11-30-2011

Including Jobs in Benefit-Cost Analysis

Timothy J. Bartik
W.E. Upjohn Institute for Employment Research, bartik@upjohn.org

Upjohn Author(s) ORCID Identifier:
https://orcid.org/0000-0002-6238-8181

Upjohn Institute working paper ; 11-178

Published Version

In Annual Review of Resource Economics 4: 55-73

Citation

Bartik, Timothy J. 2011. "Including Jobs in Benefit-Cost Analysis." Upjohn Institute Working Paper 11-178. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research. https://doi.org/10.17848/wp11-178

W.E. UPJOHN INSTITUTE FOR EMPLOYMENT RESEARCH
Researching the causes and consequences of unemployment

Including Jobs in Benefit-Cost Analysis

Upjohn Institute Working Paper 11-178

Timothy J. Bartik
W.E. Upjohn Institute for Employment Research
e-mail: bartik@upjohn.org

November 30, 2011

ABSTRACT

Public policies may affect employment by directly creating jobs, facilitating job creation, or augmenting labor supply. In labor markets with high unemployment, such employment changes may have significant net efficiency benefits, which should be included in benefit-cost analyses.

The research literature offers diverse recommendations on measuring employment benefits. Many of the recommendations rely on arbitrary assumptions. The resulting employment benefit estimates vary widely.

This paper reviews this literature, and offers recommendations on how to better measure employment benefits using estimable parameters. Guidance is provided on measuring policy-induced labor demand, estimating the demand shock's impact on labor market outcomes, and translating labor market impacts into efficiency benefits. Two measures are proposed for efficiency benefits, one relying on adjusted reservation wage gains, the other on adjusted earnings gains.

JEL Codes: H43, J68, Q28

Keywords: Reservation wages, unemployment, occupational upgrading

Acknowledgments: Paper written in response to an invitation from the *Annual Review* and will be published in Volume 4 of the *Annual Review of Resource Economics.* This preprint version is published with their permission. My thanks to Claire Black for her wonderful assistance in preparing this paper.

Introduction

What dollar value should a benefit cost analysis place on jobs? This paper considers this issue for diverse policies affecting employment. Public policies may directly create jobs by hiring workers, such as workers to build levees. Does such hiring benefit workers, offsetting some project labor costs?

Public policies may spur private job creation. For example, economic development programs, such as business tax incentives, aim at expanding a local area's jobs. Dams may create lakes that increase tourism jobs. Are there efficiency benefits from such job creation?

Public policies may spur higher employment for targeted individuals, such as the disadvantaged. For example, job training programs, by increasing job skills of disadvantaged individuals, seek to increase their wages and work hours. The resulting increase in earnings is a benefit. Should this benefit be partially offset because of reduced leisure time?

If labor markets cleared, with no involuntary unemployment and no other distortions, these questions have simple answers. Wages equal the marginal product of labor and the opportunity cost of the marginal worker's time. Efficiency effects of additional employment can be easily measured. A levee, dam, or incentive that adds to labor demand will obtain this labor by slightly increasing the wage, which will bid workers away from other work and nonwork activities. The value of the foregone time at other work is the marginal product of labor, equal to the market wage. The value of foregone time at nonwork activities is the worker's subjective value of this time, also equal to the market wage. The cost of project labor is the market wage. At the old wage, workers do not gain from additional employment. Workers' gains from increased wages are offset by costs to employers. The efficiency benefit in the labor market of additional employment is nil.

Without involuntary unemployment, each worker works as much as she wishes at her market wage. A job training program may raise a trainee's skills and wages. The wage increase benefits the trainee. A work hour increase due to increased wages also is a benefit, as the worker chose to work more. But the gross increase in earnings due to increased work hours is not the net benefit, as these increased work hours reduce worker leisure. The worker's value of leisure must have been at least equal to the previous wage; otherwise, the worker would have already worked the added hours. Suppose training raises wages by 25 percent. Then at least four-fifths (100 percent divided by 125 percent) of the earnings increase from extra work hours would be offset by foregone leisure costs.

An increased labor supply due to job training may displace other workers from jobs. If labor markets always clear, such displacement has no efficiency costs. The training-induced boost to skilled labor supply may decrease wages for that skill. The decreased wages will increase labor demanded and reduce labor supplied by the original labor suppliers. These demand and supply changes allow the skilled trainees to be fully employed. But at the old wage, the changes in quantities of labor demanded and supplied do not benefit either employers or the original workers. The wage decrease redistributes from workers to employers, with no net efficiency effects.

This same argument applies to spillover effects on other labor markets. Policies may indirectly affect labor demanded and supplied in other labor markets than the labor market first affected by the policy. For example, the local tourism induced by a dam may reduce tourism elsewhere. Reduced tourism elsewhere will reduce employment and wages in this other labor market. But if labor markets clear, such spillover effects are distributional effects that net out, with zero efficiency effects.

Involuntary unemployment makes benefit-cost analysis more difficult. First, involuntary unemployment makes it harder to see how policies will change wages, unemployment, and the employment of various groups. When labor markets clear, these changes depend only on how labor demand and supply respond to wages. But when labor markets don't clear, economists don't agree on how wages, employment, and unemployment are set. Furthermore, it is harder to see who is employed among the excess labor supply.

Second, with involuntary unemployment, although the market wage is still equal to the marginal product of labor, the value that unemployed workers place on their time may be well below the market wage. Furthermore, this value of the unemployed's time is harder to measure because it is not immediately observable. Even if one knew each unemployed worker's value of time, it is harder to determine who will be employed. As a result, when a policy increases employment of an individual or group, this change has large benefits equal to the gap between the market wage and the value of that individual or group's time, and those large benefits are harder to measure.

Third, spillover effects on labor markets with involuntary unemployment may not have zero efficiency benefits. For example, if such spillovers increase employment, the marginal product of increased employment may exceed the lower value of time of the unemployed who gain jobs. This represents an efficiency benefit. Spillovers are common. A policy may have indirect effects on other labor markets through multiplier effects and other macroeconomic effects, external benefits such as agglomeration economies, or general equilibrium effects. Measuring efficiency benefits of all spillovers is difficult.

Dealing with these issues requires assumptions about the labor market and about hard-to-observe parameters. As I will discuss, different researchers have adopted different models and assumptions, which give different answers. The literature on jobs in benefit-cost analysis is not a unified literature with researchers in fruitful dialogue. Researchers use assumptions that fit the problem at hand and their particular philosophies. Most researchers share the intuition that the efficiency benefits of increased employment are higher when involuntary unemployment is high, but some get that result in different ways and with different benefit estimates. In this paper, I advance the dialogue by identifying key parameters that determine the efficiency benefits of policy-induced employment changes.

This paper does not address how the benefit-cost analysis of policy-induced employment changes is affected by taxes or benefits, e.g., payroll taxes or unemployment benefits. Such fiscal effects are better considered as part of a broader analysis of a policy's fiscal impacts. Fiscal impact analysis is simpler, because this addition to benefits is based on observable fiscal variables. Modifying benefit-cost analysis to take account of unemployment involves harder-to-measure parameters.

Textbook and Other Approaches to Including Jobs in Benefit-Cost Analysis

The most popular textbook approach to including jobs in benefit-cost analysis is shown in Boardman et al. (2011), Haveman and Farrow (2011), and Greenberg and Robins (2008). Consider a policy that adds to labor demand, either by direct hiring or development effects. Some portion of this demand increase will reduce involuntary unemployment. The reduced unemployment has benefits equal to the wages paid minus the unemployed's reservation wages, which reflect the value of time in leisure or job search.

Labor suppliers' reservation wages are reflected in the labor supply curve. The reservation wage of the newly employed depends upon their location on the supply curve. If the newly employed are randomly chosen from the available labor supply, their reservation wage will be the average reservation wage of the available labor supply. In that case, benefits from reducing unemployment will not vary with the unemployment rate.

With assumptions about labor supply, this average reservation wage of the available labor supply can be measured. Suppose the labor supply curve is linear and passes through the current market wage and labor supply, and through the origin point where both the wage and labor supply are equal to zero. Then the reservation wage will be one-half the market wage, regardless of unemployment. Other labor supply curves yield different values for average reservation wages. For example, based on Greenberg (1997), average reservation wages range from 0 to 88 percent of market wages. (Earnings gains would be multiplied by percentages in Greenberg's Tables 1 and 2 with initial hours of zero.) If the elasticity of labor supply at the market wage is 0.1, the minimum reservation wage is half the market wage, and labor supply curves are elliptical, then reservation wages will average 61 percent of market wages.

But jobs may not be randomly assigned. Jobs may differentially go to labor suppliers with lower reservation wages. Because such labor suppliers benefit more from work, they may search more vigorously for jobs and have lower quit rates (Bartik 1991, Appendix 8.1). If so, the reservation wage of the newly employed will be lower, and employment benefits higher, if initial unemployment rates are higher.

If jobs are perfectly assigned to those with the lowest reservation wages, we can estimate the reservation wages of the newly employed if we know the labor supply curve. Suppose the labor supply curve is linear, and passes through zero wages and zero labor supply. Then if the involuntary unemployment rate is x percent, the reservation wage of the newly employed will be x percent below the market wage. If labor supply is less elastic, reservation wages will vary more with unemployment. Assume the following: unemployment in excess of 3 percent is involuntary unemployment; the elasticity of labor force participation with respect to the unemployment rate is −0.5, as implied by both Okun's Law (Gordon 2010) and empirical estimates (Bowen and Finegan 1969); the elasticity of labor supply with respect to wages is 0.15 (Fuchs et al. 1998). Then at an unemployment rate of 4.6 percent, the 2007 U.S. average, the reservation wage of the newly employed is 15 percent below the market wage. When unemployment is 9.6 percent, as it was in 2010, the reservation wage of the newly employed is 48 percent below the market wage. (The ratio of the reservation wage to the market wage will be $\exp[(UR - 0.03)(1 + 0.5)(-1) / 0.15]$.)

The real world may involve some mix of jobs being randomly allocated versus allocated to those with lower reservation wages. In this in-between case, the reservation wage of the newly employed will be lower than when jobs are always assigned to those with the lower reservation wages. However, reservation wages will vary less with unemployment.

To estimate employment benefits, we must also know what percentage of the increased employment comes from involuntary unemployment, versus displaced other employment, or more voluntary unemployment. The literature's assumptions are ad hoc. The Boardman et al. text argues that if unemployment is "very high (say, over 10 or 15 percent)" all the jobs may reduce involuntary unemployment, whereas if unemployment is "low (say, below 5 percent)," the workers come from persons who are "between jobs rather than in surplus" (Boardman et al. p. 105). The Mishan and Quah (2007) textbook on benefit-cost analysis argues that "the greater the degree of unemployment in the economy, the larger the likelihood that the worker will be drawn from the unemployment pool" (pp. 72–73). Mishan and Quah reference the pioneering work of Haveman and Krutilla (1967). Haveman and Krutilla assumed that none of the newly employed would come from the involuntary unemployed when the economy was at full employment, which was assumed to be 1953's unemployment rate of 2.9 percent. They assumed that all of the newly employed would come from the involuntarily unemployed in a Great Depression, assumed to be 25 percent unemployment. In between these extremes, Haveman and Krutilla assumed that the probability of the newly employed coming from the involuntarily unemployed varied with the unemployment rate either linearly or logarithmically. At 4.6 percent unemployment (the year 2007), the linear assumption means that the probability of drawing from the unemployment pool would be 8 percent, whereas the logarithmic assumption means that this probability would be 32 percent. At 9.6 percent unemployment (the year 2010), the linear assumption means that the probability of drawing from the unemployment pool would be 30 percent, whereas the logarithmic assumption means that this probability would be 65 percent.

Another issue is translating direct project effects into overall effects on employment. Haveman and Krutilla (1967) still provide the most detailed approach to translating a project's direct labor demands into occupational demands. Their model uses an input-output model for the project's direct industry output demands to derive overall demands by industry. However, this input-output table omits effects from household respending. The implicit assumption is that household respending might be negated by the project's tax financing. The industry outputs are then translated into occupational demands using an industry-occupation matrix.

Mishan and Quah's (2007) text discusses benefits under Keynesian unemployment. If a project is financed not by taxes, but by borrowing from idle bank balances or by money creation, then the project may produce Keynesian multiplier effects on employment. In this case, the total earnings increase may be many times the project's payroll.

Greenberg (1997) and Greenberg and Robins (2008) analyze employment benefits of programs that encourage work for the disadvantaged. The disadvantaged might be encouraged to work by job training, job search assistance, welfare-to-work programs, or wage subsidies. The benefits for that individual worker include the increase in earnings due to wage increases for the individual's original work hours and the increased earnings on additional hours worked minus the average reservation wage for the added hours. The reservation wage can be estimated if we know the worker's labor supply curve. For example, suppose we assume the following: the worker did not work before the policy, the worker requires a reservation wage of half the market wage to work at all, the worker's post-training work hours are chosen by the worker given her post-training wage, the elasticity of the worker's labor supply at the post-policy wage and work hours is 0.1, and the labor supply curve is elliptical. Based on those assumptions, the reservation wage for the added work hours is 61 percent of the increase in earnings due to increased work hours.

The Greenberg (1997) and Greenberg & Robins (2007) papers recognize that their analysis does not measure spillover effects on others of jobs programs for the disadvantaged. Spillover effects may yield efficiency effects if there is involuntary unemployment. Therefore, these estimates of the employment benefits of programs for the disadvantaged are more complete if we assume that we are close to full employment.

Not all researchers analyze employment benefits as the wages paid minus reservation wages. Mishan and Quah (2007) follow an older tradition in which the opportunity cost of the unemployed's time is the value of leisure. This value is adjusted down due to stigma effects of unemployment, perhaps "so much so that [the unemployed worker] is prepared to pay to be employed even where no wage at all is offered to him" (p. 69). The original Haveman and

Krutilla (1967) article also assumed that "involuntary leisure has a zero benefit" (p. 389). Haveman and Farrow (2011) also mention that "leisure time involuntarily imposed" may yield "negative utility" (p. 3).

Additional employment for the involuntarily unemployed may also have "empathy-based" spillover benefits for others. As Mishan and Quah (2007) note, we must consider the effects of a person gaining employment on "his friends (or enemies) and members of his family" (p. 70).

It makes a big difference whether the value of the unemployed's time is measured by the reservation wage, or by the value of leisure adjusted down due to stigma and empathy spillover effects. If we use the reservation wage to measure opportunity costs, employment benefits of public policies would be low. Reservation wages from interviews are typically close to market wages. Average ratios of the unemployed's stated reservation wages to previous market wages are 105 percent (Jones 1989), 107 percent (Feldstein and Poterba 1984), and 99 percent (Krueger and Mueller 2011). Ratios are high even when overall unemployment rates are high (14 percent unemployment in Jones [1989]; 10 percent in Krueger & Mueller [2011]). Ratios are high even for job losers, the long-term unemployed, or welfare recipients (Grogger 2009).

One could argue that reservation wages from surveys are exaggerated. Up to 44 percent of all job offers below the stated reservation wage are accepted (Krueger and Mueller 2011). However, Krueger and Mueller (2011) find that whether the offered wage was more than the stated reservation wage did significantly affect whether a job offer was accepted, and did so much better than using the worker's previous wage or wages above or below the stated reservation wage.

Reservation wages estimated from market wages are also close to market wages: 91 percent of the market wage for the unemployed in Mohanty (2005, Table 2, part (b), 1993 sample), and 80 percent of the market wage of the employed in Hofler and Murphy (1994).

Therefore, using reservation wages, employment benefits are small compared to the wages of the newly employed. Employment benefits will loom large relative to the project's budget only if the project has high input-output or multiplier effects on overall employment.

In contrast, when the unemployed's time is valued as the value of leisure, adjusted for stigma costs and empathy-based spillovers, the benefits from increased employment are much greater. Studies of "overall life satisfaction" or "happiness" show strong negative effects of unemployment (Helliwell and Huang 2011; Blanchflower and Oswald 2004). These negative effects of unemployment are in addition to the negative effects of unemployment on life satisfaction via reduced income.

By comparing unemployment's effects on life satisfaction with the effects of income on life satisfaction, we can compute the implicit dollar equivalent of the loss due to unemployment's non-pecuniary effects. The negative non-pecuniary effects appear to be at least equal to the reduction in income due to unemployment (Helliwell and Huang 2011).

Perhaps surveys of life satisfaction don't mean much because those surveyed don't treat the questions seriously or don't know how to respond. We find much smaller effects of unemployment on average positive or negative emotions during the preceding day (Knabe et al. 2009). However, measures of emotional well-being are also far less sensitive to income (Kahneman and Deaton 2010; Knabe et al. 2009), which is inconsistent with how economists approach human behavior. Furthermore, it seems strange to totally discount what people say about life satisfaction. Finally, the negative effects of unemployment on life satisfaction are consistent with much research showing that unemployment damages physical and mental health (Frey and Stutzer 2002). Many labor economics studies show that involuntary displacement from jobs has large long-run negative effects on earnings. For example, Davis and Wachter (2011) find that involuntary displacement from jobs lowers the present value of future earnings for some men by 11 percent.

The life satisfaction studies also show negative effects of local or national unemployment rates on life satisfaction that aggregate up to large dollar values, relative to the labor income effects of unemployment (Helliwell and Huang 2011; Tella et al. 2001). Empathy-based spillover effects of unemployment are smaller per person affected than unemployment's direct effects on the unemployed. But the total value of these spillover effects is large when added over the population. The total dollar value of the increase in life satisfaction from a reduced unemployment rate is 6 times (Tella et al. 2001) to 10 times (Helliwell and Huang 2011) greater than the total dollar value of the increase in life satisfaction for the newly employed.

Therefore, the opportunity cost of the reduced leisure of the newly employed could be close to zero or even negative, after we adjust for stigma and empathy-based spillover effects. This greatly increases the efficiency benefits of policy-induced increases in labor demand.

For policies that enhance the employment of the disadvantaged, empathy-based spillover benefits on nonparticipants may be more important (Greenberg and Robins 2008). If individual nonparticipants place even a small per capita dollar value on increased employment of participants, the aggregate value of such spillover effects can dominate the benefit-cost analysis of these programs. Including nonparticipants' valuation of participant employment can be viewed negatively, as paternalism (Greenberg 1997). But nonparticipant valuation may also take the form of caring and social solidarity.

Another approach to measuring the opportunity cost of labor is taken by Harberger (1971). (A similar model was developed by Harris and Todaro [1970].) The Harberger and Harris/Todaro models develop a general equilibrium view of opportunity cost. What is important is not who is immediately hired by the project, but the ultimate source of project labor.

In Harberger's paper, he considers an extreme case: involuntary unemployment in the urban sector, a market-clearing wage in a large rural sector, and perfect mobility between the two sectors. Suppose that in migrating between the rural and urban sectors, workers maximize income adjusted for the risk of unemployment. For example, if the urban wage is \$15, urban unemployment is 33.3 percent, and the rural wage is \$10, then this will be a zero net-migration equilibrium because the urban wage times the employment rate equals the rural wage. Suppose a policy raises urban labor demand. Assume the urban wage is fixed, and the rural sector is large enough that its wage is unaffected by increased urban labor demand and any migration. Then in the new equilibrium, for every 2 workers added to urban labor demand, 3 rural workers migrate to the urban sector. This maintains the equilibrium unemployment rate and forestalls further migration. The foregone product from these 3 rural workers is 3 ×\$10. Therefore, the average opportunity cost of these 2 new urban workers is (3 ×\$10) / 2 workers, which equals \$15, just equal to the urban wage. There are no employment benefits from the project's hiring to offset project labor costs.

This finding is counterintuitive, as urban workers are willing to work for less than the urban wage. But this is true if these workers are already in the urban sector. The "reservation wage" to attract an additional worker to urban employment is equal to the urban wage, as this urban wage is needed to attract rural workers given the risk of unemployment.

This specific result depends on perfect mobility. However, the broader point that we should consider general equilibrium effects is sound.

To sum up, the literature on including jobs in benefit-cost analysis does not offer a cohesive approach. Rather, a variety of approaches leads to employment benefits that range from zero percent to some multiples of 100 percent of the policy's direct employment effects. Another recent review also finds wide variation across studies in employment benefits, with ratios of social costs of labor to market wages of 5 percent to 173 percent (Bo et al. 2009, Table 2).

A Critique of the Textbook Approach

The textbook approach to employment benefits, which uses reservation wages, has some problems. The benefit for the hired individual from added employment is only a part of overall efficiency benefits. In principle, we can measure each individual's benefits using reservation wages, and then aggregate to get efficiency benefits. In practice, this is hard to do.

The textbook approach does not place enough emphasis on wage gains from occupational upgrading as part of employment benefits. New jobs create a chain of job opportunities. Job chains are mentioned in the literature (Harberger 1971; Boardman et al. 2011). However, the empirical importance of wage gains from job chains is not emphasized, nor is any guide given for estimating these wage gains.

When a new job is created in a local or national labor market, ultimately that job must lead to employment of someone who is not now employed in that labor market. That additional employment can come from the unemployed, those out of the labor force, in-migrants to the labor market, or "averted out-migrants" who otherwise would have lived elsewhere.

However, before the new job leads to additional employment, it will typically lead to a job chain of upgrading opportunities for the currently employed. A new job may be filled by someone already employed. This "job switcher" must have gained from this voluntary move. The job switcher's old job is now vacant. That job vacancy may be filled by someone already employed, who also will upgrade his or her job. Ultimately the chain is broken by the hiring of someone not employed in that labor market. But before that happens, there are wage gains.

The importance of job chains is explored by Persky et al. (2004). The average new job results in 2.5 job vacancies. This implies 1 person moving to employment and 1.5 moving to a better job. The resulting wage upgrading is about 15 percent of the wages of the new job. (Author's calculations based on the Persky et al. [2004] job chain matrices, for a job that averages their five job types. The averages are based on translating their job types into the 2006 U.S. wage distribution used in Bartik and Houseman [2008].)

These Persky et al. (2004) estimates are consistent with the occupational upgrading effects found in Bartik (1991, p. 150). A 1 percent labor demand shock to a metropolitan area's employment is estimated to move individuals up to occupations whose national wages are 0.24 percent higher. This implies that a new job leads to occupational upgrading of 24 percent of the new job's wages ($0.24 = (dW/W) / (dE/E) = (EdW)/(WdE)$, where W is wages, dW is wage change, E is employment, dE is employment change). Occupational upgrading was the only significant real wage effect of local labor demand shocks.

Another perspective is that the efficiency benefit from job creation is the earnings created, minus the opportunity cost of the person who ultimately gains employment. Even if this opportunity cost is close to the wage of the newly employed, it could be far below the new job's wage.

Consider a new job at $15 per hour. Suppose it is filled by someone now employed at $12. That job vacancy is filled by someone employed at $10. Finally, the $10 job is filled by someone who was unemployed. Suppose the opportunity cost of that unemployed person's time is zero.

Then we can calculate market-wide worker benefits in two ways. We can add up the wage gains plus the gain for the newly employed. Or we can compare the new job's wage with the opportunity cost of the newly employed worker's time. The former approach says the gain is $3 plus $2 plus $10 = $15. The latter approach says the gain is $15.

An efficiency analysis must also consider whether occupational upgrading is offset by losses to employers. Does the worker's productivity gain match the wage gain from the upgrading? Assume the worker's productivity at the worker's old occupation was typical of that occupation. Will the worker's productivity at the new occupation also be typical? If the worker's productivity at the new occupation is below standard, employers suffer a loss.

Productivity offsets are probably larger if unemployment is low. If unemployment is initially high, an increase in labor demand often allows workers to move up to occupations they previously held. Meeting the upgraded job's standards seems likely. But if unemployment is low, an increase in labor demand will lead to workers being promoted further beyond their previous job experience or job qualifications.

In addition, the individual gain for an unemployed worker who is hired, measured by their actual wage minus their reservation wage, will not reflect overall efficiency gains from that hiring. The unemployed worker's reservation wage reflects his or her probability of being hired in the future for various jobs and wages (Mortensen 1986; Shimer and Werning 2007). The acceptance of this new job means that those future job prospects are more available to other workers. This greater availability benefits these other workers. The initial gain for the newly employed understates the market-wide worker benefits.

Consider a new job at $15 per hour. All jobs last for a single time period, and we are seeking to measure employment benefits for that period. The $15 per hour job is assumed to be filled by person A who was unemployed. Suppose that person A's reservation wage was $12 because they knew that just before the time period started, they would have been hired for a job paying $12. Then the gain for person A is only $3 per hour. But because person A did not take that $12 job, it is available for person B. Suppose person B is also unemployed. Person B's reservation wage is $10 because B would have shortly been hired at that wage. Person B's gain is $2. Now the $10 job is open to person C. Assume person C would have been unemployed throughout that time period. Then person C's reservation wage during the period is person C's value of leisure, adjusted for stigma effects. Suppose this net value is zero. Person C's gain is $10. Total worker gains at $15 significantly exceed the gains for person A, the unemployed person who is directly hired for the new job.

The practical problem for the reservation wage approach is measurement. How are we going to measure all the benefits that ripple through the labor market from the hiring of one unemployed worker? These ripples include changes in future probabilities of various jobs for various workers.

Note that current reservation wages will not determine the labor supply curve. For example, in a market-clearing labor market, the reservation wage for all workers is the current market wage. Why would any worker accept a job for less? But this doesn't mean that if market wages decline, all current workers will drop out of the labor market. Reservation wages depend upon current market opportunities. Current reservation wages do not reveal the labor supply response to changed opportunities, and vice versa.

We need employment benefit concepts that are easier to measure. I consider possible approaches next.

Feasible Approaches to Measuring Employment Benefits

Two ways to measure employment benefits seem feasible. The first is an adjusted reservation wage gain approach—gains in reservation wages for all workers and nonworkers, adjusted for employer losses. The second way is an adjusted earnings gains approach—earnings gains minus the value of lost leisure, adjusted for stigma effects, empathy-based spillover benefits, and employer losses.

The adjusted reservation wage gain measure is based on research showing that the reservation wage measures the value of worker access to the labor market (Shimer and Werning 2007). The reservation wage represents the lowest wage at which the worker is indifferent between working and continuing to search. If the labor market improves, the resulting reservation wage increase is the worker's willingness to pay for access to the improved labor market. Reservation wage increases summed over the employed and not-employed equal the overall increase in worker well-being. Subtracting employer losses results in overall efficiency benefits of the demand shock.

Consider the previous example. A new job at $15 went to unemployed person A with a $12 reservation wage. This led to a $12 job for unemployed person B with a $10 reservation wage. This in turn led to a $10 job for unemployed person C with a zero reservation wage. In this case, person A's new reservation wage is $15, a gain of $3. Person B's new reservation wage is \$12, a gain of \$2. Person C's new reservation wage is \$10, a gain of \$10. Total worker benefits are \$3 + \$2 + \$10 = \$15. If there are employer productivity losses, efficiency benefits will be less.

Reservation wages are difficult to measure. A reasonable assumption is that reservation wages will increase at least as much as market wages when labor demand shocks increase wages and decrease unemployment. Theory suggests that when market wages increase, holding unemployment constant, the ratio of the increase in reservation wages to the increase in market wages will be slightly below one. (Mortensen [1986, p. 864]. The theoretical ratio of the change in reservation wages to the change in market wages is the discount factor of the worker for future dollars that are the mean unemployment spell length in the future.) Reduced unemployment will further raise reservation wages. Furthermore, evidence suggests that unemployment shocks increase reservation wages by a similar percentage to market wages. (Jones [1989] finds an elasticity of reservation wages with respect to the unemployment rate of −0.06 to −0.22. This is similar to the market "wage curve" elasticity of Blanchflower and Oswald [1994] of −0.1.) In addition, as noted above, we consistently find, at places and times with different wages, that reservation wages are near market wages. This finding suggests that reservation wages rise close to one-for-one with market wages over the long run.

How do efficiency benefits from a labor demand shock compare to the direct earnings effects from the shock? The adjusted reservation wage gain provides an answer in terms of a few parameters.

$$\begin{aligned}\left[dW_r\left(E+U\right)-fEdW_m\right]/\left(W_m dE\right) &= \left(W_r/W_m\right)S_{re}+\left(U/E\right)\left(W_r/W_m\right)S_{re}-fS_{me}\,, \\ &= \left[1+\left(U/E\right)\right]\left(dW_r/dW_m\right)S_{me}-fS_{me}\,.\end{aligned} \qquad \text{(Eq. 1)}$$

W_r and W_m are the reservation wage and the market wage, holding worker characteristics constant. E is the number of employed. U is the number of nonemployed. dW_r and dW_m are the changes in reservation wages and market wages. dE is the shock to employment. S_{re} and S_{me} are the elasticities of reservation wages and market wages with respect to the employment shock. f is the proportion of the wage increase that represents a loss to employers.

The left-hand-side numerator is the change in reservation wages over both employed and nonemployed, adjusted by the loss to employers. The denominator is the direct earnings effects of the labor demand shock. The right-hand-side of the first equals sign expresses this in terms of the elasticity of reservation wages with respect to a labor demand shock. The right-hand-side of the second equals sign expresses this in terms of the elasticity of market wages.

The adjusted earnings gain approach to measuring benefits relies on an ex post analysis. The policy leads to earnings effects. The percentage change in earnings will be the sum of the percentage changes in wages and employment rates. (We could add in changes in weekly work hours.) The labor demand increase will increase wages and job availability. Workers will respond by changes in job search behavior, reservation wages, quit rates, etc. Ex post, we can view changes in earnings, wages, and job assignments as fixed. We can imagine requiring workers to make the actual optimal choices they did under both the old and new regimes. Under a no-choice regime, a worker's reservation wage has no meaning. The worker's willingness to pay for the policy will be equal to the increased earnings minus the value of the workers' reduced leisure time, adjusted for stigma effects. An efficiency measure adjusts for employer losses. Spillover benefits due to empathy can be added.

Consider the previous example, of three unemployed workers whose job options changed due to one new job at \$15. Total earnings go up by the increased wages of the workers who would have been employed anyway, or \$3 plus \$2. Against this must be offset any employer loss if upgraded workers are less productive. There also are gains of \$10 for the worker who would otherwise have stayed unemployed. From this must be subtracted the stigma-adjusted value of reduced leisure time, which is assumed in this example to be zero. Then we can choose to add in any spillover benefits. The total efficiency benefit is \$15, with possible adjustments for employer losses and spillovers. As the example illustrates, the analysis of earnings gains must adjust for the newly employed having lower than average wages.

The adjusted earnings gains measure can be used to express efficiency benefits in terms of a few parameters. We consider again the ratio of the efficiency benefits from a demand shock to a demand shock's direct earnings effects.

$$\begin{aligned}&\left[dY - fE\left(dW_m\right) - g\left(1-h\right)W_m N\left(dER\right)\right] / \left[W_m\left(dE\right)\right] \\ &\qquad = \left(1-f\right)S_{me} + \left[1-h-g\left(1-h\right)\right]S_{ere}\ . \end{aligned} \qquad \text{(Eq. 2)}$$

dY is the change in earnings. E is employment. dW_m is the change in market wage rates, holding worker characteristics constant. dER is the change in the employment rate, defined with respect to the population. N is the population. f is the proportion of wage gains offset by employer losses. g is the proportion of earnings gains from new employment that represents a loss of valued leisure, given stigma and spillover effects. h is the proportion by which newly employed workers' wages are less than the average wage. S_{me} and S_{ere} are the elasticities of market wages and the employment rate with respect to the employment shock.

The numerator of the left-hand-side is the change in earnings, adjusted down by employer and leisure time losses. The right-hand-side writes this in terms of elasticities of market wages and employment rates.

Equations (1) and (2) are measuring the same benefits. Therefore, reservation wage changes in equation (1) must be compatible with parameter *g* in equation (2). Suppose *g* is close to one—lost leisure time is valued at close to the wage rate. Then for equation (1) to equal equation (2), the change in reservation wages must be close to the change in market wages. This is consistent with theories of how reservation wages respond to market wages. Suppose instead that *g* is close to zero—there are large stigma effects of unemployment. In that case, for equation (1) to equal (2), reservation wages must go up by much more than market wages. This makes sense. Stigma effects imply a larger value to workers of reducing unemployment, which then has larger effects on the reservation wage.

For a policy targeting the disadvantaged for increased employment, either adjusted reservation wage gains or adjusted earnings gains can be used to measure how this policy affects untargeted workers. The efficiency benefits for the trained workers are probably better evaluated separately. Because these trained workers are targeted, they differ in how the policy affects their wages and employment, and in their responses. In addition, empathy-based spillover benefits from increasing employment may be greater for the disadvantaged than for other workers. For measuring benefits for trained workers, one issue is that some trained workers may not have worked prior to training. Without an observed pre-training wage, estimating adjusted reservation wage gains is more difficult. The adjusted earnings gains approach seems an easier way to measure benefits for trained workers.

To carry out these approaches to measuring employment benefits, we can divide the analysis into three stages. First, what is the shock produced by the policy to labor demands and/or supplies of different types? Second, what are the effects of the policy on wages, unemployment, and other labor market outcomes? Third, effects on wages and employment rates, along with some parameter assumptions, can be used to compute the adjusted reservation wage and earnings measures.

Depending upon whether we want a national or local perspective, we can apply this approach to either national or local labor markets. We might also want a national perspective on the effects of shocks to local labor markets. To do so, we can use a local labor market model to analyze effects in the targeted local market, but then also consider effects in nonlocal markets. For example, an economic development strategy that attracts jobs to one state may be offset by reduced jobs in other states. (In a recent study, about 80 percent of the employment increases for one state due to its incentives are offset by employment decreases in other states [Bartik 2011a, Chapter 10].) In addition, a labor demand shock to one local labor market will attract labor supply from other local markets. Under some models, the reduction in consumption and housing demand in these other local markets will roughly offset their reduced labor supply. (For example, migration yields similar percentage effects on employment [Muth 1971; Greenwood and Hunt 1984].) However, effects of drawing labor supply from other labor markets may depend on the types of labor supply attracted and housing conditions in these markets.

The shock to employment of the policy should include any Keynesian or input-output multiplier effects. Agglomeration economy effects should be considered. Due to agglomeration economies, increased employment in some businesses may spill over into higher productivity and growth for other businesses in the same or related industries. The shock should also reflect substitution effects. For example, suppose some economic development policy in a local area subsidizes a business that largely sells its products to local consumers. A sports stadium is a good example. Most of the increased labor demand directly tied to the project will be offset by reduced sales and labor demand at other businesses selling to local consumers. Such substitution effects justify the conventional wisdom that local development should target "export-base" businesses. (Export-base businesses sell their product outside the local area.)

The employment effects of a policy should include the policy's financing. If labor markets do not clear, effects on employment in other labor markets may have efficiency effects. Effects of tax or deficit financing are available from many regional or national econometric models. In a simple model of tax financing, the negative employment effects of increased taxes will roughly offset multiplier effects due to respending. In other words, the balanced budget multiplier may be close to one (Orszag and Stiglitz 2001; Bartik and Erickcek 2003). Under this simplifying assumption, we can consider project direct effects without household respending.

From this analysis, we estimate some vector of shocks caused by the policy to labor demand or supply of various types in one or more local markets. We then use some model to determine the effects of these demand and supply shocks on labor market outcomes. These labor market models may be reduced form models. At the local level, there are estimates of how unemployment, labor force participation, and wages respond to shocks (Bartik 1991). If the unemployment response is known, there are models for how wages respond to unemployment (Blanchflower and Oswald 1994), and how labor force participation responds to unemployment (Bowen and Finegan 1969; Gordon 2010). These labor market models may be structural, such as general equilibrium models. Models may also be some hybrids of structural and reduced form models. Such hybrid models include most large-scale macroeconometric models and regional econometric models (Treyz 1993). Another type of hybrid model is an efficiency wage model, that combines a wage curve relating wages to unemployment, with labor supply and labor demand equations (Bartik 2001, Appendix 1; 2011b).

At the national level, the modeling needs to consider the government's response to changes in wages and unemployment. (Ideally this should also be done locally, but such local responses are less important.) How the Federal Reserve responds to changes in unemployment is a key issue. At an extreme, suppose Fed policy in some economic situation was to keep national unemployment from responding to some policy that shocks some employment. Such a Fed response would significantly reduce the national employment benefits of the policy.

The labor market outcomes due to the policy will be used as inputs to the adjusted reservation wage gain model or adjusted earnings gain model. Larger labor market responses mean larger policy-induced employment benefits (or costs, if outcomes change negatively). The size of the adjusted reservation wage gain depends upon the wage response. In wage curve models, wage responses will be larger if the unemployment response is larger. Blanchflower and Oswald (1994) argue that the elasticity of the wage with respect to the unemployment rate is about −0.1. The size of the adjusted earnings gain measure will depend upon responses of wages, unemployment, and labor force participation. In many reduced form models, the change in unemployment will be a driver for changes in labor force participation rates and work hours. Okun's Law as well as other empirical research finds that a 1 percent lower unemployment rate will increase labor force participation rates by about one-half of 1 percent, and weekly work hours by about one-half of 1 percent (Bowen and Finegan 1969; Gordon 2010). Therefore, the size of employment benefits of policies depends on the size of unemployment effects of labor demand or supply shocks. Unemployment effects will vary in different economic conditions.

Under extreme assumptions, even sizable labor demand shocks will cause no changes in unemployment or other labor market outcomes. As a result, these demand shocks will have no employment benefits. For example, consider the extreme case in Harberger (1971) and Harris and Todaro (1970). The urban sector has involuntary unemployment, but there is a large market-clearing rural labor market, with perfect mobility between labor markets. Under these assumptions, shocks to urban labor demand will cause enough mobility that there are no effects on unemployment and wages. The adjusted reservation wage and earnings gains measures will properly measure zero employment benefits. But is this extreme model close to the truth? Is it true that a labor demand shock in an urban labor market with involuntary unemployment will not affect unemployment and wages?

Effects on unemployment and other labor market outcomes may be greater at high unemployment than at low unemployment. If so, labor demand shocks will have greater employment benefits when unemployment is high. Labor supply shocks may cause larger losses of employment benefits when unemployment is high. At the local level, when unemployment is low, we would expect increased labor demand to have less of a labor pool to draw on. The result is less effects on unemployment, and more effects on in-migration. Empirical estimates suggest that this is the case. For example, Bartik's (1991, p. 100) estimates suggest that a 1 percent shock to local labor demand might lower unemployment rates by 0.46 percent in a depressed local economy versus 0.14 percent in a booming local economy. At the national level, if the economy is close to full employment, the Federal Reserve will be more aggressive in offsetting any policy that boosts labor demand.

The unemployment effects of job creation policies may be increased by targeting hiring on the unemployed. Labor demand policies sometimes include such targeting. For example, some wage subsidies for employers, such as Minnesota's MEED program, require subsidies to be used for hiring the unemployed (Bartik 2001, pp. 216–17). Some economic development incentives have “first source” requirements, under which assisted businesses are required to consider referrals from the local workforce system (Bartik 2001, pp. 256–258).

What is the potential impact of such targeting on the unemployed? Using Persky et al.’s (2004) empirical data on local job chains, the unemployed directly fill 13 percent of new jobs created. However, ultimately jobs that are filled by hiring the employed lead to vacancies that are filled by others. As the job chain proceeds, ultimately all newly created jobs must lead to increased employment for the unemployed, those out of the labor force, or in-migrants. Persky et al.’s job chain estimates indicate that ultimately, about 34 percent of all newly created jobs lead to hiring the unemployed.

Suppose we revise the Persky et al. (2004) job chain matrices by doubling the proportion of each job type that is filled by hiring the unemployed. We offset this doubling by proportionately reducing the probabilities of filling the job in other ways. This policy only increases the percent of the unemployed who are directly hired for new jobs from 13 percent to 26 percent. But the ultimate share of all new jobs that increase the employment of the unemployed goes up from 34 percent to 54 percent.

To achieve this large increase, however, requires that all job vacancies must be filled in a way that targets the unemployed. This requires a change in all employers’ hiring practices, not just the employers who created the new jobs. For example, perhaps such broad changes in employer practices could be encouraged by improving workforce programs that assist the unemployed.

The downward adjustments to reservation wage and earnings gains are greater when unemployment is lower. First, as mentioned above, reduced productivity due to occupational upgrading is more of a problem when unemployment is low. When unemployment is low, some workers will be promoted to jobs well beyond their previous work experience. When unemployment is high, a labor demand shock will be more likely to move up workers to jobs that are not too far outside their established work skills.

Second, the value of the unemployed's leisure time, adjusted for stigma effects, will be higher when unemployment is low. In a low unemployment economy, those with very low values of leisure time relative to their wage would be more likely to already have found a job. In addition, the empathy-based spillover benefits of reducing unemployment may be lower when unemployment is already low. The average person may perceive lower burdens of unemployment when jobs are readily found.

As an example of measuring employment benefits, consider a local labor demand shock. We ignore national effects, either because they are not being counted or because they are small. Let us look at some short-run employment benefits as a percentage of the employment shock. Bartik (1991) estimates an occupational wage upgrading elasticity of 0.24. Short-run elasticities of employment to labor force ratios might be as high as 0.51 if local unemployment is high, and as low as 0.15 if local unemployment is low (Bartik [1991], p. 100. I assume the U.S. 2010 unemployment rate of 9.6 percent to calculate the high unemployment elasticity, the 2007 unemployment rate of 4.6 percent to calculate the low unemployment elasticity.) Short-run elasticities of labor force participation rates appear to be the same at low and high unemployment, at about 0.16 (Bartik 1991, p. 166). Persky et al.'s (2004) results for the newly employed suggest their wages will be about 30 percent below the average wages of new jobs created. (Author's calculations based on Persky et al.'s matrices.)

Assume that when local unemployment rates are high, parameters *f* and *g*, the employer loss and leisure loss parameters, are close to zero. In that case, the adjusted reservation wage measure says that local employment benefits are at least 24 percent of direct earnings effects of the shock. Employment benefits will probably be much greater than 24 percent given that local reservation wages will probably increase faster than local market wages. The adjusted earnings gain measure says that when local unemployment rates are high, local employment benefits might be as great as 70 percent of the direct earnings effect of the labor demand shock [70 percent = 24 percent + (1 − 30 percent)(51 percent + 16 percent)]. If the policy has multiplier effects, these employment benefits could exceed the payroll costs of direct hires. On the other hand, suppose local unemployment is low, and therefore both f and g are close to one. In that case, both efficiency benefit measures will be close to zero even if the wage and employment rate adjustments are high.

Consider the implications of this analysis for the national benefits of demand shocks to one local area. Suppose the area that gets the extra jobs has high unemployment. Suppose that overall national unemployment rates are very low. Under these assumptions, spillover effects on other areas can be ignored. The labor market gains or losses for other areas due to taking jobs or workers away from those low unemployment areas will be small.

Conclusion

There may be considerable efficiency gains from increased employment in labor markets with involuntary unemployment. Theory, empirical evidence, and intuition all suggest that employment benefits from job creation may be greater if unemployment rates are high.

The challenge for benefit-cost analysis is how to measure such benefits. The literature offers diverse approaches that are often difficult to carry out or rely on arbitrary assumptions.

This review offers some alternatives that express employment benefits in terms of empirically measurable parameters.

Measurement of employment benefits would be improved by better estimates of how labor market outcomes respond to demand and supply shocks. But perhaps the most pressing needs are twofold. First, we need better estimates of how reservation wages respond to labor demand shocks under different labor market conditions. Second, we need some estimates of how employer profits respond to the occupational upgrading brought about by labor demand shocks. With better estimates of reservation wage and profit responses, the adjusted reservation wage measure could be better estimated. Improvements to the adjusted reservation wage measure seem easier than for the adjusted earnings measure. The adjusted earnings measure depends on subjective values of involuntary leisure due to unemployment.

Even if we improve estimates of efficiency benefits of labor demand increases, a full social accounting always depends on value judgments. This paper has focused on efficiency benefits. However, distributional effects are important. Labor demand shocks or supply shocks will often involve redistribution between workers and employers. Such redistribution will often be large compared to the policy's costs. Policy analysts must decide how to consider such redistributional effects, as well as efficiency benefits, in evaluating policies that affect employment.

Literature Cited

Bartik, TJ. 2011a. *Investing in Kids: Early Childhood Programs and Local Economic Development?* Kalamazoo, MI: WE Upjohn Institute for Employment Research. 415 pp.

Bartik TJ. 2011b. *Appendix 2B in technical appendices to Investing in Kids: Early Childhood Programs and Local Economic Development?* Kalamazoo, MI: WE Upjohn Institute for Employment Research. http://research.upjohn.org/up_press/207/

Bartik TJ. 2001 *Jobs for the Poor: Can Labor Demand Policies Help?* New York and Kalamazoo, MI: Russell Sage Foundation and WE Upjohn Institute for Employment Research. 475 pp.

Bartik TJ. 1991. *Who Benefits from State and Local Economic Development Policies?* Kalamazoo, MI: WE Upjohn Institute for Employment Research, Kalamazoo, MI. 354 pp.

Bartik TJ & Erickcek G. 2003. *Economic impact of various budgetary policy options for the State of Michigan to resolve its budget deficit for FY 2004*. Report. Kalamazoo, MI: WE Upjohn Institute for Employment Research.

Bartik TJ & Houseman SN. 2008. Introduction and overview. In *A Future of Good Jobs? America's Challenge in the Global Economy*, eds. TJ Bartik, SN Houseman, *1–16.* Kalamazoo, MI: WE Upjohn Institute for Employment Research. 327 pp.

Blanchflower DG & Oswald AJ. 2004. Well-being over time in Britain and the USA. *J. Pub. Econ*. 88:1359–86.

Blanchflower DG & Oswald AJ. 1994. *The Wage Curve.* Cambridge, MA: MIT Press. 493 pp.

Bo CD, Florio M & Fiorio CV. 2009. *Shadow wages for the EU Regions.* Work. Pap. #2009-42, Dept. of Econ., Bus. & Stat., Univ. Milan.

Boardman, AE, Greenberg DH, Vining AR & Weimer DL. 2011. *Cost-Benefit Analysis: Concepts and Practice*, 4th edn. Upper Saddle River: Pearson.

Bowen WG & Finegan TA. 1969. *The Economics of Labor Force Participation*. Princeton: Princeton University Press.

Davis SJ & Wachter Tv. 2011. Recessions and the costs of job loss. *Brook. Pap. Econ. Activity.* In press.

Feldstein M & Poterba J. 1984. Unemployment insurance and reservation wages. *J. Pub. Econ.* 23: 141–67.

Frey B & Stutzer A. 2002. What can economists learn from happiness research? *J. Econ. Lit.* 40: 402–35.

Fuchs VR, Krueger AB & Poterba JM. 1998. Economists' views about parameters, values, and policies: survey results in labor and public economics. *J. Econ. Lit.* 36: 1387–425.

Gordon, RJ. 2010. *The demise of Okun's law and of procyclical fluctuations in conventional and unconventional measures of productivity.* Work. Pap., Dept. Econ., Northwestern University.

Greenberg DH. 1997. The leisure bias in cost-benefit analysis of employment and training programs. *J. Hum. Resources* 32: 413–39.

Greenberg DH & Robins PK. 2008. Incorporating nonmarket time into benefit-cost analyses of social programs: An application to the self-sufficiency project. *J. Public. Econ.* 92: 766–94.

Greenwood MJ & Hunt GL. 1984. Migration and interregional employment redistribution in the United States. *Amer. Econ. Rev.* 74: 957–69.

Grogger J. 2009. Welfare reform, returns to experience, and wages: using reservation wages to account for sample selection bias. *Rev. Econ. Stat.* 91: 490–502.

Harberger AC. 1971. On measuring the social opportunity cost of labour. *Int. Lab. Rev.* 103: 559–79.

Harris JR & Todaro MP. 1970. Migration, unemployment and development: a two-sector analysis. *Amer. Econ. Rev.* 60: 126–42.

Haveman RH & Farrow S. 2011. Labor expenditure and benefit-cost accounting in times of unemployment. *J. Benefit-Cost Analysis* 2(2): Article 7.

Haveman RH & Krutilla J. 1967. Unemployment, excess capacity, and benefit-cost investment criteria. *Rev. Econ. Stat.* 49: 382–92.

Helliwell JF & Huang H. 2011. *New measures of the costs of unemployment: evidence from the subjective well-being of 2.3 million Americans.* Work. Pap. #16829, NBER.

Hofler RA & Murphy KJ. 1994. Estimating reservation wages of employed workers using a stochastic frontier. *Southern Econ. J.* 60: 961–76.

Jones, SRG. 1989. Reservation wages and the cost of unemployment. *Economica* 56: 225–46.

Kahneman D & Deaton A. 2010. High income improves evaluation of life but not emotional well-being. *Proc. Nat. Acad. Sci.* 107: 16489–93.

Knabe A, Ratzel S, Schob R & Weimann J. 2009. *Dissatisfied with life, but having a good day: time-use and well-being of the unemployed.* Work. Pap. #2604, CESifo Group.

Krueger AB & Mueller A. 2011. *Job search and job finding in a period of mass unemployment: evidence from high-frequency longitudinal data.* Work. Pap. #562, Industrial Relations Section, Princeton Univ.

Mishan EJ & Quah E. 2007. *Cost-Benefit Analysis*, pp. 69–75. London and New York: Routledge. 316 pp. 5th ed.

Mohanty MS. 2005. An alternative method of estimating the worker's reservation wage. *Int. Econ. J.* 19: 501–22.

Mortensen DT. 1986. Job search and labor market analysis. In *Handbook of Labor Economics,* Vol. 2, ed. O Ashenfelter, R Layard: 849–919. Amsterdam: North-Holland. 484 pp.

Muth RF. 1971. Migration: Chicken or egg? *Southern Econ. J.* 37: 295–306.

Orszag P & Stiglitz J. 2001. Budget cuts versus tax increases at the state level: is one more counterproductive than the other during a recession? Report, Center on Budget and Policy Priorities, Washington, DC.

Persky J, Felsenstein D & Carlson V. 2004. *Does "Trickle Down" Work? Economic Development Strategies and Job Chains in Local Labor Markets.* Kalamazoo, MI: WE Upjohn Institute for Employment Research. 179 pp.

Shimer R & Werning I. 2007. Reservation wages and unemployment insurance. *Qu. J. Econ.* 122:1145–85.

Tella RD, MacCulloch RJ & Oswald AJ. 2001. Preferences over inflation and unemployment: evidence from surveys of happiness. *Amer. Econ. Rev.* 91: 335–41.

Treyz GI. 1993. *Regional Economic Modeling: A Systematic Approach to Economic Forecasting and Policy Analysis.* Boston: Kluwer Academic Publishers. 544 pp.