

Underemployment Problems in U.S. Labor  
Markets in 2009: Predicting the Probabilities of  
Underemployment For Key Age, Gender, Race-  
Ethnic, Nativity, Educational Attainment, and  
Occupational Subgroups of U.S. Workers

Prepared by:

Andrew Sum

Ishwar Khatiwada

With

Sheila Palma

Center for Labor Market Studies

Northeastern University

Boston, Massachusetts

**February 2010**

CLMS Research Project:

The Labor Market Impacts of the Great Recession of 2007-2009

## Introduction

During the past two years, U.S. labor markets have been battered by the forces of the Great Recession of 2007-2009. Between November 2007, the month immediately prior to the official onset of the recession, and December 2009, payroll employment levels fell by more than 8 million, and the number of employed civilians (16+) declined by 9 million.<sup>1</sup> Aggregate unemployment levels have more than doubled over this time period, and the unemployment rate (seasonally adjusted) averaged slightly more than 10% in the fourth quarter of 2009. Rising unemployment was accompanied by a substantial increase in the number of workers reporting themselves as employed part-time for economic reasons, by increased withdrawals from the civilian labor force, and growing mal-employment problems, especially among the nation's younger college graduates.<sup>2</sup>

Among the adverse effects of the Great Recession were its impacts on reducing weekly work hours among a growing number of workers across the nation, especially younger, less well-educated employees and those workers employed in many service and blue collar occupations, especially construction crafts, transportation operatives, and material moving positions. In conducting the monthly CPS household survey, the source of data on national employment and unemployment developments, the U.S. Census Bureau collects information on the weekly hours of work of the employed, the reasons for part-time employment, and the desires and availability of those working part-time for full-time jobs. Persons working under 35 hours per week are classified as part-time workers. Those persons who work part-time due to slack demand at their firms, poor business conditions, or an inability to find a full-time job are classified as part-time for economic reasons. Members of this latter group who report that they want a full-time job and were available to work full-time are classified as underemployed workers in this research report.<sup>3</sup>

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<sup>1</sup> See: U.S. Bureau of Labor Statistics, The Employment Situation: October 2009, November 2009, December 2009, Washington, D.C., 2009.

<sup>2</sup> For a review of mal-employment concepts and measures and the economic costs associated with mal-employment, See: Andrew Sum, Ishwar Khatiwada, and Joseph McLaughlin, The Growing Problems of Mal-Employment in the U.S. and Massachusetts, Report Prepared for the Commonwealth Corporation, Boston, 2009.

<sup>3</sup> In modifying the CPS labor force questionnaire in 1994, the U.S. Bureau of Labor Statistics added specific questions about the desire of part-time workers for full-time work and the reasons for their working part-time. Their current definition of employed part-time for economic reasons is the same as the group we call underemployed. See: Anne E. Polvika and Jennifer M. Rothgeb, "Redesigning the CPS Questionnaire," Monthly Labor Review, September 1993, pp. 10-22.

In a previous research paper, we analyzed the growth in the number of underemployed workers in the U.S. over the course of the Great Recession of 2007-2009, the changing demographic / socioeconomic characteristics of the underemployed, their industrial and occupational characteristics, and their family income background.<sup>4</sup> We also identified their weekly hours of work, their hourly and weekly wages, and the economic costs of underemployment to the workers themselves and to society as a whole.

In this paper, we are again to both identify who these underemployed workers were in the fourth quarter of 2009 and examine how the incidence of their underemployment problems varied across age, race-ethnic, educational attainment, and occupational groups. We also have developed a set of logit regression models to predict the probabilities of underemployment among employed U.S. workers in the last quarter of 2009 based on their demographic and socioeconomic characteristics, the occupations of their jobs, and the unemployment rates of the states in which they lived. These models will be used to estimate the marginal probabilities of particular traits on the likelihood of being under employed and to estimate the probability of underemployment among workers with a given set of demographic / socioeconomic / occupational traits.

### **The Rise in Underemployment Problems in the U.S. 2007-2009 and the Incidence of Underemployment Problems Across Gender, Age, Education, and Occupational Groups of Workers**

During the recessionary labor market conditions prevailing from December 2007 through the end of 2009, underemployment problems among U.S. workers have increased substantially. In the fourth quarter of 2007, the average monthly number of underemployed workers (not seasonally adjusted) was 4.389 million. By the fourth quarter of 2009, the average monthly number of underemployed had more than doubled to 8.907 million. Record high levels of underemployment were established in 2009.

The incidence of underemployment problems also rose sharply over the 2007-2009 period. In the fourth quarter of 2007, only 2.0% of employed U.S. workers (16+) were

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<sup>4</sup> See: (i) Andrew Sum, Ishwar Khatiwada with Sheila Palma, The Nation's Underemployed in the Great Recession: Growth in Their Numbers, the Rising Incidence of Underemployment Problems Across Demographic/ Socioeconomic/ Occupational Groups of Workers, Center for Labor Market Studies, Northeastern University, Boston, January 2010; (ii) Jay Fitzgerald, "Study: Many Can Only Get Part-time Work," Boston Herald, February 5, 2010.

underemployed. By the fourth quarter of 2009, underemployment had risen to 6.4% of the employed, tying the first quarter of 2009 for the highest incidence in our country's post-World War II history.<sup>5</sup> While male unemployment rates have risen at a much faster rate than those of women in the Great Recession of 2007-2009, especially among those without college degrees, underemployment problems have plagued both gender groups to a similar degree (Table 1). The underemployment rates of both groups more than doubled over the course of the recession, and in the fourth quarter of 2009, the underemployment rates of both groups were nearly identical (6.5% for men and 6.4% for women). Underemployment problems of U.S. workers vary far more considerably across age, race-ethnic, nativity, educational attainment, and occupational groups of workers.

Table 1:  
The Incidence of Underemployment Problems Among Employed Persons (16+)  
All and by Gender in October-December 2007 and October-December 2009  
(in %)

	(A)	(B)	(C)
Group	October – December 2007	October – December 2009	Percentage Point Change
All	3.0	6.4	+3.4
Men	3.0	6.5	+3.5
Women	2.9	6.4	+3.5

Source: October-December 2007 and October-December 2009, CPS public use files, tabulations by authors.

Underemployment rates of the employed in the fourth quarter of 2009 varied quite widely across major age groups of workers, being highest for teens (9.4%) and young adults 16-24 (10.6%) (Table 2). They then fell steadily and steeply with age, with older workers 70 and older having the lowest rate of underemployment (3.6%) (Table 2). Among teens, underemployment rates were very low among high school students (2%) and college students (3 to 4 percent), but considerably higher among those not enrolled in school (16-17 percent). Every major age group of the employed experienced a doubling of their underemployment rates between the fourth quarter of 2007 and 2009.

<sup>5</sup> The underemployment rate (not seasonally adjusted) was 6.3% in the first quarter of 2009. The definition of underemployment was changed in 1994 in the CPS survey, but we re-estimated underemployment levels for earlier years based on the new definition.

Table 2:  
The Incidence of Underemployment Problems Among Employed  
Persons (16+) by Age Group and Race-Ethnic Group in October – December 2009  
(in %)

Age Group	Underemployment Rate (in %)
16 – 19	9.4
20 – 24	10.6
25 – 29	7.7
30 – 34	6.7
35 – 44	5.8
45 – 54	5.6
55 – 64	5.2
65 – 69	4.6
70+	3.6
<b>Race/Ethnic Group</b>	
Asian	4.7
Black, not Hispanic	7.5
Hispanic	12.0
White, not Hispanic	5.2

The underemployment rates of U.S. workers also varied widely across race-ethnic groups in the fourth quarter of calendar year 2009. Asian workers were characterized by the lowest underemployment rate at 4.7% followed closely by White, non-Hispanics at 5.2% then Black (7.5%), and Hispanic workers (12.0%). Well educated Asian workers had very low underemployment rates while underemployment rates among Hispanics were very high among younger workers, high school dropouts, newer immigrants, and those in many service and blue collar jobs. The high incidence of underemployment problems among such Hispanic workers will be clearly revealed in our multivariate statistical models designed to predict underemployment probabilities.

Underemployment rates of the out-of-school employed were strongly associated with their educational attainment, falling steadily and sharply with their level of formal schooling (Table 3). Nearly 1 of every 6 employed high school dropouts was underemployed during the fourth quarter of 2009. It fell by nearly half for high school graduates, to 3.5% for employed bachelor degree holders and to a low of 2.2% for those with a Master's or higher academic

degree. High school dropouts were between 7 and 8 times as likely to be underemployed as the best educated group of employed adults.

Table 3:  
The Incidence of Underemployment Problems Among Employed Persons (16+) by Educational Attainment and Selected Occupational Groups in October – December 2009  
(in %)

Educational Attainment	Underemployment Rate (in %)
High school dropouts	16.4
High school graduate / GED	8.4
13-15 years, including Associate Degree	6.0
Bachelor's Degree	3.5
Master's or Higher Degree	2.2
<b>Occupational Group</b>	
Protective service	1.3
Computer and mathematics	1.5
Life, physical, social science	2.2
Architecture and engineering	2.3
Personal care	11.3
Building and grounds cleaners	13.9
Food preparation and serving	14.6
Construction and extraction	15.1

The occupations of the jobs held by the employed were assigned to twenty-three major occupational groups, including several categories of professional, management, sales, service, and blue collar occupations (construction crafts, production, transportation equipment and material moving). The underemployment rates of workers in these major occupational groups ranged quite widely from lows of 1.3 and 1.5 percent in protective service (police, firemen, sheriffs) and computer / mathematical professions to highs of 14 to 15 percent among building and grounds cleaners, food preparation and serving, and construction and extraction occupations. Workers in the last three occupational groups experienced massive increases of 8 to 9 percentage points in their underemployment rates over the past two years (2007 IV – 2009 IV).

## **Predicting the Probability of Underemployment Among U.S. Workers in the Fourth Quarter of 2009**

The above findings have described how the incidence of underemployment problems varied across key demographic, socioeconomic, and occupational groups of U.S. workers in recent months. We are also interested in identifying how these traits influence the probability of being underemployed in a multivariate statistical framework. A set of logit regression models were estimated to identify the influence of a variety of demographic (age, gender, race-ethnic) socioeconomic, occupational, and state unemployment rate variables on the probability of a worker being underemployed in the fourth quarter of 2009. A complete listing and accompanying set of definitions of the dependent and independent variables appearing in these models are presented in Appendix A. The full set of logit regression results including estimated logit coefficients, their standard errors, and their significance levels are displayed in Appendix B.

In the first logit regression model, which was estimated for the combined sample of male and female employed, we only include gender, age, race-ethnic, nativity status, educational attainment, and state unemployment rate variables in the model. The two nativity variables reflect a combination of the foreign born status of the individual and the timing of their arrival in the U.S. (if before 2006, the respondent is called an established immigrant and, if 2006 onward, he is called a recent immigrant). The unemployment rate of the state in which the respondent lived was measured by the state's annual average unemployment rate in 2009 minus the U.S. average unemployment rate in that same year.

The estimated coefficients for each independent variable were converted into marginal probabilities at the mean values of the right hand side variables.<sup>6</sup> In Table 4, we display the estimated values of the marginal probabilities and their significance levels. All variables, with the exception of two of the older age variables, were statistically significant at the .01 level.

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<sup>6</sup> The mean probability of being underemployed for the sample of respondents was 6.0%.

Table 4:  
Findings of the Logit Regression Models of the Underemployment Status of  
Employed Persons (16+) in the U.S., 4<sup>th</sup> Quarter 2009  
(Marginal Probabilities Evaluated at Means)

Variable	Marginal Probability
Male	-.005**
Asian	-.011**
Black	.009**
Hispanic	.014**
Other	.020**
16-19	.073**
20-24	.050**
25-34	.013**
45-54	.000
55-64	.001
65+	-.013**
Recent immigrant	.035**
Established immigrant	.018**
H.S. student	-.141**
College student	-.088**
H.S. dropout	.028**
13-15 years	-.017**
BA Degree	-.046**
Masters Plus	-.070**
U. Rate of State	.005**

Note: \*\* Sig. .01.

A review of the findings in Table 4 reveal that the age, race-ethnic, nativity status, and educational attainment variables as well as the state unemployment rate variable significantly influenced the probability of being underemployed. The youngest workers, especially teens and 20-24 year olds, were considerably more likely than 35-44 year olds (the base group) to be underemployed while the oldest workers (65+) were significantly less likely to be underemployed. Asians were significantly less likely (-1.1 percentage points) to be underemployed than White, non-Hispanics, while Blacks, Hispanics, and members of other races were more likely to be underemployed.<sup>7</sup> Both recent (2006 onward) and longer stay immigrants

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<sup>7</sup> The members of other races include persons of mixed race as well as American Indians/Hawaiian/Pacific Islanders.

were significantly more likely to be underemployed than their native born counterparts. The biggest impact was for recent immigrants who were 3.5 percentage points more likely to be underemployed than native born workers. Educational attainment had large independent impacts on the marginal probabilities of underemployment among U.S. workers in the final quarter of 2009. High school dropouts were about 3 percentage points more likely to experience underemployment than their high school graduate counterparts while the employed with a Bachelor's or more advanced degree (MAPLUS) were significantly less likely to be underemployed than high school graduates and dropouts. Living in a state with an unemployment rate above the U.S. average (9.3%), ceteris paribus, increased the likelihood of being underemployed. Each one percentage point increase in a state's unemployment rate would raise the marginal probability of being underemployed by about .5 percentage points.

The results of the above logit regression model were used to estimate the expected probability of being underemployed for four different individuals with combined demographic / educational attainment traits and state unemployment rates that would be expected to yield quite different probabilities of underemployment. All four of these hypothetical individuals are males so that we can keep gender constant although it has only a modest effect on the results.

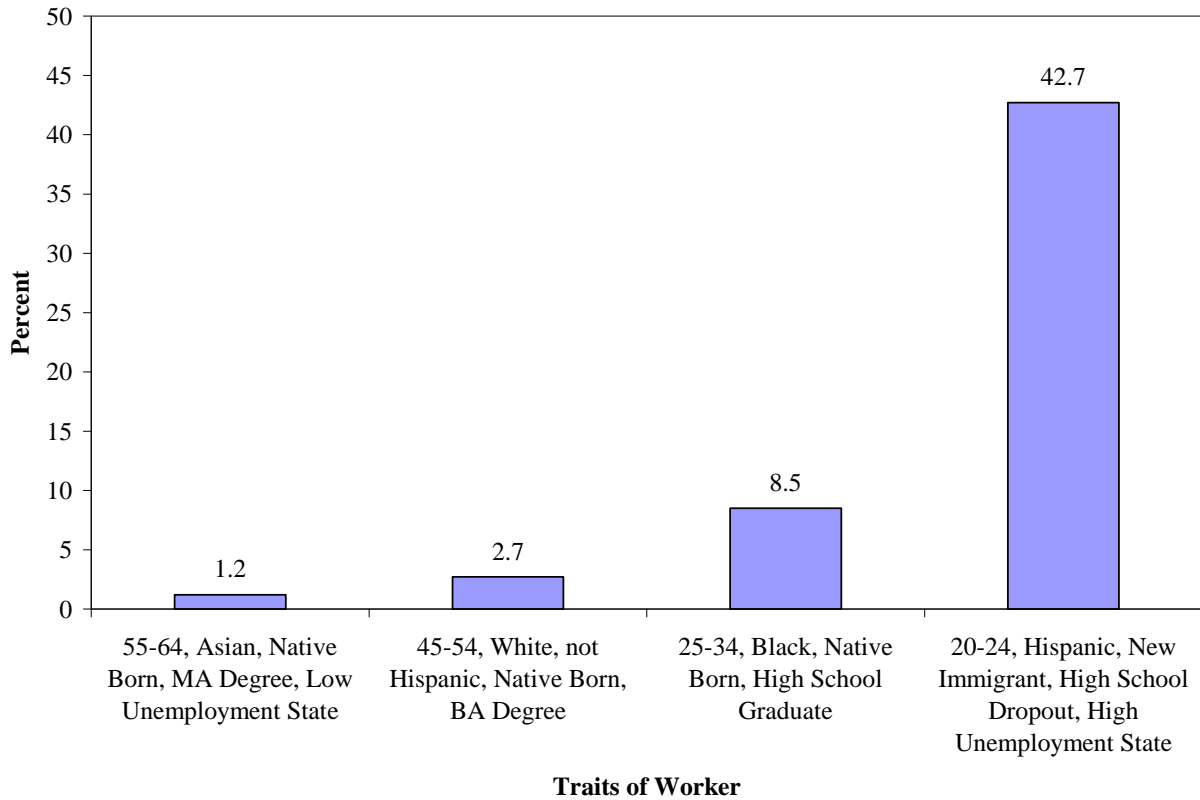
The first individual is an older 55-64 year old, Asian male, native born, who has a Master's degree, and lives in a state with an unemployment rate that was two percentage points below the U.S. average. His predicted probability of being underemployed was only 1.2%, barely a fifth of the national average for all men. The second individual is a slightly younger, 45-54 year old White, non-Hispanic male, who was native born, has a BA degree, and lived in a state with an unemployment rate one percentage point below the U.S. average. His predicted probability of being underemployed was only 2.7%, less than half of the average for all men. Our third individual is a much younger 25-34 year old Black male, who was native born, had a high school diploma but no completed years of college, and lived in a state with an unemployment rate that was one percentage above the U.S. average. His predicted probability of underemployment was 9.5% or 50 percent higher than the national average.

Table 5:  
Predicted Probabilities of Underemployment Among Selected  
Groups of Employed U.S. Workers, 4<sup>th</sup> Quarter 2009

Traits of Individual	Predicted Probability
Asian, Male, 55-64 Years Old, Masters or Higher Degree, Native Born, Lives in State with a Unemployment Rate Two Percentage Points Below U.S. Average	1.2%
White, non-Hispanic, Male, 45-54 Years Old, Native Born, BA Degree, Lives in State with Unemployment Rate One Percentage Point Below U.S. Average	2.7%
Black, Male, 25-34, Native Born, High School Graduate, Lives in State with an Unemployment Rate One Percentage Point Above U.S. Average	9.5%
Hispanic, Male, 20-24, Recent Immigrant, High School Dropout, Lives in State with Unemployment Rate Two Percentage Points Above U.S. Average	42.7%

Our final hypothetical individual is a very young, 20-24 year old Hispanic male, who is a recent immigrant to the U.S., is a high school dropout from his own country, and lives in a state with an unemployment rate two points above the U.S. His predicted probability of being underemployed is a massively higher 42.7%, or seven times the national average. His predicted probability of underemployment was 35 times as high as that of our first individual the older, well educated, Asian male, living in a low unemployment state.

**Chart 1:**  
Predicated Probabilities of Being Underemployed for Four Hypothetical  
Male Workers in the U.S., Fourth Quarter of 2009



In our second set of logit regression models, the occupational group of the job held by the employed person in the fourth quarter of 2009 was also entered into the model as an additional set of independent variables. There were 23 occupational groups of workers, and those holding management occupations were considered as part of the base group.<sup>8</sup> The models of underemployment were run separately for men and women. Table 6 provides the estimated marginal probability effect (evaluated at the means for all other predictor variables) for the educational variables and a subset of the occupational variables for men and women separately.

<sup>8</sup> All other characteristics of the base group workers were the same as those in the first set of logit models (a 35-44 year old, high school graduate, White, not Hispanic, native born, living in a state with an unemployment rate equal to the national average).

Table 6:  
The Estimated Marginal Probability Effects of Educational Attainment and  
Occupational Variables on the Underemployment Status of Employed Men and Women in the  
U.S., Fourth Quarter 2009

Variable	(A)	(B)
	Men	Women
High School Dropout	.020**	.020**
1-3 Years College	-.012**	-.001
BA Degree	-.028**	-.019**
Master's or Higher Degree	-.039**	-.038**
Computer/mathematical Education/training occupations	-.025**	-.043**
Legal occupations	.023**	.039**
Health care support	-.033*	-.009
Food prep/serving	.042**	.061**
Building/Cleaning	.069**	.100**
Lower Level Sales (Sales Clerks)	.052**	.096**
Construction/Extraction	.031**	.088**
Transportation/Material Moving	.070**	.099**
	.038**	.081**

Notes: (1) \*\* Sig. .01

(2) \* Sig. .05

The four educational variables were statistically significant in the male regression model as were three of the four educational variables in the model for women. The coefficients for the nine chosen occupational variables in the male model and eight of the nine for women also were statistically significant.<sup>9</sup> In most cases, the estimated magnitude of the coefficients on the occupational variables in the logit model for women was higher than in the model for men. This was especially true for many of the service occupations, lower level sales, and key blue collar occupations. The combined effects of education and occupational attachment on underemployment for both groups of workers were quite strong. Less educated workers in many lower level service and blue collar occupations faced sharply higher risks of being underemployed. For example, a female computer professional with a Master's degree, *ceteris paribus*, was 18 percentage points less likely to be underemployed than her counterpart with a high school diploma working in a food preparation/serving occupation.

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<sup>9</sup> For women, the estimated marginal probability effects for those employed in legal occupations was negative (-.009), but was not statistically significant as it was in the male model.

The findings of the logit regression model that included the occupational employment categories as predictors for underemployment among employed women were used to estimate the probability of being underemployed for four different women. Each of these women had varying age, race-ethnic, nativity, educational attainment, and occupational characteristics. Findings are presented in Table 7 and Chart 2. The first hypothetical woman was a 45-54 year old, White, non-Hispanic, who was native born, held a Master’s degree, and worked in a management position. She lived in a state with an unemployment rate two percentage points below the U.S. average. Her predicted probability of being underemployed was a very low one percent. Our second hypothetical female worker was a slightly younger 35-44 year old Asian woman, who was native born, has a Bachelor’s degree, and worked as a computer professional. She lived in a state with an unemployment rate one percentage point below the U.S. average. Her predicted probability of being underemployed was less than one percent (-.6%).<sup>10</sup>

Table 7:  
Predicted Probabilities of Underemployment Among Employed Women (16+)  
With Selected Demographic/Educational and Occupational Traits, 2009, 4<sup>th</sup> Quarter

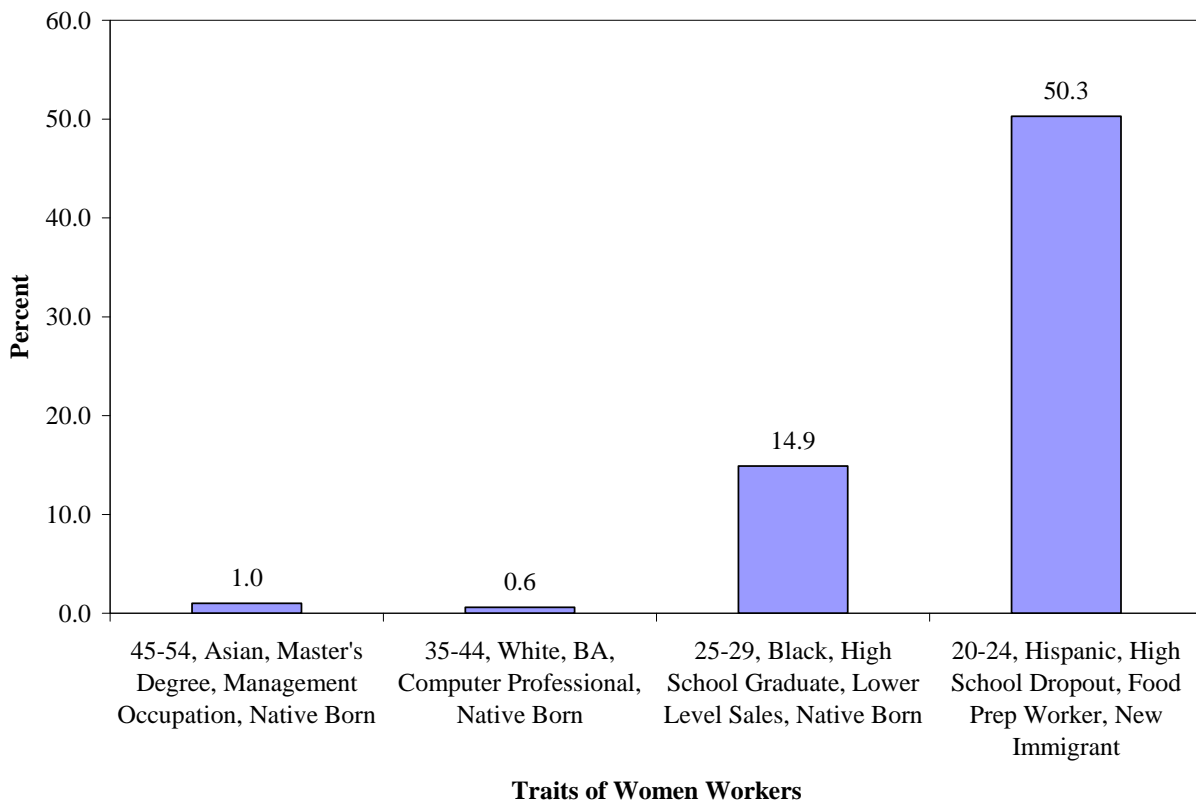
Traits of Women	Predicted Probability of Underemployment
45-54 Year Old, White, non-Hispanic, has a Master’s Degree, Management Occupation, Native Born Lives in State with Unemployment Rate Two Points Below U.S. Average	.010
35-44 Year Old, Asian, Bachelor’s Degree, Computer Professional, Native Born, Lies in a State with Unemployment Rate One Point Below U.S. Average	.006
25-29 Year Old, Black, High School Graduate, Lower Levels Sales, Native Born, Lives in a State with Unemployment Rate One Point Above U.S.	.149
20-24 Year Old, Hispanic, High School Dropout, Food Prep Occupation, A new Immigrant Arrival (Came to U.S. From 2006), Lives in a State with Unemployment Rate Two Points Above U.S. Average	.503

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<sup>10</sup> While having a BA degree does not reduce the probability of being underemployed as much as a Master’s degree, female computer professionals were significantly less likely to be underemployed than managers.

Our third hypothetical female worker is a young 25-29 year old, Black woman, native born, who has a high school diploma, worked as a sales clerk in a retail store, and resided in a state with an unemployment rate one percent above the U.S. average. Her predicted underemployment rate is a much more substantial 15 percent. Our final individual is an even younger 20-24 year old, Hispanic woman, who is a recent immigrant, lacks a high school diploma, and works as a food prep worker in a relatively high unemployment state. Her predicted probability of being underemployed is an astounding 50%. This predicted probability of being underemployed is 50 to 84 times as high as those of our first two hypothetical women.

Chart 2:  
Predicted Probabilities of Underemployment Among Four Hypothetical Women in  
Selected Age/Educational Attainment/Occupational/Nativity Status Groups, 4<sup>th</sup> Quarter 2009  
 (in %)



Clearly, the combined effects of age, nativity, educational attainment, and occupational attachment on the underemployment status of male and female workers in the U.S. were quite strong in the final months of 2009 when the nation's unemployment rate (seasonally adjusted)

reached its peak of 10.1%. Younger, less educated workers in many service and blue collar occupations in higher unemployment states were at severe risk of being underemployed. The personal costs of underemployment were frequently quite substantial, including sharply lower weekly hours of work, lower hourly and especially weekly wages, and often a lower receipt of training from one's employer and key employee benefits.<sup>11</sup> Part time employment also has been found to have lower (if not zero) returns to future wages.<sup>12</sup> The economic burdens of the recession as measured by underemployment were not evenly shared across key U.S. worker groups and were often quite regressive in their income impacts with lower income workers being far more affected.<sup>13</sup>

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<sup>11</sup> Many well educated, underemployed individuals, especially young college graduates, appear to be both mal-employed as well as underemployed, working in jobs outside of the college labor market.

<sup>12</sup> For recent findings on a zero return to work experience for women working part-time, See: Marta Tienda, V. Joseph Hotz, Avner Ahituv, et al., "Employment and Wage Prospects of Black, White, and Hispanic Women," in Human Resource Economics and Public Policy, W.E. Upjohn Institute for Employment Research, Kalamazoo, 2010.

<sup>13</sup> For a recent editorial on this issue of burden sharing in the recession, See: Bob Herbert, "The Worst of the Pain," The New York Times, February 8, 2010.