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Recent Flattening in the Higher Education Wage Premium: Polarization, Deskilling, or Both?

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ABSTRACT

The wage premium for individuals with a college or graduate degree rose substantially in the 1980s and 1990s but has changed little since the year 2000. I assess this flattening in the higher education wage premium with reference to two leading explanations of employment patterns in recent decades: the "polarization" hypothesis (Autor 2014) and the "deskilling" hypothesis (Beaudry, Green, and Sand 2013). The results suggest that ongoing polarization in employment patterns has not bolstered the relative wages of highly educated workers in occupations that require extensive skills. The flattening of returns to higher education appears to be driven by direct competition across higher education groups for similar jobs, broadly consistent with deskilling.

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1. Introduction

Holding a four-year college degree confers a distinct advantage to U.S. workers. The earnings gap between college-educated working adults and those with a high school degree is large and has grown substantially over the past 35 years. This gap may have been bolstered by technological advances in the workplace, notably the ever-growing reliance on computers, because the skills that are needed to master and apply these technologies are often acquired through or associated with higher education (Krueger 1993; Autor, Katz, and Krueger 1998; Autor, Levy, and Murnane 2003; Acemoglu and Autor 2011). Since the year 2000, however, the pattern of wage returns to higher education has altered. Growth in the wage premium for those who hold a four-year college degree without additional graduate training ("college only") changed little during the first decade of this century, and since 2010 the wage premium for individuals holding a graduate degree has flattened out as well. Despite the voluminous literature on returns to education, little attention has been paid to differences between these higher education groups (Lemieux 2006a and Lindley and Machin 2014 are exceptions).

In this paper, I assess and attempt to explain the slower growth in the higher education wage premium and its variation across the college-only and graduate degree groups. I focus on two primary, opposing explanations for changing returns to higher education.

The first potential explanation is labor market "polarization" driven primarily by technological change (Acemoglu and Autor 2011). Developed over the past decade, this theory provides a broad, cohesive explanation for changes in employment patterns in the United States and other advanced economies in recent decades. The polarization narrative may account for the

slowdown in the college wage premium through a shift in the occupational distribution of college graduates towards the routine occupations that are increasingly displaced by automation and related factors enabled by emerging technologies (such as outsourcing and rising trade). At the same time, rising demand for the cognitive skills possessed by graduate degree holders may have helped maintain and expand their wage advantage (Lindley and Machin 2014)

I will refer to the second broad potential explanation for the relative decline in the college wage premium as "deskilling." This interpretation is based on the recent work of Beaudry, Green, and Sand (BGS 2013) regarding a slowdown since the year 2000 in technological change and the associated demand for cognitive tasks in the workplace. I refer to this hypothesis as "deskilling" (a term that does not appear in BGS) because the BGS theory implies that higher-skilled workers will slide down the skill distribution and replace lower-skilled workers in occupations that are less skill intensive.

The paper begins by establishing the basic facts regarding changes in educational attainment and the higher education wage premiums, distinguishing between individuals with a 4-year college degree and those graduate degrees. The data used are from the Current Population Survey (CPS) monthly earnings (MORG) files and Annual Demographic (March) Surveys. Standard wage regressions that adjust for changing workforce composition show that the college-only wage premium has been relatively flat since about 2000, while the wage premium for graduate degree holders has flattened more recently.

I then provide additional discussion of the polarization and deskilling arguments, followed by analyses of changes in real wages and a within-between analysis of changing higher education wage premiums by broad occupation (polarization) groups. The results are highly

preliminary but suggest that competition for similar jobs has increased between education groups within broad occupation categories.

2. Changes in the higher education wage premium

The wage premium earned by individuals with higher educational attainment is commonly attributed to the more extensive skills that they possess (Card 1999, Goldin and Katz 2008). To save space, I will not review the voluminous and well-known literature on estimating and interpreting the returns to education but will instead turn directly to updated estimates of the returns to higher educational attainment (college degrees and above).

2.1 Data and descriptive statistics

Because the data I use and processing procedures followed are well-known, I describe them only briefly here, with additional details relegated to the Appendix. The primary data used are from the Current Population Survey Monthly Outgoing Rotation Group (CPS MORG) files, compiled by the National Bureau of Economic Research (NBER) and currently covering the years 1979-2014. These files contain data for the quarter-sample of the monthly CPS that receives survey questions regarding earnings and related variables in currently held jobs. The data handling and processing procedures largely follow those detailed in Lemieux (2006b, 2010). These include elimination of observations with imputed values of earnings or hours and adjustments for changing top-codes. I use hourly wages as my earnings measure, either reported directly by hourly workers or formed as usual weekly earnings divided by usual weekly hours worked for salaried workers. All wage and earnings variables are deflated by the annual average value of the GDP deflator for personal consumption expenditures (and expressed in 2014 terms for ease of interpretation). I also use the complete monthly CPS files for selected tabulations that do not involve wages (as indicated in the display notes).

Measurement of educational attainment in the CPS switched from a yearly grade attained/completed basis to a degree received basis in 1992. I formed educational categories that are largely consistent over time following the guidance of Jaeger (1997). Individuals with a graduate degree, along with information about the type of degree, are directly identified beginning in 1992. Following Lindley and Machin (2014), I code individuals who report 17 years of completed schooling in the pre-1992 period as possessing a 4-year college degree but not a graduate degree.[1]

For comparison purposes, I also use data from the CPS Annual Demographic Supplement (March) data to estimate changes in the higher education earnings premium. Following standard practice, I restrict the March CPS sample to full-time, full-year workers and use weekly earnings (annual labor earnings divided by weeks worked) as the earnings measure, once again dropping observations with imputed earnings or hours and adjusting for changing top-codes (e.g., Autor, Katz, and Kearney 2008). Income data from the annual March supplement refer to the prior calendar year, so I use data from the 1980 through 2015 surveys to cover the same earnings years as the MORG data (1979-2014).

Table 1 provides descriptive statistics for employment shares (Panel A) and average real wages (Panel B) by educational attainment, calculated using the full monthly CPS files for the employment shares and the MORG files for the wage data. These are provided for 10-year intervals that largely span the sample frame and selected other years, including the year that the education variables changed (1992) and a listing for the final year (2014).

Panel A of Table 1 illustrates the well-known, steady decline in the employment share of individuals whose educational attainment is a high school degree or less accompanied by a

[1] This generates a slight discontinuity in the relative college/graduate shares in 1992; this discontinuity is smaller than it would be if such individuals were treated as having a graduate degree.

steady rise in the share of individuals possessing a four-year college degree or graduate degree. As of 2010, slightly over a third of the employed population aged 25-64 had at least a four-year college degree, with a further increase in the subsequent four years. Nearly one in seven employed individuals had a graduate degree by 2014, with a relatively uniform increase over time between Master's degrees (which include MBAs) and professional degrees (e.g., J.D. and M.D.), and a slightly larger proportional increase for the small share of doctoral degrees.

Panel B of Table 1 illustrates the large wage gaps between the educational attainment groups, with the spread in real wages between the graduate degree group and those with less than a high school degree widening from a factor of two to a factor of three over the sample frame. Average real wages changed little over the sample frame for those with a high school degree or less. For those with at least some college education, average real wages rose somewhat between 1980 and 2000, with larger increases evident for higher educational attainment. Between 2000 and 2010, only those with a graduate degree saw any meaningful increase in real wages. Between 2010 and 2014, real wages were flat to down slightly for all groups.

2.2 Composition-Adjusted Estimates of Wage/Earnings Gaps

To assess the changing wage premium associated with higher educational attainment, I estimate standard log wage equations of the following form (where *i* indexes individuals):

$$lnW_i = X_i \beta + S_i \gamma + \varepsilon_{i,} \qquad (1)$$

X_i represents a set of demographic controls and S_i represents educational attainment. This equation is estimated separately for each year using the MORG and March CPS data as described above. The control variables in the vector *X* include dummy variables for seven age groups (e.g., 30-34, etc., with 25-29 omitted), three racial/ethnic groups, gender, marital status,

gender*marital status, and geographic location (nine Census divisions). These controls adjust for the changing composition of the estimation sample, so that the results for the education categories reflect the average wage premium associated with educational attainment for an individual with a fixed set of other demographic characteristics.[2]

Our interest centers on the estimated vector of coefficients on a set of dummy variables representing discrete categories of educational attainment (*S*). Table 2 lists the numerical results for selected years, while Figure 1 displays the results for the complete sample period of 1979 through 2014. For both displays, Panel A lists the results for the MORG data, while Panel B lists the results for the March CPS. The results are expressed in natural log terms (and hence must be exponentiated to yield exact percentage wage gaps). These conditional wage gaps are displayed for three educational groupings: the broad group of all workers with at least a four-year college degree, and the two sub-groups consisting of those with a four-year degree only and those who hold a post-graduate degree as well. The results for the "college degree or higher" group are based on regressions that are estimated separately from the one used to estimate the returns for the two sub-groups (as indicated by the horizontal line breaks in the table). The higher education wage premiums are expressed relative to the wages of high school graduates. In addition, separate estimates are provided for those holding a graduate degree. These are based on the restricted sample of individuals who have at least a college degree, hence they represent the graduate wage premium relative to the wages of the college only group (displayed separately in Figure 2).

[2] The results reported below are very similar when this set of control variables is replaced by complete interactions between four decadal age categories, four race/ethnic categories, the two genders, and marital status (married spouse present or not), for a total of 64 demographic cells. The college-only wage premium estimates that I obtain are smaller than those found by some other researchers (e.g., Lindley and Machin 2014), but the graduate degree premium is very similar.

The estimates in Table 2 and Figure 1 show that the wage premiums for higher education generally have been rising over time. However, both data sets shows that the growth has slowed in recent decades, with the slowdown for the graduate group lagging behind that for the college-only group. Growth in the college-only wage premium was cut approximately in half between the 1980s and 1990s and then slowed virtually to a standstill after 2000. It rose about 2 log points through 2010 and then was unchanged between 2010 and 2014.

For the graduate degree group, the slowdown over time is most evident based on the results for the college or higher sample, displayed at the bottom of both panels in Table 2 and also in Figure 2. Relative to the college-only group, individuals with a graduate degree saw consistent wage premium gains of about 4-5 log points in each of the decades from the 1980s, 1990s, and 2000s. During this timeframe, their wage advantage over college-only workers grew steadily, reaching about 24 log points by However, since 2010, the graduate degree premium has been flat (MORG data) or down slightly (March data).

The continued gains in the graduate degree premium while the college-only premium was sputtering contributed to the increasing "convexification" of the returns to education noted by Lemieux (2006a). The flat graduate degree premium since 2010, however, is a potential sign that the factors driving the rising return to higher education have dissipated.

3. Alternative explanations: polarization versus deskilling

The slower growth and eventual flattening in the wage premium for higher education documented in the preceding section raises the possibility that the factors propelling skilled wage premiums are dissipating. Past accounts of rising wage premiums for skilled workers generally revolved around the skill-biased technological change (SBTC) explanation of labor market developments. Under SBTC, rising reliance on sophisticated workplace technologies increases

the employment and wages of workers, mainly the highly educated, whose skills enable them to apply those technologies (e.g., Bound and Johnson 1992, Autor, Katz, and Krueger 1999). Recent research has pointed to factors that may alter or offset this process. I focus on two broad explanations: labor market polarization and deskilling.

3.1 Polarization

Among the leading explanations for recent employment developments in the United States and other advanced countries is the "polarization" hypothesis (Goos and Manning 2007, Acemoglu and Autor 2011, Autor 2014, Goos, Manning, and Salomons 2014). This is a refinement of the SBTC story that accounts for excess employment growth in the top and bottom portions of the wage distribution, with erosion in the middle.

In the polarization view, evolving workplace technologies undermine demand for "routine" jobs, in which workers are readily substituted by computer-intensive capital equipment and processes. They include white-collar office jobs (e.g., bookkeeping and clerical work), termed "routine cognitive" jobs, and blue-collar occupations that involve repetitive production or monitoring activities, termed "routine manual" jobs. These routine jobs are concentrated toward the middle of the wage and skill distribution. By contrast, workers in high-wage "nonroutine cognitive" (or "abstract") jobs tend to be complements with computer-based technologies, while low-wage service workers in "nonroutine manual" jobs are neither substitutes nor complements with computer-based technologies. Importantly, polarization arising from changes in domestic production technologies may be reinforced by related changes in overseas technologies, through the impact of offshoring and import competition (see e.g. Autor, Dorn, and Hanson 2013).

In recent decades, labor demand and job growth have been relatively rapid in the high-wage nonroutine cognitive and low-wage nonroutine manual categories, with the middle-wage routine jobs experiencing downward pressure. This pattern can be seen in Figure 3, which

displays annual job growth rates for the four broad categories over four sub-periods (classified using the broad occupational scheme from Acemoglu and Autor 2011; see Appendix B for the correspondence).[3] The figure shows substantial growth in the 1980s followed by a slowdown in the 1990s for all groups (reflecting in part the impact of the early 1990s recession).[4] Polarization is evident in the 1990s, reflected in a sharper slowdown for the routine vs. the nonroutine categories. This process appeared to accelerate after the year 2000, with substantial gains for nonroutine jobs and substantial net losses for routine jobs, particularly during the Great Recession of 2007-09 and the subsequent recovery (through 2014).

Polarization will differentially affect highly educated and less educated groups due to their very different occupational distributions. Figure 4 shows the shares of the college-only and graduate degree groups in the nonroutine cognitive (Panel A) and routine cognitive (Panel B) categories. Workers with at least a college degree account for a large and rising share of nonroutine cognitive jobs, reaching nearly 70 percent by 2014 (Panel A). Underlying this pattern is a significant rise in the share of nonroutine cognitive jobs held by individuals possessing a graduate degree, with little change in the share from the college-only group. This pattern is consistent with rising demand for the most highly educated individuals in jobs that require extensive nonroutine cognitive skills. The college-only group share also has grown in the routine cognitive category (Panel B), commensurate with their rising share of the overall workforce.

[3] Autor (2014) relabeled the nonroutine categories and collapsed the two routine categories into a single one. I maintain the original four-group categorization based on the cognitive/manual and routine/nonroutine distinctions due to the preponderance of college graduates in each of the cognitive categories.

[4] The start year of 1983 was dictated by the availability of official BLS occupational employment data beginning in that year, and the change between 1999 and 2000 is omitted to eliminate the influence of a significant discontinuity in occupational category definitions.

Figure 5 reverses the Figure 4 calculations by displaying the share of nonroutine cognitive jobs held within the college only and graduate degree groups. Among the college-only group, the fraction employed in nonroutine cognitive jobs declined between 2000 and 2014, from about 68 to 64 percent. By contrast, the share of graduate degree holders employed in nonroutine cognitive jobs has been largely stable at about 90 percent in recent years, while their overall workforce share has grown. The increasing concentration of graduate degree holders in nonroutine cognitive jobs may be a factor supporting their wage gains relative to college-only degree holders.

These tabulations suggest that polarization may be an important factor underlying the rising relative return to post-graduate education. As discussed by Autor (2014), the wage impacts of polarization depend not only on skill/technology complementarity, but also on: (i) the demand elasticity for products and services that rely heavily on the different skill/task groups; (ii) labor supply elasticity for the different skill/task groups. In regard to nonroutine cognitive jobs, both factors imply that workers in these jobs are likely to see their wages rise in response to rising reliance on computer technologies (assuming that their skills are complementary with computers). Demand for their output is relatively elastic, and an inelastic supply response due to educational and credentialing lags implies that the supply of such workers does not respond quickly to rising demand. As such, ongoing polarization should raise the wages of individuals employed in nonroutine cognitive jobs, most of whom have college or graduate degrees.[5]

[5] Based on these considerations, Autor (2014) notes that while polarization is likely to lower wages of workers in routine skill/task occupations, wages for workers in nonroutine manual jobs are likely to be relatively unaffected by polarization, despite the favorable polarization effects on employment for that group.

3.2 Slower technological progress and deskilling

The slowdown and eventual cessation of the increase in the higher education wage premium documented in section 2 raises the possibility that factors other than ongoing polarization have contributed since the year 2000. A leading alternative is the Beaudry et al. (BGS 2013) hypothesis regarding a technology slowdown that has undermined the demand for higher-skilled workers, which in turn has cascaded down the skill distribution (see also BGS 2014). I refer to this argument as "deskilling."

BGS present evidence to support the claim that the demand for cognitive and technological skills in the U.S. labor market has weakened since the year 2000. They support their empirical findings by developing a theoretical model that can explain a "boom-bust cycle" in the demand for cognitive tasks and overall labor demand. Its key feature is that cognitive skills essentially constitute a stock of organizational capital for firms, rather than a flow. The dynamics of the model predict that the stock of cognitive tasks/skills grows during the boom, but once it becomes sufficiently large, the demand for cognitive tasks/skills declines (similar to the pattern in existing models of technology diffusion and capital investment). Their model can predict the strong growth in demand and wages for workers with cognitive skills up to the year 2000—the boom phase—followed by a decline thereafter—the bust phase. Moreover, they argue that in response to this demand reversal, high-skilled workers have moved down the occupational ladder and replaced lower-skill workers, pushing the latter group further down the occupational ladder (hence my use of the term "deskilling").

BGS do not explore the implications of their model for relative wages. However, their model and evidence are consistent with limited wage growth across the skill spectrum, including the highly educated. This view can also explain rising "underemployment" of young college

graduates, defined as the tendency for them to work in jobs that do not strictly require a college degree (as suggested by the recent findings of Abel, Deitz, and Su 2014).

4. Wage effects of polarization and deskilling

The confluence of polarization and deskilling influences on the labor market in recent years has been noted by others. Autor (2014), Lindley and Machin (2014), and BGS (2013) all provide a balanced, informed discussion and interpretation of labor market developments from 2000 forward and acknowledge the possibility that polarization and deskilling may both be playing a role. Examination of wage patterns among the highly educated can provide additional evidence regarding the importance of polarization and deskilling. I focus on two general tests regarding their wage impacts for the highly educated: movements in real wages by education and broad occupation groups, and a within-between broad occupation analysis of changing higher education wage premiums.

4.1 Changes in composition-adjusted real wages

The polarization hypothesis suggests that real wages should be rising for the broad group of nonroutine cognitive employees, including college-only degree holders and post-graduate degree holders. By contrast, the deskilling hypothesis points to downward pressure on wages of skilled workers in general.

In examining movements in real wages by education and occupation group, it may be important to adjust for the changing compositions of the relevant population with respect to other wage-related characteristics. To do, I reweight the data to impose the year 2000 distribution of characteristics (other than education and broad occupation) on all other years of data. This is

done using the reweighting method of DiNardo, Fortin, and Lemieux (1996), based on the same set of control variables used for the regression analyses in Section 2 (see the notes to Table 2).

Figure 6 displays composition-adjusted real wages for the college-only (Panel A) and graduate degree (Panel B) groups. I restrict attention to the nonroutine and routine cognitive categories, given the limited shares of individuals with at least a college education working in manual occupations. For both educational groups, real wages for routine cognitive workers generally rose slowly prior to 2000, with a sharp increase evident in the late 1990s. Since 2001, however, routine cognitive workers in both higher education groups have experienced declining real wages. A similar pattern is evident for the higher paid nonroutine cognitive workers, with essentially flat real wages since the early 2000s for the college-only group and flat real wages for the graduate degree group since 2009.

These patterns suggest the absence of favorable polarization effects on the wages of the highest skilled workers in recent years (since the early 2000s for the college-only group, and since the Great Recession for those with a graduate degree).

4.2 Within-between analysis of education premiums (by broad occupation)

The preceding analyses indicate complex changes in the employment and wage patterns of highly educated individuals across the broad polarization occupation grouping in recent years. A within-between analysis is a relatively straightforward means for combining these changes into a single set of summary results.

I conduct this analysis by first estimating higher education wage premiums within each of the four broad polarization occupation groups. The regressions are otherwise identical to those reported in Table 2. Table 3 lists the regressions results, focusing on the college-only premium

(measured relative to high school graduates) and the graduate degree premium (measured relative to the college-only group), with results for the same set of years as Table 2 listed

The panel immediately below the regressions lists the decomposition of the "total" effect into "within" and "between" effects. The within effect is defined as the weighted average of the wage premium estimates for the four broad occupational group, where the weights are each occupations' share of total employment. It is interpreted as the higher education wage premium conditional on occupational skill/task group. The between effect is the difference between the total effect and the within effect.[6] It is interpreted as the higher education wage premium that is attributable to differences in the occupational employment distribution of the different education groups.

The results in Table 3 indicate that the returns to higher education are widely dispersed across the four broad occupation groups. The exception is routine manual jobs, in which the higher education wage premium is relatively small for both education groups (generally less than half its size in the other three broad occupation groups). Moreover, the wage premium changes over time have been relatively consistent and uniform across the occupation groups.

These patterns imply that changes in the total effect over time have been primarily driven by changes in the within component, with limited movement in the between component. This is confirmed by the results listed in Table 3, which shows a between effect that has changed little over time, particularly for the college-only group, and hence has accounted for a declining share of the total effect. The relative contributions are most readily observed in Figure 7, which plots annual estimates of the within, between, and total effects over the complete sample frame, in

[6] Note that the total effect corresponds to the full-sample estimates from Table 2. For example, the first total effect listed in column 1 of Table 3, 0.270, corresponds to the college-only estimate from column 1 of Panel A in Table 2.

separate panels for the two higher education groups. The between effect has been especially stable in recent years, declining slightly since about 2000 for the college-only group and remaining relatively flat since the Great Recession for the graduate degree group.

These results suggest that changes in the higher education wage premium are primarily propelled by changing competition across educational attainment groups within broad occupational categories, rather than a changing employment distribution for highly educated individuals across occupational categories. The flattening of the educational wage premium in recent years therefore appears to reflect heightened competition between educational groups for similar jobs.

5. Discussion and conclusions

I have uncovered three broad empirical results:

(1) The wage premium for higher education in the United States has flattened out in recent years, with little or no change evident since the year 2000 for individuals with a four-year college degree and essentially no change since the Great Recession for individuals with a graduate degree.

(2) Highly educated individuals working in skill-intensive nonroutine cognitive jobs have seen little or no increase in real wages in recent years.

(3) Higher education wage premiums have been propelled by changes within broad "polarization" occupation groups, suggesting that the recent flattening of these premiums reflects heightened competition across educational attainment groups for similar jobs.

I loosely interpret these findings as consistent with a "deskilling" explanation of the flattening in higher education wage premiums. Wages at the top do not appear to be getting

pulled up by complementarity with emerging technologies. Instead, the gains to higher education have moderated within broad occupation groups, suggesting greater competition between education groups for increasingly scarce highly-paid jobs.

These finding are quite preliminary and the conclusions are highly provisional. I use very coarse occupational categories and a somewhat rudimentary approach to compositional adjustment. Analysis accounting for more detailed changes in labor force composition and occupational distributions is one necessary extension of this work.

Appendix A: MORG and March CPS Data

Data handling and definitions for the CPS MORG and March data generally followed Lemieux (2006b, 2010) and Autor, Katz, and Kearney (2008); see also Buchmueller, DiNardo, and Valletta (2011).

MORG Data (variable definitions, top-coding, and imputation)

TO BE COMPLETED LATER.

March Data (variable definitions, top-coding, and imputation)

TO BE COMPLETED LATER.

Appendix B: Polarization Occupational Coding

Category	2-digit SOC Occupations
Non-Routine Cognitive	Management, business and finance operations Professional/technical
Non-Routine Manual	Healthcare support Protective services Food preparation and serving Building and grounds cleaning/maintenance Personal care and service
Routine Cognitive	Sales and related Office and administrative support
Routine Manual	Construction and extraction Installation, maintenance, and repair Production Transportation and material moving

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Table 1: Educational Attainment Shares and Real Hourly Wages

	Panel A: Employment share					
	(1)	(2)	(3)	(4)	(5)	(6)
	1980	1990	1992	2000	2010	2014
No degree (<12 yrs. education)	0.197	0.130	0.115	0.099	0.082	0.076
High school degree	0.371	0.368	0.358	0.314	0.280	0.265
Some college	0.205	0.238	0.259	0.280	0.280	0.279
College only (4-year)	0.158	0.183	0.177	0.204	0.232	0.243
Graduate Degree	0.069	0.081	0.090	0.102	0.126	0.137
Graduate degree by type						
Master's			0.068	0.075	0.094	0.103
Professional			0.012	0.014	0.016	0.016
Doctoral			0.010	0.013	0.016	0.018
	Panel B: Real Hourly Wage (2014 $) (averages by group)					
	(1)	(2)	(3)	(4)	(5)	(6)
	1980	1990	1992	2000	2010	2014
No degree (<12 yrs. education)	14.15	12.80	12.43	12.99	13.18	13.02
High school degree	16.28	15.94	15.82	17.14	17.72	17.59
Some college	18.74	19.23	19.10	20.77	21.41	21.00
College only (4-year)	22.78	25.24	25.10	28.89	30.39	29.93
Graduate Degree	27.19	31.34	31.56	36.29	39.57	39.07
Graduate degree by type						
Master's			29.85	33.88	36.73	36.32
Professional			38.20	44.87	50.60	50.01
Doctoral			35.72	41.31	46.29	45.70

Note: Author's calculations from CPS monthly files (Panel A) and MORG files (Panel B); sample weights used. See Table 2 note for MORG sample description and counts. Master's degrees include MBAs along with a wide set of other master's degrees; professional degrees are J.D., M.D., and related.

Table 2: Composition-Adjusted Wage/Earnings Differentials

	Panel A: CPS MORG Data					
	(1)	(2)	(3)	(4)	(5)	(6)
	1980	1990	1992	2000	2010	2014
Full sample						
College degree or higher	0.304	0.449	0.464	0.518	0.566	0.566
	(.003)	(.003)	(.003)	(.004)	(.004)	(.005)
College only (4-year)	0.270	0.402	0.403	0.451	0.475	0.471
	(.004)	(.004)	(.004)	(.005)	(.005)	(.005)
Graduate degree	0.383	0.553	0.581	0.648	0.727	0.725
	(.005)	(.005)	(.005)	(.006)	(.006)	(.006)
Observations	121001	123111	119014	83314	85397	80188
College degree or higher sample						
Graduate degree	0.111	0.149	0.170	0.194	0.245	0.247
	(.006)	(.006)	(.006)	(.007)	(.006)	(.006)
Observations	27042	33334	32684	26789	32305	32487
	Panel B: CPS March Data					
	(1)	(2)	(3)	(4)	(5)	(6)
	1980	1990	1992	2000	2010	2014
Full sample						
College degree or higher	0.293	0.449	0.477	0.538	0.579	0.576
	(.006)	(.006)	(.006)	(.006)	(.006)	(.007)
College only (4-year)	0.260	0.400	0.415	0.468	0.488	0.488
	(.007)	(.007)	(.007)	(.006)	(.007)	(.007)
Graduate degree	0.368	0.557	0.593	0.680	0.740	0.725
	(.009)	(.009)	(.009)	(.008)	(.008)	(.008)
Observations	34258	38123	37143	52489	45575	43435
College degree or higher sample						
Graduate degree	0.102	0.155	0.174	0.206	0.244	0.230
	(.011)	(.010)	(.010)	(.009)	(.008)	(.009)
Observations	8184	10630	10709	16350	17608	17540

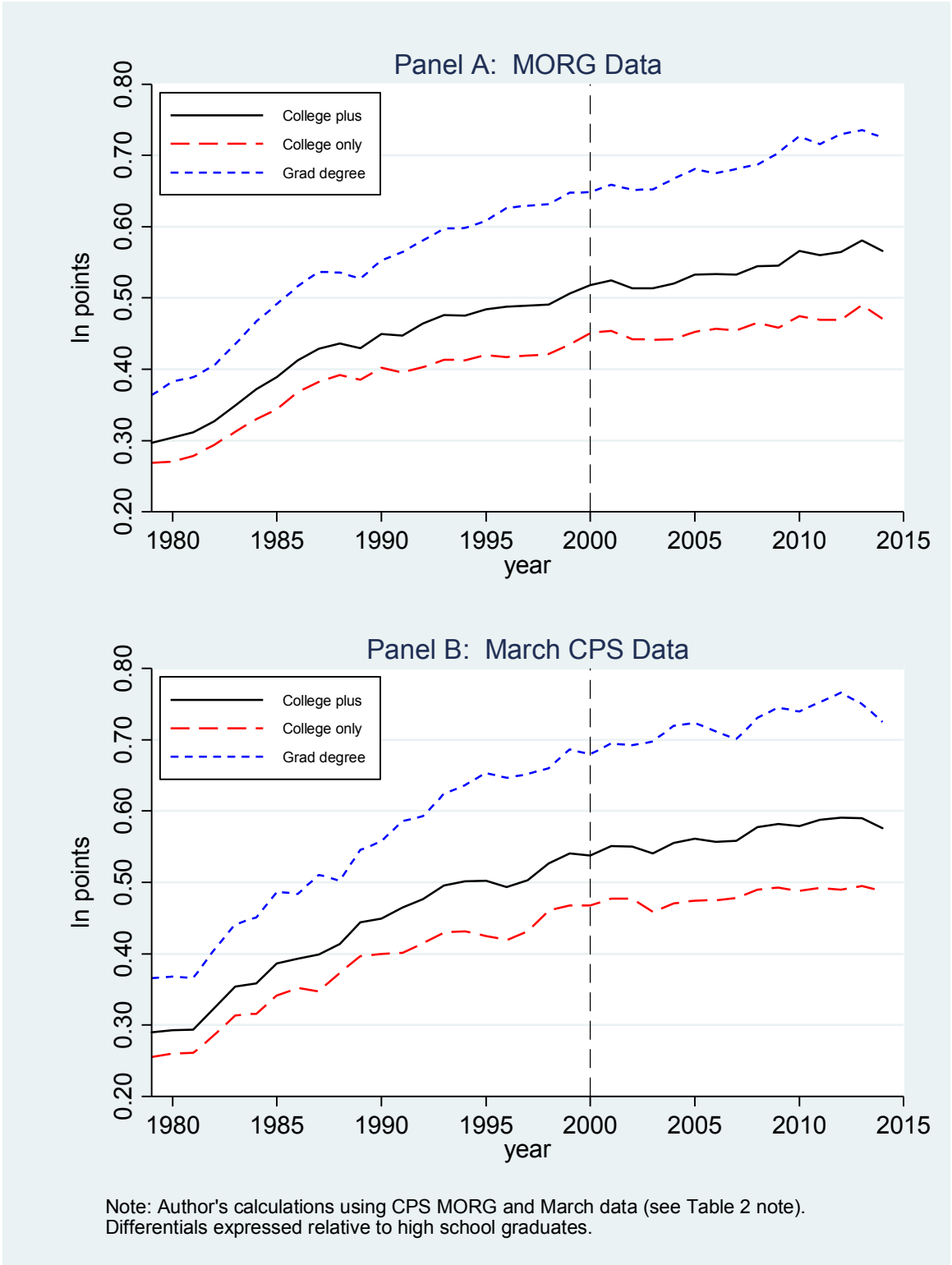
Note: Estimated diffentials from ln(wage or earnings) regressions; line breaks indicate separate regressions . Standard errors in parentheses. Samples are wage and salary workers age 25-64 for both data sources, restricted to full-time year-round workers (annual hours>=1750) in the CPS March data. Dependent variable is ln(hourly earnings) for the MORG data and ln(weekly earnings) for the CPS March data, with allocated values dropped and top-code adjustments (see the appendix). Composition adjustment relies on the inclusion of the following control variables (all categorical): 7 age, 3 race/ethnic, married, female, married*female, 8 geographic divisions.

Table 3: Within-Between Analysis of Higher Education Wage Premiums (MORG Data)
(by broad occupation groups)

	(1) 1980	(2) 1990	(3) 1992	(4) 2000	(5) 2010	(6) 2014
College only vs. High School degree						
Regressions:						
Nonroutine Cognitive	0.215	0.303	0.305	0.350	0.378	0.377
	(.007)	(.007)	(.007)	(.009)	(.009)	(.010)
Routine Cognitive	0.134	0.255	0.265	0.309	0.346	0.338
	(.007)	(.007)	(.007)	(.009)	(.009)	(.010)
Routine Manual	0.056	0.142	0.134	0.131	0.163	0.150
	(.010)	(.011)	(.011)	(.014)	(.014)	(.014)
Nonroutine Manual	0.166	0.246	0.256	0.286	0.297	0.299
	(.014)	(.014)	(.014)	(.017)	(.013)	(.013)
Decomposition:						
Within effect	0.136	0.238	0.242	0.279	0.316	0.312
share of total	0.504	0.593	0.601	0.618	0.665	0.662
Between effect	0.134	0.164	0.161	0.172	0.159	0.159
share of total	0.496	0.407	0.399	0.382	0.335	0.338
Total Effect	0.270	0.402	0.403	0.451	0.475	0.471
Graduate degree (college-only sample)						
Regressions:						
Nonroutine Cognitive	0.068	0.096	0.109	0.128	0.170	0.170
	(.006)	(.006)	(.006)	(.007)	(.007)	(.007)
Routine Cognitive	0.101	0.085	0.112	0.157	0.147	0.164
	(.021)	(.018)	(.018)	(.025)	(.022)	(.022)
Routine Manual	0.034	0.032	0.033	0.072	0.041	0.067
	(.031)	(.033)	(.037)	(.040)	(.042)	(.043)
Nonroutine Manual	-0.032	-0.008	0.015	0.151	0.194	0.176
	(.048)	(.046)	(.044)	(.050)	(.035)	(.036)
Decomposition:						
Within effect	0.068	0.088	0.103	0.131	0.163	0.165
share of total	0.609	0.588	0.605	0.675	0.668	0.669
Between effect	0.043	0.061	0.067	0.063	0.081	0.082
share of total	0.391	0.412	0.395	0.325	0.332	0.331
Total Effect	0.111	0.149	0.170	0.194	0.245	0.247

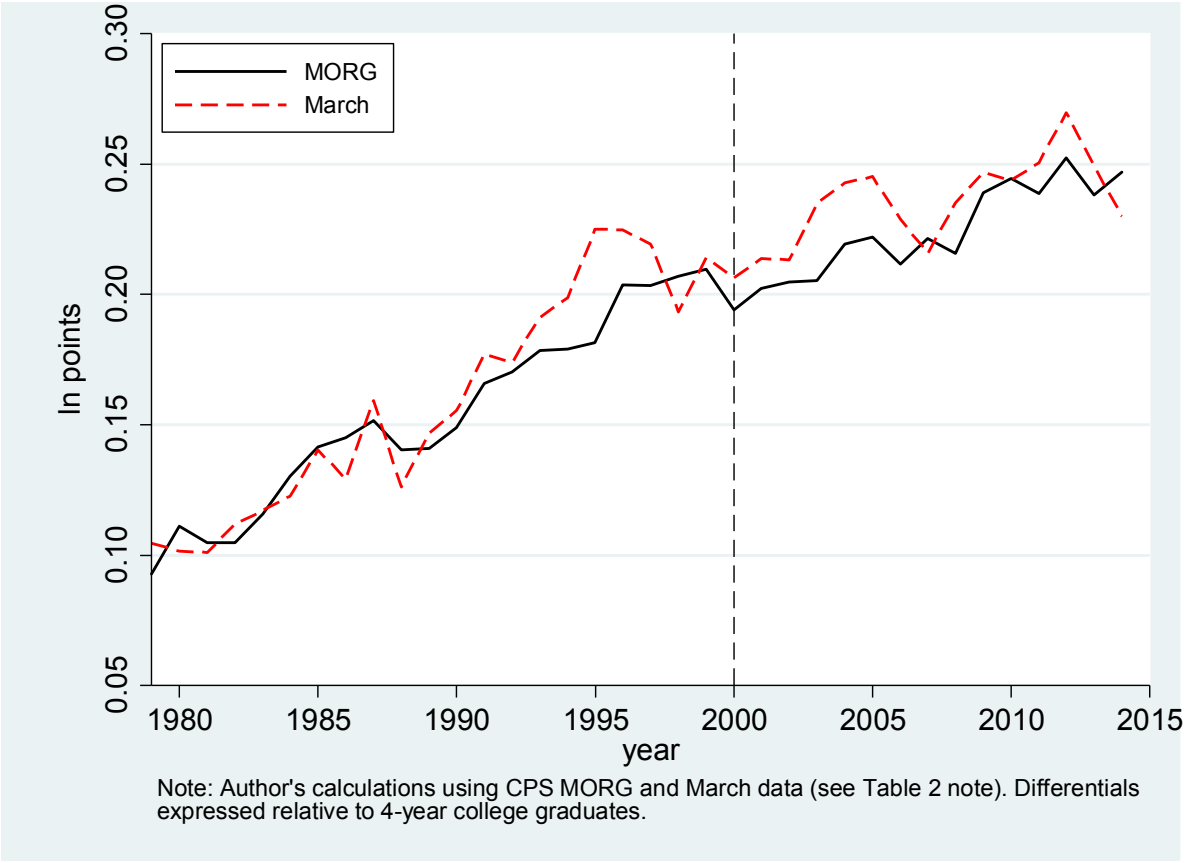
Note: See note to Table 2 for data and specification. Coefficients listed, with standard errors in parentheses, for occupation group-specific estimates. Decomposition described in the text.

Figure 1: Estimated Higher Education Wage Premium, 1979-2014



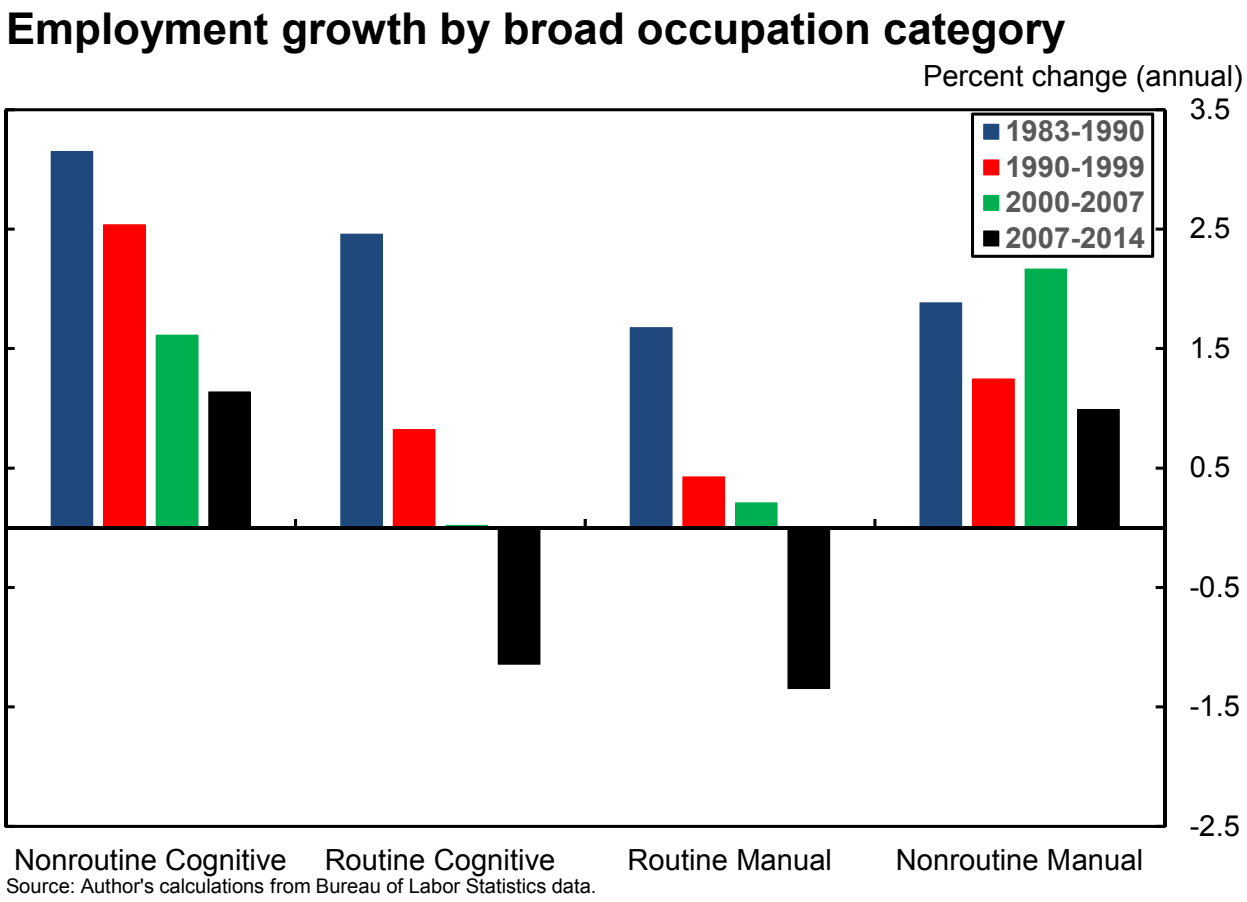
Note: Author's calculations using CPS MORG and March data (see Table 2 note).
Differentials expressed relative to high school graduates.

Figure 2: Estimated Graduate Degree Wage Premium, 1979-2014



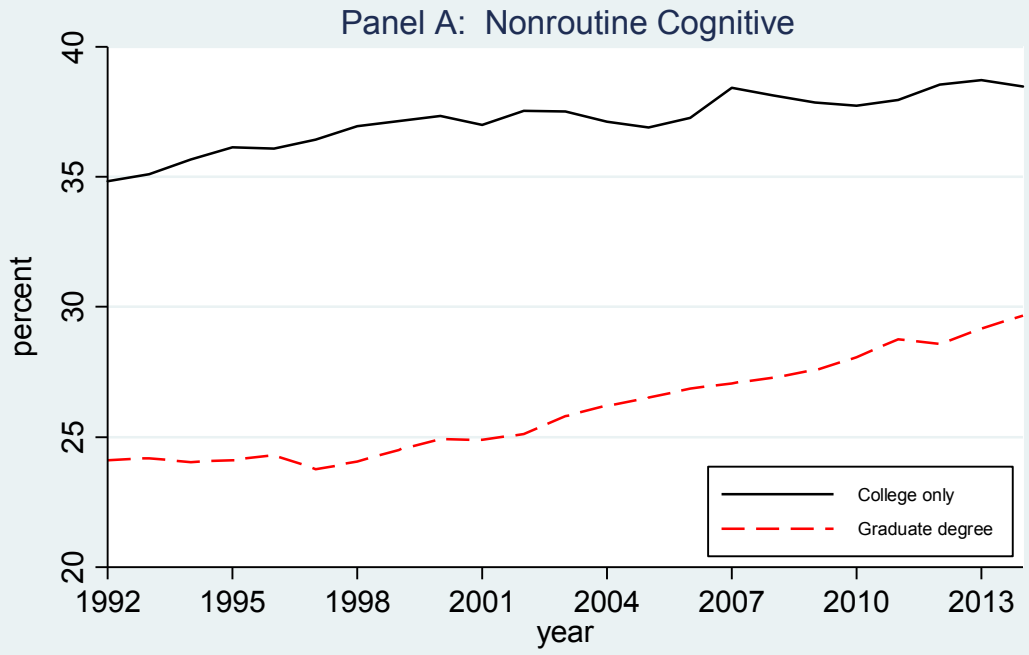
Note: Author's calculations using CPS MORG and March data (see Table 2 note). Differentials expressed relative to 4-year college graduates.

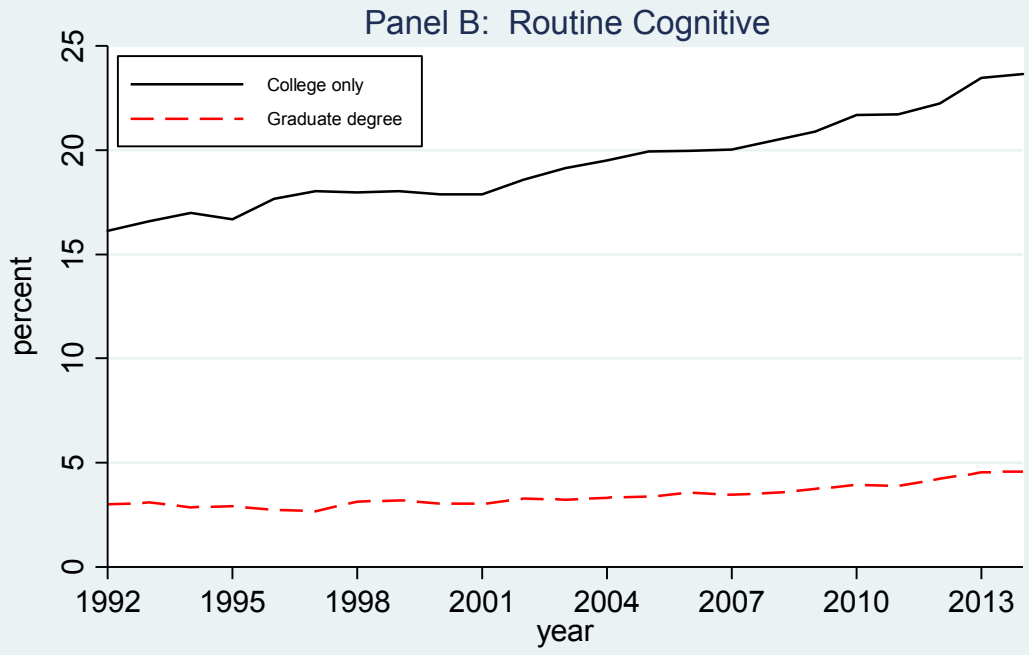
Figure 3



Source: Author's calculations from Bureau of Labor Statistics data.

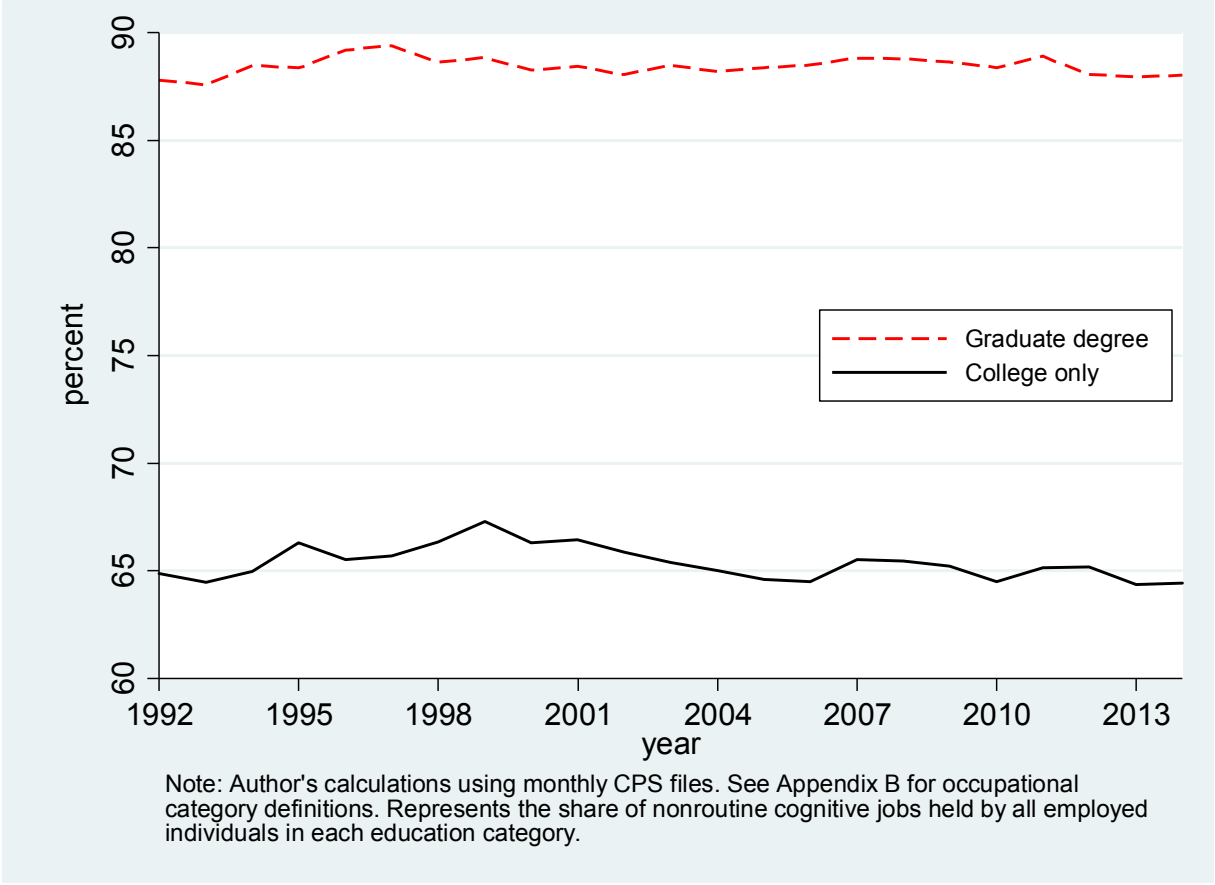
Figure 4: Educational Attainment Shares by Occupational Category, 1992-2014





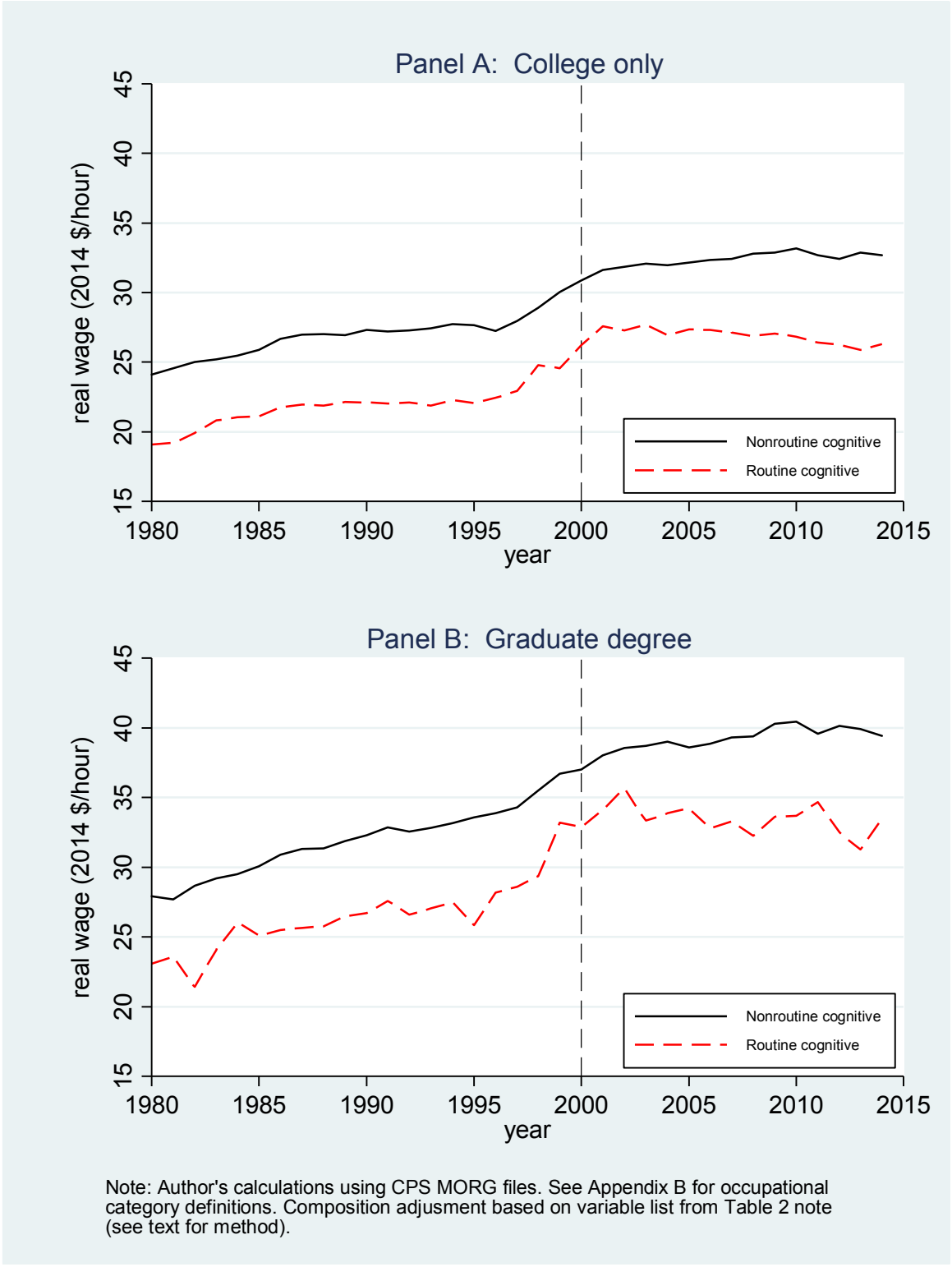
Note: Author's calculations using monthly CPS files. See Appendix B for occupational category definitions.

Figure 5: Share of Nonroutine Cognitive Employment by Educational Attainment, 1992-2014



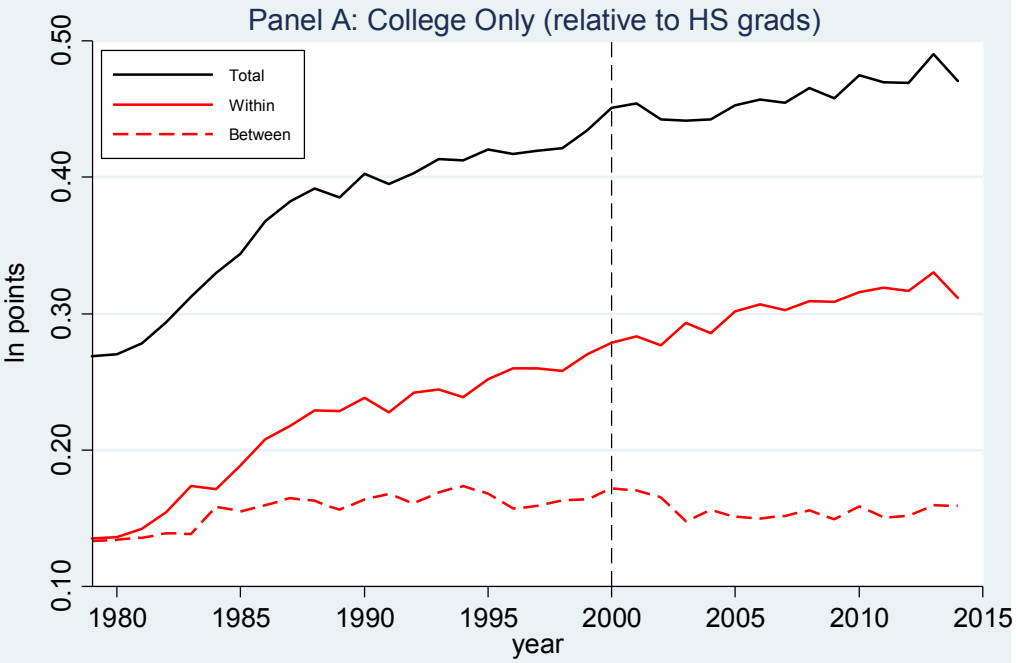
Note: Author's calculations using monthly CPS files. See Appendix B for occupational category definitions. Represents the share of nonroutine cognitive jobs held by all employed individuals in each education category.

Figure 6: Composition-Adjusted Real Wages, by Education and Broad Occupation, 1979-2014

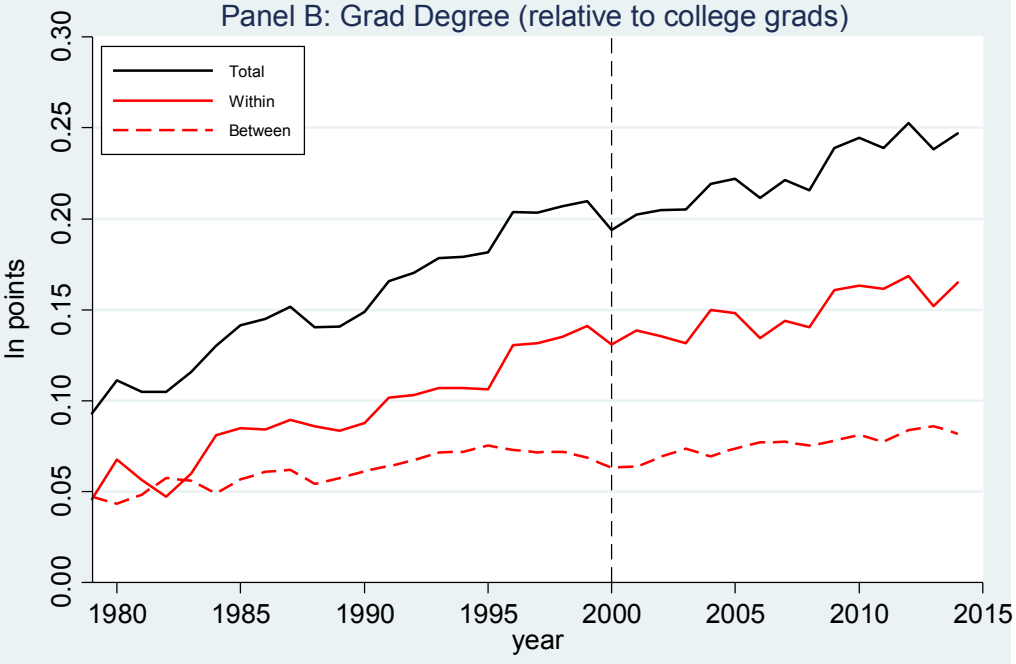


Note: Author's calculations using CPS MORG files. See Appendix B for occupational category definitions. Composition adjusment based on variable list from Table 2 note (see text for method).

Figure 7: Total and Within/Between Wage Premiums, 1979-2014



Note: See text and Table 3 for data/methods. Based on broad polarization occupation grouping (nonroutine cognitive, routine cognitive, routine manual, nonroutine manual).



Note: See text and Table 3 for data/methods. Based on broad polarization occupation grouping (nonroutine cognitive, routine cognitive, routine manual, nonroutine manual).