U.S. Labor Market Challenges over the Longer Term

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Abstract

Two forces are rapidly shifting the quality of jobs, reshaping the distribution of earnings and job opportunities, and redefining gender roles in OECD economies: employment polarization, whereby job opportunities are increasingly concentrated in high-skill, high-wage jobs and in low-skill, low-wage jobs; and a reversal of the gender gap in higher education, reflecting women's rising educational attainment and men's stagnating educational attainment. The result is a labor market that greatly rewards workers with college and graduate degrees but is unfavorable to the less-educated, particularly less-educated males. The economic and social repercussions of polarizing employment growth and stagnating male educational attainment will present challenges for policy on multiple fronts.

Leading economists from Paul Samuelson to Paul Krugman have labored to allay the fear that technological advances may reduce overall employment as workers are displaced by machines. This 'lump of labor fallacy'—positing that there is a fixed amount of work to be done so that increased labor productivity reduces employment—is intuitively appealing and demonstrably false. In 1900, for example, 41 percent of the U.S. workforce worked in agriculture. After a century of astonishing agricultural productivity growth, the number stood at 2 percent in 2000. This Green Revolution transformed physical and cognitive skill demands and the fabric of American life. But it did not reduce total employment. The employment-to-population ratio rose over the twentieth century as women moved from home to market, and the unemployment rate fluctuated cyclically with no trend increase.

What is fallacious in the 'lump of labor fallacy' is the supposition that there are a limited number of jobs. Over the long run, technological improvements create new products and services, raise national income, and increase demand for labor throughout the economy. It is not fallacious, however, to posit that as workers are displaced from older to newer activities, technological advances create winners and losers. The shift from the artisanal shop to the factory due to mechanization in the nineteenth century reduced the demand for skilled craft workers and raised demand for both more educated workers (managers, engineers, and clerks) and for less-skilled operatives. More recent technological changes from electrification to computerization have expanded the demand for highly-educated workers but substituted for less-skilled production workers.

Two forces at present are rapidly shifting the quality of jobs, reshaping the earnings distribution, altering economic mobility, and redefining gender roles in OECD economies. These forces are, one, employment polarization (a demand-side force) and, two, a reversal of the gender gap in higher education (a supply-side force), reflecting women's rising educational attainment and men's stagnating educational attainment. The result has been a labor market that greatly rewards workers with college and graduate degrees but is unfavorable to the less-educated, particularly less-educated males. The economic and social repercussions are only starting to receive study. They will pose long-term challenges for economic and social policy in the decades ahead.

This short paper first documents the importance of these two phenomena in the U.S. and the European Union and considers their repercussions for employment rates, earnings levels, and other demographic outcomes. A major theme of this paper is that males as a group have adapted poorly to

the challenges posed by the labor market developments of the last three decades; not only has male educational attainment failed to keep pace with the changing distribution of earnings opportunities, even conditional on education, males appear to be falling in occupational stature. These adverse shifts bode ill not only for male earnings and labor force participation but also for other fundamental measures of social function including marriage, child-rearing and criminality.

Employment polarization

In the United States and other advanced countries, employment growth is polarizing with job opportunities increasingly concentrated in relatively high-skill, high-wage jobs and low-skill, low-wage jobs.[1] Figure 1 plots changes in employment by decade for 1979 through 2009 for ten major occupational groups encompassing U.S. non-agricultural employment. These occupations divide into three groups. On the left-hand side of the figure are managerial, professional, and technical occupations. These are highly-educated and highly-paid occupations. Employment growth in high-skill occupations was robust for the past three decades.

The next four columns display employment growth in middle-educated and middle-paid occupations, including sales; office workers; production, craft and repair; and operators, fabricators and laborers. Their growth rate lags the economy-wide average and slows in each subsequent time interval. These occupations were hard hit by the Great Recession with absolute employment declines from 7 to 17 percent.

The final three columns depict employment trends in so called service occupations, which involve helping, caring for, or assisting others. Workers in service occupations disproportionately hold no post-secondary education and earn relatively low hourly wages. Employment growth in service occupations has been rapid in the past three decades, expanding by double digits in the 1990s and the pre-recession years of the past decade. Even during the Great Recession, employment growth in service occupations was modestly positive.

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[1] See Autor, Levy and Murnane (2003), Goos and Manning (2007), Autor, Katz and Kearney (2008), Goos, Manning and Salomons (2009), and Autor and Dorn (2009) for detailed discussion. The material in this section draws particularly on Autor (2010) and Acemoglu and Autor (forthcoming).

The consequence has been a sharp decline in the share of U.S. employment in traditional 'middle-skill' jobs. The four 'middle-skill' occupations—sales, office workers, production workers, and operatives—accounted for 57 percent of employment in 1979 but only 46 percent in 2009.

The polarization of employment is widespread in the OECD. Figure 2 plots the change in the share of employment between 1993 and 2006 in 16 European Union economies for three sets of occupations—low-, middle-, and high-wage—covering non-agricultural employment and grouped by average wages. In all 16 countries, middle-wage occupations declined as a share of employment. Low-wage occupations increased as a share of employment in 11 of 16 and high-wage occupations increased in 13 of 16. In all 16 countries, low-wage occupations expanded relative to middle-wage occupations.[2]

The comparability of these occupational shifts across a large set of developed countries—the United States among them—makes it likely that a common set of forces contributes to these shared labor-market developments. Simultaneously, the presence of substantial differences between countries in the data underscores that no single factor or common cause explains the diversity of experiences across the United States and the European Union.

Employment polarization: Demand-side causes

A leading explanation for the polarization of employment in the OECD focuses on the computerization of many job tasks, altering the composition of jobs and the tasks workers perform within jobs. The price of information technology has fallen at a stunning pace. William Nordhaus (2007) estimates that the real cost of performing a standardized set of computational task fell at least 1.7 trillion-fold between 1850 and 2006, with the bulk of this decline occurring in the last three decades.

The rapid, secular price decline in the real cost of symbolic processing creates enormous economic incentives for employers to substitute information technology for expensive labor whenever feasible. Moreover, it creates significant advantages for workers whose skills are complementary to computers and disadvantages those whose tasks are easily substituted by computers.

Although computers are now ubiquitous, they cannot do everything. Their ability to accomplish a task depends upon the ability of a programmer to write a set of procedures or rules that appropriately direct the machine at each possible contingency. For a task to be autonomously performed by a

[2] This data in this figure are from Goos, Manning and Salomons (2009).

computer, it must be sufficiently well defined (i.e., codifiable) that a machine can execute the task successfully by following the steps set down by the programmer. We refer to the procedural, rule-based activities to which computers are currently well-suited as 'routine' tasks.

Job tasks that primarily involve organizing, storing, retrieving, and manipulating information are increasingly codified in computer software and performed by machines. These advances have also dramatically lowered the cost of offshoring information-based tasks to foreign worksites. Measures of job task content uniformly find that routine tasks are most pervasive in middle-skilled cognitive and manual jobs, such as bookkeeping, clerical work, repetitive production, and monitoring jobs. The marked decline in clerical and administrative occupations is substantially a consequence of the falling price of machine substitutes for such tasks.

The automation and offshoring of routine tasks reduces the domestic demand for workers in these tasks, but, as per the Green Revolution example, does not necessarily reduce overall labor demand. Rather, it raises relative demand for workers who can perform 'non-routine' tasks that are complementary to the automated activities. These non-routine tasks can roughly be subdivided into two major groups on opposite ends of the occupational-skill distribution: abstract tasks and manual tasks. Abstract tasks are activities that require problem-solving, intuition, persuasion, and creativity. These tasks are characteristic of professional, managerial, technical and creative occupations, such as law, medicine, science, engineering, and design. Workers who are most adept in these tasks typically have high levels of education and analytical capability.

Manual tasks, on the other hand, are activities that require situational adaptability, visual and language recognition, and in-person interaction. Driving a truck through city traffic, preparing a meal, or installing carpet are all activities that are intensive in non-routine manual tasks. Such tasks demand workers who are physically adept and, often, able to communicate fluently in spoken language. Yet, such jobs are often organized in ways that may require little or no education beyond high school.

This latter observation applies with particular force to service occupations, e.g., food preparation and serving, cleaning and janitorial work, and maintenance. These jobs demand interpersonal and environmental adaptability, which are precisely the job tasks that are challenging to automate because they require responsiveness to unscripted interactions. Such jobs are also difficult to offshore because they typically must be performed in person, often in direct contact with final consumers (e.g., haircutting, food service, house cleaning).

A consequence of these forces—rising demand for highly-educated workers performing abstract tasks and less-educated workers performing 'manual' or service tasks—is the partial hollowing out or polarization of employment opportunities seen in Figures 1 and 2. This hypothesis is supported by a rapidly growing body of research that links the process of computerization to occupational change over time and across countries. Employment projections from the U.S. Bureau of Labor Statistics forecast these shifts to continue for the next decade (U.S. BLS, 2010).

Educational gender reversal

The polarization of employment opportunities in the last three decades has been accompanied by a substantial secular rise in the earnings of those who complete post-secondary education. The hourly wage of the typical college graduate in the U.S. was approximately 1.5 times the hourly wage of the typical high-school graduate in 1979. By 2009, this ratio stood at 1.95 (Figure 3). This enormous growth in the earnings differential between college- and high school–educated workers reflects the cumulative effect three decades of more or less continuous increase. Many other OECD countries have seen increases in the wage gap between college and non-college workers, though the U.S. case is more extreme.

The polarization of job opportunities is only half of the explanation for the growing wage gap, however. If the rate of growth of educational attainment had kept pace with the rising relative demand for highly-educated workers, the increase in these earnings differential may have been held in check. But in the United States, it did not. The explanation for why it did not is a puzzle and cause for concern.

As shown in Figure 4, female educational attainment rose substantially in these decades throughout the OECD. Comparing the fraction of women ages 25–34 with college ('tertiary') education in 2009 with that of women ages 45–54 in the same year, we can see that college attainment among women more than doubled in many countries over two decades. In Spain, it rose from 23 to 43 percent. In the U.S., the gains were more modest but still considerable, rising from 28 to 35 percent.

The counterpoint to gains in female skill investment is the lackluster increase among males. Figure 5 shows that male college attainment rose only weakly in most countries over the same period. In Spain, it rose from 27 to 33 percent. In the U.S., college attainment in 2009 was several percentage points *lower* among males ages 25–34 than among males who completed schooling two decades earlier.

The net effect is that female rates of college attainment now greatly exceed those of males in most industrialized countries, as shown in Figure 6. Indeed, in 2009, the ratio of female-to-male college attainment exceeded parity among younger cohorts (ages 25-34) in all eleven countries in the figure. For the European counties, this ratio averaged 1.3, almost identical to the U.S. ratio. For cohorts that were ages 45-54 in 2009, however, female-to-male college attainment was roughly at or below parity in eight of eleven countries.

The rising educational attainment of women is good news, but men's failure to keep pace is problematic. It means fewer young males will gain entry to high-end occupations and the supply of workers who can perform high-end abstract tasks is not increasing as fast as demand. This exacerbates rising wage inequality and retards the growth of advanced economies, which depend on their best-educated workers to develop and commercialize the innovative ideas that drive economic growth.

Educational gender reversal: Possible causes?

From the end of World War II to the late 1970s, the supply of college-educated workers relative to non-college-educated workers rose robustly and steadily, with each cohort of workers entering the labor market boasting a proportionately higher rate of college education than the cohort that preceded it. This inter-cohort pattern is seen in Figure 7, which plots these relative supplies for the years 1963 through 2008. From 1963 through 1982, the relative supply of college-educated workers rose steadily. But in 1983, this growth in relative supply sharply decelerated. Cohorts of workers entering the labor market after 1982 were *somewhat* more educated on average than their predecessors, but the rate of inter-cohort increased slowed markedly.

This deceleration is particularly evident when we focus in Figure 7 on young adults, those who have fewer than ten years of potential experience in the labor market. While the supply of young college-educated males relative to young high school–educated males increased rapidly in the 1960s and early 1970s, this rising tide reached an apex in 1974 from which it barely moved for the better part of the next 30 years. Notably, the deceleration in supply among females is not nearly as abrupt or as complete as for males.[3]

[3] The figure also contains some good news: the growth of the relative supply of both male and female college graduates accelerates after 2003. Unfortunately, this uptick is driven in part by declining relative employment of

Why did the supply of college-educated workers decelerate in the early 1980s? And why has it not rebounded in light of the rising returns from a college degree? Four factors are particularly relevant, as detailed by Card and Lemieux (2001a and 2001b) and Goldin and Katz (2008). First, the Vietnam War artificially boosted college attendance during the 1970s because males enrolled in post-secondary schooling were permitted to defer military service (until the final years of the war). When the Vietnam War ended in the early 1970s, college enrollment rates dropped sharply, particularly for males, leading to a decline in college completions half a decade later. This is evident in the slowdown in college supply in 1974 (a year after the war's end) depicted in Figure 7.

A second factor is that the college wage premium fell by more than 10 percentage points during the 1970s due to the rapid influx of college-educated workers into the labor force (Figure 3). This downturn in relative college earnings probably discouraged high school graduates from enrolling in college. Indeed, economist Richard Freeman famously argued in his 1976 book, *The Overeducated American*, that the supply of college-educated workers in the United States had so far outstripped demand that the net social return of sending more high school graduates to college was negative.[4]

A third partial explanation for this development is that the cohorts entering the labor market after 1982 were substantially smaller than their immediate predecessors, who in turn were the youngest Baby Boomers. Accordingly, even if these new cohorts entering the workplace brought comparatively high levels of education to the labor market, their entry would not have raised the college share as rapidly as preceding cohorts simply due to their relatively smaller numbers (Ellwood 2002).

Yet none of these factors explains why females have robustly increased their rate of college completion since the 1980s while males have not. Even if one were to (reluctantly, and with limited justification) conclude from the cross-country data that female college attainment must inevitably exceed that of males in advanced industrial economies, the level of U.S. male college attainment is still

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non-college workers (that is, a fall in the denominator rather than a rise in the numerator) during the recent economic slowdown and subsequent recession. The non-employed are not usually counted in supply calculations such as Figure 9 because they are typically viewed as voluntary non-participants—though the plausibility of that assumption clearly differs in booms and busts.

[4] Freeman, Richard B. 1976. *The Overeducated American*. New York: Academic Press. It is not entirely fair to blame the rise in U.S. earnings inequality on Richard Freeman, however. His book correctly predicted that the college glut was temporary: demand would subsequently surpass supply growth, leading to a rebound in the college wage premium.

quite low relative to peer countries. Figure 5 shows, for example, that young adult males in the U.S. have lower rates of college attainment than their peers in the Netherlands, Spain, England, Ireland, France and Denmark. This indicates that the stagnation of U.S. male educational attainment at its current low level is not inevitable.

The fact that there remains plenty of headroom for U.S. males to attain higher levels of schooling is also underscored by the enormous discrepancies in college completion rates by race group in the U.S. These gaps are illustrated in Figure 8, which plots college completion rates among young U.S. adults (ages 25 through 34) by gender in three race categories: white, black, and other nonwhite.[5] In 2008, *over half* of other nonwhite males and females ages 25 to 34 had completed college. The corresponding numbers for white males and females were only fifty to sixty percent of these levels. For black males and females, the rates were lower still, equal to thirty to forty percent of those of other nonwhites. If the educational attainments of blacks and whites were to 'stagnate' at the level already achieved by other nonwhite young adults, the U.S. would have the highest college attainment rate in the world, whereas many estimates now place the U.S. outside of the top ten.

Why have males not responded to the rising college premium as robustly as have females? One speculative explanation focuses on changes in real rather than relative earnings. The high and rising U.S. college wage premium masks a discouraging truth: the increasing *relative* earnings of male college graduates are due as much to the falling real earnings of non-college males as they are to the rising real earnings of college males. The real hourly earnings of males with a four-year college degree and no post-college education rose by only 10 percent between 1979 and 2007 (Figure 9). This should be compared to a 29 percent increase in real earnings for females with a four-year college degree. Concurrently, real earnings of high school dropout males *fell* by 16 percentage points, while those of high school graduate males with no college education fell by 12 percentage points. For non-college females, earnings trends were much less adverse: real earnings fell by 1 percent among high school dropout females and rose by 6 percentage points among high school graduate females.

[5] The vast majority of Hispanics are included in the white category. Thus, the other nonwhite group is disproportionately composed of Asians, and it is likely that the Asian share of this group rises over the 28 years depicted.

Thus, for females, the rising return to college reflects modestly positive wage growth at all education levels coupled with strongly positive wage growth at higher education levels; for males, it is more a matter of running just to keep in the same place. Indeed, the only education group for which real earnings rose robustly among both sexes between 1979 and 2007 is workers with a post-baccalaureate education (i.e., a master's degree or Ph.D.). For this group, real earnings rose by 26 percent among males and 37 percent among females.[6]

There are two clear limitations to the hypothesis that weak real earnings growth among male college graduates contributes to stagnating educational attainment among college-age males. One is conceptual: absent credit constraints, those considering college should respond to the differential between what an individual would earn with and without a college degree. This difference depends on relative wages, not real wage levels, and all evidence suggests the relative wage of college males (and females) has increased considerably. Since there is little reason to suspect credit constraints are greater among young males than females, this hypothesis can only have explanatory power if a substantial number of males are responding to the wrong economic signals.[7] This possibility does not appear to be out of the question, but is not a hypothesis that most economists will embrace.

Another limitation of this hypothesis is that there at present no direct evidence for its relevance other than the time series data above. One could begin to test this conjecture by relating changes in college enrollment rates of college-age males by demographic group to trends in real earnings levels among college workers of the same demographic groups. Additionally, one could explore whether the deceleration in male educational attainment observed in numerous European Union countries since the late 1970s coincides with decelerating real wage gains for college males in these countries. This topic appears worthy of at least cursory exploration.

Declining labor force participation: The role of labor demand shifts

[6] Though it is sometimes asserted that the 'real' earnings declines of less-educated workers are overstated because they do not account for the rising value of employer-provided in-kind benefits such as healthcare, careful analysis of representative wage and fringe benefits data conducted by U.S. Bureau of Labor Statistics economist Brooks Pierce (2001 and 2008) refutes this notion. Net of fringe benefits, real compensation for low-skilled workers fell in the 1980s. Further, accounting for fringe benefits, total compensation for high-skilled workers rose more than wages did, both in absolute terms and relative to compensation for low-skilled workers.

[7] Oreopoulos and Salvanes explore this question in a forthcoming *Journal of Economic Perspectives* paper.

As is shown in Figure 10, the employment-to-population rate fluctuates with the business cycle, and the current recession has taken a severe toll on employment. Even looking across business cycle peaks, however, it is evident that the last several decades have witnessed a long-term downward trend in the employment-to-population rate of males, in contrast to the trend for females. Figure 11 summarizes these movements by plotting changes in the employment-to-population rate by education and sex, focusing on the period between 1979 and 2007. These years are chosen because they are high water marks of their respective business cycles. During this time interval, the male employment-to-population rate declined modestly for all education levels, and substantially (10 to 12 percentage points) for those with no education beyond high school.

Figure 12 provides a longer term and more disaggregated perspective on these trends. Using the decennial Censuses and American Community Survey for earnings years 1969 through 2007, this figure plots employment to population rates for young workers ages 25-39 by sex, race and educational attainment (high school dropout, high school graduate, greater than high school). The employment to population data in these figure refer to *any employment* in the prior year, and hence is best thought of as a measure of long-term non-participation.[8] The declines in participation among less educated males over these four decades are substantial. Among black male high school dropouts, it is 35 percentage points. Among white male high school dropouts, it's closer to 15 percentage points. Notably, Hispanic males do not exhibit a similar downward trend and, moreover, there are only minor differences in employment rates between more and less educated Hispanics. Furthermore, while female employment rates rise secularly over these decades, the increase in employment among the least educated females is relatively small. Among white females, it turns downward in the current decade.

Though it is conceivable that these declines in labor force participation reflect rising affluence (i.e., rising incomes leading to more leisure), a more likely explanation is that declining earnings and employment opportunities have caused workers to drop out of the workforce. As a simple means to distinguish these explanations, I regress decadal changes in the employment-to-population rate for 80 demographic groups between 1979 and 2009 on contemporaneous changes in the mean real log hourly

[8] The x-axis of the figure is dated to the calendar year prior to the Census (e.g., 1999 instead of 2000), since the survey question refers to employment in the prior year. Unlike the above employment-to-population tabulations that use the Current Population Survey, the incarcerated population is included in these Census-based statistics.

wages of employed workers in these groups. These 80 groups are comprised of two sexes (male/female), three race categories (white, black, non-white other), four age groups (16–24, 25–39, 40–54, and 55–64), and five education groups (high school dropout, high school graduate, some college, college graduate, and more than college). Detailed results are found in Tables 1 and 2.

A summary conclusion is that changing real earnings and changing employment-to-population rates are strongly and significantly positively correlated in each of the last three decades (1979-89, 1989-99, and 2000-09). This is also true both before and during the current recession (2000-2007 and 2007-2009). Over the entire 1979-2009 period, a 10-percent decline in wages for a demographic group is robustly associated with a 5.8-percentage point fall in its employment to population rate. Table 1 also separately fits this model using only the three most recent years for which data are available, 2007–09. This model detects the same pattern seen in the 1980s, 1990s, and the pre-recession years of the 2000s: demographic groups that saw the largest drops in employment also saw the largest declines in earnings among their employed members.

As shown in Table 2, this robust positive relationship between wage and employment changes is detected for all subgroups: males and females, the three race groups, younger and older workers, and college and non-college workers. Demographic groups with declining earnings over the past three decades also experienced declining employment-to-population rates, and vice versa for groups with rising earnings.[9] This constitutes strong prima facie evidence that changing wage levels are a key factor shaping the evolution of labor force participation and, in particular, the declining labor force participation of less skilled males.

Even if we accept this hypothesis for a moment, we so far have no real explanation for why wages have risen less, or declined more, among males than among females of the same education, race, and age groups. A more detailed look at occupational polarization provides some leverage on this problem.

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[9] These regressions do not attempt to account for selection bias. If, plausibly, the lowest earning workers in a demographic cell exit the labor force when potential earnings decline, the observed wage decline in a cell will *understate* the actual fall in potential earnings (and vice versa when wages are rising). These biases work against finding a strong positive relationship between changes in earnings and changes in employment (though they also work in favor of overestimating the elasticity of labor supply since changes in LFP are correctly measured while measured wage changes understate latent wage changes). The robust relationships found in Table 1 and 2 therefore suggest that the underlying demand forces driving these wage changes are pronounced or that the biases are modest.

Gender differences in adaptation to occupational polarization

The polarization of employment into low- and high-skill occupations has unfolded with increasing velocity over the past two decades. This polarization did not unfold evenly among the sexes, however, as shown in Figure 13. The first set of columns in this figure plot the change between 1979 and 2007 in the share of employment in high-, middle-, and low-skill occupations among each sex. This figure shows that the share of male employment in middle-skill occupations dropped by 7.0 percent. For females, the fall was even larger at 15.8 percent.

Yet, this "hollowing out" of the occupational distribution had different consequences for the sexes. Females primarily moved upward in the distribution as they departed the center. Male employment instead moved in roughly equal measures to the tails of the distribution—that is, high-wage, high-skill and low-wage, low-skill jobs.

The next three sets of columns in the figure depict these relationships separately for three education groups: high school or lower, some college, and four year college or greater. The second set of columns shows that the share of males with no more than a high school education employed in middle-skill occupations dropped by 3.9 percent between 1979 and 2007. More than the entirety of this decline is accounted for by a corresponding rise in employment in low-skill service occupations. Simultaneously, the share of employment among males with some college education declined in both middle- and high-skill occupations. Even among males with a four-year college degree, employment in high-wage occupations declined modestly, with the slack taken up approximately evenly by middle- and low-skill occupations.

Some portion of this occupational shift is arguably mechanical. As the share of workers with higher education rises, it is inevitable that some subset will take traditionally non-college jobs. Put simply, when a third of the workforce is college educated, not *all* college-educated workers will be managers or professionals. Nevertheless, the decline of middle-skill jobs has clearly displaced males toward the tales of the occupational distribution, with the net effect being a slight increase in the overall share of males in low-skill occupations relative to the share in high-skill occupations, and rise in the share of males at each education level employed in low-skill occupations.

Figure 13 paints a more encouraging picture for females. Females with less than a four-year college degree experienced substantial declines in the share of their employment in middle-skill occupations between 1979 and 2007. This decline was 11 percentage points for females with high school or lower

education, and 12 percentage points for females with some college. Unlike for men, these losses in middle-skill occupations were largely offset by employment gains in high-skill occupations, and this is true for both high school and some-college educated females. In net, while female employment in middle-skill occupations declined by 16 percentage points between 1979 and 2007, female employment in low-skill occupations rose by only 1 percentage point. Employment gains in high-skill occupations account for the remainder.

It bears emphasis that gains in female occupational attainment are not simply due to 'demand shifts' favoring female workers. Women have entered professional, managerial, and technical fields by investing in relevant schooling and by increasing their labor force attachment, thereby accumulating greater experience and seniority earlier in their careers. Conversely, the share of women in traditional female career jobs, such as teaching and nursing, has declined. The net effect of these changes is that women have more successfully adapted to shifts in demand that have eroded employment opportunities in middle-skill clerical, administrative, and production jobs (though the latter had very limited female employment to begin with). [10]

These patterns of occupational change by gender and education find a clear counterpart in the marked divergence in real earnings shown in Figure 9 among gender and education groups. As middle-skill blue- and white-collar jobs have declined, demographic groups that have maintained their occupational stature or moved upward in the occupational distribution have seen real wage growth. These groups include males with at least a four-year college degree, females with at least some college education, and, to lesser extent, females with a high school diploma. Conversely, groups that have moved downward in the occupational skill distribution as middle-wage employment opportunities have declined have seen their wages stagnate or fall. Downward occupational mobility and concomitant

[10] The dramatic rise in female relative to male wages for all but post-college educated workers over the last three decades is not fully understood. In part, it reflects rising female skill and experience levels (even within education and age categories) due to higher labor force attachment (Blau and Kahn, 1997). In addition, the occupational composition of female jobs has changed significantly, with a larger share employed in professional and managerial positions. Moreover, as discussed below, technological change has arguably raised demand for the types of activities in which females specialize (e.g., interpersonal and analytic tasks) and reduced demand for the set of tasks in which less-educated males traditionally specialize (e.g., emphasizing strength, manual dexterity, and repetitive motion). See Black and Spitz-Oener (2010) for discussion. Some have also argued that a large part of the female relative wage increase is due to differential movement of high-skilled females into the labor force, rather than rising wages for females of given skill levels per se (Mulligan and Rubinstein, 2008).

declines in earnings have been most pronounced for males with only a high school degree and for high-school dropouts of both sexes. [11]

Consequences beyond the labor market

Demand-driven falls in employment among demographic groups that have historically structured their economic and family lives around full time employment are likely to yield adverse consequences in domains beyond the labor market. I present evidence here on three such outcomes: incarceration, marriage and child-rearing. My objective is not to claim a causal link. Rather, I wish to highlight the increasing depth of economic and social dysfunction among less educated males, and to underscore the need for research to better understand the role potentially played by adverse labor market shifts in these developments.

A first indicator of social dysfunction is incarceration, an outcome carefully explored in widely cited work by Petit and Western (2004). Incarceration has risen disproportionately among demographic groups that have seen the greatest declines in employment (even excluding the incarcerated) and the greatest falls in wages (measuring using only those currently employed). Figure 14 uses Census and ACS data to plot incarceration rates by decade among young adults ages 25 through 39 for years 1970–2008.[12] Incarceration rates have increased five-fold among males over these four decades. Among young adult males who have dropped out of high school, approximately 5 percent of whites and Hispanics and 25 percent of blacks were incarcerated in 2008. Incarceration rates are typically half as high among high school graduates with no college education, ranging from 5 percent for whites and Hispanics to 12 percent for blacks.[13] Among males with any education beyond high school, the incarceration rate is approximately 75 percent below those of high school dropouts in the same demographic groups.

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[11] The increased 'clustering together' of wages of non-college workers is also potentially a consequence of occupational polarization. If there are fewer middle-skill jobs for middle-educated workers—those with a high school degree or some college—this makes it likely that middle- and low-education workers increasingly compete for similar opportunities in comparatively low-skill, low-wage services. Indeed, a recent paper by Christopher Smith (2008) documents increased competition among adults and teenagers for low-skill service jobs.

[12] Incarceration rates are measured using the institutional group quarters indicator in the Census and ACS. This measure will inadvertently also include those in psychiatric hospitals and elderly care homes. This imparts a minor degree of upward bias for the young adult population.

[13] Hispanic male high school graduates are an exception to this characterization. Their incarceration rate of 5 percent is approximately equal to that of Hispanic male high school dropouts.

Incarceration rates for females are far lower. But they are not negligible for female high school dropouts, which is the one female demographic group that has fared poorly in the labor market.

A second demographic characteristic that may be taken as an indicator of economic stability is marriage. The fraction of young adults who are currently married plummeted by 30 to 50 percentage points among all race, gender and education groups between 1970 and 2008 (Figure 15). While this overall downward trend probably has little to do with labor market conditions, the differentials across education groups are suggestive. In 1970, marriage rates were equally high among college and non-college males within the three major demographic groups. By 2008, white high school dropout males were 17 percentage points less likely to be married than white males with any post-secondary. For black males, this differential was 20 percent. While again speculative, it seems plausible that the differential decline in male marriage rates by education group reflects in part a fall in the marriage market 'value' of low education males, consistent with their falling wages. There may also be important feedbacks among falling male earnings, rising female employment, and declining marriage rates for low educated males. If males are less able to generate sufficient income to support a family, women will naturally adapt by investing more in their own skills and employment. This may further reduce women's economic need for males as marital partners.[14]

If market forces are altering the incentives behind marital decisions, they will likely affect related decisions, including child rearing. To explore this possibility, I consider changes in the fraction of adults reporting that 'own' children (biological or adopted) reside with them in the same household. This outcome is not intended as a measure of fertility but rather as an indicator of whether adults are cohabiting with their children. As shown in Figure 16, there was only a modest change between 1970 and 2008 in the share of young adult females living with dependent children. This fraction stood at approximately 75 percent in 1970 among whites, blacks and Hispanics. It declined by approximately 10 percentage points over the next four decades among all race groups. The reduction was somewhat more pronounced for females with post-secondary education.

For males, the decline in the fraction living with related children was considerably larger. For white and Hispanic men, the fraction fell from approximately 75 percent in 1970 to approximately 45 percent

[14] I thank Lawrence Katz for this insightful point.

in 2008. In contrast to the pattern for marriage rates, however, the levels and trends in cohabitation with children do not differ substantially by education group. Only among black males are substantial differences apparent by education group. For black males with high school or greater education, the fraction cohabiting with related children declined from a high of 60 percent in 1970 to a low of approximately 25 percentage points in 2008. This fall is roughly on par with but slightly larger than the decline among whites and Hispanics. For black male high school dropouts, the fall was 7 to 10 percentage points greater again. In 2008, only 20 percent of males of this demographic group were living with related children.

To what extent is the steep decline in males living with their related children accounted for by a fall in male fertility versus a change in family structure? Unfortunately, the Census does not contain information on total fertility among males—only cohabitation with related children—so I cannot answer this question using these data. Though I suspect that the latter force is paramount (i.e., changes in family structure), this is merely a conjecture at this time. In either case, the fact that the downward trend in cohabitation with related children does not greatly differ by education groups suggests that the connection to male earnings and employment may be relatively weak.

In sum, the differential rise in the incarceration rate and decline in marriage among less educated males suggest an overall decline in productive activity and economic stability among members of this demographic group. It is unknown to what degree these adverse developments are caused by changes in employment and earnings opportunities and to what extent declining employment and earnings are merely symptoms of the same underlying adverse trends. However, the regression evidence in Tables 1 and 2 suggests that declining earnings and employment among less educated workers, particularly males, are caused in part by inwards shifts in labor demand.

Conclusions

Two forces are shifting the quality of jobs, reshaping the distribution of earnings and job opportunities, and redefining gender roles in OECD economies: employment polarization, whereby job opportunities are increasingly concentrated in high-skill, high-wage jobs and in low-skill, low-wage jobs; and a reversal of the gender gap in higher education, reflecting women's rising educational attainment and men's stagnating educational attainment. The result is a labor market that greatly rewards workers with college and graduate degrees but is unfavorable to the less-educated, particularly less-educated

males. The economic and social repercussions of polarizing employment growth and stagnating male educational attainment will present challenges for policy on multiple fronts. Developing a better understanding of the underlying causes and long term consequences of these trends is an important agenda item for social scientists.

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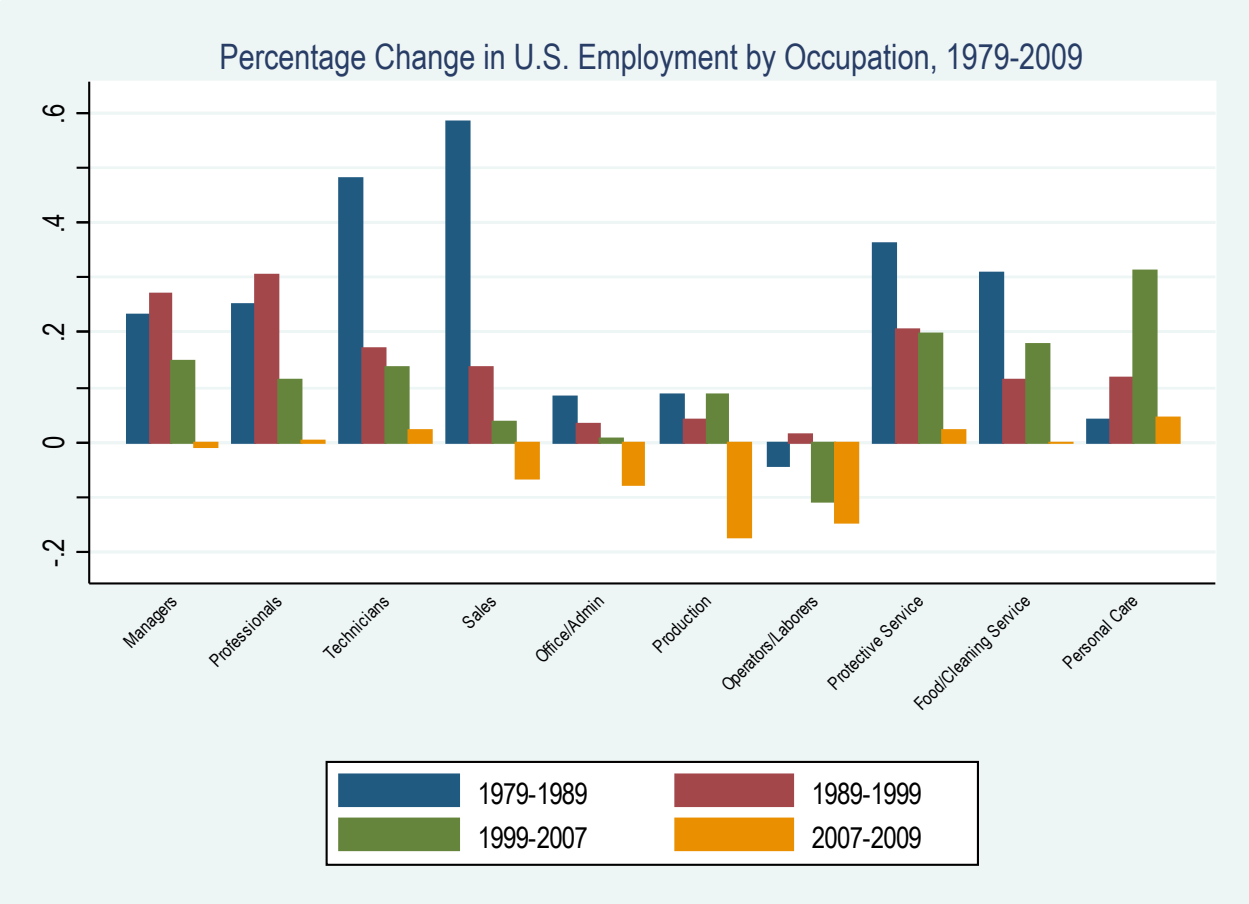
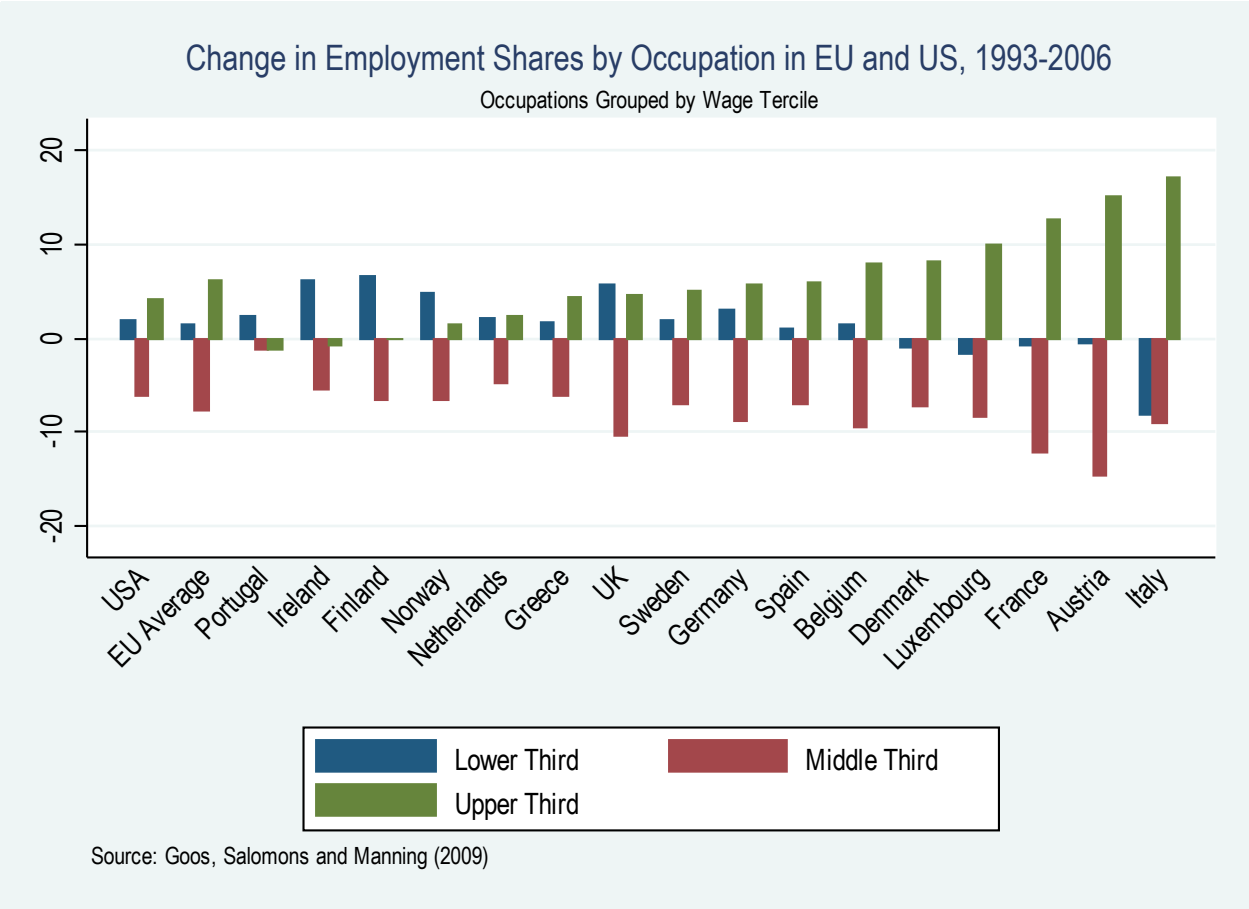
Figure 1.



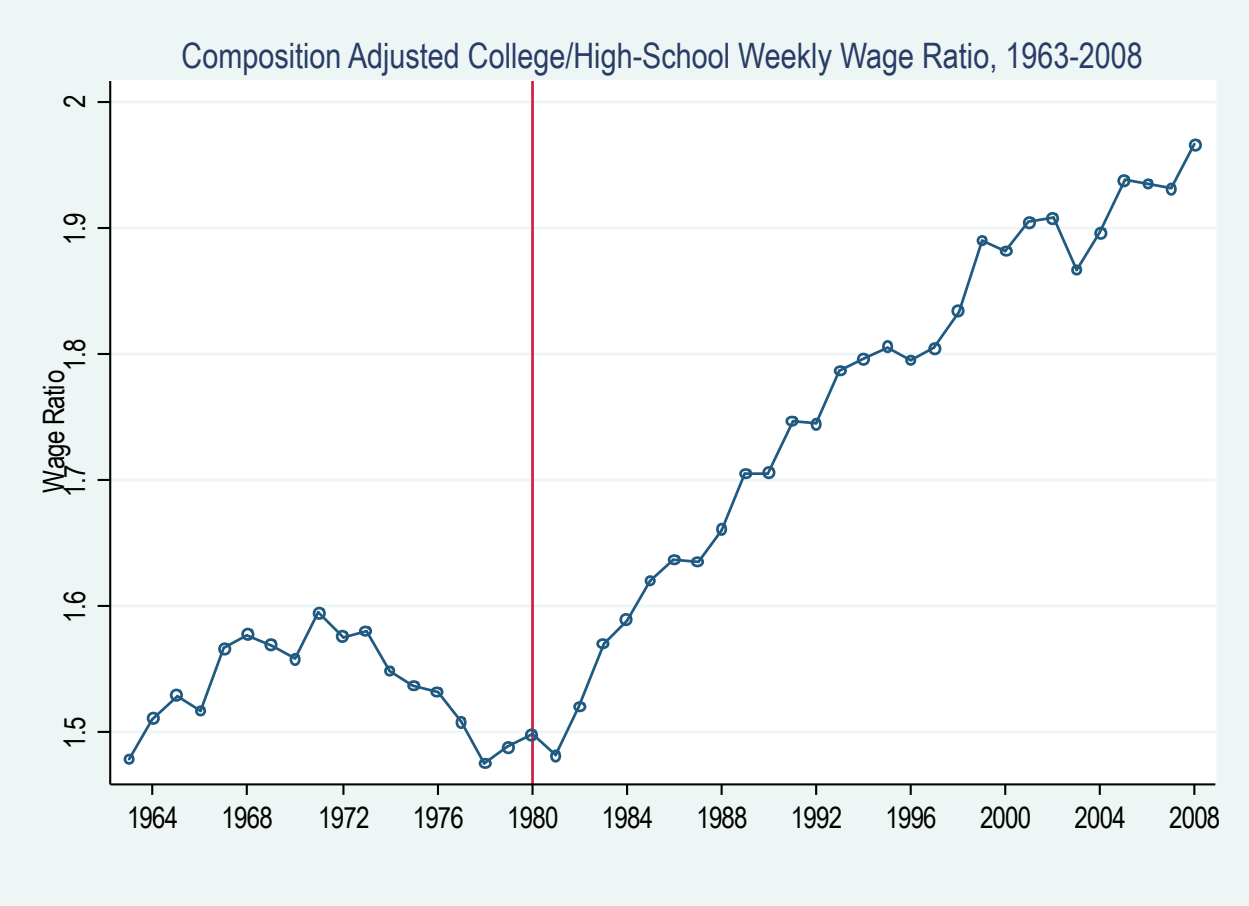
Source: May/ORG CPS data for earnings years 1979-2009. The data include all persons ages 16-64 who reported having worked last year, excluding those employed by the military and in agricultural occupations. Occupations are first converted from their respective scheme into 328 occupation groups consistent over the given time period. From these groups, occupations are then consolidated into the 10 broad categories presented in the figure. The occupation share is the percentage of all workers employed in that occupation.

Figure 2.



Source: Data on EU employment are from from Goos, Manning and Salomons, 2009a. U.S. data are from the May/ORG CPS files for earnings years 1993-2006. The data include all persons ages 16-64 who reported having worked last year, excluding those employed by the military and in agricultural occupations. Occupations are first converted from their respective scheme into 328 occupation groups consistent over the given time period. These occupations are then grouped into three broad categories by wage.

Figure 3.



Source: March CPS data for earnings years 1963-2008. Log weekly wages for full-time, full-year workers are regressed in each year on four education dummies (high school dropout, some college, college graduate, greater than college), a quartic in experience, interactions of the education dummies and experience quartic, and two race categories (black, non-white other). The composition-adjusted mean log wage is the predicted log wage evaluated for whites at the relevant experience level (5, 15, 25, 35, 45 years) and relevant education level (high school dropout, high school graduate, some college, college graduate, greater than college). The mean log wage for college and high school is the weighted average of the relevant composition adjusted cells using a fixed set of weights equal to the average employment share of each group. The ratio of mean log wages for college and high school graduates for each year is plotted. See Data Appendix for more details on treatment of March CPS data.

Figure 4.

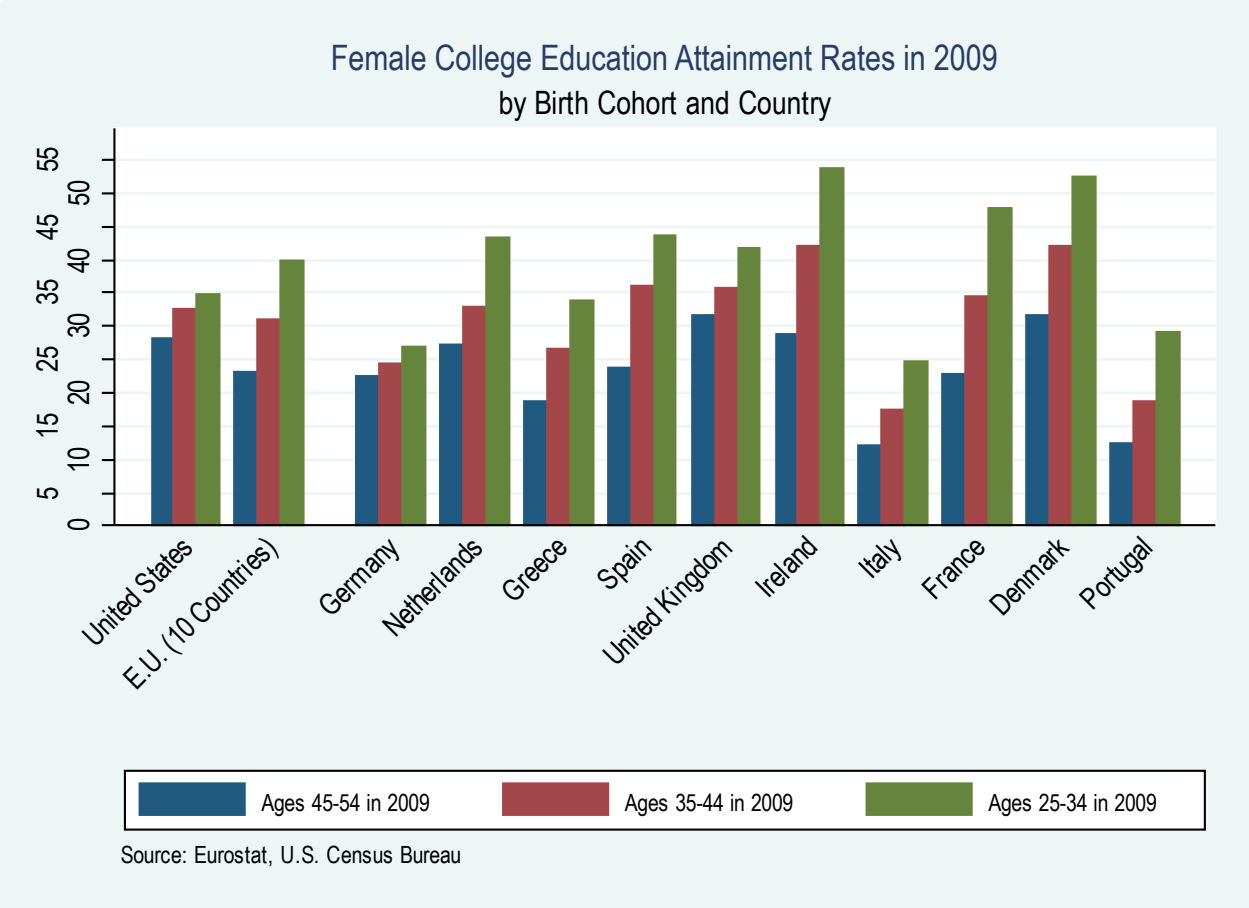

Female College Education Attainment Rates in 2009
by Birth Cohort and Country
0
5
10
15
20
25
30
35
40
45
50
55
United States
E.U. (10 Countries)
Germany
Netherlands
Greece
Spain
United Kingdom
Ireland
Italy
France
Denmark
Portugal
Ages 45-54 in 2009
Ages 35-44 in 2009
Ages 25-34 in 2009
Source: Eurostat, U.S. Census Bureau

Figure 5.

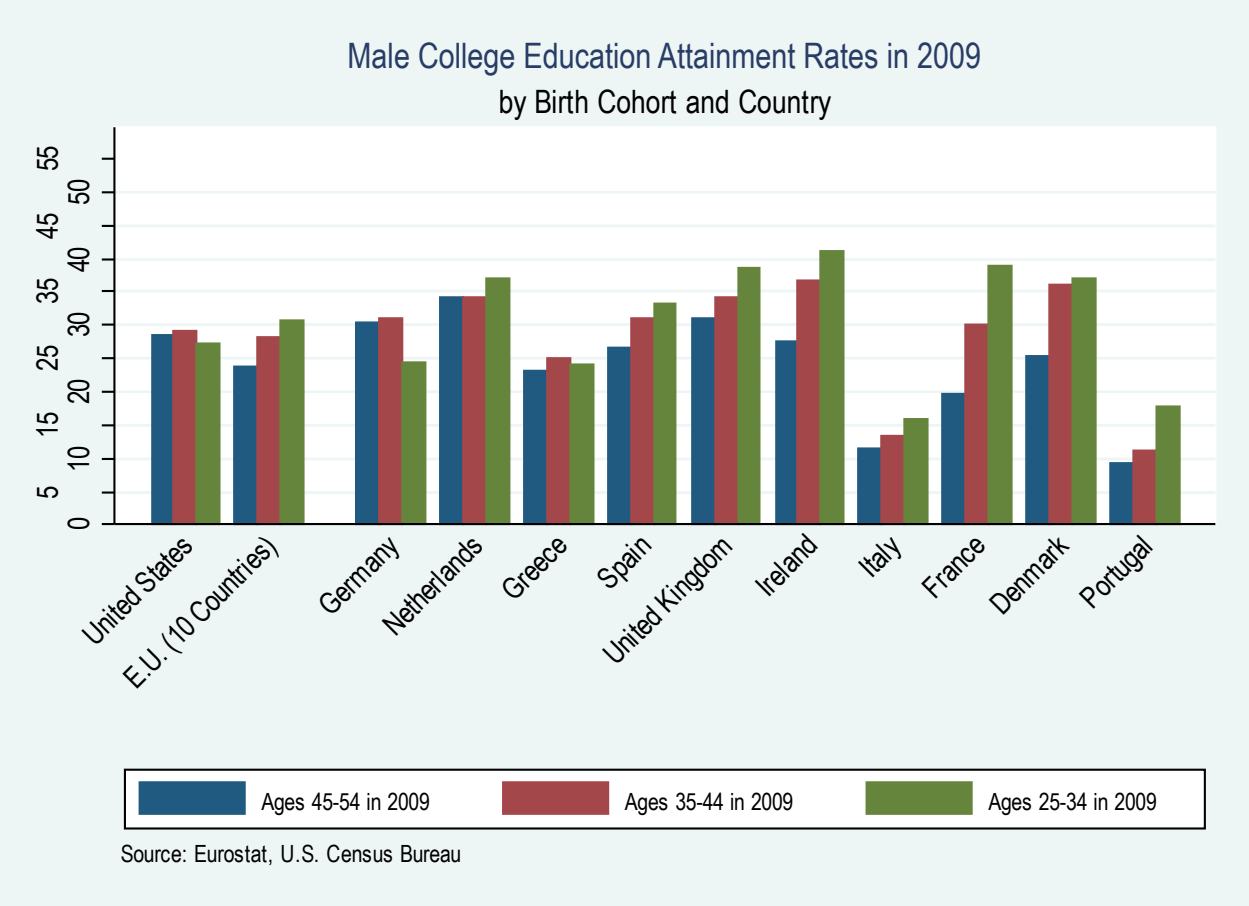

Male College Education Attainment Rates in 2009
by Birth Cohort and Country
0
5
10
15
20
25
30
35
40
45
50
55
United States
E.U. (10 Countries)
Germany
Netherlands
Greece
Spain
United Kingdom
Ireland
Italy
France
Denmark
Portugal
Ages 45-54 in 2009
Ages 35-44 in 2009
Ages 25-34 in 2009
Source: Eurostat, U.S. Census Bureau

Figure 6.

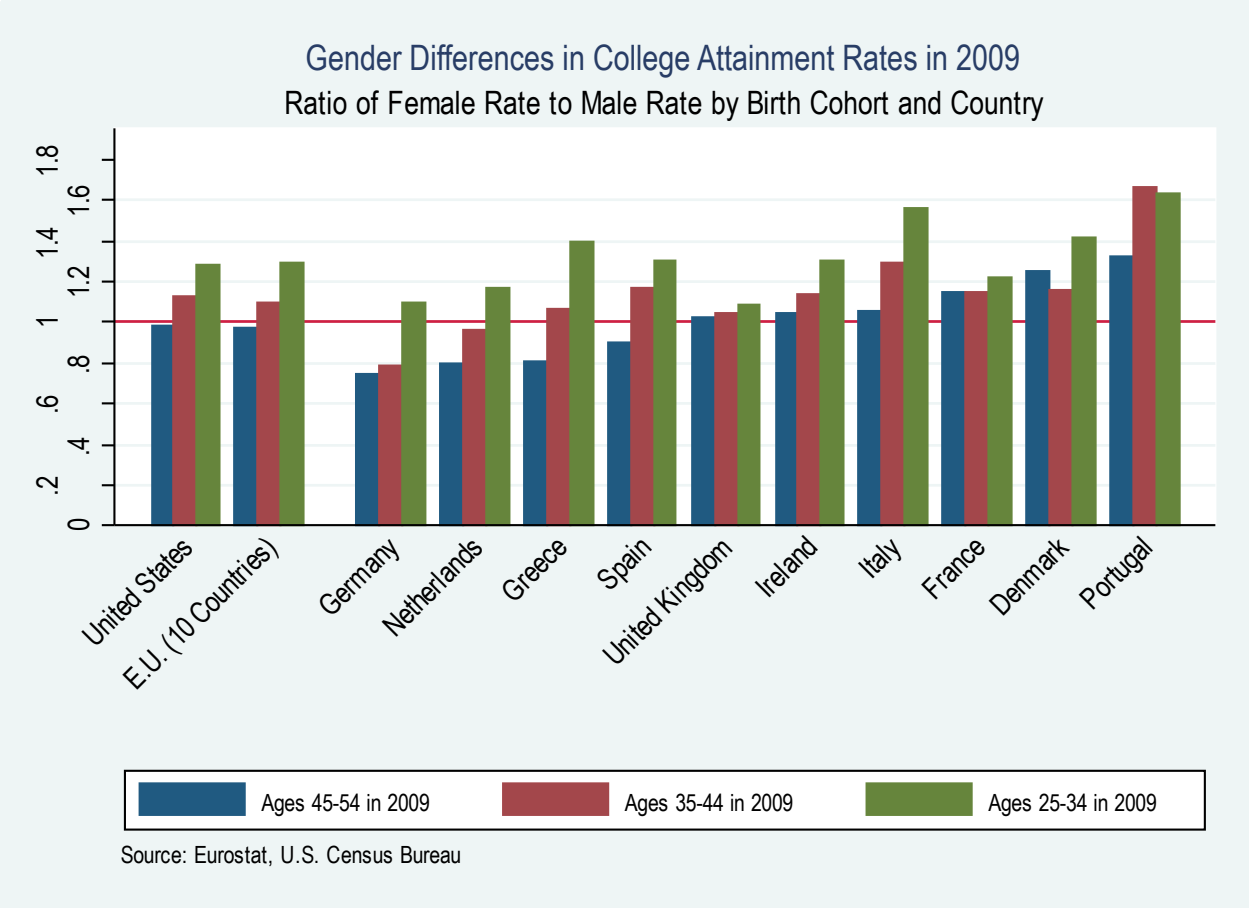
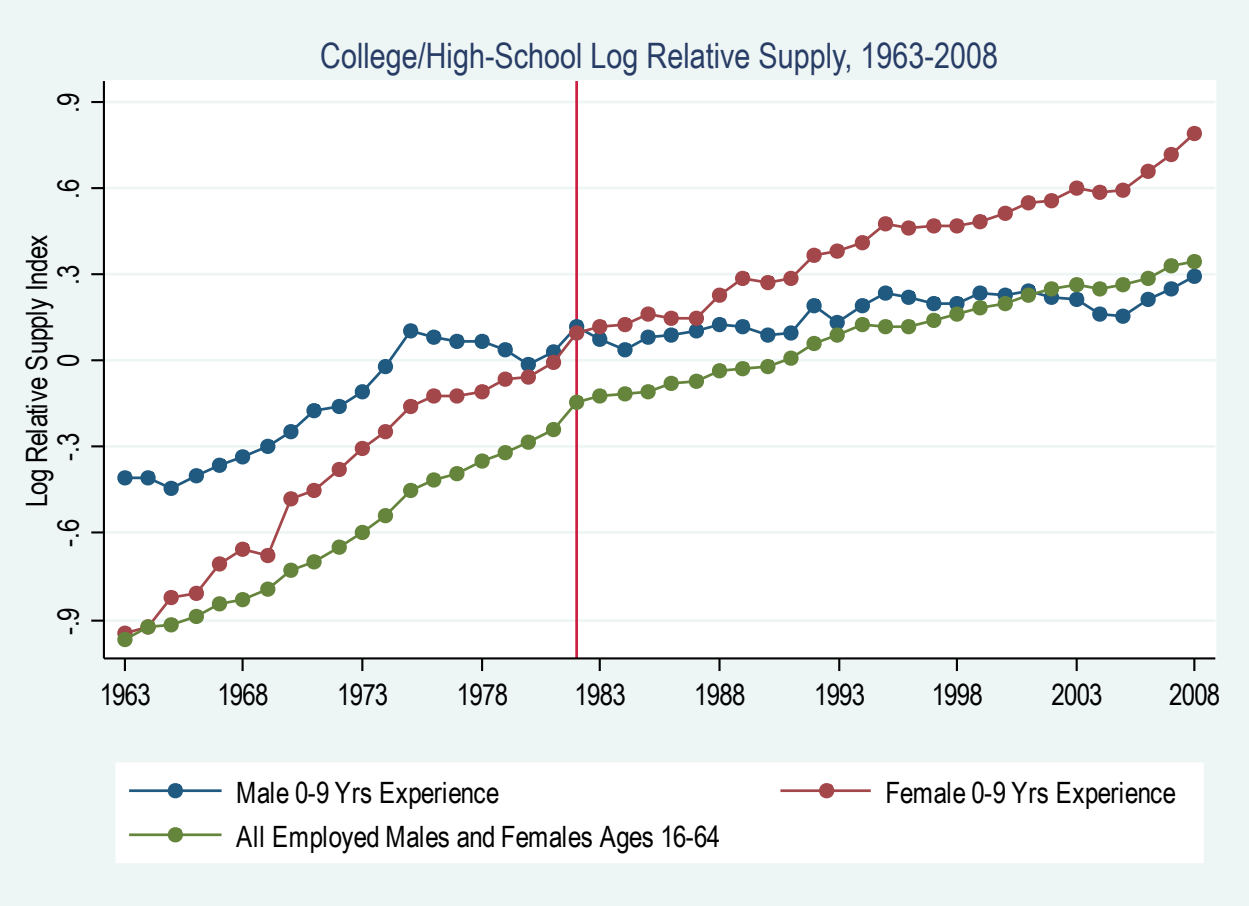
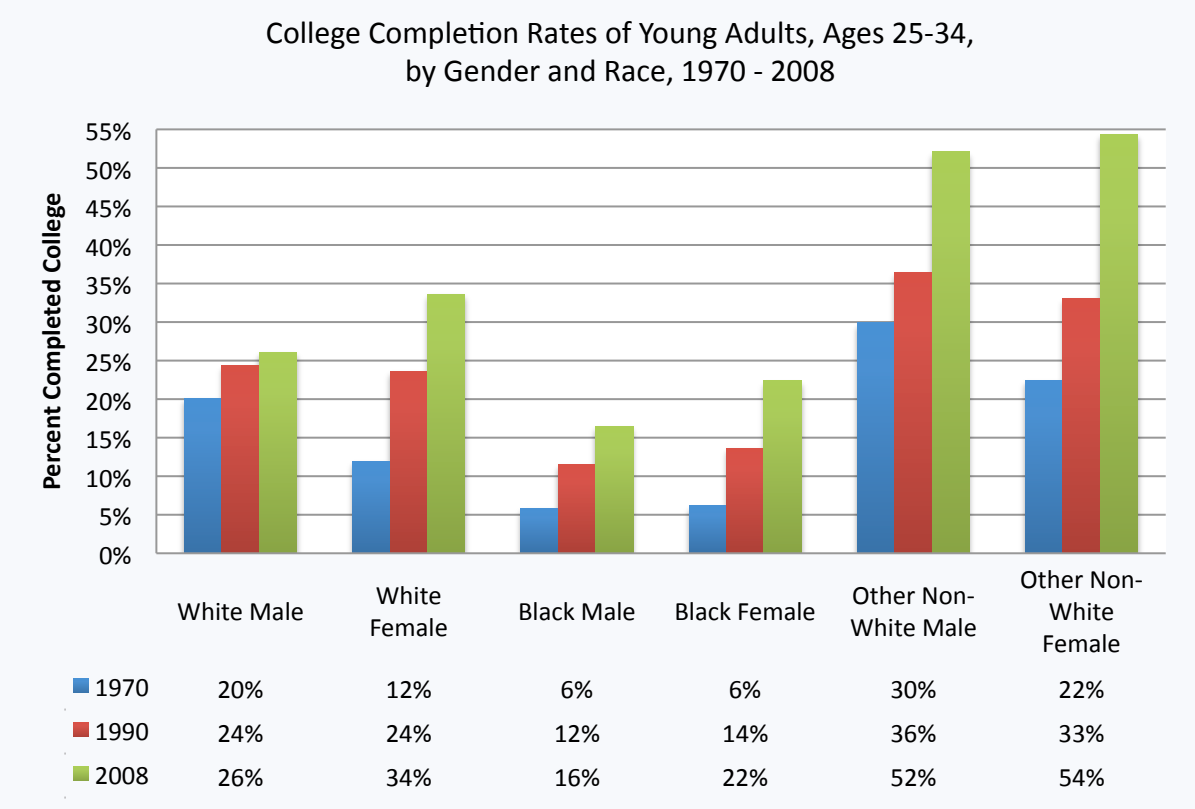

Gender Differences in College Attainment Rates in 2009
Ratio of Female Rate to Male Rate by Birth Cohort and Country
0
.2
.4
.6
.8
1
1.2
1.4
1.6
1.8
United States
E.U. (10 Countries)
Germany
Netherlands
Greece
Spain
United Kingdom
Ireland
Italy
France
Denmark
Portugal
Ages 45-54 in 2009
Ages 35-44 in 2009
Ages 25-34 in 2009
Source: Eurostat, U.S. Census Bureau

Figure 7.



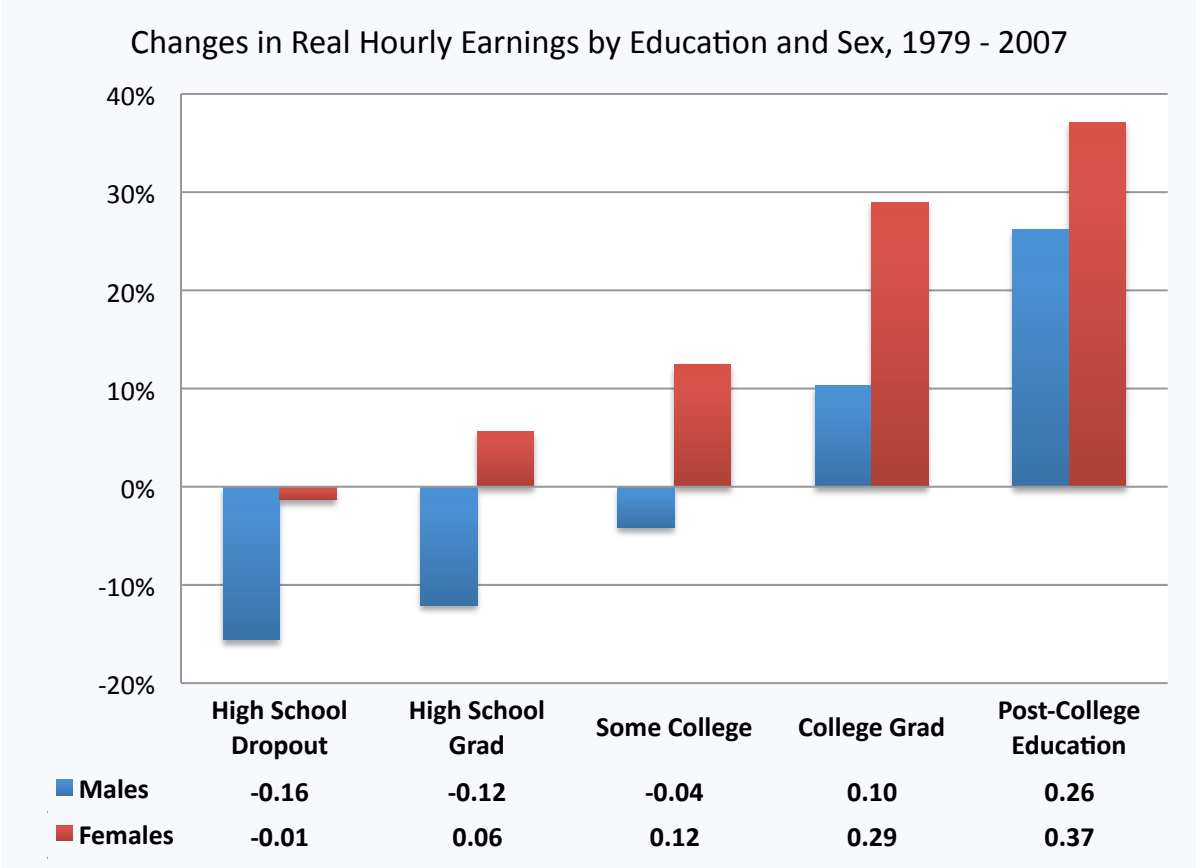
Source: March CPS data for earnings years 1963-2008. Labor supply is calculated using all persons ages 16-64 who reported having worked at least one week in the earnings years, excluding those in the military. The data are sorted into sex-education-experience groups of two sexes (male, female), five education groups (high school dropout, high school graduate, some college, college graduate, and greater than college) and 49 experience groups (0-48 years of potential experience). Number of years of potential experience is calculated by subtracting the six (the age at which one begins school) and the number of years of schooling from the age of the individual. This number is adjusted to the assumption that an individual cannot begin work before age 16. If this calculation is less than zero, the years of experience are set to equal zero. The labor supply for college and high school groups, by experience level, is calculated using efficiency units. Efficiency units are the mean labor supply for broad college (including college graduates and greater than college) and high school (including high school dropouts and high school graduate) categories, weighted by fixed relative average wage weights for each cell. The labor supply of the "some college" category is divided equally between the broad college and high-school categories. The fixed set of weights for 1963-2008 are constructed using the average wage in each of the 490 cells (two sexes, five education groups, 49 experience groups) over this time period, relative to the reference wage of a male high school graduate with 10 years of experience.

Figure 8.



Source: Census Data 1970-2000 and U.S. Census American Community Survey 2008. Education rates are calculated using all person ages 25-34. College-going for 1970 and 1980 is considered the completion of four or more years of college. College-going for 1990 onward is considered the completion of a bachelor's degree or more, or, five+ years of college.

Figure 9.



Source: May/ORG CPS data for earnings years 1973-2009. The data are sorted into sex-race-age-education groups of two sexes (male/female), three race categories (white, black, nonwhite other), four age groups (16-24, 25-39, 40-54, 55-64), and five education groups (high school dropout, high school graduate, some college, college graduate, and greater than college). The mean log wage for each gender-education group presented in the figure is the weighted average of the relevant cells using a fixed set of weights equal to the average employment share of each group. The percent change is calculated using exponentiated mean log wages for 1979 and 2007.

Figure 10.

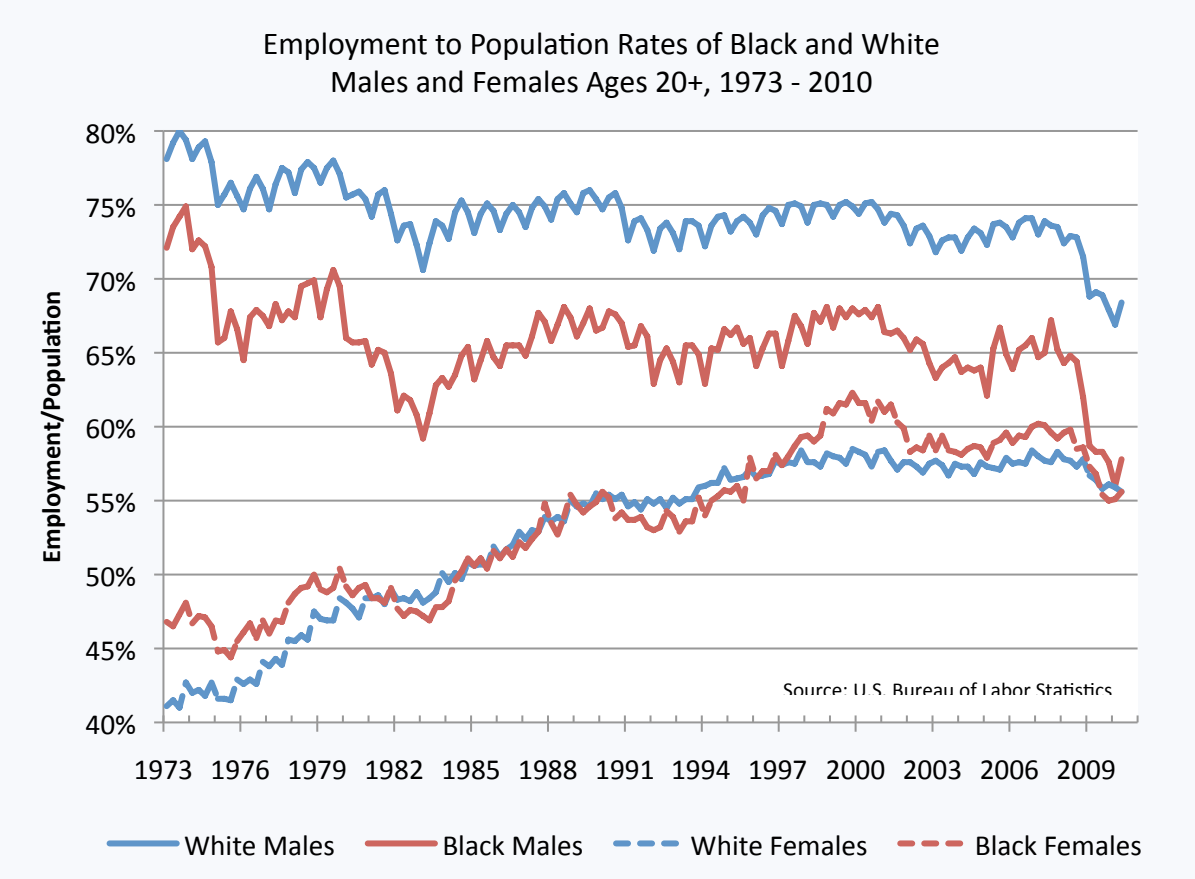
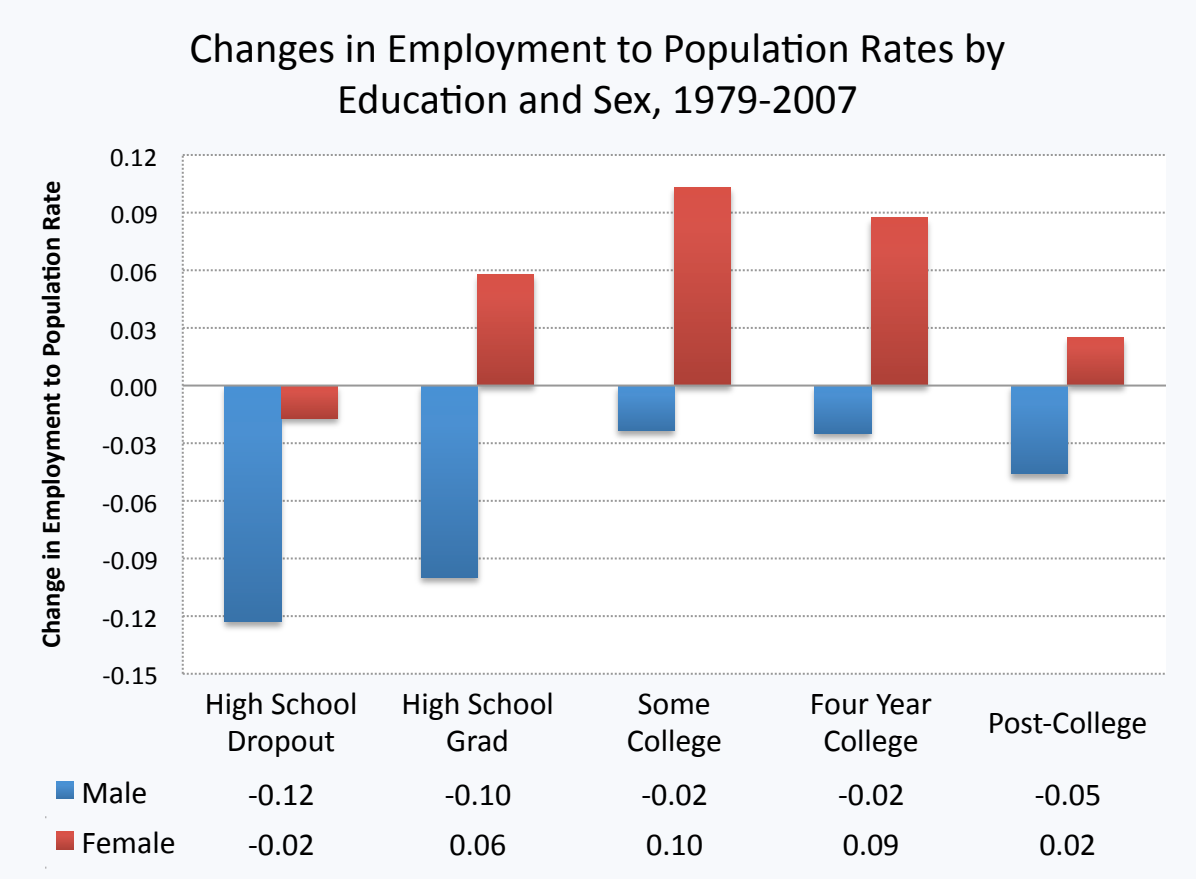
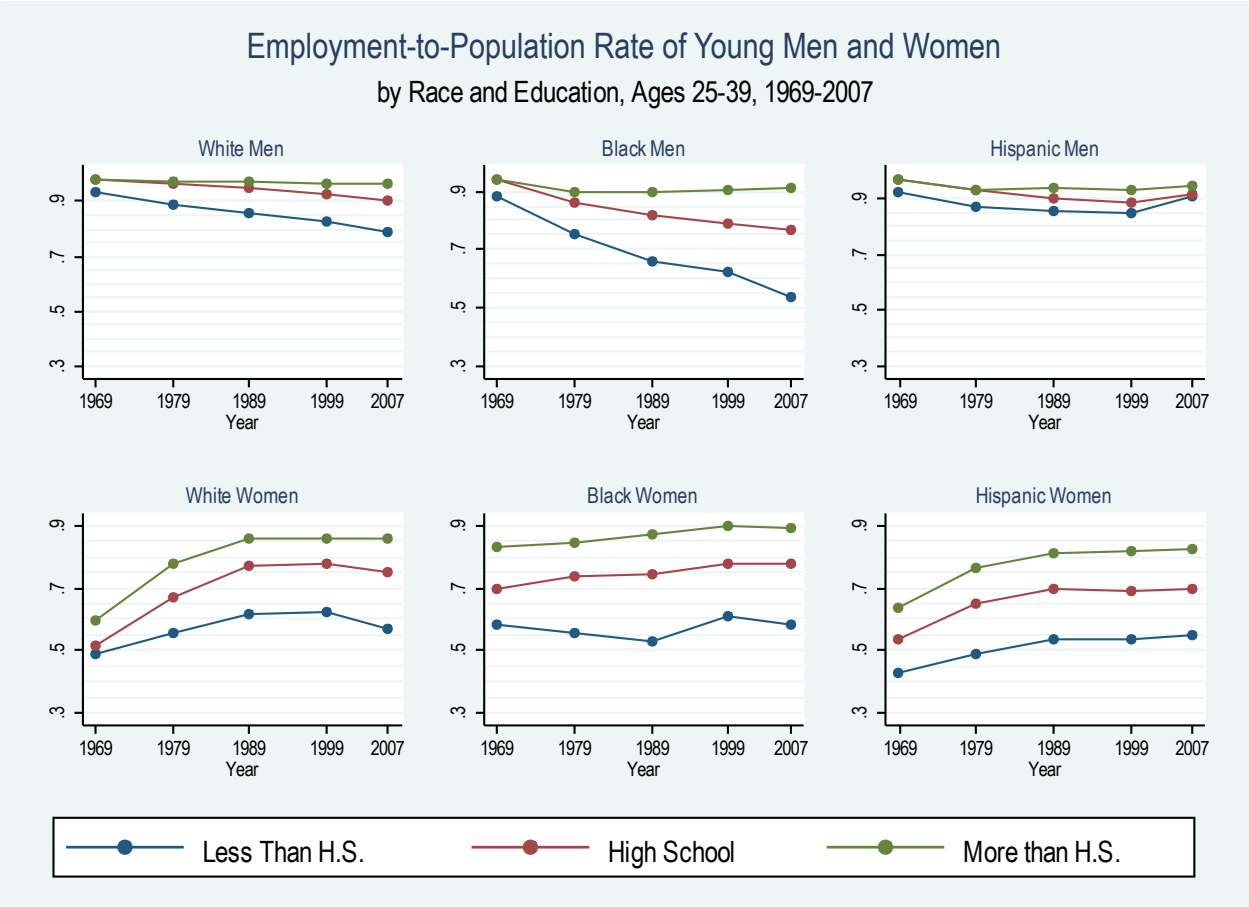

Employment to Population Rates of Black and White Males and Females Ages 20+, 1973 - 2010
Employment/Population
80%
75%
70%
65%
60%
55%
50%
45%
40%
1973 1976 1979 1982 1985 1988 1991 1994 1997 2000 2003 2006 2009
Source: U.S. Bureau of Labor Statistics
White Males
Black Males
White Females
Black Females

Figure 11.



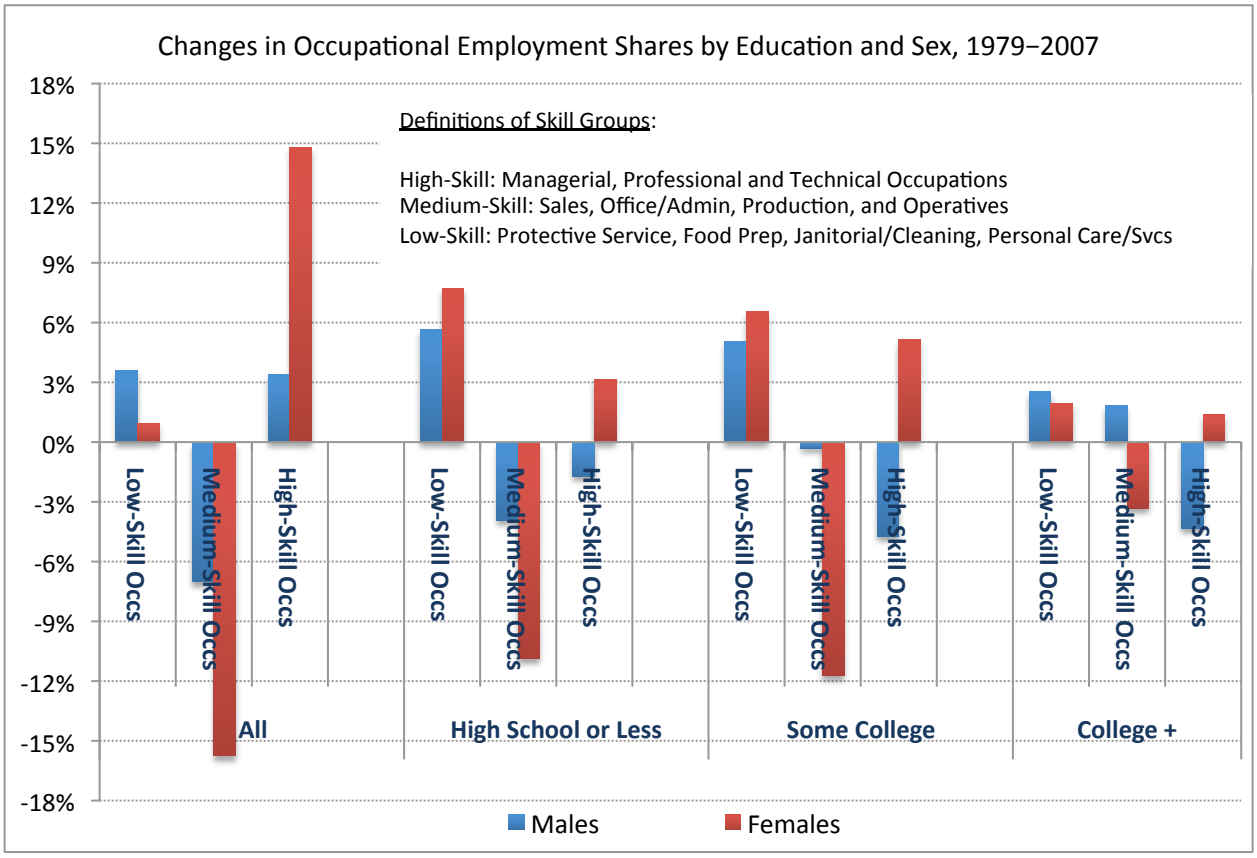
Source: May/ORG Current Population Survey 1973 - 2009.

Figure 12.



Source: Census IPUMS 1970 through 2000 and American Community Survey 2008.

Figure 13.

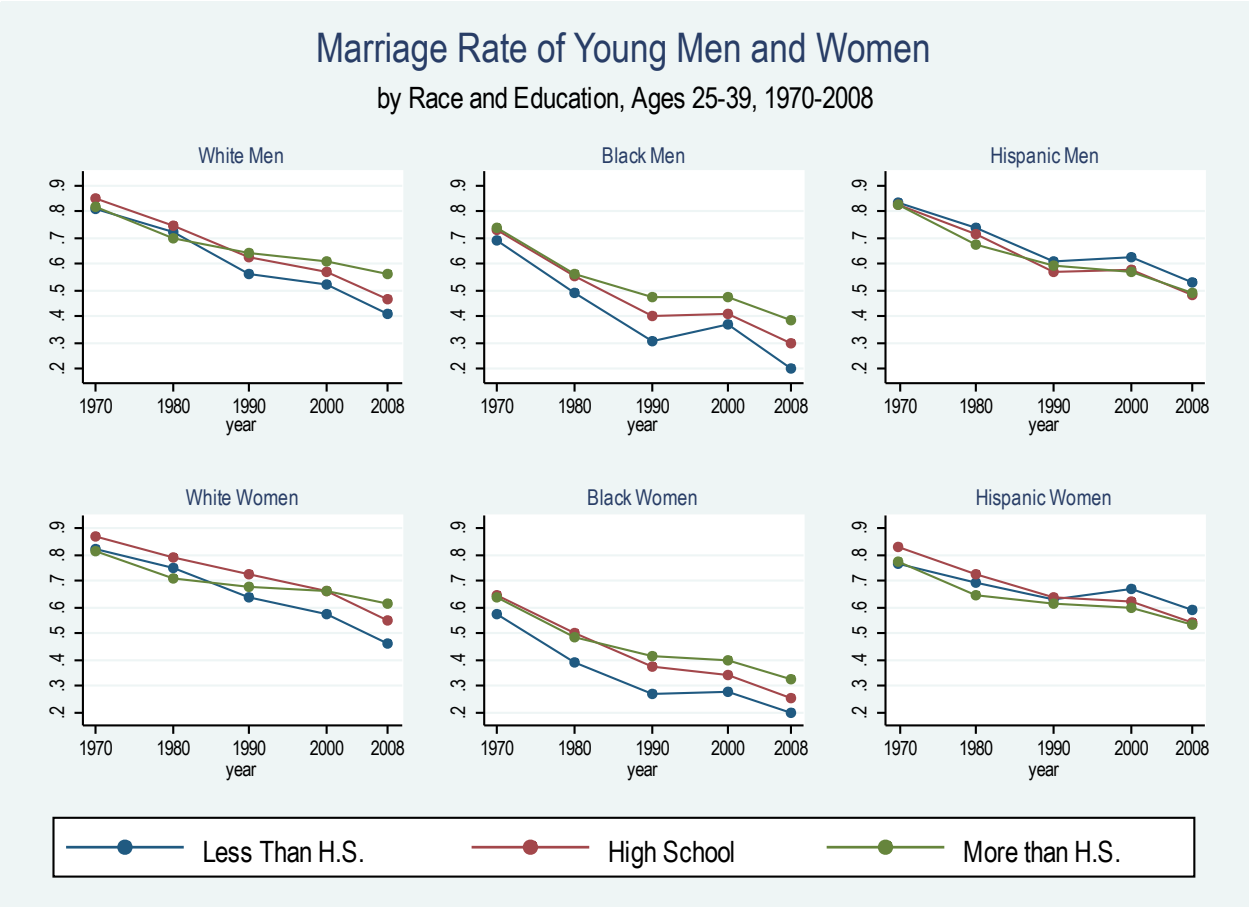


Source: May/ORG CPS data for earnings years 1979-2007.

Figure 14.

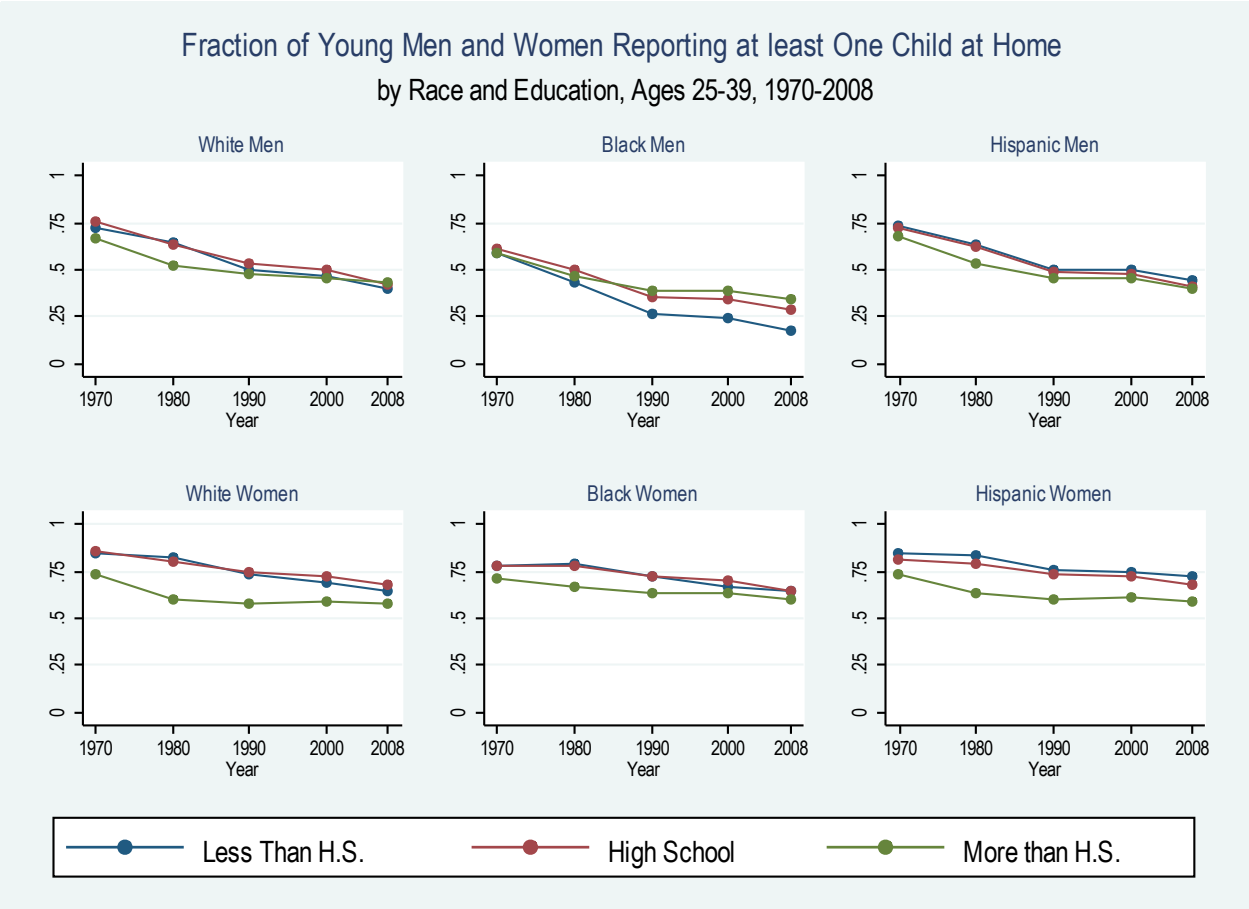
Source: Census IPUMS 1970 through 2000 and American Community Survey 2008.

Figure 15.



Source: Census IPUMS 1970 through 2000 and American Community Survey 2008.

Figure 16.



Source: Census IPUMS 1970 through 2000 and American Community Survey 2008.

Table 1.

Regression Results: Relationship between the Change in Employment-to-Population Ratios and Changes in Real Log Hourly Wages 1979-2009

	1979-1989	1989-1999	1999-2009	1999-2007	2007-2009	1979-2009
Change in log hourly wage	0.33***	0.17***	0.70***	0.29***	0.41***	0.58***
t-statistic	6.31	3.4	6.36	3.31	3.74	12.69
Constant	0.04***	-0.01**	-.09***	-0.03***	-0.04***	-.066***
t-statistic	7.25	-2.36	-15.15	-7.54	-15.19	-9.14
Observations	120	118	118	118	120	120
R-squared	0.25	0.09	0.26	0.09	0.11	0.58

Source: May/ORG Current Population Survey. The population sample includes all persons ages 16-64, excluding those in the military. The employment sample includes all persons ages 16-64, who reported having worked last year, excluding those employed by the military. Wages are calculated using all hourly workers excluding agricultural occupations, military occupations, and the self-employed, for earnings years 1973-2009. The data are sorted into sex-race-age-education groups of two sexes (male/female), three race categories (white, black, non-white other), four age groups (16-24, 25-39, 40-54, 55-64), and five education groups (high school dropout, high school graduate, some college, college graduate, and greater than college). For each of these sex-race-age-education cells, I calculate the employment to population rate and the mean log hourly wage, weighted by CPS sample weights. The change in the employment to population rate over the respective time period is then regressed on the change in the mean log hourly wage over the same time period for each demographic breakdown presented above.

Table 2.

Regression Results: Relationship between Employment-Population Ratios and Wages by Demographic Group 1979-2009

	Gender		Race			Age		Education	
	Male	Female	White	Black	Non-White Other	16-39	40-64	High School Grad. and Below	College Grad. and Above
1979-2009									
Δ log hourly wage	0.36***	0.47***	0.61***	0.55***	0.27***	0.57***	0.58***	0.85***	0.40***
t-statistic	5.75	6.60	8.26	4.42	3.53	7.74	9.45	9.01	7.12
Constant	-0.11***	-.02*	-.06***	-.10***	-.08***	-.07***	-.06***	-.05***	-.04***
t-statistic	-12.57	-1.72	-5.02	-7.26	-5.68	-6.65	-5.69	-4.58	-4.24
Observations	60	60	40	40	40	60	60	48	72
R-squared	0.36	0.43	0.64	0.34	0.25	0.51	0.61	0.64	0.42

Source: May/ORG Current Population Survey. See note to Table 1 and Data Appendix.