Displacement and Wage Effects of Welfare Reform

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Abstract

U.S. welfare reforms will add one to two million persons to the labor force from 1993-2005. Because this increase in labor supply is only about one percent of the U.S. labor force, it is unlikely that welfare reform will have sizable effects on overall U.S. wages or unemployment. However, a variety of economic models suggest that welfare reform will significantly reduce the real earnings of some groups of less-educated women.

> "What we have is a limited number of chairs, and there are a lot of potential workers circling these chairs, waiting for someone to get up." Gary Burtless, Brookings Institution.
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> "Of course, sometimes individual workers get jobs that otherwise might have gone to someone else, but the economy expands as they go to work and other firms hire more people. There is every reason to believe that helping welfare recipients get back to work raises the total number of jobs." Lawrence Summers, Deputy Secretary of the Treasury.[1]

1. Introduction

In this paper, I consider the displacement and wage effects of welfare reform. Recent welfare reforms emphasize pushing welfare recipients into the labor market. Will any jobs obtained by ex-welfare recipients come at the expense of others, who will be "displaced" by losing jobs or having fewer job vacancies available? Will the increased labor supply of welfare recipients stimulate job creation? Will the increased labor supply of welfare recipients depress wages overall, or for women with low educational attainment? Will welfare reform have greater displacement and wage effects in geographic areas with more welfare recipients and weaker economies? Will the labor market effects of welfare reform decrease over time, and if so, how rapidly? To address these questions, in this paper I will

- provide estimates of how welfare reform will affect labor supply;
- discuss the forces that will influence the displacement and wage effects of welfare reform;
- critique different methodologies for estimating the effects of welfare reform;
- review previous estimates of the wage effects of welfare reform;
- provide new estimates, using several methodologies, of the displacement and wage effects of welfare reform.

I should clarify this paper's definition of "welfare reform." The paper focuses on the welfare reforms that began in 1993, with the inauguration of a Democratic President willing to

[1] Both quotations come from the *New York Times*, April 1, 1997, "Welfare Recipients Taking Jobs Often Held by the Working Poor," by Louis Uchitelle, p. A-1.

endorse welfare changes that push recipients off welfare and into work. President Clinton's endorsement of such welfare reforms took place first by granting state governments waivers from federal welfare regulations, and then by signing the Personal Responsibility and Work Opportunity Reconciliation Act in August 1996. Dating welfare reform as beginning in 1993 has two advantages. First, as we will see, the data suggest that dramatic declines in welfare rolls, and increases in labor force participation of female household heads, began prior to August 1996. Second, there is more research available on the effects of welfare reform if we include the pre-1996 period.

This paper also assumes that current welfare reforms can be described as simply pushing low-education women into the labor force. The paper assumes that in the present political climate, other types of welfare reforms are unlikely to be pursued on a large scale. Other welfare reforms include helping welfare recipients increase their education, or providing welfare recipients a public service job. These other welfare reforms would have different labor market effects than pushing welfare recipients into the labor force.

This paper's estimates suggest that welfare reform is unlikely to have large effects on national wages or unemployment. But welfare reform is likely to significantly reduce earnings of less-educated women, either through reducing wages or increasing unemployment rates. Some of the estimates suggest that the reductions in the employment rates of less-educated women might be persistent. Although welfare reform will have larger effects in some geographic areas, the variation across geographic areas is not as large as the variation in effects across demographic groups.

2. Labor Supply Effects of Welfare Reform

Recent federal welfare policies use requirements and incentives to encourage states to increase the labor supply of welfare recipients. The 1996 welfare bill imposes financial penalties on states that fail to meet ambitious targets for either increasing the proportion of welfare recipients who are working, or reducing welfare rolls. The 1996 welfare bill also prohibits states from using federal welfare dollars to provide welfare assistance for more than five years to more than 20% of the state's caseload; this five-year time limit becomes binding in most states during 2002. Under the 1996 welfare bill, federal welfare grants to states are a fixed block grant rather than a matching percentage of state welfare spending; states bear the full cost rather than some percentage of extra welfare spending, which gives states a financial incentive to spend less. Finally, both the 1996 welfare bill and previous welfare waivers give states great flexibility in administering welfare. The political mood in most states supports using this flexibility to impose work requirements on welfare recipients and to make it more difficult to get on welfare or stay on welfare. Work requirements directly increase the labor supply of welfare recipients. The increased difficulty of receiving welfare will force many persons into the labor force.

States can take many actions to cut welfare rolls and increase the labor supply of welfare recipients. State policies have included more stringent time limits or work requirements than the federal law, cutting welfare benefits for welfare recipients who are not working, allowing welfare recipients to keep more of their welfare benefits if they work, and providing "welfare to work" services such as short-term training, counseling, and job placement. States also are using administrative procedures to reduce welfare rolls. States are "diverting" applicants for welfare assistance away from welfare, through such means as requiring applicants to search for jobs before considering their application, or providing applicants an "emergency" check if they agree

not to apply for welfare assistance for some time period (Vobejda and Havemann, August 12, 1998). States are also more frequently "sanctioning" welfare recipients—cutting their benefits in part or in whole—for failure to meet various rules, most commonly for missing appointments with caseworkers (Vobejda and Havemann, March 23, 1998, U.S. Department of Health and Human Services, August 1998). According to the U.S. DHHS, sanctions have risen 30 percent nationally since 1994, and many states sanction more than 25 percent of their caseload. (U.S. DHHS, August 1998).

Welfare reform's effects on labor supply can be seen in aggregate data. Figure 1 shows U.S. trends in welfare rolls, and in labor force participation for two groups: female household heads with other relatives in the household, between the ages of 16 and 44, and less than a college education; and other women with less than a college education. About 29% of the female head group receives welfare, compared to only 2% of the group of other less educated women.[2] As the figure shows, the decline in welfare rolls since 1994 has been accompanied by an increase in labor force participation rates of female heads. These trends in welfare and the female head labor force are unlikely to be due to the economy, as similar trends did not occur during past economic recoveries, for example, the recovery from the 1981-82 recession. The most plausible explanation is that the welfare waivers granted to states from 1993-96, followed by the welfare reform bill in 1996, have led to states pushing women off welfare and into the labor force.

[2]These figures are derived from the March 1997 Current Population Survey. The percentages reporting AFDC receipt in the CPS are blown up by 1.33, based on Blank's(1997) estimates that AFDC caseloads in the CPS are only 75% of the true AFDC caseload.

Several studies have estimated the effects of recent welfare reform on welfare rolls, or on labor force participation. Other studies have predicted the future effects of welfare reform on welfare rolls and the labor force. Table 1 provides a brief summary of these studies.[3]

The studies in Table 1 use various methodologies, focus on different aspects of welfare reform, and cover different time periods. Some studies focus on how welfare waivers affected welfare rolls prior to 1996 (Levine and Whitmore, 1997; Blank, 1997). One study estimates the relative effects of welfare policies and the Earned Income Tax Credit on the employment of single mothers during 1993-96 (Meyer and Rosenbaum, 1998). Another study extends such analysis to the 1996-98 period (Bishop, 1998). Several studies compare the labor force participation of a group with a high welfare receipt rate to a group with a low welfare receipt rate (Daly, 1997; Bartik, study 6 and study 7, available in Bartik, 1998). Several studies estimate the future effects of welfare reform on welfare rolls and/or labor supply, due to federal work requirements (McMurrer, Sawhill, and Lerman, 1997a, 1997b), the switch from matching to block grants (Chernick and Reschovsky, 1996), and time limits (Duncan, Harris, and Boisjoly, 1998). The last study in the table is the forecast used in this paper. This forecast is discussed further below.

An important issue in many of the estimates in Table 1 is how reducing welfare rolls affects labor force participation. To derive the estimates in Table 1, I assume that removing (or never starting) one single parent case from the welfare rolls increases the number of labor force participants by 0.47, and removing a two-parent case increases labor force participants by 0.38. These numbers are derived by assuming that cases removed from the rolls, or not started because of welfare reform, have a labor force participation rate of 0.60; the data suggest that the

[3]A more extensive review of these studies in provided in my working paper, "The Labor Supply Effects of Welfare Reform" (July 1998), available on the Upjohn Institute's web site at www.upjohninst.org.

employment rate while on welfare of single parent cases is 0.13, and of two-parent cases is 0.22 (McMurrer et al, 1997b).[4]

How reasonable are these assumptions about the labor force effects of reducing welfare rolls? Surveys in several states suggest that those leaving welfare "voluntarily" have an employment rate of 50-60%, while those leaving welfare due to sanctions have an employment rate of 40-50% (Tweedie and Reichert, 1998).[5] The surveys do not report labor force participation, so we need assumptions about unemployment to estimate labor force participation.[6] According to the March Current Population Survey, unemployment rates during March of female household heads who received welfare the previous year have averaged 37% over the six March's from 1992 to 1997.[7] Unemployment rates of that magnitude, combined with employment rates of 40-60%, imply labor force participation rates of more than 60%, for example a labor force participation rate of 63% if employment rates are 40%.[8] State surveys cannot report employment

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[4]Edin and Lein's (1997) book suggests that official figures understate the work of welfare recipients, because many welfare mothers engage in unreported or underground work. However, their research also shows that unreported and underground work is usually only a few hours per week. Low-income working mothers also engage in unreported and underground work, and do so almost as much as welfare mothers. Hence, underground and unreported work does not much alter the labor supply effects of welfare reform. See Bartik (July, 1998) for more discussion.

[5]Most surveys reviewed by Tweedie and Reichert ask about employment as of the survey, rather than employment at any time after leaving welfare.

[6]Danziger and Kossoudji's (1995) study did ask about labor force participation rates of former general assistance recipients in Michigan. As of two years after the abolition of general assistance, 39% of non-disabled younger (40 years old or less) former recipients reported being employed, and 43% percent reported being unemployed, for an unemployment rate of over 50 percent.

[7]The group examined is female heads, with relatives in the household, less than a college degree, ages 16-44, who received AFDC last year. Unemployment rates, using sample weights, for each year from 1992 to 1997 are: 41%, 36%, 40%, 39%, 35%, and 33%. Each year's estimate uses about 400 observations.

[8]The 63% labor force participation rate is derived by dividing the employment rate of 40% by one minus the unemployment proportion of 0.37. One could use the same unemployment rate to calculate labor force participation for welfare recipients. If the employment rate of single-parent cases is 0.13, and their unemployment rate is 0.37, then their labor force participation rate would be 0.21. The change in labor force participation rates for single-parent cases would be 0.42, close to the 0.47 assumed in this paper. However, unemployment rates for those still on welfare would be lower than those excluded from welfare, as welfare reduces the incentive for job search. Labor force participation rates of current welfare recipients would be lower than 0.21, and the change in labor force participation rates would be greater than 0.42.

rates of those who never entered welfare due to welfare reform, but this group might have higher labor force participation than those who entered welfare but were later forced off. On the other hand, state surveys may not accurately predict the labor force participation of those forced off welfare in the future, when states may be dealing with "hard core" welfare recipients, who will have lower labor force participation rates if forced off welfare.

Another approach to estimating the labor force effects of reducing welfare rolls is to look at research on how welfare affects work. Danziger, Haveman, and Plotnick's (1981) well-known review article gives a "midpoint" estimate that abolishing welfare would increase annual work hours per welfare recipient by 600 hours. Assuming that when employed, most persons work around 35-40 hours per week, this is equivalent to increasing the average employment rate at any point in time by about .30 (=600 hours divided by "full-time full-year" work hours of around 2000 hours). Unemployment of 37% yields an increase in labor force participation of 0.48, close to the 0.47 increase for single parent cases assumed in this paper.

Based on this discussion, the assumptions in this paper about the labor force participation effects of reducing welfare rolls appear reasonable. One can come up with reasons why the assumed participation effects might be a bit high or low, but they appear unlikely to be grossly in error.

Despite the different methodologies of the studies in Table 1, the estimated effects on labor supply are consistent. Welfare reforms prior to 1996 increased the labor force by 100,000 to 300,000 persons. Reforms from 1996-98 increased the labor force by an additional 500,000 to 600,000 persons. In the 10 years after 1998, welfare reforms will add at least another half-million participants to the labor force. From 1993-2008, welfare reform will likely increase the labor force by between one million and two million persons.

Table 2 gives more detail on this paper's "best forecast" for the effects of welfare reform on the labor force. These numbers are used in the paper to simulate the labor market effects of welfare reform. This forecast assumes that welfare reform accounts for changes in welfare rolls that cannot be explained by unemployment and population trends from 1993-98. The trends in the "unexplained" welfare caseload from 1996-98 are projected forward, under the assumption that negative effects will eventually increase by twice as much as they did from 1996-98, as states adapt to the 1996 bill. The reductions in the welfare rolls are extensive enough in this best forecast that the work requirements in the 1996 welfare bill have little effect. However, I assume that due to the prevailing political mood, and federal bonus grants for states that are "succeeding" at welfare reform, states will gradually increase the proportion of their caseload working to a level between the current level and the nominal requirements in the welfare bill. The federal time limits are assumed to not be binding; I assume that state reductions in caseloads due to sanctions will remove so many long-term recipients from the caseload that no more than 20% of any state's caseload will be on welfare more than five years. Anecdotes and surveys suggest that those sanctioned and dropped from welfare may disproportionately have lower education levels or greater family problems (Vobejda and Havemann, March 23, 1998; Michigan Family Independence Agency, 1998). Without sanctions, these same cases would be most likely to reach the five-year time limit (Duncan et al, 1998).

Finally, the best forecast assumes a recession beginning in 2001 and a recovery beginning by 2004. Because of the recession and recovery, welfare reform's effects on the labor force peak in 2005, and then decline slightly. The rise in unemployment has lagged effects on welfare rolls, which then peak in 2004-2005. The forecast assumes that welfare reform policies have *percentage* effects on welfare caseloads, so welfare reform's effects on caseloads are greatest when caseloads

would otherwise be high.[9] This assumption seems reasonable, because states during a recession will face financial problems that force them to restrict welfare spending. In addition, many welfare reform administrative practices, such as sanctioning and diversion, would have effects proportional to the size of the caseload.

As alternatives to this "best forecast," Table 3 reports other scenarios. These scenarios differ in how many welfare recipients are required to work, whether there is a recession, the extent to which trends in welfare caseloads continue, and whether the five-year time limits will become binding. The estimates in Table 3 suggest that the effects of welfare reform on labor supply are not grossly sensitive to alternative assumptions. The "best forecast" that welfare reform's post 1993 impact on labor supply will peak at 1.4 million in 2005 seems reasonable.

3. Theories of Labor Market Effects of Welfare Reform, and Related Estimation Issues

If welfare reform increases the labor force by 1.4 million persons, about 1 percent of the U.S. labor force, will this have large effects on wages and unemployment rates? The answer depends on the model and parameter estimates. For example, as we will see, Mishel and Schmitt (1995) estimate that a labor supply shock of less than one million participants from welfare reform will lower the wages of the bottom 30% of the workforce by 12%, whereas George Johnson (1998) estimates that a labor supply shock of 10 million from immigration will not affect the wages of any group of native workers by more than 5%. The difference between these two estimates largely depends on different estimates of how responsive labor demand is to wages. This section of this paper focuses on these modeling and estimation issues.

[9]This is implicitly assumed because welfare reform is assumed to account for the unexplained change in the *log* of the welfare receipt rate.

Models of Wage and Displacement Effects

According to standard economic models, the labor market effects of an increase in labor supply of some type of labor (e.g., less-educated women) largely depend on how responsive labor demand and labor supply for that type of labor are to wages. The effects of the supply shock on the wages and employment of the type of labor being shocked are given by the following formulas:

(Equation 1, the wage effect) $\%\Delta W = S$ times $[(-1)/(Es + Ed)]$

(Equation 2, the employment effect) $\%\Delta Eo = S$ times $[(-1)Es/(Es + Ed)]$

(Equation 3, the displacement proportion) $D = (-1)$ times $\%\Delta Eo/S = [Es/(Es + Ed)]$

$\%\Delta W$ is the percentage change in wages for this type of worker in response to a supply shock. $\%\Delta Eo$ is the percentage change in employment for workers in this labor market, except for those added to the labor force by the supply shock. *S* is the supply shock for this type of labor, expressed as the additional labor force participants due to the supply shock as a percentage of the original employment level for this type of labor. *D* is the displacement proportion, or the ratio of the loss of employment of the original labor force to the number of new labor force participants added to the labor market for this type of labor. *Es* is the elasticity of labor supply of this type of labor with respect to wages (that is the ratio of the percentage *increase* in the quantity of labor supplied to jobs to the percentage *increase* in wages, moving along a given labor supply curve). *Ed* is (-1) times the elasticity of labor demand for this type of labor with respect to wages (with the multiplication by minus one, this is the ratio of the percentage *increase* in the quantity of labor demanded to the percentage *reduction* in wages moving along a given labor demand curve). *S* is

of course positive, and *Es* and *Ed* should also be positive (recall that *Ed* is minus one times the elasticity of labor demand).[10]

From these three equations, if *Ed* is larger (labor demand responds more to wages), then the percentage change in wages in response to a supply shock will be smaller, the percentage loss in employment of the original labor force will be less, and the displacement proportion will be lower. Intuitively, if labor demand is more responsive, a smaller wage adjustment is needed to restore equilibrium after a positive supply shock, and more adjustment is due to expanding demand rather than reducing employment of the original workers. To take an extreme case, if the elasticity of labor demand is infinite, then wages and the employment of the original workers will be unchanged, with zero displacement.

In addition, if *Es* is larger (labor supply responds more to wages), then a supply shock will have smaller effects on wages, but larger displacement effects on the employment of the original workers. Intuitively, if labor supply is more responsive, a smaller increase in wages is needed to restore equilibrium after a supply shock, but more of the adjustment is due to reducing the labor supplied by the original workers. To take an extreme case, suppose *Es* is zero. Then there will be zero displacement of the original workers, and the percentage decrease in wages will only depend on the elasticity of labor demand.

An important issue in deciding on how responsive labor demand and supply are to wages is what equilibrium condition is expressed by these demand and supply functions, and in particular, what else is held constant as we vary wages for one of these functions. The demand

[10]These are standard results in economics, and can be found in many places in the literature, for example in Freeman (1977). These equations can be derived by specifying the equilibrium condition $Ls(w) + G = Ld(w)$, where $Ls(w)$ is labor supply as a function of wages, G is the supply shock, and $Ld(w)$ is labor demand as a function of wages. To derive the formulas, totally differentiate this equilibrium condition with respect to G and evaluate at $G=0$.

function should be a general equilibrium demand function that shows how labor demand for this type of labor varies with wages in response to a supply shock, allowing output and the wages and prices of other factors of production to change. These "feedback effects" of changes in output, other wages, and factor prices, on the labor market being shocked will only be large if the type of labor being analyzed is a large share of total production costs or has strong interaction effects with another factor of production.

For example, these feedback effects are important if we analyze the effects of a supply shock on the average wage of all labor, and on the shock's average displacement effects for labor overall. Overall labor is around 70% of the value of inputs to production, and so feedback effects cannot be ignored. In the short-run, the positive supply shock to labor will increase overall output, but we can assume that the overall capital stock does not change. Hamermesh's (1993) review of the labor demand literature suggests a "best guess" that the "output-constant" elasticity of labor demand is (-0.3). But this is not the relevant elasticity of labor demand to use in evaluating the wage and displacement effects on the overall labor market of a shock to labor supply, as output will increase due to an increase in overall labor supply. In the short-run, the relevant elasticity of labor demand is one divided by the "factor price elasticity for overall labor," where the factor price elasticity for labor shows how the average wage that employers are willing to pay for labor varies with the overall quantity of labor, holding the capital stock constant. Hamermesh's "best guess" implies that the factor price elasticity for labor overall is also about (-0.3).[11] Hence, the relevant short-run labor demand elasticity is 1/(-0.3) = -3.33. Multiplying this by (-1) to enter in the equations given above, this relatively large elasticity dominates the

[11]Hamermesh (1993) discusses these demand concepts. As he shows, the output-constant elasticity of demand for overall labor is $-(1-s)\sigma$, and the factor price elasticity is $-(1-s)(1/\sigma)$, where s is the factor share of labor, and σ is the elasticity of substitution between overall labor and capital. Empirical research suggests that σ is close to one.

calculations. If the elasticity of labor supply is small, wage and displacement effects of a given shock to overall labor will be small relative to the size of the supply shock. For example, if the elasticity of labor supply is zero, then percentage wage effects on average wages for labor overall will be less than one-third the percentage supply shock. Furthermore, the elasticity of labor supply would have to be greater than 3.33 for the displacement proportion to exceed one.

In the long-run, the elasticity of labor demand for labor overall will be considerably greater in absolute value, in fact on theoretical grounds we would expect long-run demand for labor overall to be infinitely elastic with respect to wages (*Ed* is infinite) in response to a labor supply shock. The supply shock will initially lead to lower overall wages for workers. Lower wages will increase profit rates. With greater profits, firms will invest and expand the capital stock. This expansion of the capital stock increases the overall demand for labor, flattening out the long-run "general equilibrium" demand curve for overall labor. As capital and labor demanded increase, wages will increase and profit rates will decline. The expansion of the capital stock will continue until profit rates have been restored to their original level, assuming that the long-run supply of capital is perfectly elastic at a fixed long-run profit rate. If production is constant returns to scale in capital and labor, the original profit rate will not be restored until capital and labor demand have expanded enough to bring wages back to their original level.[12] Thus, the long-run labor demand curve will be perfectly elastic at the original wage rate. In the long-run, a shock to labor supply will have no effects on the average overall wages for all workers. Furthermore, in the long-run a shock to labor supply will have no overall displacement effects for all labor—the volume of employment will expand exactly enough to accommodate the extra labor supply. The supply

[12]This is a basic result in economics. With a linear homogeneous production function in capital and labor, the profit rate and wage rate will be functions of the capital/labor ratio. If the profit rate is restored to its original level, so must be the capital/labor ratio, which implies the wage rate will also be at its original level.

shock might still have wage or displacement effects on different types of workers. But these effects will represent redistribution within the labor sector of the economy, not a redistribution from labor to owners of capital.

What does this imply for welfare reform? The welfare reform shock is estimated to be a maximum of 1.4 million additional labor force participants, about 1% of overall U.S. labor supply. The above discussion implies that it is unlikely that this shock would have large effects on average U.S. wages. In the short-run, the shock would reduce average U.S. wages by 3/10ths of 1% if the elasticity of labor supply is zero, and by even less with any positive labor supply elasticity. Displacement effects would be minimal unless labor supply elasticities are very large, which, as discussed below, seems unlikely. In the long-run, the capital stock would expand enough to bring overall U.S. wages back to their original level and eliminate any overall displacement of the original workers.

Although economists have reached some consensus on how average wages affect overall labor demand, economists have not yet reached a consensus on how wages of the different types of labor—differentiated by education or skill, for example—affect demand for each type of labor. According to Hamermesh's (1993) review, "Knowledge of the extent of substitution among various groups of workers is not well developed" (p. 136).[13] For welfare reform, the most relevant labor demand elasticity is for less-skilled women. In the few studies that have been done, when the wage of some less-skilled group is the dependent variable, the factor price elasticity is considerably less than one in absolute value, that is a change in the employment of less-skilled workers of *x*% is associated with a change in the wage of the less-skilled group of considerably

[13]Studies estimate either output-constant elasticities of labor demand, or factor price elasticities, neither of which is exactly what determines the demand response to a supply shock. A supply shock will increase output, so output-constant demand elasticities are not quite right. A supply shock will alter the quantities of other labor inputs, so factor price elasticities are not quite right.

less than *x*%. (Berger, 1983; Juhn and Kim, 1995; Borjas, Freeman, and Katz, 1997). But when the employment of a less-skilled group is the dependent variable, the output-constant elasticity of labor demand is considerably less than one, that is a change in the employment of less-skilled workers of *x*% requires a change in the wage of the less skilled group of considerably more than *x*% (Grant, 1979). In the minimum-wage literature, in which employment of teenagers (presumably less-skilled) is the dependent variable, the implied elasticity of teenage employment with respect to changes in teenage wages caused by the minimum wage is considerably less than one (Katz, 1998). It is hard to reconcile these findings.[14] Estimates of demand for less-skilled workers may be biased. Moderate positive elasticities of labor supply of less-skilled workers in response to wages will bias estimates of either factor price or labor demand elasticities for less-skilled workers toward zero.[15] As Hamermesh comments, "...we really know very little about the impact of different methods of estimating parameters describing labor-labor substitution or about the effects of thinking seriously about the interaction of relative supply and demand..." (Hamermesh, 1993, p. 127).

Uncertainty also exists about the elasticity of labor supply. Traditionally, economists have believed that the labor supply of males and female household heads responds little to wages. But some recent estimates suggest that labor supply elasticities for low-skilled groups may be modestly positive, perhaps as large as a 0.4 elasticity (Juhn, Murphy, and Topel, 1991).

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[14]Although these findings can be reconciled with some specifications of the production function, for many commonly used production functions these findings are contradictory. This point will be illustrated later with specific production functions and parameters.

[15]When employment is the dependent variable, unobserved demand shocks will move us along a supply curve, resulting in a positive correlation between the residual and wages, biasing the negative coefficient on wages towards zero. When the wage is the dependent variable, unobserved demand shocks will also lead to a positive correlation between the equation residual and employment, biasing the negative coefficient on employment toward zero.

In addition, the effective labor supply curve could be based on a "wage curve" (Blanchflower and Oswald, 1994), not a more conventional labor supply curve that describes labor force participation decisions. Wage curve models assume that firms may find it profitable to pay wages above the wage that clears the labor market, and as a result the equilibrium wage will be accompanied by involuntary unemployment. Above-market clearing wages may be profitable for firms by easing worker recruitment, improving worker productivity, and reducing worker turnover. The equilibrium wage curve is assumed to vary with unemployment, as higher unemployment makes it less necessary to pay high wages to get, keep, or motivate productive workers. When the wage curve is combined with a labor force function that expresses the labor force as a function of wages and unemployment, the wage curve can also be written as an equilibrium relationship between wages and employment. This equilibrium relationship functions as the effective labor supply curve. Equilibrium wages, employment, and unemployment will satisfy both the demand function and the wage curve.

In wage curve models, the elasticity of labor supply will be relatively high, compared to conventional labor supply functions. For example, Blanchflower and Oswald's estimates of *aggregate* wage curves suggest an effective *aggregate* labor supply elasticity of around one, that is a 1% increase in overall employment is associated with a 1% increase in average wages.[16] As for wage curves for particular types of labor, the scanty available evidence suggests they also may show a high effective labor supply elasticity.[17] Because of these high effective labor supply

[16]Blanchflower and Oswald estimate that the effect of ln(unem. rate) on ln(wage) is 0.1. At an unemployment rate of 6%, a 1% decrease in unemployment would increase wages about 1.6%. Cross-section studies suggest that a 1% decrease in unemployment increases labor force participation by perhaps half a percent (Bowen and Finegan, 1969). Combining these relationships, a 1.5% increase in employment is associated with about a 1.6% increase in wages.

[17]Blanchflower and Oswald do not find huge differences in the sensitivity of different groups' wages to overall unemployment (pp. 150-153); if some group's unemployment had huge effects on wages, greater differences would be expected. Also, see estimates below that suggest little sensitivity of relative wages of different

elasticities in wage curve models, labor supply shocks have smaller negative effects on wages, but larger displacement effects.

An increase in labor supply of one type of labor will also have spillover effects on wages and employment for other types of labor. Lower wages of the type of labor that is shocked, and the increased output due to the supply shock, will shift labor demand curves for other types of labor. For types of labor that are strong substitutes for the type of labor being shocked—for a welfare reform shock, these would probably be labor types with low skills and high proportions of women—labor demand would decline, reducing the wage and employment of these types of labor. For types of labor that are complements to the type of labor being shocked, or for which the expanded output from the supply shock outweighs any substitution effect—for welfare reform shocks, these might be types of labor with higher skills—labor demand would rise, increasing the wage and employment of these labor types. But because we lack an empirical consensus about how substitutable different labor types are in production, no definite predictions can be made about the magnitude of these effects.

Other spillover effects of welfare reform are more difficult to model. Employment of some welfare recipients may cause employers to be more or less willing to hire other welfare recipients. Employed welfare recipients may provide job leads for friends, or be role models. Not much is known about the importance of these "information effects."

Estimation issues

What is the best way to estimate these wage and displacement effects of labor supply shocks? Few research studies have attempted to estimate the labor market effects of labor supply

groups to relative unemployment.

shocks. The labor market effects of immigration shocks have received the most attention. Hence, in discussing methodologies for estimating the effects of supply shocks, I will refer to findings and arguments from immigration research.

There are two important methodological issues in estimating the labor market effects of labor supply shocks: whether structural or reduced form estimation is preferable; whether it is better to use local data or national data.

Reduced form estimation of the effects of supply shocks regresses the labor market outcomes (e.g., wages, employment) on the supply shock, as in equations (1), (2), and (3) above. The structural approach is to estimate the supply and demand curves, and use these estimates to simulate the effects of a supply shock.

The reduced form approach avoids possibly erroneous assumptions about labor market structure. For example, the reduced form approach does not require assumptions about whether a wage curve model or a more conventional supply and demand model is better. But reduced form models may provide biased estimates of the effects of supply shocks because the supply shock variable is likely to be endogenous. For example, the magnitude of immigration or persons leaving welfare in a local economy or nation will probably be greater if economic conditions are stronger. A regression of labor market outcomes on a supply shock may reflect the influence of economic conditions on the supply shock variable as much as the influence of the supply shock on the economy. Researchers can eliminate this bias using “instrumental variable” estimation methods, which requires finding instrumental variables that affect the supply shock variable, but are uncorrelated with unobserved variables affecting economic outcomes. But finding variables that affect labor supply shocks but are uncorrelated with economic outcomes is difficult.

A related point is that supply shocks are often so small that reduced form regressions of labor market outcomes on supply shocks may find it difficult to reliably detect any effects. The effects may be overwhelmed by statistical "noise," or by even modest endogeneity of the supply shock variable.

Structural estimation fits the effects of supply shocks into an overall model of the labor market. This structural model may suggest restrictions that help correct for any endogeneity problems, for example by suggesting instrumental variables that shock supply but not demand. Even if supply shocks are small, structural methods may still be able to obtain good estimates of the effects of supply shocks. Structural methods can still get precise estimates despite small supply shocks because the estimated supply and demand parameters are based on the larger natural variations in overall labor supply and demand of different groups, not just the smaller variations due to supply shocks. Finally, structural estimates allow the results to be compared to our previous knowledge about supply and demand elasticities, to see if the estimates seem plausible.

Another estimation issue is whether to rely on local data—data on states or metropolitan areas—or on national time-series data. Local data has many more observations than national data, allowing more precise estimates. But a labor supply shock in one area may cause spillover effects on other areas. If such effects are not accounted for, the local effects of supply shocks cannot be used to infer national effects. For example, an increase for one local area in immigrants or welfare recipients in the labor force may affect other local areas by altering demand for the other areas' products, or causing capital or labor to migrate.

In the research literature on the labor market effects of immigration, the most-discussed spillover is the effect of immigration to one area on native migration. If each less-skilled immigrant to Los Angeles leads to net out-migration of one less-skilled native from Los Angeles,

then we would not expect immigration to Los Angeles to affect local wages or employment rates. This native out-migration from Los Angeles would spread immigration's effects across the nation. Whether immigration leads to offsetting native migration is much disputed (Filer, 1992; Borjas, Freeman, and Katz, 1997; Card, 1997).

Research on internal migration suggests that migration cannot quickly restore labor market equilibrium. For example, research suggests that even after 10 years, migration does not fully adjust the local population in response to increases in local employment (Bartik, 1992; Treyz, Rickman, Hunt, and Greenwood, 1993). There also are some peculiar but consistent results in the migration literature that suggest that migration may do less to restore labor market equilibrium than one might assume. For example, several studies have found that a 1% shock to the labor force from migration leads to a 1% increase in employment. (Muth, 1971; Greenwood and Hunt, 1984). It is unclear why migration has such a large effect on employment, because migrants will not spend all their income on locally produced goods. The large effects of migration on employment might be explained in part by non-labor income of migrants, and in part by agglomeration economies that make production more profitable in larger local economies. Whatever the explanation, this finding suggests that migration will do little to restore equilibrium after a labor supply shock. These large effects of migration on employment also suggest that labor supply shocks due to migration, such as immigration, may have quite different labor market effects than similarly sized labor market shocks due to increased labor force participation, such as shocks due to welfare reform. Even though many immigration studies find little effect of immigration on local wages, this may mean little for the likely effects of welfare reform.

4. A Variety of Estimates of the Displacement and Wage Effects of Welfare Reform

This section of the paper presents a wide variety of estimates of the displacement and wage effects of welfare reform. I begin with previous estimates. I then look informally at the data, first at the size of welfare reform shocks, and then at the national data on labor market outcomes for female household heads. I next present new reduced form estimates of the effects of welfare reform. This is followed by structural models. I first simulate the effects of welfare reform based on structural models from three immigration studies. Finally, I present simulations of the effects of welfare reform based on my own structural model of the labor market, which is a wage curve model.

Previous Studies of the Effects of Welfare Reform on Wages

Four previous studies provide estimates suggesting the effects of welfare reform on wages. These studies are described in Table 4. If these studies are adjusted to the welfare reform supply shock assumed in this paper—1.4 million additional labor force participants by the year 2005—then the results from the four studies are reasonably consistent. All four studies imply that a welfare reform shock of 1.4 million labor force participants will lower wages of some low-education group by 5% to 15%.

However, these four studies are not particularly satisfactory, as is recognized by the authors. The first three studies in table 4 use similar methodologies: assume certain demand and supply elasticities. The assumed demand elasticities (-0.3 for all three studies) and supply elasticities (zero for Mishel and Schmitt, 0.4 for the other two studies) are reasonably consistent with some previous research. But, as discussed in section 3, some studies imply considerably

higher demand elasticities for less-educated workers. In addition, one might get considerably higher supply elasticities in a wage curve model.

Mishel and Schmitt, and Holzer, consider their estimates to be somewhat unrealistic thought experiments. Holzer is concerned that many former welfare recipients may be so lacking in skills that they may be unable to compete for most low skill jobs. If this is so, wage effects on other less-skilled workers would be less than is assumed in Holzer's study, but nonemployment rates for ex-welfare recipients would be extremely high. Mishel and Schmitt also believe that nonemployment rates for ex-welfare recipients will be high. In addition, they imply that wages might not adjust downward as much as their estimates imply, and that welfare recipients who get jobs may displace others from jobs.

McCrate's study uses a quite different methodology than the other three studies. Her focus is the "reduced form" relationship between welfare benefits and wages, where welfare benefits affect wages by affecting labor supply. The main problem in these estimates, as McCrate recognizes, is that welfare benefits may depend on the economy. Welfare benefits are set via a political process that takes into account a state's economy and how it affects the typical voter. For example, welfare benefits are set higher when state unemployment is high (Baicker, 1998). As McCrate says, despite the positive relationship she finds between welfare benefits and women's wages, "It remains unclear, however, how much of that relationship is due to the market-mediated effect of welfare on wages, and how much is due to the politically driven effect of wages on welfare, since attempts to control for endogeneity were unsuccessful."(p. 418)

Comparing welfare reform shocks with various employment numbers

Before estimating the wage and displacement effects of welfare reform, I compare the size of welfare reform shocks with different employment levels and employment growth numbers. These comparisons provide intuition for how much various employment numbers must adjust to accommodate the extra labor supply from welfare reform, and allows a guess about whether such employment adjustments are likely without significant changes in wages.

The long-run welfare reform increment to labor supply of 1.4 million over the 1993-2005 time period is about 1% of 1993 employment. As discussed in section 3, it seems likely that this supply increment can be accommodated in the long-run without significant declines in average wages for all workers, or increases in overall unemployment rates.

Might effects on the overall labor market be important in the medium run? The maximum 5-year labor supply increment for welfare reform is estimated, in our best forecast from section 2, to be 1.008 million over the 1995-2000 period. Comparing this to national employment changes during recent 5-year time periods, this welfare reform shock is between 7% and 19% of recent 5-year employment changes.[18] Such an adjustment does not seem large, although perhaps it could lead to some modest changes in wages and unemployment rates.

Consider the long-run change in labor supply for less-educated females. This long-run increase of 1.268 million is about 3% of total U.S. employment of women with less than a college education.[19] As discussed in section 3, the long-run wage and displacement effects of this labor

[18]The shock of 1.008 million is 8.3% of national employment change from 1992-97 as measured in the CPS, Outgoing Rotation Group; 9.9% of 1991-96 (CPS ORG); 18.2% of 1989-94 (CPS-ORG), and 7.5% of the total change in full-time and part-time employment from 1991-96, as measured in the Regional Economic Information System of the U.S. Department of Commerce.

[19]Using the "best forecast," I assume that labor supply effects on single parents are effects on women, and effects on two parent households are effects on men. I compare this forecast with employment numbers for women with less than a college education because the March 1997 CPS shows that 98.5% of women receiving AFDC have less than a college education.

supply increase depend on the elasticities of labor demand and labor supply for less-educated females, about which there is much uncertainty.

Consider possible medium-run effects of welfare reform on the labor market for less-educated females. In the "best forecast" of section 2, the maximum 5-year increment to the labor force of less-educated women from welfare reform is 905,000, over the 1995-2000 time period. This is 30% of the 1992-97 change in national employment for this group, 34% of the 1991-96 change in national employment for this group, and 67% of the 1989-94 change in national employment for this group.[20] Fully accommodating this growth shock within five years requires sizable adjustments. Intuition suggests that over a 5-year period, such a supply shock would induce significant wage and unemployment rate changes for less-educated females.

Table 5 reports similar comparisons for each state, and for each of the 10 largest metropolitan areas. As the table shows, the variation across geographic areas is greater when welfare reform shocks are compared to 5-year growth than to employment levels. We might expect more medium-run variation than long-run variation in the effects of welfare reform across geographic areas.

The table also identifies states in which welfare reform is likely to have large or small impacts. Welfare reform is expected to have large labor market effects in California, New York, Illinois, Ohio, Michigan, West Virginia, and Rhode Island—a variety of states in the Northeast and Midwest, along with California, that have modest growth rates and high welfare rolls. For the 10 largest MSAs, welfare reform is expected to have large labor market effects in Los Angeles, New York, Chicago, and Detroit. Welfare reform is expected to have small labor market effects in a number of mostly Midwestern and Mountain states, including Indiana, Minnesota, Colorado,

[20]The changes in national employment for women with less than a college education are measured using data from the CPS, Outgoing Rotation Group.

Utah, North and South Dakota, Nebraska, Nevada, Idaho, and Virginia—states with modest welfare rolls and/or more robust growth.

Casual evidence from national time-series

Can the wage and displacement effects of welfare reform already be seen in national data? In the "best forecast" in section 2, welfare reform increased the labor force from 1993-97 by more than 400,000 persons. This increase in the labor force was apparent in Figure 1, causing the labor force participation of female heads to deviate from trends for other less-educated women. The labor market effects of welfare reform might be evident in recent trends for female heads in wages and unemployment.

As shown in figures 2 and 3, from 1995-97 the wages of female heads declined relative to other less-educated women, and unemployment of female heads stayed stable while unemployment declined for other less-educated women. In 1997, the wages of female heads would have been 2.5% greater if their wages had followed 1995-97 trends for other less-educated women. Unemployment rates for female heads would have been 0.6% lower if they had followed 1995-97 trends for other less-educated women.[21] However, these effects are small enough that CPS data suggests they can be explained by compositional effects: female heads who are ex-welfare recipients have lower wages and greater unemployment than other female heads, and hence more ex-welfare recipients in the female heads group would lower wages and increase

[21]From 1995-97, the ln(wage) for female heads declined from 2.130 to 2.116, while the ln(wage) for other less-educated women increased from 2.141 to 2.152. From 1995-97, unemployment for female heads stayed at 11%, while unemployment for other less-educated women decreased from 6.0% to 5.4%.

unemployment for female heads, even if wages and unemployment of each individual were unchanged.[22]

Reduced form estimates of the effects of welfare reform on wages and unemployment rates

Table 6 presents reduced form estimates of how reductions in welfare rolls are associated with changes in wages and unemployment for five groups. The adult population is divided by gender and by education into four groups. One more group is separated from the less-educated female group: female heads of household, with other relatives in the household, and 16-44 years of age.[23]

Estimates use pooled annual time series and cross-section data on all 50 states (plus the District of Columbia) from 1979 to 1997. All estimates include year dummies and state dummies, to control for unobserved time-period or state influences. The last estimates control for past trends in labor markets by including lags in wages and unemployment. The estimates are the effects of reducing welfare rolls by an amount equal to the maximum predicted reduction in welfare rolls in the "best forecast."

[22]Based on the CPS, the 1997 female head population was 6.859 million. From 1995-97, labor force participation for this group increased from 69.5% to 75.7%, while the labor force participation for other less-educated females increased by only 0.4%. The extra labor supply of female heads because their labor force participation increased more than 0.4% is ((75.7-69.9)/100) times 6.859 million =.398 million. These extra labor force participants are 7.7% (=.398/(.757*6.859)) of the total female head labor force in 1997. If unemployment had decreased from 11% to 10.4% among the "original" female head labor force, overall female head unemployment would stay at 11% if unemployment among the new participants was 18.3%. Data from the 1992-97 March CPS suggests that unemployment among female heads who received welfare the previous year averaged 37%, while unemployment among female heads who did not receive welfare the previous year averaged 7%. Suppose unemployment of the "original" female head group was 10.4%, and unemployment of new participants was 18.3%. Then employment of the new participants is .324 million out of total female head employment of 4.619 million, or 7.0% of total employment. For compositional effects to explain a relative wage decline of 2.5% in the ln(wage), the ln(wage) of the new participants must be 35.7% lower than those of the original labor force. Data from the 1992-97 March CPS shows that female heads on AFDC last year had an average ln(wage) of 1.786, versus an average ln(wage) of 2.190 for female heads not on AFDC last year.

[23]This is the closest one can come to consistently defining "single mothers" for all the years from 1979-97 in the CPS ORG data.

The estimates in column (1) make no attempt to correct for biases that occur because the ln(welfare receipt rate) will be endogenous. We expect lower unemployment and/or higher wages to lower welfare rolls. Hence, it is not surprising that column (2) shows that lower welfare rolls are associated with higher wages and lower unemployment for all groups. This association probably reflects causation from the economy to welfare rolls rather than the reverse.

The other estimates in the table attempt to control for the endogeneity of welfare rolls. The estimation strategy is to use state policy variables affecting welfare rolls as instruments for state welfare rolls. State welfare policy variables will be good instruments if state policy is not directly or indirectly caused by state labor market outcomes.[24]

Column (2) reports estimates that use the level of state welfare benefits as an instrument. These estimates reverse the sign of the effects of welfare reform on wages, but not unemployment: welfare reform is now estimated to have negative effects on wages, but welfare reform is still estimated to reduce unemployment. These estimates are unconvincing, and suggest that welfare benefits is a poor instrument. It is difficult to believe that welfare reform reduces unemployment for all groups. Furthermore, it seems suspicious that welfare reform's negative effects on wages are similar for all five groups rather than greatest for female heads. As mentioned before, there is evidence from other studies that state welfare benefits may be set higher when state unemployment is high, possibly due to political pressure from typical voters. If this is so, then using state welfare benefits as an instrument will lead to biased results, which is what we seem to get.

[24]In addition, to be a good instrument state policy variables must be good predictors of state welfare rolls, which they are. The F-tests on the instruments in the first-stage estimation prediction of state welfare rolls always have large values: 21.69 for the estimates in column (2), 12.07 for the estimates in column (3), and values greater than 30 in all cases in column (4).

Columns (3) and (4) report estimated effects of welfare reform using as an instrument another policy variable: whether the state has been granted a waiver that year to experiment with its welfare program. These estimates are closer to expectations. The negative effects of welfare reform on wages are concentrated on female heads. Welfare reform's effects on unemployment for all groups are statistically insignificant, although the estimates are imprecise, and the point estimate suggests that welfare reform lowers unemployment for female heads.

I conclude that these reduced form estimates of the effects of welfare reform are not convincing. The estimates suggest that a state policy variable such as welfare benefits is probably endogenous, which raises doubts about the whole strategy of using state policy variables as instruments. Convincing reduced form estimates of the effects of welfare reform will require instruments that shift the labor supply of welfare recipients independently of state policy or state labor market outcomes. Such instruments are hard to find.[25]

Applying the Borjas/Freeman/Katz model to welfare reform

Borjas, Freeman, and Katz's (1997) recent paper analyzes the labor market effects of immigration to the U.S., and U.S. trade with less-developed countries. They calculate how immigration and trade have increased the effective labor supply of different education groups; these calculations, together with estimates from previous studies of how relative labor supplies affect relative wages, are used to estimate how immigration and trade affect relative wages. Table 7 uses their methodology to estimate the effects of welfare reform on the labor supply of different education groups. Table 8 then uses their methodology to estimate the effects of welfare on the

[25]One might consider national policy changes with differential effects across states, for example, the changes in income disregards implemented in 1981 by President Reagan, or changes in the 1950s and 1960s in federal matching rates for state welfare spending.

relative wages of different education groups. For comparison, Tables 7 and 8 reprint the estimated effects of immigration and trade from Borjas, Freeman, and Katz.

As shown in Table 7, welfare reform, like immigration and trade, has disproportionate supply shock effects on low-education groups, and in particular on the lowest education group, high school dropouts. However, the labor supply shock from welfare reform is much less than the shock from immigration. Welfare reform only adds 1.4 million persons to the labor force, whereas immigration has added more than 10 million persons to the labor force over the last 15 years (Johnson, 1998). The welfare reform shock is slightly less than that from trade.

Because the labor supply shock from welfare reform is smaller than that of trade or (in particular) immigration, the relative wage effects of welfare reform are much less than those of trade or immigration (Table 8). Welfare reform is estimated to affect the differentials between low and high-education groups by less than 1% over the 1993-2005 period.

The estimates in Table 8 assume that the elasticity of relative wages with respect to relative labor supplies is quite modest. Borjas, Freeman, and Katz base their middle-ground estimates on estimates from national time series data, in which the ln(relative wages) of two education groups is regressed on the ln(relative labor supply) of the two groups, and a time trend.[26]

The estimates they obtain are consistent with some estimates of labor demand, but not others. Their estimates imply a large (in absolute value) output-constant elasticity of labor demand with respect to own wages for less-skilled workers, for example, a wage elasticity of -2.9 for high school dropouts.[27] As mentioned previously, estimates of factor price elasticities in the research

[26]Borjas, Freeman, and Katz do consider other possible elasticities of relative wages with respect to relative labor supplies, but these alternative values are still fairly close to the elasticities they estimate.

[27]I calculated constant output labor demand elasticities assuming a nested CES production function, with an elasticity of substitution between capital and the labor aggregate of 1.0 (Cobb-Douglas), and with an CES

literature, such as those of Borjas, Freeman, and Katz, may underestimate the effects of labor supply on relative wages (and hence overstate the labor demand elasticity), whereas estimates of output-constant labor demand curves may underestimate labor demand elasticities. Borjas, Freeman and Katz's estimates of how relative wages respond to relative labor supply will be biased if shifts in labor demand cause changes in relative labor supply, for example if business cycles cause changes in relative quantities of different types of labor employed.[28] If labor demand is less responsive to wages than is assumed by Borjas, Freeman, and Katz, then relative wages will respond more to relative labor supplies. The next section of the paper will consider some alternative labor demand elasticities.

The methodology used by Borjas, Freeman, and Katz does not segment the labor force by gender. Segmenting by gender may be unimportant when analyzing immigration and trade shocks, which have similar effects on male and female labor supply. But welfare reform mostly increases the labor supply of less-educated women, not men. If the labor market is significantly segmented by gender, with imperfect substitutability between less-skilled men and women, Tables 7 and 8 may be misleading. The modest estimated wage effects of welfare reform on all less-educated workers in Table 8 may mask larger effects on the wages of less-educated women. The next section addresses the issue of segmenting the labor force by gender.

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parameter in constructing the labor aggregate that is equal to one over the relative wage estimates used by Borjas, Freeman, and Katz. I also assumed a labor share of costs of 0.70, a high school equivalent share of labor costs of 0.428, and a high school dropout share of 0.062. I used Hamermesh's (1993) formulas for substitution elasticities in a nested CES function, and the theoretical constraint that substitution elasticities of all factors with respect to a single factor, when weighted by each factor share, must sum to zero, to derive own substitution elasticities and demand elasticities. The resulting elasticities of labor demand were: -0.93 for HSE, -0.78 for CE, -2.93 for HSD, and -0.47 for HSG.

[28]As noted by Freeman (1977), "it can be readily demonstrated that inadequate controls for supply and for shifts or differences in the level of relative demand schedules...tends to bias estimates of [the elasticity of substitution] from wage equations upward." (p. 159).

Finally, the estimates in Table 8 only address possible relative wage effects of welfare reform, and do not consider displacement effects or unemployment effects. These effects will be considered in later sections.

Applying the Johnson model to welfare reform

George Johnson has developed a general equilibrium simulation model of the effects of immigration that can be applied to welfare reform. The model divides the labor force into four groups, by gender and into "high school equivalents" and "college equivalents." The four types of labor are assumed to be combined into an aggregate labor input via a CES production function with some elasticity of intraskill substitution. Aggregate labor and capital are combined to make output according to another CES production function. The model can estimate the response of wages to labor supply shocks both in the short-run, when capital is fixed, and in the long-run, when sufficient investment occurs for the return to capital to go back to its original level. The model can also allow for labor supply to respond to wages.

Tables 9 through 12 present estimates applying this Johnson model to welfare reform. Table 9 uses the parameter estimates most emphasized by Johnson: an intraskill elasticity of 1.5 and an elasticity of capital/labor substitution of 1.0, with no elasticity of labor supply. These parameter assumptions are similar to those of Borjas, Freeman, and Katz (1997), except here the labor force is also differentiated by gender.

As can be seen in Table 9, welfare reform's effects on wages are quite modest, as are the effects of immigration in Johnson's estimates. These modest effects occur for two reasons. First, the size of the welfare reform supply shock is modest for all four groups of workers. Welfare reform's supply shock only increases the female high school equivalent labor force by a little more

than 2%. Second, the parameter estimates assumed by Johnson imply that labor demand for less-educated workers is fairly responsive to wages. The constant-output elasticity of labor demand for female high school equivalents with respect to their wage is about -1.3, which is modestly large in absolute value.

As Table 10 shows, the wage effects of welfare reform increase significantly if we use a different educational breakdown: high school dropouts vs. high school graduates. The welfare reform labor supply shock on the less-educated female group increases to almost 9%. Even with modestly large elasticities of labor demand, wages for this group are predicted to go down by 5% in response to the welfare reform supply shock. These results differ from what were obtained with the Borjas, Freeman and Katz model for two reasons. First, the use of gender/education categories increases the size of the welfare reform supply shock for one of the groups, female high school dropouts. Second, in the Borjas, Freeman, and Katz model, the analysis for this educational grouping assumed a considerably more wage elastic labor demand curve.

Table 11 shows how estimated wage effects vary with changes in the assumed "intraskill elasticities." With a lower value of the intraskill elasticity—i.e., it is harder to substitute one type of labor for another in production—wage effects increase significantly. The table also shows what constant-output demand elasticities are implied by the different parameter estimates. The higher value of the intraskill elasticities implies demand elasticities that are consistent with empirical estimates from regressing the wages of different labor types on labor supplies. The lower value of the intraskill elasticity implies demand elasticities similar to those that researchers get from regressing the quantity of different labor types on wages of different labor types. Using the lower intraskill elasticity, the demand elasticities are similar to those in the studies by Mishel and Schmitt, Bernstein, and Holzer that are reviewed in section 4.1. In the absence of a consensus on

how relative wages and relative labor quantities are interrelated in production, it is perhaps safest to assume that the truth lies somewhere in-between the estimates reported in Table 11. For example, the effects of welfare reform on the average wage of female high school dropouts might plausibly be somewhere in-between 5 and 15%.

Finally, Table 12 reports the effects of assuming that labor supply shows some responsiveness to wages, at least for low-skill labor. I assume that low-skill labor might have a modest labor supply elasticity equal to the 0.4 value estimated for low-wage workers by Juhn, Murphy, and Topel (1991). (I could assume higher values and argue that these correspond to flat wage curves, but it seems wiser to do so only in a model that explicitly incorporates unemployment, which will be presented in a later section.) As shown in Table 12, with these modest demand elasticities, adding a modest labor supply elasticity does significantly cut down on the estimated effects on wages, reducing the effects on the wages of female dropouts from -15% to -9%. In estimates not presented, adding these labor supply elasticities makes much less difference in models that assume higher labor demand elasticities, as one would expect. Adding the modest labor supply elasticities also causes the model to have some displacement effects: as wages go down, some of the original unskilled workers no longer have jobs. For the parameter estimates assumed here, for every 10 welfare recipients in the female dropout category who get a job, about four of the original female high school dropout group lose their job.[29]

[29]This effect can be approximately calculated by taking the ratio of the labor supply elasticity of 0.4 times the change in the female high school dropout wage in Table 12, to the percentage shock reported in Table 10 for female high school dropouts, and then multiplying by minus one.

Estimated effects of welfare reform shocks on employment and wages by wage decile, using modified Card methodology

David Card's (1997) paper examines the effects of immigration in different metropolitan areas on the employment/population ratio and the wage rate of different predicted wage deciles, where these predicted wage deciles are interpreted as proxies for different skill levels. Although his focus is immigration, the effects of immigration are derived from a model that relates employment/population ratios and wage rates of each decile to the population share in each decile. The endogeneity of each decile's population share is controlled by predicting the population share based on previous shares of immigrants in that MSA from different countries, and recent volumes of immigration to the U.S. from each country, along with predictions of the likely wage for immigrants from each country.

Card's estimates can be used to estimate the effects of welfare reform if one is willing to make some assumptions. Suppose labor force participation rates were unchanged in response to shocks to population shares of different deciles. As a result, a change in the ln(population share) in a decile would cause the same effect on the ln(labor force share) in that decile. The estimates in Card's paper would also reveal the effects of shocks to the ln(labor force share) of each decile. The effects on employment/population ratios would all be due to changes in unemployment rates. More realistically, a shock to a decile's population share should bring a less than proportionate shock to the decile's labor force share. Card's estimates in this case should provide a lower bound to the effects of exogenous shocks to a decile's labor force share.

Under these assumptions, Table 13 reports "lower bound" estimates of the effects of a welfare reform shock of 1.4 million labor force participants on labor market outcomes for different deciles. Almost all the labor supply effects of welfare reform are on the wage

distribution's bottom decile. Hence, the estimated effects of this labor supply shock are almost all in the bottom wage decile. These effects are more on employment/population ratios than on wages.

This application of Card's model probably understates the effects of welfare reform on women with low predicted wages. As mentioned above, the model estimates are probably lower-bound estimates of the effects of labor force shocks. Also, although Card estimates different effects for men and women, his model assumes that what matters is how the shock affects overall labor in each decile, and that the division of a labor supply shock by gender does not matter. If there is some segmentation by gender, the greater percentage effect of welfare reform on the lowest predicted wage decile of women should have greater effects on this group.

One of the most interesting implications from Card's paper is that labor supply shocks' effects on wages may be less than their effects on the employment of the original workers. All the previous empirical studies reviewed in this paper have focused on the effects of labor supply shocks on wages. As Card recognizes, his findings are consistent with two different models. In one model, "the elasticity of substitution between different skill categories is very high, and...the elasticity of labor force participation is moderately large." (Card, 1997, p. 35) In the other model, "labor markets adjust slowly to ... short-term immigrant inflows, with an influx of new immigrants leading first to employment losses and only in the longer run to changes in relative wages." (page 37) This latter model is essentially a wage curve model, with some lags in how supply shocks affect wages and stimulate employment growth. The next section develops an explicit wage curve model to simulate the effects of welfare reform.

Welfare reform's effects in a wage curve model

I also simulated the effects of welfare reform in a wage curve model with involuntary unemployment. Table 14 summarizes some of the main features of this 23-equation model. The model is designed to describe a state's labor market. The model is estimated using pooled annual time-series cross-section data for all 50 states and the District of Columbia for all years from 1979 to 1997. Five types of labor are included in the model: males and females, differentiated by whether they are college graduates or not, and a separate type of labor for less-educated female heads of household, ages 16-44, with other relatives in the household.

On the demand side, the model includes an equation for overall labor demand, equations for the share of demand for five different types of labor, and a personal income equation that allows expansions in state employment to feed back into expanded local demand. On the supply side, the model includes a wage curve expressing overall wages as a function of overall unemployment, five relative wage curve equations determining relative wages for each type of labor, and labor force participation and population migration equations for each type of labor.

All equations in the model include fixed state and time period effects, to allow for unobserved influences of state characteristics and the national economy. The model is identified via lags. It is assumed that labor demand, labor supply, wages, and migration respond to their various determinants only after a lag. Although this assumption of lagged response seems plausible, it is imposed by assumption rather than estimated. The lagged structure of the model does impose the implicit assumption that there will in the short-run be some immediate displacement in response to a labor supply shock: it takes time for unemployment to affect wages

and in turn cause labor demand to increase in response to the supply shock. Adjustment is not allowed to take place instantaneously in the model.[30]

As shown at the bottom of Table 14, where the model is estimating well-established parameters, the estimates are reasonably consistent with this previous research. The overall labor demand elasticity is about the expected size, the labor supply responses to wages and unemployment rates are plausible, the sensitivity of wages to unemployment is consistent with research by Blanchflower and Oswald, lower unemployment has greater effects on wages at low unemployment rates as was found by Blanchflower and Oswald,[31] and the responses of migration to wages and unemployment seem plausible.

The model also estimates various parameters for which no real consensus is available from previous research. Relative labor demand is not very sensitive to relative wages.[32] But the model also allows for relative demand for each labor type to be directly affected by the availability of different types of labor. The rationale for this direct supply effect is that employer hiring of

[30]The model does allow an immediate response of the employment share of a group to changes in the labor market share of the group. The assumption is that employer hiring responds to who happens to be applying for jobs.

[31]The estimation of the wage curve tested entering unemployment into the equation in various ways: the log of the unemployment rate, one over the unemployment rate, the unemployment rate, and the unemployment rate and unemployment rate squared together, with the final model chosen using the Akaike Information Criterion. The preferred model for overall wages uses the log of the unemployment rate; the preferred model for relative wages uses the unemployment rate itself, except for female heads and less-educated females, which use one over the unemployment rate.

[32]Note that the specified model, with log(employment share) as a function of log(relative wages), could be derived from a production function with a CES labor aggregate. However, the estimation does not impose the restrictions that would be implied by a CES function. Each employment share is allowed to have its own response to relative wages. The model simulation then adjusts the shares to force them to add up to one. A preliminary version of the model allowed employment for each type of labor to respond to all five wages; this model showed even less effects of relative wages on relative employment.

different labor types may depend on who applies for the job.[33] This direct effect of relative supply on relative demand is highly statistically significant in the model.

The model also estimates that relative wage curves are not very sensitive to relative unemployment rates. I know of no previous findings on relative wage curves and relative unemployment.[34]

The simulation uses the labor supply shocks due to welfare reform in the "best forecast" from Table 2 of this paper, for each year from 1994 to 2008. The model was simulated for a "typical state," based on projections of the percentage impact of welfare reform on the labor supply of each of the five labor groups. To represent the effects of implementing welfare reform in all states, the model was simulated with migration responses suppressed. The rationale for this suppression is that if welfare reform is implemented in all states, there should be no net incentives for in- or out-migration.[35]

The basic simulation results are summarized in Figures 4 and 5 and Table 15. The simulation results show that welfare reform has modest overall effects, with some effects on unemployment that occur first, and effects on overall wage rates somewhat later. The overall economy recovers from the welfare reform by the 2008 end of the simulation period, although it

[33]The labor force share was added to the model because preliminary estimates showed relatively little response of the employment shares to shifts in relative supply; the intent was to allow another avenue of response. However, as will be seen, even with this extra avenue of response, employment shares do not completely adjust to supply shocks in any medium-term time period.

[34]A preliminary version of the model allowed each group's wage to be affected by unemployment rates for all five of the groups. This model showed even less sensitivity of relative wages for a group to relative unemployment.

[35]An alternative way of modeling national effects would be to include national variables in the model (with year effects specified as random), and then to simulate what happens if national variables are equal to the same variables for the typical state. But national variables generally have insignificant effects or the "wrong sign" when entered into these state estimating equations. This suggests that unobserved national effects may be biasing these estimates.

does seem to be oscillating somewhat about the original equilibrium. Unemployment is back to its original level by 2003.

However, in looking at different labor types, welfare reform has sizable effects on the unemployment rate for female heads, the group whose labor supply receives the largest percentage shock from welfare reform. Higher unemployment rates for this group persist throughout the simulation, and unemployment rates for this group are driven up by more than 3% for most of the simulation period.

What explains this pattern of estimates? In this model, overall labor demand is responsive to supply shocks; overall unemployment has significant effects on average wages, and average wages have significant effects on labor demand. But demand for the labor type being shocked is not particularly responsive to supply shocks; a group's unemployment has little effect on relative wages, and relative wages have little effect on relative labor demand. There are some modest direct effects of labor force composition on the composition of who is hired. These direct effects are insufficient for labor demand for a type of labor to fully accommodate a supply shock targeted at that type of labor.

For displacement, these estimates imply that there is not much long-run displacement effects from welfare reform for workers overall, but there are significant displacement effects on the female head group. Displacement numbers are presented in Table 16. These displacement estimates incorporate not only the effects of the welfare reform on unemployment, but also how welfare reform affects labor force participation of the original workers.

Welfare reform would be expected to have greater effects in some geographic areas. In areas with a greater proportion of the population receiving welfare, the supply shock from welfare reform will tend to be greater. In addition, because of the nonlinearity of the overall wage curve,

areas with higher baseline rates of unemployment will have weaker wage responses to a supply shock, and hence a smaller and slower adjustment of overall employment to the supply shock. Table 17 considers how effects might vary in geographic areas with higher welfare populations or higher unemployment rates.

Table 17 considers the effects of the welfare reform supply shock on the real average earnings of the original labor force in the year 2002, the year in which the real earnings effects of welfare reform peak in the national simulation. The simulation considers how these effects are altered: (1) allowing for population migration so that the effects represent effects on a geographic area rather than national effects; (2) multiplying the shock by 1.5, which is about the amount by which welfare populations are higher in states such as California and New York; (3) multiplying the baseline overall unemployment rate by 1.3, which again is consistent with current local vs. national unemployment rate differentials in high unemployment areas such as California and New York; (4) considering both larger shocks and higher baseline unemployment rates; (5) finally, considering both much larger shocks and much higher unemployment, such as might be consistent with New York City aggressively pursuing welfare reform.

As expected, population migration moderates the real earnings losses caused by welfare reform supply shocks. Real earnings reductions due to welfare reform in high unemployment, high welfare population states such as New York and California might be 50% or so greater in magnitude than the overall national real earnings reductions from welfare reform. Still, the overall impression is that welfare reform's adverse effects on labor market outcomes are more concentrated on particular groups such as female heads than on particular geographic areas.

The geographic concentration of welfare reform's effects would be greater if we treated some large, economically distressed central cities, such as Detroit, as separate labor markets.

There is no consensus in urban economics about the extent to which inner city neighborhoods or central cities are separate labor markets. Such separate labor markets seem more plausible for the less-educated, who are less likely to have transportation access to or information about jobs throughout the metropolitan area. Separate city labor markets for the less-skilled would be likely to further increase the adverse effects of welfare reform on the real earnings of some less-skilled groups. Even without separate city labor markets, however, some inner city neighborhoods have sufficient concentrations of female-headed households that the effects of welfare reform on these neighborhoods would be large.

5. Conclusion

Based on the theories and studies reviewed in this paper, there is enough evidence for several conclusions about the labor market effects of welfare reform:

- Welfare reform is unlikely to have large effects on the overall national labor market. The labor supply shock from welfare reform is not large relative to the national labor force. It is difficult to create a plausible model in which a relatively small labor supply shock would result in large overall wage or displacement effects. The overall labor market is flexible enough to respond to a supply shock without huge adjustment problems for average wages or unemployment rates.

- There is a strong likelihood that the labor supply shock from welfare reform will have substantial effects on labor market outcomes for the particular demographic groups on which the shock is most concentrated, such as female household heads, female high school dropouts, etc. This conclusion can only be avoided if one is willing to assume a labor market that quickly clears and has unusually large labor demand elasticities for less-educated women.

- Welfare reform will have somewhat larger effects on some states or metropolitan areas: those with high welfare rolls, aggressive welfare reform policies, and/or high unemployment. However, the difference in effects across socioeconomic or demographic groups are more marked than the differences across states or metropolitan areas. Welfare reform will have large effects on some inner city neighborhoods, both because of the concentration of female-headed households in these neighborhoods, and possibly due to some segmentation of the inner city labor market from the metropolitan labor market.

- The empirical evidence suggests that more of the adverse earnings impact of welfare reform on less-educated women will occur through effects on unemployment and employment/population ratios rather than through effects on wage rates. The evidence suggests that relative wages do not change much in response to supply shocks, and relative employment does not adjust enough to fully offset supply shocks, so unemployment changes quite a bit. This is most easily explained using a wage curve model, although one could also try to explain these effects by a model with elastic labor demand and supply curves.

More precise conclusions could be reached if we had better estimates of some basic parameters of the labor market. In particular, we need much better estimates of the elasticities of labor demand with respect to wages for less-skilled women.

The evidence on these consensus conclusions should soon become much stronger. Over the next few years, as welfare reform is aggressively pursued, this paper predicts adverse trends in the real earnings of less-educated women that are large enough to be observable. This paper has made testable predictions.

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