The Undereducated American

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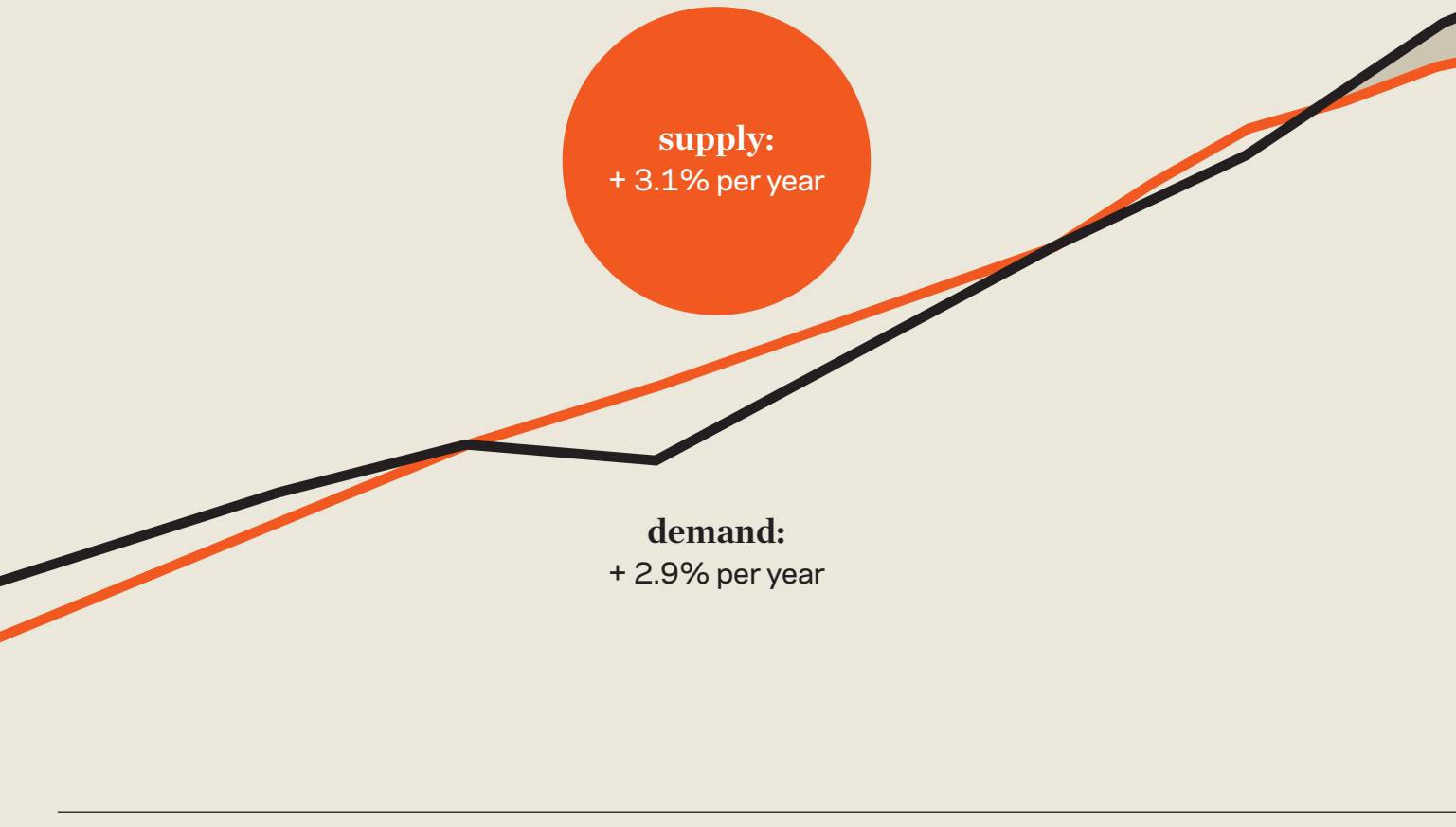
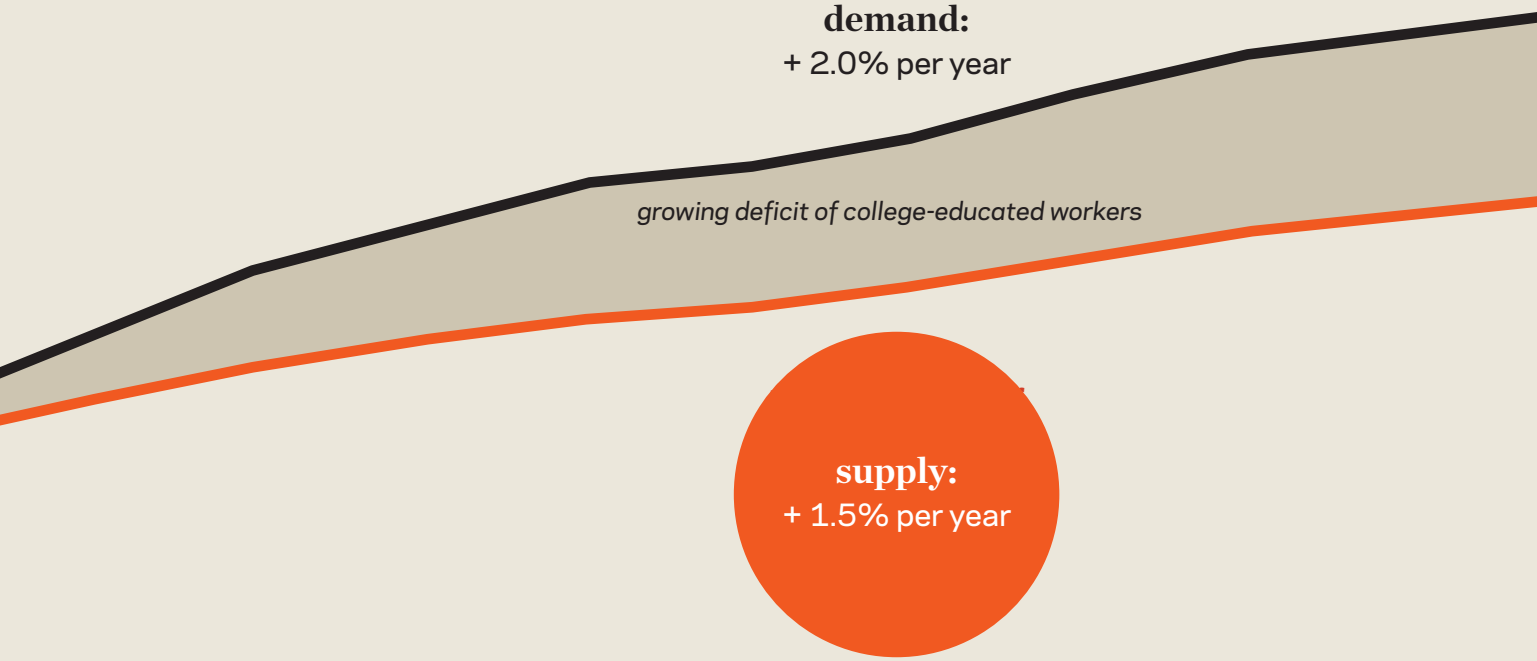
The United States has been underproducing college-going workers since 1980. Supply has failed to keep pace with growing demand, and as a result, income inequality has grown precipitously.

From 1915 to 1980, supply grew in tandem with demand. But, starting in 1990, the share of college-educated young people in the workforce rose very slowly.

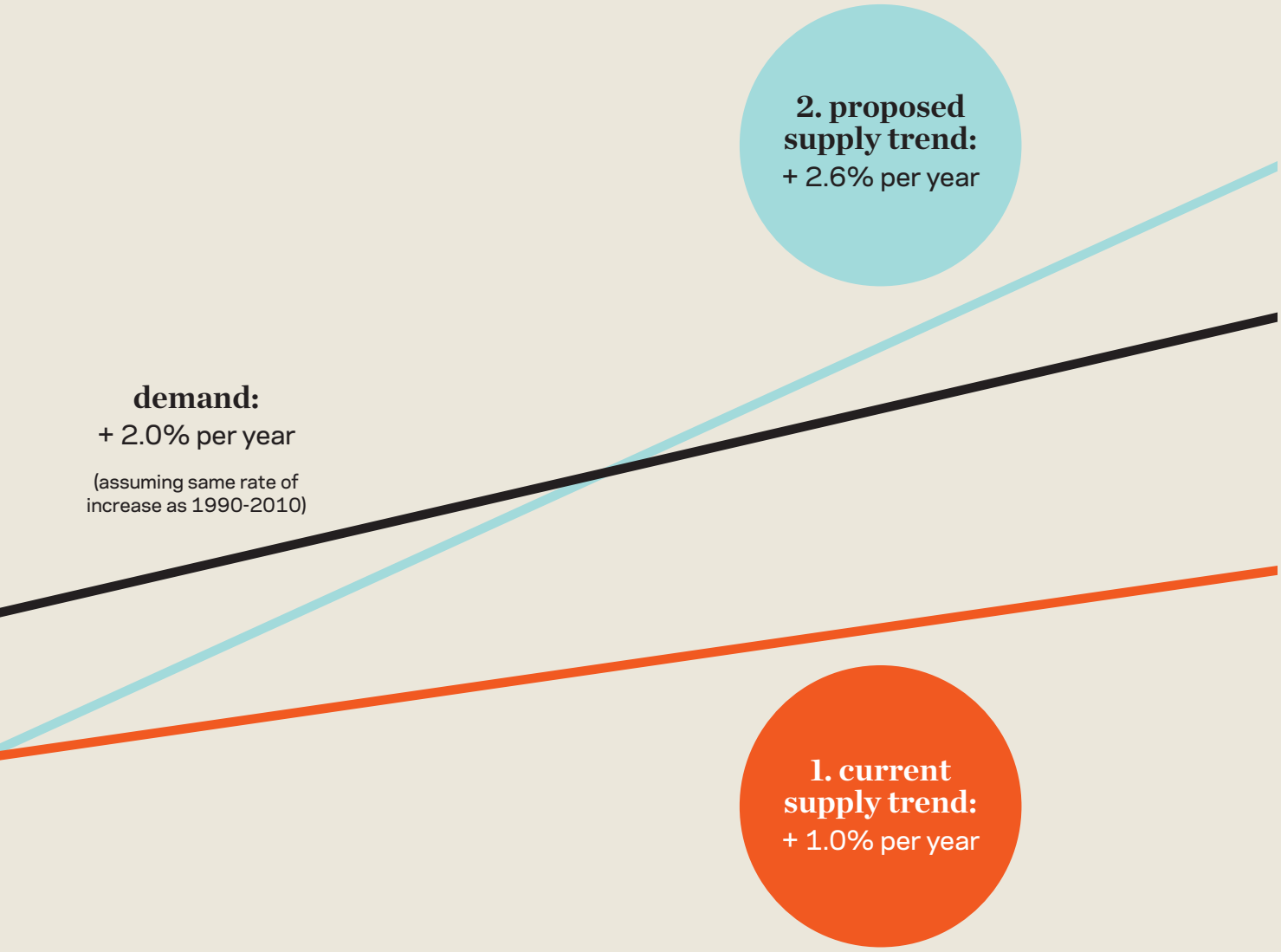




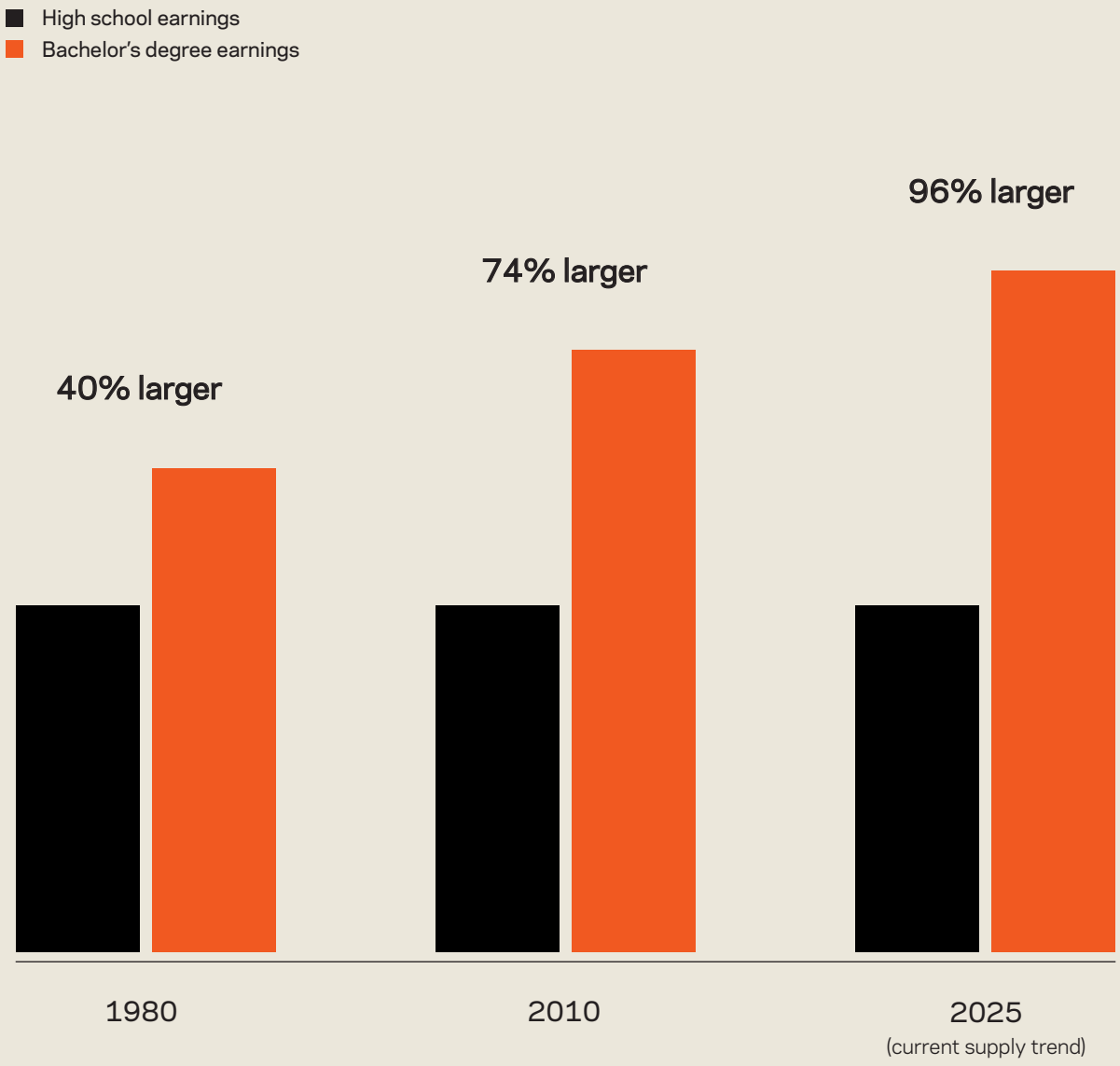
supply:
+ 1.5% per year

2010

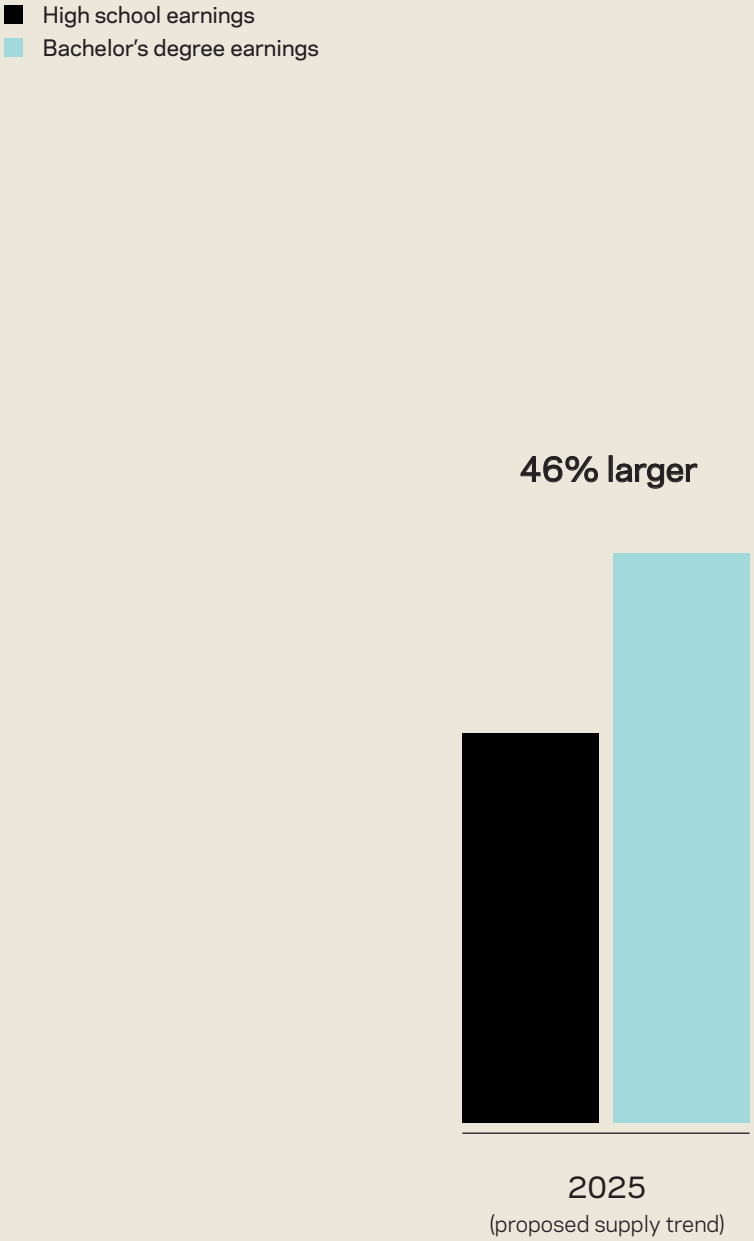
Looking ahead to the year 2025, there are two potential paths forward.



If we continue to underproduce college-educated workers, the large and growing gap between the earnings of Americans of different educational attainment will grow even wider.



What's the solution? If we were to add 20 million postsecondary-educated workers to the workforce, income inequality would decline.



Adding an additional 20 million postsecondary-educated workers over the course of the next 15 years is not impossible. It will make our level of educational attainment comparable with other developed nations, help us meet the economy's need for efficiency, and reverse the growth of income inequality.

Introduction

Americans are undereducated.

Our analysis of wage and employment data shows that the United States has been underproducing college-educated workers for decades. Postsecondary education is in high demand among employers—and as the recovery takes hold and hiring resumes, it will continue to be in high demand. The undersupply of postsecondary-educated workers has led to two distinct problems: a problem of efficiency and a problem of equity. Without enough talent to meet demand, we are losing out on the productivity that more postsecondary-educated workers contribute to our economy. Moreover, scarcity has driven up the cost of postsecondary talent precipitously, exacerbating inequality. The result is that, as we lose our global lead position in percentage of the workforce with postsecondary credentials, we have become the global industrialized leader in income inequality.

The growing disparity in earnings between those with a college education and those without is the principal reason for this widening chasm. To resolve these twin dilemmas, we propose adding an additional 20 million postsecondary-educated workers to the economy and increasing degree attainment rates. Specifically, this means that of these new 20 million people:

- 15 million would hold Bachelor's degrees.
- 1 million would hold Associate's degrees.
- 4 million would have attended some college, but earned no degree.[1]

On the efficiency side, these 20 million additional workers would meet the growing demand for postsecondary-educated workers while boosting gross domestic product (GDP) by $500 billion.[2]

[1] We have used the statistical framework originally developed by labor economists David Autor, Lawrence Katz, Alan Krueger, and Melissa Kearney.

[2] See Patrinos, Harry and George Psacharopoulos (2011) in Education: Past, Present, and Future Global Challenges. New York: The Work Bank, Human Development Network for estimates for countries throughout the world on the macroeconomic returns to additional educational output.

On the equity side, adding these workers would reduce the wage premium paid to college-educated workers from 74 to 46 percent, beginning to reverse the decades-long inequality trend. To be clear, adding 20 million additional college-educated workers will help raise the wages of all workers. Inequality will be reduced because the wages of college-educated workers, while rising, will no longer be rising faster than the wages of high school–educated workers. The wages of high school–educated workers will rise by 24 percent, those with Associate's degrees will rise by 15 percent, while the wages of those with Bachelor's degrees will rise by 6 percent.

Critics will respond that we already have too many college graduates, and that it is irresponsible to invest more in postsecondary education during a time when many graduates are unemployed. This is not the first time critics have complained that too many young people were going to college. In 1976, Harvard economist Richard Freeman published *The Overeducated American*, arguing that the huge investment in college education was wasteful and that the surge in college attendance among baby boomers was sure to reduce the earnings of college graduates in the future. At that time, using the best available evidence and sound economic reasoning, his conclusion seemed reasonable. Also in the midst of the 1981 recession, stories popped up in the media questioning the value of college. *The Washington Post* ran a story chronicling the experience of Lyman Crump, who translated his liberal arts college degree into a job as a janitor. In 1984, Ronald Kutscher, the Assistant Commissioner for employment projections at the Bureau of Labor Statistics, was quoted in *The New York Times* as saying, "We are going to be turning out about 200,000 to 300,000 too many college graduates a year in the '80s."

It turned out that the critics' predictions were startlingly shortsighted. Instead of declining, earnings for college-educated workers grew rapidly throughout the 1980s and 1990s, outpacing growth in earnings of their less-educated counterparts. The gap between these relative wages widened significantly.This trend remained strong for more than 20 years, and technology has accelerated the trend, as unskilled labor is increasingly automated and employers look for workers who can productively utilize the latest technological products. As a result, Richard Freeman would eventually concede that he did not foresee the rising demand for college-educated labor. Economists now generally agree that the "overeducated American" saw impressive wage growth and employment stability through the 1980s and 1990s because of, not in spite of, his or her postsecondary education.

During this same period, however, the earnings potential of workers with only a high school diploma began to erode. Middle-class earnings are increasingly secured by those with at least some postsecondary education, and men with only a high school diploma have been losing ground for decades. These two trends combined—rising relative wages for college-educated workers and falling relative wages for those with only a high school diploma—have contributed significantly to the concomitant rise in income inequality in the United States.

The relative wages of college-educated workers have been rising much faster than the wages of people with a high school diploma. The laws of supply and demand are the best single indicator of whether the United States is producing enough, too few, or too many college graduates. If the relative earnings of college-educated

workers rise faster than the earnings of their counterparts, it means the demand is growing faster than supply. The data, therefore, are unequivocal—Americans are undereducated.

To correct our undersupply and meet our efficiency and equity goals for the economy and for our society, we will need to add an additional 20 million postsecondary-educated workers to the economy by 2025. Reaching this goal is a significant challenge; it requires more productivity from our education system at all levels. That effort is not only possible, but critical to maintaining American economic strength in an increasingly competitive world, as many, including President Obama, have recognized.

These numbers put our goal firmly in line with the President's postsecondary education goal. Reaching our goal of 20 million additional postsecondary workers assumes that by 2025, 75 percent of the workforce will have at least one year of postsecondary education. This represents a significant increase from the current trend, which would lead to 65 percent of the labor force with at least some college by 2025. Furthermore, achieving this goal would result in 55 percent of the labor force having at least an Associate's degree, compared with 42 percent today. For the youngest age cohort, 60 percent of workers would have an Associate's or Bachelor's degree, compared with the 42 percent who had a college degree in 2005.

We lay out our argument in five sections. The first tracks the evolution of increasing educational attainment in this country and in other countries around the world. We give an overview of the data that demonstrate that other countries have accepted that economic growth has been tied to rising educational levels. The second section documents the change in the supply and demand of college-educated workers from 1915 to 2005. We assess and confirm the consensus economic interpretation of the rise of the Bachelor's degree to high school wage premium from 1980 to 2005 that suggests that there has been an undersupply of college graduates. The third section shows how this rising Bachelor's degree premium has led to a sharp, distressing rise in inequality and discusses the positive effects of increased postsecondary attainment on wages and inequality. We find that attaining our goal of 20 million additional workers with postsecondary education will help reverse the growth of income inequality. The fourth section addresses the arguments that we have too many college graduates today. Neither the historical earnings data nor future projections of postsecondary demand support the notion that college workers are oversupplied. The final section details our calculations regarding how many additional college graduates are needed between now and 2025 to meet the rising demand for college-educated workers and to meet a target Bachelor's degree to high school wage ratio that will result in a more shared prosperity.

Our findings are not surprising. Postsecondary education has historically been one of the safest long-term investments we can make in our economic future. Educated workers are more productive, earn more, and pay more taxes. Not only is higher education a sure return on investment, but access to postsecondary education has become the arbiter of economic success and upward mobility in our society. More postsecondary education will achieve not only a more dynamic and vibrant economy, but a more equitable society.

Section One

Economic growth is linked with educational attainment.

"A clear trend has emerged: The United States is losing ground in postsecondary education relative to our competitors. The significance of these rankings goes beyond mere bragging rights—increasing our supply of skilled labor is central to the vitality of the U.S. economy."

Over the past century, economic growth in the United States has been tied to technological change. First, it was the assembly line machines of the manufacturing age, and now it is computers and the Internet that have revolutionized skill needs in the workforce. America's relentless engine of technological development, fueled by increasingly fierce global competition, has required an ever-growing pool of workers savvy enough to integrate these sophisticated new tools into their work routines. The growing need for technical sophistication has been coupled with a reduced need, often the result of automation, for unskilled labor. As an outcome of these technological changes, there has been a persistent and ongoing demand for more postsecondary education and training. We have long been at the forefront of keeping up with this growing need. In fact, the United States' commitment to mass education has a long history. We were the first country to institute free and compulsory education in publicly-run schools. We expanded this commitment first to mass attendance in high schools in the first part of the 20th century, and then to a majority of young people having at least some postsecondary education (most often in public colleges and universities) in the second half of the 20th century.

For many years, the United States was the undisputed leader in educational expansion and had a significantly higher rate of college completion than any other country. In the 1960s, when our lead in the share of the workforce with a college degree was large compared with other industrialized countries, we continued to expand

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access to college, and eventually between 50 and 60 percent (approximately 35 percent would get a degree) of each age cohort attended post-secondary institutions.

What looked like folly and wasted resources to some turned out to be very productive for our economy—and other countries noticed and followed suit. As other countries expanded their educational systems, our advantage narrowed. By 2008, the United States had dropped to second behind Norway in the share of its workforce with a four-year degree.[3] **Figure 1** includes short-term college degrees (our Associate's degree), which results in the United States being third in terms of prime-age adult educational attainment, behind Canada and Japan.[4]

More significantly for our future, the picture is bleaker for the United States among the 25–34 age group, which includes the majority of recent

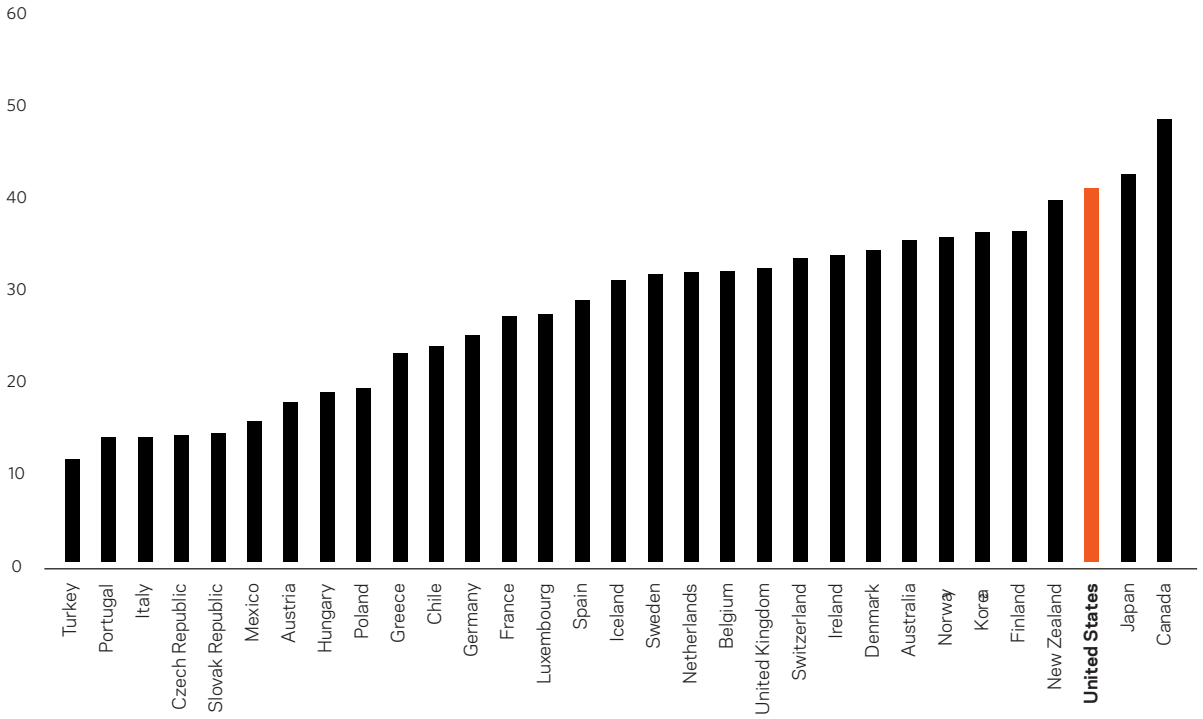
[3] "Type A tertiary education," according to the Organisation for Economic Co-operation and Development (OECD).

[4] Their shares of short-term degrees in the workforceare 24 percent and 19 percent, respectively, compared with 10 percent for the United States.

college graduates. Here, the United States ranks seventh in Bachelor's degree completion (Norway is again first) and ninth in all tertiary degrees (**Figure 2**). Forty-two percent of U.S. 25- to 34-year-olds have college degrees, far below the 55 percent college degree completion rate attained by young adults in Canada, Japan, and South Korea.

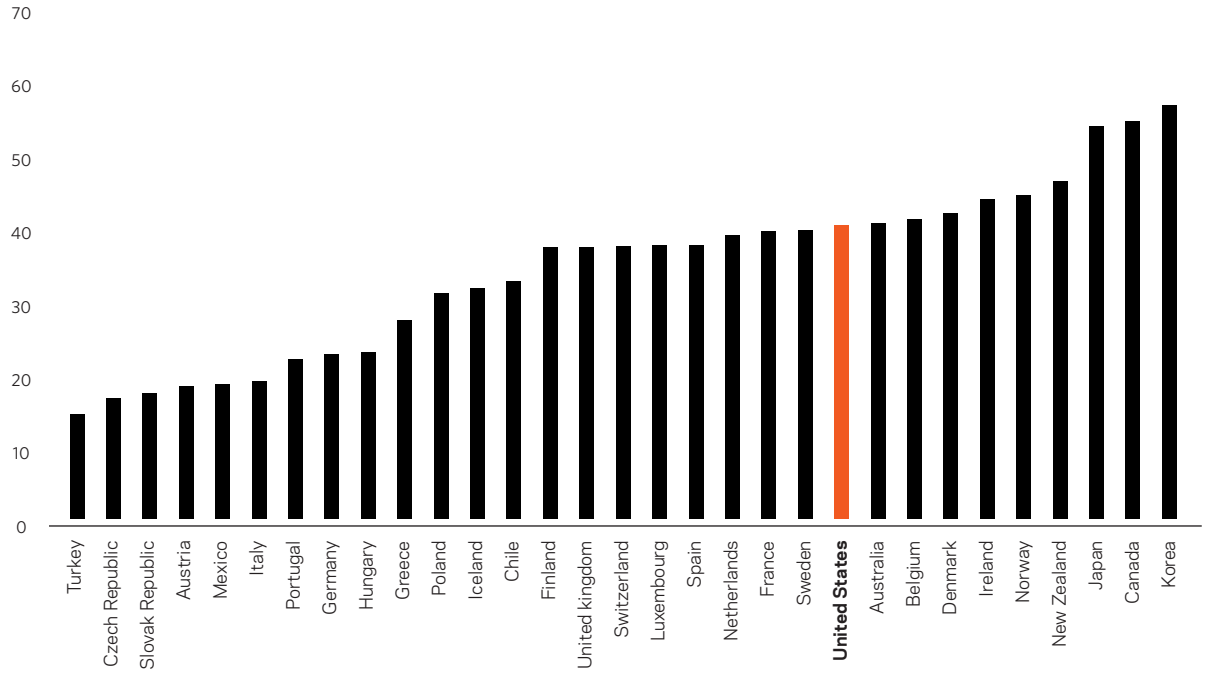
A clear trend has emerged: The United States is losing ground in postsecondary education relative to our competitors. President Obama and other leaders are rightly alarmed at our current position and have called on the nation to redouble its postsecondary education efforts to regain a competitive edge. The significance of these rankings goes beyond mere bragging rights—increasing our supply of skilled labor is central to the vitality of the U.S. economy. It is no coincidence that the expansion of American higher education occurred as the nation was enjoying economic growth and global economic domination. Education was a primary driver of that growth.

Figure 1. Attainment of College Degrees, 25- to 64-Year-Olds in OECD Countries, 2008



Source: OECD, *Education at a Glance* (2010)

Figure 2. Attainment of College Degrees, 25- to 34-Year-Olds in OECD Countries



Source: OECD, *Education at a Glance* (2010)

Section Two

High wage premiums indicate that we need more college-educated workers.

"The evidence is clear that the United States needs more, not fewer, college graduates. Proof is apparent when applying the most fundamental concept of economics: supply and demand."

The increased focus on the availability of skilled labor in the United States is not born of idle concern; the evidence is clear that the United States needs more, not fewer, college graduates. Proof is apparent when applying the most fundamental concept of economics: supply and demand. In the labor market, workers supply their services for a price (or wage) and employers demand services in the form of jobs. The "supply curve" shows that workers are willing to supply more labor at higher prices and less at lower prices. Conversely, the demand curve shows that employers are willing to hire more workers at lower prices and fewer workers at higher prices. The market clearing price, or "equilibrium," is where the two curves intersect.

Technically, there is never a shortage or surplus in the market, but an equilibrium price based on the current state of supply and demand. If goods go off the shelves faster than expected, or if their price is higher than expected, then firms will make above-average profits and expand supply, ultimately leading to a new equilibrium with more production at a lower price. Conversely, if goods are not sold at their expected price, extra stock will build up and prices will drop (sales and closeouts) to clear inventory. This situation will lead firms to produce less in the future or even lead some firms to go out of business. In either case, supply will contract to the point at which the new market price and supply will generate normal profits for the remaining firms. In the short term, there can be a shortage of goods, such as if a cereal maker does not have enough of a certain cereal brand on the shelf. However, in the long term, the company will adjust to the level of demand and prices will adjust. In the long term, technically speaking, there is no such thing as a shortage—only different levels of supply and demand, which affect the prices of goods.

The labor market is not a perfect market. It is based on personal decisions, not easily produced products. Furthermore, in the real world, politics often intrude on the labor market. State and federal governments, for example, set minimum wages, and workers can organize into unions to engage in collective bargaining relationships. Government trade policies can affect the labor market, too, through the importation of goods from abroad produced by workers who are paid lower wages. In addition, a number of economists argue that employers sometimes pay higher wages than necessary to motivate their workers and help them identify with their companies, a concept called an "efficiency" wage.

Even so, supply and demand are still the most critical of the economic laws governing labor markets.[5] Ultimately, companies enforce these economic laws by hiring workers with the skills they need to fill their job openings and earn a

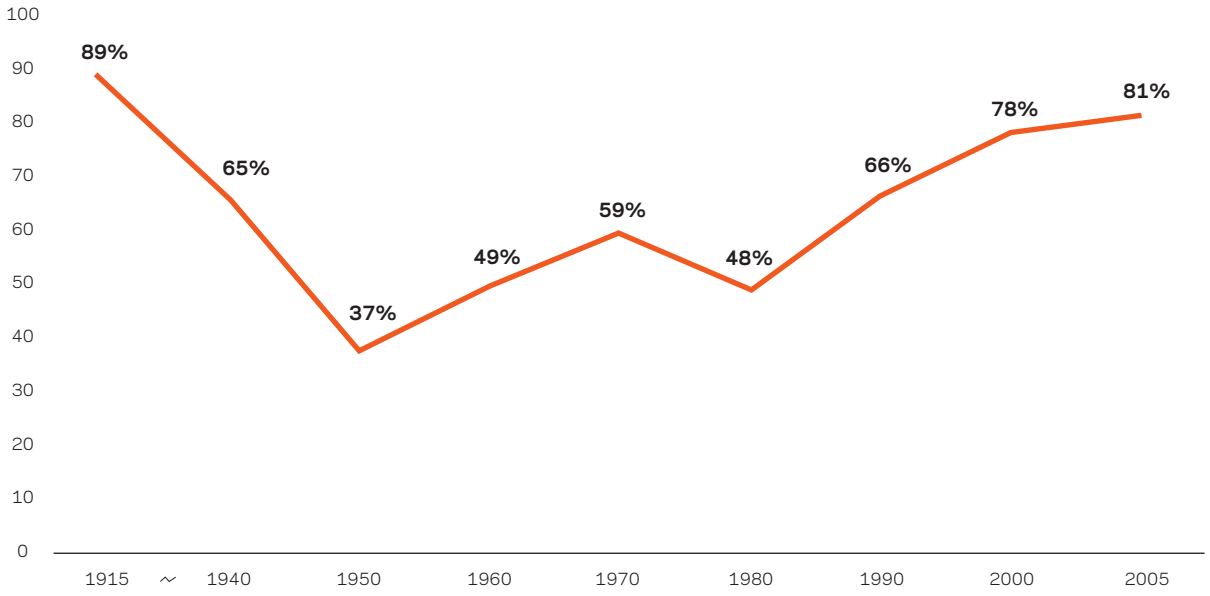
If qualified workers are in short supply relative to employer demand for them, the rational response on the part of employers is to bid up wages for the workers they want—in this case, college-educated workers.

[5] See Autor, Katz, and Kearney (2008) and Hotchkiss and Shiferaw (2010) for a quantitative proofs of this point.

healthy return on investment. If qualified workers are in short supply relative to employer demand for them, the rational response on the part of employers is to bid up wages for the workers they want—in this case, college-educated workers. This has the effect of increasing the "wage premium" that college workers make relative to less-educated workers. Today, employers are signaling that they want employees with college degrees or other forms of postsecondary training for the majority of jobs.[6] In fact, they want these employees so much that they are willing to pay Bachelor's degree holders 74 percent more, on average, than they pay workers with only a high school diploma.

This wage premium is not static, indicating that employers are responding to the market and not just hiring degrees. Historically, the wage premium has risen and fallen depending on the complex interaction between supply and demand.[7] As reported in Goldin and Katz (2008), the premium fluctuated throughout the 20th century (in **Figure 3**, the earnings of workers with a graduate degree are included with those with just a Bachelor's degree).

Figure 3. Wage Premium of Skilled versus Unskilled Labor, 1915–2005



Source: Goldin and Katz (2008)[8]

[6] Because of data limitations, we do not have complete historical data on those with two-year degrees or certificates. Although our analytic focus is on the Bachelor's degree premium, it should be remembered that there are many other people who have postsecondary education but not a four-year degree (e.g., two-year degrees, certificates, and some college but no degree).

[7] We would have liked to have tracked the Associate's/high school and Bachelor's/Associate's wage ratios, but information of those getting an Associate's degree (as distinct from some college without a degree) only became available in the Current Population Survey in 1992, by which time most of the increase in earnings inequality had occurred.

[8] "Skilled labor" is defined as all Bachelor's and graduate degree holders plus one-half of those with some postsecondary education with a Bachelor's degree (including Associate's degrees). "Unskilled labor" is defined as those who did not complete high school, those with a high school degree and no postsecondary education, and the other half of those with some postsecondary education.

In 1915, there were few college graduates, and they tended to be business leaders with earnings much higher than less-educated rank-and-file workers. As the Great Depression dawned and jobs were hard to come by, the number of college-going young adults increased. That increase in supply, combined with wage and price controls related to World War II, contributed to a dramatic fall in the skilled-to-unskilled wage premium to just 37 percent by 1950. From there, though, the premium began climbing again, fueled by strong economic growth in the postwar years, hitting 59 percent by 1970. Over the next decade, the supply of college-educated workers spiked as waves of highly educated (by historical standards) baby boomers entered the workforce and, predictably, the wage premium dropped in tandem. From 1980 on, however, both the supply of college-educated workers and the wage premium paid to them continued to grow as the spread of information technology fueled a skyrocketing demand for college level skills throughout the economy.

Since we know the change in supply of educated workers over these years and the relative price of skilled versus unskilled labor, we can use the supply and demand model of Autor, Katz, and Kearney (2008) to compute the change in "relative demand" for skilled workers.[9] **Figure 4** shows the nearly parallel growth of supply and demand for college-educated workers (25-64 years old) from 1915 to 2010. The data on this chart represent the relative position of supply and demand for college talent each year, as compared with 1970 conditions (set to zero).

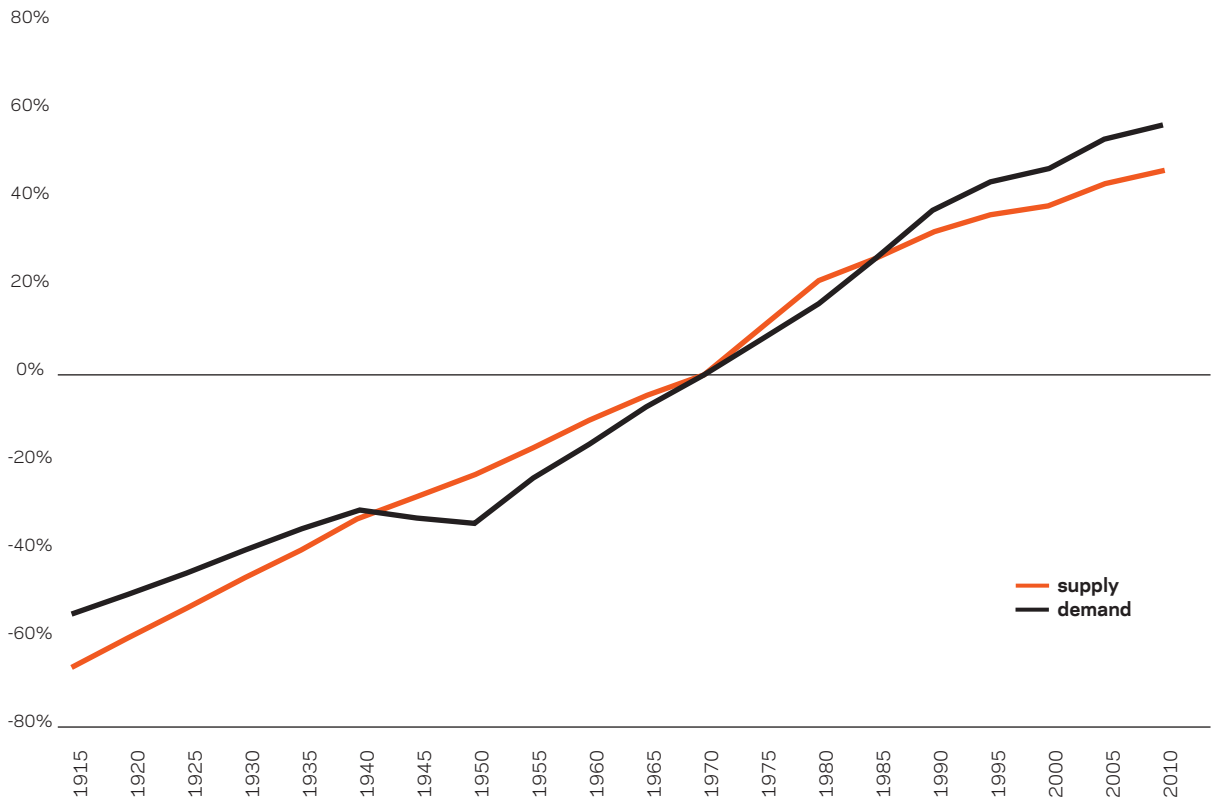
In 1890, just 4 percent of workers had earned a high school diploma; by 1915, this figure rose to 16 percent. This means that, in 1915, approximately 6 percent of workers had ever attended school after high school.

The education of the workforce has risen steadily for two reasons. First, younger people are completing more schooling than previous generations. Second, these more highly educated young workers replace retiring workers who have much less education. From 1915 to 1990, the supply of college-educated workers in the workforce rose steadily by 3.1 percent a year because of both of these factors. Starting in 1985, however, the increase in youth college-going compared with their immediate predecessors slowed down to a crawl. But the net replacement of less educated retirees with more highly-educated young people still means that the relative supply of college-education in the work force grew by 2.5 percent a year from 1980 to 1990.

As the workforce gradually became more educated, however, adding more beyond what was there after 1990 became more difficult because the education of retirees was progressively higher and the difference between the educational levels of new entrants and that of retirees shrank. Consequently, from 1990 to 2000, the supply of college-educated workers rose by 2.0 percent a year and fell to 1.0 per year from 2000 to 2010. The movements of demand follow a different logic. Depression and war in the early twentieth century resulted in slow-

[9] This figure is based on a logarithmic scale which means that the numbers of different years can be understood as the percent difference from 1970 conditions. In others words, in 1915, relative supply of college-educated labor in the work force was 68 percent less than the 1970 ratio of college-educated to non-college labor (while the relative demand in 1915 was at 55% lower than it was in 1970).

Figure 4. The March of Supply and Demand for College-Educated Workers Relative to 1970 Conditions, 1915-2010

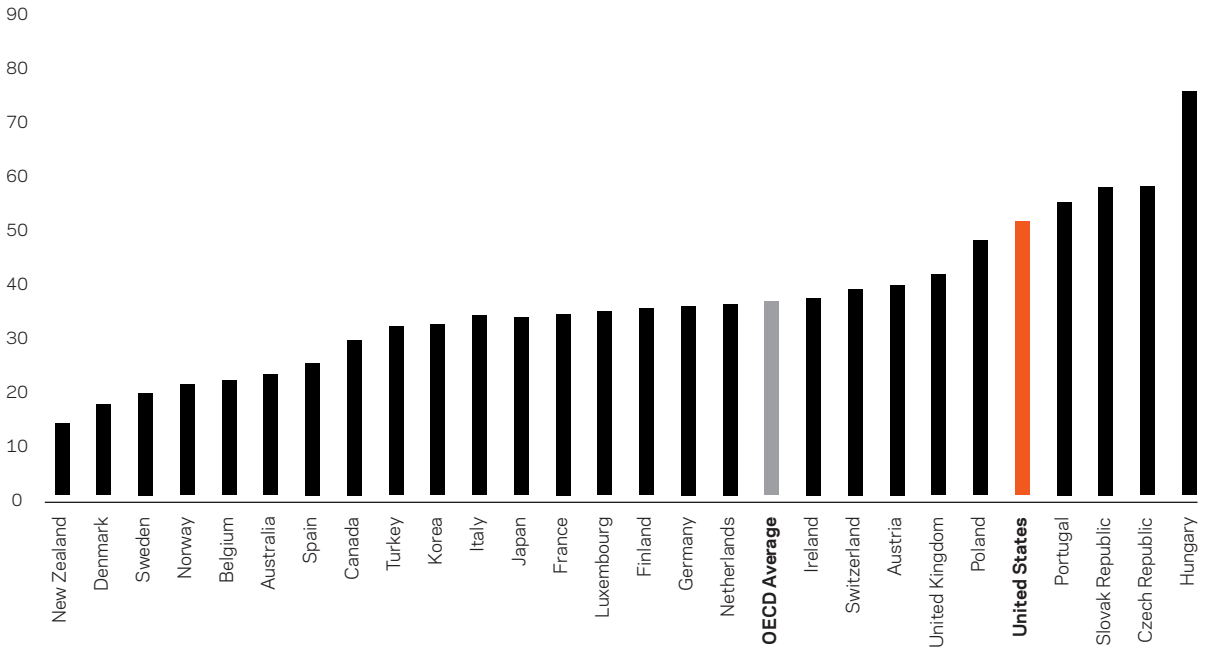


Source: Goldin and Katz (2008)

growing demand for skilled workers in those years, even as more young people stayed in school longer. Relative demand for skilled labor grew by 1.7 percent per year from 1915 through 1950. Starting in 1950, the long boom of the fifties and sixties was followed by the computer and internet revolutions starting in the 1980s. The yearly growth of demand between 1950 and 2005 was an impressive 3.6 percent.

These numbers demonstrate that increasing demand for more skilled workers has a long, consistent history and is not solely based on the more recent history of rising computerization. Further, the interaction of supply and demand explains the movements of the skilled labor premium shown in **Figure 3**. In particular, it explains the rise in the Bachelor's to high school wage premium (which is not exactly the skill

Figure 5. Bachelor's and Above to High School Wage Premium, OECD (1998-2008 average)



Source: OECD, 2010

premium) from 40 percent in 1980 to 74 percent today. If demand continues to grow at 2.0 percent and our supply follows trend, the wage premium will grow to 96 percent by 2025.

Finally, it is worthy of note that other industrialized countries have seen the same rise in relative demand. No one has done as comprehensive a study on these countries as has been done for the United States, but we can compare the relative earnings on the basis of educational attainment. Although the same forces are affecting our economic competitors, they were increasing their supply of college-educated workers at a much faster rate. Consequently, as **Figure 5** shows, the Bachelor's to high school wage premium in the United States in 2010 was much higher than the average of all OECD countries. In fact, only four small countries besides the United States had Bachelor's to high school wage premiums above 70 percent (or even 60 percent)—the Czech Republic, Hungary, Portugal, and the Slovak Republic.

Section Three

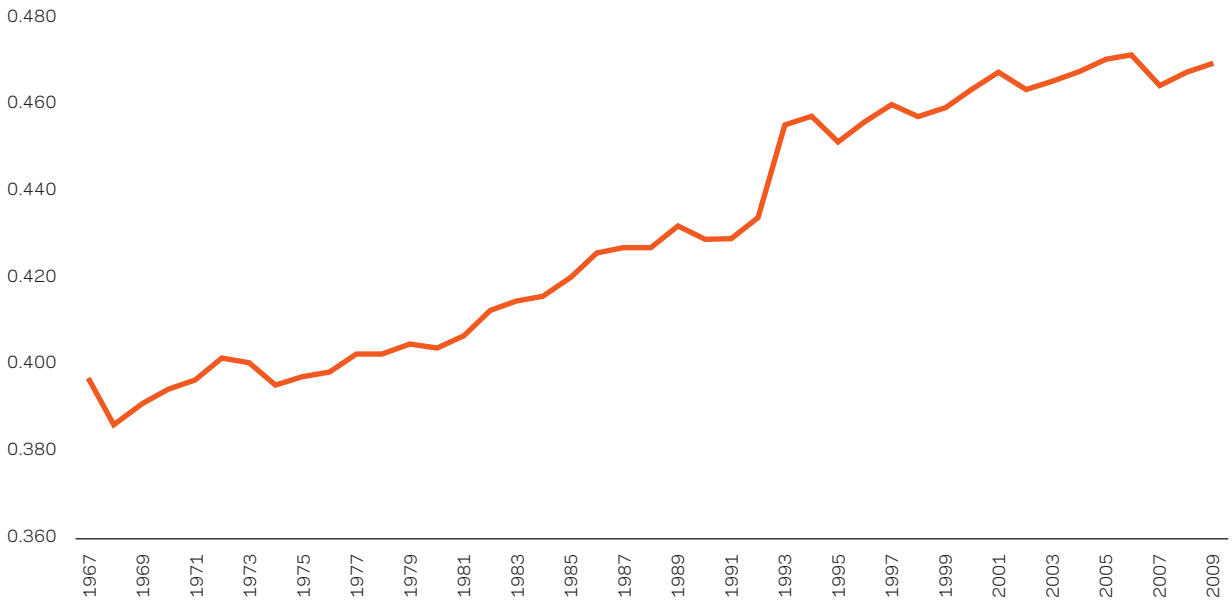
Income inequality is driven largely by access to college.

"One notable drawback to rapidly growing wages for more highly educated workers has been the concomitant rise in income inequality in the United States since 1980."

One notable drawback to rapidly growing wages for more highly educated workers has been the concomitant rise in income inequality in the United States since 1980. As earnings are the major component of household incomes, it is not surprising that the trends in income inequality follow the trends in earnings inequality. Starting from the end of World War II through 1973, income inequality remained very stable. With the full implementation and expansion of Social Security, gains at the bottom of the income ladder were actually slightly greater than the gains in income at the median level.

As **Figure 6** shows, inequality (as measured by the Gini Coefficient)[10] started to jump in 1982, after varying only slightly from 1967 to 1981.[11] This is largely in keeping with the trend in the Bachelor's to high school wage premium. Earnings based on educational attainment changed during these same years: In 1979, those with a Bachelor's degree earned 40 percent more than those with a high school diploma and no postsecondary education: $44,792 versus $31,952 (in 2005 inflation-adjusted dollars). By 1999, that wage premium had risen to 72 percent, with earnings of workers with Bachelor's degrees rising to

Figure 6. Gini Coefficient for Household Incomes: 1967–2009



Source: Census Current Population Reports (2010).

[10] The Gini coefficient is the most common measurement of inequality. A value of 0 would express total equality, and a value of 1 would express maximal inequality.

[11] Income information was first available in the Current Population Survey in 1967.

$52,668 and those of workers with high school diplomas only falling to $30,586. By 2005, earnings had risen for both groups of workers, but the Bachelor's degree to high school wage premium had still increased modestly to 74 percent ($54,502 to $31,242).

If we agree that this 74 percent premium is too high—both because it is a signal that the economy is underproducing college graduates and because of its contribution to wage inequality—the problem becomes judging what level would sufficiently addresses both issues. We settled on a Bachelor's degree to high school wage premium level of 46 percent for three reasons:

- This was the average premium rate for a Bachelor's degree over a high school diploma from 1950 to 1970 in the United States.
- Forty-six percent represents a 10 percent rate of return for each of the four years of college attendance (compounded), high enough to still make borrowing money to attend college a good investment.
- This level of wage premium is consistent with the premium level in many other industrialized countries with more educational attainment, including Australia, Finland, France, Germany, and the United Kingdom (see **Figure 5**).

We believe that workers should be rewarded for their efforts and hard work in college, and we believe that 46 percent strikes the proper balance between an appropriate return on their investment in postsecondary education and the importance of shared prosperity to stability and fairness in our society. How would this 46 percent premium affect wage inequality? At 2009 levels, the earnings of the 90th percentile were 428 percent higher than earnings at the 10th percentile. Lowering the Bachelor's degree to high school wage premium drops that percentage significantly but does not eliminate the advantages of a college degree. If the Bachelor's to high school wage premium was at a more healthy 46 percent of earnings in 2009, the 90th percentile would still be 376 percent higher than earnings at the 10th percentile.

We believe that 46 percent strikes the proper balance between an appropriate return on investment in postsecondary education and the importance of shared prosperity to stability and fairness in our society.

The remaining question is, what it would take to bring the wage premium down to 46 percent? The answer goes back to supply and demand. Until the economy's demand for workers with postsecondary education is met, the wage premium will continue to rise or not come down appreciably. That means producing more workers with postsecondary credentials.

Section Four

But—are there too many college graduates already?

"With many college graduates unsuccessful in finding work in the current economic climate, the temptation to reject post-secondary education as a viable economic option grows stronger, especially among working families for whom college costs are always a stretch."

For decades, it has been conventional wisdom among parents that they should encourage their children to attend college. In 2002, a government study underscored the importance of this point when it reported that those with a four-year degree had lifetime earnings of $2.1 million versus $1.2 million for those with only a high school diploma (U.S. Census, 2002).[12] However, with many college graduates unsuccessful in finding work in the current economic climate, the temptation to reject postsecondary education as a viable economic option grows stronger, especially among working families for whom college costs are always a stretch.

As a result, some commentators continue to insist that we have more college graduates than we need. The media has also participated by giving a platform to these arguments. In 2010, *The New York Times* ran "Plan B: Skip College," while The Washington Post ran "Parents Crunch the Numbers and Wonder, Is College Still Worth It?" Even *The Chronicle of Higher Education* has succumbed, recently running "Here's Your Diploma. Now Here's Your Mop," a story about a college graduate working as a janitor that implied college does not pay off in hard times. [13]

Indeed, commentators have been opining for decades that we are overeducated. In 1976, Richard Freeman published *The Overeducated American*, in which he argued that the United States was producing too many college graduates. The main indicator that he used to prove this point was that the growth of earnings for those with Bachelor's degrees was anemic relative to the growth of earnings of those with just a high school diploma in the early 1970s. Consequently, it seemed logical to conclude at the time that we were "overeducating" our young people relative to the needs of the 1970s economy.

What Freeman could not have foreseen was that it turned out that the 1970s were an aberration because of the entry into the labor market of a large number of baby boomer college graduates who had very little work experience. Starting in the 1980s, the Bachelor's degree wage premium skyrocketed, indicating that supply was not growing fast enough to meet the growth in demand. The wage premium currently stands at 74 percent, a historically high rate that implies the economy would benefit substantially from additional workers with a Bachelor's degree.

Arguments that we are overproducing college graduates often center on the skills used in various jobs. Those who argue that there are too many workers with college degrees focus on two similar but distinct points: (1) many of these workers are "malemployed" in low- to middle-skill

It turned out that 1970s were an aberration because of the entry into the labor market of a large number of baby boomer college graduates who had very little work experience.

[12] In a forthcoming report, we have updated these numbers using 2009 data. A Bachelor's degree now earns $2.7 million over a lifetime—84 percent more than workers with only a high school diploma. See Carnevale, Rose, and Cheah, 2011.

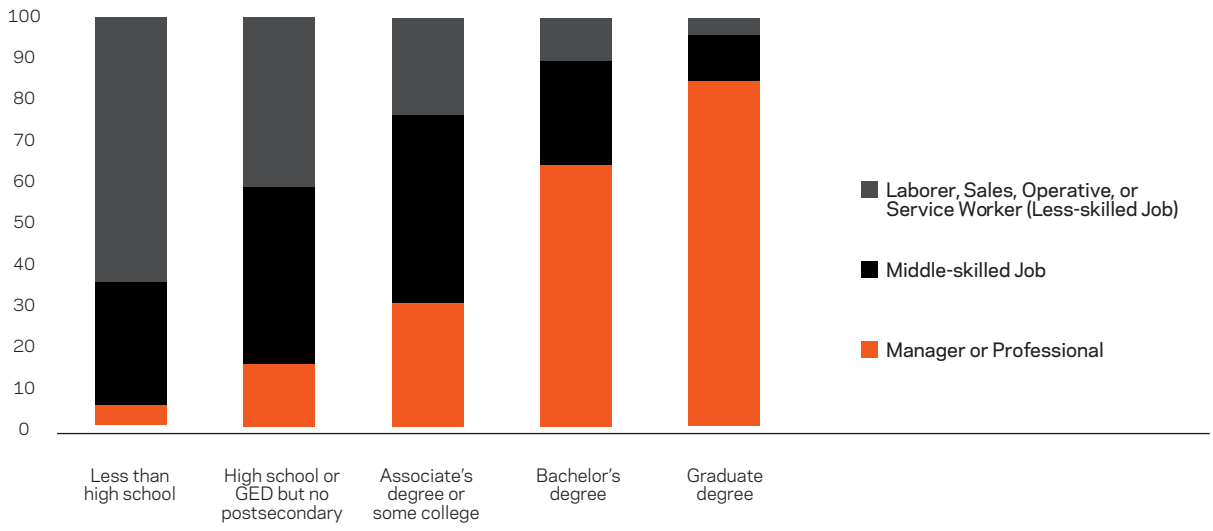
[13] These articles, and others like them, are also concerned with the growing costs of college and the decisions prospective students will make with regard to debt. Appendix 3 gives more detail on accounting for the costs of college, and still finds that college is worth it.

jobs for which a degree is unnecessary (taxi drivers, for instance);[14] and (2) many jobs that are composed mainly of workers with Bachelor's degrees do not require these credentials (e.g., insurance salesman).

If we believe that employers are acting rationally, however, neither argument holds up. To test whether there are too many college graduates, we analyzed pay in specific occupations that employ both workers with Bachelor's degrees and workers with only high school diplomas. To simplify the analysis, we divided jobs into three tiers: managerial and professional jobs, middle-skill jobs (e.g., skilled blue collar workers, technicians, police officers, firefighters, line supervisors, and clerical workers), and less-skilled jobs (e.g., workers at factories, construction sites, retail outlets, and service businesses).[15] These groupings are meant to be hierarchical, and the median earnings among full-time, full-year workers from 2007 to 2009 were $55,000 for managerial/professional workers, $39,310 for middle-skill workers, and $28,212 for less-skilled workers.

As **Figure 7** shows, highly educated workers are more likely to be in the top tier of managers and professionals and less likely to be in the lower tier of unskilled workers. But there are people at each education level employed in each of the three tiers. Among those with a high school diploma and no college, 17 percent were employed in

Figure 7. Occupational Employment by Educational Attainment for Full-time, Full-year Workers, 2007–2009



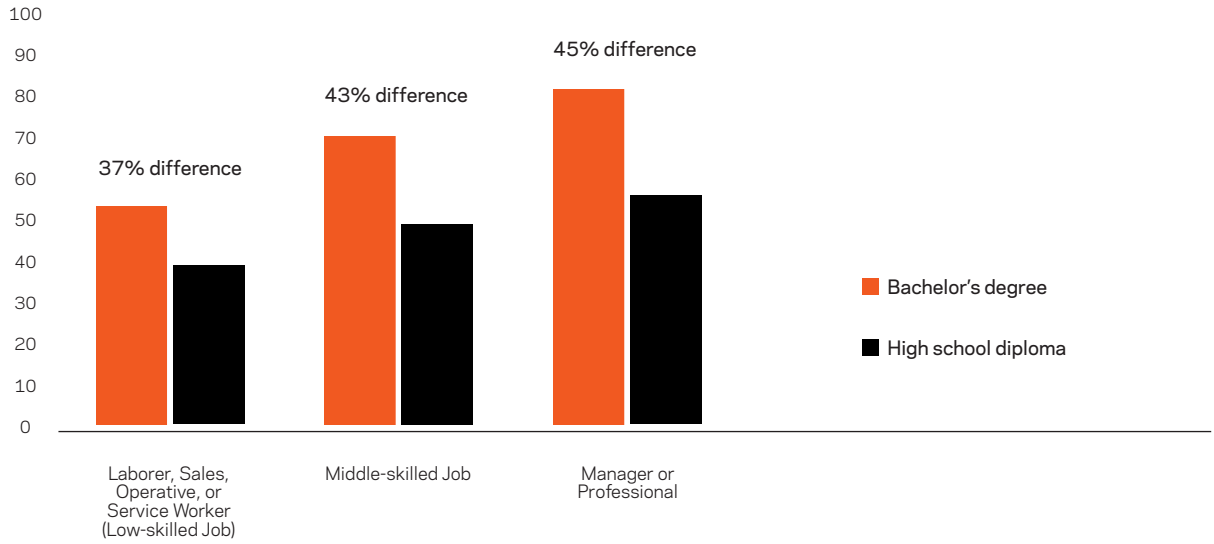
[14] For a more technical and narrower definition of overeducation, see Rubb (2003).

[15] See Carnevale and Rose (1998) for a detailed description of how these occupations were grouped.

managerial/professional jobs, 43 percent in middle-skilled jobs, and 41 percent in less-skilled jobs. By contrast, among workers with a Bachelor's degree, 65 percent were in managerial/professional jobs, 25 percent in middle-skilled jobs, and 11 percent in less-skilled jobs.

The data demonstrate how rare it is for high school graduates to become managers and professionals (just 17 percent), implying that some postsecondary education is a prerequisite for entry into most of these jobs. However, the fact that at least one in three Bachelor's degree holders are in jobs that do not require a four-year degree mistakenly seems to support the notion that these workers did not have earnings gains from finishing their four-year degree (i.e., that their degree "wasn't worth it" and/or that they "don't need it"). **Figure 8**, however, indicates just the opposite. It shows the median earnings of full-time, full-year workers in the occupational tiers for those with only a high school diploma and those with a Bachelor's degree. *Within* each occupational tier, those with Bachelor's degrees earn between 37 to 45 percent more than those with only high school diplomas.[16] In fact, the median earnings of workers with a Bachelor's degree in less-skilled jobs (the bottom 11 percent of workers with a Bachelor's degree) are just slightly below the median earnings of high school diploma workers in elite jobs (the top 7 percent of only high school workers). The median earnings of workers with a Bachelor's degree in middle-

Figure 8. Median Earnings by Occupational Tier and Educational Attainment, 2007–2009



[16] Some people believe in Thurow's "job competition" model, in which pay is connected to the job and not the quality of the individual worker. Therefore, workers with a Bachelor's degree earn more than workers with only high school diplomas because employers hire them for the best-paying job. The fact that there is a large wage premium within jobs undercuts the premise of this approach.

skill jobs are 25 percent higher than those of high school workers in elite jobs.

The conclusion drawn from the data is that job clusters do not completely reflect pay. For example, a police officer is considered a middle-skill job, but officers with a Bachelor's degree earn 30 percent more than those with just a high school diploma. Much of this gap is related to more employees with Bachelor's degrees working in higher-paying jobs on the police force, such as detectives or supervisors. Another example is a self-employed plumber or other craftsperson who earns more than many college graduates.

There are various reasons for the discrepancies in pay beyond postsecondary attainment, however. Some of these discrepancies are due to the fact that occupations may have the same names but represent very different bundles of tasks. Some is due to the fact that some employers pay more than others (Holzer, et al., 2011). Some of the discrepancy relates to the industry in which one works. But it is important to remember that while access to postsecondary education is crucial, so is access to learning on the job. Employer investment in learning is roughly equivalent in size to the entire postsecondary system (Carnevale, Smith, and Strohl, 2010). Sometimes a job is the best teacher.

Nonetheless, it is true that people with college degrees do better than others in very similar positions. In other words, many workers with a Bachelor's degree in "non-college jobs" transform these jobs into positions that utilize their skills, such that their jobs come to resemble jobs that require a Bachelor's degree.[17]

Still, the data suggest that roughly 15 percent of workers with Bachelor's degrees have not been able to translate their skills into labor market success. This is a diverse group. The group also includes some immigrants who have trouble using their credentials to get professional jobs in the United States, some people moving between jobs, some people with physical disabilities or drug and/or alcohol problems, some people with mental illness, and some people who become enamored with a less-stress, low-paid manual position.

Table 3 presents a series of narrow job occupation titles across the job market: Some are heavily populated with workers with a Bachelor's degree and others that do not have many workers with a Bachelor's degree. This list is meant to provide examples where postsecondary skills led to higher earnings relative to workers with only a high school education in the same narrow field. The number of occupations in which there is a low wage premium is small, and these tend to be low-skill or very job-specific skill occupations (such as skilled blue collar workers).

The first group of jobs in this table consist mainly of "Bachelor's degree jobs": those where a plurality of workers have a Bachelor's or graduate degree. Among insurance agents, for example, 80 percent have attended college and nearly 50 percent have at least a four-year degree. By contrast, in 1959, half of insurance agents had only a high school education and only 23 percent had a four-year degree. Furthermore, there was not much leeway in the job, as college-educated insurance agents made only 10 percent more than their high school-educated counterparts. The preponderance of

[17] Harrington and Sum (2010) find a much smaller premium for "malemployed BA workers" relative to the earnings of all high school-educated workers. We were unable to obtain their methodology and therefore 'could not determine where our two approaches differed. However, we used full-time, full-year workers where they do not, and this difference probably explains some of the increase in the wage premium over high school-educated workers.

Table 3. Bachelor's Degree and High School Graduates in Specific Job Titles

Detailed occupation	Share with Bachelor's degree	Share with high school diploma	Bachelor's degree wage premium
BACHELOR'S DEGREE JOBS			
Marketing and sales managers	48.2%	11.7%	**43.5%**
Insurance underwriters	47.8%	16.8%	**39.6%**
Clinical laboratory technologists and technicials	44.2%	12.6%	**62.3%**
Sales representatives, wholesale and manufacturing	39.4%	22.3%	**63.8%**
Insurance sales agents	39.4%	17.8%	**50.0%**
Real estate brokers and sales agents	36.3%	17.9%	**46.8%**
Medical and health services managers	35.5%	9.0%	**82.3%**
Purchasing managers	34.7%	17.2%	**49.4%**
MIDDLE SKILL JOBS			
Dental hygienists	33.8%	6.9%	**75.9%**
Wholesale and retail buyers, except farm products	32.4%	25.0%	**67.0%**
Property, real estate, and community association managers	29.9%	26.1%	**70.7%**
Police officers	29.5%	18.0%	**30.0%**
Travel agents	27.2%	21.1%	**33.3%**
Reservation and transportation ticket agents and travel clerks	25.8%	31.2%	**53.8%**
Loan interviewers and clerks	22.4%	32.9%	**47.7%**
Diagnostic related technologists and technicians	20.8%	7.8%	**42.9%**
Bartenders	20.5%	32.7%	**36.9%**
LOW SKILL JOBS			
Retail salespersons	19.9%	37.5%	**54.1%**
Fire fighters	19.6%	22.3%	**25.5%**
Insurance claims and policy processing clerks	19.6%	32.6%	**20.5%**
Counter and rental clerks	18.3%	42.1%	**73.3%**
Customer service representatives	17.9%	34.0%	**32.2%**
New accounts clerks	14.3%	40.8%	**43.1%**
Telemarketers	14.0%	41.3%	**68.3%**
Waiters and waitresses	10.5%	41.2%	**34.3%**
Cashiers	7.7%	47.5%	**55.6%**
Hairdressers, hairstylists, and cosmetologists	6.9%	38.6%	**69.1%**

college-educated workers among insurance agents today has led some to conclude that college-level skills are not needed and that employers are just hiring the credential without regard to actual need. The problem with this argument is that among insurance sales agents today, workers with a Bachelor's degree earn 50 percent more than workers with only a high school diploma. If employers are acting rationally—and there is no reason to doubt that they are—then employers must be paying for the added benefits of hiring more highly educated workers.

Table 3 also shows other middle-skill and low-skill jobs in which having a four-year degree is not traditionally considered a requirement. Yet college graduates in these jobs earn considerably more than high school–educated workers in the same positions. College-educated workers in these jobs are often concentrated in the higher-paying subfields within these job categories. Even when the titles are the same, the actual job tasks are different and even when the job tasks are very similar, workers with a Bachelor's degree often prove themselves to be more valuable to their employers.

Overall, the Bachelor's to high school wage premium can be attributed to workers with a Bachelor's degree landing more often in managerial and professional jobs; being more likely to work in higher paying middle-skill jobs; and being more likely to earn more within narrow job titles. Unless we concede that employers are paying more to some than to others for the same skill sets—an irrational economic action—it becomes clear that workers with a Bachelor's degree are able to translate their added skills into higher pay. Further, jobs that were once held by workers without college degrees decades ago have been transformed to require many more skills, as evidenced by a wage premium in those positions.

Overall, the Bachelor's to high school wage premium can be attributed to workers with a Bachelor's degree landing more often in managerial and professional jobs; being more likely to work in higher paying middle-skill jobs; and being more likely to earn more within narrow job titles.

Finally, while many employers use college degrees as necessary requirements for being hired, this "sheepskin effect" has a logical basis. Since job recruitment can be hit or miss at identifying the best workers, employers often use educational credentials to maximize the chances of finding skilled employees. As long as college-educated applicants have higher analytical and technical skills than applicants without degrees, employers minimize their search costs by using degrees as a hiring screen. However, once in the job, employers look to the production of each individual worker in rewarding promotions and pay advances. It is unlikely that employers would continue to use degrees as an indicator of performance if doing so did not consistently give them the results they wanted.

Section Five

How many more college graduates do we need for efficiency and equity purposes?

"Today, about two-thirds of young people in their late teens attend college for at least a year. We estimate that to meet the demand for more skilled workers and to keep the Bachelor's degree to high school wage premium at 46 percent, the number of youth attending college for at least a year will need to rise to 86 percent by 2025."

If supply and demand work as economists predict, then the question remains why market signals (i.e., the wage premium) have not led more young people to attend and complete college. In fact, there are more than half a million students who graduate in the upper half of their high school graduating class who don't get either a two- or four-year degree (Carnevale and Strohl, 2010). The true but unsatisfying answer is that there are a host of social and economic reasons that even qualified students don't enroll or complete college degrees.

However, for students who are less successful in high school, the decision not to enroll in college or to drop out may be reasonable, given their past experiences in school. Every decision individuals make cuts off another potential choice. If these students decide to pursue a four-year degree and fail to obtain one, they are passing up the opportunity to start work directly out of high school, which would then permit them to gain experience and find a better job. Furthermore, they might be passing up or delaying the opportunity to learn useful job skills by pursuing a certificate in a vocational, business, or trade school.[18] In other words, pursuing a Bachelor's degree and failing to obtain one has real costs to the student, not only in terms of the financial cost of attending college, but in terms of delaying the acquisition of appropriate job skills.

Athreya and Eberly (forthcoming) empirically model the decision-making process of high school students with low grades and hence low chances of successfully earning a degree.[19] They find that, even though the reward of obtaining a degree is high, the "risk-adjusted" returns are lower, leading many prospective students to make the "rational" choice to enter the labor market immediately after high school and not pursue postsecondary education. This is also applicable to adult students who see too much risk and not enough reward in returning to college for skill enhancement.

Any strategy to increase the number of college graduates must be based on improving the quality of graduating high school seniors; otherwise, we cannot produce the additional college graduates needed to meet the desired goal.

These findings suggest that any strategy to increase the number of college graduates must be based both on (1) removing barriers to degree completion for qualified students, and (2) improving the quality of graduating high school seniors. Otherwise, we will not be able to produce the additional college graduates needed to meet our desired goal of a 46 percent wage premium. Our calculations to attain 46 percent assumes that a strategy that accounts for these youth is both possible and desirable.

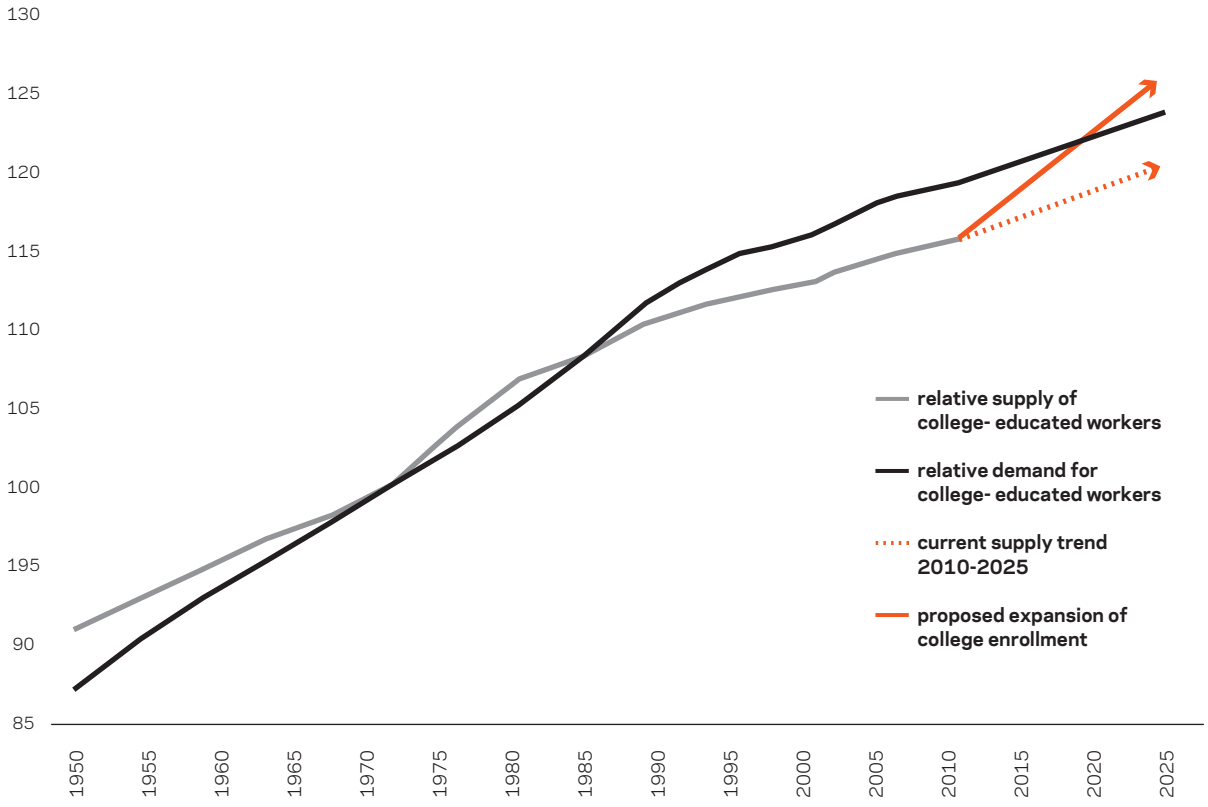
[18] See also Carneiro and Heckman (2010).

[19] In *Pathways to Prosperity* (2011), researchers from the Harvard Graduate School of Education deal with the lack of preparation of many high school graduates by suggesting that they pursue technical and vocational certificates.

If we continue following current trends, there will be 8 million more postsecondary-educated workers by 2025.[20] Without intervention, then, we will see a yearly supply gain of 1 percent. By 2025, the new educational division of workers would be 34 percent with at most a high school diploma, 32 percent with some college but no four-year degree, and 34 percent with a Bachelor's or graduate degree.

To determine whether this increase will be enough to move the wage premium to 46 percent, we need to estimate the growth in demand for college-educated workers between 2010 and 2025. One option is to look at the long-term trend in the rise of demand for college talent. From 1915 to 2005, this figure grew by 2.8 percent per year. However, the share of workers with a Bachelor's degree was very low in 1915

Figure 9. Supply and Demand with Two Paths Forward to 2025



[20] We chose 2025 because that much time would be needed to realistically increase the supply of college-educated labor to meet technological need and reduce the Bachelor's degree to high school wage premium.

and reached 30 percent in 2005. Going forward from 30 percent is likely to be different, and more difficult, than moving up to 30 percent.

Consequently, we estimate that relative demand will only increase at 2.0 percent per year between now and 2025. The dotted red line in **Figure 9** shows supply rising by 1 percent a year, resulting in an increasing gap between it and the yearly 2 percent rise in demand. We project that this scenario, in which demand grows at a faster rate than supply for fifteen years, will result in the Bachelor's degree to high school wage premium rising to 96 percent.

We estimate that to meet the demand for more skilled workers and to reduce inequality, the number of young people attending college will need to rise from 66 percent today to 86 percent by 2025.[21] As **Figure 10** shows, the share of young adults with a college degree will also rise to 60 percent—46 percent with a Bachelor's degree and 14 percent with an Associate's degree. As the red line on **Figure 9** shows, this projected growth represents a 2.6 percent yearly rise in the supply of college-educated workers, an increase over the current yearly growth of 1 percent. While 2.6 percent is higher than the recent growth rate of college workers, it is lower than the 2.9 percent yearly growth rate that existed between 1915 and 2010.

We estimate that to meet the demand for more skilled workers and to reduce inequality, the number of young people attending college will need to rise from 66 percent today to 86 percent by 2025.

If we attain a 2.6 percent growth rate, three-quarters of the labor force would have at least some postsecondary education—34 percent having obtained an Associate's degree or attended some college, and 41 percent having obtained a Bachelor's degree. That would mean adding 15 million workers with Bachelor's degrees above current levels and 5.3 million additional workers with some college (including about 1.4 million additional workers with Associate's degrees). Since even without our intervention, the current trend of increasing college attendance would result in 8 million new college-educated workers, our preferred path requires producing an additional 12 million people with postsecondary attendance over 15 years.

Finally, if this alternative path is adopted, GDP will be $500 billion higher than current projections and there will be earnings increases across the board even though the earnings gaps between Bachelor's degree holders and high school educated workers will decline. **Figure 11** projects the average increase in earnings by education level. Earnings of workers with a Bachelor's degree would rise by 6 percent (from $56,138 to $59,329 [2010 dollars]) and the

[21] Appendix 2 traces the year by year changes in BA attainment and the share of young people going from high school to postsecondary. Because not every college graduate enters or remains in the labor force, adding 15 million additional workers with Bachelor's degrees to the workforce would actually require about 18 million additional college graduates.

Figure 10. Share of Credientials Among Youth Ages 25-30 in 2010 and 2025

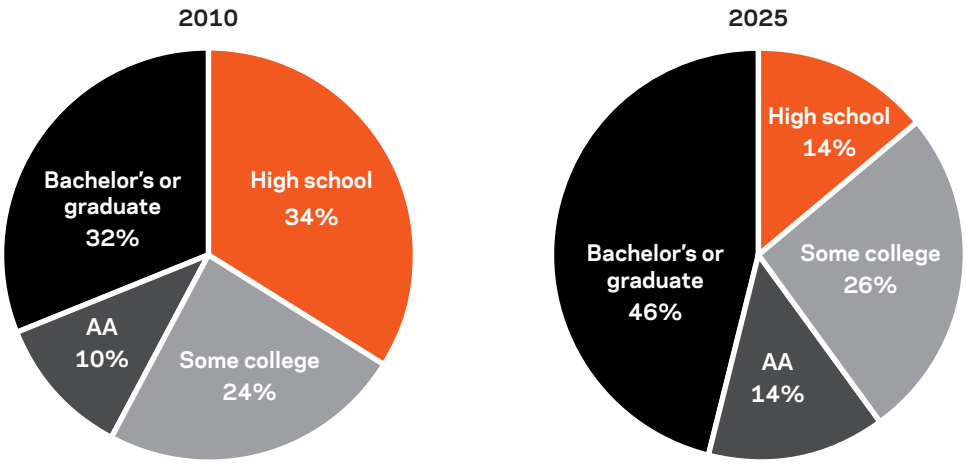
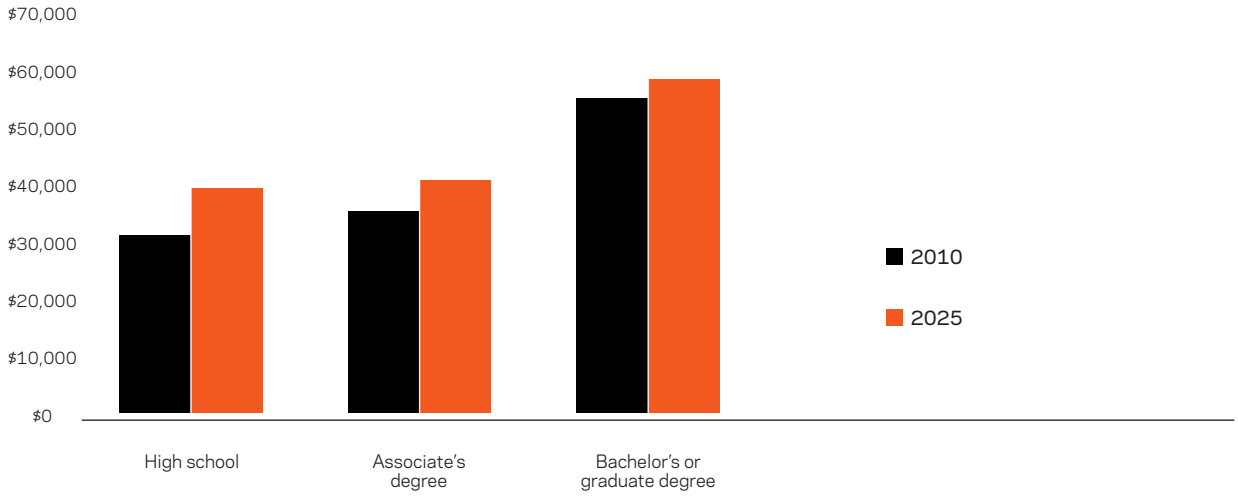


Figure 11. Change in Earnings by Attainment Level



earnings of workers with only a high school diploma would rise by 24 percent (from $32,179 to $40,003), which would bring the wage premium down to 46 percent. For those with an Associate's degree, earnings would rise 15 percent (from $36,160 to $41,584).

Given the declining earnings of male high school graduates over the past 30 years, our predicted 24 percent rise in real high school earnings may seem improbable. But the supply and demand conditions for less-skilled workers will be very different under our 2025 scenario: Output per worker will be 25 percent higher than it is today, and the share of the labor force with only a high school diploma or less will decline from 40 percent to 25 percent, making high school workers more scarce. High school workers' scarcity will result in higher wages. Further, as part of meeting the goal of producing more college graduates, we specified that the quality of the K-12 system would have to increase; therefore, the quality of the non-college-educated group in 2025 is likely to be higher than their counterparts today. Therefore, our projected higher wages for high school graduates reflect both higher skills and a large decline in supply.

Conclusion

Getting an additional 20 million postsecondary-educated workers will be difficult, but is not beyond our capacity.

"If we do nothing, current trend will produce 8 million college graduates. Adding an additional 12 million over fifteen years is an attainable goal, as it represents less than a million additional students per year."

Two of the most pressing challenges facing the United States in the coming decades are remaining competitive in the global economy and ensuring that we follow through on the promise of a decent living wage to those willing to work for it. Helping more students complete their college degrees is one way to address both of these challenges.

Reaching our goal of 20 million additional postsecondary-educated workers in 2025 is not an impossible, or even improbable, task. If we do nothing, current trend will produce 8 million college graduates. Adding an additional 12 million over fifteen years is an attainable goal, as it represents less than a million additional students per year. There is clearly room to grow, as many students who are capable of college-level coursework never enroll in college. Moreover, most European countries have higher educational attainment levels than we do in the United States. There is no reason to think that these countries have an inherently more capable population. Attaining 20 million more will put us back in the ranks of other developed nations in terms of educational attainment.

Still, just because it is possible does not mean it will be easy. First, it will take political will and commitment from various actors. In this budgetary climate, this is a lot to ask for, but is not out of reach. Moreover, attaining 20 million additional college-educated workers will require higher performance from all of our educational institutions. Although we have focused on easily quantifiable metrics such as the number of workers with four-year degrees, the increased number of people with some college but without a four-year degree is just as important.

By increasing the number of people in the workforce with postsecondary credentials to 20 million, we will not only have a more competitive economy, we will also have more equitable prosperity.

However, beyond the immediate and obvious benefits to our economy, meeting the goal of an additional 20 million postsecondary-educated workers is likely to have wider repercussions for our entire society. We have established that meeting this goal of an additional 20 million postsecondary-educated workers by 2025 will have a profound effect on the Bachelor's degree to high school wage premium, making the return to earnings on education a more reasonable 46 percent and reversing wage inequality. We believe that this is a desirable outcome. By increasing the number of people in the workforce with postsecondary credentials to 20 million, we will not only have a more competitive economy, we will also have more equitable prosperity—and the American dream will come within reach of millions more of our citizens.

Appendix 1: Methodology

The statistical framework presented in Autor, Katz, and Kearney (2008) is based on a simplified model of how the economy functions based on skilled and unskilled labor (a "constant elasticity of substitution production function" in which the earnings of each group of workers equals their marginal product). Their supply and demand framework is based on dividing the economy into two groups: skilled workers (those with a Bachelor's or graduate degree plus half of workers who have attended college but not received a Bachelor's degree) and unskilled workers (those with at most a high school diploma plus the other half of the some college group). The relative wage of skilled vs. unskilled workers is determined by the weighted average of the wages of Bachelor's and graduate degree wages as the wage of skilled workers and the wage of those with a high school diploma or equivalent as the wage of unskilled workers. The relative supply of skilled vs. unskilled workers consists of the wage bill of skilled labor divided by the wage bill of unskilled labor.

From available government data sources, information on prices and quantities (average earnings by level of education and number of workers with different levels of education) is available. Equation 1 is the wage bill, and Equation 2 describes the change in supply. These numbers, along with a reasonable setting of the elasticity of substitution between skilled and unskilled workers, can be plugged into Equation 3 to determine the change in relative demand (which is not observable). The results of these computations for selected years from 1915 to 2005 are presented in Table 8.1 and Appendix D of Goldin and Katz (2008).

1. Wage Bill = $\log(q_s)/(1-=\log(q_s))$, where q_s equals the share of skilled labor of total wages.

2. Change in relative supply $\left(\log\left(\frac{S}{U}\right)\right)$:

$$\log\left(\frac{S}{U}\right)=\log\left(\frac{w_S S}{w_u U}\right)-\log\left(\frac{w_S}{w_u}\right)$$

where S = number of college equivalents (those with a Bachelor's or graduate degree and half of those with some college but not a four-year degree), U is high school equivalents (those with a high school diploma or GED, those who have not finished high school, and half of those with some college), and are the composition-adjusted (fixed weights at 1980 levels of division within college and high school equivalents) wages of skilled and unskilled labor.

3. Change in relative demand $(\log(D_{su}))$:

$$\log(D_{su})=\log\left(\frac{S}{U}\right)+\sigma_{su}\log\left(\frac{ws}{wu}\right)$$

where σ_{su} is the elasticity of substitution between skilled and unskilled labor. From previous research, this figure has been estimated between 1.4 and 1.84; a value of 1.64 is used.

Estimation of the Number of Extra College-Educated Workers Needed between 1980 and 2005 to Have the Bachelor's degree to high school Wage Premium be 46 Percent.

In an exercise not discussed in the body of the text, we estimated the number of extra college-educated workers who would have needed to have been produced from 1980 to 2005 to result in a 46 percent wage premium. We begin by setting $\log\left(\frac{w_S}{w_u}\right)$ at 0.417, rather than the 0.576 that it was. This implies that the change in the wage bill was just 0.25 percent a year rather than the observable 0.9 percent. Using Equation 2, the change in relative supply (2.0 percent per year), the result must be 3.08 percent per year to equal the 3.48 percent change per year in relative demand.

Using Equation 1, the change in the wage bill must now be 3.33 percent per year (3.08 percent and 0.25–the log of the relatives, which is subtracted on the right side of the equation). The relative wage bill is dependent on changes in the number of bodies and the wages of skilled and unskilled labor. To change the relative wages in order to produce a smaller Bachelor's degree wage premium, we chose to decrease the pay of workers with a Bachelor's degree and increase the pay of high school wages by the same percentage. The log of the wage bill in 2005 was 1.779; the log of

the simulated wage bill had to be 1.517. Equation 3 shows that a 7.95 percent increase in high school wages and a 7.95 percent decrease in college wages get us to this point.

4. 1,517 = 1.779 x (1-p)/(1 + p) where p equals the change in wages
Reordering the terms gets us p = (1.779-1.517)/(1.779+1.517).

The next task is to translate this change in earnings into changes in people with more education. To get the extra added demand of 3.33 percent per year, the wage bill has to be higher. Using Equation 4, the new ratio of the skilled to unskilled wage bill must rise from 57.6 percent to 60.0 percent. Because the relative wages have been lowered, the number of college equivalents must be increased by 12.1 percent. Table A1 shows the distribution of workers by educational levels; therefore, the number of college equivalents (approximately 61 million) must be increased by 7.3 million to reach 68.3 million.

TABLE A1: WORKERS 18- TO 65-YEARS-OLD BY EDUCATION, 2005

Education level	Employment	Share	Equivalents
1. HS or less	54,055,955	40.0%	74,109,159
2. AA + SC	40,106,408	29.7%	
3. BA + Grad	40,883,985	30.3%	60,937,189
Total	135,046,348		

Note: HS = high school; SC = some college.

Because some college counts as one-half of a college equivalent, there is no single solution to the number of extra Bachelor's degree recipients and number of extras who have some college. If the number of people with postsecondary education does not change, then all of the increase in college equivalents is accomplished by having 14.6 million people with some college obtain a Bachelor's degree. In this simulation, we can alter the number of people who have at least some college. If we change the 60 percent of the workforce with some postsecondary education to 72 percent, then the number of people with some college would increase by 17.8 million, while the number of people with a Bachelor's degree would decrease by 1.5 million to satisfy the 7.3 million increase in college equivalents.

These two scenarios represent extremes on how to obtain the added college equivalents. We choose to simulate that the labor force shifted to 66 percent going on to postsecondary education, which resulted in 6.6 million extra people with Bachelor's degrees and 1.6 million extra people with some college, to reach the 7.3 million increase in college equivalents needed to result in the lower Bachelor's degree to high school wage premium.

Estimation of the Number of Extra College-Educated Workers Needed between 2005 and 2025 to Have the Bachelor's degree to high school Wage Premium be 46 Percent

The next task was to estimate the number of additional college-educated workers needed to meet the rising demand for college educated workers and result in a Bachelor's degree to high school wage premium of 46 percent in 2025. We considered the following relevant numbers: From 1915 to 2005, the change in relative demand was 2.83 percent per year, and from 1980 to 2005, it was 3.48 percent; however, from 1980 to 1990 the change was 5.0 percent per year, from 1990 to 2000 it was 3.0 percent, and from 2000 to 2005 it was 1.4 percent annually.

Obviously, the greater the increase in relative skill demands the more extra Bachelor's degrees that will have to be produced. It is tempting to pick the trend line from 1915 to 2005, but we think that this number is too high. The rise during the 20th century started from a position in which there were very few people with postsecondary education, and as a result it was very easy for the economy to incorporate more college-educated workers. If we presume that the relative demand for college-educated labor will increase by nearly 3 percent a year, eventually virtually the entire workforce should have a four-year degree. Therefore, it would seem that there has to be some slowing in the increase in relative demand for skilled labor. To accommodate for this, we chose the lower number of 2.0 percent per year.

Since we are keeping the relative wages fixed from our simulated 2005 numbers (with a 46 percent wage premium), a 2 percent rise in relative demand is accomplished with an annual 2 percent rise in relative supply. This means that the share of the wage bill going to college equivalents must rise to 69 percent: 15 percent higher than 2005 level when adjusted for a lower Bachelor's degree to high school wage premium.

Once again, getting to 69 percent can be accomplished in many different ways, depending on the number of people who have some postsecondary education. To split the adjustment between more people going to college and more people getting a Bachelor's degree among those going to college, we picked a new postsecondary education rate for the workforce in 2025 to be 75 percent (up from the 67 percent of today's young cohorts). To get the number of added college-educated workers needed, we kept the total labor force of 18- to 65-year-olds fixed at its 2005 level. The total labor force will grow because many aging baby boomers will continue to work (resulting in a much expanded number of workers over 65 years old), and because of new immigrants coming into the country.

Finally, if we had used 2.83 percent as a gain in relative demand (trend figure 1915–2005), the added number of workers with Bachelor's degrees required to meet growing technological demand would have been 27.5 million, as opposed to the 18 million with the 2 percent growth in relative demand. Conversely, if relative demand grew by only 1 percent a year, there would be less pressure to change the entire education pipeline. Consequently, the share of the workforce with at least some postsecondary education could be 70 percent, and then the 1 percent growth would require 14 million extra workers with Bachelor's degrees. If the K–12 pipeline produced 75 percent going to postsecondary education (as we presume in our current projection), the added some college would only require 5.9 million new workers with Bachelor's degrees.

Appendix 2: Simulation to Create Additional 18 Million Bachelor's Degrees through 2025

Year	Share going on to postsecondary education	Additional Bachelor's degree attainment of 25- to 64-year-olds
2011	67.0%	0.1%
2012	68.0%	0.2%
2013	69.0%	0.3%
2014	70.0%	0.4%
2015	71.0%	0.5%
2016	72.5%	0.5%
2017	74.0%	0.5%
2018	75.5%	0.5%
2019	77.0%	0.5%
2020	78.5%	0.5%
2021	80.0%	0.5%
2022	81.5%	0.5%
2023	83.0%	0.5%
2024	84.5%	0.5%
2025	86.0%	0.4%

Appendix 3: Considering the Costs of College-Going

Stories about one-year tuition, fees, room, and board running to more than $50,000 a year get a lot of media attention and send chills up the spine of many parents of young children. In reality, this experience of college is the exception. Students have a wide variety of choices when facing college costs and a high proportion of college students from moderate-income families get grants, scholarships, and tax benefits. Consequently, the "net price" that most students pay for a year of schooling is much lower than the "sticker price" of total college costs at all schools, and only a tiny fraction (5 percent) of students in four-year schools pay more than $50,000 for college.

A slightly different calculation is 'out of pocket expenses' which includes room, board, tuition, fees, travel, books, and other expenses but excludes tax benefits. The National Center for Education Statistics reports that in the academic year ending in June 2008, the average out-of-pocket expenses for a 'lower middle-class' family was $10,000 while the comparable figure was $17,300 for a family in the highest income group. All of these figures include room and board, expenses that a young adult might face regardless of whether they are enrolled in school or not (if they are not living at home).

Finally, the numbers on total debt of graduating seniors are not as dire as some make them out to be. Fully 34 percent of young Bachelor's degree holders have no debt at all, while the median debt value of all graduating students is about $12,000. Heavier debt loads apply to progressively smaller shares of student: only one in four have debts over $30,000 and only ten percent have debts over $40,000.

A more thorough economic accounting of the costs of college might include the wages lost by attending school instead of working. But two factors make this cost rather low. First, the vast majority of students either work part-time while in school and/or full-time during the summer months. Second, the jobs available to 19-22 year-olds without any postsecondary education pay very little.

Adding up all the direct and indirect costs of choosing to get a four-year degree (which often takes longer than four years) amount to under $150,000 for most students. Measured against added earnings of over $25,000 a year for 40 years and it's clear that the investment in a Bachelor's degree is a sound one.

For the small share of students whose college costs run over $200,000, getting a Bachelor's degree is still a good investment—even allowing for only average returns. Given that these students are in the best schools and come from the wealthiest families, it is highly likely that these students will make considerably more than the typical Bachelor's degree holder. Consequently, their earnings premium is higher than average and support paying off these high expenses in under 10 years.

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Acknowledgments

We would like to express our gratitude to the individuals and organizations that have made this report possible. First, we thank Lumina Foundation and the Bill and Melinda Gates Foundation for their support of our research over the past few years, and in particular, we are grateful for the support of Jamie Merisotis, Hilary Pennington, Holly Zanville, and Parminder Jassal. We are honored to be partners in their mission of promoting postsecondary access and completion for all Americans.

We would like to thank Larry Katz and David Autor for their kind assistance in helping us understand all of the details on their supply and demand model. We would also like to acknowledge Harry Holzer, who read an early draft and made several useful suggestions.

We also want to thank our editor, Vic Caleca, and our designer, Levine and Associates, as well as Jeff Strohl, Nicole Smith, Tamara Jayasundera, Laura Meyer, and numerous other colleagues, too many to list here, who provided support and insight throughout the process.

Finally, we would like to thank Michelle Melton at the Center for her editorial and research assistance throughout the project.

The views expressed in this publication are those of the authors and do not necessarily represent those of Lumina Foundation or the Bill and Melinda Gates Foundation, their officers, or employees.

The Undereducated American is comprised of a full report and an executive summary. Both can be accessed online at cew.georgetown.edu/undereducated.

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