THE HAMILTON PROJECT

POLICY PROPOSAL 2018-01 | FEBRUARY 2018

Stagnation in Lifetime Incomes

An Overview of Trends and Potential Causes

Fatih Guvenen

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BROOKINGS

Abstract

Lifetime incomes have stagnated for the majority of American men since the cohort of workers that entered the labor market in the late 1960s. The evidence shows that those who turned age 25 after the 1960s have experienced a large decline in their starting wages relative to earlier cohorts, and did not experience faster growth in their wages over the life cycle to make up for those earlier losses, resulting in lower lifetime incomes. These trends coincided with a stagnation of educational attainment for men, as well as rising income disparities among workers with some college experience. In light of these facts, this paper presents some design considerations for human capital policies that aim to boost wage growth for younger workers by: (1) identifying promising labor market data collection practices to ensure that students are taught skills that are both valued in their local labor market and resilient to shifts in demand, and (2) providing targeted tuition subsidies for enrollment in two-year community colleges and technical colleges.

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Introduction

In the decades following World War II, real wages grew steadily and inequality gradually declined. Families across the income distribution shared in the economic gains. By 1970 the typical household lived similarly to how we live today. While they missed some of today's gadgets—flat-screen televisions, personal computers, and smartphones—they had most of the major furnishings of a modern home—refrigeration, electricity, modern sanitation, and telephones.

Starting in the 1970s, the pace of technological progress appeared to accelerate, especially in computation and communication. The transition from mainframe to desktop computers, the steady decline in the cost of computation, and the widespread availability of the internet changed the ways that firms organize their production and the ways people communicate and consume. And yet, this visible progress has been accompanied by an apparent slowdown in measured productivity growth that started around the same decade—the 1970s—and has continued since then except for a brief rebound from 1995 to 2004. Wage growth has stagnated while wage inequality has increased. The median worker who entered the workforce in the early 1980s and might now be planning for retirement has experienced virtually no real increase in lifetime earnings relative to the previous generation.

This slowdown in spite of apparent technological progress is puzzling. With the power of a 1970s supercomputer in their pockets, American workers seem more productive than ever before, and yet they are not seeing those returns through higher income. The political ramifications of a large group of citizens that do not feel connected to the rewards of living and working in an advanced society are playing out in populist movements in the United States and Western Europe that support protectionist and nationalist policies. These fears damage support for many of the traditional vehicles of economic growth, such as international trade and technological innovations.

The stagnation of lifetime wage incomes is part of a broader set of trends that collectively represent a dramatic shift in the U.S. economic landscape in the past half century. A partial list of these major trends includes the substantial rise in wage inequality, the slowdown in the growth of college attainment (with the male attainment rate virtually flat since the mid-1970s), the declining labor share of income, increasing concentration of economic activity at the largest firms, increasing segregation and sorting of workers across firms, and rising geographic segregation of households by income and education, among others. Despite decades of intensive research by economists and other social scientists, our understanding of the root causes of these phenomena and their relationship with each other remains incomplete.

Against this daunting backdrop, any single policy proposal that addresses the stagnation of lifetime wage incomes can hope to make only a modest improvement. Therefore, the primary goal of this policy proposal is to complement such efforts by providing an accurate and detailed description of the facts regarding stagnation of lifetime wage incomes—based on recent work from new and rich data. A better understanding of the underlying facts can inform more-effective policy proposals today and in the future.

Once this primary goal is accomplished, I discuss considerations relevant to the design of human capital policies that can improve wage growth, especially among younger workers. There is growing evidence that a mismatch between the skill portfolio of a worker and the skill requirements of a job is a major factor in slowing wage growth, so aligning worker skills with the demands of newer jobs can be an important step forward. I propose a new federal competitive grant to pilot data and implementation initiatives that would facilitate linkages between workforce development programs and local labor markets.

The second part of the proposal aims to improve access to technical and career focused education in a way that is effective in boosting enrollment while minimizing perverse effects (such as downgrading by individuals who would have otherwise chosen a four-year college education).

Background

The trends in stagnating wages are often documented using survey-based cross-sectional data (i.e., snapshots of an economy at different points in time) that researchers stitch together, so to speak, to track evolution over time. While this approach—largely dictated by data availability—can provide useful insights, it can also conflate life-cycle trends with cohort effects. In other words, the evolution of earnings over the course of a worker's life (life-cycle trends) can be confused with the changes in the living standards of one generation of workers compared to another (cohort effects).

Thanks to a confluence of factors in recent years, researchers are increasingly able to access larger and richer data on earnings from both public and private sources.[2] These newer data sets provide many advantages: they are constructed from actual earnings records as opposed to being collected through surveys and are therefore much less susceptible to measurement error; they contain information on millions of workers, which allows fine-grained analysis while still delivering precise estimates; and perhaps most importantly, they track the earnings *histories* of each worker (often over many years, and sometimes covering the entire working life), which allows researchers to separate life-cycle trends from variation across cohorts.

One study by Guvenen et al. (2017) examined the earnings histories of millions of American workers from 1957 onward and compared the lifetime earnings of each (year-of-birth) cohort over time.[3] The main picture that emerges from their analysis is one of widespread *stagnation* in the living standards of many American men. In particular, from 1957 to 1967 the median male worker in each successive cohort that entered the U.S. labor market (i.e., turned age 25) saw relatively robust gains in lifetime earnings compared with his predecessors (top panel of table 1). However, these gains vanished starting with the cohort that turned age 25 in 1968 and were followed by a steady decline in lifetime earnings from one cohort to the next until the latest cohort with complete data—the 1983 cohort. The cumulative loss in inflation-adjusted lifetime earnings for the median male worker from the 1968 cohort to the 1983 cohort ranges from 10 percent to 19 percent.[4] This loss corresponds to an estimated lifetime cumulative loss that ranges from about $96,000 to $243,000 *after* adjusting for mitigating gains in non-wage benefits (employer-provided health insurance and pension contributions).[5]

For women, the picture is only slightly more positive (bottom panel of table 1). Although female workers experienced strong gains in percentage terms that were widespread across the

TABLE 1.

Change in Selected Percentiles of the Lifetime Income Distribution across Cohorts

Cumulative change between labor market entry cohorts:	25	Median	75	90
		Men		
1957 to 1983	–6.6	**0.7**	14.3	35.0
1957 to 1967	11.0	**12.3**	15.8	22.8
1967 to 1983	–15.8	**–10.3**	–1.3	10.0
		Women		
1957 to 1983	46.8	**58.6**	68.3	83.1
1957 to 1967	17.4	**19.6**	20.9	22.9
1967 to 1983	25.1	**32.7**	39.2	49.0

Source: Guvenen et al. 2017.

Note: Each cell reports the percent change. Earnings data adjusted for inflation using the personal consumption expenditure (PCE) deflator.

earnings distribution, these gains started from very low *levels* of lifetime earning in early cohorts. As a result, though the gender gap in lifetime earnings closed quite significantly during the lifetimes of the 27 cohorts studied in their analysis, the remaining gap is still large at about 40 percent.

It is worth stressing that the decline in lifetime earnings for men occurred primarily as a result of lower earnings while working—rather than fewer years worked over the life cycle—which points to stagnant wages and rewards to working for many male workers.[6] In other words, the declining labor force participation rate among prime-age men—which receives a lot of attention as a sign of an anemic labor market and is a well-established fact—turns out to make only a small contribution to falling lifetime incomes among men. The median lifetime earnings of employed workers in cohorts that entered the labor force in 1983 was 7.2 percent lower than of those that entered the workforce in 1967.

One possible explanation for this decline for men is that workers are not seeing wage increases over the course of their working lives in the same magnitude as during the 1960s and 1970s; in other words, the annual raise might be vanishing. However, the life-cycle profiles of income reveal a different story. Year-over-year income increases within a given cohort remained relatively steady throughout this period. But workers entering the labor force after 1967 earned lower and lower wages at the beginning of their careers. Despite receiving similar wage increases over the life cycle, workers who entered at a lower wage were never able to catch up. The decline in lifetime income is largely accounted for by a steady decline in median income between the ages of 25 and 35, without any sufficiently large offsetting increase in earnings during later years. Importantly, this suggests that the labor market conditions during the first decade of work can have important implications for the life-cycle income of a cohort. Since we consider nearly 30 years of prime-age employment, we do not have data on lifetime incomes for workers who enter the labor force after 1983. But using the facts about life-cycle income trends, we can extrapolate based on observations of early median wages.

Since 1983 the entry wage of a median male worker has continued to decline, except for a brief period of rising wages in the second half of the 1990s. If early life incomes remain important indicators of lifetime income, this likely implies that the trend of declining lifetime incomes will continue among working men. Since 2000 the trend of entry wages of female workers has begun to mirror that of male workers, declining gradually after a sharp rise during the second half of the 1990s. This could mean that the different patterns for men and women have converged to a single trend of gradually declining lifetime incomes. Since we can only observe the first few working years of these more-recent cohorts, we cannot draw any firm conclusions. But it certainly suggests that we have not escaped the era of stagnant incomes.

Compounding the stagnation in median lifetime earnings for men was a sustained rise in inequality starting in the early 1970s. Mainly focusing on annual earnings, a vast literature has documented rising wage gaps *between* various worker groups—for example, gaps defined by education and/or experience (Card and Lemieux 2001; Katz and Murphy 1992), employer characteristics (Barth et al. 2014; Song et al. 2015), and geographical areas (Owens 2016). Furthermore, in some cases, inequality has also risen *within* the same groups, making it harder to find simple explanations that rely on these observable characteristics that define the groups. In particular, income inequality rose substantially within college-educated workers—a fact that will turn out to be crucial for the policy proposal I describe in this paper.

A similar pattern of rising inequality is also seen in lifetime earnings, starting around the same time as the stagnation in median lifetime earnings noted above. Starting with the 1968 (or so) cohort, the bottom three-quarters of the lifetime income distribution in newer cohorts experienced almost no gains relative to their predecessors. Over the whole period, the bottom 5th percentile of the lifetime income distribution fell by 9 percent, while the 95th percentile increased by 46 percent (Guvenen et al. 2017).

LIFETIME INCOME TRENDS: DECLINING MALE INCOME AND INCREASING FEMALE INCOME

The main evidence summarized here is from Guvenen et al. (2017), who examine administrative data from the U.S. Social Security Administration—a 1 percent representative sample of U.S. workers—on earnings covering 57 years, from 1957 to 2013. The analysis focuses on lifetime income as the aggregate value of inflation-adjusted labor earnings for each individual from ages 25 to 55, which allows them to compute lifetime incomes for 27 consecutive cohorts of American adults that entered the labor force from 1957 to 1983.

From the cohort of men that entered the labor force in 1957 to the cohort that entered in 1967, the *lifetime* income of the median male worker increased by between 7 and 12 percent.[7] This upward trend peaked with the 1968 cohort, after which median lifetime income started to decline. In particular, from 1968 on, the median male worker in each subsequent cohort experienced a lower lifetime income than his counterpart in the previous cohort, with a cumulative decline of between 10 and 19 percent by 1983 (i.e., over the next 17 cohorts).[8]

A well-known parallel trend is the rise in non-wage compensation, which most notably includes rising employer-provided health benefits and employer contributions to private pension plans. Although micro-level data on these benefits

are not available for the full period that will allow an exact calculation of their effects, Guvenen et al. (2017) use aggregate data on benefits from the National Income and Products Accounts to estimate an upper bound for the potential lifetime gains from these fringe benefits. From the 1968 cohort to the 1983 cohort, the annualized value of the rise amounts to $1,200 per worker per year (which amounts to a rise of $37,200 when aggregated over 31 years for the latter cohort).[8]

While this rise in average benefits mitigates some of the decline in wage income, it was not nearly large enough to offset the decline for the median male worker. Even with expenditures on these benefits added in, the median male worker in the 1983 cohort earned a lifetime income that was lower than his counterpart in the 1968 cohort by an amount ranging from $96,000 at low end to $243,000 at the high end (depending on the inflation measure used).

Turning to women, the trends in median lifetime income follow a more complex pattern, sharing some of the slowdown observed for men after the 1968 cohort, but also reflecting increasing engagement of women in the labor force (as Goldin [2004] and others have observed).

Specifically, the median female worker experienced between a 13 and 20 percent rise in lifetime incomes over the first 11 cohorts, and another 22 to 33 percent increase from the 1968 to 1983 cohorts. While these gains appear robust when expressed in percentage terms, the absolute gains (i.e., in dollar terms) are more modest because of the very low levels of lifetime income received by the earliest cohorts. Consequently, while the gender lifetime income gap has closed considerably over the 27 cohorts we examine, the remaining gap is still sizable, at about 40 percent for the 1983 cohort.

DELVING DEEPER: WHERE IN THE LIFE CYCLE DID THE LOSSES OCCUR?

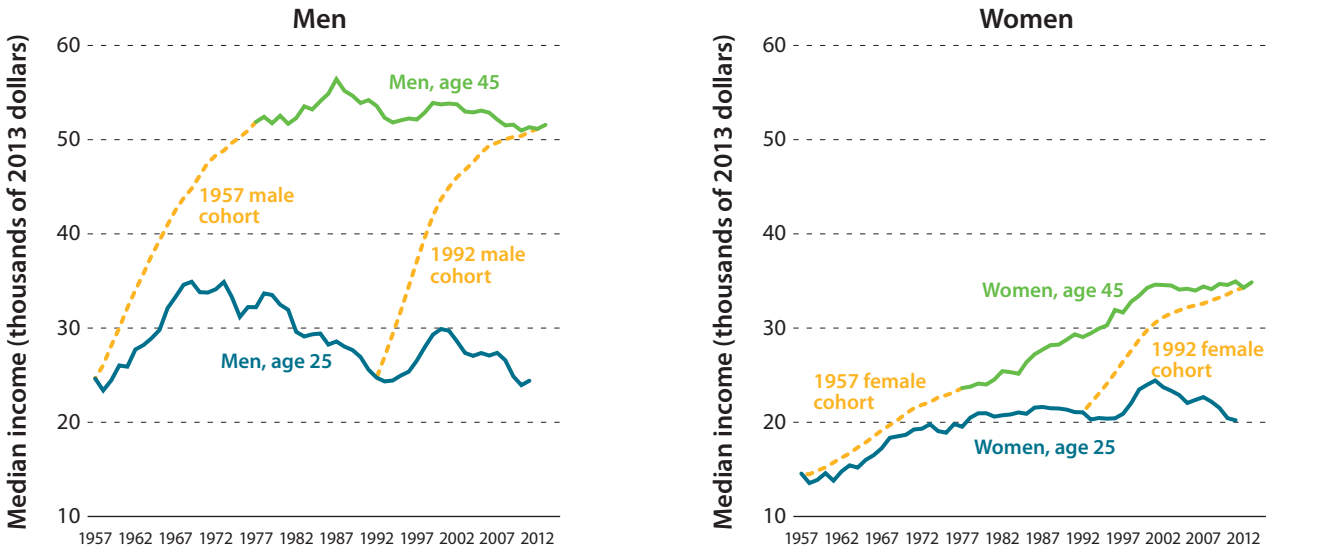
To make progress toward understanding the drivers of the stagnation in median lifetime incomes, it is useful to locate the stages of the life cycle when newer cohorts experience a decline in incomes relative to previous cohorts. Figure 1 plots median income by age for every cohort that entered the labor force from 1957 to 2011, with the left and right panels showing data for men and women, respectively. Notice that, to shed light on how more recent cohorts are faring, this figure includes post-1983 cohorts (i.e., 27 additional cohorts) who have yet to complete their working lives.

For men, there was no overall growth in entry-level real median income from 1957 to 2012 (as denoted by the blue line), despite the fact that real GDP per capita grew threefold during this period and the real mean wage per worker rose by 80 percent. Even worse, from 1968 to 2011 the real median income at age 25 actually fell from about $35,000 to $25,000, a decline of 29 percent.

Of course, it is possible that newer cohorts make up for lower entry incomes by growing their earnings faster as they gain experience in the labor market. But the second takeaway is

FIGURE 1.

Median Real Income by Age, Sex, and Cohort, 1957–2012



Source: Guvenen et al. 2017.

Note: Horizontal axes show calendar year. Incomes are inflation-adjusted to 2013 dollars using the PCE deflator.

precisely that this is not happening, at least not sufficiently to make up for lower early-career earnings. This can be seen in the same figure, which also plots the median income at age 45 for each cohort (as shown by the green line), including some that entered after 1983 and have at least 21 years of observations. The two orange dotted lines plot median income over the life cycle for the first (1957) and last (1992) cohorts (that is observed for at least 20 years) to give a sense of wage growth for these workers as they aged.

The overall picture is not one of steeper wage growth for recent cohorts of men that makes up for their lower wages at younger ages relative to older cohorts. There is a slight catch-up between ages 35 and 45 for the newest cohorts, but the magnitudes are not large enough to make up for the losses coming from weak early-career outcomes.[9] For comparison, the right panel of figure 1 shows the same analysis for women, where newer cohorts have experienced a slowdown in growth (as opposed to an absolute decline) in median income at age 25, but partially made up for this slow start with faster growth between ages 25 and 45 (as seen from the steepening of the orange dashed line in the 1992 cohort).

Putting these two pieces together, the decline in median lifetime incomes for men appears to stem from the stagnant or declining entry-level wages earned when they enter the labor force, and not from weak earnings growth experienced during their working years. The key conclusion I draw from these results is that in order to understand stagnating wages, we need to understand why the labor market experiences of newer cohorts were *already* different from those of their predecessors by the time they turned 25.

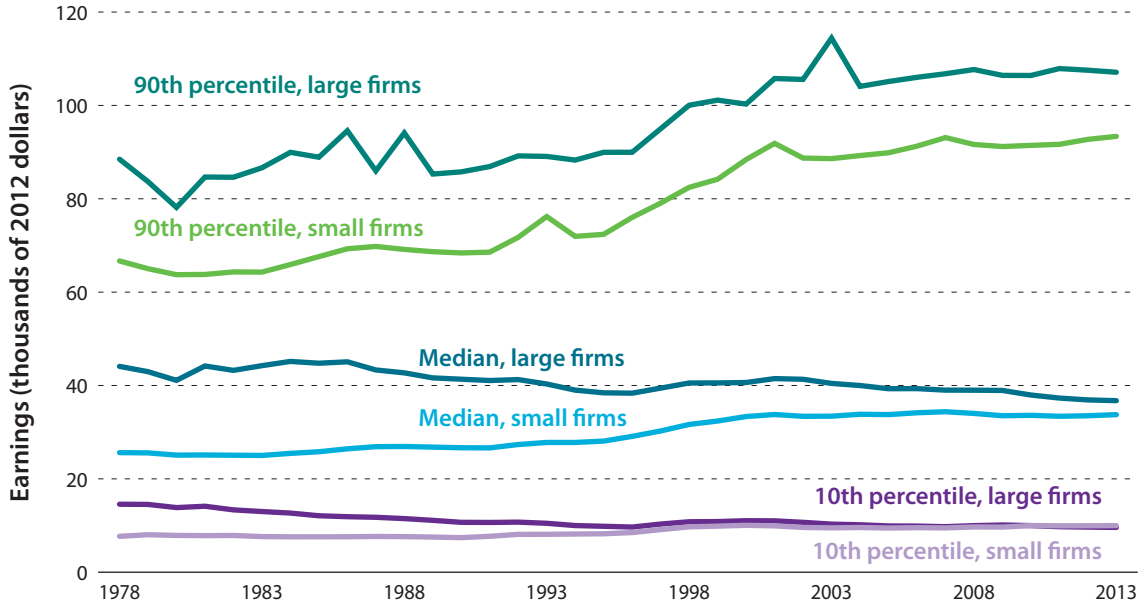
To shed some light on the possible forces that shape the stagnation of entry wages, Guvenen et al. (2017) examine state-level data from the 1960s through 2014, and find that three factors are all positively correlated with the median male income at age 25: (1) the share of 25- to 30-year-olds who are college graduates in the state, (2) the population share of 25- to 30-year-olds in the state, and (3) the manufacturing employment share in the state.[10] Other usual suspects, such as rising trade, changes in the gender ratio, racial composition, marital status, or union coverage, do not seem strongly correlated with the decline in entry wages for men. These findings suggest that education and demographics can be important factors in understanding income stagnation as well as the decline in the manufacturing sector as a complementary trend.

DECLINE IN BOTTOM-END EARNINGS IN LARGE FIRMS

A different cut of the data reveals an interesting dichotomy in the stagnation of incomes and how it relates to employers and worker skills. This link can be established in several steps. First, a well-documented empirical fact is that large firms (shown by the dark blue line) pay their employees more

FIGURE 2.

Annual Earnings by Earnings Percentile and Firm Size, 1978–2013



Source: Song et al. 2015.

Note: Small firms are defined as those with 100–200 employees in a given year, and larger firms are those with more than 10,000 employees.

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TABLE 2.

Large-Firm Wage Premium by Skill Level, 1987–2013

		Log wage premium over employees at firms with fewer than 100 employees		
Education level	**Firm size**	**1987–1996**	**1997–2006**	**2007–2013**
High school or less	1,000+	0.29	0.18	0.16
	100–1,000	0.15	0.13	0.14
At least some college	1,000+	0.27	0.21	0.23
	100–1,000	0.18	0.14	0.16

Source: Bloom et al. forthcoming.
Note: Firm size refers to the number of employees.

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than small firms (the light blue line) even after controlling for worker characteristics—what is often called the large-firm premium.[11] More-recent evidence strongly suggests that this premium might be declining significantly for low-skill workers while changing little for high-skill workers. This can be seen in figure 2, which shows the 10th percentile, median, and 90th percentile of annual income for workers employed in small firms (i.e., those with 100–200 employees) and in large firms (those with more than 10,000 employees).

A clear pattern of convergence is seen here: whereas in the early 1980s the median employee at large firms used to earn substantially more than their counterpart at smaller firms—about $45,000 a year versus $25,000—this gap has largely disappeared by the 2010s. The same pattern holds true at the lower end—the pay gap between small and large firms at the 10th percentile of wages (the light and dark purple lines, respectively) was more than 40 percent in 1980 and is virtually zero today. For the 90th percentile of wage earnings (the green lines), the convergence seen below the median is absent. This suggests that the stagnation of wages below the median could be due to the disappearance of a certain kind of premium low-skill workers were receiving when employed by larger firms.

Bloom and coauthors (forthcoming) examine possible explanations for the decline in the large-firm premium and provide another piece of corroborating evidence that skills matter for the stagnation of wages in large firms (summarized in table 2). Using data from the CPS, they show that the large-firm premium has all but disappeared for workers with high school education or less, whereas it has held steady for workers with college education. Given the robust positive correlation between wages and education, perhaps this result should not be too surprising in light of figure 2, but it is still noteworthy given that their analysis relies on different data and measures education directly. Another result from their analysis is that the decline in the premium did not happen because of a change over time in the differential ability of low-skill workers employed by large firms. Instead, it happened because of the pure premium (what one firm pays relative to the average for the same type of worker) paid by large firms disappearing over time.

Overall, there are two main takeaways from this analysis for the stagnation in wages. First, wage growth has been weaker for workers employed by larger firms than for those employed at smaller firms. Second, the decline in the large-firm wage premium has affected middle- and low-skill workers. Together, these findings point to various factors that eroded the power and productivity of low-skill workers at large firms, such as the decline of unions (which were especially prevalent in larger firms), rising outsourcing, competition from low-cost offshore labor, competition from automation, and so on. As many historical episodes have taught us, one of the only effective ways to overcome these challenges is for low-skill workers to obtain skills allowing them to perform tasks that cannot be easily done by machines or other low-skill workers. This is a point that is made forcefully by Goldin and Katz (2008) in their fascinating book-long treatment of the race between education and factors like technological progress that periodically made old skill redundant. In each instance, some workers rose to the challenge and reaped higher rewards provided by new skills. I will return to this theme when discussing the policy proposals in the section "A New Approach."

The Challenge

There are two interrelated pieces to the puzzle of stagnating lifetime incomes. The first piece is best explained through a model that helps us think about how wages are determined in a modern economy and how fundamental changes in the structure of the economy get translated into the earnings of different types of workers. One model that has shown significant potential for explaining many key trends in the labor market since the 1960s is the so-called brain versus brawn (or brain–brawn) model, referring to the distinction between cognitive and physical skills.

The second piece of the puzzle starts with the observation that the brain–brawn model can generate the observed pattern of income decline if the demand for brawn (i.e., physical skills) falls. This raises the question: what drove the decline in demand (and consequently the price) of brawn? I discuss some possibilities at the end of this section.

All else equal, the decline of the value of brawn reduces all wages but hits low-ability workers especially hard because their overall skill mix is skewed toward brawn. Similarly, the rise in the value of brain benefits everyone but to different extents: high-ability individuals gain much more because they are better at learning new and complex skills than their low-ability counterparts.

Guvenen and Kuruscu (2010, 2012) show that the combination of the three ideas discussed in box 1 yields implications that are consistent with many of the key labor market trends for male workers since the 1970s.[13] The model can explain the prolonged stagnation in median wages of men after the 1970s because the skill mix of the median worker was skewed toward brawn and the cost of acquiring skills was too high for such workers. In other words, the median male worker in the 1950s and 1960s had a high school degree or less and could find a well-paying job in manufacturing, mining, or transportation sectors where his brawn could be put to good use. But starting in the 1970s and continuing today, the rapid spread of automation, the decline of unions, the rise of offshoring and outsourcing, and the rise of the service sector all reduced the demand for physical labor and led to the subsequent decline in the wages of the median male worker.

This framework can also help explain the rise in wage inequality. Because workers differ in their endowments of brain and brawn, a higher value of brain relative to brawn spreads the entire distribution of wages even if workers do not change their human capital investment behavior. Of course, workers do respond to skill-biased technical change (SBTC), and they do so in a way that is proportional to their learning ability. This variation in how workers respond to technological change can explain three key facts observed in the U.S. data since the 1970s.

- **The fall and subsequent rise in the college wage premium.** Because college graduates have higher ability than high school graduates, the strong investment response by high-ability workers leads to a surprising outcome in the short run: high-skill wages *fall* even though SBTC pushes the price of cognitive skills up. This is because high-ability workers gravitate toward jobs that allow them to acquire skills, and as Gary Becker (1962) observed, when skills are general and labor markets do not feature large frictions, workers pay for their own training by accepting lower wages. As counterintuitive as this implication might seem, it is precisely what happened during the 1970s when the college premium (the average wage of college graduates relative to high school graduates) fell for about a decade. Of course, while the costs of higher investment are borne in the short run, the benefits in the form of higher skills are realized eventually, leading to much higher wages for the high-ability workers. Not surprisingly, the college premium rebounded starting in the 1980s and has continued to rise strongly, with a few brief interruptions.[14] Falling wages, even over a decade, are not always an indication of a problem; they could sometimes be a reflection of workers investing more in human capital through either formal education or on-the-job training, and accepting lower pay while they do so.

- **Young workers experience larger wage changes.** Because human capital is a durable asset, the benefits of investment accrue over the rest of an individual's working life. As a result, younger workers (especially those with high ability) have more incentive to acquire new skills to enjoy those benefits. This helps explain the fact that wages for high-skill workers changed more for newer cohorts.

BOX 1.

A Brain–Brawn Model of Jobs and Workers

A simple model of what drives the major labor market trends since the 1970s is the brain–brawn theory of jobs and workers. Various versions of this framework have been studied by researchers in recent years and have been found to provide a consistent explanation for key empirical trends (Black and Spitz-Oener 2010; Guvenen and Kuruscu 2010; Rendall 2010; Yamaguchi 2012).

According to this model, each job (or occupation) requires two types of labor skills: cognitive skills, or brain; and physical skills, or brawn. Occupations differ in how much of each skill they require.[12] For example, a physics professor will likely need a lot of brain power but relatively small amounts of brawn to perform teaching and research, whereas a heart surgeon will arguably require just as much brain but also more brawn to be able to perform long and critical surgeries, and a construction worker needs less brain but even more brawn than either of the first two occupations. Goldin (1994) argued that one reason for lower pay to women relative to men before the past few decades was the high rewards to physical strength in manufacturing as well as mining, utilities, and construction.

The brain–brawn model rests on three key ideas. The first is that a worker can improve their cognitive skills substantially with proper investment in human capital through formal education and job training, whereas their physical skills are much harder to improve substantially over the life cycle. To simplify, suppose that brawn is fixed for a given individual, whereas brain can be improved with investment. The second idea is that workers are born with different levels of cognitive ability, which is the efficiency with which they can acquire new cognitive skills. Consequently, even when faced with the same labor market conditions (e.g., the relative prices, or wages, of brain and brawn), those with high ability will accumulate more cognitive skill because the cost of doing so is lower for them. So, at any given age, high-ability workers will have more brain relative to brawn compared to low-ability workers. Furthermore, each worker's brain–brawn mix can vary continuously, which creates systematic differences among workers even within narrowly defined education groups. This seemingly small detail will turn out to be important when we discuss education policies below.

Third, and finally, the model assumes that there has been a secular rise in the price of cognitive skills relative to physical skills, starting in the early 1970s. This is essentially a restatement of the skill-biased technical change (SBTC) hypothesis that has been extensively studied (see Acemoglu and Autor [2011], Katz and Autor [1999], and Katz and Murphy [1992] for surveys of this literature). The standard approach in the literature is to model SBTC as a rise in the demand for high-skill labor versus low-skill labor (often equated with high versus low levels of education, or college versus high school graduates), with a given worker only able to be one of the two types. In the brain–brawn framework, SBTC is modeled as a rise in the value of brain relative to brawn, with every worker possessing both types of skills, albeit in different amounts. This apparently small distinction turns out to generate rich implications.

- **A large part of the rise in wage inequality happened within education groups.** This point is often overlooked in discussions of the rise in the college premium. I expand on this point later in this section.

So far, the discussion has focused mainly on men, following much of the earlier literature on inequality and stagnant wages. This focus was partly justified by the fact that men have had a consistently high labor market participation rate throughout this period, which avoids difficulties with movements into and out of employment. That said, arguably the largest transition in the labor market from the late 1960s to the 21st century was the rising labor force participation rate of married women. It turns out, as Rendall (2010) has shown, that the brain–brawn model is consistent with this important trend as well.

Rendall's explanation starts with the observation that while men and women have the same levels of cognitive ability, men have higher endowments of physical strength. When brawn commanded a high wage, men had a comparative advantage in the labor market, allowing them to outcompete women for high-paying jobs in manufacturing, mining, construction, and transportation, among others. But as SBTC started to reduce the price of brawn, this comparative advantage began to disappear, drawing more women into the labor force with higher wages and allowing them to compete better with men in newer types of jobs that emphasize cognitive skills. This explanation fits nicely with the timing of the growth of the service sector, which relies less on brawn, and the decline in manufacturing during the same time female employment and earnings were rising in the United States. In a similar spirit, Black and Spitz-Oener (2010) show that a large part of the closing of the gender wage gap over this period can be explained by the rise of cognitive tasks and decline of routine tasks in jobs performed by women.

FACTORS DRIVING THE DECLINE IN THE VALUE OF BRAWN

Factors leading to a declining demand for physical abilities in the labor market have been well documented. These include declining union power since the 1960s, rapid productivity growth through automation and routinization of work, outsourcing in sectors that traditionally require physical skills and low-skill labor such as manufacturing, and the corresponding rise of the service sector that relies less on

physical skills, among other developments. Clearly, these driving forces are not mutually exclusive—to some extent they are interconnected—and all reflect falling demand for physical skills that increasingly face competition from new technologies, machines, and low-skill off-shore workers.

To quantify one particular factor that reduced demand for low-skill labor, Acemoglu and Restrepo (2017) focus on industrial robots (i.e., robots that can function without human operators). These robots are predominantly used in auto manufacturing (about 40 percent), followed by electronics manufacturing (20 percent); their numbers increased fourfold from 1993 to 2007. Using variation across time and locations in the use of such robots, they estimate that each additional robot per one thousand workers reduced the employment-to-population ratio by between 0.18 and 0.34 percentage points. Taking a ballpark figure of 60 percent for the employment-to-population ratio, each robot replaced about 3.0 to 5.7 workers during this period.

The pressure from automation on low-skill jobs is likely to continue, and will probably grow further. A recent report by McKinsey Global Institute (2017) estimates that 60 percent of occupations have at least 30 percent of their activities that can be technically automated with current technology. Going forward, Frey and Osborne (2017) estimate that 47 percent of U.S. workers face a risk to their jobs from automation over the next two decades. Either way, these are large figures that should provide ample motivation to carefully study policies that can help workers prepare for the jobs of the future.

IS EDUCATION THE PANACEA?

An important point to remember when discussing the rising benefits to education is that the simple statistics often cited obscure a very wide range of outcomes for college-educated workers. Take the college premium, for example: in 1980 the average wage for workers with at least a college degree (including those with advanced degrees) was about 40 percent higher than the average for workers with at most a high school degree, and this premium rose to about 90–100 percent by 2010.[15] But this fact is about the averages, which masks important variation. To illustrate this point, suppose we compare workers with at most a high school degree to those with some college or more. What fraction of workers with at least some college education earn higher wages than 75 percent of workers with at most a high school degree? In other words, what fraction of workers with some college experience earn more than the 75th percentile of the wage distribution of workers with less education?

For men in 2015, the answer is 57 percent, implying that the remaining 43 percent of workers with some college education earn less than the top quarter of workers with less education.[16] This is a reflection of significant overlap between the two wage distributions: attending college is not necessarily a foolproof way to earn more. What is perhaps more interesting is that despite the large rise in the college premium over time, these fractions have not moved nearly as much. For example, the 43 percent figure just quoted for 2015 was about the same—at 42 percent—in 1970. Using a higher threshold for high-skill—defining them as workers with at least a bachelor's degree—changes the levels of these statistics but not the trend: in 1970 31 percent of workers with at least a bachelor's degree earned less than the top quarter of workers with a high school degree or less, and this fraction has fallen only slightly, to 30 percent by 2015, despite a doubling of the average college premium.

To complete the picture, figure 3 shows the annual wage earnings distributions for male workers with a high school degree or less (dark green lines) and those with some college or more (light green lines). The left panel displays data for 1970 and the right panel shows data for 2010. There is substantial overlap between the two distributions in both periods, which does not seem to change in a visible way over the 40-year period.[17]

A New Approach

The stagnations of wages and of lifetime incomes discussed in this policy proposal are at the center of a series of dramatic changes in the U.S. economic landscape in the past half century. Despite decades of intensive research by economists and other social scientists, our understanding of the root causes is still incomplete. However, the analysis presented in this paper—along with economic theory and additional research on human capital investment—suggests directions for reform. In this section, I discuss design considerations for policies that address stagnant early-career wages experienced by newer cohorts over time.

The discussion focuses on two types of human capital policies. First, I describe efforts to align workforce development programs with the rapidly evolving demands of firms, thereby achieving the greatest return on educational investments. Second, I discuss how to make these workforce development programs more accessible to the students who will benefit from them the most, thereby amplifying the benefits of the first type of policy.

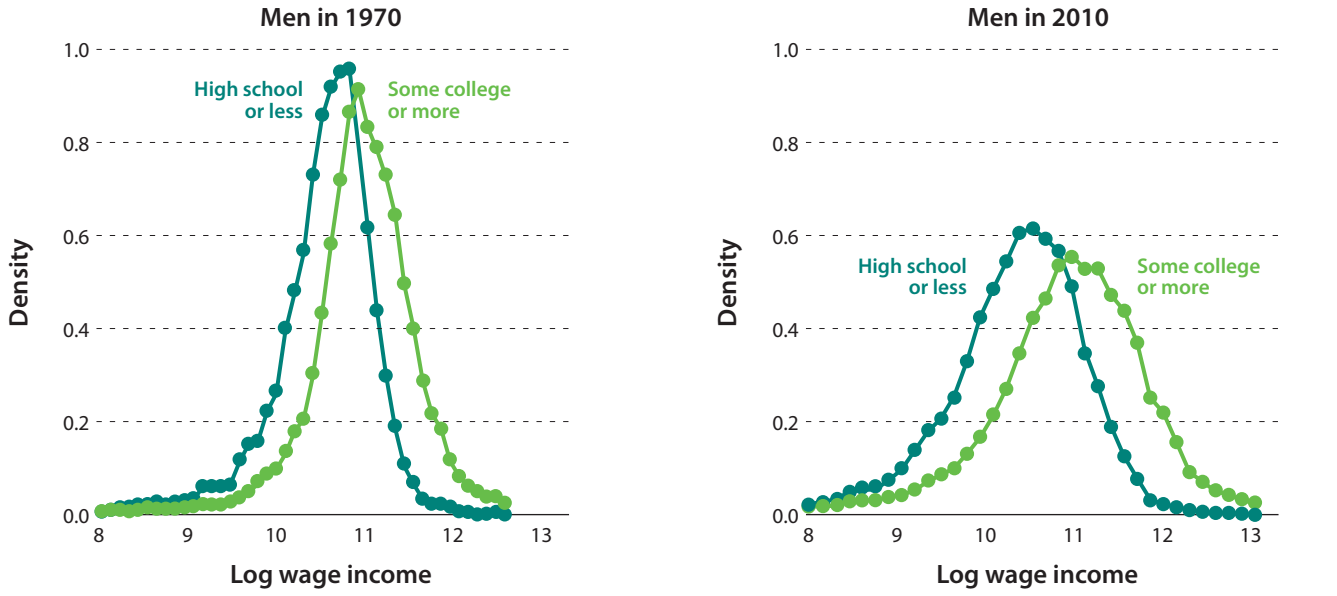
TEACHING THE RIGHT SKILLS

As discussed above, some workers with at least some college experience earn less than some workers with less schooling, suggesting that not all education is created equal and that raising educational attainment is only one—certainly important—ingredient in a more complex strategy for raising wages. Recent research on education and skill acquisition emphasizes the task composition of jobs and occupations as well as the relative prices of different tasks (cognitive versus physical versus routine tasks) as key determinants of wage trends over time.

For example, Altonji, Kahn, and Speer (2014) document a large increase in wage differentials across U.S. college majors in the past 20 or so years and show that about two-thirds of this increase can be explained by changes in the value of

FIGURE 3.

Wage Distributions of High- and Low-Skill Workers, 1970 and 2010



Source: Current Population Survey 1971 and 2011; author's calculations.

tasks performed in the occupations associated with each major. In particular, workers with college majors associated with abstract tasks experienced a larger rise in wages relative to those workers with majors associated with more-routine tasks. This finding is consistent with the brain–brawn theory discussed earlier. But, more importantly, it reinforces the point that not all education confers identical labor market benefits, and that those educational options with higher returns are precisely those that teach skills that are in higher demand and are better protected against competition from newer technologies, automation, and imports, among other factors. Kirkebøen, Leuven, and Mogstad (2016) find similar evidence in Norway of substantial earnings differentials across college majors, large enough to rival the college premium itself. This suggests that the fields and tasks that a student is trained in are just as important as attending college in the first place.

Another important consideration in ensuring that education confers valuable skills is being cognizant of differences in local labor demand, especially for middle- and low-skill jobs. Recent evidence shows that a major factor stunting wage growth is the mismatch between the portfolio of skills possessed by a worker and the skills required by his job (Guvenen et al. 2015; Lise and Postel-Vinay (2016). This *skill mismatch* not only leads to lower wages at a worker's current job, but also depresses wages at future jobs many years later. This long-lasting effect of mismatch seems to stem from lower skill accumulation on the job for mismatched workers, which then causes a poor match to impact a worker's entire career. Both papers report substantial wage losses—exceeding 10 percent of lifetime income—from poor skill matches between a worker and his employer. Similarly, Macaluso (2016) focuses on local skill remoteness to quantify the mismatch between local demand for and supply of skills and shows that it is an important factor in explaining wage growth in the local labor market.

These different pieces of evidence suggest that a successful workforce development program needs to teach skills that are in high demand, especially by local employers.[18] In order to develop up-to-date programs of study in high-return fields, workforce development programs and community colleges need detailed information about labor market demands and the flexibility and resources required to implement ongoing updates. To facilitate linkages between workforce development programs and local labor markets, I propose that the U.S. Department of Labor finance a competitive grant program to pilot innovative data and implementation alignment initiatives with sufficient resources to provide grants to several locations. The goal would be to identify best practices in (1) data collection that generates a fine-grained picture of the types of tasks and skills demanded by employers and the extent to which these are over- or under-supplied by workers in the local area, and (2) to see how design and process factors affect the speed and extent of changes to workforce development programs. Funding projects in different states (that, ideally, vary in their demographic and industrial composition) and teams that would take different and innovative approaches to the skill mismatch problem would generate actionable information about best practices in workforce development programs.

These projects would begin by collecting two types of data: (1) job postings in the local area with detailed qualifications and skill requirements, and (2) data on worker skills and training that can be obtained by local colleges, technical and community colleges, apprenticeship programs, and high schools. Grant applications would detail what additional data would be collected, how it would be processed and displayed, with whom it would be shared, and how it would inform decision-making and reform in workforce development programs. Working jointly with the appropriate stakeholders, researchers would redesign programs to incorporate real-time labor market demand alongside other degree, curriculum, and pedagogical considerations. Additional grant funding could be made available to speed progress in the workforce development programs, such as through equipment upgrades or capital improvements.

A concrete example of such an effort is the Workforce Alignment Committee in Minnesota, which was established by a group of leaders from industry, government, and education with the goal of addressing talent shortage in the state of Minnesota. As part of this effort, the group started a pilot data project, RealTime Talent, as a public–private collaboration, with the aim of collecting and providing granular job-specific labor market data.[19] Although this project is still new, it holds promise for providing the kind of feedback from labor market data to educators to align resources toward the skills that are urgently needed.

A key consideration in designing such a proposal is to be cognizant of the relative *breadth* and *transferability* of the skills taught. To understand why it is critical to do so, it is important to point out that economists have long emphasized a key benefit of *general* education: it can endow students with the ability to adapt to changes, especially those brought on by rapid technical change. In other words, with general education students learn how to learn. Since the classic articulation of this hypothesis by Nelson and Phelps (1966) fifty years ago, economists have studied it extensively and generally found supporting evidence.[20] In fact, many authors have argued that general education is a strength of the U.S. education system and that the high and persistent unemployment experienced by European economies starting in the 1970s was partly due to the specific training that made up the core of its education policies.[21] In contrast, education in specific skills can yield high wages in certain jobs as long as those skills are in high demand, but workers might find it hard to retool for new careers or technologies if demand shifts. This is a very real

concern that any education proposal must keep in mind. Therefore, I should make clear that the proposal does not advocate training in very narrow skills that are tied to a very particular firm or technology that has little transferability.

This raises the question of how we can operationalize the notion of narrow versus broad skills, and measure transferability across jobs (as well as across occupations, industries, and vintages of technologies). Although research on these questions is arguably still in its infancy, there are some promising recent developments that can shed light.

One idea is to use the task-based modeling approach described above and infer the breadth of a skill by the fraction of occupations in which that task or skill is used (either used at all, or used above a certain threshold). A major resource that researchers and practitioners can build on is the O*NET project, which provides detailed and useful information on the task composition of occupations and the skills and abilities required to perform those tasks. To give a concrete example, one ability category under physical abilities in O*NET is "Gross body equilibrium," defined as the "ability to keep or regain your body balance or stay upright when in an unstable position." For each occupation, O*NET provides both an importance score and intensity score that quantifies the use of this ability in that job. As one can guess, the top occupations where gross body equilibrium is a central skill include dancers, roofers, flight attendants, and structural iron and steel workers, and occupations where this skill is almost never used includes (among many others) chief executives, lawyers, economists, court clerks, and interior designers. O*NET contains this sort of detailed information for dozens of skill and ability categories; it also groups occupations into families to give an idea of how readily the skills used in one occupation are transferable to similar occupations.

IMPROVING AFFORDABILITY TO BOOST EDUCATIONAL ATTAINMENT

Despite its many advantages in providing flexibility to high-ability students, the U.S. tradition of liberal arts education provides some students with little to no specific skills that can be put to immediate use in a starting job. Technical training, vocational schooling, and apprenticeship arguably do not have sufficiently prominent places in the U.S. educational system today. Participation in career and technical education programs has declined significantly since the 1980s due to a confluence of factors—increasing course requirements for high school graduation by states, the expansion of STEM requirements, and declining funding, among others—all of which can perhaps be traced to the growing consensus that all young individuals should be encouraged to attend college (Jacob 2017). Similarly, vocational schooling is a very small part of the U.S. postsecondary education landscape compared to other developed economies. For example, only about 4 percent of Americans aged 25 to 29 have completed some form of vocational schooling in the United States in the past decade, compared to more than 35 percent in Germany (OECD 2017).

Perhaps the best-known example of a policy effort to expand access to postsecondary training is the America's College Promise proposal made by President Obama in 2015 (White House 2015), which aimed to provide community college at no cost to students. Because my proposal will share some common elements, I will use it as my departure point to illustrate some of the issues that must be considered in devising an effective policy.[22]

In thinking about efforts to encourage postsecondary training for low- and middle-income workers—including vocational education, apprenticeships, and career and technical education—it is important to address at least three important questions that are relevant to policy design. First, what is the cost of such a policy and how much will it increase enrollment in community colleges? Second, what types of students will enroll in response to this policy? Are they primarily high school graduates who would otherwise not have pursued any postsecondary schooling, or will some students who were planning to enroll at a four-year college now choose to enroll at a community college because its price has fallen relative to four-year colleges? How do they compare to other students in terms of income and ability? Third, what is the wage impact of this policy on (1) those who enroll at community colleges who would not otherwise enroll in a postsecondary program, (2) those who switch to a community college who would otherwise have enrolled at a four-year college, and (3) at the aggregate level?

Answering these questions is a bit harder than it first appears because we need a careful quantitative model of schooling and work choices faced by students who differ in their family incomes, abilities, and tastes for schooling, among other relevant differences. Policies will affect the behavior of both students and their parents, which can potentially crowd out (or undo) the intended effects of policy. Fortunately, researchers have developed increasingly rich models over the past two decades that can shed some light on the trade-offs and can help guide policy proposals (see, e.g., Abbott et al. [2016]). Based on what we know, we can answer the three questions as follows.

Both empirical studies (that use exogenous variations to identify causal impact) and simulation models predict a rather large increase in community college enrollment rates in response to a tuition subsidy (Dynarski 2000; Kane 1995). An important recent study on the subject is Krivorotov (2016), who builds a model where students can choose between attending four-year public colleges, four-year private colleges, or two-year colleges; or to not attend any postsecondary school. Using life-cycle income profiles for different groups of workers and allowing for heterogeneity in ability and tastes, he finds that a $1,000 increase in tuition subsidies for two-year

colleges can increase enrollment substantially—by up to 10 percentage points. However, he also finds that downgrading is a real concern for policies such as America's College Promise: in the simulation model, about one-third as many students downgrade from four-year colleges to two-year colleges as those who upgrade from high school to two-year colleges. An effective policy therefore must mitigate the incentives to downgrade while boosting the incentives to upgrade. The simulation model suggests that one way to achieve that would be by providing a modest subsidy to four-year public colleges (which provide the closest competition to the subsidized two-year colleges and are the main source of downgrading).

These estimated effects provide important guidance for policy design. In particular, a tuition subsidy targeted at community colleges would provide an important boost for enrollment, with downgrading limited by modest subsidies targeted at four-year public colleges. A specific implementation of this proposal could be as follows.

First, in light of stagnant postsecondary degree completion rates, an important policy design aspect is the existence of incentives that encourage students to complete their postsecondary programs. One way to achieve this would be by making the tuition subsidy grow as the student progresses toward graduation. For example, rather than offering free tuition from the beginning, the subsidy could be set at 50 percent of tuition in the first year, and could be free in the second year. Additionally, if the student graduates, the first year's tuition would be refunded, or a graduation bonus paid.[23] For students who graduate, this backloaded structure would have the same cost as offering free tuition, but it would also ensure that the subsidies go toward the students with highest ability and motivation. This is an important benefit given that an important concern with free tuition policies is their tendency of encouraging too many low-ability students without attractive options in the job market, who might be attracted to the consumption value of school life but derive little tangible benefit.[24]

Second, the overall cost of this graduated policy would be lower (compared to a full tuition subsidy to all) both because the first year (50 percent) tuition requirement would limit demand and because students who discontinue would not be refunded their first-year tuition. These funds could then be directed toward subsidizing four-year public colleges. One policy that would further encourage the best graduates of community colleges to continue their education would be to boost their graduation refund if it is applied toward the tuition of a four-year public college. Again, this would be a subsidy targeted at the most promising students, which is an important objective of policies of this kind.

Of course, an important consideration in implementing a policy of tuition subsidies is to ensure that adequate instructional capacity exists for two-year institutions to accommodate the inflow of students (in particular, if tuition does not cover full educational costs, a tuition subsidy might not be a sufficient investment in that capacity).

Questions and Concerns

1. You note that women are now experiencing faster income growth over their careers than they did in the 1960s and 1970s, while income growth for men is essentially unchanged. Is it clear why this occurred and does it matter for your policy proposals?

Both early-career wages and subsequent wage growth have increased for women in recent decades. However, women's wages started from a very low baseline level, and their wage growth may have benefited from a reduction in labor market discrimination and other impediments. In addition, women have benefited from a shift in labor demand to tasks for which women as a group have a comparative advantage.

Maintaining and accelerating women's economic progress—while also ending the stagnation of men's early-career wages—requires well-designed human capital investments of the kind described in this proposal.

2. As the economy changes over time, labor demand sometimes shifts unpredictably. Are you concerned about the difficulty of anticipating employer needs in your proposal to teach the right skills?

It is certainly true that employer needs have shifted over time and will continue to change. This is why I propose to balance specificity of skills (i.e., how well-targeted they are to the immediate demands of employers) with flexibility and transferability of skills across employers and types of work. In addition, it is important to note that many workers will be better advised to pursue four-year postsecondary degrees, which confers more-flexible human capital. As discussed in the proposal, postsecondary policies should be designed to increase the accessibility and value of workforce development programs without diverting students who would be better suited for bachelor's degree programs.

3. Critics of claims about the negative impacts of skills mismatch have argued that businesses can adjust to the preferences and abilities of their potential workforce; in other words, business needs are not immutable. Does this undermine your proposal to better align curriculum and local employer needs?

The economic and policy discussion regarding skills mismatch has largely focused on the possible unemployment effects of mismatch, which is not the focus of this paper. Rather, I argue that wages would be higher at the beginning of many workers' careers if their postsecondary curriculum better reflected the skills that are valuable to local employers. While it is true that employers have some flexibility in how they arrange work, which allows them to set up business processes that complement the skills of their employees, this flexibility is not unlimited. When workers possess valuable skills at the beginning of their careers they can be on track for sustained success in the labor market.

Conclusion

Beginning with the late 1960s cohorts, the lifetime median wage income of American men has stagnated from one cohort to the next. Evidence from cohorts with partial life cycle data strongly suggest that this pattern of weak lifetime wage growth has been continuing in more recent cohorts. While income growth for women has been stronger, it has also weakened, and the median woman's lifetime income remains about 40 percent below the median man's lifetime income in the most recent cohorts who turned age 55.

The income stagnation does not seem to come from changes in the life-cycle patterns of earnings (e.g., a flattening of the life-cycle profile), but rather from a lower starting wage level for newer cohorts. This suggests that the drivers of lower lifetime earnings might be already determined—to a large extent—by the time newer cohorts turned age 25. This fact suggests that successful human capital policies should be directed at individuals before they join the labor market.

I therefore propose to better align career and technical training with workers' abilities and employers' skill demands. Building on evidence of mismatch between the skill portfolio of a worker and the skill requirements of a job, the proposal calls for using big data tools (combined with empirical methods from research discussed in this paper) to aggregate and analyze the task content of job openings in local areas and compare these to the task and skill contents of the available labor force to identify the extent and types of skill shortages, which will provide guidance into types of skills that should be prioritized in technical education. I then discuss important trade-offs involved in any attempt to provide targeted, specific postsecondary instruction with immediate value in local labor markets.

In addition, I propose to improve access to postsecondary alternatives to bachelor's degrees in a way that is effective in boosting enrollment while minimizing unintended consequences, such as diversion of individuals who would have otherwise chosen a four-year college education. I then discuss research relevant to important design considerations for any such policy.

In addition to the policy options outlined in this paper, several other proposals in this volume would stimulate early-career wage growth for American workers. Abigail Wozniak describes potential modifications to the Federal Pell Grant Program to encourage relocation for both college and postgraduate career opportunities. Jared Bernstein's chapter on stimulating labor demand includes proposals for direct job creation programs, which would enhance early-career earnings for individuals who might face barriers to joining the workforce.

In the book's final section, Ben Harris proposes five policies that would increase wage transparency and reduce the asymmetry of information in workers' pay negotiations, directly benefiting entry-level job applicants who might have limited prior knowledge about wage levels in their industry. Finally, Heidi Shierholz offers a collection of policies to strengthen protections for low-wage workers (many of whom are entry-level workers), including increasing the minimum wage and overtime salary thresholds and boosting unionization.

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Acknowledgments

For helpful discussions and comments, I thank the panel members at the Hamilton Project Authors' Conference, George Krivorotov, Conor Ryan provided outstanding research assistance. The views expressed herein are mine and do not necessarily reflect those of the Federal Reserve Bank of Minneapolis.

Endnotes

1. The views expressed herein are mine and do not necessarily reflect those of the Federal Reserve Bank of Minneapolis.
2. Among others, see Baker (forthcoming); Chetty et al. (2017); Chetty et al. (2014); Guvenen, Ozkan, and Song (2014, 2017); Kopczuk, Saez, and Song (2010) for recent studies using U.S. data of this sort.
3. For the ease of exposition, I label each cohort by the year they turn age 25 (rather than year of birth) to give a better idea about when each cohort approximately joined the labor force. The statistics mentioned here refer to the baseline sample in Guvenen et al. (2017) that selects workers who earned an annual income above a minimum threshold for 15 out of the 31 years from ages 25 to 55. Lifetime earnings is defined as the sum of all earnings from ages 25 to 55. Other reasonable definitions and selection criteria give qualitatively similar results.
4. The lower and upper bounds reported here are obtained using the personal consumption expenditure (PCE) and consumer price index (CPI) deflators, respectively, for inflation adjustment.
5. These findings of stagnation and decline in lifetime earnings for men complement those of Chetty et al. (2017), who document a decline in upward earnings mobility from parents to their children in the United States since the 1940s.
6. Guvenen et al. (2017) compute average annual earnings over the life cycle for years worked, which shows a substantively similar picture to what is revealed by lifetime earnings discussed here.
7. The value ranges given here reflect different assumptions about the price index used to adjust for inflation.
8. Since 1979, changes in nonwage compensation have played a much smaller role in offsetting slow wage growth. See the introduction to this volume for more details.
9. Median income at age 35 is omitted to keep the figure readable, but the data reveal virtually no catch-up between ages 25 and 35 for any cohort of men.
10. Their panel regression analysis controls for time variation in these factors at the national level over time, so they are identified from differential trends in these variables across states over time.
11. This is probably one of the oldest documented empirical facts in labor economics, going back to Moore (1911), and has been shown to hold true for most of the 20th century (see, e.g., Brown and Medoff 1989; Oi and Idson 1999; Slichter 1950).
12. This structure builds on a large literature that models occupations as a collection of tasks performed, and then groups tasks based on their similarities. It turns out that most tasks can be classified into one of three categories: (1) cognitive, (2) physical, and (3) dexterity/motor skills. The first two correspond to brain and brawn and capture the bulk of the variation across all tasks. See, among other papers, Black and Spitz-Oener (2010); Gathmann and Schoenberg (2010); Ingram and Neumann (2006); Papageorgiou (2009); Poletaev and Robinson (2008). Acemoglu and Autor (2011) is an excellent survey of task-based models and empirical evidence on the subject.
13. The model is calibrated to match the level of wage inequality and educational attainment rates in the 1970s.
14. Another popular explanation for the fall of the college premium in the 1970s is the rapid rise of the supply of college educated workers in the labor market during that time combined with a model where high- and low-skill workers are partly substitutable in the production process. In such a world a higher supply of college educated workers reduces their relative wage—or the college premium. The growth of college educated workers slowed down starting in the early 1980s, leading to a recovery and growth in their wages. The two stories are complementary and both likely contributed to the behavior of the college premium during this period.
15. Note that—because this calculation includes workers with advanced degrees—it shows a larger and continually growing premium relative to for the premium for workers with only a bachelor's degree.
16. Author's calculations from the Current Population Survey data using a sample of men between the ages of 25 and 60 who worked at least 13 weeks during the year and earned at least an annual income corresponding to 520 hours times half the minimum wage in that year.
17. One measure of overlap between two distributions is Weitzman's measure of overlapping coefficient, which measures the area below both distributions simultaneously. The overlapping coefficient measure was 0.67 in 1970, which was barely changed—at 0.68—40 years later, indicating roughly a stable two-thirds overlap between the wage distributions of the two education groups. However, note that adjustment was not made for differences in age or other wage-relevant worker characteristics that likely differ between the two groups.
18. See Holzer (2014) for a Hamilton Project proposal that addresses similar issues.
19. See http://www.realtimetalent.org/about/history/ for more information.
20. See, e.g., Gill (1988); Welch (1970), among others. Several papers explored the idea that in times of great technical change cognitive ability and general human capital can help workers adapt to rapidly changing conditions, including Caselli (1999), Galor and Moav (2000), Greenwood and Yorukoglu (1997), and Violante (2002).
21. In fact, in an edited volume published by the Brookings Institution in 1987 entitled *Barriers to European Growth*, the editors, Robert Lawrence and Charles Schultze, opened the discussion by pointing out this limitation of specific skills training and urged European workers to acquire "general training to adapt to new tasks," and argued that "European education, which has encouraged apprenticeships that provide specific skills, must adapt" (Lawrence and Shultze 1987, 4–5). Krueger and Kumar (2004) build a model with specific and general training that highlights the trade-offs between flexible general education and less-flexible vocational education.
22. This policy proposal is focused on boosting early-career earnings, and as such does not specifically address the needs of nontraditional students or displaced workers who would also benefit from a better community college experience.
23. See Baum and Scott-Clayton (2013) for a Hamilton Project proposal that includes college completion bonuses.
24. This is an often-noted drawback of low or free tuition policies in many European countries.

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Highlights

Lifetime incomes are stagnating and young workers are earning less today than the generation before them at the start of their careers. In order to boost early-career wages, Fatih Guvenen of the University of Minnesota and the Federal Reserve Bank of Minneapolis proposes reforms aimed at better aligning employer needs with employee skills, in the hopes of raising both early-career and lifetime incomes.

The Proposals

Identify high-demand skills in local labor markets and ensure students can attain those skills. In order to accomplish this, Guvenen proposes a new federal competitive grant to pilot data and implementation initiatives that would facilitate linkages between workforce development programs and local labor markets.

Provide targeted tuition for alternatives to four-year degrees. Congress would appropriate subsidies for enrollment in two-year community colleges and technical colleges.

Benefits

This proposal would benefit young adults searching for employment early in their career, in that their skills would be better aligned with employer needs. This would increase both the likelihood of employment and wages after employment is obtained.

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