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Economic and Financial Consequences of Corporate Cyberattacks

In late 2017, a cyberattack exposed personal information on nearly 70 million customers of Target Corp., the Minnesota-based discount retailer. Customers worried about the potential cost of stolen phone numbers and credit card information. The combination of reduced customer traffic, costs associated with responding to the breach, and the need to establish reserves against future legal judgements reduced Target's earnings before interest and taxes by nearly 30 percent—a reduction of the company's earnings by \$1.58 billion, from \$5.52 billion for the year before the attack to \$3.94 billion for the year after it. Costs directly related to the attack, including settlements of lawsuits, totaled \$292 million.

In **What is the Impact of Successful Cyberattacks on Target Firms?** (NBER Working Paper No. 24409), [Shinichi Kamiya](#), [Jun-Koo Kang](#), [Jungmin Kim](#), [Andreas Milidonis](#), and [René M. Stulz](#) identify characteristics of companies most likely to fall victim to cyberattacks and assess the financial and economic consequences. They study cyberattacks on public corporations reported to the Privacy Rights Clearinghouse over the 2005–14 period. The most likely victims are firms that are high-value and have a high profile. They also tend to have more intangible assets on their balance sheets and to have boards which have historically been less

attuned to risk. Attacks that breach customers' personal financial data do the most dam-

sample, 30 percent were in the service industry, 27 percent in finance, 18 percent in man-

After suffering a breach of customers' personal data, the average attacked firm loses 1.1 percent of its market value and experiences a 3.2 percentage point drop in its year-on-year sales growth rate.

age, eroding equity value, undermining credit ratings, and frightening away customers.

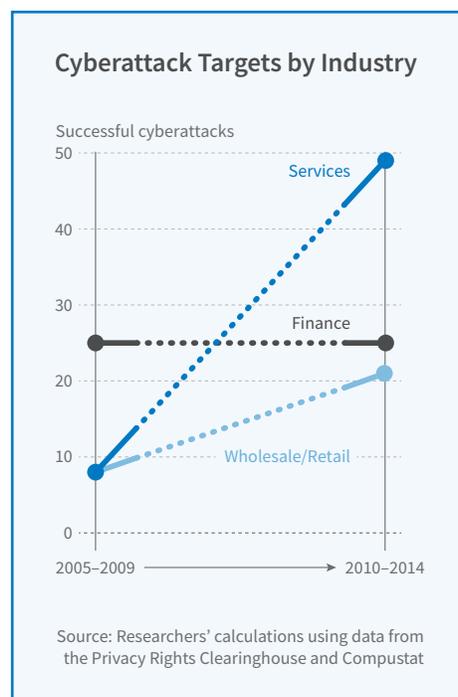
Of the 188 cyberattacks in the study

ufacturing, and 15 percent in wholesale and retail trade. When firms suffered breaches of personal data, such as Social Security numbers and bank information, the average immediate loss in stock value was 1.12 percent, or \$607 million, based on a mean market value of equity of \$54.2 billion. Firms that experienced repeated attacks and/or lacked explicit risk monitoring committees suffered significantly greater losses.

Sales growth for large firms declined by 3.4 percentage points following an attack, relative to before the attack. Compromised companies in the retail sector experienced a 5.4 percentage point decline in sales growth.

Attacks can have long-run effects. Credit ratings of the victims of corporate cyberattacks remain depressed for three years. Further, the firms endure heightened cash flow volatility and report a lower ratio of net worth to total assets, reflecting less capacity to weather adversity.

Compared with non-affected firms, those hit by cyberattacks are more likely to raise



money by borrowing than by issuing stock. When they borrow, they do so at longer maturities, to reduce their exposure to rollover risk.

Firms respond to cyberattacks by increasing their attention to cybersecurity. In many cases, the board of directors explicitly priori-

tizes risk management or establishes a risk oversight committee. Firms also appear to adjust CEO compensation policies to reduce CEOs' risk exposure and risk appetite. In the three years after an attack, the average CEO sees stock option awards decline by 6.6 per-

cent, while restricted stock grants — which are more subject to downside risk — increased by 10.4 percent. CEO turnover was not significantly higher at firms that experienced a successful attack than at non-affected firms.

— Steve Maas

Small Business Lending Declined after Dodd-Frank Passed

The Dodd–Frank Wall Street Reform and Consumer Protection Act, which was passed in the wake of the 2008 financial crisis and was designed to safeguard the banking system, appears to have made it more difficult for small businesses and entrepreneurs to obtain funding.

In **The Impact of the Dodd-Frank Act on Small Business** (NBER Working Paper No. 24501), [Michael D. Bordo](#) and [John V. Duca](#) find that the 2010 legislation reduced the incentives for all banks to make small loans. It also raised the benefits of scale in the banking business, tilting the playing field away from small banks which historically were a more important source of loans for small businesses than their larger-bank counterparts.

After controlling for economic conditions and other influences on lending, the researchers report that the share of commercial and industrial loans of less than \$1 million at large banks — those with at least \$300 million in assets — has fallen by 9 percentage points since 2010. The share of small loans at smaller banks has declined by twice as much. The real volume of small loans declined sharply in 2011, and it has grown only slowly in subsequent years, while the volume of loans of over \$1 million has increased by 80 percent since 2011. This development marks a sharp break from the

1993 to 2010 period, when the value of small and large loan originations followed roughly similar trends. The researchers conclude that this divergence is due in part to new compli-

Relatively small commercial and industrial loans have fallen by 9 percent at large banks and by even more at smaller banks since 2010, when the legislation was enacted.

ance regulations that have increased the fixed costs associated with making loans. The regulations made loans to large and established firms relatively more attractive by treating loans to small and new firms as much riskier when calculating banks' scores in stress tests.

trial loans to enterprises of different sizes. The survey responses suggest that credit standards for making commercial and industrial loans became relatively tighter for small businesses

compared with medium- and large-sized firms in the period after the legislation was enacted until regulatory relief was provided to smaller banks in 2015. That relief appears to have arrested growth in the gap between small and large loans, but it has not reversed the

earlier decline nor narrowed the gap.

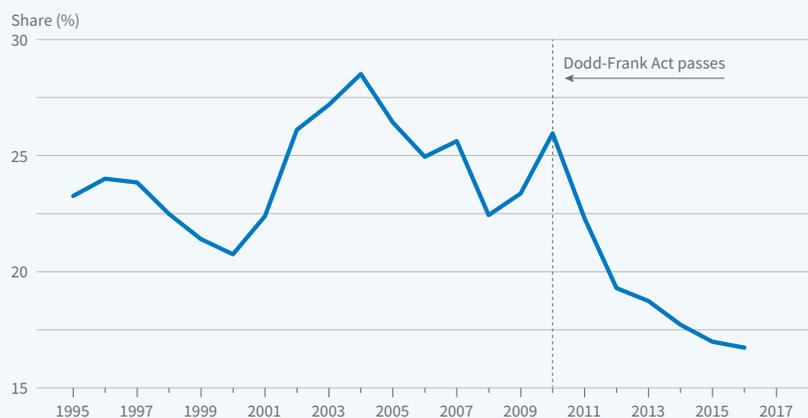
The researchers also suggest that this legislation may have reduced the role of small banks — a traditional source of loans for small business — in the banking sector more generally. Because they are less able than larger banks to absorb the increased operating costs imposed by new regulations, small banks may have had new incentives to consolidate with larger institutions.

The study also finds that both Dodd-Frank

and the earlier Sarbanes-Oxley Act unintentionally dampened small business formation, with the 2015 regulatory relief easing some of the earlier Dodd-Frank effects.

— Steve Maas

Small-Loan Share of Commercial and Industrial Loans at Large Banks



Source: Researchers' calculations using data from the Consolidated Reports of Condition and Income and the Federal Financial Institutions Examination Council

The researchers analyze data from the Federal Reserve Board's Senior Loan Officer Opinion Survey, which includes a question about the change from the previous quarter in the credit standards for commercial and indus-

Using Online Prices to Calculate Purchasing Power Parity

Prices of similar products in different countries are used to calculate purchasing power parity (PPP), a measure of the relative cost of living in various nations. PPP estimates are used to compare the standards of living across countries, and are sometimes used as a basis for comparison of exchange rates. Calculating PPP measures can often take a long time, however, because of lengthy data collection and analysis and the inherent lags in producing government economic statistics.

Alberto Cavallo, W. Erwin Diewert, Robert C. Feenstra, Robert Inklaar, and Marcel P. Timmer suggest an alternative procedure that can yield much more current PPP measures: compute them using online prices. This makes possible generation of quarterly price comparisons. In **Using Online Prices for Measuring Real Consumption Across Countries** (NBER Working Paper No. 24292), they describe their methodology, outline strengths and weaknesses, and compare their approach to other PPP calculations.

The researchers develop a method similar to that of the International Comparison Program (ICP) at the World Bank. The ICP data collection process, however, is not especially transparent, and the publication of PPP values can take up to six years.

The researchers use online price data from the Billion Prices Project at MIT, a research initiative that scrapes web prices from large online retailers. The data cover products across 11 countries in three categories: electronics, fuel, and

food and beverages. Certain branded products are sold in multiple countries, but the majority of goods, such as ground coffee, are grouped into item categories of like products.

Data gathered online can be used quickly and transparently to compute PPP measures, but the results may be less accurate in countries that are more rural and have fewer large retailers.

Beyond increased transparency surrounding data collection processes, the researchers can also collect data at high frequency: every day. This allows them to examine PPP variation within a year, which can be of substantial interest in high-inflation countries.

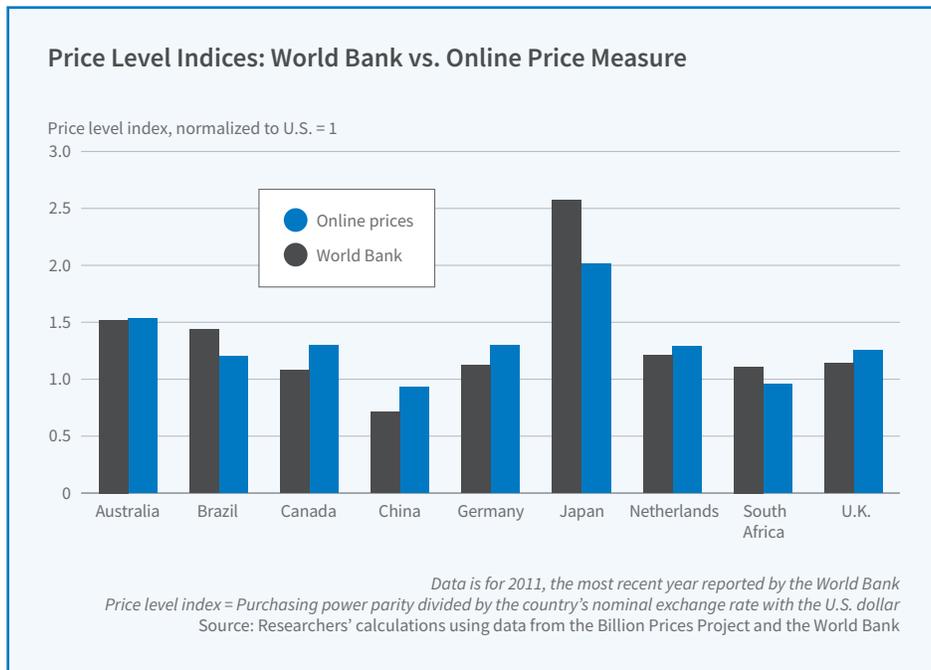
ers' PPPs and the ICP extrapolations differ by more than 50 percent.

The researchers note that while using online prices results in timelier estimates, this approach also has draw-

backs. In particular, since the online sample is comprised of large retailers, the data may misrepresent consumption patterns in countries where large retailers are less prevalent. These large retailers are also more likely to sell products in urban localities. The researchers' estimates do not show much regional variation, as online retailers tend to have a single price for a product within a country. The ICP, in contrast, collects prices from physical stores for different kinds of retailers and in a variety of geographical locations, and it incorporates expenditure weights to determine which products are more important in a particular category, a capability not possible with the online data primarily due to

insufficiency of data regarding the quantities sold. The researchers note that, while they are working to expand their coverage of various spending categories, their price indices currently cover less than 25 percent of all consumption in the countries studied, due in part to hard-to-measure sectors such as housing and health services. They hope to ameliorate these problems in the future.

—Morgan Foy



The researchers' price indices track closely with those of the ICP for the years in which they are both available. In 2011, for example, the average deviation between the researchers' measure and the ICP value was about 15 percent. The ICP extrapolates its estimates beyond the years in which the data analysis has been completed, and the researchers' estimates deviate by more from the ICP extrapolations. In 2017, for example, the research-

Married Women Who Retire Early May Forfeit Social Security Wealth

Health status, expected Social Security benefits, and the leisure associated with reduced work are among the considerations that affect the retirement decisions of married couples. Because women live longer, on average, than men, and often have interrupted careers as a result of childbearing, one might expect them to retire later than men. In **The Return to Work and Women's Employment Decisions** (NBER Working Paper No. 24429), [Nicole Maestas](#) examines retirement patterns of couples. She documents two patterns: women tend to marry older men and couples often retire at the same time. She then shows that by retiring early, women often forego both substantial future earnings and significant amounts of prospective Social Security benefits that they would have received if they had worked longer.

Using the Health and Retirement Study, Maestas compares two groups over time: the “early cohort,” born from 1936 to 1947, and the “boomer cohort,” born from 1948 to 1959. The oldest members of the early cohort reached age 62 in 1998; the oldest members of the boomer cohort turned 62 in 2010. In the early cohort, 69 percent of women are younger than their husbands, by an average of 2.7 years. For the boomer cohort, 63 percent of wives are younger, with an average age difference of 2.0 years.

The average employment rate, lifetime number of years worked, annual earnings, and hourly wages all increased from the early cohort to the boomer cohort for women ages 51 to 56. For men in their early 50s, the employment rate and the number of years worked both declined; earnings and hourly wages grew, but less so relative to women. Maestas finds that the employment rate for married women was higher at every age from

51 to 64 for the boomer cohort relative to the early cohort. In contrast, the employment rate for men in the boomer cohort was lower than the early cohort until age 58.

For both female cohorts, real earnings

Women tend to marry men who are older and to retire at the same time as their husbands. This pattern contributes to a substantial gender gap in Social Security wealth.

increased until age 55 and began to decline at age 57. Men's earnings, on the other hand, continuously decreased from ages 51 to 61. In addition, women's earnings increased by 31 percent across cohorts, but men's earnings increased only 10 percent. So the gender earnings gap shrinks as individuals age into retirement.

For both cohorts, women were more likely than men to retire “early”—before age

for women in the boomer cohort is about \$145,000, 26 percent greater than the average value for the early cohort. Men's SSW also increases across cohorts, but only by 7 percent. Maestas calculates that SSW would be substan-

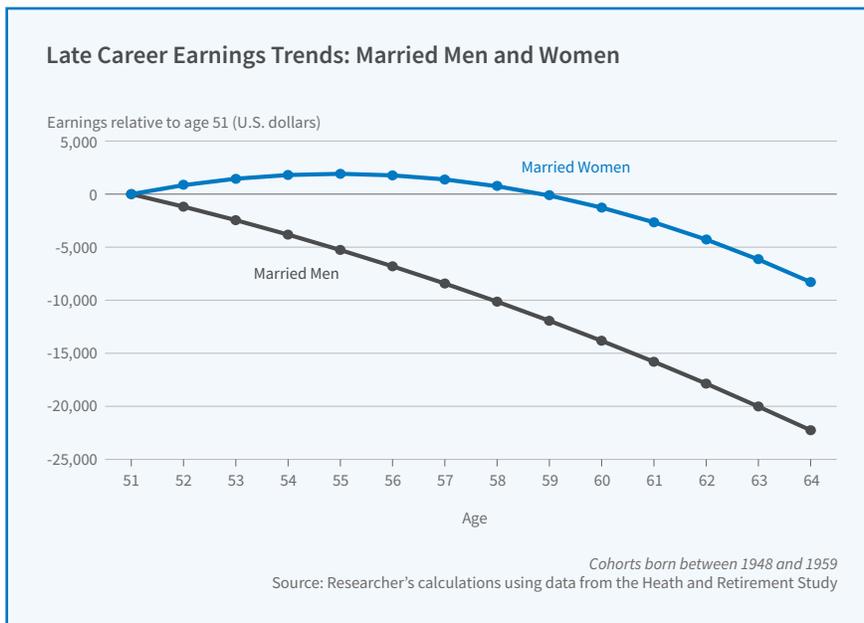
tially higher for women in both cohort groups if they continued working until age 70: 17 percent higher for early cohort women and 10 percent higher for the boomer cohort. Conversely, SSW for men would decline by 3 percent (in real terms) in the early cohort and by 1 percent in the boomer cohort if they worked until age 70. This is because women's earnings later in life replace lower earnings years from earlier in a

woman's career—men see no such benefit. If women continued to work through their 60s, this would virtually eliminate the gender gap in SSW.

When ranked by the amount of additional SSW they would receive if they worked to age 70, married women in the top quartile would gain an average of over \$36,000, compared with only \$1,300 for those in the bottom quartile. Despite these potentially significant differences in the financial consequences of early retirement, Maestas finds that the early

retirement rate among women with a lot to gain from continued work is comparable to that for women with relatively little potential gain. “This suggests that individuals do not factor these potential gains into their employment decisions, and it raises the question of whether individuals are able to correctly assess the opportunity costs associated with reducing work effort before age 70.”

—Morgan Foy



62—or move from full- to part-time employment. In the boomer cohort, 47 percent of women retired or reduced work early, but only 41 percent of men did so.

Social Security benefits at age 65—determined by an individual's highest annual earnings over a 35-year period—are higher for women in the boomer cohort. For example, average Social Security wealth (SSW), the present discounted value of lifetime benefits,

Conditional Cash Transfers Boosted Education and Earnings

More than 80 countries around the world currently administer conditional cash transfer (CCT) programs that provide low-income families with money in exchange for their engaging in certain behaviors. Studies of these programs have often found positive short-term effects on education and health outcomes, but evidence on the long-term and intergenerational effects of these programs has been limited.

In **Do Conditional Cash Transfers Improve Economic Outcomes in the Next Generation?** (NBER Working Paper No. 24303), [Susan W. Parker](#) and [Tom Vogl](#) study one of the best-known CCTs—Mexico’s Progresa program. Progresa was rolled out in rural areas of the country beginning in 1997. It provides low-income families with cash conditional upon their children attending school and family members visiting a health clinic for regular check-ups. Today, the program covers 6 million families—about a quarter of all Mexican families—in both urban and rural areas.

Using data from the 2010 Mexican Census of Population and Housing Units, the researchers compared individuals in two birth cohorts: a younger group that was exposed to Progresa before the age of 12, and therefore was affected by the program, and a slightly older group whose members were too old to be affected by the time the program was rolled out in their area.

The researchers find substantial edu-

cation effects for children exposed to the program. On average, those who were under the age of 12 when the program became available completed 1.4 grades of education more than the older

Childhood exposure to Mexico’s Progresa program raised average educational attainment by 1.4 years. Girls were 30 percentage points, and boys 18 percentage points, more likely to obtain some secondary schooling.

cohort. Women exposed to Progresa as girls under the age of 12 were 30 percentage points more likely to obtain some secondary schooling; men were 18 percentage points more likely. Childhood exposure to the program also increased the probability that a child would com-

plete some high school by 10 to 15 percentage points. The researchers conclude that “the estimated education impacts represent remarkable increases in educational attainment among children who grow up with Progresa.”

Men in the cohort that was affected by Progresa worked an average three hours a week more than those in the older, not-exposed cohort. They were also more likely to work in the formal labor market and in non-agricultural occupations. Earnings impacts, while positive, were statistically insignificant for men. However, the researchers find significant effects on sectoral average earnings among male workers, on the order of \$40–\$50 per month.

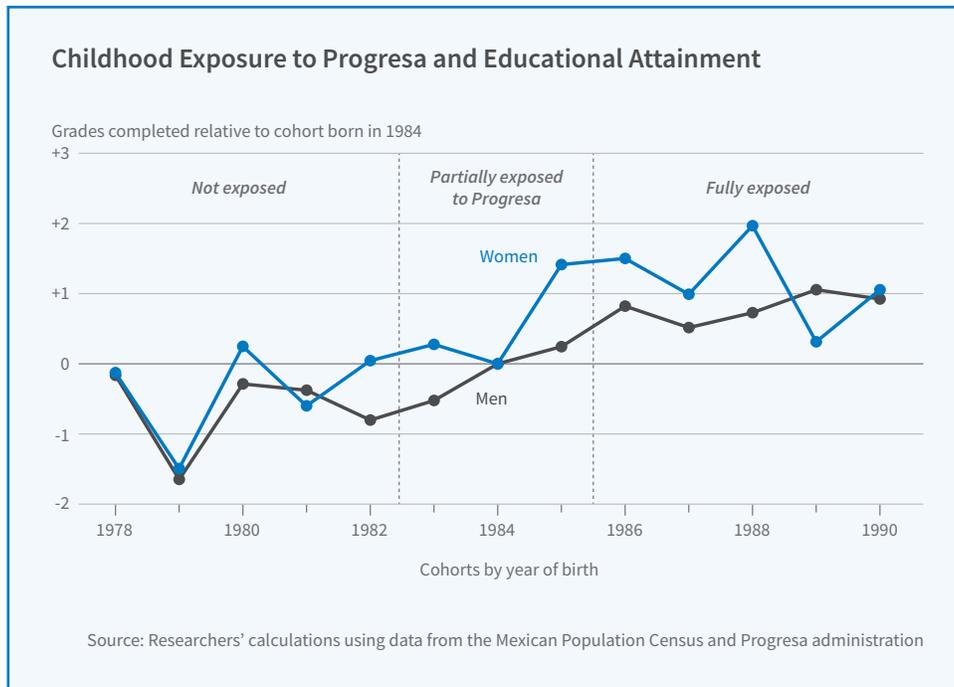
Progresa exposure also improved both housing conditions and ownership of durable goods.

The economic benefits women derived from childhood exposure to Progresa are at least partially driven by a

“moving to opportunity” effect. Women exposed to the program as children were more likely to migrate and to live in urban areas.

The researchers conclude that “these results suggest that CCTs and their accompanying educational gains, have important economic consequences for the next generation.”

—Dwyer Gunn



Long-Term Effects of Nevada's Job-Search Assistance Program

In late 2009, the state of Nevada provided individualized job-search assistance to randomly selected recipients of unemployment insurance (UI). Of the 32,751 people receiving UI benefits during this period, 4,673 were offered assistance. Those chosen to receive individual assistance were sent letters asking them to attend meetings scheduled up to a month after the date they filed for UI; they were told that failing to show up would end their benefits.

At the meetings, interviewers reviewed and evaluated recipients' job-search activity. Those who did not meet the search requirements of Nevada state law were removed from the UI rolls; those who were searching received personalized job counseling, including an assessment of their occupational skills, help developing a search plan and résumé, and referrals to local employers.

In Long-Term Effects of Job-Search Assistance: Experimental Evidence Using Administrative Tax Data (NBER Working Paper No. 24422), Dayanand S. Manoli, Marios Michaelides, and Ankur Patel compare the subsequent experience of those who received personalized assistance with that of other UI recipients who did not. They analyze tax return data spanning the 2001–15 period.

While many previous studies have examined the short-run effects of job placement programs on employment, this is one of the first that can track program participants for an extended period of time.

The researchers find that the assistance

Individuals who received personalized counseling after filing for unemployment benefits had higher subsequent total income and tax liability.

program increased employment by more than four percent over the subsequent six years for those randomized into the program relative to those who were not. The employment rate of participants in the year after the intervention was 8 percent higher than that of the non-assisted group. This effect declined somewhat over time, but remained in the 4 to 7 percent range over the subsequent five years. As

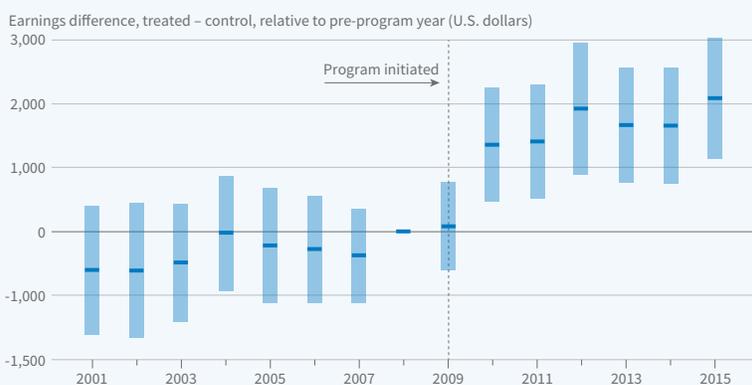
a result, the program increased participants' earnings in the range of 11 to 14 percent over the entire six-year follow-up period. Average W-2 wages for the assisted group were \$2,076 higher than those for the non-assisted group in 2010 and \$2,369 to \$2,800 higher in each

of the subsequent years. Average earnings conditional on employment averaged \$1,500 more for the assisted group. Total UI benefits paid out from 2009 through 2011 were \$818 lower for those in the assistance program, about four times the cost of the job-search assistance program. There was no difference between the assisted and non-assisted groups in the amount paid in UI benefits after 2011.

The positive earnings effect of the program appears to have affected other behaviors, such as home ownership. UI beneficiaries who were not in the assistance group displayed a steeper decline in their home ownership rate between 2009 and 2012 than did those who received assistance. The positive effect of the assistance program on subsequent employment may have helped those receiving assistance to avoid mortgage default or bankruptcy.

—Linda Gorman

Nevada's Job-Search Assistance Program and Earnings Outcomes



Light-blue bars represent 95% confidence intervals
Source: Researchers' calculations using data from the Nevada Department of Employment, Training, and Rehabilitation and the Internal Revenue Service

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