THE JOB IMPACT OF THE AMERICAN RECOVERY AND REINVESTMENT PLAN

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A key goal enunciated by the President-Elect concerning the American Recovery and Reinvestment Plan is that it should save or create at least 3 million jobs by the end of 2010. For this reason, we have undertaken a preliminary analysis of the jobs effects of some of the prototypical recovery packages being discussed. Our analysis will surely evolve as we and other economists work further on this topic. The results will also change as the actual package parameters are determined in cooperation with the Congress. Nevertheless, this report suggests a methodology for ensuring that the package contains enough stimulus that we can have confidence that it will create sufficient jobs to meet the President-Elect's goals.

This report also presents some discussion of the trade-offs involved in choosing different elements of the package. For example, how do tax cuts, fiscal relief to the states, and increases in infrastructure spending compare in terms of jobs created? Similarly, how do the different types of spending differ in terms of the timing of the jobs they will create? The report also discusses the types of jobs that will be created and the possible demographic composition of the workers who will find jobs as a result of the stimulus.

We reach several key preliminary findings:

- A package in the range that the President-Elect has discussed is expected to create between three and four million jobs by the end of 2010.

- Tax cuts, especially temporary ones, and fiscal relief to the states are likely to create fewer jobs than direct increases in government purchases. However, because there is a limit on how much government investment can be carried out efficiently in a short time frame, and because tax cuts and state relief can be implemented quickly, they are crucial elements of any package aimed at easing economic distress quickly.

- Certain industries, such as construction and manufacturing, are likely to experience particularly strong job growth under a recovery package that includes an emphasis on infrastructure, energy, and school repair. But, the more general stimulative measures, such as a middle class tax cut and fiscal relief to the states, as well as the feedback effects of greater employment in key industries, mean that jobs are likely to be created in all sectors of the economy.

- More than 90 percent of the jobs created are likely to be in the private sector. Many of the government jobs are likely to be professionals whose jobs are saved from state and local budget cuts by state fiscal relief.

- A package is likely to create jobs paying a range of wages. It is also likely to move many workers from part-time to full-time work.

It should be understood that all of the estimates presented in this memo are subject to significant margins of error. There is the obvious uncertainty that comes from modeling a hypothetical package rather than the final legislation passed by the Congress. But, there is the more fundamental uncertainty that comes with any estimate of the effects of a program. Our estimates of economic relationships and rules of thumb are derived from historical experience and so will not apply exactly in any given episode. Furthermore, the uncertainty is surely higher than normal now because the current recession is unusual both in its fundamental causes and its severity.

A. Aggregate Jobs Effects

Estimating the aggregate employment effects of the proposed American Recovery and Reinvestment Plan involves several steps. The first is to specify a prototypical package. We have assumed a package just slightly over the $775 billion currently under discussion. It includes a range of measures, all of which have been discussed publicly. Among the key components are:

- Substantial investments in infrastructure, education, health, and energy.

- Temporary programs to protect the most vulnerable from the deep recession, including increases in food stamps and expansions of unemployment insurance.

- State fiscal relief designed to alleviate cuts in healthcare, education, and prevent increases in state and local taxes.

- Business investment incentives.

- A middle class tax cut along the lines of the Making Work Pay tax cut that the President-Elect proposed during the campaign.

A second step is to simulate the effects of the prototypical package on GDP. We use multipliers that we feel represent a consensus of a broad range of economists and professional forecasters. Our particular multipliers for an increase in government purchases of 1% of GDP and a decrease in taxes of 1% of GDP are given in Appendix 1. They are broadly similar to those implied by the Federal Reserve's FRB/US model and the models of leading private forecasters, such as Macroeconomic Advisers.

The final step is to take the effect on GDP and translate it into job creation. Not all of the increased output reflects increased employment: some comes from increases in hours of work among employed workers and some comes from higher productivity. We therefore use the relatively conservative rule of thumb that a 1 percent increase in GDP corresponds to an increase in employment of approximately 1 million jobs, or about three-quarters of a percent. This has been the rough correspondence over history and matches the FRB/US model reasonably well. The effect on jobs using the estimates from most private sector forecasting models would be somewhat larger. We look at the effects in 2010Q4, which is the end of the two-year period that is the focus of the recovery plan.

Table 1 shows that we expect the proposed recovery plan to have significant effects on the aggregate number of jobs created, relative to the no-stimulus baseline.

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Table 1
**Aggregate Effect of the Recovery Package on GDP and Jobs in 2010Q4**

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	Real GDP (billions of chained 2000 $)	Payroll Employment
Without Stimulus	$11,770	133,876,000
With Stimulus	$12,203	137,550,000
Effect of Package	Increase GDP by 3.7%	Increase jobs by 3,675,000

Source: Authors' calculations based on methodology described above and multipliers described in Appendix 1.

The table shows that we expect the plan to more than meet the goal of creating or saving 3 million jobs by 2010Q4. There are two important points to note, however:

First, the likely scale of employment loss is extremely large. The U.S. economy has already lost nearly 2.6 million jobs since the business cycle peak in December 2007. In the absence of stimulus, the economy could lose another 3 to 4 million more. Thus, we are working to counter a potential total job loss of at least 5 million. As Figure 1 shows, even with the large prototypical package, the unemployment rate in 2010Q4 is predicted to be approximately 7.0%, which is well below the approximately 8.8% that would result in the absence of a plan.[1]

Figure 1
Unemployment Rate With and Without the Recovery Plan
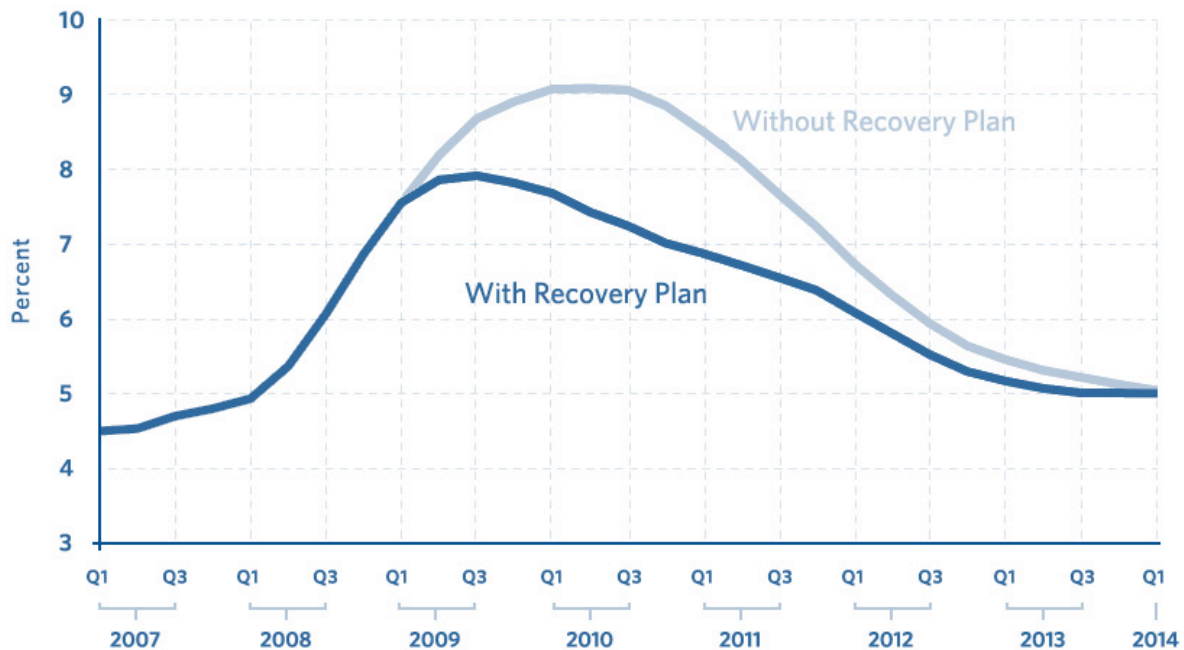
Second, as emphasized above, there is considerable uncertainty in our estimates: both the impact of the package on GDP and the relationship between higher GDP and job creation are hard to estimate precisely. In light of the substantial quarter-to-quarter variation in the estimates of job creation, we believe a reasonable range for 2010Q4 is 3.3 to 4.1 million jobs created.

B. Jobs Effects of the Components of the Recovery Package

To estimate the jobs effect of each potential component of the package, we use an analysis similar to what we use to estimate the overall jobs effect. We take an estimate of the amount of spending related to a component and apply the relevant multiplier to estimate the likely overall effect on GDP. The total effect on jobs is then estimated using the 1% of GDP equals 1 million jobs rule of thumb.

We further consider the direct and indirect effects of the program. The direct effects are those coming from the hiring directly caused by the program. Here we include not just workers hired by the federal government under the program, which we expect to be a relatively small number, but workers hired under projects financed by the program and workers hired to produce the goods demanded as the result of tax credits and subsidies targeted to specific activities (such as smart electrical meters and software systems for health IT). The indirect effects are those coming from the fact that the newly employed workers spend more and this stimulates other industries. For core spending programs, we assume the direct output effects move one-for-one with the spending increase. Broad tax cuts have jobs effects, but they stem only from indirect effects: tax cuts only have effects when people go out and spend the money. One dollar of state fiscal relief is assumed to result in $0.60 in higher government purchases (largely averting spending reductions that were assumed in the baseline) and $0.30 in lower government taxes (largely due to preventing state and local tax increases that were assumed in the baseline). The results are shown in Table 2.

Table 2
Effects of the Components of the Recovery Package on Jobs in 2010Q4

Component	Total Effect	Direct Effect	Indirect Effect
Energy	459,000	305,000	153,000
Infrastructure	377,000	236,000	142,000
Health Care	244,000	166,000	78,000
Education	250,000	166,000	83,000
Protecting Vulnerable	549,000	140,000	409,000
State Relief	821,000	442,000	379,000
Making Work Pay Tax Cut	505,000	0	505,000
Business Tax Incentives	470,000	0	470,000
All Components	3,675,000	1,456,000	2,219,000

Source: Authors' calculations. See text for details.

These estimates show that all components of the program make important contributions to job creation. The direct spending programs have the largest job bang for the buck. State fiscal relief also has important direct and indirect effects on jobs, and so very strong job bang for the buck. Tax cuts, though they have no direct jobs effect and generally affect consumer and firm spending only gradually, also have important job creation benefits by the end of the two-year window.[2]

It is important to note that the jobs effects of temporary broad-based tax cuts would probably be considerably smaller. Large proportions of temporary tax cuts are saved, blunting their stimulatory impact on output and employment. The prototypical recovery package only provides for the first two years of the Making Work Pay tax cut. Our analysis assumes that households treat the tax cut as permanent in determining their short-run spending.

C. The Timing of Job Creation

The different components of the stimulus package also differ in terms of the timing of the jobs they will create, and therefore serve different purposes in terms of cushioning the downturn and fostering recovery. Because it takes time to carry out new spending programs authorized by legislation, we expect the jobs created by spending on infrastructure, education, health, and energy to be concentrated in 2010 and 2011. At the other extreme are funds to protect the most vulnerable, which are generally spent promptly, and tax incentives for businesses to invest quickly. State fiscal relief and broad-based tax cuts fall in between: funds for these programs can be disbursed quickly, but there can be a delay before the main response of spending.

Table 3 summarizes the information about the timing of the effects of the different components. For example, the second entry in the middle column indicates that we estimate that the spending on protecting the vulnerable will create 83% as many jobs in 2009Q4 as it will in 2010Q4. That is, this spending will have nearly equal effects in the two periods.

Table 3
Effects of the Components of the Recovery Package on Job Creation
in 2009Q4 and 2011Q4 relative to 2010Q4

Component	2009Q4	2011Q4
Energy, Infrastructure, Health, Education	46%	41%
Protecting the Vulnerable	83	17
State Relief	48	48
Business Tax Incentives	83	28
Making Work Pay Tax Cut	67	37

Source: Authors' calculations. See text for details.

D. Breakdown by Industry

To get more detailed information on the breakdown of the jobs created, we use a simulation from a prominent private forecaster on a plan that is similar – though not identical – to the type of plan the President-Elect is considering. The simulation yields a breakdown by industry of jobs created in 2010Q4. We combine the shares of jobs created in each industry from this simulation with our estimates of total job creation from a likely-sized program. For example, if the simulation implied that 18.4% of the jobs created would be in construction, our estimate of the number of jobs created in construction in 2010Q4 is 18.4% of our estimate of overall job creation of 3.675 million, or 678,000. The results of this exercise are shown in Table 4.

Industry	Jobs Created in 2010Q4
Mining	26,000
Construction	678,000
Manufacturing – Total	408,000
Wholesale Trade	158,000
Retail Trade	604,000
Information	50,000
Financial Activities	214,000
Professional and Business Services	345,000
Education and Health Services	240,000
Leisure and Hospitality	499,000
Other Services	99,000
Utilities	11,000
Transportation and Warehousing	98,000
Government – Total	244,000
Total	3,675,000

Sources: Authors' calculations and estimates of effects by industry from Mark Zandi, "The Economic Impact of a $600 Billion Fiscal Stimulus Package," Moody's economy.com, Nov. 28, 2008.

While estimating the effects at the industry level is even more difficult than estimating aggregate effects, there are well-established cyclical differences across industries that underlie the qualitative results of this analysis. For example, the largest percentage declines in employment over the past year have been in construction and manufacturing.

The estimates suggest that 30% of the jobs created will be in construction and manufacturing, even though these industries employ only 15% of all workers. Both sectors have been particularly hard-hit recently. The other two significant sectors that are disproportionately represented in job creation are retail trade and leisure and hospitality (mining is also represented disproportionately, but employs less than 1% of all workers). Construction, manufacturing, retail trade, and leisure and hospitality all employ large numbers of low- and middle-income workers whose incomes have stagnated in recent decades and who have suffered greatly in the current recession.

E. Effects on Different Demographic Groups

The sensitivity of employment and unemployment to the overall health of the economy varies across demographic groups of the population. For example, African-American, Hispanic, young, less-educated, and male workers all tend to suffer disproportionately during recessions. The experience in the current downturn is typical: unemployment rates among these groups have risen substantially more than the overall unemployment rate. Historically, when unemployment falls overall, these groups tend to experience particularly large employment gains.

On the other hand, some groups, such as older, college-educated, and female workers, tend to experience smaller rises in unemployment for a given rise in the overall rate. For example, in the current recession, during which the overall unemployment rate has risen 2.3 percentage points, the unemployment rate for women has increased 1.6 percentage points. Historically, when unemployment falls overall, these groups tend to experience smaller employment gains.

It is possible to look more closely at the possible gender composition of jobs created by the recovery package by considering the industrial breakdown of job creation from Table 4. Data are readily available on the fraction of women in each industry. If we assume that jobs created in an industry will be allocated between men and women following the industry average, we can estimate the jobs likely to go to women by industry. The proportion female and this estimate of the likely jobs created for women in each industry are given in Table 5. Summing across industries suggests that the total number of created jobs likely to go to women is roughly 42% of the jobs created by the package. Given that so far in the recession women have accounted for roughly 20% of the decline in payroll employment, this calculation could reflect that the stimulus package skews job creation somewhat toward women, possibly as a result of the investments in healthcare, education, and state fiscal relief.[3] However, it is important to keep in mind that it is possible that the gender composition of the jobs created by industry will not follow the industry average, and so smaller fractions are possible.[4]

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Table 5
Fraction of Employment that is Female

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Industry	Fraction Female	Number of Created Jobs Expected to go to Women
Mining	13%	3,000
Construction	13	88,000
Manufacturing – Total	29	117,000
Wholesale Trade	31	49,000
Retail Trade	50	304,000
Information	42	21,000
Financial Activities	59	127,000
Professional and Business Services	45	154,000
Education and Health Services	77	186,000
Leisure and Hospitality	53	262,000
Other Services	52	52,000
Utilities	26	3,000
Transportation and Warehousing	24	23,000
Government – Total	57	140,000
Total	49	1,529,000

Sources: BLS Establishment Survey and authors' calculations from Table 4.

One useful consequence of this consideration of demographic and industrial composition is to again point out the importance of balance in the recovery package. Much of the discussion of the recovery plan has focused on infrastructure, rebuilding schools, and energy investments. This type of spending disproportionately creates jobs in sectors like construction. But, the prototypical package also includes substantial quantities of investment in education and health care, as well as of state fiscal relief. This component tends to encourage employment in sectors such as education and health. The recovery package is also likely to include a middle-class tax cut. This component should further spread the jobs benefits of the package. For example, the indirect effects are likely to be large in retail trade. Because different groups have different representation in various industries, maintaining a range of components is important for ensuring that the benefits of job creation are spread broadly among all Americans.

F. Kinds of Jobs

The recovery plan is likely to create jobs paying a range of wages. Significant shares of jobs are created in sectors that pay above average, such as construction and business services, as well as sectors that pay below average, such as retail trade and leisure/hospitality (hotels, restaurants).

Union representation is higher than average in some of the sectors in which the recovery package creates significant numbers of jobs. Union coverage in construction and manufacturing, which

account for almost one-third of the jobs created by the package, are 14% and 11%, respectively, compared to 7.5% coverage for the private sector overall.

Along the same lines, recent research by Robert Pollin and Jeannette Wicks-Lim (available at http://www.peri.umass.edu/green_jobs) suggests that investments in green energy will create jobs that generally pay well above the typical wage. For example, compared to the national median wage of $15 in 2007, some of the jobs created by these investments include: electricians (median wage, $21.50/hour), carpenters ($18/hour), operations managers ($43/hour), and production supervisors ($23/hour). The occupation-weighted average wage in green energy jobs is about 20% above the national average.[5]

Finally, in addition to creating high-quality jobs, the program is likely to improve existing jobs. One important way that it will do this is by moving workers from part-time to full-time work. Over the past year, as the overall unemployment rate has risen by 2.3 percentage points, the number of workers working part-time for economic reasons has risen by 3.4 million. This is a main reason why the underemployment rate rose to 13.5% in December compared to 8.7% a year earlier.[6] We estimate that our program will cause the unemployment rate to be about 1.8 points lower in 2010Q4 than it otherwise would have been. If the same relationship between movements in overall unemployment and movements in workers working part-time for economic reasons holds for the effects of the recovery package, the program will allow about 1.8/2.3 times 3.4 million, or 2.7 million, workers to move from part time to full time. It will reduce the underemployment rate by more than three percentage points compared to its level in the absence of the recovery package.

G. Conclusions

This study has sought to investigate the likely job creation effects of the American Recovery and Reinvestment Plan currently under consideration. As emphasized at many points in the analysis, there is substantial uncertainty around all of our estimates. Nevertheless, we believe they can provide useful guidance as we go forward. Among the key lessons from the analysis are:

- The recovery plan needs to be large to counter the tremendous job loss that is likely to occur.
- The plan needs to include a range of components, such as direct government spending, state fiscal relief, and tax cuts to ensure that jobs are created quickly and throughout the economy.
- The range of components is also important for ensuring that both male and female workers benefit from the program.
- An aggressive recovery program is important for protecting all Americans from job loss, but particularly for aiding those groups disproportionately hurt by the rise in the overall unemployment rate.
- A well designed recovery plan will not only create numerous jobs, but also many jobs paying good wages and providing full-time employment.

APPENDIX 1
Multipliers for Different Types of Spending

For the output effects of the recovery package, we started by averaging the multipliers for increases in government spending and tax cuts from a leading private forecasting firm and the Federal Reserve's FRB/US model. The two sets of multipliers are similar and are broadly in line with other estimates. We considered multipliers for the case where the federal funds rate remains constant, rather than the usual case where the Federal Reserve raises the funds rate in response to fiscal expansion, on the grounds that the funds rate is likely to be at or near its lower bound of zero for the foreseeable future.

We applied these multipliers directly to the straightforward elements of the package, but made some adjustments for elements that take the form of transfers to the states and tax-based investment incentives. For transfers to the states, we assumed that 60% is used to prevent spending reductions, 30% is used to avoid tax increases, and the remainder is used to reduce the amount that states dip into rainy day funds. We assumed that these effects occur with a one quarter lag. For tax-based investment incentives, we used the rule of thumb that the output effects correspond to one-fourth of the effects of an increase in government spending with the same immediate revenue effects. This implies a fairly small effect from a given short-term revenue cost of the incentives. But, because much of the lost revenue is recovered in the long run, it implies a fairly substantial short-run impact for a given long-run revenue loss. We confess to considerable uncertainty about our choice of multipliers for this element of the package.

Output effects of a permanent stimulus of 1% of GDP (percent)

Quarter	Government Purchases	Tax Cuts
1	1.05	0.00
2	1.24	0.49
3	1.35	0.58
4	1.44	0.66
5	1.51	0.75
6	1.53	0.84
7	1.54	0.93
8	1.57	0.99
9	1.57	0.99
10	1.57	0.99
11	1.57	0.99
12	1.57	0.99
13	1.57	0.99
14	1.57	0.99
15	1.57	0.99
16	1.55	0.98

ENDNOTES

[1] Forecasts of the unemployment rate without the recovery plan vary substantially. Some private forecasters anticipate unemployment rates as high as 11% in the absence of action.

[2] These estimates, like the aggregate ones, are subject to substantial margins of error. One additional source of uncertainty concerns the impact of the state fiscal relief. We believe that the rule of thumb that 60% of funds devoted to state relief will be used to prevent spending cuts and that 30% will be used to prevent tax increases, and that these effects will occur with a lag of about three months, are good first approximations. But, the effects will clearly differ across states, and the average could differ from what we have assumed. Another source of uncertainty concerns the jobs effects of a given increase in GDP. Again, we think that our assumption that the relation between higher GDP and increased employment is the same across the different components of the package is a good starting point. But, the exact effects are likely to vary somewhat across components. For example, simulations using private-sector forecasting models suggest that the number of jobs created by a given increase in GDP is likely to be slightly higher for broad-based tax cuts than for infrastructure spending, presumably because the jobs created by infrastructure spending pay higher wages on average. This effect is small, however, and does not reverse the conclusion that a dollar of infrastructure spending is more effective in creating jobs than a dollar of tax cuts.

[3] This percentage is calculated as the difference in female payroll employment from November 2007 to November 2008 (December 2008 data were not yet available) divided by the change in total payroll employment over the same time period.

[4] It is precisely because of the uncertainty surrounding this type of calculation that we do not do similar calculations for groups that are a smaller fraction of the labor force. For teenagers, for example, it is likely that the within- industry variation in cyclicality for demographic groups swamps the across-industry variation.

[5] These data are from the BLS Occupational Employment Survey.

[6] The underemployment rate is the most comprehensive measure of labor underutilization (measure U-6 in Table A-12 of the monthly jobs report) published monthly by the BLS.