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The Economic Effects of Moving Public Assistance Recipients into the Labor Force

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The Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (PRWORA) contained "welfare-to-work" provisions aimed at moving individuals from public assistance rolls to jobs. Many public assistance recipients took jobs during a period of strong job growth in the latter half of the 1990s. It is less clear that PROWRA has been successful in this regard.

The PRWORA has two work requirements: Able-bodied childless adults 18-49 must work, train, or volunteer for 20 hours per week, and able-bodied adults 18-59 with no children under six must work or participate in a training program if assigned by a state. However, many states use loopholes in the PRWORA to waive the work requirements. Specifically, most states fail to assign recipients to a training program, in effect, negating the work requirement. Also, states have used regulatory loopholes to waive the 20 hour per week requirement for the vast majority of those subject to work requirements.

Policymakers are discussing reform legislation that would (1) require states to assign those adults to training programs if they are not working, and (2) eliminate the loopholes states use to waive the work requirement. Researchers have estimated that these requirements would add 1.11 million new workers to the U.S. work force.

The issue we need to address is this: "What happens to GDP when you add 1.11 million new workers to the work force?"

Case 1: The "naïve" forecast

When an employer hires a worker and compensates that worker to the tune of $18 per hour (including wages, salaries, and benefits), it is because that work (at the margin) contributes $18 worth of value to the organization. The hourly compensation rate in this case represents the "value of the marginal product of labor," and is the contribution of that worker to GDP. We may think of GDP as representing the total value added to an economy in a year by labor and capital, and the compensation rate as representing the value added by a worker in an hour.

Thus the first way to measure the contribution to GDP of moving 1.11 million workers into the labor force is to multiply the number of new workers by their compensation rate

The main challenge here is figuring out what that compensation rate would be, since it varies by gender and by education or skill level. We separate the labor force into four groups by gender (male/female) and education (no college/at least some college). Based on data from the most recent Current Population Survey, updated to the prices and expected income levels of 2018, we have the information on the levels of annual total compensation shown in Table 1.

The U.S. government provides assistance to qualified individuals through its Supplemental Nutrition Assistance Program, otherwise known as “SNAP” or “food stamps.” A total of 24.88 million adults are in households that receive SNAP benefits, and of these, about a third (8.52 million) work. An estimated 95.5% of adult SNAP beneficiaries, and 97.6% of those who work, have no more than a high school education. When SNAP beneficiaries are moved into work, almost all of them will be entering the unskilled (“on-the-job training” or OJT) segment of the labor force, where compensation and productivity are relatively low (Hanson and Hamrick 2004). The average annual labor compensation of those SNAP recipients who work is just $21,471, compared to $67,996 for the US population as a whole. Working SNAP recipients work for about two-thirds as many hours per week as non-recipients; and if they earn too much they graduate out of the program.

Now assume that 1.11 million SNAP recipients are moved into work, in proportion to their current proportions as broken down by gender and skill level. Since their average annual total compensation is $21,471, this would represent **an increase in GDP of $23.8 billion** (= 1.11 million × $21,471). This may be represented by

$$\Delta GDP = \sum_i \sum_j w_{ij} dL_{ij}$$

where *w* is the annual compensation for the group, indexed by *i* for gender and *j* for skill level, and *dL* represents the change in employment for the group. A more formal treatment of, and justification for, this measure is given in Appendix 1.

This is a “naïve” estimate of the effect on GDP, because it does not take into account any behavioral reaction on the part of other workers or of investors.

Case 2: Short run with same capital stock but labor adjustment

The incorporation of an additional million workers in the labor force will put downward pressure on wages. In the current case, the effect will mainly be on the wages of unskilled workers, who now have to compete more strongly for jobs. The lower wages will lead some workers to withdraw from the labor force. This will mitigate to some extent the increase in GDP measured using the "naïve" approach.

Table 1. Estimated labor compensation for SNAP recipients, and all adult individuals, US, 2018

	SNAP recipients		All individuals	
	Men	Women	Men	Women
High school education or less				
Population (m)	9.88	13.89	73.86	65.16
Employment (m)	4.86	5.41	57.93	43.73
Total compensation ($ bn)	122	96	3,751	2,143
Compensation per year ($)	25,104	17,802	64,753	49,009
At least some college education				
Population (m)	0.39	0.72	30.90	32.13
Employment (m)	0.10	0.15	27.84	25.19
Total compensation ($ bn)	4	4	2,931	1,693
Compensation per year ($)	36,809	25,869	105,288	67,203

Source: CPS …

To determine the relevant magnitude, we need to measure the "displacement effect" (given by λ_u), which gives the number of current unskilled workers who stop working, for every 100 SNAP recipients who newly enter employment. We estimate this to be 10.14, so for every 100 new unskilled workers, 10.14 existing workers would be displaced, raising employment by 89.86. The details of the derivation and estimation of λ_u) are given in Appendix 2.

One of the most important parameters needed for the computation of λ_u is the wage elasticity of supply of unskilled labor, given by ε_u. We use a value of 0.4 for ε_u, which is probably near the upper end of the plausible range (Johnson 1998; Juhn, Murphy & Topel 1991; Bartik 2000). This implies that a 10 percent increase in the wage rate for unskilled workers would increase the supply of unskilled workers by 4%. We assume that this elasticity is 0 for skilled labor, in line with common usage.

When we allow for the displacement effect, the increase in GDP resulting from 1.11 million SNAP recipients taking up employment would be $21.5 billion**.** This is roughly 10 percent lower than the "naïve" estimate of the effect on GDP because it allows for an adjustment in the labor supply.

Case 3: Long run with adjusted capital stock but no labor adjustment

When the supply of workers to the market rises, the wage will fall, as we have seen, and this induces employers to boost their hiring. It also opens up a long-term opportunity for investors, who can now draw on a larger and cheaper pool of workers. This will lead to increased investment, and an expansion of the country's capital stock, which in turn will raise GDP further.

If we assume that the capital stock will expand until the return on capital falls back to its original level, we can – with some additional assumptions about the relevant parameters – estimate the long-term effect on GDP. The technical details are set out in Appendix 3. The result is that a 1.11 million increase in employment, resulting from changes in SNAP procedures, would raise GDP by $45.9 billion**.**

Case 4: Long run with adjustments to the capital stock and to labor supply

In this case we allow the capital stock to adjust to the additional supply of labor, and we also allow the labor force to respond to the reduction in wage rates. This combines the displacement effect from Case 2 with the expansionary effect of more capital from Case 3. The result, which is the most plausible of all those considered here, would see an increase of GDP of $41.4 billion, resulting from the increase in employment for SNAP recipients of 1.11 million**.**

These results are calculated in an Excel program, which has been calibrated to reflect the best-available estimates of the relevant parameters. Here is a reproduction of the "face page" of that program:

		Instructions
Change in employment (millions)	1.11	Change the green cell (b6) if necessary.
		Then type Ctrl-Shift-F
	Result: Increase in GDP	
	$ billion	
Short-term effects:		
"Naïve" estimate (with no behavioral reaction)	23.84	The effects on GDP are in the yellow cells
Supply effects included	21.48	
Long-term effects:		
Capital stock rises, no labor supply effects	45.92	
Capital stock rises, labor supply reacts	**41.43**	This is the best estimate, resulting from long-run CGE calculations

The user simply enters the change in employment that is expected as a result of changes in the SNAP policies and procedures, and types Ctrl-Shift-F. This latter step recalibrates the program, and the model estimates the effects on GDP in the short-run and long-run, in each case without and then with labor supply reaction.

Robustness

The results shown here are only as convincing as the parameters, and model, that undergird them. In this section we explore the robustness of the results to the choices we make about the parameters of the model. Specifically, we vary the parameters shown in Table 2, one by one, and show the implications for employment in Table 3.

If unskilled labor is relatively unresponsive to a change in wages, then the increase in employment of 1.11 million will lead to a very small offsetting fall in employment among those already working, and the increase in GDP will be almost as large as in the "naïve" case – compare columns (1) and (2) in Table 3. If capital and labor are closer substitutes, then the effect will be a tiny increase in the contribution of more labor to GDP, but it is not measurable at the level of one decimal place, as a comparison between columns (1) an (3) in Table 3 shows.

Finally, if labor is less easily substituted across types (male/female, skilled/unskilled), then an increase in the employment of unskilled labor will create a larger displacement effect, resulting in a smaller rise in GDP than in the baseline case. The broad conclusion is that our model is robust to the choice of the key parameters, and so can be used with some confidence.

Table 2. Parameters for robustness checks

Parameter	Symbol	Value in model	Alternative value
Wage elasticity of supply of unskilled labor	ε_u	0.4	0.2
Elasticity of substitution between labor and capital	σ	0.5	1.1
Elasticity of intrafactor substitution	τ	1.5	0.9

Table 3. Effects of an increase in employment of SNAP recipients by 1.11 million, using different model parameters ($ billion in 2018 prices)

	Baseline	Labor less responsive to wages	Capital a better substitute for labor	Less substitution within labor types
	(1)	**(2)**	**(3)**	**(4)**
Short-term effects				
"Naïve" estimate	23.8	23.8	23.8	23.8
Labor supply effects included	21.5	22.6	21.5	20.2
Long-term effects				
Capital stock rises	45.9	45.9	45.9	45.9
Capital stock rises & labor supply reacts	41.4	43.6	41.4	38.9
Memo items: Parameters				
ε_u	*0.4*	***0.2***	*0.4*	*0.4*
σ	*0.5*	*0.5*	***1.1***	*0.5*
τ	*1.5*	*1.5*	*1.5*	***0.9***

Source: Authors' calculations. For definitions of parameters, see Table 2.

Concluding comments

We find that if 1.11 million people were moved into employment, the effects on GDP would be substantial, raising it by $41.4 billion, which is slightly higher than the GSP of Vermont ($31 billion in 2016) or Wyoming ($38 billion), and just a bit lower than the GSP of Montana ($46 billion) or South Dakota ($48 billion).

While these results are plausible, they are only as good as the underlying data, parameters, assumptions, and model. We have chosen these with care, but it is worth emphasizing that our results are estimates, and other researchers could plausibly reach somewhat different conclusions.

Appendix 1.

Derivation of the "Naïve" Measure of the Effect of More Employment on GDP

A country's GDP is generated by inputs of capital (*K*) and labor (*L*). But labor varies along a number of dimensions, including skill and gender. We distinguish four groups, as follows:

Code	Group	Notes
1	Male, unskilled	High school education or less
2	Female, unskilled	High school education or less
3	Male, skilled	At least some college education
4	Female, skilled	At least some college education

The economy's production function is given by

$$Y = F(L_1, L_2, L_3, L_4, K).$$

In a market-based economy we expect labor to be paid the value of its marginal product (i.e. the contribution to output of the last worker worth hiring). So

$$w_i = {}^{\partial Y}\!/_{\partial L_i} \equiv F_i(L_1, L_2, L_3, L_4, K),$$

and the return on capital is given by

$$r = {}^{\partial Y}\!/_{\partial K} \equiv F_k(L_1, L_2, L_3, L_4, K).$$

The value of labor and capital incomes must add up to the value of GDP; this "adding up" constraint implies:

$$Y \equiv \sum_i w_i L_i + rK.$$

When one more worker of type *I* is hired, assuming no change in the stock of capital or the employment of existing workers, the addition to GDP (which is what interests us) is

$${}^{\partial Y}\!/_{\partial L_i} = F_i = w_i.$$

The injection of more workers will affect wages: those with similar skills to the new workers will see their wages fall due to the extra competition for work; owners of capital will gain, because they can now hire labor more cheaply. These are short-run effects, and hold only as long as the stock of capital and labor supply do not respond to the introduction of the additional workers.

Denote the change in the quantity of labor of type *i* (*i* = 1,…,4) by dL_i. Then the total change in income going to group j (j = 1,…,4) is given by (following Johnson 1998):

$$\frac{\partial w_j L_j}{\partial L_i} = w_i \gamma_j C_{ij}.$$

where $\gamma_j = {}^{F_j L_j}/_{F}$ is the output elasticity of group *i*, and $C_{ij} = {}^{F_{ij} F}/_{F_i F_j}$ is the partial elasticity of complementarity between factors *i* and *j*. If the two factors are substitutes, $C_{ij} < 0$, and group *j* loses income if more workers of type *i* enter the market. If $C_{ij} > 0$, the two types of labor are complementary, and more labor of type *i* pushes up the income of workers of type *j*.

Similarly, for capital, the change in return is given by

$$\frac{\partial rK}{\partial L_i} = w_i \gamma_k C_{ik}.$$

Implementation

We implement this model using a nested constant elasticity of substitution (CES) model. Output is given by a CES production function that combines an aggregate of labor (*G*) and capital (*K*):

$$Y = a\left[\mu G^{\frac{\sigma-1}{\sigma}} + (1-\mu)K^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}},$$

and the labor aggregate is constructed as a CES aggregation of the four types of labor, so

$$G \equiv b\left[\delta_1 L_1^{\frac{\tau-1}{\tau}} + \delta_2 L_2^{\frac{\tau-1}{\tau}} + \delta_3 L_3^{\frac{\tau-1}{\tau}} + \delta_4 L_4^{\frac{\tau-1}{\tau}}\right]^{\frac{\tau}{\tau-1}},$$

where τ is the elasticity of intrafactor substitution, and the adding-up condition requires that $\sum \delta_i = 1$. When GDP (i.e. *Y*) is maximized, we get the first-order conditions:

$$r = \frac{\partial Y}{\partial K} = MP_K = (1-\mu)a^{1-\frac{1}{\sigma}}\left(\frac{Y}{K}\right)^{\frac{1}{\sigma}},$$

$$\frac{\partial Y}{\partial G} = MP_G = \mu a^{1-\frac{1}{\sigma}} \left(\frac{Y}{G}\right)^{\frac{1}{\sigma}}, \text{ and}$$

$$\frac{\partial Y}{\partial L_i} = MP_G \delta_i b^{1-\frac{1}{\tau}} \left(\frac{G}{L_i}\right)^{\frac{1}{\tau}}, \ i = 1, \ldots, 4.$$

We start with values of Y (i.e. GDP), the capital stock (K), and the different types of labor (L_i), as well as values for the elasticity of substitution (σ) and the elasticity of intrafactor substitution (τ), and are then

Table A1.1. Parameters required for the model

Parameter/Variable	Symbol	Value	Notes and Sources
Inputs			
GDP	Y	\$20.272 trn	GDP in 2017, raised by 2.5% for growth and a further 2% for inflation.
Capital stock	K	\$63.649 trn	University of Groningen and University of California, Davis, Capital Stock at Constant National Prices for United States, retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/RKNANPUSA666NRUG, June 30, 2018. Figure for 2014 updated to 2018 using 2% real growth plus 2% annual inflation.
Employment ("labor")	L_i		See Table 1 for breakdown by type of labor (male/female by unskilled/skilled). From Current Population Survey, forecast to 2018.
Elasticity of substitution	σ	0.5	Krusell et al. 2000: between unskilled labor and equipment: 1.67; between skilled labor and equipment: 0.67.
Elasticity of intrafactor substitution	τ	1.5	See Table A.1.2 for sources.
Generated by model			
	a	0.562	
	μ	0.151	
	b	275.15	
	δ_1	0.310	
	δ_2	0.195	
	δ_3	0.310	
	δ_4	0.185	
Return on capital	r	0.15323	Initial value; also long-run value.

able to calibrate the system to yield values of μ, a, b, and the δ_i through a series of successive optimizations. The values that we use are set out in Table A1.1.

Once the system has been calibrated, we are able to increase the amount of employment that results from the changes in SNAP policies and procedures, re-optimize where necessary, and so compute the new level of GDP.

The modeling of labor markets ranges from fairly basic to highly complex, and Boeters and Savard (2011) give an excellent survey of the issues involved. For instance, Hanson and Hamrick (2004) developed a large CGE model for the USDA, with 99 categories of household, and several industrial sectors.

However, a model of this complexity is not needed for our current purpose, which is to get a robust estimate of the impact on GDP of moving more SNAP recipients into employment. A more pragmatic approach is taken by Bartik (2000), who also uses the Johnson (1998) model, and provides a good summary of the relevant literature.

Table A1.2. Estimates of the value of the intra-labor elasticity of substitution (τ)

Study	Estimate of τ
Ghosh 2018. Elasticity of substitution between male and female labor	1.7
Johnson 1970	1.34
Johnson 1997	1.5
Katz and Murphy 1992	1.41
Krusell et al. 2000. Elasticity of substitution between unskilled labor and skilled labor.	1.67
Cicconi and Peri 2005	1.50
Autor et al. 2008	1.57

Appendix 2.

Derivation of the "Displacement Effect" Parameter λ_u

When more workers enter the labor market, they push down wages, and this in turn leads some existing workers to withdraw from the market and stop working. This is the "displacement effect", represented by λ_U, that we need to derive and measure. This derivation follows Johnson (1998).

Let *V* be the disutility of work, distributed according to some distribution $z(V)|_{V_0}^{V_1}$, and *b* be the "pecuniary" benefit when not working (including food stamps, pensions, and so on). For a wage w_i, as long as $V_0 < w_i - b < V_1$, some people will choose to work ($w_i - b > V_0$) and some will not ($w_i - b < V_0$). From this one can set up a labor supply function:

$$L_i = \left[1 - \int_{w_i - b}^{V_1} z(V).dV\right] N_i = Z_i(w_i - b, \mu_i).N_i$$

This says that the labor supply depends on the size of the adult population (*N*) and the distribution of wages relative to the disutility of work. A higher wage is assumed to elicit greater labor supply, so

$$\frac{\partial L_i}{\partial w_i} = z_i(w_i - b, \mu_i).N_i > 0.$$

The real wage elasticity of labor supply for group *i* is then

$$\epsilon_i \equiv \frac{\partial L_i}{\partial w_i}\frac{w_i}{L_i} = z_i N_i \frac{w_i}{L_i} = z_i \frac{w_i}{Z_i}.$$

If we assume $\epsilon_S = 0$, so the supply of skilled labor is unresponsive to wages (as is widely believed), and if we separate labor into just two categories, skilled (S) and unskilled (U), and assuming that the entrants into the labor force are essentially all unskilled, we have

$$L_U = Z_U(w_U - b, \mu_U).$$

Since the wage is given by the marginal revenue product of labor (see Appendix 1), we have

$$w_U = F_G G_U(L_U + L_{SNAP,} L_{S)},$$

where L_{SNAP} represents the labor supply of SNAP recipients. In the long-run, F_G is constant because the ratio of capital to labor is constant in "steady state", and we normalize it to equal 1, choosing the units of the other variables appropriately. By totally differentiating, we get

$$\frac{\partial L_U}{\partial L_{SNAP}} = -\lambda_U = -\frac{\beta(1-m_U)\epsilon_U}{\tau+\beta(1-m_U)\epsilon_U},$$

where $m_U = {}^{L_{SNAP}}/_{L_U}$, τ is the elasticity of intrafactor substitution (see Appendix 1), and β is the share of unskilled labor in aggregate labor compensation. If the supply of existing workers were unresponsive to a change in the wage rate, $\epsilon_U = 0$, and so $\lambda_U = 0$, meaning that the injection of more workers due to changes in SNAP policies and procedures would not displace any existing workers.

To estimate λ_U we need values for β, m_U, ϵ_U and τ, and these are shown in Table A.2.a. Johnson (1998) argues that ϵ_U cannot plausibly be greater than 0.4 (see also John, Murphy and Topel 1991). We use this upper bound of 0.4, which potentially overstates the displacement effect, but in Table 3 we also present the results assuming $\epsilon_U = 0.2$.

We estimate λ_U to be 0.10, which means that for every 100 members who enter the unskilled segment of the labor force, 10 leave (as a result of the lower wages). Johnson (1998), in his study of immigration into the United States, estimates a displacement parameter of 0.12, which is very similar to the value we found.

Table A2.1. Estimating λ_U

Parameter value	
β	0.440
m_U	0.037
ϵ_U	0.4
τ	1.5
Using the formula:	
$\boldsymbol{\lambda_U}$	**0.1014**

Appendix 3.

Derivation of the Long-term Effects of More Employment When Capital Can Adjust

In the long run, an influx of labor pushes down wages, inducing employers to hire more workers. The result is a higher level of profit. In due course, the increased profit rate attracts investment that would not otherwise have been undertaken. This in turn pushes up GDP further.

In long-run steady state:

$$\frac{\dot{K}}{K} = g_Y,$$

which says that the growth rate of the capital stock must equal the growth rate of GDP, because otherwise one would outpace the other indefinitely, and this is implausible. If there are no long-term net flows of capital to or from other countries, all changes in the capital stock are financed by domestic savings, from which depreciation must be netted out. Thus

$$\dot{K} = sY - \delta K.$$

These equations imply that the long-run output-to-capital ratio is stable, and equals

$$\frac{Y}{K} = (g_Y + \delta)/s.$$

Since

$$r = F_K = \gamma_K \frac{Y}{K} = \gamma_K \left(\frac{g_Y + \delta}{s}\right),$$

it follows that, given γ_K, g_Y, δ and *s*, the rate of return on capital eventually returns to its initial level.

To implement this, we use the parameters that are discussed in Appendix 1 and derive an estimate of *r* (see bottom row of Table A.1.1). After adding labor to the production function, the marginal product of capital rises, so we then add capital until its rate of return (*r*) goes back to its original level. The new levels of capital and labor in the production function give us the new value of GDP.

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