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Does Labor Supply Matter During a Recession? Evidence from the Seasonal Cycle*

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Abstract

This paper examines the seasonal cycles in recession years and non-recession years since 1948 in order to test the propositions that demand matters more, and supply matters less, for determining employment at the margin during recessions. I find that the summer and Christmas seasonal changes for employment and unemployment are essentially the same number of log points in recession years and non-recession years. Even the 2008 and 2009 summers and Christmas' looked a lot like summers and Christmas' in non-recession years. Although recessions undoubtedly reflect labor market failures, my results suggest that labor supply and demand operate at the margin during recessions in much the same way that they do during non-recession years.

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During the recession of 2008-9, the federal government took a number of steps to help citizens and the economy, including expansion of food stamps and unemployment insurance, helping financially distressed homeowners refinance their mortgages, and offering tax credits to poor and middle class persons buying homes. The stimulus potential from these and other programs is said to derive from their redistribution of resources to persons with a high propensity to spend, but the same programs also implicitly raise marginal income tax rates because eligibility for them falls with the potential recipient's income.[2]

High marginal income tax rates by themselves "normally" reduce economic activity, rather than increase it, although there is plenty of room to debate the magnitude of incentive effects. For the same reason, social safety net programs are not expected to increase employment in the long run. But a number of economists believe that recessions are those rare instances when labor markets are "slack": labor supply does not matter, and might even affect the aggregates in the opposite direction as usual (Eggertsson, 2010a). Thus, it is possible that government spending programs like unemployment insurance could stimulate economic activity during a recession, even while they eroded labor supply incentives, and even while those programs had very different effects in non-recession years.

The slack market hypothesis that, as compared to non-recession years, demand matters more and supply matters less for determining aggregate employment and output at the margin in a recession is also the intellectual basis for Keynesian models of the business cycle (Eggertsson, 2010b, p. 2). Yet this hypothesis has not been the subject of

[2] Topel and Welch (1980), Mulligan (2009).

much empirical testing,[3] even though it is theoretically possible that supply matters at the margin just as much during times of severe labor market distortions as it does "normally." The purpose of this paper is to examine seasonal fluctuations in the monthly U.S. data dating back to the 1940s to attempt to measure the degree to which labor supply and demand differentially affect employment and unemployment during recession periods than during non-recession periods.

The seasonal cycle has several analytical advantages. As Jeffrey Miron (1996, p. 17) explains, "The seasonal fluctuations are so large and regular that the timing of the peak or trough for any year is rarely affected by the phase of the business cycle in which that year happens to fall."[4] For example, Barksy and Miron (1989, Table 2) found that GNP falls 8 percent more than normal from Q4 to Q1. In a $14 trillion/year ($3.5 trillion/quarter) economy: that's a sudden reduction of $280 billion, which is a larger change than even the largest *year*-to-*year* change in government spending created by the American Recovery and Reinvestment Act of 2009 (Congressional Budget Office, 2009, Table 2), and larger than other peacetime government spending shocks (Alesina and Ardagna, 2009; Auerbach and Gorodnichenko, 2010; Barro and Redlick, 2009).

Many economic fluctuations are not easily partitioned into "demand" or "supply," but the seasonal cycle features an obvious demand change – Christmas – and an obvious supply change – the availability of young people for work during the summer.[5] Moreover, these two seasonal impulses (measured as percentage changes from the previous and subsequent seasons – more on this below) react little to the business cycle, and thus provide the opportunity to measure different effects between recessions and non-recessions of a similar impulse. Finally, the seasonal cycles have occurred many times: there have been 13 summers and 14 Christmas' during U.S. recessions since 1948. Even

[3] Jurajda and Tannery (2003) find that unemployment insurance affects individual behavior to about the same degree in depressed localities as in less depressed ones, but it is possible that individuals who remain unemployed as the result of unemployed insurance are replaced by other workers differently in recessions than in non-recession years (i.e., unemployment insurance may shift labor supply the same in recessions and nonrecessions, but the aggregate employment impact is different). A couple of papers (Auerbach and Gorodnichenko, 2010; Barro and Redlick, 2009) have examined whether fiscal policy multipliers are greater during recessions, which are indirectly tests of whether labor demand matters more during recessions (Mulligan, 2011).

[4] See also an econometric literature on the cyclical sensitivity of seasonality by Krane and Wascher (1999), Christiano and Todd (2002), and Matas-Mir and Osborn (2004).

[5] See also (Miron 1996, p. 9) and the labor market indicators shown below.

during the present recession – arguably different from many of the previous ones – Christmas and summer each occurred twice.

Previous work on the seasonal cycle has featured quarterly data, which had the advantage that the Bureau of Economic Analysis used to report seasonally unadjusted quarterly national accounts. However, unlike the labor market series used in this paper for which the raw data are seasonally unadjusted, much of the national accounts are built from seasonally adjusted inputs, and seasonally "unadjusted" national account series were obtained by attempting to remove the seasonal adjustments that had been implicitly introduced via the ingredients.[6] More important, the supply and demand shifts of interest here do not coincide exactly with calendar quarters. The seasonal labor supply surge is seen already in June, which is part of the second quarter, and concludes in September, which is at the end of the third quarter. Obviously, Christmas is in December, and some of its activity spills into November, both of which are part of the fourth quarter, but the monthly data permit me to include October in the benchmark for Christmas, rather than the third quarter which would differ from the fourth not only in terms of Christmas demand but also in terms of summer labor supply.

Section I takes for granted that recessions are appropriately characterized as times of severe labor market malfunctions, and briefly shows that a couple of familiar theories predict that labor demand matters significantly more at the margin, and labor supply matters significantly less, during recessions than during non-recession years. However, other theories of labor market distortions predict that the incidence of supply and demand shifts would be no different during recessions than they would be during non-recessions, and predict that income redistribution causes greater deadweight loss in recessions, so it is important to answer these incidence questions with empirical evidence.

Section II presents the evidence on Christmas seasonal fluctuations. I find that the Christmas fluctuations for employment, unemployment, and wages are large and in the directions to be expected from a large increase in labor demand. Contrary to the slack labor market hypothesis, Christmas demand does not increase employment, or reduce unemployment, at a larger rate during recession years than in non-recession years.

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[6] In other words, seasonally unadjusted national accounts series are more accurately described as "twice adjusted," rather than unadjusted.

The summer seasonal patterns for teen employment, teen unemployment, wages, and total employment are large and in the direction to be expected if labor supply had shifted significantly more than labor demand. However, Section III shows how the seasonal cycles for recessions and non-recessions are not significantly different from each other. Section IV reconciles the Christmas and summer seasonal estimates, concluding that labor supply and labor demand shocks each have essentially the same marginal effects during recessions as they do during non-recession years, contradicting the slack labor market view of recessions. An appendix shows that labor demand is high during the summer, but nevertheless labor demand's summer seasonal change is dominated by the summer seasonal change in supply.

I. Economic Theories of Unemployment Differ in Terms of the Incidence of Supply and Demand Shocks

The hypothesis that recession employment is less than optimal, and that people cannot find work at the going wage, is quite different from the hypothesis that supply has little marginal effect on aggregate employment during a recession. A couple of brief examples show that, as a matter of economic theory, employment during a recession could be either be more, less, or equally sensitive to supply and demand shocks than it would be at times when employment is better characterized as efficient.

I.A. Slack Labor Markets and Non-wage Allocation Mechanisms

One "slack market" perspective on the labor market says that real wage rates have a floor – perhaps due to minimum wage laws, unions, or nominal rigidities – that is typically at or below the market clearing wage during non-recession periods, but above it during a recession. Moreover, employment is assumed to be determined only by demand during a recession, but by the combination of supply and demand during non-recession periods.[7] For example, a cut in marginal income tax rates during a recession would increase labor supply, but that would only add to the excess labor rather than adding to actual employment. On the other hand, a labor demand shift during a recession would

[7] See also Barro and Grossman (1971).

affect labor usage one-for-one without being even partially crowded out by factor rental rate adjustments.

Admittedly, the "slack market" view is over-simplified because wage rates are not the only mechanism to help clear the labor market. Suppose, for illustration, that recessions are times when labor unions are able to set a floor on wages with the objective of maximizing labor's surplus. There would be unemployment in the sense that workers would have an individual incentive, but no opportunity, to work more at the wage floor, but nevertheless the wage floor would adjust according to supply and demand conditions. In fact, if the wage elasticity of labor demand were constant, the union wage markup would be a constant proportion of the marginal worker's reservation wage and the sensitivity of employment to supply and demand parameters would be the same as it would be in a competitive labor market, even while the total amount of employment was less than the competitive level. If instead the employment-wage tradeoff were not isoelastic, then workers' reservation wages could be "over-shifted," so that the employment in the distorted market would be more sensitive to supply than it would be in a competitive market (Sumner, 1981).

The contrast between the "slack market" view and non-wage labor allocation models also appears in studies of statutory minimum wages. For example, employers might react to a binding floor on a job's cash pay by changing the non-pecuniary aspects of the job, in which case equilibrium employment would be depressed by the floor but still be sensitive to workers' willingness to work.[8] The point of my paper is not that recessions are caused by labor unions and statutory minimum wages,[9] but that only empirical research can resolve the question of whether labor market distortions necessarily create a "slack" market in the sense that labor supply does not matter at the margin.

[8] Rosen, (1972, pp. 338-9) discusses such a model of the minimum wage.

[9] Although Ohanian (2009) blames much of the 1930s Depression on union support for high minimum wages, and macroeconomics has a long tradition of considering "sticky wages" among the causes of recessions.

I.B. An Econometric Model to Nest the Supply and Demand Hypotheses

These economic hypotheses can be represented formally, and related to the seasonal fluctuations associated with Christmas and summer, as a single econometric model of the supply and demand for labor. The model features two groups of potential workers: one group *L* for which academic year school enrollment is low, or zero, and another group *N* that is largely enrolled in school during the academic year. Suppose for the moment that wages adjust to clear the labor market, with labor demand and labor supply of the forms (1) -(4):

$$\ln L_t = \alpha^D(a_t) + \gamma^D(X_t) - \beta_L^D(X_t)\ln w_{Lt} + \left[\beta_L^D(X_t) - \eta^D(X_t)\right]\ln w_{Nt} + \varepsilon_{Lt}^D \qquad (1)$$

$$\ln N_t = \alpha^D(a_t) + \gamma^D(X_t) - \beta_N^D(X_t)\ln w_{Nt} + \left[\beta_N^D(X_t) - \eta^D(X_t)\right]\ln w_{Lt} + \varepsilon_{Nt}^D \qquad (2)$$

$$\ln L_t = \alpha_L^S(a_t) + \gamma_L^S(X_t) + \beta_L^S(X_t)\ln w_{Lt} + \varepsilon_{Lt}^S \qquad (3)$$

$$\ln N_t = \alpha_N^S(a_t) + \gamma_N^S(X_t) + \beta_N^S(X_t)\ln w_{Nt} + \varepsilon_{Nt}^S \qquad (4)$$

where L_t and N_t are work hours per person (hereafter, "labor usage") of the two groups and w_{Lt} and w_{Nt} are their real wage rates in month t, respectively.[10] X_t indicates the state of the business cycle (normalized to have its largest values during business cycle troughs) at month t and a_t the state of the seasonal cycle (e.g., a dummy variable indicating the academic year). I assume that the two types of labor enter the production function homothetically (the wage elasticity of overall labor demand is $-\eta^D$), and that seasonal and business cycles shift overall labor demand but not relative labor demand. I assume that the two types of labor are substitutes (results below suggest that the elasticity of substitution between teenagers and persons aged 20-24 is about five), so we have the parameter restrictions $\beta_N^D, \beta_N^D - \eta^D, \beta_L^D, \beta_L^D - \eta^D, \beta_N^S, \beta_L^S \geq 0$. Seasonal impulses, business cycles, and month-specific shocks shift both labor supply and labor demand.

[10] For a general equilibrium model of labor market seasonals, with similar results, see Mulligan (2011).

“Keynesian” economists sometimes characterize recession labor markets as “slack” or “out of equilibrium” in the sense that recession labor supply exceeds labor demand at the going wage. In this view, employers collectively face a more elastic supply of labor during a recession because employees are supplied not only from out of the labor force, but also from a large pool of involuntary unemployed. Other “sticky price” Keynesian models (e.g., Barro and Grossman, 1971; Eggertson, 2010a) predict that aggregate labor demand is completely inelastic during a recession because employers are unable to adjust the price of their output, and must produce whatever consumers demand at the fixed prices. The model (1) - (4) embodies these theories by allowing labor supply and demand elasticities to vary over the business cycle. The hypotheses that labor demand is less (labor supply is more) wage elastic during a recession are represented as $\beta_i^{D\prime}(X)<0$, $\eta^{D\prime}(X)<0$ ($\beta_i^{S\prime}(X)>0$, $i=L,N$), respectively.

The reduced form for the labor market quantities is:

$$\begin{pmatrix} \ln L_t \\ \ln N_t \end{pmatrix} = \Theta(X_t)v_t^S + \left[I-\Theta(X_t)\right]v_t^D = v_t^D + \Theta(X_t)\left[v_t^S - v_t^D\right] \tag{5}$$

where the 2x1 vectors v_t^S (v_t^D) (each vector has one entry for the *L* group, and another entry for the *N* group) are the sum of the α, γ, and ε supply (demand) shifters, respectively. Θ is the incidence matrix: it depends on the relative supply and demand elasticities and shows the degree to which the amount of labor usage is affected by supply or demand at the margin.[11] When the incidence matrix is close to zero (the identity matrix), labor usage is primarily determined by demand (supply) at the margin, respectively. In the special case that both groups have the same supply elasticity, and shocks are common to the two groups, then the labor usage effects of supply and demand

[11] The vectors v_t^S and v_t^D and matrix $\Theta(X_t)$ are calculated as:

$$v_t^S \equiv \begin{pmatrix} \alpha_L^S(a_t)+\gamma_L^S(X_t)+\varepsilon_{Lt}^S \\ \alpha_N^S(a_t)+\gamma_N^S(X_t)+\varepsilon_{Nt}^S \end{pmatrix}, \quad v_t^D \equiv \begin{pmatrix} \alpha^D(a_t)+\gamma^D(X_t)+\varepsilon_{Lt}^D \\ \alpha^D(a_t)+\gamma^D(X_t)+\varepsilon_{Nt}^D \end{pmatrix}$$

$$I-\Theta(X_t) \equiv \begin{pmatrix} \beta_L^S(X_t) & 0 \\ 0 & \beta_N^S(X_t) \end{pmatrix} \left[\begin{pmatrix} \beta_L^S(X_t) & 0 \\ 0 & \beta_N^S(X_t) \end{pmatrix} + \begin{pmatrix} \beta_L^D(X_t) & \eta^D(X_t)-\beta_L^D(X_t) \\ \eta^D(X_t)-\beta_N^D(X_t) & \beta_N^D(X_t) \end{pmatrix} \right]^{-1}$$

The reduced form for wages is $\begin{pmatrix} \ln w_{Lt} \\ \ln w_{Nt} \end{pmatrix} = \begin{pmatrix} \beta_L^S(X_t) & 0 \\ 0 & \beta_N^S(X_t) \end{pmatrix}^{-1} \left[I-\Theta(X_t)\right]\left[v_t^D - v_t^S\right]$.

are summarized by the familiar incidence index $\eta^D(X)/[\eta^D(X)+\beta^S(X)]$, which depends only on the ratio of the overall supply elasticity $\beta^S(X)$ to the (magnitude of the) overall demand elasticity $\eta^D(X)$.[12]

For the purposes of long run analysis, economists generally agree that labor demand is fairly elastic, but they ultimately disagree about the magnitude of the long run incidence parameters because estimates of the wage elasticities of group labor supply vary from close to zero to greater than one. The hypothesis of interest in this paper is not necessarily whether the incidence matrix Θ is close to the identity matrix, but whether it varies with the business cycle.

If supply were to increase just for the *N* group, and demand were held constant, then the labor usage effects would be represented by the right-hand column of the incidence matrix. The bottom entry θ_{NN} in that column is between zero and one, and the top entry θ_{LN} is in the interval [-1,0]: an increase in *N* supply (weakly) increases the usage of *N* labor and reduces the usage of *L* labor. An increase in *N* demand (weakly) increases the usage of both types of labor. As explained further below, the different effects of *N* supply and *N* demand on the usage of *L* labor helps measure the relative size of supply and demand shifts in applications when both are shifting at the same time.

I.C. The Christmas and the Academic Seasons as Demand and Supply Shifts

Equation (5) shows that, in order to detect the incidence matrix's business cycle – that is, the sign of $\Theta'(X)$ – it helps to have a season or seasons in which supply and demand are known to shift by different amounts because the incidence matrix multiplies the gap (v_t^S - v_t^D). Christmas and summer are two such seasons.

The Christmas and summer seasonal fluctuations are fundamentally different, in that the former can be interpreted as primarily a labor demand increase and the latter interpreted as primarily (although not solely: more on this below) a labor supply increase. Figure 1 displays three labor market indicators – weekly hours worked, hourly pay for full-time jobs, and unemployment – for each of two seasons, from the Current Population Survey Merged Outgoing Rotation Group (CPS-MORG) public use files from January

[12] Fullerton and Metcalf (2002).

2000 through December 2009.[13] For the moment I focus on persons aged less than 35, because their job turnover rates are expected to be greater and thereby more visibly display the effects of short term fluctuations like Christmas or summer. The Figure shows seasonal "spikes:" the level of the indicator during Christmas (the months of November and December) or the summer (the months of June-August), relative to the indicator during the four months nearby the season. Wages and unemployment are measured in logs, and hours spikes are expressed as a proportion to a group's average hours for the entire season and adjacent months. The spikes shown in Figure 1 are averages for the years 2000-2009.

The Figure's top panel displays weekly hours spikes, where weekly hours are measured as zero for any survey respondent who was on vacation or otherwise not at work during the survey reference week. Each group's spike is positive on Christmas. During the summer, the spikes are positive only for the two younger age groups.[14] All three Christmas wage spikes (middle panel) are positive, while all three summer wage spikes are negative.[15]

Retail sales, which currently average about $360 billion per month, are usually more than 25 percent higher in December.[16] As a result, the retail sector is expected to have especially high labor demand during the Christmas season. One may also expect labor supply to be different, especially during Thanksgiving and during the last two weeks of December, but the Census Bureau data shown in Figure 1 do not measure activity during the week of Thanksgiving, Christmas, or New Year's Day.[17] According

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[13] I omit observations from District of Columbia, where seasonal changes, and their business cycle, are much different from the rest of the country due to changes in Congressional activity. I also omit observations from Louisiana in 2005 (Hurricane Katrina).

[14] The teen summer hours spike is 0.295 (that is, teen weekly per capita hours worked during the summer are 29.5% more than their per capita weekly hours worked during April, May, September, and October), which far exceeds the scale used in Figure 1.

[15] The fraction of people employed changes over the seasons, which means that composition changes contribute to seasonal fluctuations in the average hourly wage among employees. However, the supply and demand interpretation, and not composition bias, explains why (a) the Christmas wage seasonal is so different from the summer wage seasonal, (b) the wage seasonals always have the opposite sign of the unemployment seasonals, and (c) hourly wages fail to increase during the summer even for the 25-34 age group for whom the composition has little change.

[16] I use the Census Bureau's monthly NSA Retail and Food Service Sales. Before 1992, I use the Census Bureau's discontinued NSA retail sales series. My regression analyses of retail sales include a dummy variable for year less than 1992.

[17] The CPS survey reference week is the calendar week that includes the twelfth of the month.

to the common demand shift interpretation, it is no surprise that all groups have work hours and wages that are higher than normal during the Christmas season.

The summer labor supply shift among school aged people is potentially massive. Table 1 displays October employment in selected industries, averaged for the years 2000-2009. About 20 million people aged 16-34 are enrolled in school during the academic year (especially those aged 16-24), and 19 million of them are not working full time. Considered as an "industry," school enrollment is many times larger than, say, the U.S. military or the entire construction industry. Summer vacation makes millions of young people available for work. By itself, this is a supply shift that is specific to the *N* group: it should increase hours for the *N* group, reduce hours for the *L* group, and reduce both groups' wages.

Agriculture, construction, and other industries are expected to be more active when the weather is warmer, and school vacation impacts family activities. For these and other reasons, the composition of labor demand, if not its level, is expected to be different during the summer. Nevertheless, it is less than obvious that, absent pressures from the supply side, summer labor demand would be *several million* greater and thereby shift as much as labor supply does (see also Miron, 1996, p. 9). More important, the data shown Figure 1 do not suggest any massive summer labor demand shift: persons aged 25-34 actually work fewer hours during the summer, and (unlike Christmas) the summer wage spike is negative for all three age groups.

All three Christmas unemployment spikes (bottom panel) are positive and all three summer unemployment spikes are negative. Taken literally, the model (1) - (4) is silent about unemployment, but the unemployment data shown in Figure 1's bottom panel appear to confirm the hypotheses that labor demand increases more than supply during Christmas and labor supply increases more than demand during the summer.

II. Christmas Demand in Recessions and Booms

The business cycles of the Christmas and academic seasons are examined with the same basic annual time series regression specification. The dependent variable is a seasonal outcome measure, and the independent variables are a cubic in calendar time (normalized to zero in 1980) and a measure of the state of the business cycle in November and December (or, for summer analysis, June through August). The time cubic captures demographics and other slow moving determinants of the seasonal cycle during non-recession years. The coefficient on the business cycle indicates how much, if any, the seasonal is different during recessions than during non-recession years.

The Christmas seasonal for a labor market outcome, such as log aggregate employment, is measured as the average of seasonally unadjusted November and December values minus the average of seasonally unadjusted values for the "nearby months" of September, October, January, and February. I use two alternate monthly time series to capture the business cycle. The first is a 0-1 indicator for whether November or December (or, in the case of academic seasons, one of the months June, July, or August) was in part of a business cycle peak-trough interval defined by the NBER recession dating committee. The alternative business cycle variable is the seasonally adjusted average percentage of men aged 25-54 who were unemployed during the months September through February, deviated from its 3.9% average for non-recession years (hereafter, "standardized unemployment"). Because periods of high unemployment[18] have standardized unemployment approximately one percentage point greater than its value in non-recession years, standardized unemployment is readily compared with the dichotomous NBER variable, which is also one unit greater during recessions.

Figure 1 uses the CPS-MORG from 2000-2009 to examine the typical Christmas and summer seasonal fluctuations. But the purpose of this paper is to determine the amount, if any, by which seasonal fluctuations are *different* during recession years than they typically are. For this purpose it helps to have more accurate data for many recessions, which for employment and unemployment have been aggregated by month and age category by the Bureau of Labor Statistics (BLS) dating back to January 1948 for all of the monthly CPS respondents (hereafter, "the household survey"), and not just the outgoing rotation groups. In addition, I use the BLS seasonally unadjusted monthly employment aggregates of the establishment survey, and seasonally unadjusted measures of retail sales (from January 1967) published by the Census Bureau.

[18] Defined, for example, as months that are between NBER peaks and troughs, or within 6 months of a NBER trough.

Under the assumption that the Christmas season shifts labor demand more than it shifts labor supply, the slack market theory predicts that a given sized labor demand increase will increase employment more during a recession. As a result, the labor demand increase will reduce unemployment more during a recession, and increase the labor force less (if at all).

The top panel of Table 2 displays the constant term estimates: the average Christmas seasonal for log employment, log unemployment, and the log labor force (from the perspective of the benchmark year in the calendar time cubic, 1980). Not surprisingly, each of them has an economically and statistically significant seasonal. The Table's first column shows how, in the average non-recession year, log aggregate November and December employment is 0.0129 above what it is in the nearby months. Christmas unemployment is below trend. The second row of the Table reports similar constant terms when the NBER recession indicator is replace with a recession indicator based on a standardized unemployment rate (see above). All of the constant terms are broadly consistent with the Christmas hours and unemployment seasonality shown in Figure 1.

The table's second panel displays the various regressions' coefficients on the business cycle term: the estimated gap between the recession seasonal and the non-recession seasonal. The table's third panel displays the size of a recession seasonal relative to a non-recession seasonal, which is calculated as one plus the ratio of the corresponding business cycle coefficient displayed in the second panel to the corresponding constant term from the top panel. Assuming for the moment that the Christmas seasonal impulse does not vary over the business cycle, the three of the four point estimates for employment's seasonal recession-nonrecession gap have the "wrong" sign – the Christmas employment seasonal is smaller during recessions. Unemployment is low during the Christmas season, but the third and fourth rows of the table show that the Christmas unemployment drop is about the same in recession and non-recession years, depending on how a recession is measured.[19] Contrary to the slack labor market

[19] Recall that the unemployment likelihood used as the dependent variable is the seasonally-unadjusted deviation of December from nearby months. The unemployment likelihood used as a business cycle measure is the September – February average of seasonally adjusted prime-aged male unemployment per capita.

theory, Christmas does expand the labor force during recessions, but the theory is correct that the expansion is less.

The business cycle for employment and wage seasonality depends both on the business cycle of the incidence matrix and on the business cycle for the underlying seasonal impulse to tastes or technology. Because the business cycle of the incidence matrix is the object of interest here, and employment and wage seasonal changes are readily measured, a seasonal fluctuation that is ideal for measuring the cyclicality of the incidence parameter would derive from a seasonal impulse to tastes or technology whose magnitude is independent of the business cycle, or at least would have a business cycle of a known magnitude. Some of the impulses driving the Christmas seasonal changes, such as seasonal weather patterns, may be independent of the business cycle. But others, like end-of-year retirements or the preference for Christmas retail purchases, are probably different during a recession.

In order to be conservative relative to the hypothesis that the incidence matrix has no seasonal, I measure the seasonality of the incidence parameter as seasonality of aggregate log labor activities (employment, etc.) per unit seasonality of retail sales, with retail sales normalized by a seasonally adjusted measure of national labor income.[20] The bottom panel of Table 2 displays the results. For example, if the Christmas seasonal for log aggregate household employment is seven percent greater during recessions (see table's fifth row) but Christmas seasonal for normalized retail sales is six percent less, so 1.14 (=1.07/0.94) is entered in the corresponding cell of the Table's bottom panel. Only three of the eight entries are on the expected side of one – that is, showing employment or unemployment to be more sensitive to Christmas during recessions, or showing that the labor force is less sensitive. Even the most extreme estimate (0.79) is closer to the null of one than to the slack labor market hypothesis of zero.

Although Christmas is not primarily a supply shock, the basic equilibrium theory above permits us to infer the business cycle of the supply incidence matrix Θ from estimates of the demand incidence matrix (I - Θ) made possible from the Christmas season. In particular, employment's demand incidence matrix (I - Θ) seems to have little

[20] In the slack market model, a recession would be a time when the retail sector could expand without taking resources from other sectors, so aggregate employment would expand more with retail sales during recessions even while *retail* employment per dollar of retail sales had no business cycle.

or no business cycle (Table 2, first and second columns), which means that the supply incidence matrix $\Theta = I - (I - \Theta)$ has little or no seasonal.

Figures 3-6 display the time series used in Table 2 together with fitted values from the regressions reported in the Table's "NBER" rows. Figure 3 shows how only four of the twelve NBER recession year payroll employment observations lie above the non-recession regression function. As shown in Figure 4, CPS employment (otherwise known as employment from the "household survey") has a Christmas seasonal that is slightly larger in the average recession year.

According to the slack market theory, Christmas labor demand would be satisfied from the pool of unemployed, without raising factor prices and thereby without expanding the labor force. Table 2's fifth row shows how the point estimates of the coefficient on the recession term are sometimes in the right direction, but that the recession and non-recession seasonal patterns are statistically indistinguishable. [21] Figures 5 and 6 show why the average non-recession is not much different from the average recession year in terms of the size of the Christmas unemployment and the labor force changes: above half of the recession years have a seasonal change that is greater the non-recession recession function and the other half have a seasonal change that is less.

III. The Summer Seasonal for Employment and Unemployment

Although employment is high in both the summer and in December, the evidence presented in Figure 1 and Table 1 suggest that the impulses creating high employment in the two seasons are fundamentally different. Among other things, the summer patterns for wages and unemployment are the opposite of the December patterns, which suggest that supply is the more important impulse in the summer and demand is the more impulse in December. The appendix uses further results on wages and hours, and finds that labor demand is high during the summer, but its increase is less than half of the increase in labor supply. Thus it is no surprise that summer wages are low and summer

[21] One explanation of my results is that a recession can be model as α labor markets that fit the simple shortage model, and 1-α labor markets with no shortage, with $\alpha << 1$. In this case, labor market aggregates might have responses to the seasonal shifts that look like α times the shortage model and 1-α times the no-recession-nonrecession gap model. However, in this case it would be incorrect to claim that, from an aggregate point of view, supply doesn't matter during a recession – it does in 1-α of the markets – and incorrect to claim that demand is dramatically more potent in recessions – it is in only α of the markets.

unemployment is high. As a result, according to the slack market theory, the summer employment surge during recessions should be less than half of what it normally is.

The summer seasonal change for a labor market outcome, such as log aggregate employment, is measured as the June through August average of seasonally unadjusted values minus a seasonally unadjusted average for the "nearby months" of April, May, September, and October. I use two alternate monthly time series to capture the business cycle, much like the series used to examine the Christmas seasonal change. The first is a 0-1 indicator for whether a business cycle peak-trough interval defined by the NBER recession dating committee included any part of the summer. The alternative business cycle variable is "standardized unemployment": the average seasonally adjusted percentage of men aged 25-54 who were unemployed during the "nearby months" April through October, deviated from its 3.9% average for non-recession years.

Table 1's first two rows display constant terms from the summer seasonal regressions: that is, the average summer seasonal for employment and unemployment by age group for the non-recession years (from the perspective of the benchmark year in the calendar time polynomial, 1980). For the younger age groups, the gap between academic-year and summer is positive and economically significant for *both* employment and unemployment, which is to be expected given that so many of the younger people become available for work when the academic year ends. For the non-recession years, summer log employment per capita for teenagers ages 16-19 exceeds the average for nearby months by 0.247 and summer log unemployment per capita exceeds the values for the nearby months by an average of 0.279.

The top row of the Table also suggests that the size of the summer seasonal impulse may exceed the impulses associated with the largest postwar business cycles. Log employment per capita for persons aged 16-19 fell "only" 0.156 from 1979 to 1983, and "only" 0.295 from 2007 to 2010, whereas it falls 0.247 at the end of a typical summer.

Even without regard for recessions, the summer seasonal varies over time. For example, minimum wages, activities at school, and other factors can change the propensity of teens to work during the school year, and therefore the fraction of teens whose labor supply would shift when summer begins. These factors are considered in my analysis by its inclusion of a smooth function of calendar time among the independent variables.[22]

Table 1's middle rows display the estimated coefficients on the NBER recession indicator variable: that is, the gaps between a summer seasonal change during recession years and the corresponding seasonal change for non-recession years. The gaps for employment are typically in the direction predicted by the various theories – that is, that employment would expand less during recession summers – but are not economically significant. For example, the average recession seasonal for log employment per 16-19-year-old is only 0.017 smaller than the average of 0.247 for non-recession years, or about 93 percent of the non-recession seasonal change (see the fifth row of the table). Recall that the slack labor market view predicts that the recession employment seasonal would be zero. The gaps for unemployment are not always in the direction predicted by the theory, and are statistically indistinguishable from zero.

Figures 1 and 2 display the annual time series for the summer log employment (unemployment, respectively) seasonal change for the 16-19 age group together with fitted values from the regression used for the employment (unemployment) rows of Table 1's third column. Each of the figures indicates recession year observations with squares and non-recession year observations with circles. The fitted values follow a smooth curve for the nonrecession years, and small spikes down in the recession years.[23] The employment data also display small down spikes in many (but not all) of the recession years, which is why the recession coefficient of -1.70 is statistically significant.

However, -1.70 is small enough that slack labor market theory fails to come even close to fitting even one of the recession observations better than the hypothesis that the recession and non-recession seasonal changes are the same. Every single recession economy absorbed large numbers of new teen arrivals into the labor market without a statistically abnormal rise in unemployment: all of the recession employment seasonal observations are far from zero.

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[22] In separate results (not shown in the Table), I have also replaced the time polynomial with the prior academic year average employment per capita, or just dropped the time polynomial and limited the sample to 1980-2009 – in both cases results were quite similar.

[23] The recession years appear as spikes because most recessions do not include more than one consecutive summers, and the spikes are small because the recession coefficient of -1.70 shown in Table 3 is small compared to the non-recession seasonal of 24.7 (both in 100ths of log points).

I replicated the specifications used for Table 3's top three panels, except I replaced the NBER recession variable with the business cycle variable based on the prime-aged male unemployment rate. The results are summarized in Table 3's bottom panel, as ratios of the recession year seasonal changes to non-recession year seasonal changes. Interestingly, the confidence intervals are tighter with these specifications, but nevertheless all of the employment specifications have a 95 percent confidence interval that includes one. In other words, these data fail to reject the hypothesis that the summer employment season is the same in recession and non-recession years, despite having considerable power to do so.

IV. Conclusions

By definition, a recession is a time when the economy does not function normally. Low employment rates, and high unemployment rates, are an important reason why the economy produces so much less than its potential at business cycle troughs. These are good reasons to formulate and test theories of business cycles, and to examine possibilities for public policy to bring economies closer to their potential. However, much business cycle theory assumes, without empirical evidence, that recessions are those rare instances in which employment and work hours are primarily determined by demand at the margin, and hardly affected by labor supply. This assumption is critical for public policy analysis, and needs to be tested empirically.

This paper examines the seasonal cycles in recession years and non-recession years since 1948 in order to test the proposition that demand matters more, and supply matters less, for determining employment at the margin during recessions. I find that the summer and Christmas seasonal changes for employment and unemployment are essentially the same number of log points in recession years and non-recession years. When school lets out and young people storm into the labor force, a recession economy creates summer jobs. Even the 2008 and 2009 summers and Christmas' looked a lot like summers and Christmas' in non-recession years.

I interpret the Christmas seasonal employment change as a consequence of a seasonal demand impulse, and in that regard Christmas offers rather direct evidence of the marginal employment effects of demand. In addition, economic theory tells us that my finding that the employment effect of demand shifts was at most 14 percent larger during recessions puts a lower bound on the incidence of a recession supply shift relative to the incidence of a non-recession supply shift.[24] For example, if the magnitude η^D of the labor demand elasticity were equal to the magnitude of the labor supply elasticity β^S during non-recession years (so that the supply incidence index was 1/2 during non-recession years), then the labor usage effect of a common supply shock during a recession would be at least 86 percent of what the effect would be during a non-recession year. This combination (0.86,1.14) of relative supply index and relative demand incidence index is plotted in Figure 8 as the red box that is on the dashed line and to the left of all of the other red boxes. The other three red boxes on the dashed line correspond to the other three Christmas employment seasonal change estimates shown in the bottom panel of Table 2, translated to supply incidence estimates using the same assumed ratio $\eta^D/\beta^S = 1$.[25]

Because this paper is not designed to estimate the magnitude of incidence indexes during non-recession years – just to estimate how the incidence indexes vary over the business cycle – I alternately assume a relatively small value of one for the non-recession ratio η^D/β^S, and a moderate to large value of three.[26] The ratio of three implies relative supply incidence indices along the solid line shown in Figure 8. The four red boxes on this line are also derived from the four employment estimates shown in the bottom panel of Table 2. For example, the relative demand incidence index of 1.14 implies a relative supply incidence index of 0.95, which is plotted in Figure 8 as a red box at (0.95,1.14).

By the same logic, estimates of the relative supply incidence index can be translated into estimates of the relative demand incidence index. In this way, each of the

[24] Recall that the labor usage effect of a one unit supply shift (experienced by essentially all types of workers) is one minus the effect of a one unit common demand shift.

[25] If R^D and R^S are the recession demand and supply incidence indices, respectively, relative to their non-recession values, then the two are related according to $(R^S-1)\eta^D = (1-R^D)\beta^S$.

[26] With an aggregate production function that is Cobb-Douglas in labor, the magnitude of the wage elasticity of aggregate labor demand would be the inverse of one minus labor's exponent, and thereby at least 3. Economists usually estimate the wage elasticity of labor supply to be less than three. Values of η^D/β^S greater than three would only strength my conclusion, but further expand Figure 8's vertical scale.

twelve summer employment seasonal estimates shown in the bottom two panels of Table 3 are plotted twice in Figure 8 as green boxes. Interestingly, there is considerable overlap between the estimates derived from the Christmas season and estimates derived from the summer season. More important, all of the estimates are far from the values (shown as blue circles in Figure 8) implied by the "slack market" hypothesis that labor supply does not matter during a recession.

These findings appear to contradict the view – which is the basis for much fiscal policy and business cycle analysis – that labor supply shifts have little (or even perverse) effects on aggregate employment during a recession, and contradict the view that demand shifts encounter significantly fewer supply constraints during a recession than they normally would. Admittedly, recessions are times when the labor market does not function well, but nonetheless labor supply and demand seem to operate on the margin during recessions in much the same way that they do during non-recession years.

The Christmas cycle is at least as large as the high frequency peacetime government spending changes that have been observed in U.S. history, so my results suggest that large government spending shocks might have much the same employment effects in a recession as they would in non-recession years. Of course, the seasonal results by themselves do not rule out the possibility that government spending significantly increases employment regardless of whether or not it were a recession (although see Alesina and Ardagna, 2009 and Barro and Redlick, 2009, on this point).

Even if the slack market theory were taken less literally – perhaps the theory is only supposed to illustrate general tendencies rather than quantitative effects – that would hardly help reconcile it with the empirical results. Even if the slack market hypothesis were half right, in the sense that the supply incidence index during recessions was as close to zero as it is to its non-recession value (see the blue triangles shown in Figure 8), the theory still vastly disagrees with both the Christmas and summer season estimates. More important, it is common practice in *quantitative* macroeconomic work to assume that supply has *zero* effect at the margin during recessions.[27] The fact that unemployment

[27] For example, the models of Gali, Lopez-Salido, and Valles (2007) and Smets and Wouters (2007) include a Calvo (1983) pricing setup in which output prices, and thereby labor demand, are independent of supply conditions in the short run. Uhlig's (2007) model includes a sticky wage and labor markets for which equilibrium labor usage is independent of labor supply conditions.

exists is not itself evidence of a zero marginal supply effect, and the slack market theory finds little support in the seasonal fluctuations.

Another approach to reconciling the slack market theory with the seasonal data might dismiss teen and other low skill or "fringe" labor markets as hardly relevant for macroeconomic analysis, and continue to assert that the slack market theory works for the rest of the economy.[28] Even in this case, my results would help advance our understanding of fiscal policy during recessions. My paper suggests that, among other things, if government spending during recessions were to expand employment more, and marginal tax rates were to reduce supply less, then fiscal policy impulses must be targeted away from the "fringe" labor markets where the slack market theory fails. More important, the slack market theory has been motivated by the existence of unemployment as a real social problem. Teens and other low skill persons experience more than their share of unemployment, and their unemployment likely contributes disproportionately to crime, political unrest, and other adverse social consequences of unemployment. A good quantitative theory of unemployment and its social consequences may not be able to ignore the labor markets examined in this paper.

It is possible that the labor market has different mechanisms to adapt to various supply and demand shifts, and that certain types of fiscal policy might be different from Christmas in this regard. The seasonal cycle is also easily anticipated.[29] Either case raises the question of how, exactly, fiscal policy might be different from Christmas, why government spending might encounter fewer supply constraints than Christmas does, and how that information can be used to better design fiscal policy during recessions.

[28] This assertion contradicts "sticky price" Keynesian models (some of which were cited above), because they obtain slack market effects through *final product* demand, and therefore do not have radically different business cycles for skilled and unskilled workers.
[29] Presumably supply can better adjust to an anticipated demand shock than to an unanticipated one, and demand can better adjust to an anticipated supply shock than to an unanticipated one. It's not clear how this possibility relates to the *interaction* between the business and seasonal cycles, though.

V. Appendix: The Roles of Supply and Demand in the Summer Seasonal Change

A couple of pieces of evidence suggest that labor demand changes over the summer, perhaps in part because outdoor work becomes more productive when the weather is warmer and days are longer. For one, the summer hours seasonal is a bit larger for teen boys than for teen girls, even though boys are not enrolled in school more than girls are. The 0.295 proportional seasonal hours change shown in Figure 1 is for boys and girls combined; separately the proportional changes are 0.311 for boys and 0.277 for girls, respectively.

Table 4 lists the main industries hiring teens during the summer. Using the CPS-MORG for 2000-2009, I calculated the per capita hours that teens worked in each of the two digit industry categories coded by the NAICS Association (with one addition – given my focus on teens, I distinguished private household services from other services) separately for summer (June through August) and for nearby months (April, May, September October). For each industry, I then calculated the difference between its summer per capita hours and its nearby-month per capita hours and expressed it as a percentage of the seasonal hours change for all industries combined (by construction, the percentages sum to 100 across industries). Industries were sorted (from largest to smallest) by their teen percentage and shown in Table 4.

Interestingly, every single industry utilizes more teen work hours during the average summer week than during the average week in April, May, September or October – even the educational services industry whose customer demand is much lower during the summer.[30] Not surprisingly, some of the teen summer work is done in the agricultural, forestry, fishing, and hunting industries, which are industries that also use 13 percent more hours from people aged 25-34 during the summer. Restaurants and construction utilize a lot of teen labor during the summer, when they also increase their usage of workers aged 25-34. These three industry groups fit a summer demand story because they even increase their employment of people who are not normally enrolled in school. However, most industries do not fit this pattern. Retail trade industries, as well as local government, use a lot of teen labor during the summer, but at the same time

[30] Hours worked in Educational Services among persons 25-34 drops 18 percent in the summer (see the last row in the Table).

actually reduce their usage of persons aged 25-54. Overall, 15 industry groups have little increase in the hours of persons working 25-54, and those industries provide almost 2/3 of the hours worked by teens over and above the hours they work in April, May, September, and October. In addition to the evidence shown in Figure 1, Table 4 suggests that summer demand cannot explain a majority of summer teen seasonal hours changes.

Given that wage elasticities of labor supply are nonnegative, and that the wage elasticity of overall labor demand is not positive, the combination of the wage and hours data permit estimation of bounds on the relative importance of supply and demand in creating the summer seasonal changes. One of the bounds is most easily seen in the case when the two groups *N* and *L* have the same labor supply elasticity β^S, in which case the supply equations become:

$$d\ln N_t - d\ln L_t = \alpha_N^{S\prime}(a_t)da_t + \beta^S(X_t)\left[d\ln w_{Nt} - d\ln w_{Lt}\right] + \varepsilon_{Nt}^S - \varepsilon_{Lt}^S \qquad (6)$$

where *d* denotes summer seasonal changes, and I have assumed that the *L* group's summer seasonal supply change is zero (that group is not enrolled in school). Isolating the supply change from (6), and considering the average year when the ε's are zero, we have

$$\frac{\alpha_N^{S\prime}(a_t)da_t}{d\ln N_t} = 1 - \frac{d\ln L_t}{d\ln N_t} - \beta^S(X_t)\frac{d\ln w_{Nt} - d\ln w_{Lt}}{d\ln N_t} \geq 1 - \frac{d\ln L_t}{d\ln N_t} \qquad (7)$$

where the inequality follows from the assumption that $\beta^S \geq 0$ and the finding that wages fall more during the summer for persons aged 16-24 than for persons aged 25-34 (see Figure 1). The left hand side of (7) is the amount of the *N*-group (hereafter, "school-aged) seasonal summer supply change, expressed as a fraction of that group's equilibrium seasonal hours change. Using the data underlying Figure 1, I find $d\ln L/\ln N$ = -0.20: it follows from equation (7) that the school aged seasonal summer supply change exceeds their seasonal hours change by at least 20 percent.

In their seasonal change form, the demand equations (1) and (2) can be averaged to become:

$$\frac{\alpha^{D\prime}(a_t)da_t}{d\ln N_t} = \frac{d\overline{\ln N_t}}{d\ln N_t} + \eta^D(X_t)\frac{d\overline{\ln w_t}}{d\ln N_t} \leq \frac{d\overline{\ln N_t}}{d\ln N_t} \tag{8}$$

where bars denote averages of values for the *L*- and *N*-groups, weighted by their shares of aggregate payroll. The inequality follows from my finding that wage rates are low during the summer and the assumption that the wage elasticity of labor demand ($-\eta^D$) is not positive. The left hand side of (8) is the amount of the seasonal summer demand change, expressed as a fraction of the equilibrium log seasonal hours change. Using the data underlying Figure 1, I find that the weighted average seasonal log hours change, expressed as a fraction of the equilibrium school-aged seasonal log hours change, is 0.09. In words, the summer seasonal demand increase may, as suggested above, be positive but it is no more than nine percent of the equilibrium log seasonal hours change for school-aged persons. The results for equations (7) and (8) quantify my conclusion that the summer demand change is substantially less than the summer supply change among school-aged persons.

Table 1. School Enrollment is a Huge Occupation

2000-2009 average

Selected Activities in October	millions of persons aged 16-34
Enrolled in School	20.3
Enrolled in School, not otherwise employed full-time	18.7
Restaurant or other food service worker	4.8
Construction worker	4.0
U.S. Military	1.2

Note: U.S. Military estimate refers to all military personnel with 16 or fewer years of service, regardless of age.

Sources: CPS-MORG 2000-2009. U.S. Military from FY 2003 - FY 2009 issues of U.S. Department of Defense, "Selected Military Compensation Tables Report."

Table 2. Christmas Seasonal Changes in Labor Force Status

Each column of the Table reports results from two regressions, with the dependent variable varying by column. The dependent variables are 100 times the deviation of November & December log per capita (establishment employment, a household employment, unemployment, or labor force) from the average of Sept., Oct., Jan. and Feb. The business cycle indicator is either an indicator for NBER recession dates or "standardized unemployment": the deviation of the percentage of prime-aged males who are unemployed (averaged for Sept, Oct, Jan, and Feb) from 3.9.

		Outcome Measure			
Statistic	Bus. Cycle Indicator	Emp., Est.	Emp., HH	Unemp.	Labor Force
Non-recession Seasonal, 100ths of log points	NBER	1.29	0.81	-6.85	0.35
		(0.04)	(0.05)	(0.71)	(0.05)
	Standardized Unemp.	1.28	0.83	-7.34	0.36
		(0.04)	(0.05)	(0.67)	(0.04)
Recession Coefficient, 100ths of log points	NBER	-0.07	0.06	-1.77	-0.02
		(0.06)	(0.08)	(1.09)	(0.08)
	Standardized Unemp.	-0.05	-0.05	0.77	-0.07
		(0.02)	(0.02)	(0.33)	(0.02)
Recession Seasonal/ Non-recession Seasonal	NBER	0.95	1.07	1.26	0.94
		(0.05)	(0.10)	(0.21)	(0.19)
	Standardized Unemp.	0.96	0.94	0.89	0.80
		(0.01)	(0.02)	(0.04)	(0.07)
Recession Seasonal/ Non-recession Seasonal, relative to Retail Sales	NBER	1.00	1.14	1.33	1.00
		(0.06)	(0.12)	(0.24)	(0.20)
	Standardized Unemp.	0.95	0.93	0.89	0.79
		(0.02)	(0.03)	(0.04)	(0.06)

Notes: OLS standard errors in parentheses.

Independent variables are: a business cycle indicator, a 3rd order time polynomial (0 = 1980) and a constant.

Log per capita retail sales' recession seasonal is 0.945 times its non-recession seasonal (1.01 when the business cycle is measured as standardized unemployment). These ratios are used to construct the bottom panel from the third panel.

Table 3. Summer Seasonals For Employment and Unemployment, by Age Group

Each column reports results from an employment regression and an unemployment regression. The dependent variable is 100 times the summer deviation of log per capita employment (unemployment) from the average of April, May, Sept., and Oct.

		Age Group					
Statistic	Outcome	16-17	18-19	16-19	20-24	25-34	16+
Non-recession Seasonal, 100ths of log points	Emp.	31.1	20.3	24.7	5.1	-1.2	1.6
		(0.6)	(0.4)	(0.4)	(0.2)	(0.1)	(0.1)
	Unemp.	36.0	20.2	27.9	9.6	3.1	9.8
		(1.5)	(1.4)	(1.2)	(0.8)	(0.9)	(0.7)
Recession Coefficient, 100ths of log points	Emp.	-1.39	-1.78	-1.70	0.05	0.03	0.00
		(0.95)	(0.70)	(0.70)	(0.26)	(0.11)	(0.11)
	Unemp.	-3.01	-0.94	-2.30	-0.82	-0.84	-1.96
		(2.41)	(2.16)	(1.84)	(1.31)	(1.47)	(1.18)
Recession Seasonal/ Non-recession Seasonal	Emp.	0.96	0.91	0.93	1.01	0.97	1.00
		(0.03)	(0.03)	(0.03)	(0.05)	(0.09)	(0.07)
	Unemp.	0.92	0.95	0.92	0.91	0.73	0.80
		(0.07)	(0.11)	(0.07)	(0.13)	(0.47)	(0.12)
Addendum: business cycle measured according to prime-aged male unemployment							
Recession Seasonal/ Non-recession Seasonal	Emp.	1.01	0.98	1.00	1.01	0.97	0.98
		(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.02)
	Unemp.	0.96	0.94	0.94	0.91	1.01	0.88
		(0.02)	(0.03)	(0.02)	(0.04)	(0.15)	(0.03)

Notes: OLS standard errors in parentheses.

Independent variables are: NBER recession dummy, a 3rd order time polynomial (time 0 = 1980) and a constant. Addendum replaces NBER recession dummy with the seasonally adjusted unemployment likelihood of prime-aged males, averaged April-October.

Table 4. The Industries Providing Summer Jobs for Teens Often Do Not Have More Labor Demand

2000-9 CPS-MORG Data

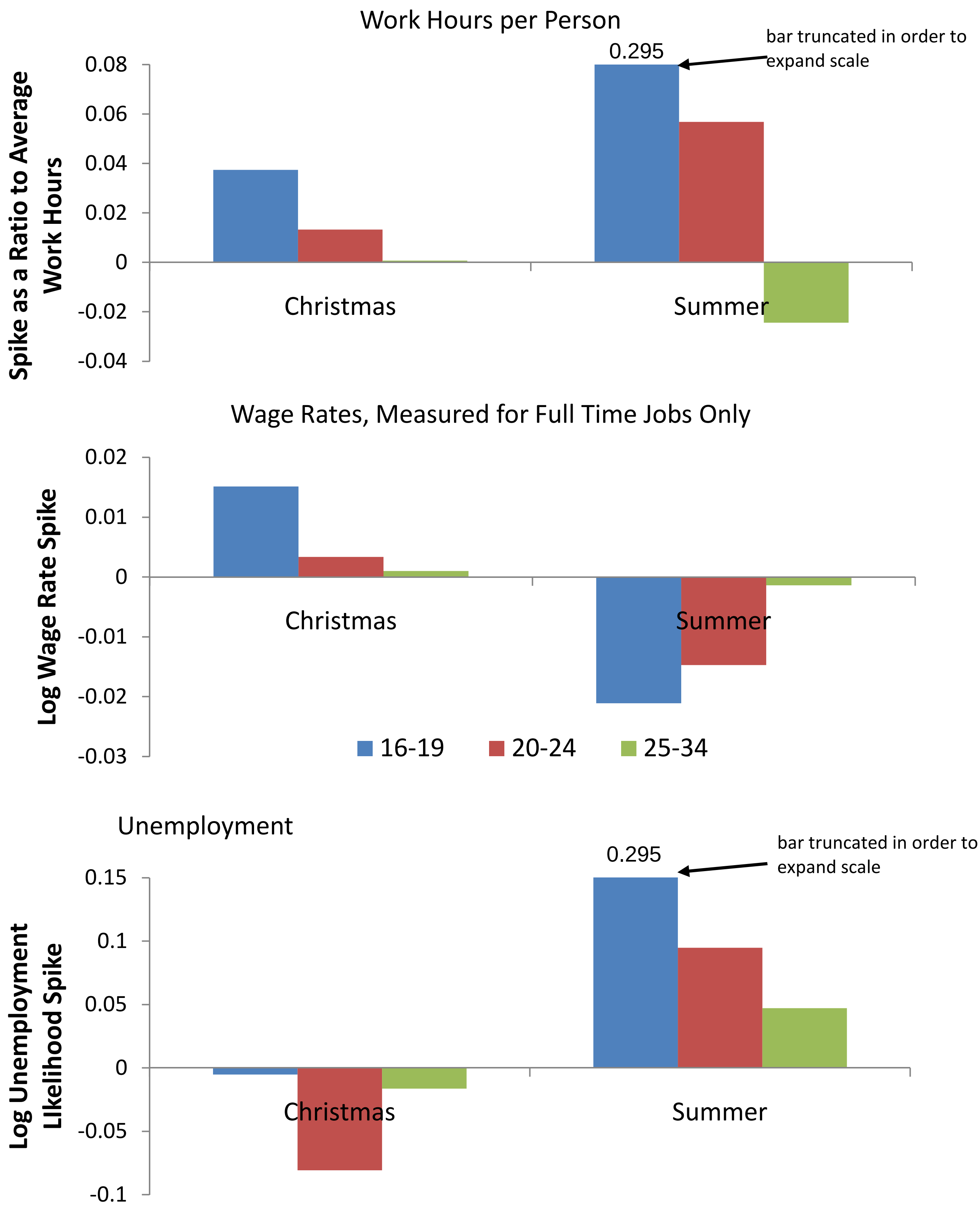
65% of teen summer work is in industries expanding total work hours of persons aged 25-34 less than 2%

Industries Ranked by their Contribution to Teen Summer Work Hours

percentage of teen summer work hours	Industry name	Summer Total Hours Change, Ages 25-34
15.9%	Arts, enterainment, and recreation	1%
15.5%	Accommodation and food services	4%
10.8%	Retail trade	-1%
8.8%	Construction	3%
8.6%	Local government	-26%
6.7%	Manufacturing	-3%
5.7%	Health care and social assistance	0%
4.1%	Management, admin. and waste mgt services	3%
3.7%	Private households	-4%
3.5%	Agricultural, forestry, fishing, and hunting	13%
3.2%	Professional and technical services	-1%
2.4%	Other services, except private households	-12%
2.1%	State government	-12%
1.7%	Finance and insurance	-1%
1.7%	Transportation and warehousing	-2%
1.4%	Federal government	12%
1.2%	Information	0%
1.1%	Wholesale Trade	-2%
1.0%	Real estate and rental and leasing	9%
0.3%	Mining	16%
0.3%	Utilities	-4%
0.3%	Educational services	-18%
100.0%	All industries	-2%

Notes:
"teen summer work hours" are the deviation of per capita teen work hours June-August from its value in April, May, September, and October.
"Total work hours" are the sum of all hours worked in the age group, include zeros for persons not working

Fig. 1 Seasonal Labor Market Spikes for Selected Groups



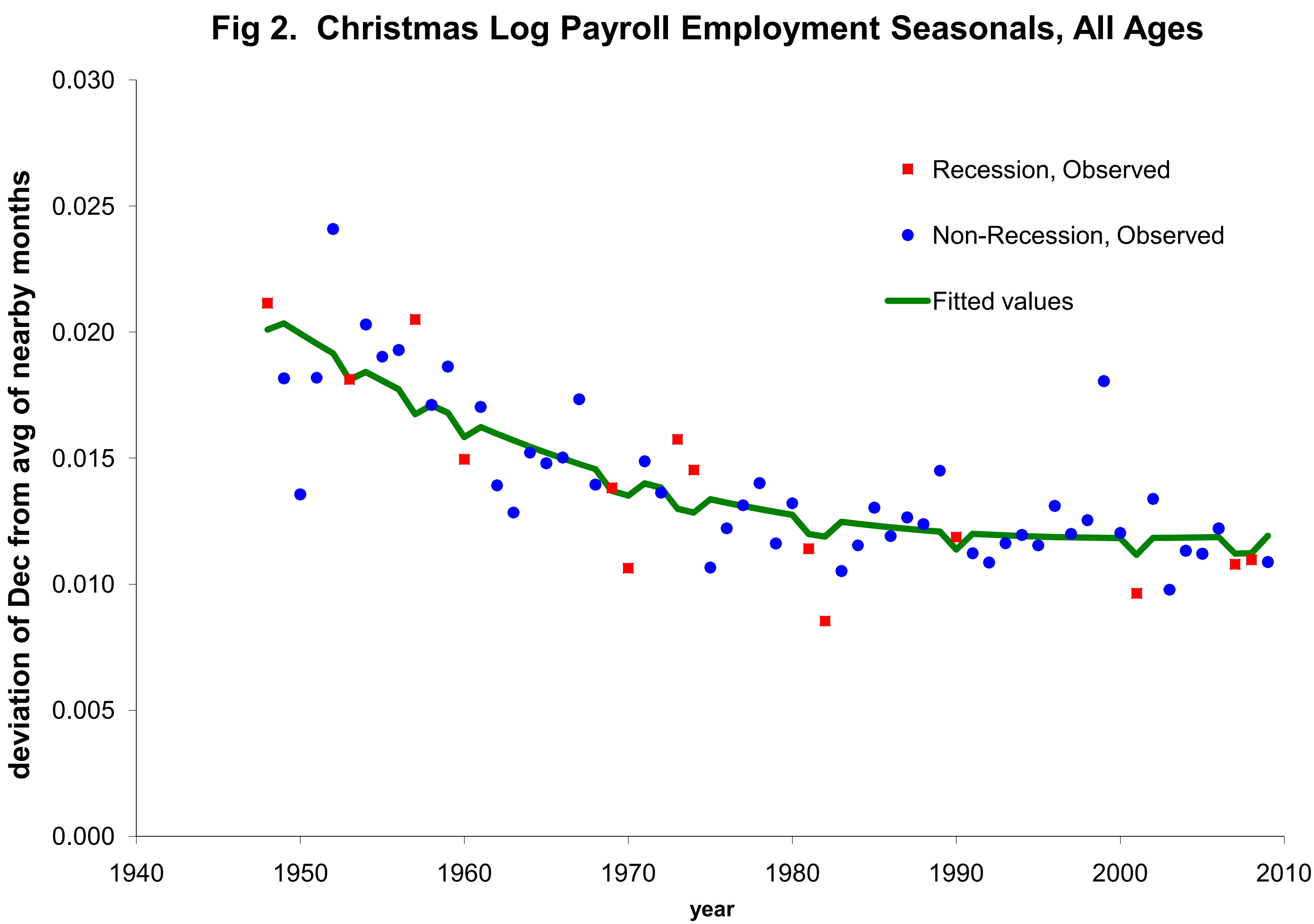


Fig 2. Christmas Log Payroll Employment Seasonals, All Ages
0.030
0.025
0.020
0.015
0.010
0.005
0.000
deviation of Dec from avg of nearby months
Recession, Observed
Non-Recession, Observed
Fitted values
1940
1950
1960
1970
1980
1990
2000
2010
year

Fig 3. Christmas Log CPS Employment Seasonals, All Ages

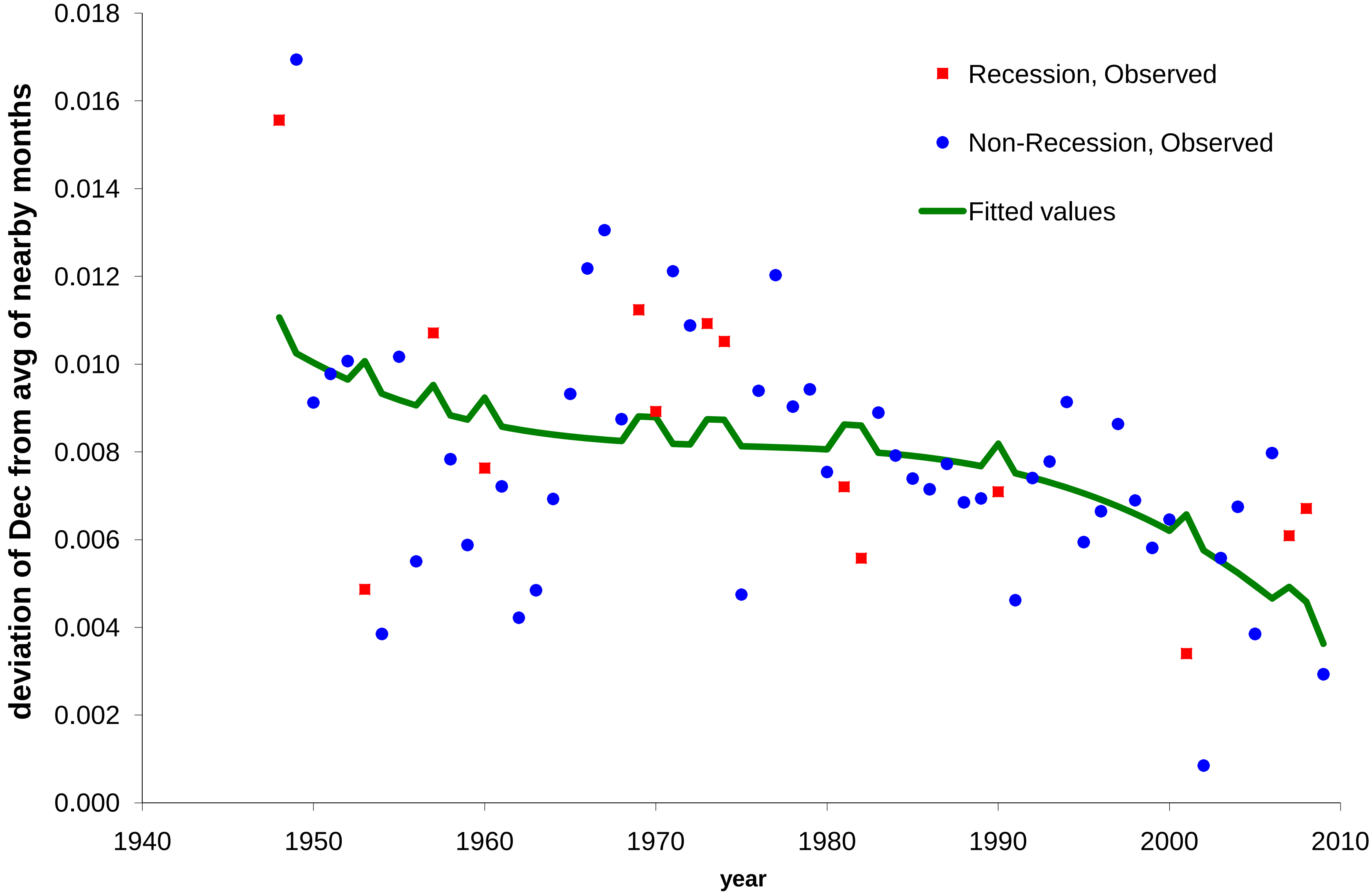
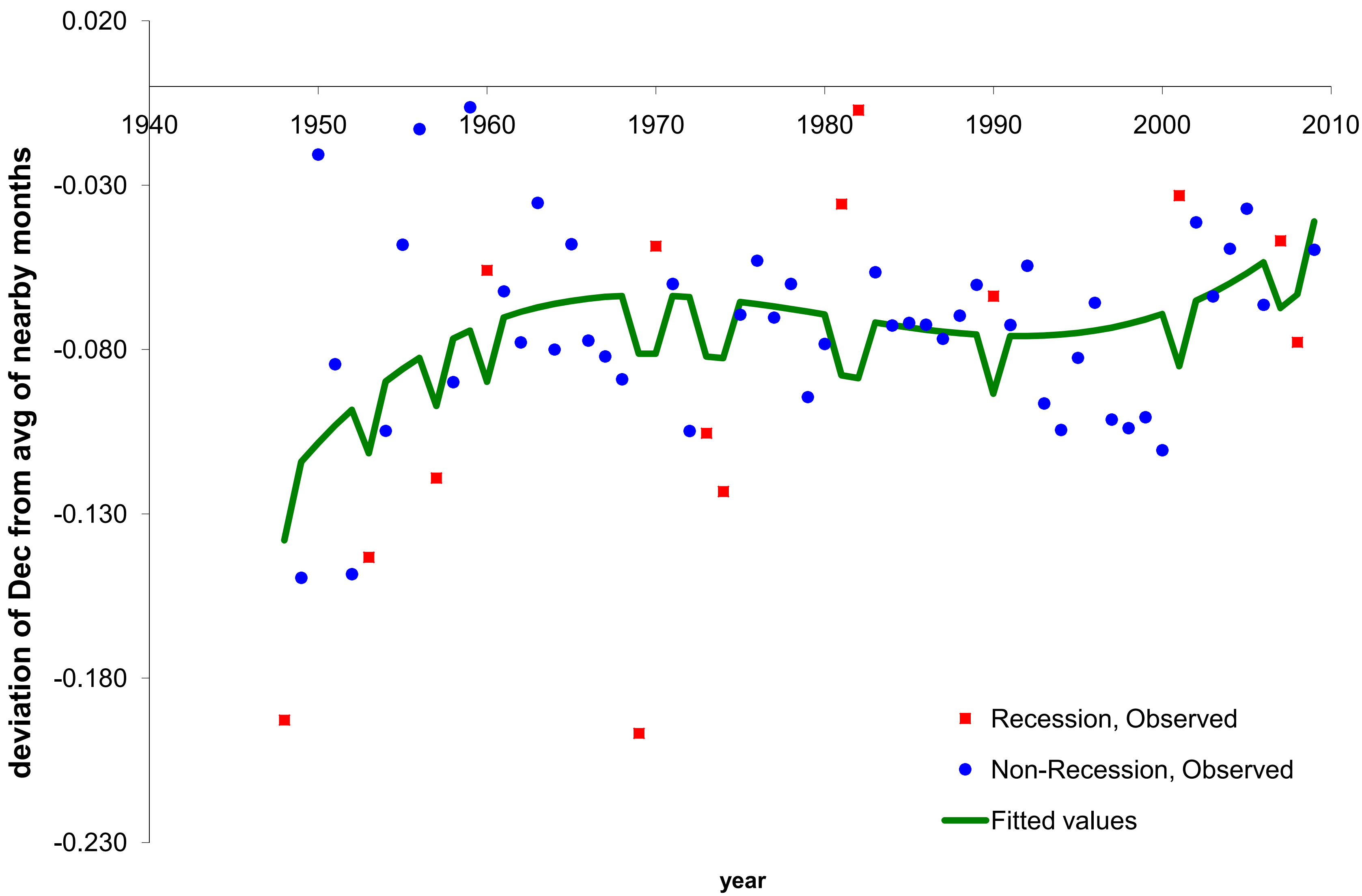


Fig 4. Christmas Log Unemployment Seasonals, All Ages



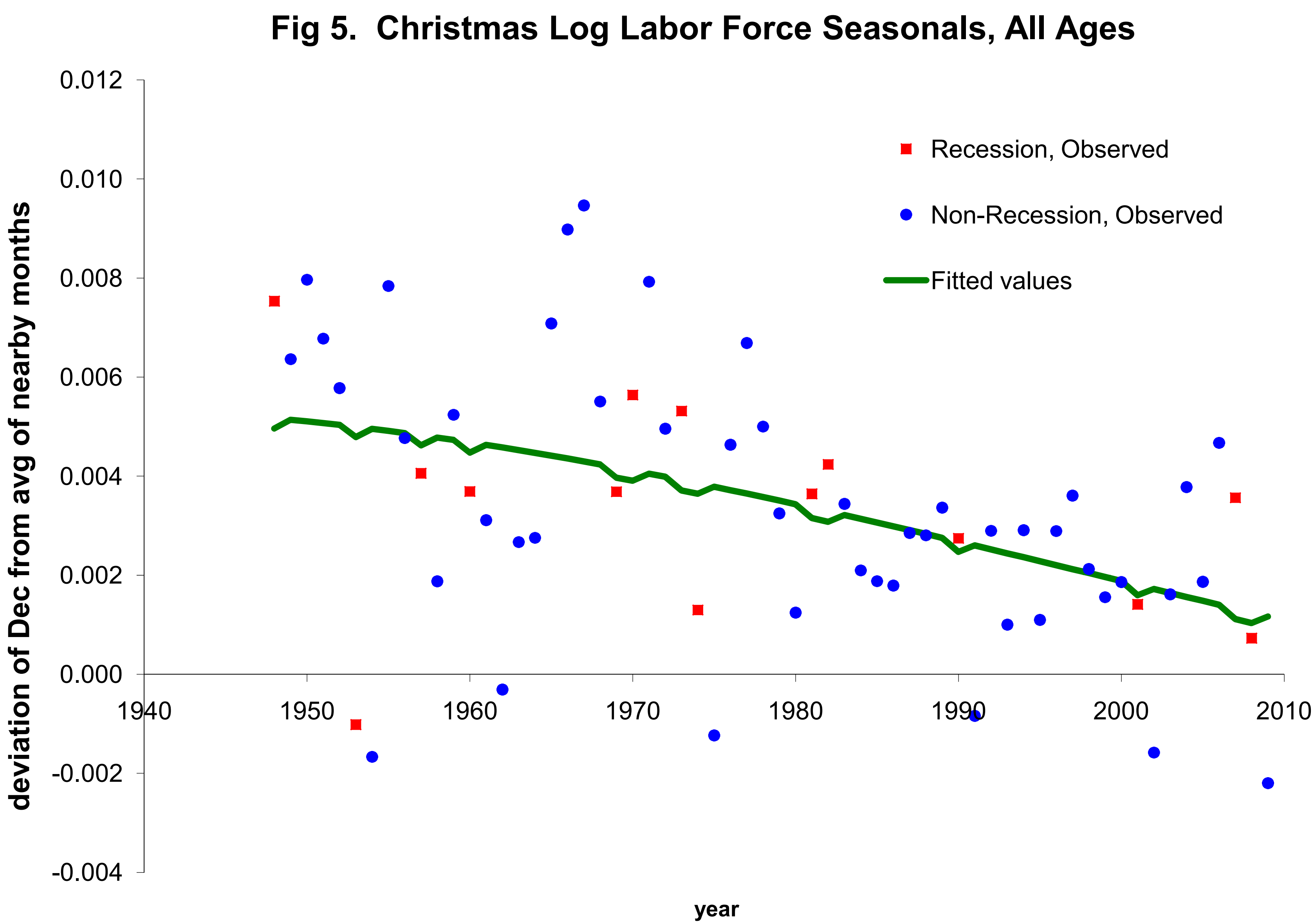
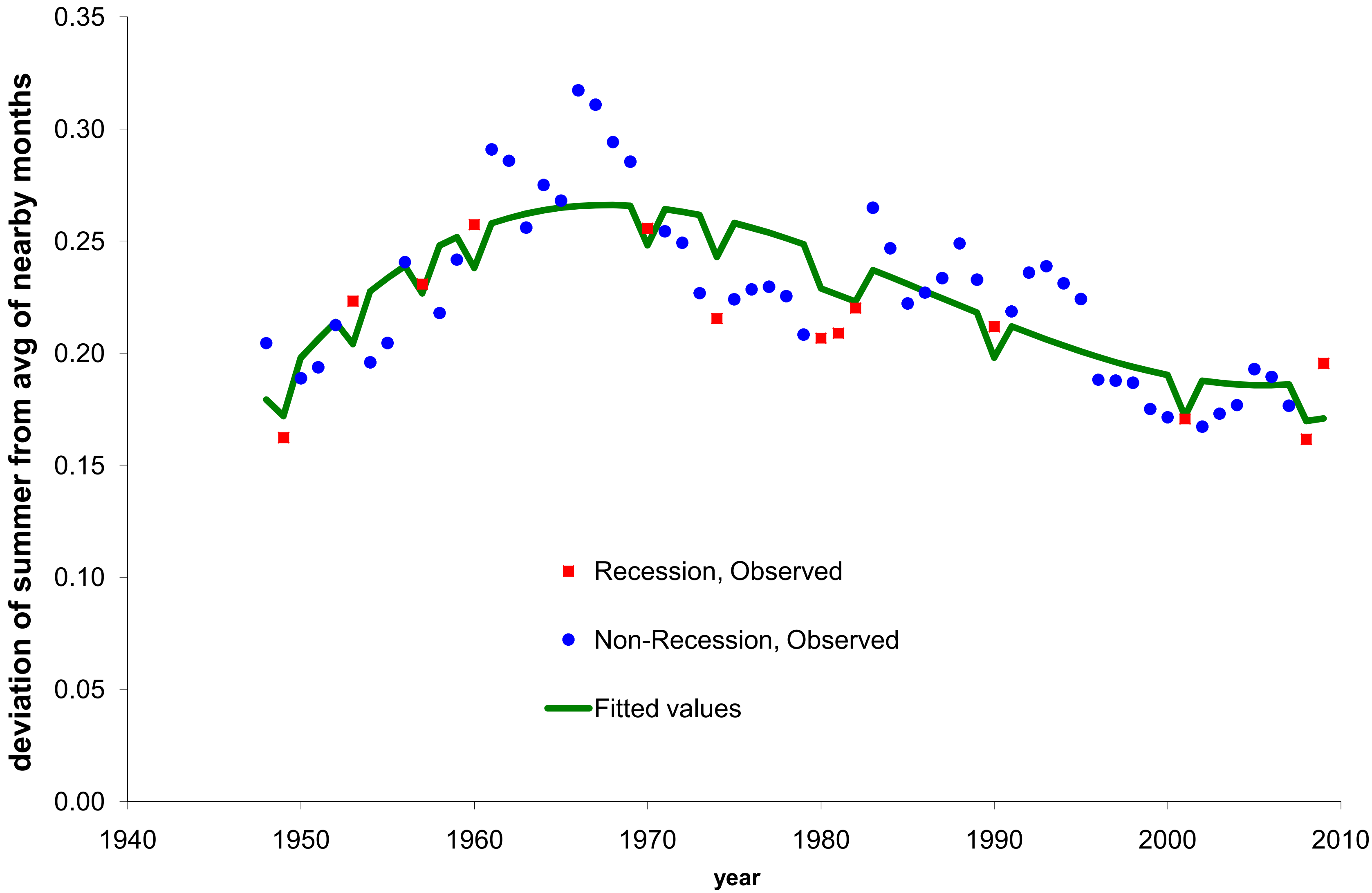


Fig 5. Christmas Log Labor Force Seasonals, All Ages
0.012
0.010
0.008
0.006
0.004
0.002
0.000
-0.002
-0.004
deviation of Dec from avg of nearby months
1940
1950
1960
1970
1980
1990
2000
2010
year
Recession, Observed
Non-Recession, Observed
Fitted values

Fig 6. Summer Log Employment Seasonals, Ages 16-19



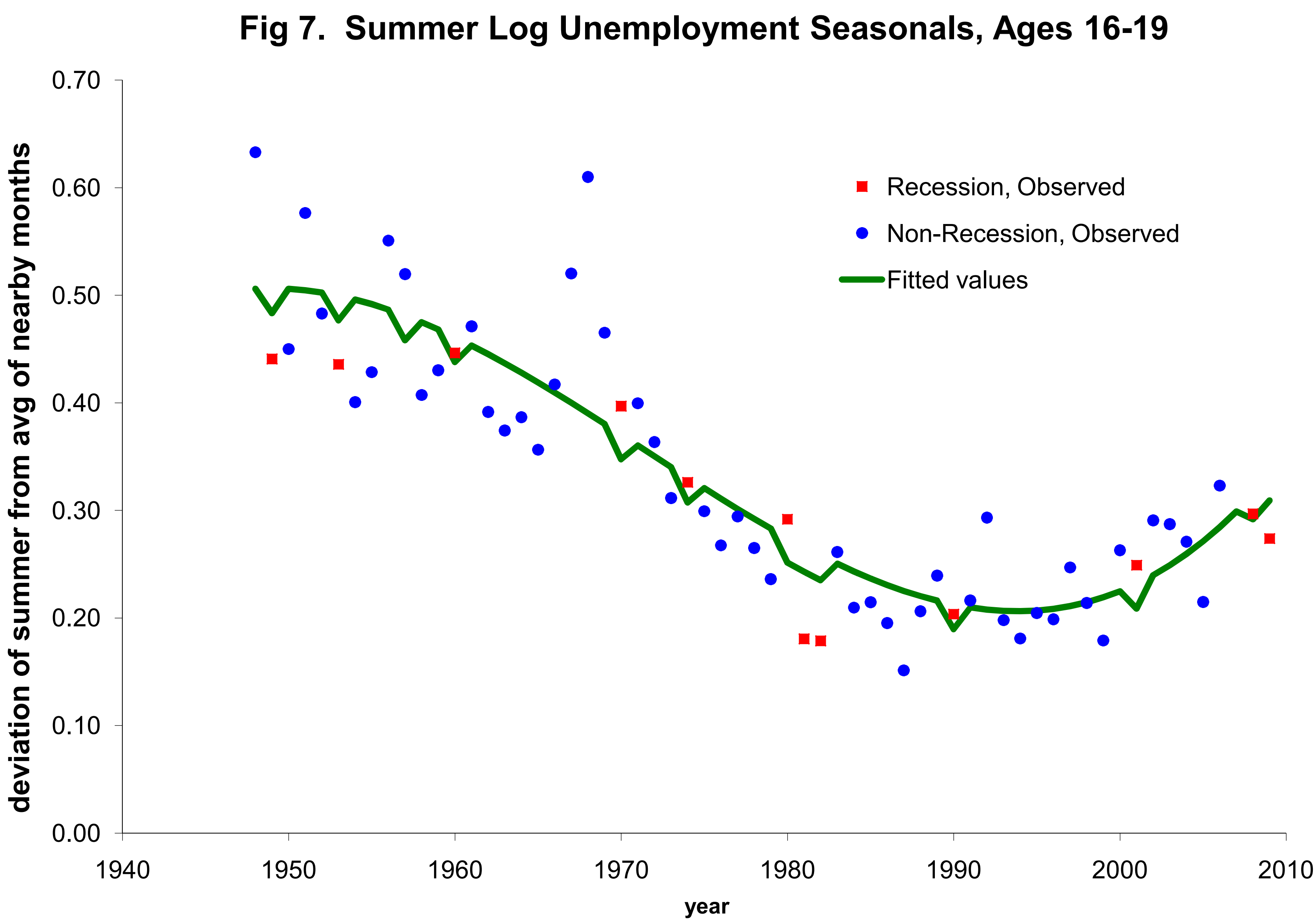
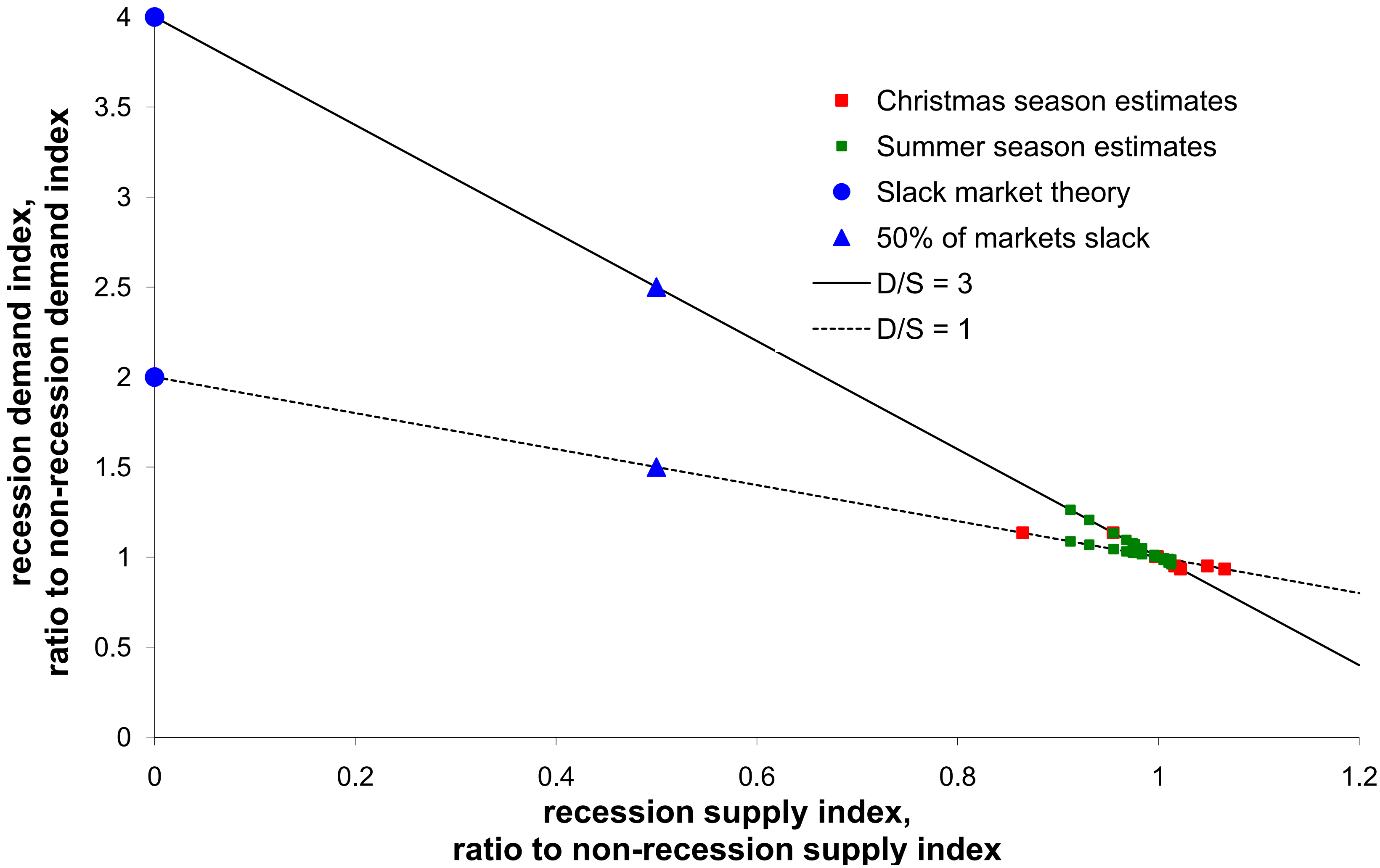


Fig 7. Summer Log Unemployment Seasonals, Ages 16-19
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
deviation of summer from avg of nearby months
1940
1950
1960
1970
1980
1990
2000
2010
year
Recession, Observed
Non-Recession, Observed
Fitted values

Fig 8. The Incidence Parameter has Little or No Business Cycle



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