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ORIGINAL PAPER

Hysteresis and persistent long-term unemployment: the American Beveridge Curve of the Great Depression and World War II

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Abstract Long-term unemployment plagued the American economy of the Great Depression. The stigma of a long unemployment spell made reentering employment difficult even during the brisk economic recovery, which lead to unemployment hysteresis and persistently high joblessness. Unemployment figures disaggregated by duration confirm the importance of hysteresis for the Great Depression, as the long-term unemployed were less likely to return to gainful employment until the war. Using the theoretical framework of the Beveridge Curve, I find that hysteresis was a significant problem during the 1930s, but that the essentially unlimited labor demand during the World War II provided jobs even to the long-term unemployed. As a result, labor market conditions in the 1950s resembled those of the 1920s prior to the Depression and so the labor market scars of the Great Depression were healed.

Keywords Unemployment · Great Depression · Beveridge Curve · Hysteresis

JEL Classification N12 · J60 · E32

The results are striking: the interwar United States is characterized by pure hysteresis, with a completely insignificant [unemployment] level effect.

Gordon and Schultze (1988, p. 300)

Larry Ball, Jon Faust, Martha Starr, Evan Kraft, Bob Feinberg, Alan Isaac, John Parman, Henry Hyatt, and seminar audiences at Johns Hopkins, George Mason University, the College of William and Mary, the Census Bureau, the Social Science History Association, the Southern Economic Association Meetings, and American University provided useful comments.

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Hysteresis appears to be an important feature of American depression.
Blanchard and Summers (1986, p. 69)

1 Introduction

Long-term unemployment was perhaps the most pressing problem facing policymakers during the Great Depression. Indeed, a primary focus of relief efforts under the New Deal programs of the 1930s was to provide unemployment for those long-term unemployed who had been out of work for years and had little hope of reemployment. Jensen (1989) labeled these intractably unemployed as the "hard-core" unemployed, and estimated that they represented roughly 10% of the labor force from 1934 to 1939. This made the hard-core unemployed a plurality of total unemployment, which ranged from 14.3 to 22% over the same period. Woytinsky (1942) also uses a similar appellation of "hard-core" unemployed for the unemployed and unemployable, and finds that already by 1930 in Buffalo the long-term unemployed were 15% of the overall unemployment pool.[1] Bakke conducted a multi-year survey to see the effects of the Depression on the unemployed in England. Both employers and employees confirmed that the long-term unemployed of the time faced much more difficulty in finding work than the recently unemployed: "[T]he longer a man was out of work, the harder it was to get work" (Bakke 1933, p. 50).[2]

Contemporary observers of the problem of long-term unemployment came up with several competing explanations. One explanation, technological unemployment, held that technological progress had outstripped the capacity of the workforce to adapt, such that unemployment would persist even in the face of an economic recovery from the Depression (Clague 1935; Lonigan 1939; Woirol 1996). This view found support even among top policymakers of the time: "I suppose that all scientific progress is, in the long run, beneficial, yet the very speed and efficiency of scientific progress in industry has created present evils, chief among which is that of unemployment" (Roosevelt 1936). The other theory argued that the long-term unemployed were considered poor candidates for reemployment by employers due to their long period of joblessness, which kept them persistently unemployed.

Blanchard and Summers (1986) outlined an alternative to the technological theory, that of "hysteresis in unemployment." Negative macroeconomic shocks allow high unemployment to develop, which meant that the large numbers of long-

[1] The situation would undoubtedly worsen by later in the decade, though data are not available from Buffalo to examine this possibility.

[2] "Works managers in Greenwich testified that even a short period of unemployment handicapped a man in his efforts to market his labour. There was, first of all, the preference that the employer had for the man who had just come from a job. In all probability he would be more competent than a man who had been away from his tools for some period. The handicap increased with the length of time out of work. ...[T]he complaint was made even among the labourers that the man just out of a job was given the preference. ...The general impression among the men was that the chances of getting a job were inversely proportional to the number of men who had come out since they were discharged" (Bakke 1933, pp. 50–51).

term unemployed now face discrimination by employers.[3] As job openings would not be filled by these long-term unemployed, the duration of unemployment reached record levels, sometimes as high as 5–6 years.[4] This implied that the natural rate of unemployment would rise with the actual unemployment rate (Phelps 1994). Gordon (1989) tested this theory, arguing that hysteresis would imply that the inflation rate is determined not by the level of output, which is the standard Phillips Curve relationship, but instead inflation is determined by the change in output. Gordon and Schultze (1988) extends this analysis the late American economy of the late 1930s once hysteresis had set in, and found strong support for hysteresis during the American Great Depression, which was also a finding of Blanchard and Summers (1986). Crafts (1989) finds that the long-term unemployed did not exert downward wage pressure and this led to a rise to the British NAIRU from 1925 to 1939. Ball (2009) finds support for hysteresis after the most recent recession. This paper contributes to this debate using alternative evidence based not on the relationship between the unemployment rate and the inflation rate, but on the relationship between the unemployment rate and the job opening rate, otherwise known as the Beveridge Curve.

The Beveridge Curve[5] (BC) is the downward sloping relationship between the job opening rate and the vacancy rate, and provides an alternative method to analyze hysteresis which will be fully explored in this paper. During a recession, few jobs will be posted at the same time as the unemployment rate is high. During a boom, employers will have a high job opening rate, while the unemployment rate will be low. This traces out a locus of points which are downward sloping and convex to the origin, which describes a Beveridge Curve over a business cycle with movements *along* the curve. However, holding business cycle conditions constant, it is possible to observe shift of the BC or movements *of* the curve itself (Dow and Dicks-Mireaux 1958; Blanchard and Diamond 1990) as was observed for many European countries in the 1980s (Nickell et al. 2003). If the BC shifts outward, then workers are having a harder time being matched to job openings. This represents a worsening in the job matching process, which will cause both the unemployment rate and the job opening rate to be higher in equilibrium, and vice versa for an inward shift of the Beveridge Curve. While many theories have been developed to explain shifts in the Beveridge Curve, the classes of theories can be grouped into roughly two categories, mirroring the categories of explanations for long-term unemployment: structuralist and hysteretic.

Shifts of the Beveridge Curve are often assumed to be related to nondemand factors such as "maladjustment" even in the earliest paper on the Beveridge Curve (Dow and Dicks-Mireaux 1958). This class of explanations for mismatch in labor markets includes sectoral shocks to or technological changes in the labor market

[3] Blanchard and Wolfers (2000) provide an overview of these arguments and a strong case for the interaction between adverse shocks and inflexible labor market institutions. Ljungqvist and Sargent (1998) provide an example of a structuralist view on the European unemployment problem of the 1980s.

[4] See Table 1 for some evidence to this effect from Philadelphia.

[5] This curve is often attributed to Beveridge (1944), though it is not explicitly defined in that book and should perhaps instead be attributed to Dow and Dicks-Mireaux (1958) where the unemployment–vacancy relationship is discussed at length.

which make employers' needs less well matched to workers' skills (Entorf 1994; Jackman and Savouri 1999; Kocherlakota 2010), which I will call "structural mismatch." Workers' skills could be a poor match for employers' needs, inexperienced young workers may not be good fits for positions requiring more experienced workers (Jackman and Savouri 1999), workers could be in sectors which need to shrink, while job openings are instead in growing sectors (Barnichon et al. 2012),[6] or unemployed workers could be located far from a booming region where many job vacancies are available (Rogers 1997).[7]

All these types of mismatch unemployment may be present simultaneously, and this mismatch causes unemployment to rise as the unemployed flow out of unemployment more slowly (Sahin et al. 2014). Structural mismatch cannot be addressed by demand-side stimulus, but can only be addressed by the passage of time (Kocherlakota 2010) or through structural reforms which improve labor market performance (Jackman et al. 1990; Nickell 1997; Nickell and Layard 1999), and thus the increase in the unemployment rate is primarily an increase in the "natural rate" of unemployment (Daly et al. 2012). Additional factors that might cause a similar shift in the BC would be increases in unemployment benefits which reduce search effort (Benjamin and Kochin 1979; Katz and Meyer 1990; Hagedorn et al. 2013; Farber and Valletta 2015).[8]

An alternative theory would be that these shifts in the Beveridge Curve are due to hysteresis in unemployment, working through the difficulties in matching the long-term unemployed to permanent employment. As the long-term unemployment is viewed as poor candidates for employment, the unemployment rate remains elevated, while job vacancies remain open longer as employers prefer to hire the recently unemployed or the currently employed. One way that this hypothesis has been tested for the current recession is by disaggregating the Beveridge Curve by duration, so that there is a separate BC for the short-term and long-term unemployed. If sectoral factors are salient, then the BC should shift outward for both the long-term and short-term unemployed. However, if hysteresis is the primary driver of this mismatch, then the Beveridge Curve should not shift outward for the short-term unemployed, while it should shift outward for the long-term unemployed. This decomposition has been performed for the most recent recovery in Ghayad (2013a). The aggregate Beveridge Curve shifted out, as shown in Fig. 1. However, the Beveridge Curve for the short-term unemployed shows no change in the wake of the 2007–2009 recession, while the BC for the long-term unemployed shifts out decisively, as shown in Fig. 2.

[6] The economist John Cochrane voiced support for this view in a recent interview: "When we discover we made too many houses in Nevada some people are going to have to move to different jobs, and it is going to take them a while of looking to find the right job for them. There will be some unemployment" (Cassidy 2010).

[7] In the 1930s an example would be the numerous jobs available in agriculture in California, while farmers could not find work in states affected by the Dust Bowl (Gregory 1991) or more recently the example of steelworkers in Pittsburgh who must become nurses in a different city (Shimer 2007).

[8] Unemployment benefits only begin at the state level in Wisconsin in 1932 and at the national level in 1935, so this would not have played much of a role in the early phases of the Depression (Price 1985).

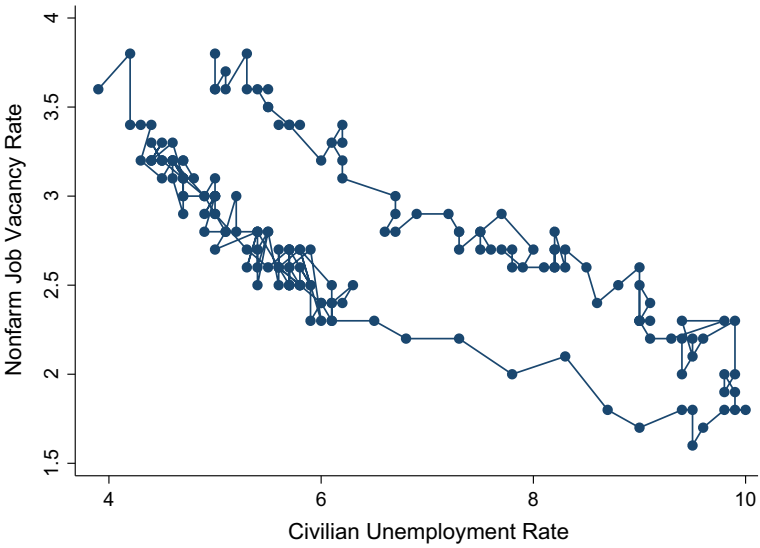

Fig. 1 Beveridge Curve: 2000–2015. *Notes* Unemployment rate from BLS and nonfarm job vacancy rate from the BLS JOLTS dataset. All data monthly

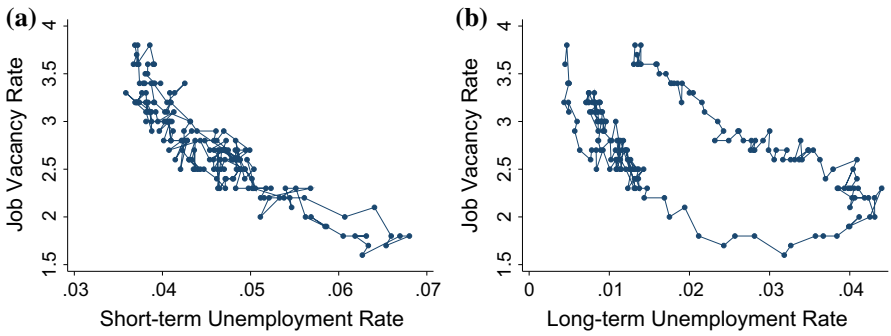

Fig. 2 Beveridge Curve for short-term (**a**) and long-term (**b**) unemployment: 2000–2015. *Notes* Short-term unemployed are unemployed for 26 weeks or less, and long-term unemployed are unemployed for 27 weeks or more. Reproduction of chart in Ghayad (2013a), based on BLS unemployment rate and JOLTS data

This paper will contribute to this debate by combining monthly data on unemployment rates, unemployment duration, and job openings to address this issue. A Beveridge Curve is constructed monthly and annually for the period 1930–1953 which, to the best of my knowledge, is a new contribution to the literature. The position of the BC is quantified to separate movements along the curve from movement of the curve. During the 1930s the Beveridge Curve shifts outward when output is falling. During the slow recovery, the Beveridge Curve shifts inward slowly (and incompletely). World War II rapidly makes matching more efficient, as the effectively infinite labor demand of the World War II

decisively ended the problem of long-term unemployment, overcoming the hurdles the long-term unemployed faced in rejoining labor markets. The postwar demobilization does correspond to a brief outward shift as sectoral reallocation took some time before job vacancies in civilian sectors absorbed job seekers formerly in the military or munitions production. On net, the 1950s see a return to a similar Beveridge Curve as the 1920s, with wartime demand sufficient to reverse the labor market scarring of the Great Depression.

2 Theories of persistent unemployment

There are several dimensions to hysteresis, whose origins can be traced to the physical sciences and, at its simplest, implies that there is path dependence, where previous values of a variable are important for determining present values of that variables (Isaac 1994). Hysteresis has been applied to many other subjects like trade and investment.[9] Indeed, hysteresis implies that the natural rate of unemployment consistent with stable inflation (or NAIRU) will be dependent on how high unemployment was in the recent past.[10] High unemployment will tend to persist in the form of a higher NAIRU, as shown by Layard et al. (2005) and Daly et al. (2012). This phenomenon is also often referred to as unemployment scarring, as the damage done by high unemployment does not heal fully after the recovery (Arulampalam et al. 2001).

Blanchard and Summers (1987) discussed several possible explanations for persistently high unemployment. One is that a lack of investment would then lead to decreased labor demand, which would help explain higher unemployment. The capital stock did shrink during the 1930s due to the investment collapse during the Great Contraction and weak investment during the recovery,[11] so these factors could have played a role in the late 1930s. Another possibility is that of insider–outsider unemployment, as discussed in Lindbeck and Snower (1988), where insiders (either the members of labor unions or the employed more generally) push for high wages. This benefits insiders who receive higher wages but harms the unemployed outsiders, who would prefer employment at lower wages to unemployment.[12] Given that wages were somewhat slow to fall in the Great Depression, especially in 1929–1931, and wages rose during the recovery of 1933–1937 despite double-digit unemployment (Bordo et al. 2000; Cole and Ohanian 1999), this argument seems *prima facie* plausible, though it would clearly interact with unemployment scarring in keeping the unemployed out of work for longer periods.

Another factor underlying persistent long-term unemployment is unobserved heterogeneity, as in Ahn and Hamilton (2014) and Jarosch and Pilossoph (2015),

[9] See Baldwin (1988), Dixit (1989), Franz (1990), Dixit (1992), Feinberg (1992), and Cross (1993).

[10] See Friedman (1968), Phelps (1967, 1968), Blanchard and Katz (1997), Ball and Gregory Mankiw (2002).

[11] See (Kendrick 1961, p. 320).

[12] Labor unions lobbied the Roosevelt administration to block job retraining programs for those hired on emergency job programs like the WPA as there were already too few jobs for the skilled union workers that made up their membership (Jensen 1989, p. 577).

where poor-quality workers are more likely to be unemployed for longer periods of time in response to a negative aggregate labor demand shocks as a direct result of their poor quality. An alternative theory might be that similar workers differ in how long they are unemployed based on random chance, but that the long-term unemployed face a stigma with employers that prevents them from finding new work easily, so they remain unemployed (Eriksson and Rooth 2014).[13] There have been several attempts to distinguish between unobserved heterogeneity and duration dependence (Heckman 1991; Jackman and Layard 1991; Van den Berg and Van Ours 1996; Machin and Manning 1999).[14]

There are several reasons that duration dependence might arise. As longer unemployment spells tend to occur because employers have not hired an unemployed person several times, there can be a stigma effect where the long-term unemployed are seen as lower-quality workers, which is formalized in Doppelt (2014). Layard et al. (2005, pp. 258–266) discuss several reasons why employers might discriminate against the long-term unemployed, such as demotivation and demoralization among the unemployed (for which they find extensive support in the literature), which gives employers' discrimination against the long-term unemployed some justification. They also examine the behavior of exit rates from unemployment, which tend to be lower among the long-term unemployed especially after periods of high overall unemployment, which is consistent with duration dependence, and not based on heterogeneity between various groups of workers, i.e., that the long-term unemployed differ systematically from the short-term unemployed. Duration dependence can also arise from the depreciation of the human capital of the long-term unemployed as the unemployed are not able to practice their skills (Pissarides 1992; Acemoglu 1995). The long-term unemployed may also exert less effort in searching (Elsby et al. 2010; Faberman and Kudlyak 2014).

While many workers who experience involuntary unemployment during prosperous periods are selected (negatively) based on their quality, a larger share of workers experience involuntary job separations due to weak demand during recessions, which should reduce the quality signal from duration during downturns as shown in Gibbons and Katz (1991), Biewen and Steffes (2010), and Nakamura (2008). During the Great Depression, this effect was undoubtedly important. However, given the large numbers of unemployed relative to the few job vacancies, employers could easily fill positions from the rank of the recently unemployed or already employed. Thus even a mild stigma could still greatly lengthen unemployment duration.[15] The long-term unemployed, once a vanishingly small part of the workforce, became a plurality of the unemployed during the Depression.

[13] Note that both theories will generate hysteresis in unemployment as an inpulse to the unemployment rate will tend to persist due to this discrimination on the part of employers.

[14] I do not stress the term structural unemployment as the many long-term unemployed are in some sense structurally unemployed, as there are reasons other than current business cycle conditions impeding their employment. However, with sustained labor demand for such a large magnitude even the long-term unemployed will be hired, so they represent an intermediate case. As argued in Standing (1983), discussions of structural unemployment in this context are often muddled and unclear.

[15] This effect can be seen in the ranking model of Blanchard and Diamond (1994). A model of stigma for the long-term unemployed is presented in Vishwanath (1989), which predicts lower exit rates from unemployment for the long-term unemployed.

However, Woytinsky discusses an additional effect which would increase stigma during a deep recession, which relates to the changing composition of job separations (Woytinsky 1942, p. 55). While during normal times a large fraction of the flows to unemployment result from voluntary separations (such as quits), during a deep downturn like the Great Depression the quit rate falls due to poor employment prospects for the unemployed at the same time as involuntary separations for economic reasons (like layoffs) increase. As quitting workers are generally expecting to find better jobs, they tend to be higher-quality workers, so the reduction in the quit rate tends to reduce the average quality of the pool of unemployed.

As the long-term unemployed were not seriously considered as potential employees, they did not represent labor market slack in the same way as the short-term employed did. Layard et al. (2005) find that the long-term unemployed have less of a downward effect on prices and tend to keep the unemployment rate high: "In other words, the long-term unemployed are much less effective inflation-fighters, since they are not part of the effective labour supply." (Layard et al. 2005, p. 39) This result can also be found in Ball et al. (1999, p. 232), and is part of the hysteresis effect working through long-term unemployment. Farber (2011) find that those unemployed during the 2007–2009 period had low probabilities of reemployment and difficulty finding full-time employment. Kroft et al. (2013) and Eriksson and Rooth (2014) found similar results using similar experimental methods. Experimental evidence from Oberholzer-Gee (2008) shows that fake resumes that are identical except for duration of unemployment result in significantly fewer callbacks. Similarly, Ghayad (2013b) sent out fake job applications that varied based on duration of unemployment and the possession of skills relevant for job postings, and found that unemployment duration was a much more important determinant than skill match between job and applicant.

3 Beveridge Curve

The Beveridge Curve (Dow and Dicks-Mireaux 1958; Blanchard and Diamond 1990), which relates changes in job openings to unemployment, is the most useful way to examine labor market issues of this type as it allows for business cycle conditions to be separated from other factors that affect the labor market. The relationship between job openings and the unemployment over the business cycle is fairly intuitive. During a business cycle downturn, unemployment is high, while employers offer relatively few job openings. Near a business cycle peak unemployment is low and employers offer many job openings to increase production. This describes a single Beveridge Curve over the business cycle. It is possible, as well, to observe shifts in the Beveridge Curve. An outward shift of the BC, which corresponds with a worsening of job matching, will mean both more job openings and a higher unemployment rate as unemployed workers are matched to job vacancies at a slower rate at any of the business cycle. Similarly, a shift toward the origin of the Beveridge Curve will correspond to the unemployed being matched to jobs at an increasing rate. I use a standard Beveridge Curve formulation of a

Cobb–Douglas function with the unemployment rate and job vacancies as arguments following Pissarides (2000).[16]

3.1 Beveridge Curve data

Constructing a BC requires figures for the job vacancy rate and the unemployment rate. The job opening data are drawn from the work of Zagorsky (1998), who constructs a job vacancy rate from 1923 to 1994 based on help-wanted indexes. Nationally representative job vacancy and other labor turnover series are only collected beginning in 2000. Estimates of job vacancies based on newspaper help-wanted ads historically have used to estimate job opening rates (Barnichon 2010). One such index was initially collected by the Metropolitan Life Insurance Company (Metlife), which will largely cover this period of interest for this study, and the Conference Board continued the series in the postwar. From 1929 through 1926 25–30 newspapers are included in the Metlife index and coverage expands to 100 newspapers from 1927 to the 1940s. The Metlife index is formed by combining the percent changes in help-wanted ads across the newspapers considered, and then the series is normalized to $100 = 1947-1949$. The help-wanted index is the benchmarked to an actual vacancy series using a survey from 1961 to 1962 (Abraham and Wachter 1987), and the vacancy rate is adjusted for growth in the labor force.

While the Lebergott/Census figures are available at an annual frequency for 1929–1940, similar methods as used by Lebergott can be used to construct monthly series based on employment and labor force data collected by governmental agencies. While I examined several series, the series from the National Industrial Conference Board conformed most closely to the annual estimates of Lebergott. These estimates were published in National Industrial Conference Board (1940) and other issues of the Conference Board's *Economic Record*. All estimates follow roughly the same procedure. Nonagricultural employment figures are available from the Bureau of Labor Statistics (BLS) at a monthly frequency back to 1929. Agricultural employment is available from the Department of Agriculture monthly, and the sum of these two series makes up total employment. The labor force is derived from interpolated estimates of decennial censuses. Unemployment is then the difference between employment and the labor force, and the unemployment rate is the ratio of unemployment to the labor force.[17]

The Conference Board figures can be used to calculate two estimates of unemployment. The first classifies workers on emergency relief employment programs like the Works Progress Administration (WPA) and the Civilian Conservation Corps (CCC) as unemployed workers, consistent with the method of Lebergott (1964), and another which counts these emergency workers as employed, consistent with the method of Darby (1976). These annual unemployment rates can be seen in Fig. 3, and the monthly series are displayed immediately

[16] If there were data on hiring rates for the period and if the assumption of a stable unemployment rate was satisfied, then a matching efficiency term could be derived, which would define an isoquant.

[17] Note that there are no discouraged workers here, and any nonemployed "gainful" worker counts as unemployed even if they are not actively seeking employment.

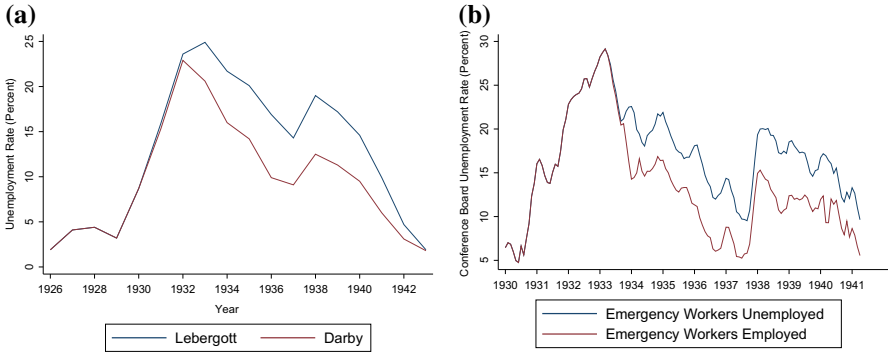

Fig. 3 Great Depression unemployment rate, with (*blue*) and without (*red*) emergency workers on New Deal employment programs included among the unemployed. *Notes* Lebergott counts WPA workers as unemployed in his unemployment rate, while Darby counts WPA workers as employed in his unemployment rate. Monthly data from Conference Board counts emergency workers as unemployed, author's calculations for series with emergency workers as employed. *Source*: Lebergott (1964), Darby (1975), National Industrial Conference Board, *Economic Record*, June 1940 and subsequent issues (color figure online)

to their right. 1940 sees the beginning of the Current Population Survey (CPS), which was initially under the control of the WPA but was soon transferred to BLS administration.[18] While the definitions of unemployment, employment, and the labor force are not identical to those of the current BLS definition post-1948, the two series conform closely for the months in 1948 when they overlap. Official unemployment rate data begin in 1948 and are used to examine labor market conditions in the immediate postwar for comparison.

The construction of historical unemployment rate series requires some assumptions and interpolations that introduce potential errors. Romer (1986) discusses how these measurement errors can generate spurious volatility in the historical unemployment rate series. Romer focused her analysis on the pre-1930 period to compare to the postwar to see whether postwar volatility was truly lower than pre-Depression volatility if both data series were constructed in similar ways. She also compared her estimates to those of Lebergott (1964), who constructed the unemployment rate based on interpolated estimates of the labor force and sectoral indexes of employment which were combined to create an aggregate employment series back to 1890.[19] The Conference Board series does not rely on sectoral employment estimates as the BLS in 1930 began publishing data for nonagricultural employment based on the BLS establishment survey as discussed in Wallis (1989). Combining these numbers with agricultural employment data from the Department of Agriculture and labor force interpolations from the Census as described in Nixon and Samuelson (1940) provides a series with fewer errors than those Romer discussed for the pre-1930 period. The American Federation of Labor (AFL 1936) and the author (Mathy 2016) also computed their own series using similar methods

[18] To complicate things further, the Census Bureau performed the direct work of conducting the survey.

[19] Weir (1992) revisits these estimates and improves upon the Lebergott series.

with slightly different assumptions about the labor force and agricultural employment.

The lack of a need to advertise job openings during the Depression when employers were reducing their labor input can also generate some measurement error. Given that many unemployed were looking for each job opening and were expending extensive search effort, posting a vacancy would not require paying for help-wanted advertising and jobs would be solicited by the unemployed themselves. Additionally, firms facing dismal sales prospects were cutting back on expenses including all types of advertising expenses which would certainly reduced help-wanted advertising budgets. Indeed, the vacancy rate was near zero during much of the 1930s, and thus variations in actual job openings would not necessarily be captured by this vacancy series in the same way as it would during periods of lower slack. Moreover, with the job opening rate near zero, measurement error would be relatively more significant. Despite these caveats, the Zagorsky vacancy series does capture changes in labor demand effectively even during this period.

Woytinsky (1940) was the first to propose the "added-worker" effect. This effect arises when a male head-of-household becomes unemployed and other members of his household will enter the labor force and search for employment to replace his lost income. Woytinsky compared labor force participation for families of differing sizes in Philadelphia, and found that larger families had larger labor supply, with unemployed male breadwinners sending their wives and children to work to replace their income. As this makes the interpolated labor force estimates lower-bounds, this would, if anything make actual unemployment *larger* than the above estimates as unemployment is the difference between employment and the labor force. This also implies that the outward shift of the Beveridge Curve is more pronounced than described above if unemployment is higher than estimated, and makes these findings likely underestimates.[20]

The annual unemployment rate–vacancy rate dyads for 1926–1941 are plotted in Fig. 4. The unemployment rate–vacancy rate pairs for the 1920s fall in the upper left portion of the graph, while those for the 1930s fall in the lower right. Two lines are plotted, which are based on extrapolating the percent changes in the vacancy rate and the unemployment rate between the 1926–1929 period (pre-Depression normalcy) and the 1933–1937 recovery. Comparing two nonrecessionary periods shows that this shift is not an artifact of the downturn phase of 1929–1933. However, this severe recession does cause a scarring effect so that the postwar recovery, despite seeing some of the fastest GDP growth outside of wartime in US history, still had a persistent long-term unemployment problem as the Beveridge Curve shifted outward. While this exercise is informative, the following section will quantify the shifts in the Beveridge Curve for this period more rigorously.

[20] The likely possibility of procyclical labor force participation also figures prominently in Romer (1986)'s argument for spurious volatility in unemployment rates.

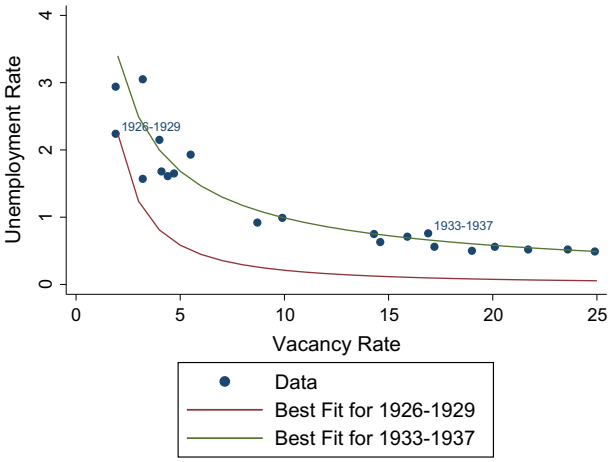

Fig. 4 Beveridge Curve 1926–1941. *Notes* Vacancy rate from Zagorsky (1998) and unemployment rate from Lebergott (1957). *Lines* are extrapolation of percent changes in job opening rate and unemployment rate between 1926–1929 and 1933–1937

3.2 Quantifying Beveridge Curve shifts

A Beveridge Curve is defined by the plotting of data points for the job vacancy rate and unemployment over a business cycle, as described above. As this relationship is convex to the origin, a common functional form for the Beveridge Curve is of the Cobb–Douglass form in the unemployment rate and the vacancy rate, which finds support in Petrongolo and Pissarides (2001). By specifying a functional form, changes in observed unemployment–vacancy dyads can be separated into movement along a given Beveridge Curve and shifts of the Curve itself. The Beveridge Curve is defined as a Cobb–Douglass functional form over the unemployment rate u_t, the job vacancy rate v_t, and a variable b_t which represents the position of the Beveridge Curve isoquant, or

$$b_t = u_t^{\alpha} v_t^{1-\alpha}. \tag{1}$$

3.3 Calibration

I calibrate these coefficients in two stages. First I estimate the coefficients for the Beveridge Curve using postwar data. Data on unemployment are drawn from the BLS. Data on vacancies are drawn from Zagorsky (1998). For simplicity, I will use the Cobb–Douglas form of Eq. 1 above. As labor markets do not show scale effects, it is a reasonable assumption that Beveridge Curve relationships would not vary with scale and thus the coefficients on unemployment and vacancies would sum to one. As B is simply a constant that represents the position of the Beveridge Curve, this is assumed to be a time-invariant, which implies that there is a single Beveridge Curve. Next I take logarithms and changes, which results in the following expression,

$$0 = \alpha \Delta ln(u_t) + (1 - \alpha)\Delta ln(v_t), \tag{2}$$

which can be rewritten as

$$\frac{\Delta ln(v_t)}{\Delta ln(u_t)} = \frac{\alpha}{1 - \alpha} \tag{3}$$

Letting ψ_t represent the ratio on the left-hand side, we obtain the following

$$\alpha_t = \frac{\psi_t}{\psi_t - 1} \tag{4}$$

Using a difference of 12-month yields n estimate of α of 0.5016561, and for a 24-month difference I obtain .5185415. As these are very close to the 0.5 generally used in the literature, I will use coefficients of 0.5 and 0.5 on the unemployment rate and the vacancy rate.

4 Results

I compare the behavior of the Beveridge Curve's Position over the business cycle and compare the data to the predictions of the structural and hysteretic theories. This is a test in the spirit of Gordon and Schultze (1988) who examines these two types of theories ("structuralist" versus "hysteresis") for the European unemployment experience of the 1980s. The hysteresis hypothesis would predict that matching efficiency should worsen during a downturn as long-term unemployment rise. Matching efficiency should also improve when the economy recovers as the long-term unemployed will then transition into employment. Structural mismatch theories do not predict any relation between matching efficiency and the business cycle, as the degree of mismatch is orthogonal to business cycle conditions. Once we control for the movements of the business cycle, we can see clearly the considerable outward shift of the BC in Fig. 5, which occurs during the 1929–1933 collapse in output.[21] Recovery begins in 1933, but it is not strong enough to reemploy the long-term unemployed quickly and unemployment stays high.

The evolution of the position of the Beveridge Curve shows clear evidence for the hysteresis theory and is not supportive of a structural explanation. The Beveridge Curve shifts outward during the 1929–1933 Great Collapse, shifts inward slightly somewhat during the 1933–1941 recovery period,[22] and shifts back inward massively during the wartime boom. Only the start of American mobilization for the World War II and the massive labor demand it engendered shifted the Beveridge Curve inward. As anyone, even minorities, women, and the long-term unemployed

[21] For robustness, I include alternatives to the BCP estimates from the Conference Board series in the form of the American Federation of Labor monthly unemployment series and the author's own calculations of a monthly unemployment rate. The results are little changes by the choice of unemployment rate.

[22] 1937–1938 was a sharp but brief recessionary period which does not seem to have lasted long enough to have had a significant hysteretic effect.

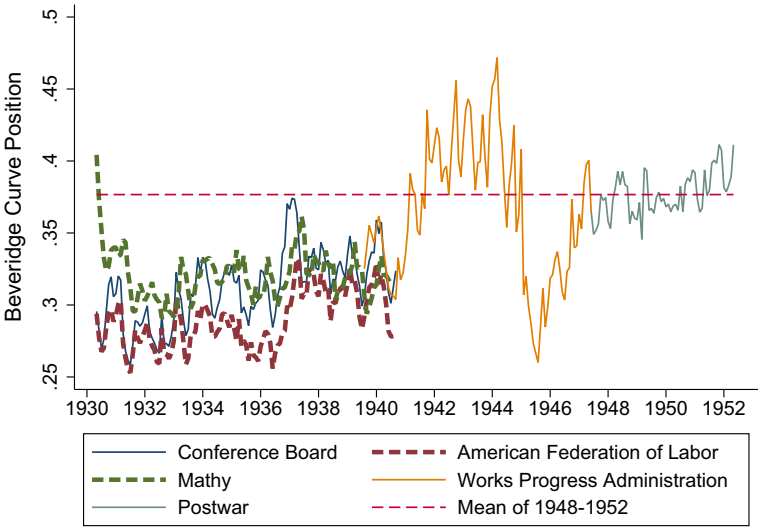

Fig. 5 Beveridge Curve Position: 1929–1953. *Notes* Author's calculations of Beveridge Curve isoquant using a Cobb–Douglass functional form of the unemployment rate and the vacancy rate and exponents of $\frac{1}{2}$. *Blue line* uses monthly unemployment rate from Conference Board for 1930–1940, *green dashed line* uses monthly unemployment rate calculated by author, *burgundy dashed line* uses American Federation of Labor monthly unemployment rate for 1930–1940, *yellow line* uses WPA unemployment estimates for 1940–1947, and *azure line* uses official BLS figures starting in 1948. Zagorsky (1998) figures used for vacancy rate in all periods. *Horizontal dotted line* is mean estimated Beveridge Curve Position for 1948–1952 for comparison (color figure online)

could find employment during the war, the scars on the labor market were able to be healed on the domestic front.[23]

The ability of an increase in aggregate demand to reverse hysteresis is also consistent with evidence presented in Ball et al. (1999), where persistent increases in demand can undo the effects of hysteresis. This is consistent with the evidence in Diamond and Şahin (2015), who find that the Beveridge Curve shifts out after recessions and shifts in during recoveries in the postwar.[24] Margo (1991) also finds the same result that the persistently high demand during the war overcame the stigma of long-term unemployment.

While these authors could find this effect even among the relatively small changes in demand during the postwar, the demand increase during the World War II is an order of magnitude larger than any change seen in postwar data. In 1945, about half of GDP was going toward the war effort (Congress 1944a). While the

[23] The shift in priorities from creating more employment to deal with a surplus a unemployed workers, which was the problem of the 1930s, to the priority of creating more war material given a rapidly diminishing pool of surplus or unemployed workers in the early 1940s, makes for a stark contrast. The possibilities for increasing war production using the unemployed and any available worker are discussed extensively in the reports of the Office of War Mobilization and Reconversion.

[24] Diamond and Şahin (2015) argue that this means that shifts in the Beveridge Curve are not very informative about structural changes in the economy in terms of a natural rate of unemployment, but these regular shifts related to the business cycle can be adequately explained by a hysteresis-based explanation such as the one presented in this paper.

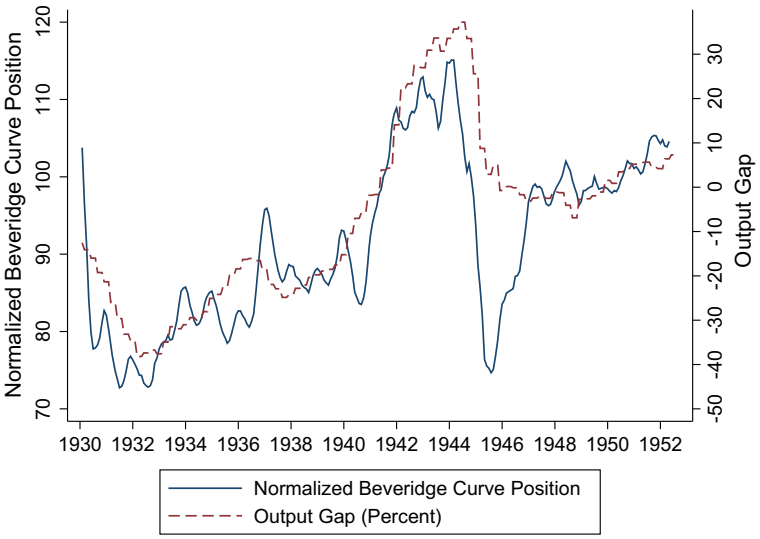

Fig. 6 Smoothed Beveridge Curve Position: 1929–1953. *Notes* Author's calculations of Beveridge Curve isoquant using a Cobb–Douglass functional form of the unemployment rate and the vacancy rate. Estimated Beveridge Curve Position is smoothed with a 7-month moving average. Output gap is percent difference between actual and potential GDP from Gordon and Krenn (2010)

Beveridge Curve had shifted inward somewhat during the recovery, the war completed this shift and returned the Beveridge Curve to a position of normalcy after the war. Eriksson and Rooth (2014) find that the stigma of a long unemployment spell is persistent, but that subsequent employment can eliminate the stigma effect, consistent with the cleansing effect of wartime demand on the labor market. The US government was worried that returning veterans would face high unemployment due to a skills mismatch and just the sheer number of them returning home, as to put in place educational programs, training programs for both disabled and nondisabled veterans, and loans to purchase a home or business (Director 1946b, p. 21) (Congress 1944b, p. 16, 24). Fortunately, these fears were unfounded and returning veterans found work easily. Two million demobilized veterans were able to find work before Victory in Japan Day (August 15, 1945), and 8 million more were able to find work by October 1946, for a total of 10 million veterans employed (Director 1946a, p. 60).

Figure 6 shows a moving average of the BCP so that high-frequency fluctuation is smoothed out.[25] This moving average is plotted with estimates of the output gap, which shows a close connection between changes in output relative to trend and matching efficiency with the exception of the immediate postwar. This divergence can be attributed to structural factors, as mismatch increases when output is also

[25] The choice of using a was dictated to smooth out noise while minimizing the distortion of the underlying series. This method is preferred to seasonal adjustment due to issue related to seasonal adjustment as discussed in Wright (2013). A 7-month moving average, symmetric with three months on either side of the center month, was chosen visually to smooth seasonal variation without eliminating trends.

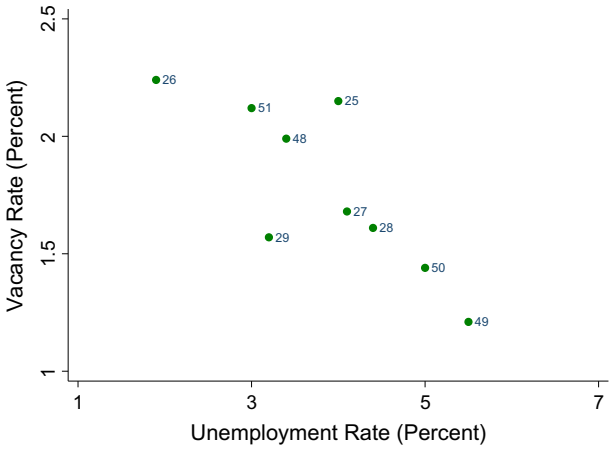

Fig. 7 Beveridge Curve for 1920s and postwar. *Notes* Vacancy rate from Zagorsky (1998) and unemployment rate from Lebergott (1957). Years listed are 1924–1929 and 1948–1951

high. After the war, demobilization was quick and relatively painless, but even so former soldiers had to return to their jobs, female workers returned to their households, and workers in munitions production shifted to jobs in other sectors.[26] Examining the behavior of the BCP in relation to the output gap gives results that confirm both intuition and the historical record. If wartime demand had not interceded to reverse hysteresis, perhaps Hansen (1939)'s fear of secular stagnation may have been realized, as hysteresis ossified and hardened into persistently slow growth and persistently high unemployment (Summers 2014).

By the early 1950s the American economy returned to normalcy and the Beveridge Curve had returned to its position during the 1920s, which can be seen in Fig. 7. The war, despite its great cost and the sacrifice involved, had cleared out the lingering problems in the American labor market resulting from the Great Depression and allowed a fresh start after the war. While I cannot perform a direct test of the structural hypothesis, it seems unlikely that structural problems would only present themselves coincidentally during a period of low demand. Furthermore, it seems implausible that the command-and-control economy of the 1940s would have been effective at eliminating severe structural misallocation, especially considering the large sectoral shifts required to move away from civilian market-based production to centrally planned military production. Figure 8 shows sample Beveridge Curves given the BCP for the representative years of 1928, 1933, 1944, and 1950. Once movements along the curve are separated from shifts of the curve itself, we can see that the BC shifts outward from 1928 through 1933, then shifts

[26] Concerns about veterans returning to high postwar unemployment were prominent among the framers of the GI Bill, which subsidized education for veterans which also kept them from the labor force for a few years (Olson 1973). Lawrence Klein was able to successfully forecast a rapid postwar recovery due to pent-up demand in sectors like consumer durables before the GI BIll was passed, so unemployment likely would have remained low even without the GI Bill (Woytinsky 1947).

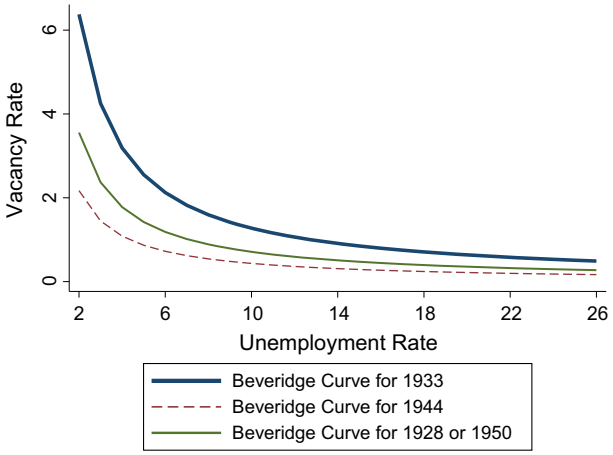

Fig. 8 Sample Beveridge Curves for 1928, 1933, 1944, and 1950. *Notes* Beveridge Curve Position calculated as a function of the unemployment rate and the vacancy rate using $(u_t v_t)^{-1/2}$. Numerically the isoquant for 1933 corresponds to 0.28, that of 1944 corresponds to 0.48, and the isoquants for both 1928 and 1950 are roughly 0.375. Job vacancy rates are from Zagorsky (1998), and unemployment rates are from National Industrial Conference Board, *Economic Record*, June 1940 and subsequent issues

inward through 1944, before shifting outward slightly so that the Beveridge Curve returns to its original position by 1950.

5 Evidence on duration

The Social Security Administration collected several estimates of unemployment duration from unemployment insurance records (Winslow 1938), which are displayed in Fig. 9. The share of the long-term unemployed rises steadily even as GDP rose again starting in 1933. An additional source for evidence on the inability of the long-term to exit joblessness is from several city-level studies published in a series of WPA reports which are reproduced in Woytinsky (1942). The first series chronologically is from Buffalo, where the unemployed were surveyed by year from 1929 to 1933. This period coincides with the NBER recession dates during the downturn phase of the Depression, and can be seen in Fig. 10. The short-term unemployment rate remains low as overall unemployment rose, which meant that those unemployed for more than one year quickly became the vast majority of the unemployed and about 20% of all gainful workers were unemployed. The longest series on duration during the Depression comes from Philadelphia (Palmer 1937) where the unemployed were surveyed from 1932 to 1938 with the exception of 1934. The evidence on duration can be seen in Fig. 11, with long-term unemployment staying very high even after unemployment began falling in 1933.

To confirm the importance of long-term unemployment as a driver of the hysteresis effect, a separate BC is constructed for unemployment by duration. If hysteresis is largely driven by long-term unemployment, then the Beveridge Curve

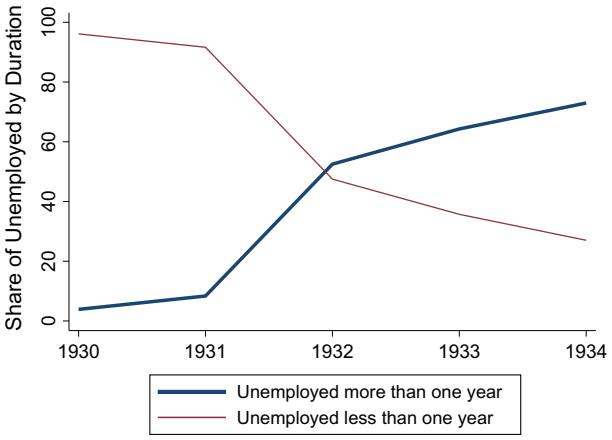

Fig. 9 National duration estimates 1930–1934. *Notes* Estimates are from Social Security Administration (Winslow 1938) based on employees covered by unemployment insurance

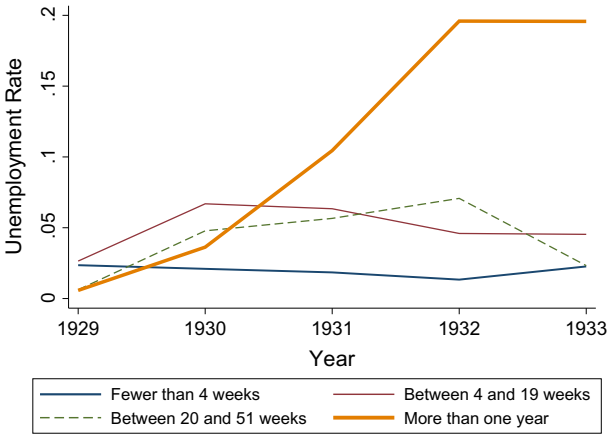

Fig. 10 Duration estimates for Buffalo 1929–1933. *Notes* Unemployment rate calculated by dividing difference between gainful workers and employed workers by number of gainful workers. 1930 Census does not have a labor force concept yet, so gainful workers are used instead, which includes the modern concept of the labor force as well as discouraged workers. *Source*: Woytinsky (1942)

should shift out for long-term unemployed, while no shift should be apparent for short-term unemployment. On the other hand, if structural factors are dominant, mismatch should increase for workers across all durations. The evidence regarding shifts in the Beveridge Curve of Ghayad (2013a) for the 2000s is reproduced in Fig. 2. The BC for the short-term unemployed is unchanged, while the outward shifts of the Beveridge Curve can be clearly seen uniquely among the long-term unemployed, showing the importance of long-term unemployment in explaining these shifts.

To deal with the problem of long-term unemployment, New Deal program to provide relief employment was implemented starting in 1933. Only one member of

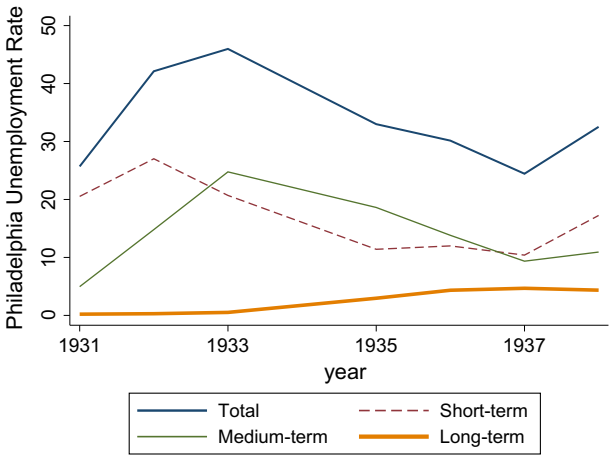

Fig. 11 Philadelphia unemployment rate by duration for the 1930s. *Notes* Short-term unemployed are unemployed for less than one year, medium-term unemployed are unemployed between one and five years, and long-term unemployed are unemployed for more than five years. Unemployment rate calculated by dividing difference between gainful workers and employed workers by number of gainful workers. The 1930 Census did not have a labor force concept, so gainful workers were used instead, which is effectively the sum of the modern concept of the labor force and discouraged workers. *Source*: Woytinsky (1942)

each family could participate, though over 7 million American through June 1939 participated in the Works Progress Administration (WPA) which built infrastructure like schools, roads, and bridges across the nation, with million more working on other programs like the Civilian Conservation Corps which worked on projects in national parks (WPA 1947, p. 6, 17). WPA workers suffered from an additional stigma relative to other long-term unemployed not on relief employment, as they were seen as displaying their type in resigning themselves to low-paid emergency work, with WPA workers stereotyped as lazy shovel leaners. This effect is confirmed by (Margo 1991, p. 339) who found that the long-term unemployed on emergency employment in states that had higher employment growth were no likelier to find employment, while the long-term unemployed who did not participate were more likely to find employment by 1940 in states with high employment growth. These WPA workers, though they were able to survive the Depression due to these programs, became "hard-core" unemployed, and they likely contributed to this outward Beveridge Curve shift seen in Philadelphia.

While women received training in the WPA for household work, men were not provided much training during the early years of these programs, though both men and women were trained once the defense buildup started in 1940. In October 1942 the WPA conducted a survey to see how many workers qualified for private employment. Fifty-three percent of the workers were immediately qualified for immediate employment in the private sector or war industries, and 27 percent would qualify under further training. These employment opportunities were a major reason the WPA was wound down in 1943, as labor demand and job retraining had combined to produce a situation where emergency employment was no longer

necessary (WPA 1947, p. 90, 92, 93). While this effect was evident for all after the war, wartime demand had already reversed hysteresis for the long-term unemployed by October 1942, ten months after the declaration of hostilities.

Similar evidence is presented for the Depression using data from Philadelphia. The WPA commissioned a report on labor market conditions in that city which provided evidence on unemployment by duration for the 1930s (Palmer 1937). While a local vacancy rate series is not available, national vacancies are used instead. The Beveridge Curve for the long-term unemployed in Philadelphia shifts outward, while the Beveridge Curve for the short-term unemployed actually shifts *inward* during this period as can be seen in Fig. 12. The importance of a reduction in matching efficiency among the long-term unemployed is confirmed for the Great Depression, which provides further support for the importance of hysteresis in unemployment and again provides little evidence in support of structural mismatch.

While these Philadelphia unemployment data do not track individuals and instead sample the unemployed in various years, the data on duration are broken down by number of years unemployed over the years 1932–1938 with the exception of 1934 which is missing. This allowed Woytinsky to calculate the transition probabilities of unemployed workers out of unemployment into employment by duration. As an

Fig. 12 Depression Beveridge Curves by duration of unemployment. *Notes* Short-term unemployed are unemployed for one year or less in Philadelphia. Medium-term unemployed are unemployed for between 1 and 5 years in Philadelphia. Long-term unemployed are unemployed for five years or more in Philadelphia. *Source*: Woytinsky (1942)

Table 1 "Estimated chance of being hired during a 12-month period after the specified duration of unemployment" (1930s Philadelphia)

Duration of unemployment	1932	1933	1934	1935*	1936	1937	1938
Male							
Under 1 year	0.41	0.39	0.48	0.48	0.54	0.70	0.40
1 but less than 2 years	0.22	0.23	0.46	0.46	0.42	0.50	0.13
2 but less than 3 years	0	0.28	0.44	0.46	0.42	0.46	0.12
3 but less than 4 years	0	0	0.20	0.25	0.43	0.41	0.23
4 years and over	0	0	0	0	0	0	0.26
Female							
Under 1 year	0.61	0.66	0.60	0.60	0.62	0.74	0.48
1 but less than 2 years	0.40	0.40	0.50	0.50	0.51	0.57	0.12
2 but less than 3 years	0	0.38	0.50	0.50	0.51	0.50	0.16
3 but less than 4 years	0	0	0.10	0.25	0.32	0.42	0.17
4 years and over	0	0	0	0	0.50	0.40	0.24

* Represents interpolation

Table reproduced from (Woytinsky 1942, p. 103). Zeroes, especially for longer durations, may be the result of insufficient data and not a precisely measured zero. 1934 and 1935 values interpolated due to a missing year (1934). Columns refer to the 12-month period ending in May

example, to have been unemployed for between 2 and 3 years in 1937 implies that one was unemployed for between 1 and 2 years in the previous year, 1936, which implies that one was unemployed for less than 1 year in 1935.

I aggregate men and women in this sample, though there are some differences between the sexes. In Philadelphia, employment opportunities for women were better than for men (Palmer 1937, p. 18). The most common professions for men were in manufacturing and mechanical industries, hit very hard by the Depression, while women were overrepresented in domestic and personal jobs, which were less cyclical industries (Palmer 1937, p. 20). Among previously unemployed workers, unemployment was higher for men than for women, but more women were unemployed overall in 1935 and 1936 due to the huge number of new female entrants into the labor force, likely driven by economic reasons such as their husband losing his job (Palmer 1937, p. 36). Regardless, women of all durations of unemployment were more likely to transition to employment in every year of this period, with the sole exception of women unemployed between 3 and 4 years in May 1934 and 1936 (Woytinsky 1942, p. 100), so it seems that they faced better job prospects than men, perhaps due to being concentrated in lower skill industries.[27]

The probability of the unemployed exiting to employment is lower as unemployment duration increases (Woytinsky 1942, p. 103), as shown in Table 1. For the year 1937, men unemployed for less than a year had a 70% chance of being hired and women unemployed less than a year had a 74% chance of being hired. In

[27] In the interest of brevity and a lack of data on duration, I do not discuss racial differences in employment prospects, though twice of many blacks as white were unemployed in Philadelphia for both genders, and they would have faced both discrimination based on both race and unemployment duration, making their prospects even more dire (Palmer 1938, p. 22).

contrast, men unemployment for 3–4 years had only a 41% probability of being hired and women of the same unemployment duration had a 40% chance of being hired. This is clear evidence of duration dependence, which holds true even during recovery periods after 1933. For the Great Depression, the evidence supports a strong relationship between the unemployment rate and unemployment duration, which was also the case in the postwar (Dynarski and Sheffrin 1990), and is again consistent with hysteretic theories of Depression labor markets.

6 Conclusion

This paper has presented a Beveridge Curve, at both a monthly and annual frequency, for the 1920s through the 1950s. This relationship between the unemployment rate and the vacancy rate was used to separate changes in unemployment–vacancy dyads into movements along a curve and movements of the curve. This was crucial, as the Beveridge Curve was shifting out at the same time as output was falling and unemployment was rising from 1929 to 1933, in line with a hysteresis-based explanation of these shifts. While the Beveridge Curve did not continue to shift outward, it only slowly shifted inward slowly during the 1933–1941 period when output was recovering,[28] which is again consistent with a long-term unemployment problem developing during this period. While emergency programs and other relief efforts blunted some of the effects of the Depression, especially for the long-term unemployed, participation in these programs worsened discrimination against the hard-core unemployed. Duration data for this period show that long-term unemployment grew as a share of the total unemployed, as it was largely the short-term unemployed who transitioned back to employment during the recovery. The BC for the long-term unemployed shifted outward, the BC for the medium-term unemployed stayed roughly constant, and the BC for the short-term unemployed actually shifted inward during the late 1930s. This is again consistent with a hysteretic effect where the long-term unemployed had trouble matching to jobs, while the short-term unemployed did not face the same discrimination.

The Great Depression was followed immediately by the World War II. This conflict required immense sacrifice, but did have the silver lining of healing some of the scars of the Great Depression. However, this did make the long-term unemployment problem of the 1930s relatively short-lived. The solution to long-term unemployment was the effectively unlimited labor demand of the wartime era with the goal to produce at all costs. As a result, the Beveridge Curve shifted inward as all workers were quickly and efficiently matched to new jobs. The postwar demobilization period demonstrates this result is not mechanical or automatic and that not all shifts in the Beveridge Curve are not always due to the hysteretic effect of mismatch stemming from long-term unemployment. Structural mismatch characterizes this period from 1945 through 1948 as sectors related to the military

[28] The recovery period is marred by the sharp but brief 1937–1938 recession.

and munitions production shrank as solders returned from war and workers transitioned back to the civilian sector.

While these enormous shifts took place relatively quickly and costlessly, a higher vacancy rate coexisted with a higher unemployment for a time, while this sectoral transition took place, shifting out the Beveridge Curve. By about 1948 however, this process was complete and the Beveridge Curve of the 1950s strongly resembled the Beveridge Curve of the 1920s. While hysteresis can cause high unemployment to persist, it can be reversed given sufficient labor demand to overcome the stigma of long-term unemployment. The discrimination against the long-term unemployed of this period, especially strong among the emergency unemployed who exchanged destitution for stigma, has not been repeated in American history, even after the most recent recession. However, the unemployment of the 1930s left a scar that would have lasted until the 1940s had not a situation of truly full employment arisen during the war.

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