

THE ECONOMY GOES TO COLLEGE

The Hidden Promise of Higher Education in the Post-Industrial Service Economy

Anthony P. Carnevale & Stephen J. Rose



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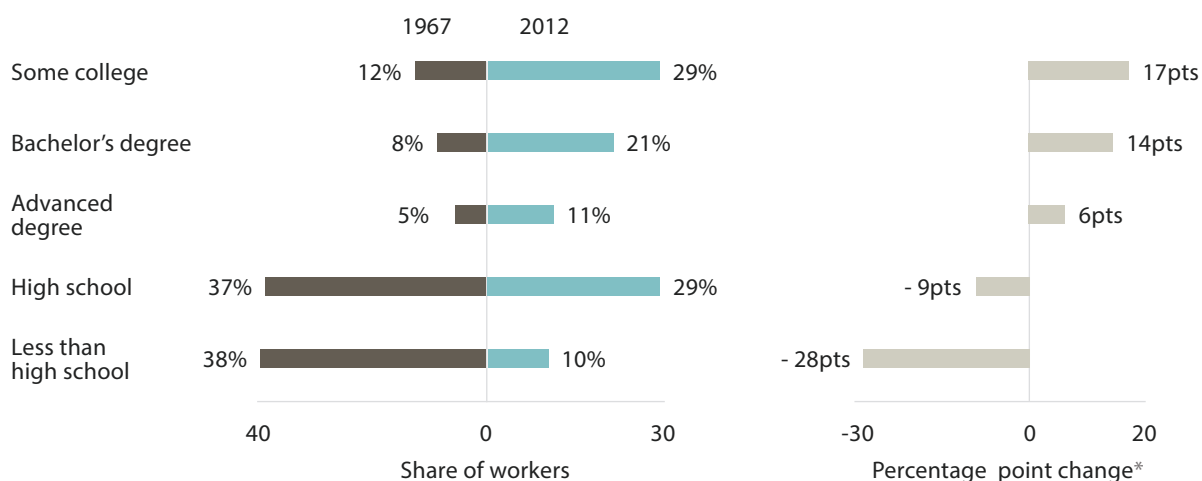
What are we to make of the nation's new post-industrial service economy? Many Americans are worried. In 1947, nearly half of U.S. workers were employed in goods-producing industries (i.e., manufacturing, mining, agriculture, and construction). By 2007, that share had dropped to less than 19 percent of the workforce. Those numbers seem to prove that our economy is out of balance, and to confirm fears that the good manufacturing jobs of the past are being replaced with low-paid, dead-end service jobs.

And yet, many of the findings in this report contradict those fears. The percentage of U.S. workers with high-skill, high-wage jobs is actually larger today than ever before. In addition, the education level of the American workforce has increased dramatically over the past four decades. In the

45 years between 1967 and 2012, the proportion of high school dropouts fell from 38 percent of working-age adults to just 10 percent, while workers with at least some postsecondary education went from one-quarter to 61 percent (Figure 1).

Perhaps the most telling evidence of the growing importance of college-educated workers is their rising contributions to total earnings relative to their share of the workforce (Figure 2). In 1967, people with Bachelor's or graduate degrees represented a little more than 10 percent of the workers and a little more than 20 percent of the wages. At that time, high school-educated workers represented more than 70 percent of all workers and generated more than 60 percent of the earnings. By 2012, workers with a college degree or better grew to more than 30 percent of the workers and produced

FIGURE 1. Between 1967 and 2012, the share of high school dropouts in the workforce declined by 28 percentage points, while the share of workers with at least a Bachelor's increased by 20 percentage points.



Source: Georgetown University Center on Education and the Workforce analysis of data from the U.S. Census Bureau, *Current Population Survey*, 1967-2012. * Values may not sum to total due to rounding.

more than half the earnings in the economy. By 2012, the share of high school workers had fallen below 40 percent of all workers and their share of earnings had fallen below 30 percent.

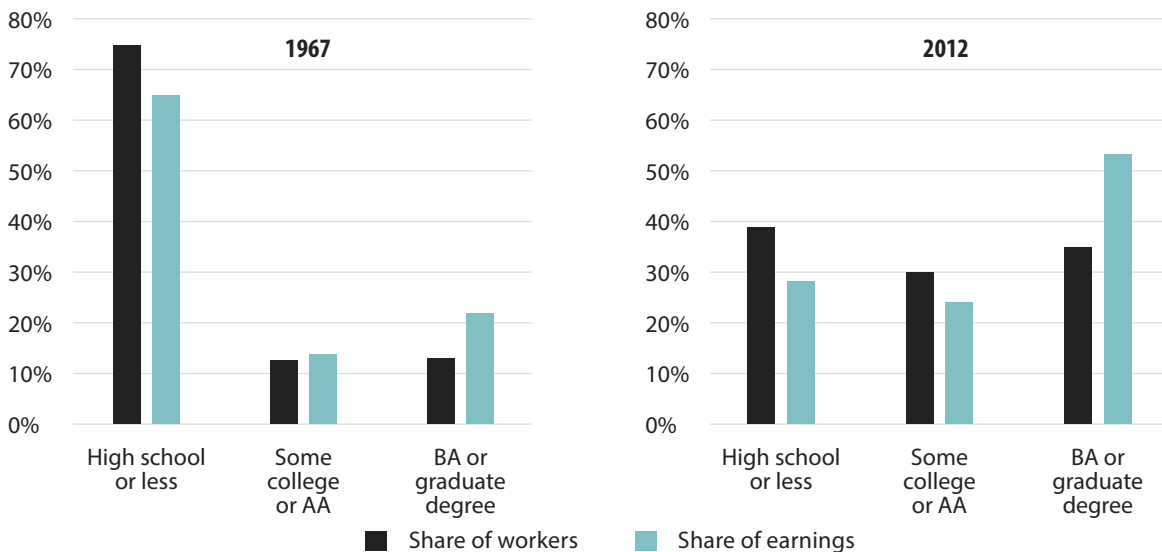
This is a remarkable upgrading in the skills and earnings share for employees with at least some college. Demand is high for these elevated levels of skill; employers are paying substantially more for workers with postsecondary education. The college wage premium – the difference between the average wages of college- and high school-educated workers – has increased substantially since the 1970s. In 1979 the wage premium was just 36 percent for both male and female workers. As Figure 3 shows, it grew steadily until reaching its

maximum level in 2007 with the male premium at 82 percent and the female premium at 75 percent.

How does this picture of a service economy rich with high-skill, high-wage jobs jibe with the popular portrait of a declining manufacturing economy stricken with low-skill dead-end “Mc-Jobs?” How do all those educated workers fit into those low-skill slots? The answer is: They don’t.

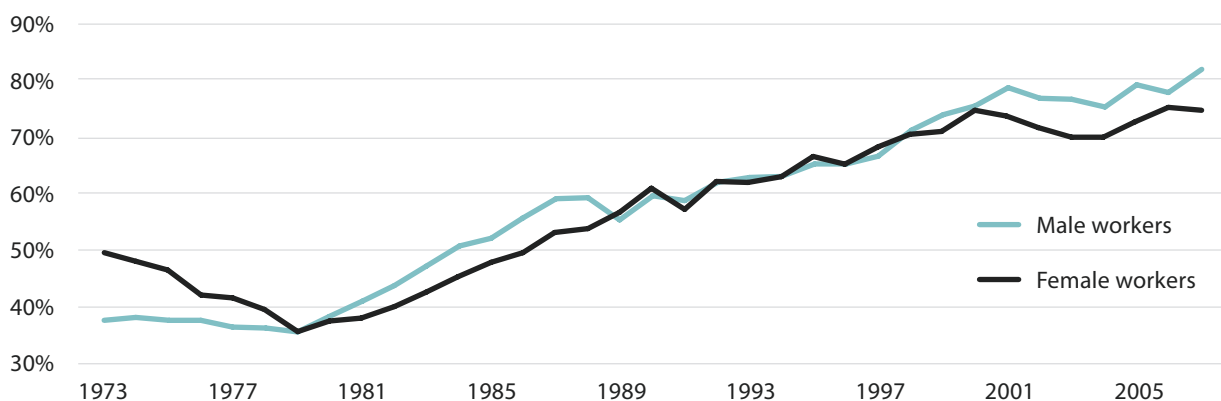
The shift in America’s workforce has not been from factories to fast-food outlets. Rather, the key growth in U.S. employment has come in offices and non-office settings like hospitals and schools that provide higher-skill services; nearly two-thirds of Americans now work in these higher-skill workplaces.

FIGURE 2. By 2012, workers with a Bachelor’s degree or better accounted for 34 percent of workers and 53 percent of all earnings.



Source: Georgetown University Center on Education and the Workforce analysis of data from U.S. Department of Commerce, Bureau of Economic Analysis, *Input-Output Accounts* and U.S. Census Bureau, *Current Population Survey*, 1967-2012.

FIGURE 3. Between 1973 and 2007, the college wage premium for men grew from less than 40 percent to above 70 percent.



Source: Georgetown University Center on Education and the Workforce analysis of data from the Economic Policy Institute, based on hourly earnings from the U.S. Census Bureau's *Current Population Surveys*, 1973-2007.

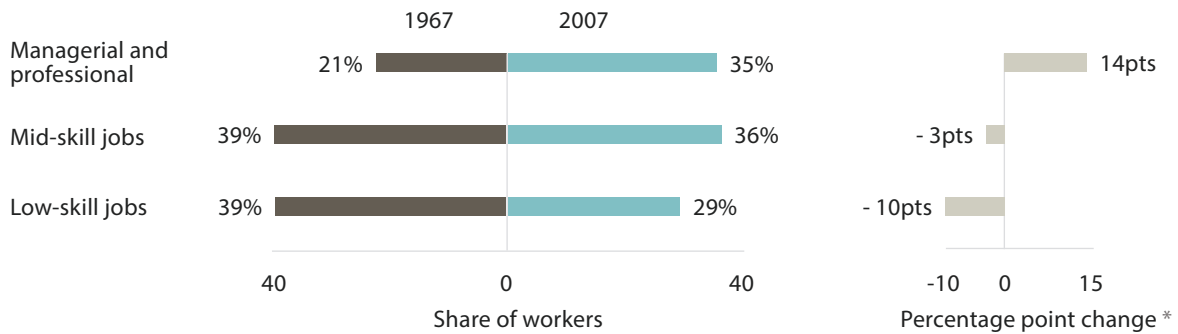
- Between 1967 and 2007, the share of high-skill managerial and professional jobs grew by more than 13 percentage points, from 21 percent to 35 percent of total U.S. employment.
- Contrary to conventional wisdom, the good jobs in the middle haven't been "hollowed out" by the collapse in manufacturing; despite de-industrialization, the share of middle-skill jobs declined only modestly from 39 percent to 36 percent of the overall workforce. Mid-skill jobs have declined only slightly, but have shifted from high school-educated industrial workers toward industrial technicians and service workers with at least some college.
- Over that time, the share of low-skill jobs actually fell from 39 percent to 29 percent of the workforce.

The U.S. economy's largest and fastest growing sectors – business services, finance, healthcare,

and education – have little room for high school educated workers. Also, advances in information technology and the rise of complex consumption and production networks have been key factors in America's economic transformation since the 1960s. The increasing technological sophistication of our economy has only increased the demand for educated workers who can utilize that technology. As employers have bid up the price for college-educated workers, the real wages of high school-educated workers have fallen.

The striking findings in this report are rooted in an innovative input-output analysis of the U.S. economy – a type of economic analysis developed for this study that allows researchers to get underneath the hood of the nation's economy. Our analysis utilizes two key data sources: input-output (I-O) tables compiled by the U.S. Bureau of Economic Analysis that measure all

FIGURE 4. High-skill jobs are increasing, middle-skill jobs are changing, and low-skill jobs are declining dramatically.



Source: Georgetown University Center on Education and the Workforce analysis of data from the U.S. Census Bureau, 1967-2007. * Values may not sum to total due to rounding.

economic activity in the United States; and comprehensive surveys of U.S. workers issued by the Bureau of Labor Statistics (BLS) that detail workers' educational and occupational backgrounds.

We developed this analysis to show the relationship between the shifts in the characteristics of workers (pay, education, and occupation) and the two main drivers of change in our economy – what we produce and how we produce it. The analysis of the I-O tables reveals every phase of the production, distribution, and retailing of a good or service; this is the usually *unseen* value chain that underlies every good or service. With I-O analysis, all the links in that value chain are revealed, including the vital business-to-business transactions that take place before the final sale to the consumer. The changes in those business-to-business relationships – which are usually the longest part of the value chain – have been the main engines of change in the post-industrial service economy.

To see how those changes are affecting American workers, we then conduct a workforce analysis that looks at the BLS surveys of U.S. workers in tandem with the I-O tables. This workforce analysis uncovers the skill and education levels of workers involved at each step in the value chain of a good or service. This comprehensive look at the workforce offers crucial insights into why some American workers have been doing so well in our post-industrial economy while others are falling so far behind.

The rise of the high-skill, high-wage service economy means that the tendency reflexively to favor manufacturing jobs over service-sector jobs doesn't make sense. The dominant service-sector jobs today are in high-end services; they are not "McJobs." The United States should be preparing *more* workers to fill these high-end service jobs, not hoping against hope for a revival of manufacturing. This is a challenge, but it has the virtue of being connected to the actual, existing economy, rather than the economy's idealized

past. It is time to recognize that the transition from an industrial to a post-industrial economy has resulted in a shift away from an economy rooted in high school-level skills to an economy anchored in postsecondary education and training.

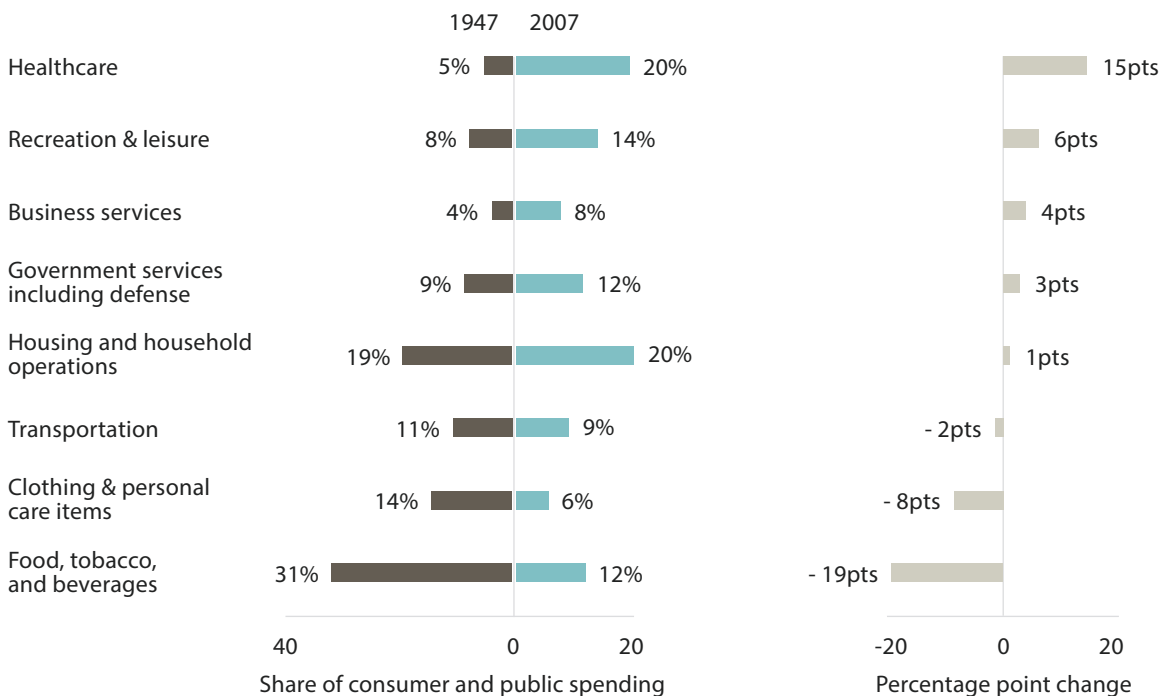
Ten skill-biased trends have defined the post-industrial economy.

The findings in this report allow us to identify 10 trends in the post-industrial economy that have been driving the creation of *more* – not fewer – high-skill jobs in the U.S. workforce. Although

advances in technology have *increased* productivity and thus reduced the demand for manufacturing workers, the growing importance of technology in the overall economy has increased the demand for educated workers who can utilize it. This increasing demand for highly educated workers arguably has been the defining feature of our post-industrial economy. The 10 mutually reinforcing trends below show in detail what has been driving the upskilling – not the deskilling – of the American workforce.

1. The transition to a skill-intensive, service economy is rooted in increased productivity in

FIGURE 5. Food and clothing were responsible for 45 percent of consumption in 1947 and just 18 percent in 2007.



Source: Georgetown University Center on Education and the Workforce analysis of data from the U.S. Department of Commerce, Bureau of Economic Analysis, *Input-Output Accounts, 1947-2007*.

the goods-producing sectors (i.e., manufacturing, mining, agriculture, and construction). The result has been: a dramatic increase in output and a parallel decline in employment shares in these goods-producing sectors; increased education requirements for the jobs that remain in these sectors; and a productivity dividend that has allowed consumption to shift away from these relatively low-education sectors.

Agriculture, for example, has gone from employing 80 percent of the U.S. labor force in 1800, to 40 percent in 1900, to less than 2 percent in 2000. At the same time, agricultural output over the past 200 years has increased by at least 20 times per worker. Similarly, the sharp drop in the share of manufacturing jobs since 1950 has been accompanied by a dramatic rise in output per worker. Technological advances have been key drivers of this growth in productivity, which has meant that even in these relatively low-education sectors there has been an increase in workers' education levels.

The productivity increases in agriculture and manufacturing have made food and many other goods much less expensive. That has freed consumers to spend more heavily on other goods and services, as is detailed in the next trend.

2. The changes in Americans' consumption patterns have led to the expansion of sectors with more highly educated workers. The dramatic productivity gains in agriculture and manufacturing have allowed Americans to reduce their spending in these sectors, which have relatively low-educated workforces. Food and clothing dropped from 45 percent of money spent on immediate

consumption in 1947 to 18 percent in 2007. Over the same period, spending on healthcare increased from 5 percent to 20 percent of total consumption. There were also substantial gains in the business services and government services sectors, both of which have highly educated workforces (Figure 5).

We find that roughly 20 percent of the increase in demand for postsecondary talent stems from changes in the kinds of goods and services Americans consume – i.e., a massive drop in the proportion of their budgets that consumers spend on food and clothing concomitant with a sharp rise in spending on healthcare, education, and personal business services.

Consumption patterns not only have shifted toward service industries that already had higher levels of postsecondary education, but it is in these same industries that the demand for postsecondary workers has grown the most. For example, the share of healthcare workers with a high school education or less declined by 43 percentage points between 1967 and 2007, (from 74% to 31%) while the share with some college increased by 19 percentage points (from 18% to 37%) and the share with a Bachelor's or graduate degree jumped 24 percentage points (from 8% to 32%).

3. The upskilling of America's workforce is mostly driven by changes not in what we produce, but by changes in how we produce it – i.e., by changes in "production recipes." Production recipes are the complex mix of inputs needed to provide a good or service, and they have been changing dramatically throughout the U.S. economy.

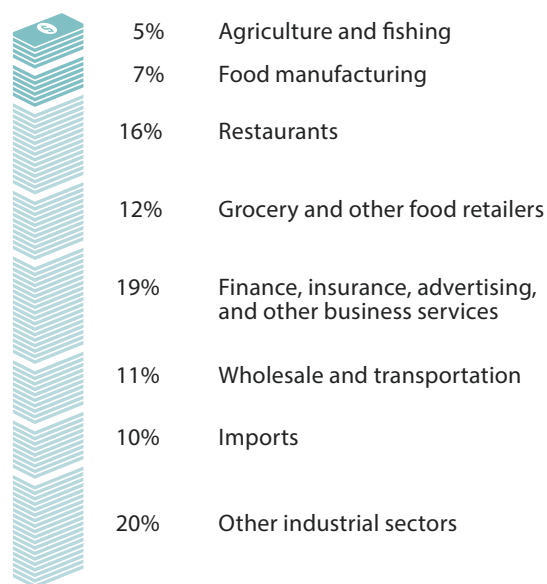
Many of these changes are somewhat hidden because they involve the growth of business-to-business intermediate sales or structural changes within firms as more employment is concentrated in front-office functions and less in direct production. Most people aren't aware of the many direct and indirect components that are needed for production. We find that changes in the educational content of these components – the “production recipes” of goods – have driven 80 percent of the change in demand for college-educated workers. Consider for example the \$1 trillion a year the United States spends on transportation products and services – i.e., purchases of new cars, auto repair, insurance, and bus, plane, and train travel expenses. In 1967, 9 percent of the value of transportation output went to finance, insurance, and professional and business services. By 2007, 21 percent of value added in transportation came from these professional and business services.

These new production recipes require more complex value-added chains that shift more work toward employees with at least some postsecondary education. Even the value-added networks that produce basic commodities like food are a case in point: today, farmers account for only 5 percent of the value added in food production. Almost 20 percent of the value added in the food network comes from the bankers, insurance firms, advertisers, and other business services involved in bringing final food output to the table.

The food network is also a classic example of the shift from unpaid household labor to commercialization in service functions and the increase in education and training that has accompanied that shift. We've come a long way from an agrarian

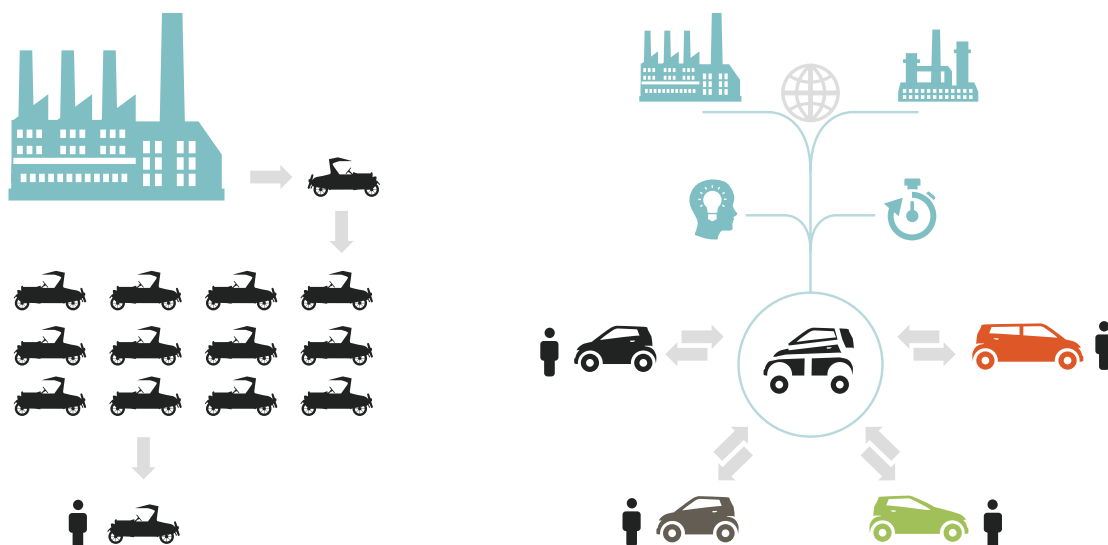
society in which a substantial share of food was produced, prepared, and eaten at home; to an industrial society in which food was produced commercially, sold to households, and primarily prepared and eaten at home; to a more complex post-industrial economy where nearly half our spending is on food and drink consumed away from home. Twelve percent of food value comes from grocers and 16 percent from restaurants (Figure 6). And while there may have been nothing better than grandma's home cooking, the commercial production and preparation of food that has replaced grandma's fare requires many workers with considerably more education and training.

FIGURE 6. Farming and fishing contributed only 5 percent of the total value of food in 2007.



Source: Georgetown University Center on Education and the Workforce analysis of data from the U.S. Department of Commerce, Bureau of Economic Analysis, *Input-Output Accounts*, 2007.

FIGURE 7. The economy has moved from mass production of standardized goods to mass customization of goods and services.



According to our calculations, *80 percent of the upskilling in the overall American economy is accounted for by changes in production recipes.*

4. Increasing wealth from productivity growth has empowered consumers to demand more sophistication in the creation and delivery of goods and services. We find profound shifts in value chains across all industries that largely explain the decline in hands-on production workers and the rising value added by service workers with college degrees. The U.S. economy has undergone a fundamental shift from an industrial economy based on the mass production of standardized goods and services to a more complex system of economic value – focused on quality, variety, customization, convenience, speed (cycle time), innovation, novelty, brand, and social responsibility. This shift to more complex systems of economic value is what

lies beneath the rising demand for college-educated workers that has been a key driver in the U.S. economy since at least 1983, when the college wage premium over high school began its meteoric rise.

In today's economy, plain vanilla is no longer good enough. Variety and the customization of goods and services have become key competitive principles. New cars now come with a dizzying array of options, and the old world of three TV networks has been replaced with thousands of cable channels.

Consumers' tastes have grown more demanding and diversified due to a mix of economic and demographic forces. As Americans have gotten richer, they've been able to buy a wider variety of goods and services – and they're looking more and more for quality, convenience, and sophistication (see Figure 7). On the demographic front, the entry

of women into the workforce has been a key factor in the changing structure of the American family. As a result, personal tasks like child care that were traditionally done at home are increasingly being commercialized. The commercialization of such services inevitably expands market standards beyond price competition. And that's happening with many other goods and services, too, as Americans' purchasing decisions are being driven more and more by ethical, environmental, and health concerns.

As consumers have demanded more from companies, those companies have demanded a deeper and broader set of skills from their workers: not just cognitive skills, but interpersonal skills and other non-cognitive competencies. Employers have raised entry-level education requirements for their workers and expect them to engage in lifelong learning on the job. Producing today's high-quality goods and services requires employees to have a deeper knowledge of their fields of study and a better understanding of applications on the job. Growing demands for variety and customization require the flexibility to master short production runs and various consumer interactions. Greater expectations of convenience, customer service, and social responsibility require empathy for the customer or client. The endless quest for innovation requires deep domain knowledge, critical thinking skills, creativity, and a tolerance for change.

5. The increasing scope of economic value would not be possible without the rise of information technology – i.e., the computer in all its manifestations. Spending on information technology as a percentage of all business fixed investment has grown from near zero after World War II to nearly

50 percent today. Information technology makes possible many new forms of value added. It monitors quality in production and in the use of goods and services. Information technology provides the flexibility to tailor goods and services to smaller markets and even to individual customers. In addition, by integrating producers and consumers into economic networks, it helps create an environment in which goods and services can be delivered globally or locally in a convenient and timely manner.

Modern information technology is ultimately biased in favor of highly skilled workers because it complements more than it substitutes for skill. Computer technology automates repetitive tasks but leaves non-repetitive tasks and higher levels of human interaction to workers who, in turn, require higher levels of cognitive and non-cognitive competencies. Virtually all workers now have non-routine interactions with more powerful and flexible technology. Computers have become more like an artisan's tools reflecting complex human input and less like the single-purpose mass-production machines characteristic of the industrial economy.

Today, for every task surrendered to automation, new opportunities are generated for exploiting the technology's capabilities. Moreover, the more flexible and powerful the machinery, the more employees, work teams, and organizations must increase their skills to deploy its technical capabilities fully. These more flexible and powerful technologies work best in combination with more flexible and highly skilled workers to deliver quality, variety, customization, convenience, brand consistency, speed, and innovation at the lowest cost.

6. Widely distributed information technology allows the shift to complex learning networks driven by widely shared information, measured outcome standards, and direct consumer participation – making these new networks the dominant form of organization for both consumption and production in all industries. These flexible networks use information technology to integrate production, minimize cost, and engage customers. The growth of networks of production and service delivery has gradually displaced the two dominant institutional forms typical of the industrial economy.

The signature institutional format in the industrial era was the massive vertically integrated company where absolute authority at the top of the managerial pyramid was transmitted through tiers of middle managers to compliant workers at the point of production or service delivery. The second dominant organizational form of the industrial era – which persists in some sectors today – is the chaotic structure of service industries like healthcare and education. These fragmented structures tend to operate without cost efficiency and the benefit of scale; productivity is low, prices vary widely and are relatively high, and individual service organizations (such as small businesses, hospitals, and schools) offer face-to-face services (from doctors, lawyers, and teachers, for instance) that are too isolated to deliver consistent quality, innovation, or cost efficiency across a broad array of providers.

Both the top-down industrial behemoth and the fragmented model of service delivery are being displaced by networks of institutions and individuals that foster direct consumer participation and measured outcomes. Today, automakers can

respond to an online request from an individual customer for a unique option package and then assemble that car with parts delivered just in time from thousands of intermediate suppliers worldwide. And the fragmented structures of key services like healthcare are gradually being integrated by network-based price and outcome standards.

In general, these networks allow the creation and consumption of more complicated production chains. A single organization is rarely able to produce different kinds of value added at competitive prices. One organization may be good at mass production but require partner institutions to handle customer service and innovation. Cost and efficiency concerns also argue for networks. While individual employers try to maintain core competitive assets, they have powerful incentives to contract out specialty functions such as business services, information technology, and human resources. More flexible and extended networks also allow individual employers to share risk and cost with other institutions and to expand or contract their peripheral commitments depending on market conditions.

As production networks have gone global, there's been a sense in America that the imported goods we consume are the products of low-skill labor and include few if any U.S. inputs. But a 2007 study of Apple's iPod – whose parts are made and assembled almost entirely overseas – shows that its value chain has many links in the United States (Linden, Kraemer, and Derick, 2007). The study examined the value chain of Apple's fifth-generation 30 gigabyte iPod, whose packaging noted it was "Assembled in China." And yet only \$4 of the iPod's \$299 final price was attributed to its

assembly and testing, and less than half its cost went to overseas inputs. By contrast, \$80 of the final price went to its licensing fee for design and intellectual property – a fee that reflected the high-skill labor of Apple’s American-based designers and engineers. Altogether, at least 55 percent of the iPod’s final price went to U.S. companies involved in its design, wholesaling, or retailing.

7. Networks are a crucible for learning in the economy and tend to increase entry-level skill requirements and lifelong learning requirements at all levels of the workforce. Workers not only need greater knowledge to get their jobs, but they need critical-thinking skills to do the problem-solving and innovating that are increasingly required on the job. Both institutions and workers now rush to catch up to, keep up with, and get ahead of consumer demand.

In the post-industrial era, both learning and innovation have become more diffused in production and service networks. The industrial era was driven by major inventions brought to market by firms like General Electric, General Motors, IBM, Kodak, and Xerox. While bringing inventions to market is still characteristic of many industries – pharmaceuticals and chemicals, for example – post-industrial expansion is notable for using existing science and technology in ever more complicated learning networks. Google, for instance, creates new wealth by developing networks made from available technology in collaboration with its users.

In the old-line firms, orders flowed from the top down. Learning from front-line personnel and customers rarely flowed back up the hierarchy. A

key characteristic of the high-performing product and service networks of today is that they are integrated and effective learning communities. By contrast, the highly fragmented service industries like postsecondary education do lots of teaching and learning at the interface with their students and clients but capture very little of that knowledge across their institutional and disciplinary networks and thus fail to innovate.

Effective economic networks increasingly include education and training at the entry level and also encourage lifelong learning. Small changes in skill requirements on a job create a demand for more formal and informal training for the workers doing that job. And when skill changes grow great enough, they are passed back into the education system either as an increase in general learning requirements or in more occupation-specific kinds of learning. Technological change, for example, has increased the need for general learning in math as well as more specific occupational preparation in computers, engineering, and the sciences.

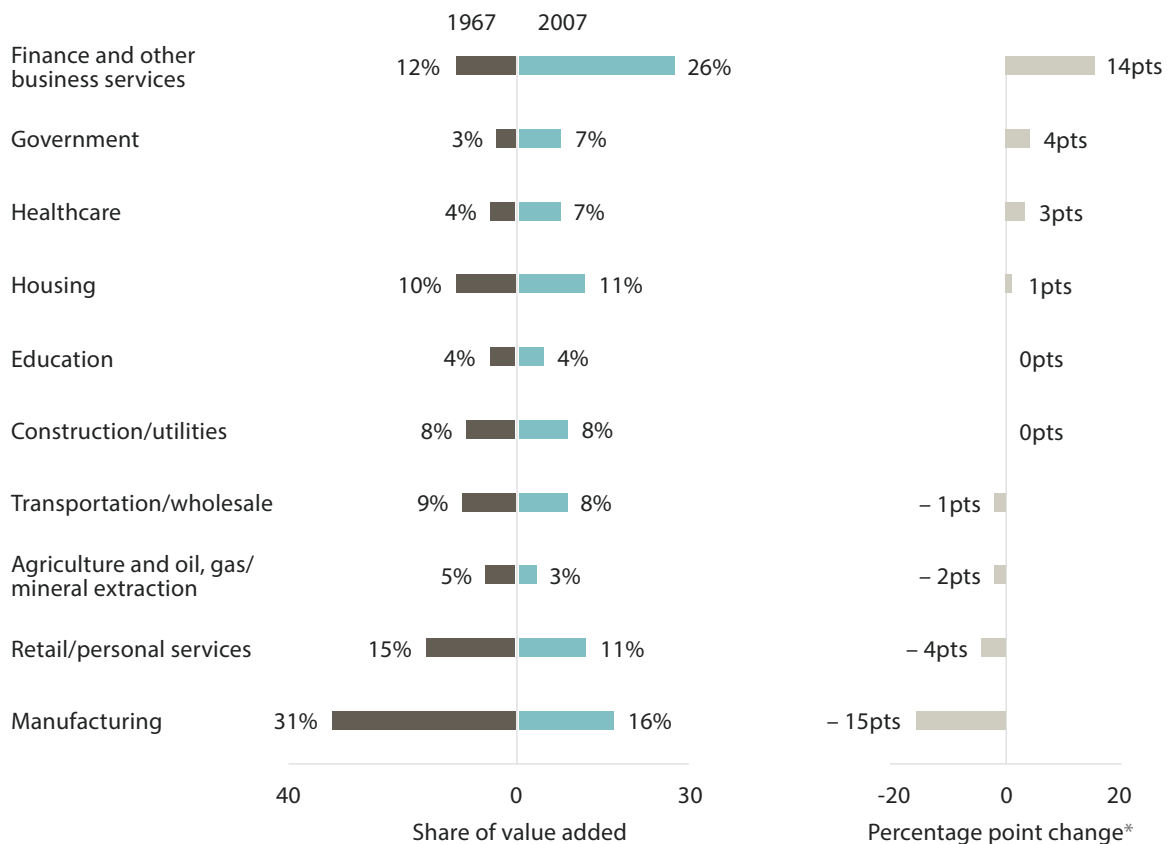
8. Business-to-business services, which employ highly educated workers, are the hidden hands transforming production and consumption recipes. Business services are what hold together the value-added chains in production and consumption networks. Business services include a wide variety of professional functions such as consulting, accounting, management, and legal services as well as clerical services and finance.

The business services “super sector” has replaced manufacturing as the U.S. economy’s largest industry cluster. Furthermore, there has been a

remarkable reversal in fortunes: in 1967, manufacturing was responsible for 31 percent of all value added in the economy and the business services sector accounted for just 12 percent; by 2007, manufacturing declined to 16 percent of all value added and business services jumped to 26 percent – the percentage point decline in manufacturing almost exactly equaled the percentage point rise in business services (Figure 8).

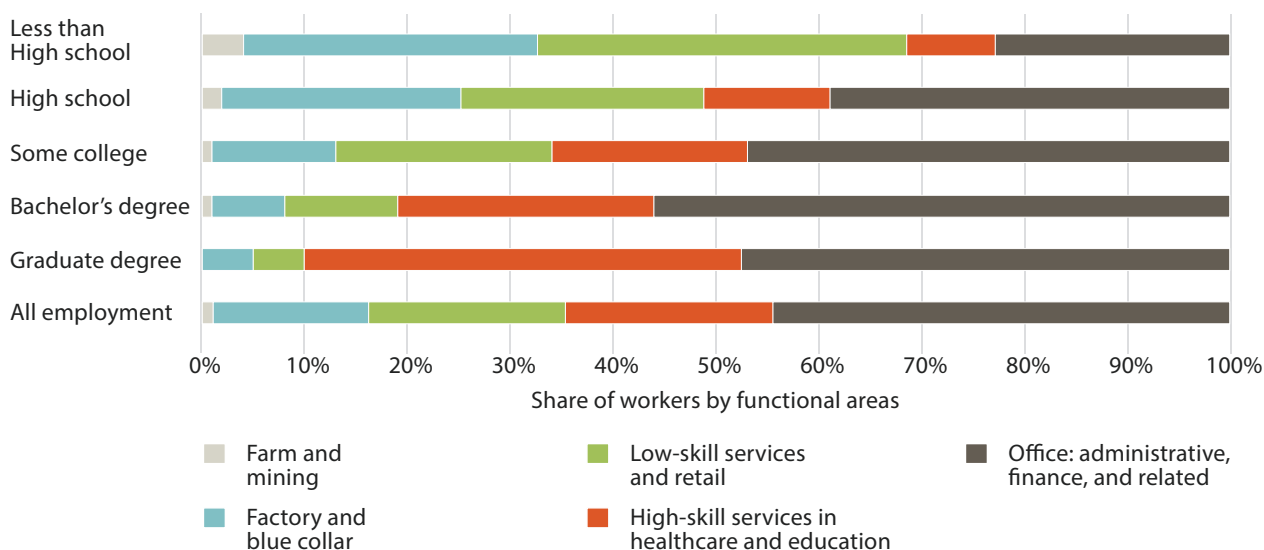
9. White-collar office and professional workers with postsecondary degrees are central in the post-industrial networks of production and service delivery. As this report will show, the new division of labor has led to 44 percent of the U.S. workforce being employed in offices. The rise of office work has displaced the great outdoors and the factory floor as the dominant venues for work, especially for workers with a postsecondary

FIGURE 8. Between 1967 and 2007, there was a big twist: the manufacturing industry’s importance to the economy declined; finance and other business services took its place.



Source: Georgetown University Center on Education and the Workforce analysis of data from the U.S. Department of Commerce, Bureau of Economic Analysis, *Input-Output Accounts*, 1967-2007. *Values may not sum to total due to rounding.

FIGURE 9. Those with a Bachelor's or graduate degree are predominantly employed in the high-end service sector.



Source: Georgetown University Center on Education and the Workforce analysis of data from the U.S. Department of Commerce, Bureau of Economic Analysis, *Input-Output Accounts* and U.S. Census Bureau, *Current Population Survey*, 2007.

education. Our communities are organized more and more around the gravitational pull of offices. Office buildings define the skylines of our cities. The office has even taken up residence in our homes, with the home office occupying a room of its own or commanding any flat space near a chair.

Office-based work plus high-skill services now employ 64 percent of the workforce – up from 50 percent in 1967 – and those workers receive 74 percent of overall compensation. In contrast, the low-end service economy of retail, food, and personal services has remained roughly stable at just below 20 percent of the labor force, and workers in that sector receive just 11 percent of compensation. Eighty-five percent of those with a Bachelor's or graduate degree now work in an office or in high-skill professional services (Figure 9).

10. The growth of the office/high-skill service economy has significantly increased the share of high-quality managerial and professional jobs relative to middle-skill and low-skill jobs. As Figure 4 shows, in 1967, just 21 percent of jobs were in high-skill managerial and professional occupations. By 2007, these jobs had increased to 35 percent of the overall workforce. Meanwhile, low-skill jobs have plummeted from 39 percent to 29 percent of the overall workforce and are clustered in occupations that are declining rather than growing (e.g., unskilled blue-collar and service/sales positions). Jobs in the middle-skill range have not been hollowed out. Jobs in middle-skill occupations (skilled blue-collar, supervisory, and clerical workers) fell only slightly from 39 percent to 36 percent.

CONCLUSION

Ultimately, these 10 mutually reinforcing trends have one effect in common; they all point toward the increasing importance of education – with postsecondary education as its capstone – in the nation’s economy. In the United States, economic output per capita has increased from \$22,000 in 1967 to \$49,000 in 2012 (in 2009 dollars). Over that period, the share of workers with at least some postsecondary education increased from 25 percent to 65 percent of the U.S. workforce and the workers’ contribution to U.S. output grew from 36 percent to 77 percent of the total value added from labor. It has become clear that in the future young adults will have to have some sort of postsecondary credential (including certificates) if they are going to earn middle-class salaries.

On balance, the rise of the post-industrial service economy is a hopeful story. It suggests that the limits to economic growth are, as yet, not in sight. The expanded kinds of economic value on offer in the post-industrial era are still relatively new and there is considerable unmet demand for its innovations even in the most advanced economies, let alone in developing nations that have yet to realize the full potential of the agricultural and industrial revolutions. In addition, an economy that relies more on services relies less on back-breaking labor, and a more efficient post-industrial economy uses less energy and fewer scarce materials extracted from the Earth.

Despite predictions of decline, the U.S. economy can grow stronger and more equitable by ramping up postsecondary education.

As America continues to drag itself slowly out of recession, doubts have emerged about our economic future. In a constantly changing world that’s more globally integrated than ever, fears are rampant that the U.S. economy – with its huge service sector and relatively small manufacturing base – is fundamentally out of balance and cannot produce the kind of jobs Americans need.

This report shows that view is mistaken. That view confuses current problems – cyclical unemployment and high income inequality – with structural economic shifts that have profoundly and irreversibly transformed how everything in the U.S. economy is produced. Where we work, how we work, what we consume, and how we consume it have all been altered radically by the relentless march of technological change and educational upgrading. These shifts reflect our ability to produce more commodities with fewer but more highly skilled workers and to produce a wider range of commodities that more consumers can purchase.

In aggregate, our findings indicate that there is an intimate fit between the rise of America’s new service economy and the huge increases in educational attainment of the U.S. workforce. Today’s educated workers are needed to run our increasingly skill-driven economy; they are not having their human capital wasted in dead-end jobs. Far from it – they are being

rewarded greatly for their human capital, as today's high education wage premiums attest.

Today's approximately 80 percent premium for a college education (over high school) is artificially high because America is underproducing college talent. This underproduction of college talent is causing employers to bid up the cost of college labor artificially, contributing significantly to the growing wage inequality between college haves and have-nots. An earlier study finds that increasing the supply of college talent by 20 million people could still provide upper middle-class wages for college graduates and distribute the economic benefits of college degrees more evenly to both employers and workers (Carnevale, Rose, 2011). In our analysis we find that this increase in college access and success could add almost \$500 billion a year in economic growth and retain a wage premium of college-educated workers over high school of about 46 percent a year.

No doubt there are other reforms and policies that should be considered to increase our growth rate and bring down today's troubling inequality. But we think improving the educational levels of our workforce and the environment within which they work is a great place to start. And whatever other policies are needed, we feel sure that they will benefit by starting from an accurate picture of what today's new service economy is and how it really works.

Of course, some may argue that our picture of today's economy is not accurate – that it is far too optimistic about the state of our economy and its long-run potential. This is hardly unprecedented. Looking at economic history, one finds many cases of people worrying about our economic future.

Sylvia Nasar in the *Grand Pursuit: The Story of Economic Genius* writes about the long history of economists predicting a bleak future.ⁱ In our own recent history, there have been multiple predictions of extended economic malaise ahead: in the 1950s there was the fear that automation would lead to high levels of "structural unemployment." Pessimism rose at the end of the 1970s with "stagflation" followed by a double dip recession in 1979 and 1981 that led to a brief period when the unemployment rate topped 10 percent. Despite strong economic growth during the rest of the 1980s, worries arose about a "day of reckoning" and a Japanese onslaught that would displace America as the world's strongest economy. The prominent MIT economist, Lester Thurow, went one better in arguing that a combined Europe would lead to the United States being the third-rated economic power after Europe and Japan by the first decade of the 21st century.ⁱⁱ

One of the reasons for these concerns is that the economy is chaotic and diverse: 120 million households, 140 million workers, and tens of millions of companies all pursuing their own interests. In many ways, it is a wonder that this process is as smooth as it is and that it frequently leads to positive outcomes for the large majority of the population. Since the economy is always changing, there can be a disconnect between people's past experiences and what is happening now.

As the old relationships tend to decline, it is natural to think that this current disruption will have permanent negative consequences. The physiocrats, writing in the mid-1700s, provided the most detailed elaboration of how the old is what matters. They argued that only agriculture

created value and that manufacturing was “barren” and only manipulated things without adding value. In retrospect, this position seems quaint, as manufacturing has been the driving force of economic growth over the past 200 years.

Are some now making the same mistake when they imply that only manufacturing matters, that services provide mostly low-skill, dead-end jobs and that the current U.S. economic trajectory is taking us toward a bleak future? We think so, but this pessimistic view has been supported recently by three lines of argument, the first two of which are, interestingly, diametrically opposed to one another:

- The rise of advanced technologies like robotics will reduce the need for skilled labor and produce a shortage of good jobs.
- The growth potential of our economy is limited because today’s technologies will not yield the growth dividends we have seen in the past.
- Today’s economy is putting more and more college-educated, skilled workers into jobs for which they are overqualified.

All these objections are inaccurate assessments of today’s economy and its future potential. Let’s start by addressing the question of an economic transformation driven by more capable robots. Kevin Drum, in a widely read *Mother Jones* article and web posting, predicts that “[s]mart machines won’t kill us – but, they will take our jobs, and sooner than you think.”ⁱⁱⁱ While this repeats the age-old theme that automation kills jobs, it is based on a much more advanced perspective on how much machines can do. Or as Drum says: “The Luddites weren’t wrong. They were just 200 years too early.”

Drum predicts that machines will be smarter than humans within a couple of decades; they will be able to do most things better than ever before and even fix global warming. By 2040, our “robot paradise” will be here, but it will not be a real paradise because no one will have a job.

But Drum hasn’t followed his own logic far enough. If robots can do everything – create themselves, produce and upgrade themselves, repair any problems themselves, diagnose and treat diseases, etc. – then why do we need to work? Since the robots don’t need to be paid, this cornucopia of capabilities should cost nothing as we will have entered the world of “true communism” – to each according to her needs and from each according to her ability, with everyone free to read poetry in the morning, fish in the afternoon, attend parties at night, or do whatever mix of activities she chooses. It sounds like the retirement life of multimillionaires, only that deteriorating health won’t be a problem for most people – robots would have found the cure for cancer and most other diseases.

But this utopia, if it ever arrives, is highly unlikely to be here by 2040. From 1950 to 2012, real GDP per person grew by 340 percent or slightly less than 2 percent a year. Although he doesn’t think in these terms, Drum is actually predicting that real growth will increase astronomically (by perhaps as much as 10 percent per year) as smart machines are able to increase output with very few human requirements.

This is not remotely realistic. One way to see the limited effects of robots is to see how greater technological capacity would change how things are produced in each of our major industries.

The second line of argument about our bleak economic future is diametrically opposed to the premises of the first. According to this view – laid out in Robert Gordon’s essay “Is US Economic Growth Over?” – slow economic growth began in the 2000s, was made worse by the financial crisis, and is never going away because of faltering innovation. Gordon posits that economic growth should not be taken as a given and that strong growth only occurs in waves associated with innovations that set off “industrial revolutions.” Gordon believes that our most recent industrial revolution – computerization – has already run its course (contra Drum) and lacks further ability to drive economic growth.

He begins his argument with a wild extrapolation: he shows that economic growth was very low from 1300 to 1750 and predicts we will eventually return to this level. He shows that the rate of economic growth (of per capita GDP) grew steadily in the 19th and 20th centuries and then accelerated more, reaching a peak in the 30-year golden age following the end of World War II. Starting in the 1970s, growth rates declined but ended up at levels that are still high when considered against pre World War II rates of growth. But Gordon decides that the recent decline from peak growth will continue unabated until it approaches zero.

Gordon backs up this extrapolation by talking about six headwinds to growth: demographic burdens (baby boom retirements), little increase in educational attainment, high levels of inequality, globalization, rising energy and environmental costs, and high levels of household and government debt. He singles out inequality

as a special problem, not because it necessarily interferes with growth *per se* but rather because it reduces the incomes received by most of the population from economic growth.

Gordon has company in Tyler Cowen’s *The Great Stagnation*, which makes similar arguments. In both cases, there is no real analysis of how these factors decrease growth and it is just posited that these factors obviously will have negative consequences. Moreover, it is posited there is essentially nothing we can do about these “headwinds.”

We disagree with this approach. It cannot be assumed that all these headwinds collectively will have the effect of stopping growth. After all, any historical period has had economic problems that were barriers to growth. Why should we assume that today’s headwinds are uniquely able to *stop* growth when that has not happened in the past?

It also cannot be assumed that there is nothing we can do about these headwinds or that they will all remain as troublesome as they are today. Take slow growth in educational attainment. This slow growth is not “baked into the cake” but can rather be affected by policy. Either that or we have to believe that the low rates of college completion among Hispanics and African Americans – which Gordon cites – are somehow innate to these groups. Similarly, inequality can potentially be mitigated by policy (one way, in fact, is by increasing educational attainment, as we argue in this report). Globalization may not always have the wage-depressing effects it now has in advanced countries as wages in developing countries (e.g., China) continue to rise. The household debt

problem is likely to diminish over time as the economy recovers. And the government debt problem, as we have recently seen, is not a “crisis” but rather a difficult but manageable problem that does not need to be “solved” by growth-reducing austerity. And so on. The assertion that these headwinds add up to an insurmountable barrier to growth is just that: an assertion, not a convincing argument.

So, America is not losing all our good jobs to robots or running out of growth potential or wasting our college graduates in low-skill jobs. In fact, we have a bright future ahead of us *if* we adjust to the demands of our evolving high-skill service economy. The choice is ours.

But there is a dark side to the post-industrial service economy. In the final analysis, the American economy is a bittersweet story. And not enough has been done to invest in modernizing the U.S. manufacturing base. But the critics are wrong when they say that the United States traded a high-wage manufacturing economy for a low-wage, low-skill service economy. On balance, the shift to the service economy has been a good thing – but only for workers with education and training beyond high school.

Of course, there are real reasons to be concerned about our post-industrial economy. The loss of manufacturing jobs has been devastating for high school-educated men and women and their families. It’s precisely those workers without college degrees who are being left behind in the new service economy. And that education gap has been a key factor fueling the income inequality that’s distorting our economy and our society.

Our data reinforces concerns over the growing income inequality and declining social mobility that have scarred America in recent decades. Our findings here and in other studies suggest that class- and race-based inequality in postsecondary education is limiting access to learning and earning on the job (Carnevale and Rose, *The Undereducated American*, 2011; Carnevale and Strohl, *Separate & Unequal*, 2013).

In theory, education is the preferred solution to growing inequality and declining economic mobility, but, in fact, it may be operating as a more and more important mechanism for reinforcing the intergenerational reproduction of privilege by class and race. In a society in which people start out unequal, educational attainment measured by test scores and grades can become a dodge – a way of laundering the found money that comes with being born into the right tax bracket or the right race.

Young people born into families in the right neighborhoods with the best schools are best able to navigate the pre-K through 12th grade human capital development system and gain preferred access to postsecondary institutions that put them first in line for jobs with the most training, as well as the most powerful and flexible technology. In the post-industrial economy, these are the advantages that account for the cumulative differences in lifetime earnings.

Moreover, the class and race inequality in the postsecondary education system is especially daunting. It is much less likely now to spring from personal bigotry than from mechanisms that are race and class neutral, in theory, but, in fact, reliably

produce unequal opportunity among classes as well as between whites and other racial and ethnic groups – especially among African Americans and Hispanics in the current American context. The complexity and severity of these problems demand solutions that are serious and bold.

Among all the ways to start out unequal, race is still the worst. American racism persists even without racists. The lingering effects of Jim Crow still haunt our institutions, isolating minorities in ghetto neighborhoods and in decrepit schools that don't send kids to college. Race and economic class often go together, but class is the common coin of the realm when it comes to limiting college opportunity. The seminal work of Eric Turkheimer and his team at the University of Virginia shows that for most low-income kids there is no relationship between innate abilities measured in childhood and aptitudes developed by the time they are old enough for college. In other words, if you come from a poor or working-poor family, chances are you won't be able to "be all you can be." At worst, these children are not only isolated geographically, oftentimes in our urban free-fire zones, they are isolated from the American dream. With no way out, they don't live in America, they live underneath America.

Conversely, students from affluent families are much more likely to become all they can be in the transitions among childhood, college, and careers. Turkheimer and his team find that test scores of affluent children when they are young are good predictors of their developed abilities when it's time to apply to college.

The Crucial Role of Education in Combating Inequality in the Post-industrial Economy

Education alone won't solve the problems of racial and class inequality, of course. But because education in a post-industrial economy is more important for success than ever before, it must be the centerpiece of any solution. The authors believe there are two key educational policies America can implement to combat inequality.

America can lessen inequality by dramatically expanding access to postsecondary education and training. College-educated workers in America now make 80 percent more on average than workers without a college degree. This report and our earlier study find that the college wage premium has grown so high because the United States for decades has been under producing college talent (Carnevale and Rose, 2011). That has caused employers to bid up the cost of college labor and exacerbate the income inequality between college haves and have-nots.

The authors find that America could reduce inequality significantly by adding around 20 million college-educated workers to the workforce over the next 15 years. (Right now, the United States is on track to add only about 8 million.) Such an increase in the college-educated workforce would raise total output by \$500 billion a year by 2025 (about 3.5 percent of GDP).

According to our estimates, this additional growth would reduce the wage premium for college-educated workers to about 46 percent a year. That level that would still justify the investment in a college

education, and is equivalent to what the U.S. college wage premium was from roughly 1950 to 1970.

While expanding access, the two-tier nature of the U.S. postsecondary system must also be addressed. Simply expanding access to postsecondary education won't be enough to combat inequality. Currently, the U.S. postsecondary system is deeply divided between a top-tier of roughly 500 universities that provide enormous advantages to their graduates, and the remainder of the schools that confer far fewer benefits on their students.

A previous study, co-written by one of the authors, shows that students in the top-tier schools are disproportionately white and wealthy, and that those top-tier schools spend two to five times more per student on instruction than other institutions (Carnevale and Strohl, 2013). The stark difference between the top-tier and the rest can be seen in the graduation rates of minority students.

The few African-American and Hispanic students who attend the top-tier schools have a graduation rate of 73 percent, while just 40 percent of African-American and Hispanic students who attend other institutions end up graduating. There are also huge differences in educational and career outcomes that separate all students at the top-tier and lower-tier schools.

Clearly, there needs to be a continuing push to broaden access for African Americans and Hispanics to the top-tier schools, but perhaps more importantly, America needs to invest much more heavily in the rest of our postsecondary institutions, so we can close the gap between the two tiers.

Implementing these policies won't be cheap or easy. But there are many precedents in America for these sorts of investments: the founding of our land grant colleges, the establishment of the G.I. Bill, and the dramatic expansion of public universities that continued throughout the postwar era. The legitimacy of such efforts is deeply rooted in the democratic project.

Efforts to combat inequality are rooted in the venerable grand bargain that Western nations struck early in the industrial era. Then, the newly emerging democracies of the West were struggling to reconcile the conflict between the values of democratic citizenship and economic markets. While democracy presumes equality, markets are driven by the pursuit of wealth and the accumulation of vast fortunes. The essential bargain these nations achieved was that some part of the growth dividend from capitalism would be shared to ensure that all people could lead decent lives.

The seminal statement on this grand bargain was put forward in a speech by British economist Alfred Marshall to the Cambridge Reform Club in 1873. Marshall argued that markets would become the paymaster for a constant expansion in publicly funded education and social services. This arrangement would guarantee all citizens full membership in society, while preserving free markets and legitimizing the economic differences those markets generate.

"The question," Marshall said, "is not whether all men will ultimately be equal – that they certainly will not – but whether progress may not go on steadily, if slowly, till, by occupation

at least, every man is a gentleman,” valuing education and leisure more than the “mere increase in wages and material comfort.”

In 1949, British sociologist T. H. Marshall (no relation to Alfred) updated the original concept in a speech commemorating his predecessor’s famous remarks. In “Citizenship and Social Class,” the latter Marshall asserted that citizens must have “a modicum of economic welfare and security ... to share to the full in the social heritage and to live the life of a civilized being according to the standards prevailing in the society.” This ideal of citizen equality, he wrote, was most heavily bolstered by “the education system and the social services.” Marshall’s 1949 speech proved enormously influential, becoming the widely recognized summation of the argument for the massive expansion in both public education and the welfare state after World War II.

Once again, we are struggling to reconcile the conflicts between democracy and capitalism. What is new in the post-industrial service economy is that education is not just the preferred path, but increasingly it’s the only reliable path to a middle-class life. And so it makes the task of reform that much more urgent. The economic inequality that plagues many Americans today need not persist. By pursuing policies that significantly expand postsecondary education and training, America can help ensure that the great wealth of our post-industrial economy is much more widely shared.

Endnotes

- i. Nasar, *Grand Pursuit*. 2012.
- ii. Ibid.
- iii. Drum, “Welcome, Robot Overlords.” (2013).

PRODUCTION RECIPES

One of the key analytical tools in this report is the “production recipe,” which is the complex mix of all the contributions that go into providing a good or service. By looking at production recipes, we can see all the workers involved in the provision of a good or service – and we can track the education levels of all those workers. By breaking that information down by sector, we can then get a precise measure of the education level of the workers in each economic sector.

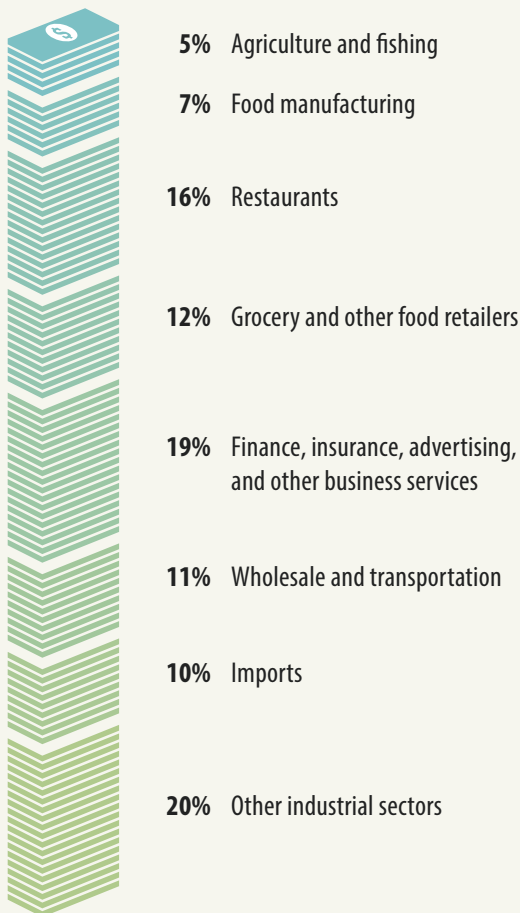
The production recipes listed are the 11 final output categories analyzed in this report. “Final output” is everything the United States produces for consumption, investment, or export. These final output categories include all the products (except for imports) consumed by private or public buyers in the United States. They account for the vast majority of America’s economic output.



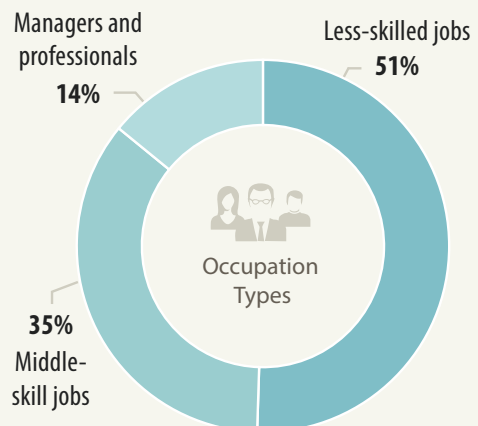
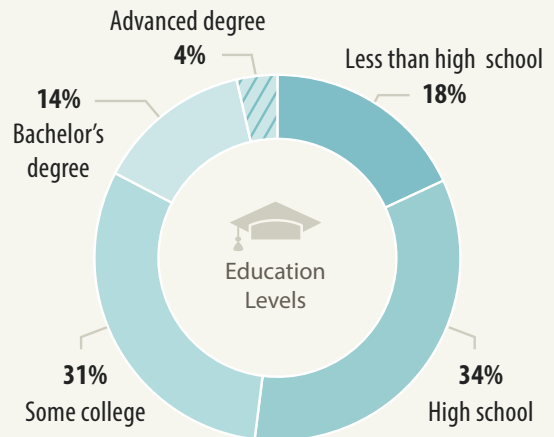
Food

FIGURE 11. Surprisingly, critical sectors in food production contribute little overall value to the commodities produced. For example, agriculture and fishing account for a mere 5 percent of the total value of food commodities, with food manufacturing comprising just 7 percent. Restaurants and grocery stores contribute 16 percent and 12 percent, respectively, while the largest value is generated by finance, insurance, advertising, and other business services, at 19 percent, along with other industrial sectors, at 20 percent. This field is made up of a relatively high portion of workers with low education levels: 18 percent have less than a high school diploma, 34 percent have only a high school diploma, and 31 percent have some college. Only 14 percent have a Bachelor’s degree, and just 4 percent have an advanced degree. Workers in this field also tend to be concentrated in low-skilled positions, with 52 percent in less-skilled occupations, and only 15 percent classified as managers and professionals.

Key industrial sectors as of 2007



Aggregate worker profiles as of 2007

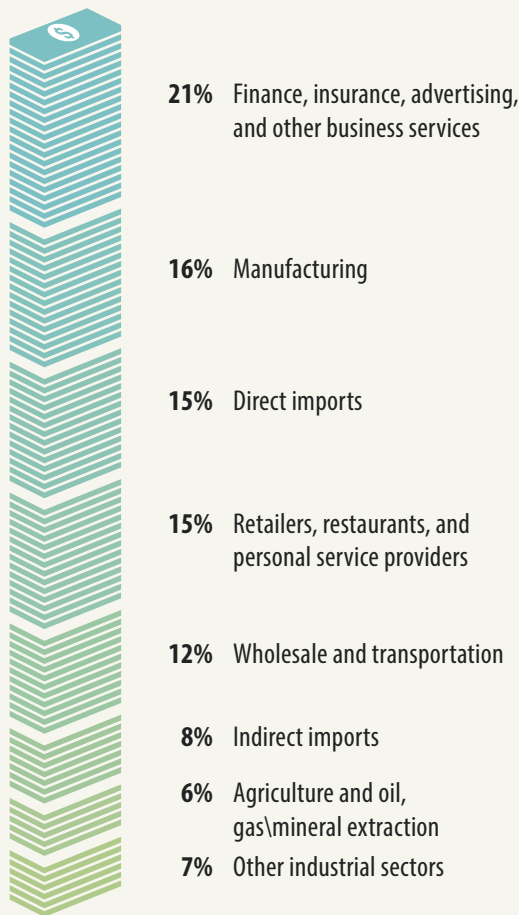


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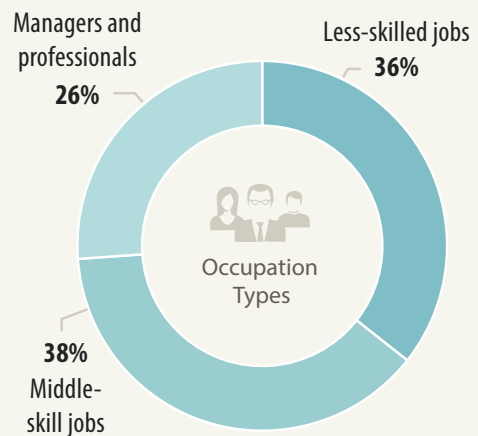
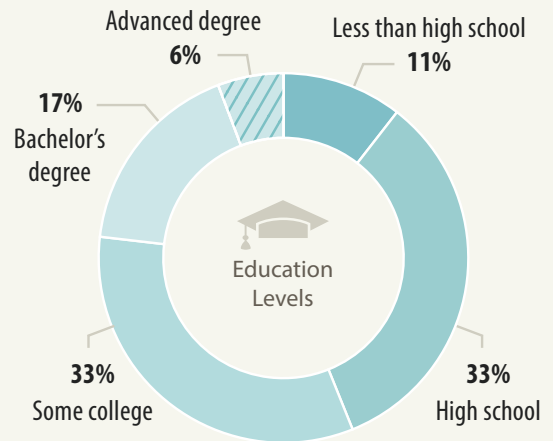
Transportation

FIGURE 12. A diverse group of industrial sectors drives value in transportation commodities: 21 percent is generated through finance, insurance, advertising, and other business services; 15 percent through direct imports, with an additional 8 percent stemming from indirect imports; and 15 percent through retailers, restaurants, and personal service providers. Manufacturing accounts for 16 percent of the value of transportation commodities, a relatively high portion relative to other commodities. The distribution of workers in this field is skewed toward those with lower levels of education: 11 percent have less than a high school diploma, and those with high school diplomas and some college each comprise 33 percent. In comparison, just 17 percent have a Bachelor’s degree and only 6 percent have an advanced degree. Occupation types reflect educational attainment, with 26 percent of workers in managerial and professional positions, 38 percent in middle-skill jobs, and 36 percent in less-skilled positions.

Key industrial sectors as of 2007



Aggregate worker profiles as of 2007



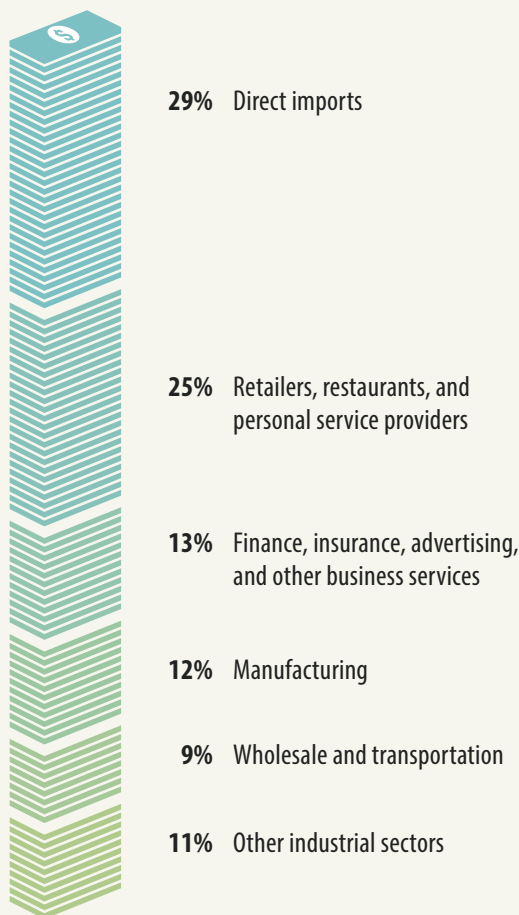
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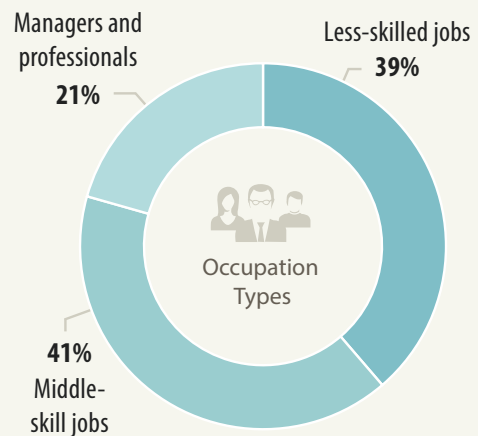
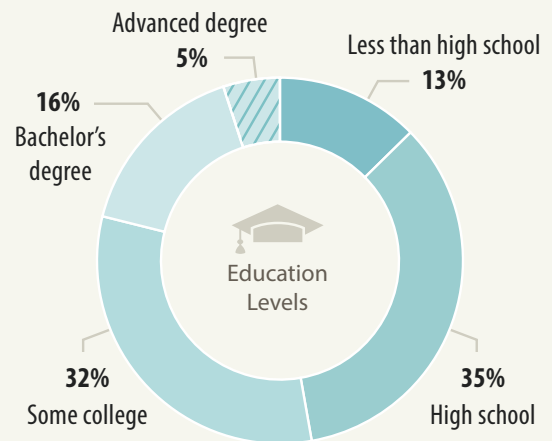
Clothing and Personal Care

FIGURE 13. In clothing and personal care commodities, the largest share of value is attributable to imports, at 29 percent – significantly higher than most other fields. Just 25 percent of the value added in personal care comes directly from restaurants, retailers, and other personal service providers. However, only 12 percent of value in clothing and personal care is attributable to the U.S.-based manufacturing sector. The workforce in clothing producing sectors is relatively less-educated – 13 percent do not have a high school diploma, and 35 percent hold only a high school diploma. Only 16 percent have obtained a Bachelor’s degree and just 5 percent hold an advanced degree. The remaining 32 percent of positions require some college. Similarly, a small portion – 21 percent – of all positions in this field are considered managerial or professional occupations, while 41 percent are middle-skill level positions and the remaining 39 percent are classified as less-skilled jobs.

Key industrial sectors as of 2007



Aggregate worker profiles as of 2007

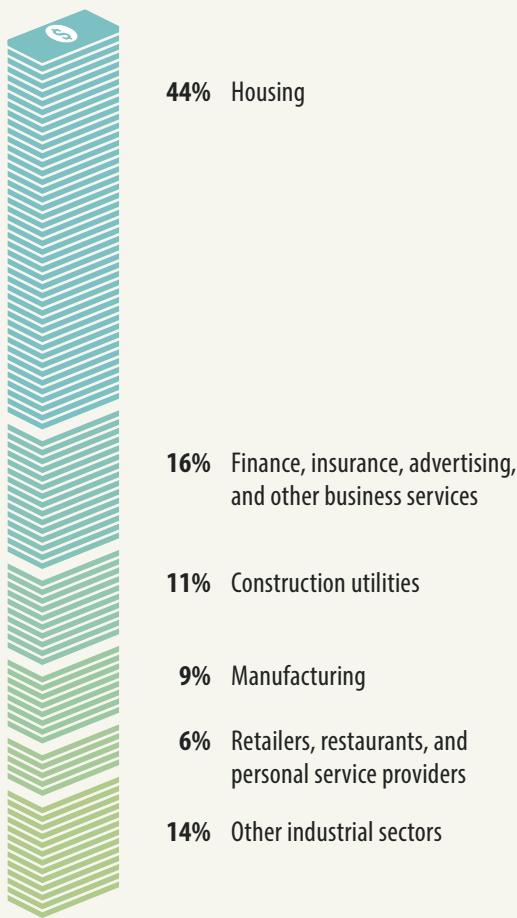


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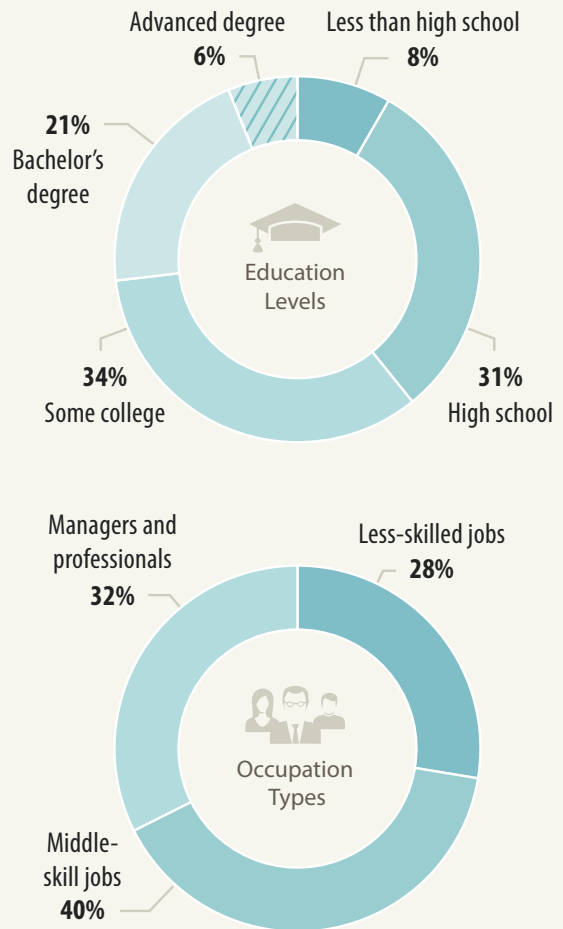
Housing and Household Operations

FIGURE 14. Forty-four percent of the value in housing and household operations is generated by housing, while the remaining value is created throughout other industrial sectors. Positions in this field vary widely with respect to education requirements, with 39 percent requiring a high school diploma or less, 34 percent requiring some college or an Associate’s degree, and 27 percent requiring a Bachelor’s degree or higher. Skill levels are also relatively evenly split, with 40 percent of jobs categorized as middle-skill level, 32 percent as managerial or professional, and just 28 percent classified as less-skilled work.

Key industrial sectors as of 2007



Aggregate worker profiles as of 2007

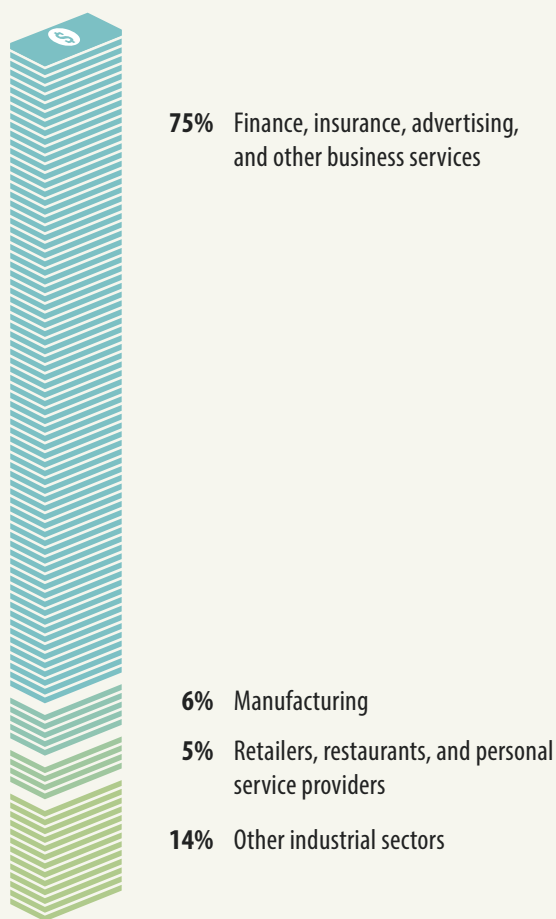


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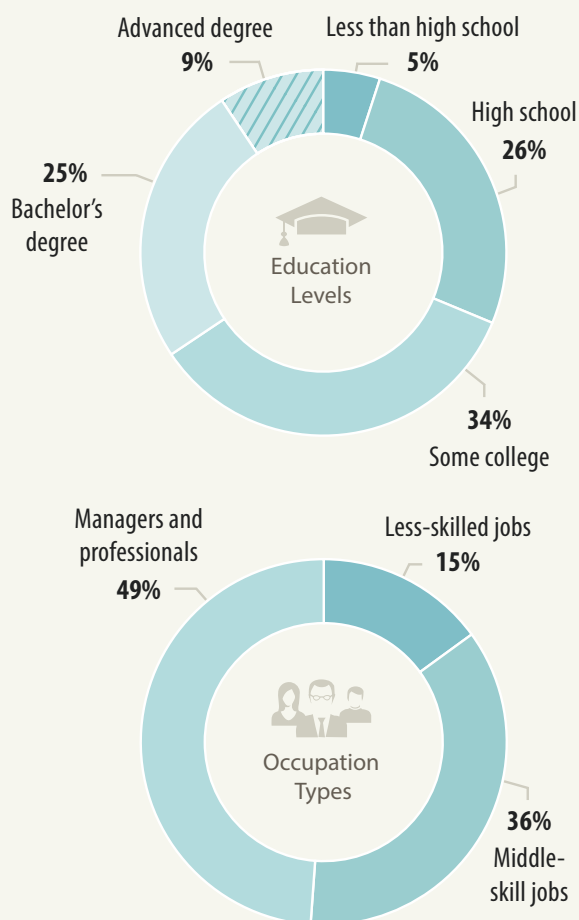
Business Services

FIGURE 15. A considerable 75 percent of the value added in business services comes from finance, insurance, advertising, and other business services – surprisingly, manufacturing and retailers, restaurants, and personal service providers account for an additional 5 percent and 6 percent, respectively. Surprisingly, this field is split relatively evenly across education levels: 5 percent of workers have less than a high school diploma, and 26 percent have only a high school diploma; 34 percent have some college or an Associate’s degree, and 25 percent hold a Bachelor’s degree, while 9 percent have an advanced degree. Despite this, the available jobs in this field are concentrated among managerial or professional skill levels, with these positions making up 49 percent of available jobs; 36 percent are considered middle-skill level, and just 15 percent are less-skilled jobs.

Key industrial sectors as of 2007



Aggregate worker profiles as of 2007

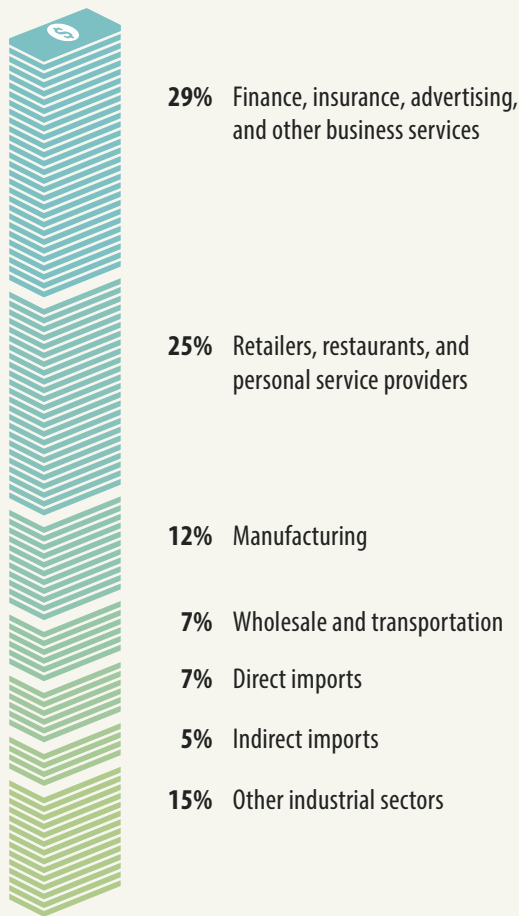


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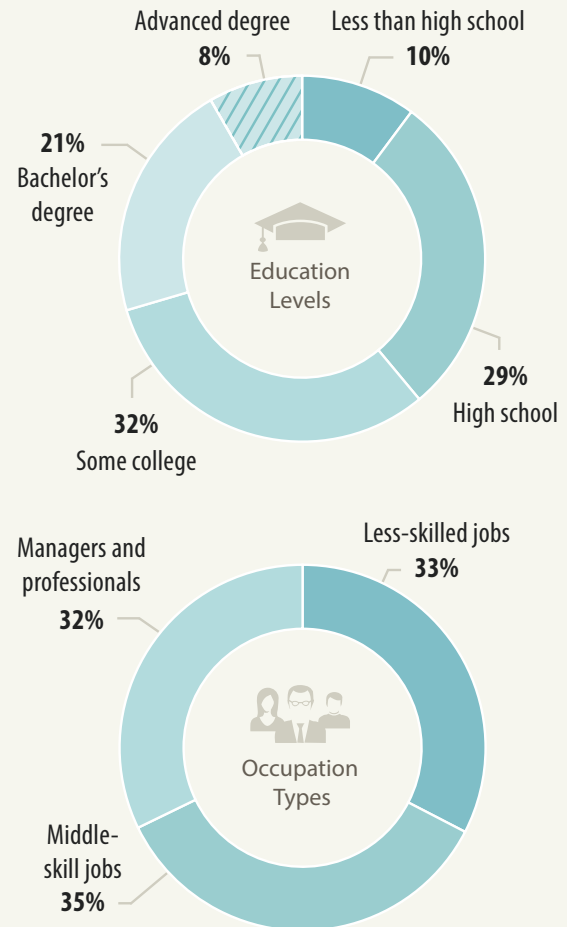
Recreation and Leisure

FIGURE 16. Retailers, restaurants, and other personal service providers contributed 25 percent of the value generated in the production of recreation and leisure commodities, with an additional 29 percent of that value associated with finance, insurance, advertising, and other business services. Surprisingly, 12 percent of the total value of these commodities is generated by manufacturing. While 39 percent of those employed in this field hold a high school diploma or less, 32 percent have some college, just 21 percent have a Bachelor’s degree, and 8 percent hold an advanced degree. Most jobs in this field are classified as middle-skill level, at 35 percent; the remaining jobs are split evenly, with 33 percent described as less-skilled positions, and 32 percent considered managerial or professional positions.

Key industrial sectors as of 2007



Aggregate worker profiles as of 2007



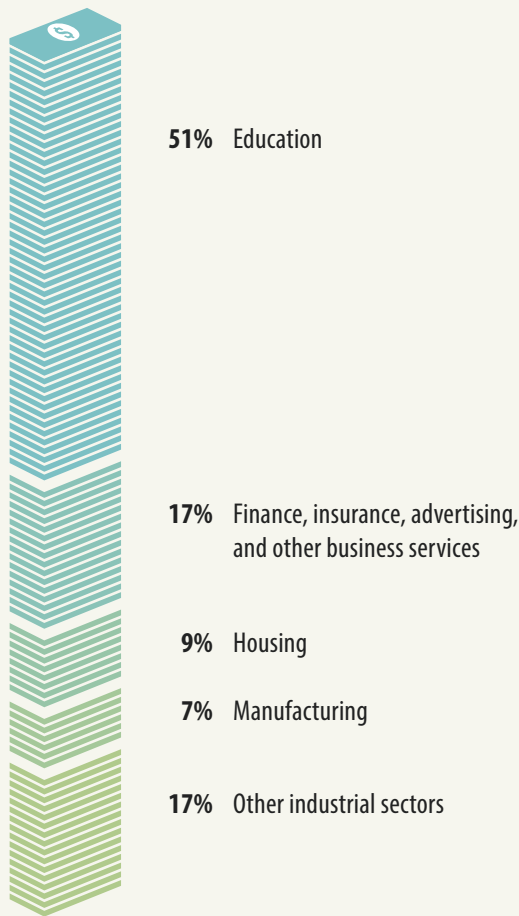
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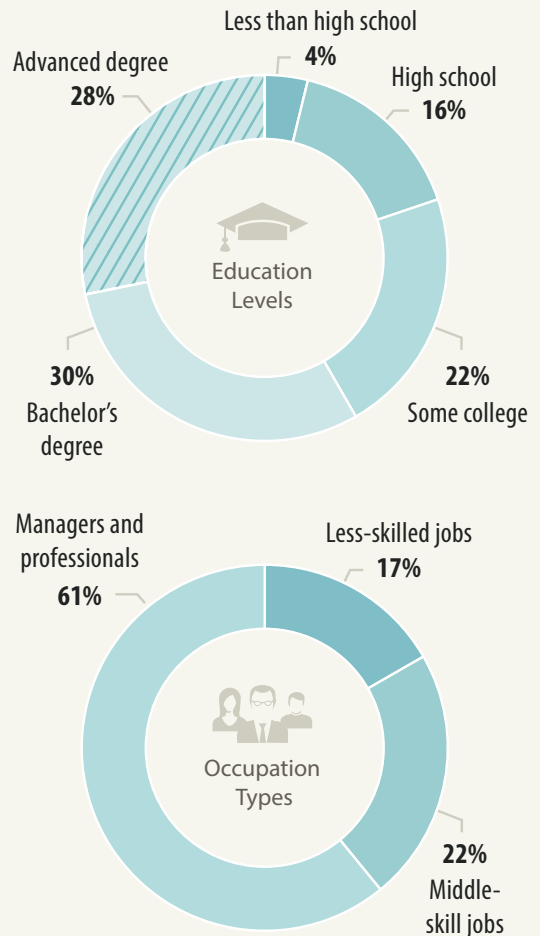
Education

FIGURE 17. The substantial portion of the value added in education is generated by outside industries – 17 percent comes from finance, insurance, advertising, and other business services, 9 percent is generated by housing, and 7 percent comes from manufacturing. Producing education commodities requires a highly educated workforce, with 30 percent of those in this field holding Bachelor’s degree and an additional 28 percent holding an advanced degree. Only 20 percent of jobs require a high school diploma or less, while the remaining 22 percent of positions require some college or an Associate’s degree. These patterns are similar for occupational classifications, with 61 percent of employees performing managerial or professional roles, and only 22 percent in middle-skilled jobs.

Key industrial sectors as of 2007



Aggregate worker profiles as of 2007

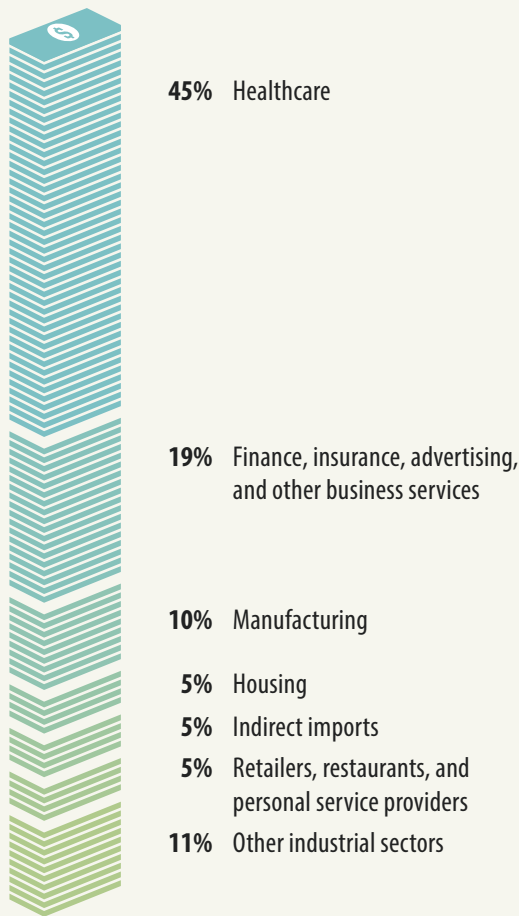


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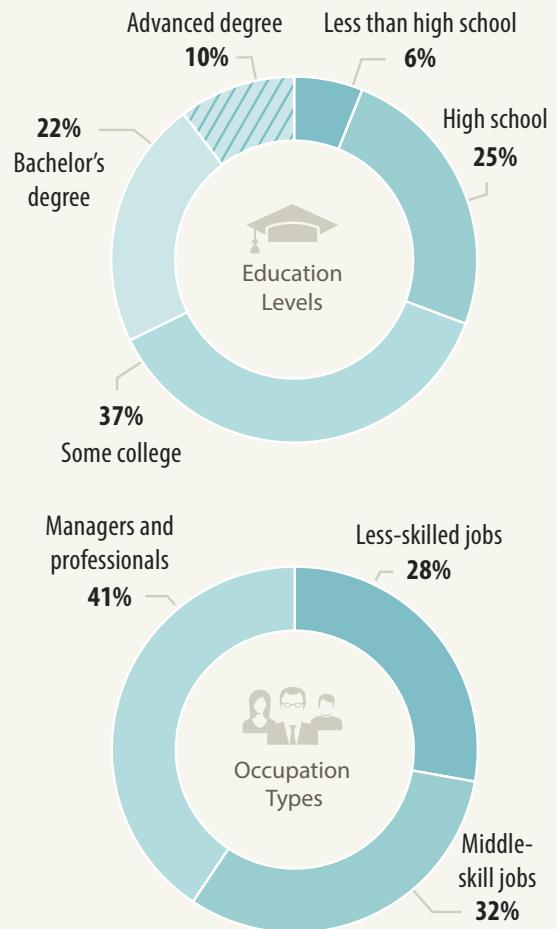
Healthcare

FIGURE 18. In the production of health commodities, 45 percent of the total value in this field is generated by health industries themselves, making this the largest contribution of any industrial sector. Finance, insurance, advertising, and business services comprise an additional 19 percent of the value added in healthcare. Thirty-one percent of workers in this field have a high school diploma or less, with 22 percent of workers holding a Bachelor’s degree and 10 percent holding an advanced degree. The remaining 37 percent workers have some college experience. Despite this relatively even split in education requirements, healthcare positions are heavily concentrated in managerial and professional positions, which comprise 41 percent of all jobs in this field. Only 28 percent are considered less-skilled positions.

Key industrial sectors as of 2007



Aggregate worker profiles as of 2007



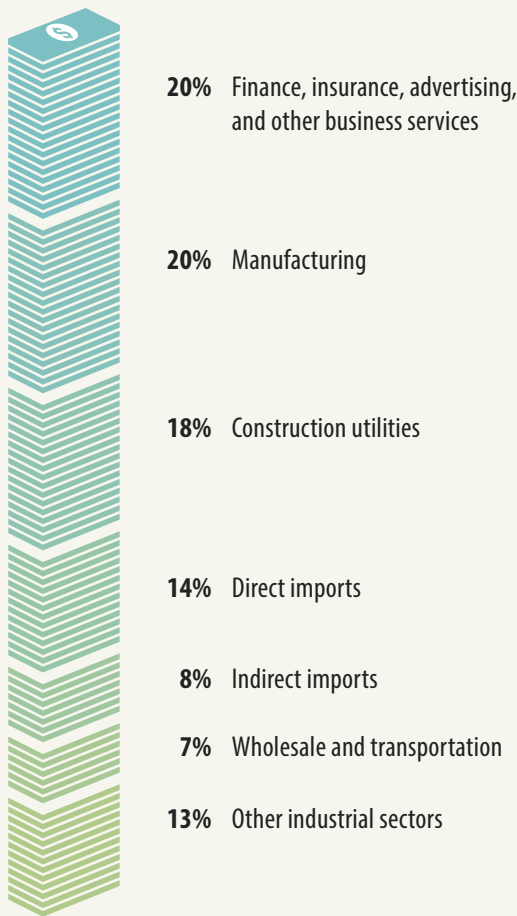
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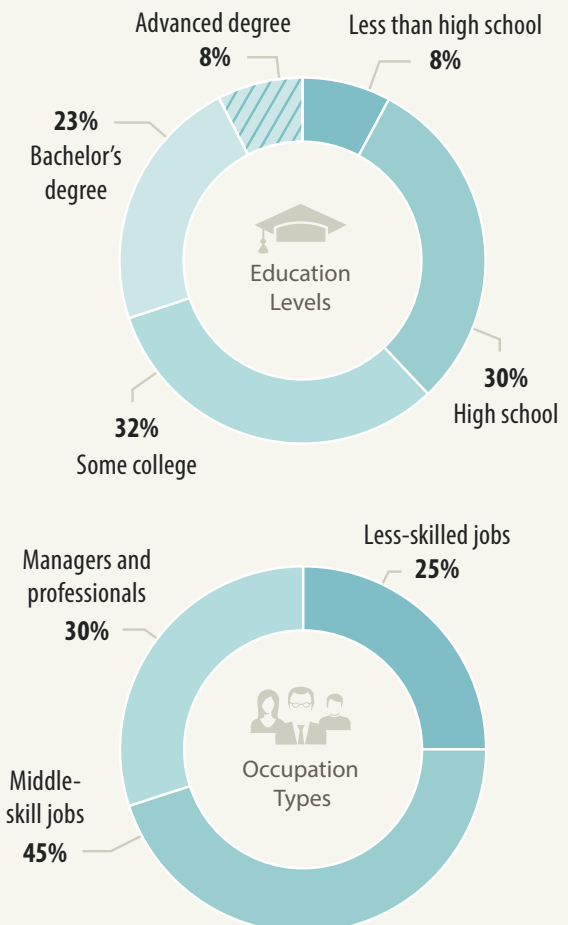
Investment

FIGURE 19. Twenty percent of the value in investment commodities is generated by finance, insurance, advertising, and other business services, with an equal portion generated by manufacturing; 18 percent is contributed through construction utilities, and 22 percent is generated through a combination of indirect and direct imports. Thirty percent of those employed in these industries have a high school diploma, 8 percent have less, 32 percent have at least some college, 23 percent have a Bachelor’s degree, and 8 percent have an advanced degree. While 45 percent of positions are classified as middle-skill level, 25 percent are considered less-skilled, and the remaining 30 percent of positions are designated managerial or professional positions.

Key industrial sectors as of 2007



Aggregate worker profiles as of 2007

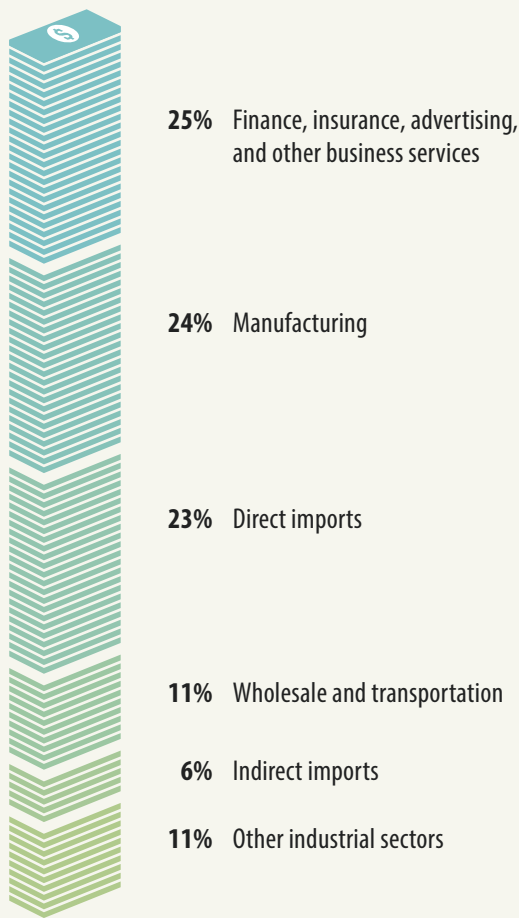


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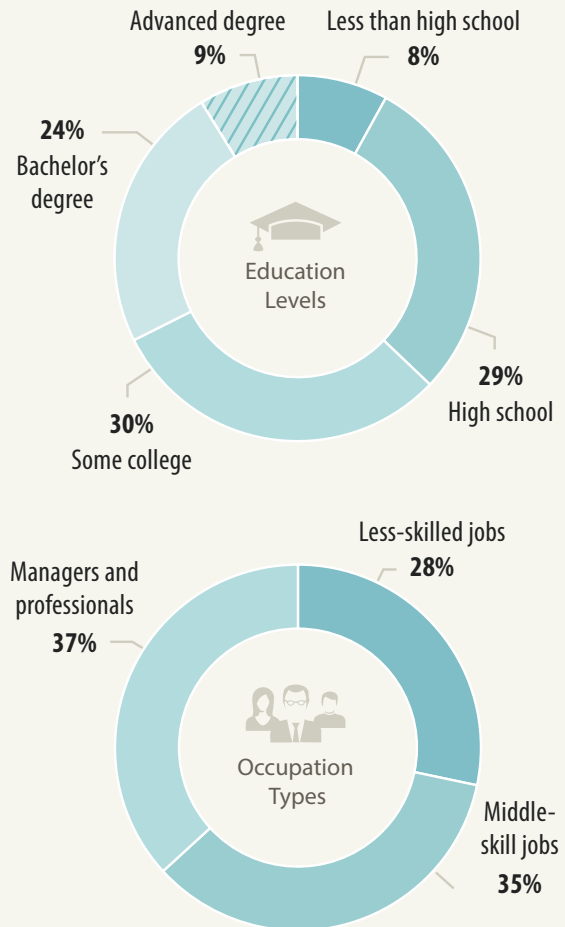
Exports

FIGURE 20. Export commodities' value is comprised of a variety of industrial sectors, with 25 percent generated in finance, insurance, advertising, and other business services, and 24 percent generated through manufacturing. Interestingly, direct and indirect imports comprise 23 percent and 6 percent of the value of export commodities, respectively. Of workers involved in the production of these commodities, 29 percent have a high school diploma, and 8 percent have less than a high school diploma. On the other end of the education spectrum, 9 percent of workers in this field have an advanced degree, and 24 percent have a Bachelor's degree, with the remaining 30 percent having some college experience. In terms of occupation types, export commodities are relatively evenly split, with 37 percent of workers in managerial and professional positions, 35 percent in middle-skill jobs, and 28 percent in less-skilled jobs.

Key industrial sectors as of 2007



Aggregate worker profiles as of 2007



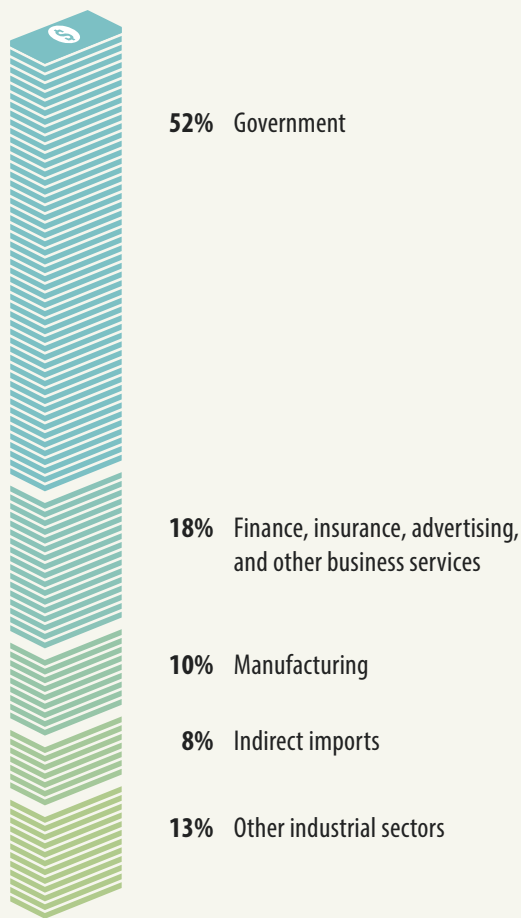
Source: Georgetown University Center on Education and the Workforce analysis of data from U.S. Department of Commerce, Bureau of Economic Analysis, *Input-Output Accounts, 1947-2007*.



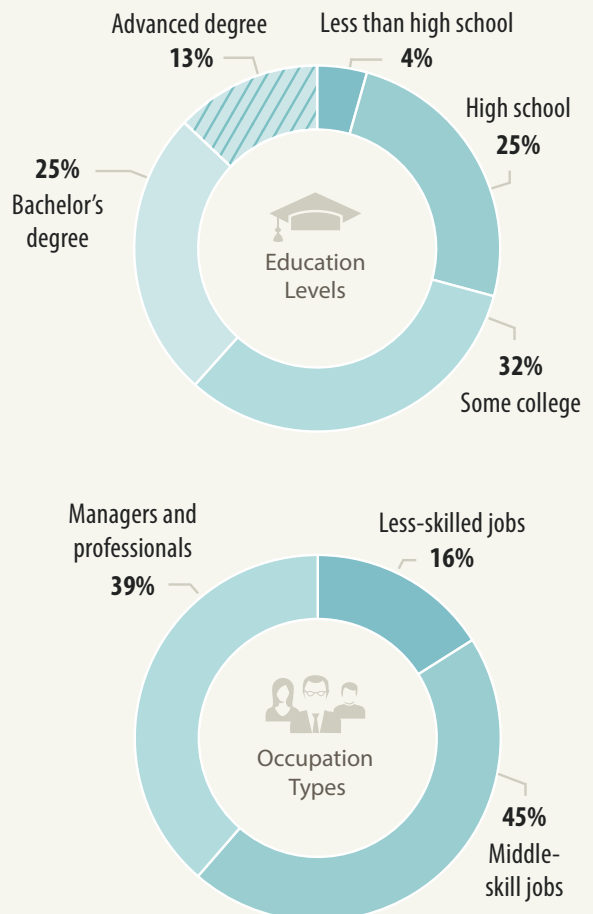
Government

FIGURE 21. More than half of the value of government commodities is generated by the government itself, at 52 percent, with an additional 18 percent contributed by finance, insurance, advertising, and other business services. The demand for highly educated workers in this field is high, with 13 percent of the population holding an advanced degree, 25 percent holding a Bachelor’s degree, and 32 percent having at least some college. The occupations in this field are relatively high skilled, with 39 percent classified as managerial or professional positions, and 45 percent considered middle-skill jobs.

Key industrial sectors as of 2007



Aggregate worker profiles as of 2007



Source: Georgetown University Center on Education and the Workforce analysis of data from U.S. Department of Commerce, Bureau of Economic Analysis, *Input-Output Accounts, 1947-2007*.

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The Economy Goes to College comprises a full report and an executive summary. Both can be accessed online at cew.georgetown.edu/economygoestocollege

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