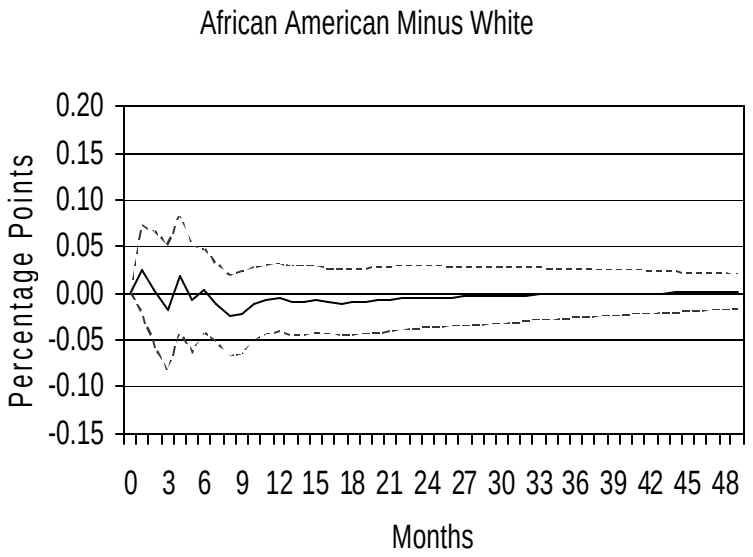
Notes: The figures plot the impulse response functions of the impact of a 1 standard deviation increase in the federal funds rate has on a particular demographic group's labor market outcome. The VAR ordering is a follows: industrial production growth, the percent change in the Consumer Price Index for Urban Consumers, the log of the Commodity Research Board spot price index, the labor market outcome, the Federal Funds Rate, change in log nonborrowed reserves, and change in log total reserves. The system uses 6 lags and estimation starts in September 1973 with the sample extending to September 2002. The dashed lines are lower and upper bounds of 95% Confidence Intervals based on bootstrapped standard errors. The asymptotic standard errors yield similar confidence intervals.

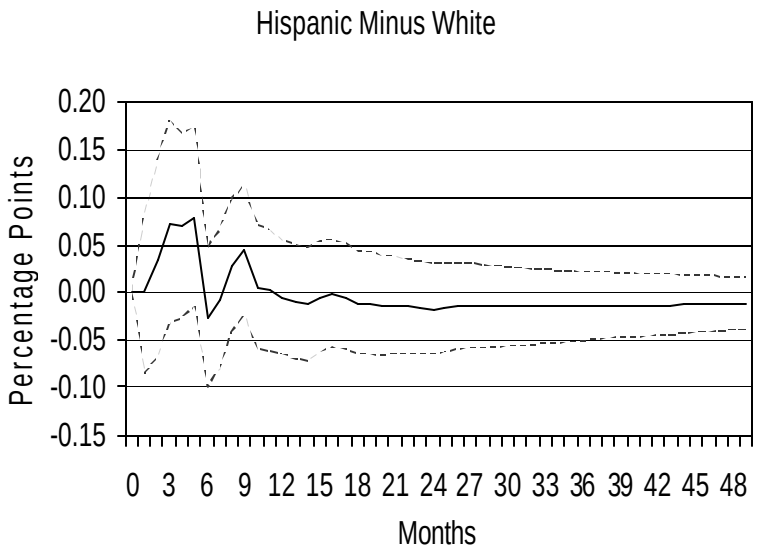
Figure 2: The Effect of Positive Innovations in the Federal Funds Rate on the Racial and Ethnic Differences in Unemployment Rates



Notes: The figures plot the impulse response functions of the impact of a 1 standard deviation increase in the federal funds rate has on a particular demographic group's labor market outcome. The VAR ordering is a follows: industrial production growth, the percent change in the Consumer Price Index for Urban Consumers, the log of the Commodity Research Board spot price index, the labor market outcome, the Federal Funds Rate, change in log nonborrowed reserves, and change in log total reserves. The system uses 6 lags and estimation starts in September 1973 with the sample extending to September 2002. The dashed lines are lower and upper bounds of 95% Confidence Intervals based on the VARs bootstrapped standard errors. The asymptotic standard errors yield similar confidence intervals.

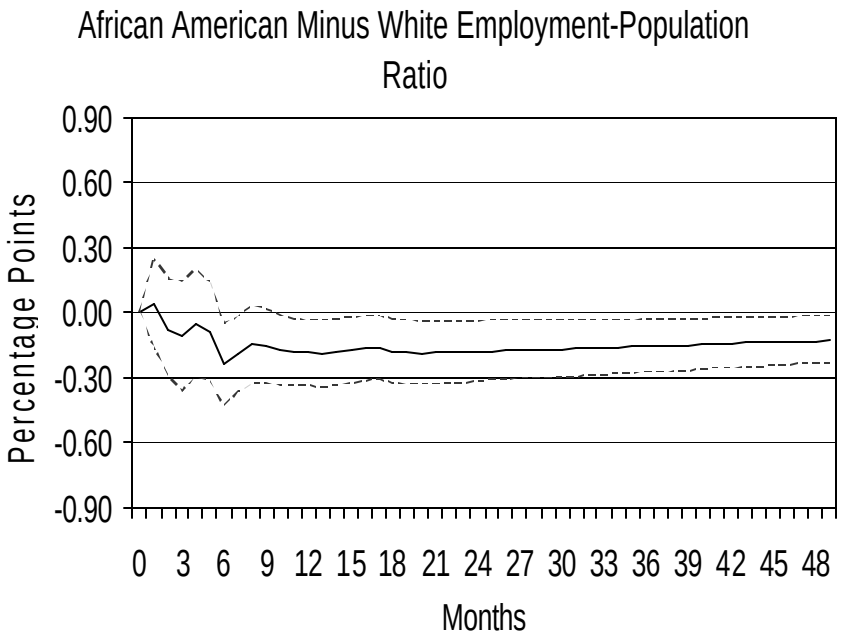
Figure 3: The Effect of Positive Innovations in the Federal Funds Rate on Racial and Ethnic Differences in the Labor Force Participation Ratio

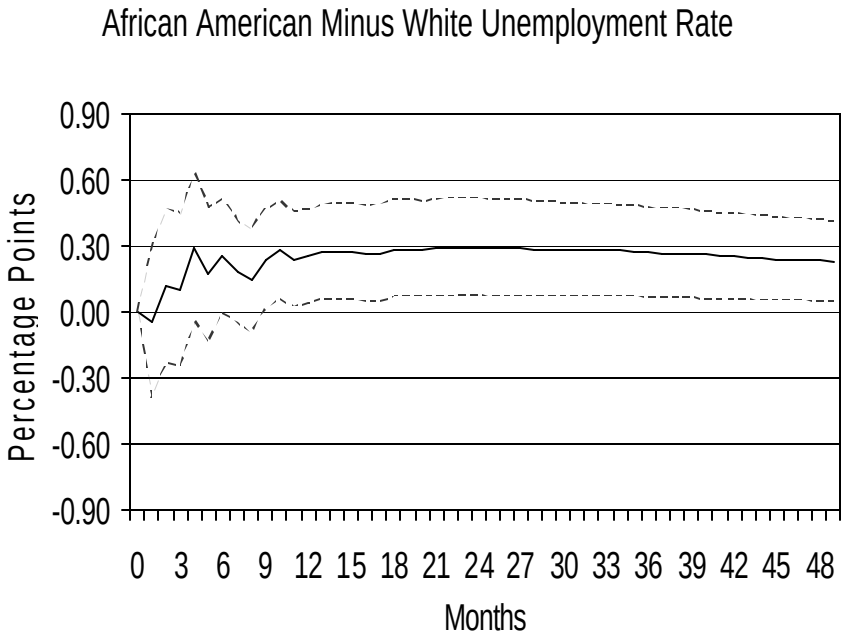




Notes: The figures plot the impulse response functions of the impact of a 1 standard deviation increase in the federal funds rate has on a particular demographic group's labor market outcome. The VAR ordering is a follows: industrial production growth, the percent change in the Consumer Price Index for Urban Consumers, the log of the Commodity Research Board spot price index, the labor market outcome, the Federal Funds Rate, change in log nonborrowed reserves, and change in log total reserves. The system uses 6 lags and estimation starts in September 1973 with the sample extending to September 2002. The dashed lines are lower and upper bounds of 95% Confidence Intervals based on the VARs boots trapped standard errors. The asymptotic standard errors yield similar confidence intervals.

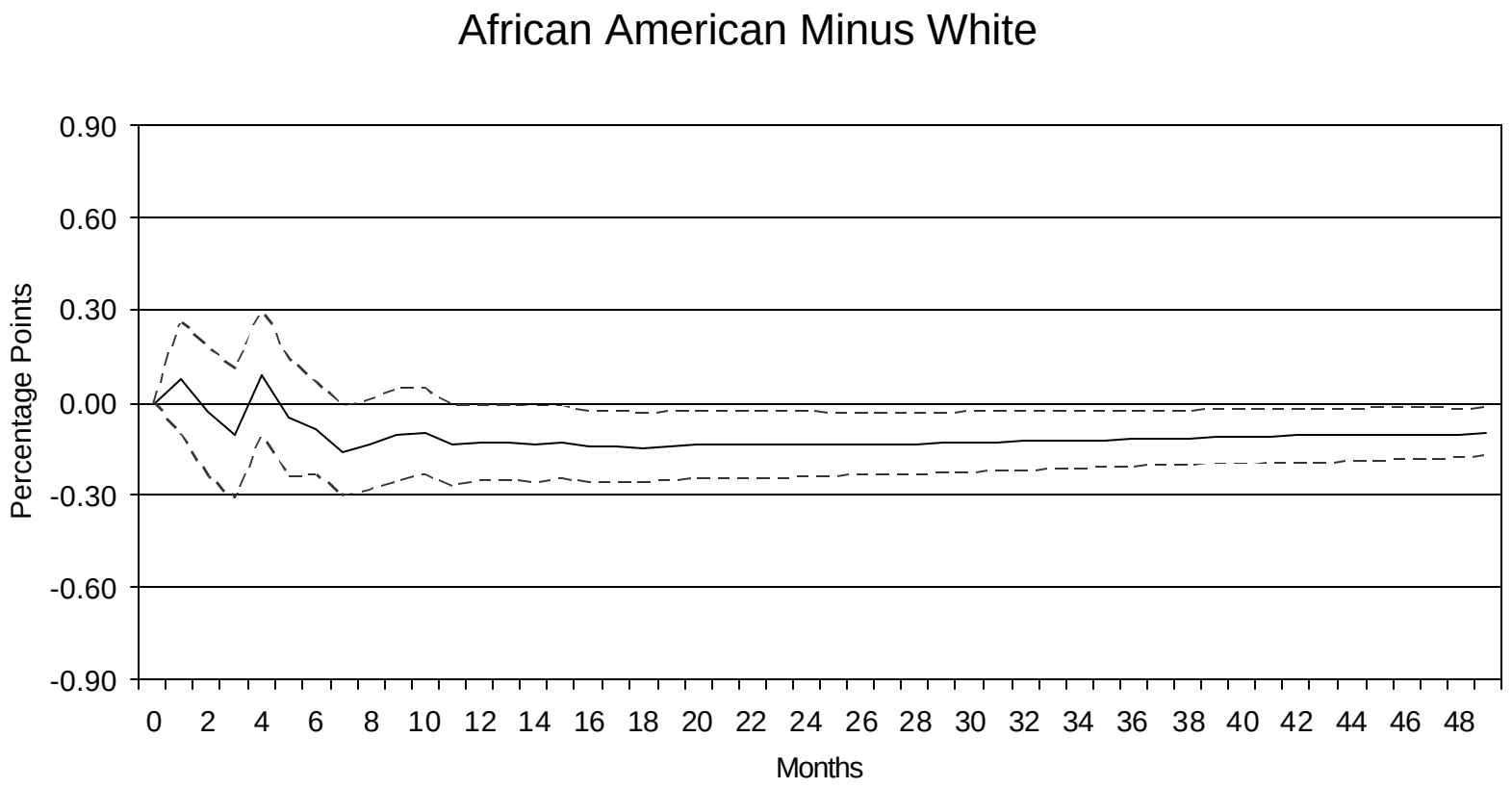
Figure 4: The Effect of Positive Innovations in the Federal Funds Rate on the Racial Differences in Teen Labor Market Outcomes





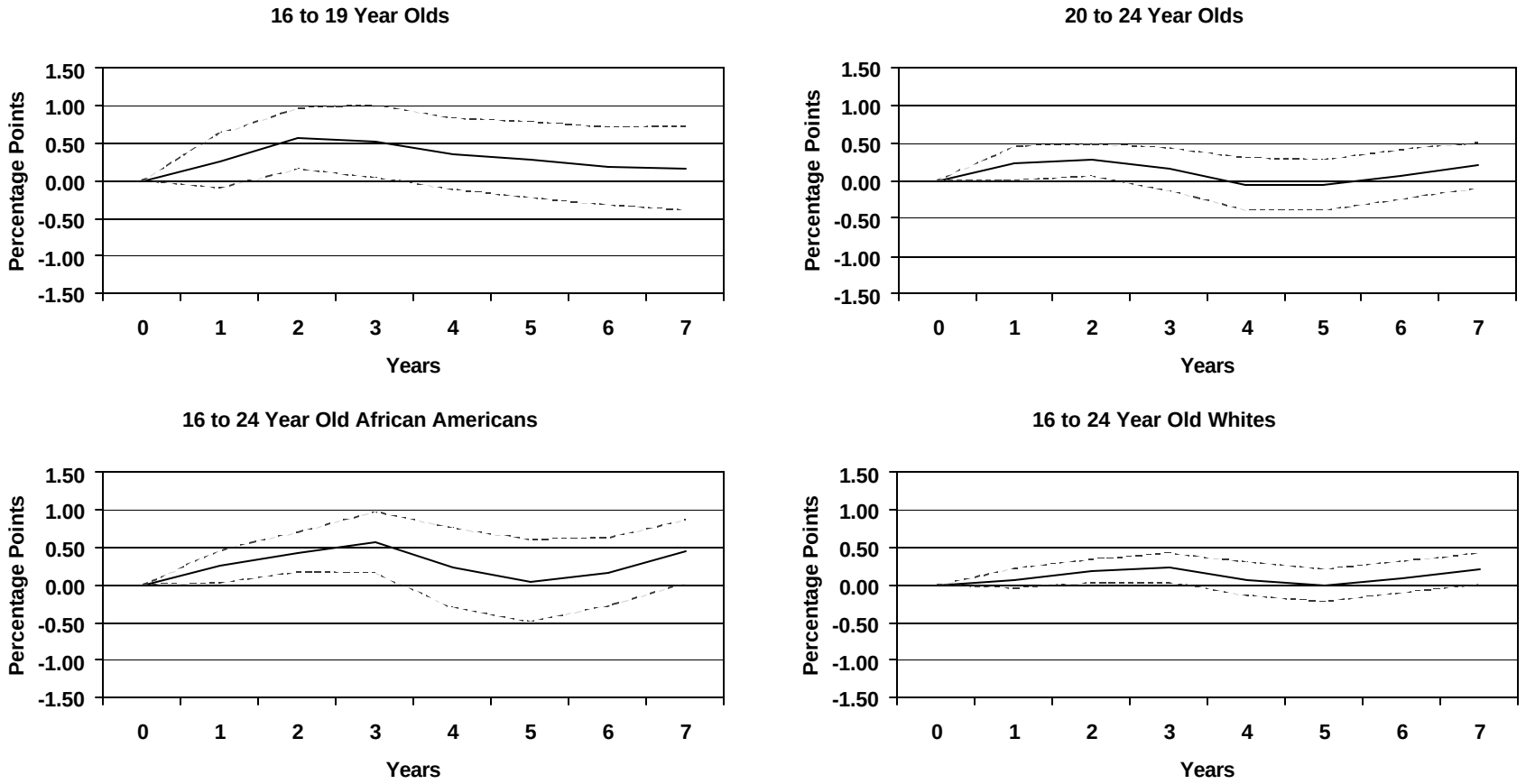
Notes: The figures plot the impulse response functions of the impact of a 1 standard deviation increase in the federal funds rate has on a particular demographic group's labor market outcome. The VAR ordering is a follows: industrial production growth, the percent change in the Consumer Price Index for Urban Consumers, the log of the Commodity Research Board spot price index, the labor market outcome, the Federal Funds Rate, change in log nonborrowed reserves, and change in log total reserves. The system uses 6 lags and estimation starts in September 1973 with the sample extending to September 2002. The dashed lines are lower and upper bounds of 95% Confidence Intervals constructed from bootstrapped standard errors. The asymptotic standard errors yield similar confidence intervals.

Figure 4 cont.: The Effect of Positive Innovations in the Federal Funds Rate on the Racial Difference in Teen Labor Force Participation Rates



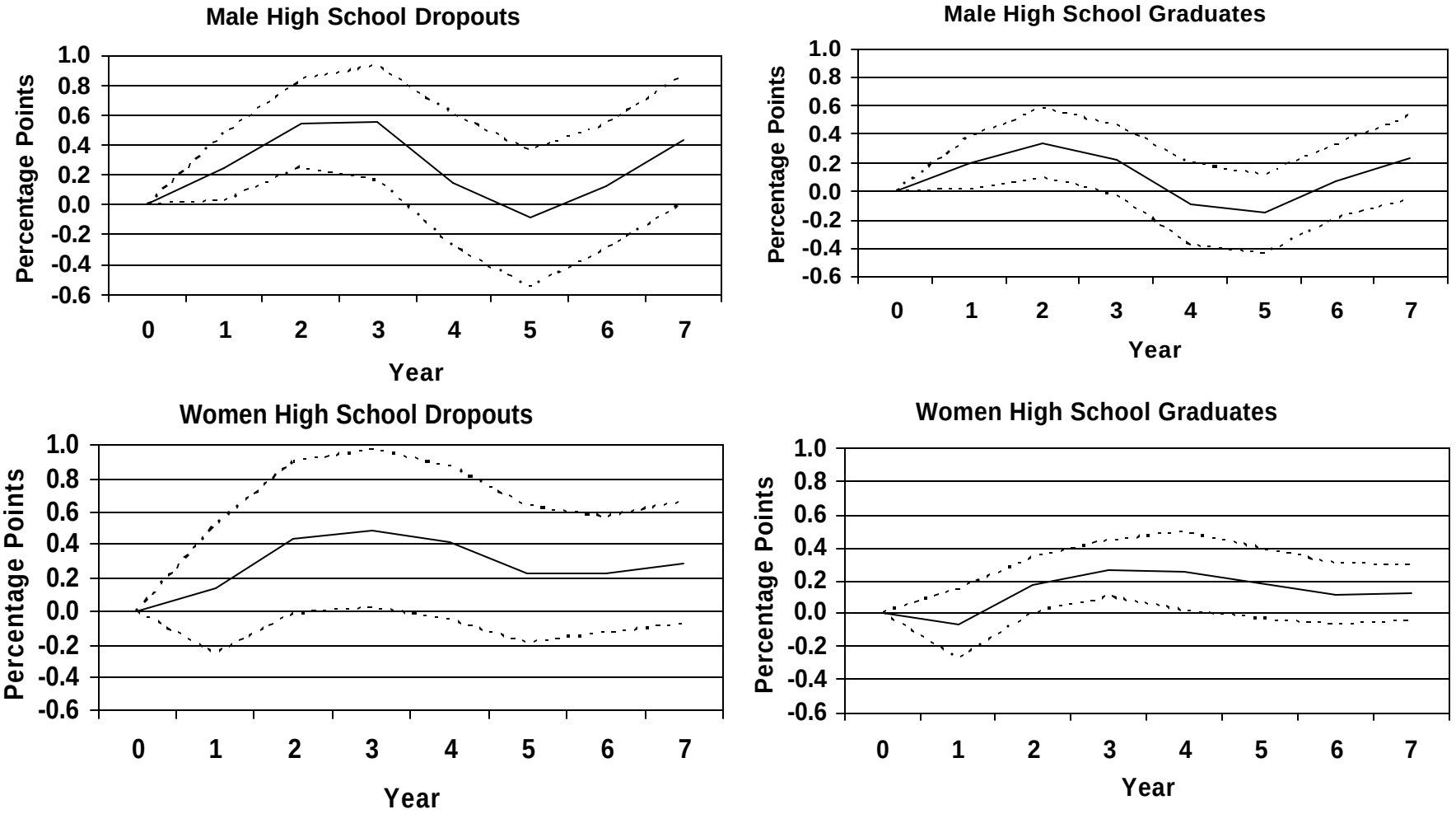
Notes: The figures plot the impulse response functions of the impact of a 1 standard deviation increase in the federal funds rate has on a particular demographic group's labor market outcome. The VAR ordering is a follows: industrial production growth, the percent change in the Consumer Price Index for Urban Consumers, the log of the Commodity Research Board spot price index, the labor market outcome, the Federal Funds Rate, change in log nonborrowed reserves, and change in log total reserves. The system uses 6 lags and estimation starts in September 1973 with the sample extending to September 2002. The dashed lines are lower and upper bounds of 95% Confidence Intervals constructed from bootstrapped standard errors. Asymptotic standard errors yield similar confidence intervals.

Figure 5: The Effect of Positive Innovations in the Federal Funds Rate on the Unemployment Rates of Out-of-School Young Adults



Notes: The figures plot the impulse response functions of the impact of a 1 standard deviation increase in the federal funds rate has on a particular demographic group's labor market outcome. The VAR ordering is a follows: industrial production growth, the percent change in the Consumer Price Index for Urban Consumers, the log of the Commodity Research Board spot price index, the labor market outcome, the Federal Funds Rate, change in log nonborrowed reserves, and change in log total reserves. The system uses 2 lags andestimation starts in October 1973 with the sample extending to October 2001. The dashed lines are lower and upper bounds of 95% Confidence Intervals based on bootstrapped standard errors. The asymptotic standard errors yield similar confidence intervals.

Figure 6: The Effect of Positive Innovations in the Federal Funds Rate on the Unemployment Rates of Out of School Young Adults by Gender and Educational Attainment



Notes: The figures plot the impulse response functions of the impact of a 1 standard deviation increase in the federal funds rate has on a particular demographic group's labor market outcome. The VAR ordering is a follows: industrial production growth, the percent change in the Consumer Price Index for Urban Consumers, the log of the Commodity Research Board spot price index, the labor market outcome, the Federal Funds Rate, the change in log of nonborrowed reserves, and change in log of total reserves. The system uses 2 lags. The dashed lines are lower and upper bounds of 95% Confidence Intervals based on the VARs bootstrapped standard errors. The asymptotic standard errors yield similar confidence intervals.

APPENDIX
Relevant Federal Open Market Committee Excerpts

The following are selected quotes from the February 3-4, 1994 and June 29-30, 1999 FOMC meetings. Prior to 1998, the FOMC Secretariat produced a transcript that contains member's names. The detailed transcripts are available at www.federalreserve.gov/fomc/transcripts.

February 3-4, 1994:

Mr. Forrestal: on the price side, for the first time in a long time our directors have talked a little about seeing some price increases.

Mr. Melzer: we project that the CPI will move up sharply in 1994 and will be even high in 1995. Indeed, there may be some early warning signs that the economy's contractionary course has already come to an end.

Ms. Phillips: I think that we're now seeing some major risks on the inflation front

Vice Chairman Mcdonough: with the unemployment rate coming down to what we think is a reasonable estimate of the NAIRU—in the low 6 percent area—we do have to be considerably concerned about inflation.

Chairman Greenspan: while we may not find it in the broader price indexes, there was at least an inkling that the presumption that inflationary indicators are all quiescent is, as I said, sort of fraying at the seems… The presumption that inflation is staying down is very hard to maintain.

Vice Chairman Mcdonough: …send the right signal in the sense that the federal reserve, the central bank, is being watchful, as it should be. And we would be moving earlier in the economic cycle than the fed has done historically…

Mr. Jordan: …that 25 basis point move would be viewed clearly as the first of a series of moves.

Mr. Boehne: this is as good as it gets in terms of convincing evidence to move.

Mr. Forrestal: We certainly has a demand surge in the fourth quarter and it would appear that that is going to continue to some extent.

Mr. Syron: What we all want to do very clearly is to maximize long-term growth in the economy, controlling real growth. As Larry Lindsey said, controlling prices is a mechanism for doing that.

Chairman Greenspan: (reading the statement he plans to release) …the decision was taken to move toward a less accommodative stance in monetary policy in order to sustain and enhance the economic expansion… this is the first firming of reserve market conditions by the Committee since early 1989.

APPENDIX continued:
Relevant Federal Open Market Committee Excerpts

June 29-30, 1999:

"The members' concerns about inflation had increases appreciably since the meeting in late March"

"Indeed, in the absence of some policy firming most of the members saw tightening labor markets and an updrift in measured inflation as a significant risk.'

"it remained unclear how long faster gains in productivity could continue be offset increases in labor costs and avert an intensification of price inflation"

"most members had become increasingly worried about the risks of an overheating economy and rising inflation over time."

"the concerns about the outlook for inflation tended to focus on the risk that, in the absence of an appreciable moderation in overall demands, very tight labor markets would at some point foster significantly faster increases in labor compensation that could no longer be offset by stronger productivity growth…. The higher labor cost increases would in turn generate more rapid price inflation."

"the declines in commodity and other import prices that had helped to suppress inflation and inflation expectations over the last two years were not likely to be repeated.

"…an increase of ¼ percentage point in the federal funds rate to an average of around 5 percent. In the view of most members, such a policy move represented a desirable and cautious preemptive step in the direction of reducing what they saw as a significant risk of rising inflation."

"the persisting strength of domestic demand augmented by increasing demand from abroad would show through at some point to even tighter labor markets and higher inflation… In these circumstances a small preemptive move at this time would provide a degree of insurance against worsening inflation later."

ENDNOTES

[1] For general studies, see, for example, Hoynes (2000), Romer and Romer (1998), Moorthy (1988), Korenman and Okun (1989), Spriggs and Williams (2000) and Blank and Blinder (1996), Shulman (1991), Wilson, Tienda and Wu (1991), Badgett (1994), and Clark and Summers (1981, 1990).

[2] For studies on race and ethnicity, see, for example, Reimers (2000), Freeman and Rodgers (2000), Freeman (2001), Hoynes, Hines and Krueger (2001). A second round of studies continues to find gains, but they have not made up the lost ground that occurred from the 1970s to 1980s (Holzer and Offner (2001) and Milanovich (2002)).

[3] Thorbecke also provides a narrative of how the contractionary monetary of policy in 1974 and the Volcker disinflation from 1979 to 1982 had a greater cost to African Americans.

[4] The additional years also contain an easing by the Federal Reserve in 1995 and 1998, which were in response to the Russian default and perhaps the East Asian crisis.

[5] It is well known among labor economists that an individual's probability of employment or in the aggregate, the economy's employment-population ratio depends on the product of the labor force participation rate and one minus the unemployment rate. The employment-population ratio can be written as:

$$\frac{E}{P} = \frac{LF}{P} \times (1 - UR)$$

where E denotes employment, P denotes the civilian population, LF denotes the labor force (E + U), and UR denotes the unemployment rate.

[6] The importance of industrial production and the CPI-U is well known. It may not be well known that the Commodity Research Board spot price is a component of the Bureau of Economic Analysis' index of leading indicators. Our main reason for including total reserves and nonborrowed reserves is to allow direct comparability to Thorbecke's estimates. Christiano et al. show that these two variables have different responses to an increase in the Federal Funds Rate. Nonborrowed reserves experience a persistent drop, consistent with the existence of a liquidity effect. The drop in total reserves is initially quite small. However, over the simulated time horizon of the impulse response function, total reserves fall. The Federal Reserve protects short-run reserves by increasing borrowed reserves. As a check for robustness, we estimate the VAR with only industrial production, the Consumer Price Index, the labor market outcome and the federal funds rate. We obtain qualitatively similar results to the estimates presented in this paper.

[7] The employment-population ratio is defined as the share of the civilian population that is employed. The labor force participation rate is the share of the civilian population that is either employed or actively searching for a job. The unemployment rate is the share of the labor force (employed plus unemployed) that this actively searching for a job.

[8] The series used in Thorbecke ranges from March 1973 to December 1996. Extending the time series to September 2002 requires that I ensure that each time series remains stationary and the VARs residuals remain homoscedastic. Using augmented Dickey-Fuller tests, I found that the logarithm of the reserve series have unit roots.[8] First-differencing each series removed the unit roots.[8] The African American, white and Hispanic employment-population ratios and African American unemployment rate appear to have unit roots, but the racial and ethnic differences in which I am most interested do not have unit roots.

[9] The MacKinnon approximate p-values for the African American and Hispanic employment-population ratios are 0.28 and 0.27. The p-value for the African American –white difference is 0.04 and the Hispanic –white difference is 0.00. The p-value for the African American unemployment rate is 0.14, but the p-value for the racial difference is 0.06.
The p-value for the Hispanic labor force participation rate is 0.17. The ethnic difference's p-value is 0.00.

[10] Although not on the scale of September 11th, Bagliano and Favero (1998) find evidence of large residuals in 1984 when sudden borrowing increased by Continental Illinois.

[11] Immediately after September 11th, the Federal Reserve Board took a variety of actions that led to unexplainable (large residuals) movements in reserves. Following the terrorist attacks on September 11, 2001, the Committee established or enlarged reciprocal currency (swap) arrangements with the European Central Bank, the Bank of Canada, and the Bank of England. The purpose of these arrangements was to facilitate the functioning of U.S. financial markets by providing as

necessary through the foreign central banks the liquidity in dollars needed by European, Canadian, and British banks whose U.S. operations had been disrupted by the disturbances in the United States. On September 17, 2001, the Committee members voted unanimously to ease reserve conditions appreciably further, consistent with a reduction in the federal funds rate of 50 basis points to a level of 3 percent. In conjunction with these policy moves, the Federal Reserve would continue to supply, as needed, an atypically large volume of liquidity to the financial system. As a consequence, the Committee recognized that the federal funds rate might fall below its target on occasion until more normal conditions were restored in the functioning of the financial system (FOMC Transcripts for September 17th, 2001).

[12] Excluding the post September 11, 2001 segment of the time series has no impact on the standard deviations. They range from 1.23 to 1.26.

[13] The VARs and impulse response functions are estimated using STATA Version 8.0. An earlier version reported confidence intervals based on the VARs asymptotic standard errors. The confidence intervals reported in this version are based on standard errors constructed from bootstrapped samples of 500. In most cases, the standard errors yield smaller confidence intervals. See Lutkepohl (1993, Section 3.7) for a discussion of the standard errors and STATA version 8.0 for a detailed description of the bootstrapping program.

[14] These estimates were generated from the same VARs and impulse response functions in Figures 1-4, but the unemployment rate of a particular demographic group is placed in the model and not the racial or ethnic difference. The detailed estimates are available from the author upon request.

[15] For example, Romer and Romer (1994a) provide evidence that during the early 1960s and early to mid-1990s, economic growth would have been lower in the absence of expansionary monetary and fiscal policy. Further, Bernanke (1990) asserts that the Federal Reserve's responses to the 1987 stock market crash prevented a major financial market crisis and subsequent real decline in GDP.

[16] The models are robust to using a VAR that only contains industrial production, consumer prices, the labor market measure and the federal funds rate, different lag lengths, and different period lengths for the impulse response functions.