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A LABOR MARKET THAT WORKS: CONNECTING TALENT WITH OPPORTUNITY IN THE DIGITAL AGE

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APPENDIX: TECHNICAL NOTES

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APPENDIX:
TECHNICAL NOTES

These technical notes are a supplement to the McKinsey Global Institute report *A labor market that works: Connecting talent with opportunity in the digital age*, which is available online at www.mckinsey.com/insights/mgi.

This appendix provides additional detail on the methodologies and data sources employed in the report. Specifically, it includes the following topics:

1. Methodology for modeling the global GDP and employment impact of online talent platforms

2. Estimating the potential impact of improving labor market program and education spending

3. Methodology for determining the potential financial impact of online talent platforms on companies.

1. THE GLOBAL GDP AND EMPLOYMENT IMPACT OF ONLINE TALENT PLATFORMS

We calculate the potential impact of online talent platforms on GDP and employment in 2025 for seven focus countries that represent approximately 60 percent of world GDP and 50 percent of the world's population: the United States, the United Kingdom, Germany, Japan, China, India, and Brazil. We base the estimates on a consensus forecast of GDP growth for each country; on detailed data regarding each country's labor market characteristics, its demographics, and its Internet usage; and data from LinkedIn member surveys on usage of online talent platforms.

The results from these seven countries were then applied to 47 economies around the world that collectively represent 91 percent of world GDP and 70 percent of the world's population, adjusting for each country's specific labor market characteristics and trends. The final step in our calculation was to extrapolate those results to account for the remainder of the world economy, thereby arriving at an estimate of the impact on global GDP.

The relationship between GDP, productivity, and employment

In this research, we use a supply-side model of the economy that considers the long-run inputs to production rather than the short-term components of aggregate demand. We focus on the impact in 2025, with the assumption that economies around the world will have recovered from the Great Recession and be operating at full potential. This implies that each country will be at its natural rate of unemployment, meaning that anyone who wants to work will be able to find a job after the average search time. If this assumption does not hold, then our estimates of the GDP and job creation impact for 2025 may be overstated.

We also choose to focus on the impact in 2025 because by that time, more people will have access to the Internet and will be able to utilize online talent platforms. These technologies are only in their early stages today and are evolving rapidly. We cannot predict what new functionalities may arise, but we do project a continued expansion in the number of individuals and companies around the world that will use online talent platforms.

For any country, GDP can be determined by multiplying the amount of valued-added output per worker (also called labor productivity) by the number of workers actively employed in the economy. For the purposes of our analysis, we start with the following equation:

$$Y = \frac{Y}{L} \times \left[P \times LFPR - U \right]$$

where Y is real GDP output, Y/L is output per worker (or productivity), P is a country's population, $LFPR$ is the labor force participation rate, and U is unemployment. This research focuses on the working-age population—people between 15 and 64 years old—when examining these indicators.

Online talent platforms have the potential to influence all of these variables with the exception of population. We calculate the impact from five mechanisms that can increase productivity (or output per worker) and the labor force participation rate, and decrease unemployment:

- **Improved participation.** As we show in Chapter 1 of the report, 30 to 45 percent of working-age people in countries around the world are not working or are economically underutilized. This includes individuals who are unemployed, those who are working part-time but would prefer to work full-time, newly retired people, stay-at-home parents, discouraged workers, and others who are out of the labor force for other reasons. Online talent platforms will increase the likelihood that those who are not participating in the

labor force will find opportunities of interest to them, whether permanent full-time jobs, part-time jobs, or freelance work. This may mobilize some fraction of stay-at-home mothers; youth who are not in employment, education, or training; retired people; and working-age individuals who have been discouraged or are inactive for other reasons. We model this impact as increased labor force participation and hours worked.

- **Faster matches.** Online talent platforms reduce the amount of time it takes for those who are unemployed (whether they are between jobs, are new entrants to the workforce, or have been inactive for a long period) to obtain new positions. This will reduce the number of unemployed people at any given time. We model the impact as a reduction in the number of unemployed people.

- **New matches.** Online talent platforms can synthesize detailed matching attributes to enable broader searches that help companies and workers find one another. They enable new matches that would not have been made otherwise. This may be due to the enhanced transparency of job openings and to the ability of the unemployed to look for work opportunities across geographies. We model these impacts as a reduction in the unemployment rate.

- **Better matches.** Online talent platforms make it possible to match individuals who are already employed with better jobs or more effective teams. They do this by providing more transparency into the skills and traits of individual workers as well as the requirements of specific jobs and tasks. When workers are matched more appropriately to jobs, they will be more productive (that is, those individuals can produce more output). We calculate the potential to raise productivity through better matches for the subset of the population in each country that changes jobs each year by taking advantage of online talent platforms.

- **Reduced informality.** Around the world, many people are engaged in informal employment, which typically involves low and variable wages and a lack of legal and social protections. Informal enterprises lack the economies of scale, technology tools, and management expertise to grow and become more productive. Previous MGI research has found that around the world, informal enterprises operate at just half the average productivity level of formal companies in the same sectors. Online talent platforms can bring many individuals out of the shadow economy and guide them to better and more productive opportunities. We model the impact of moving from informal to formal employment as an increase in labor productivity.

Methodology and data sources for calculating GDP impact

To arrive at baseline GDP estimates for 2025, we averaged GDP growth projections from the International Monetary Fund (IMF), IHS Global Insight, and The Economist Intelligence Unit. Data on labor force participation rates for each country came from the World Bank. The projected demographic mix for each country came from the International Labour Organization and the OECD. We used projections for Internet penetration rates for each country from previous McKinsey research. Finally, we estimated the share of the population that might use online talent platforms by 2025 as described below.

To quantify how online talent platforms raise GDP and employment, we used a variety of international and national data sources, as well as survey results from LinkedIn, the McKinsey Global Institute, and other sources as noted. We assess the impact through five channels as described below:

Specific metrics and data sources are summarized in Exhibit A1.

Our macroeconomic model draws from a variety of public and private data sources

Mechanism	Metric	Source
Increased participation	Size of inactive demographic groups	World Bank; US Bureau of Labor Statistics; Eurostat; Statistics Bureau; of Japan China Yearly Statistical Book
	Activation rate through online talent platforms	MGI European Aspirations Conjoint Survey 2014; LinkedIn-MGI Job Transition Survey
	Potential time share	MGI European Aspirations Conjoint Survey 2014; LinkedIn-MGI Job Transition Survey
	Reasons of part-time work	US Bureau of Labor Statistics; Eurostat
	Activation rate through online talent platforms	MGI European Aspirations Conjoint Survey 2014; LinkedIn-MGI Job Transition Survey
	Potential time share	MGI European Aspirations Conjoint Survey 2014; LinkedIn-MGI Job Transition Survey
Faster matches	Job changes	US Bureau of Labor Statistics; Federal Statistical Office of Germany
	Job search time	US Bureau of Labor Statistics; Eurostat; Statistics Bureau of Japan; China Yearly Statistical Book
	Job search time reduction	LinkedIn-MGI Job Transition Survey 2015
	Impact due to online talent platforms	LinkedIn Survey of Professional Job Seekers; World Bank
New matches	Opening positions	US Bureau of Labor Statistics; Eurostat
	Unemployed workers with previous experience	US Bureau of Labor Statistics; Eurostat
	Discoverability of potential candidates	LinkedIn member data; World Bank
	Qualification rate	General assumptions
	Screening/hire rate	McKinsey HR benchmark
	Match realization rate	LinkedIn member data
Better matches	Overqualification rate	LinkedIn survey of professional job seekers; UNESCO
	Probability of change	LinkedIn member data and survey of professional job seekers
	Productivity differential	LinkedIn survey of professional job seekers; UNESCO; Topel and Ward (1992); Molloy, Smith, and Wozniak (2014); Fallick, Haltiwanger, and McEntarfer (2012)
	Impact due to online talent platforms	LinkedIn survey of professional job seekers; World Bank
Reduced informality	Size of the informal sector relative to GDP	Schneider et al. (2010)
	Formalization rate through adoption of online talent platforms	General assumptions
	Productivity gains from formalization	Farrell (2004)

SOURCE: McKinsey Global Institute analysis

Increased participation

Online talent platforms can enable people who are currently not working to find part-time or full-time positions or freelance work. They can also enable part-time workers to add additional hours to raise their incomes. We model these two effects separately.

- **Increase in participation of inactive working-age adults.** A large segment of the working-age population is not currently working or seeking employment. Many do so as a matter of personal choice or for health or family reasons. But there is also evidence that some small fraction of these people would work if they had the opportunity. Online talent platforms can bring members of this group into the workforce by helping them find opportunities they were not aware of or by facilitating part-time freelance work. To estimate this effect, we considered the size of the inactive working-age population and the percentage of different subsegments of the group that might be willing to work. We then made assumptions about the number of hours they would work.

  - **Size of the inactive working-age population.** For each country, we considered six groups of inactive people 15 to 64 years old: 1) inactive women; 2) inactive men; 3) youth who are not involved in education, employment, or training; 4) students; 5) discouraged job seekers; and 6) the retired.

  - **Activation rates through online talent platforms.** Using the results from the MGI European Aspirations Conjoint Survey, we estimated the percentage of each of the six groups of working-age people described above that might be willing to work if they had the right opportunities.[1] This ranges from an average of 30 percent for retired people to an average of 60 percent for discouraged workers; it varied by groups of individuals and across countries. For example, our survey data show that in the United Kingdom, as many as 60 percent of women who are out of the labor force would like to work some hours. We assume that 20 percent of them would actually find part-time or freelance work through online talent platforms, resulting in 12 percent of all women out of the labor force choosing to work a few hours per week. In countries such as India, which have lower rates of Internet penetration and cultural barriers regarding working women, we assumed lower participation and activation rates.

  - **Hours worked.** Using the results from the European Aspirations Conjoint Survey, we assumed that each group of inactive workers would work the following number of hours per week if they had an opportunity to do so: eight to 10 hours per week for inactive women; 12 hours per week for inactive men; 12 hours per week for youth who are not in education, employment, or training; 12 hours for students; 32 hours per week for discouraged workers; and six hours per week for retired people.

- **Increase in hours for part-time workers.** In many countries, some people who work part-time would prefer full-time work. Online talent platforms can make it possible for these part-time workers to gain additional hours by helping them find either freelance work opportunities or new positions that offer more hours.

  - **Reasons for part-time work.** For each country, we consider four groups of part-time workers: 1) those working part-time due to family duties; 2) students; 3) those working part-time for economic reasons; and 4) retired and other part-time workers.

  - **Share of part-time workers seeking more hours.** Using data from the MGI European Aspirations Conjoint Survey (2014) and from the LinkedIn – MGI Job Transition Survey (2015), we estimate the portion of each part-time group that would

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[1] MGI conducted the survey covering 16,000 Europeans in eight countries (France, Germany, Italy, Poland, Romania, Spain, Sweden, and the United Kingdom) during August 2014.

want to work more hours. The estimates vary across countries. For example, we assume that among those who work part-time due to family duties, 50 percent of those in Japan and 60 percent of those in the United Kingdom would add hours. We assume that 25 percent of part-time workers who are retired in the United States and 35 percent in China would add hours.

— **Increase in hours worked.** For each group of part-time workers, we assume a different number of hours worked per week, ranging from two hours per week for retired people to 16 additional hours for those who work only part-time for economic reasons.

Faster matches

Online talent platforms can enable more efficient job searches and help reduce the amount of time people spend unemployed. To estimate the GDP impact of accelerated matching of candidates and openings, we consider how reducing job search time will result in fewer people being unemployed at any given time. To make this calculation, we obtained data on the number of persons who change from employment to unemployment each year, the average length of time that it takes them to find a new job, the percentage of job seekers we expect to have access to and to be likely users of online talent platforms, and the expected reduction in search time from using these platforms.

- **Job switchers.** For the United States and Germany, we used national statistics to determine the number of people currently changing from employment to unemployment each year and assume the same share of workers will switch jobs in 2025. We estimated the number of people in Japan and the United Kingdom who would switch jobs based on data from Germany and additional data on labor fluidity (for example, the share of people who have been in their current job for a year or less). For China, Brazil, and India, where data on job switching is not available, we used the average rate of job switching from the United States and Japan for people who go from employment to unemployment in any given year.

- **Job search time.** The current duration of search time was calculated for job seekers using national statistics and data from the International Labour Organization and the OECD. The average length of unemployment ranges from eight months to 13 months across our seven focus countries, with the longest search times in Germany and the shortest in the United States. We assume that the reduction in search time achieved through online talent platforms will vary depending on how long an individual has been unemployed. The long-term unemployed, for example, may not benefit as much as those who are temporarily between jobs. Therefore we considered various durations of unemployment: less than one month, one to three months, three to six months, six to twelve months, and longer than one year. For each of these unemployment durations, we scaled a job search time reduction parameter, assuming that those who have been unemployed for the longest period receive the least significant boost.

- **Job search time reduction.** A survey of LinkedIn job switchers asked respondents how much they believed their search was accelerated by using an online talent platform. These estimates were collected for each country and ranged from 41 percent to 52 percent. To make a conservative estimate of the impact for the broader population, we used only half the reported reduction in job search time, ranging from 20 percent to 26 percent. We also scaled the results based on the respondent's duration of unemployment, assuming that reduction in search time is smaller for the long-term unemployed (reflecting other factors at work, such as skills erosion).

- **Impact due to online talent platforms.** We used a combination of World Bank Internet penetration data and historical activity on LinkedIn to estimate the percentage of job

changes likely to be affected or facilitated by online talent platforms in 2025. This value ranges from 97 percent in the United States to 45 percent in India.

New matches

Online talent platforms can enable matches between unemployed people and job openings that otherwise would not have taken place. To estimate the potential GDP impact of these new matches, we considered the number of job vacancies by occupation in a country and the number of unemployed workers with previous experience in those occupations. We then considered the likelihood of a candidate exactly fitting the needs of the vacant job and a match occurring with the assistance of an online talent platform.

- **Job vacancies.** We obtained job vacancy data for the United States, the United Kingdom, and Germany. We estimated the number of job vacancies by occupation for the other countries, assuming the distribution across occupations is similar. We then scaled the number of potential vacancies in 2025 based on projected total employment.

- **Unemployed workers with previous experience.** We used employment data to estimate the share of unemployed people whose most recent previous working experience was in the field in question. In the case of the United States and Germany, the data is from national sources; we estimated the data for remaining countries. If the number of unemployed workers exceeded the number of open positions, we considered only the number of open positions. Due to a lack of detail in the data on previous occupations and the variability of specific skills within particular occupations (as evident in the many different types of specialized nurses, lawyers, and teachers, for example), we further assumed that only 35 percent of workers with previous experience in an occupation are actually potential fits for any open position.

- **Screening/hire rate.** To estimate the likelihood of a qualified candidate's passing through the interview or screening process and being offered a job, we used an average interview-to-hire ratio of 2:1 for those with a tertiary or upper secondary degree, 5:1 for those with a lower secondary degree, and 6:1 for those with a primary education or less. This is based on a McKinsey human resources benchmark estimate, adjusted to take into account the fact that we are considering only candidates with prior relevant experience who are ready to switch.

- **Match realization rate.** To estimate the proportion of potential matches that actually take place, we considered LinkedIn member data and weighted the percentage of active and passive job seekers who did switch jobs. This ranged from 28 percent to 39 percent, based on the country.

Better matches

Because they enable broader and more efficient searches, online talent platforms can enable individuals to find jobs that better match their skills and preferences. To estimate the potential impact of better matches, we considered the size of the working-age population in each country in 2025; the number of individuals who self-identify as "overqualified" for their current jobs, based on a recent LinkedIn survey; and the number who would actually change jobs if offered a new one. This gives us the potential number of improved matches by country. To assess the impact on labor productivity from switching to a job that is a better fit, we used data on the historical wage increase received by workers who switch jobs, based their education level, with the assumption that increased wages reflect higher labor productivity.

- **Working-age population.** For each country, we used UN population projections (medium scenario) and the 2014 share of employed persons as a percentage of the working-age population to estimate the number of employed persons in 2025.

- **Share of workers who would benefit from a better job match.** A 2014 survey of job seekers on LinkedIn asked respondents why they were considering a new job. We assumed that the respondents who replied that they were looking for "more challenging work," "a role that is a better fit for my skills," or "to have a greater impact" could benefit from a better job match. These results are shown in Exhibit 4 in Chapter 1 of the main report. Because not all workers are equally likely to be truly overqualified or have the ability to obtain a better job, we then scaled back this share of survey responses based on the education level of the population. We assumed that 100 percent of the effect would hold for those with a tertiary degree but only 90 percent, 50 percent, and 10 percent effects, respectively, for those whose educational attainment ended with upper secondary, lower secondary, and primary or less.

- **Probability of changing jobs.** Even if individuals feel overqualified for their current job, not all will be willing or able to change jobs even if they are offered a new opportunity. To estimate the likelihood of changing jobs, we used LinkedIn member data to determine what percentage of self-reported overqualified respondents would actually make a change in a 12-month period. This ranged from 20 percent to 26 percent among passive job seekers and from 54 percent to 70 percent among active job seekers, depending on the country.

- **Productivity increase from finding a new job.** We estimate the productivity differential from finding a better job match based on the wage gains received from actual job switchers, assuming a 1:1 ratio between wage gains and productivity. A LinkedIn survey found that most people who switched jobs reported a wage increase of between 10 and 30 percent. We took 15 percent as the average considering the potential selection bias of the survey respondents. We then adjusted the wage gain by education level, as less skilled workers are less likely to get large salary increases from job switches. The adjustment factors are 70 percent, 50 percent, and 20 percent, respectively, for those whose educational attainment ended with upper secondary, lower secondary, and primary or less.

- **Job switches made because of online talent platforms.** Finally, we used data on the number of people who changed jobs using an online talent platform (as opposed to some other source of information). We used LinkedIn survey data regarding those who made a job change due to online talent platforms in 2014 (that is, those who responded "strongly agree" to the question "I would not be in my current job or role if it were not for LinkedIn") and then scaled the result based on the country's Internet penetration in 2015.

Reducing informal employment

Online talent platforms can reduce the number of people engaged in informal employment by making work opportunities accessible to a wider population and creating incentives to formalize work by capturing additional demand or making payment more reliable. Those who currently work in the shadow economy can take up freelance work opportunities from around the globe online, and those who are engaged in local tasks such as acting as a driver or carrying out household work can gain access to new customers and more reliable payment methods by participating in online platforms for the same type of work. The productivity gains associated with this transition can boost GDP.

To estimate the GDP gains from the reduction of informal employment, we start with the share of GDP produced by informal workers in each country. Then we estimate the share of informal workers who might move into formal employment for each country and sector. We then assume a productivity increase from this transition.

- **Size of the informal economy.** To estimate the size of the informal economy as a percentage of a country's GDP, we use the widely accepted source *Shadow economies all over the world* by Schneider et al. (2010).[2] The informal economy ranges from 8 percent in the United States to 37 percent in Brazil. Excluding the impact of online talent platforms, we make the assumption that in 2025, this share will be the same as it is today.

- **Formalization rate.** We estimate the shift from informal to formal employment by examining the size of different sectors within the informal economy. Some sectors, such as construction, are less likely to be formalized than other sectors such as manufacturing and household services. By assigning a formalization rate to each sector and integrating the sectors, we derive an overall formalization rate. For advanced economies (the United States, the United Kingdom, Germany, and Japan), we assume that 8 percent of informal employment can be transitioned to the formal sector. For the other countries, we assume a 5 percent formalization rate.

- **Productivity gains from formalization.** A review of the literature on productivity differentials between the formal and informal sectors finds ranges that vary widely across countries and sectors, such as 15 percent among Brazilian retailers and 84 percent among legal firms in Mexico. However, since the variance is wider in emerging markets than in advanced economies, we assume a 10 percent differential for advanced economies and a 30 percent differential for emerging markets.

By 2025, online talent platforms can increase GDP by up to 2.4 percent in seven focus countries

We began our analysis by calculating the GDP and employment impact for seven focus countries: the United States, the United Kingdom, Germany, Japan, China, India, and Brazil (Exhibit A2).

Exhibit A2

The impact of online talent platforms ranges from 1.5 percent of GDP in China and Japan to 2.4 percent in Brazil

GDP █ >0.9% █ 0.5–0.9% █ <0.4%   Employment █ 2–3% █ <2%

Country	% of GDP	Increased partici-pation % of GDP	Reduced unemployment % of GDP		Higher productivity % of GDP		GDP $ billion	Employment	
			Faster matches	New matches	Better matches	Reduced informality		% of em-ployees	1,000 people
United States	2.3	1.1	0.6	0.1	0.4	0.1	512	2.7	4,091
United Kingdom	2.0	0.9	0.5	0.1	0.4	0.1	68	2.4	766
Germany	1.7	0.8	0.4	0.1	0.4	0.1	70	1.9	708
Japan	1.5	0.7	0.2	0.0	0.4	0.1	78	1.6	906
Brazil	2.4	0.8	0.8	0.1	0.1	0.6	69	2.6	2,686
India	1.9	1.2	0.2	0.0	0.2	0.3	222	2.2	11,343
China	1.5	0.7	0.4	0.0	0.1	0.2	485	1.7	12,868

NOTE: Numbers may not sum due to rounding.

SOURCE: MGI Online Talent Platforms Model; McKinsey Global Institute analysis

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[2] Friedrich Schneider, Andreas Buehn, and Claudio E. Montenegro, *Shadow economies all over the world: New estimates for 162 countries from 1999 to 2007*, World Bank policy research working paper number 5356, July 2010.

The impact as a share of GDP impact is highest in Brazil, which has relatively high unemployment, a high share of informality, and relatively large numbers of inactive women and youth. The largest effect among the four advanced economies is found in the United States, which has a declining labor force participation rate, skilled workers who can take advantage of better matches, and a highly fluid job market. Our model shows the lowest relative impact in Japan and China for a variety of reasons such as relatively high participation rates, low unemployment, and low online talent platform adoption. See the Country Appendix (available online at www.mckinsey.com/mgi) for detailed results by country.
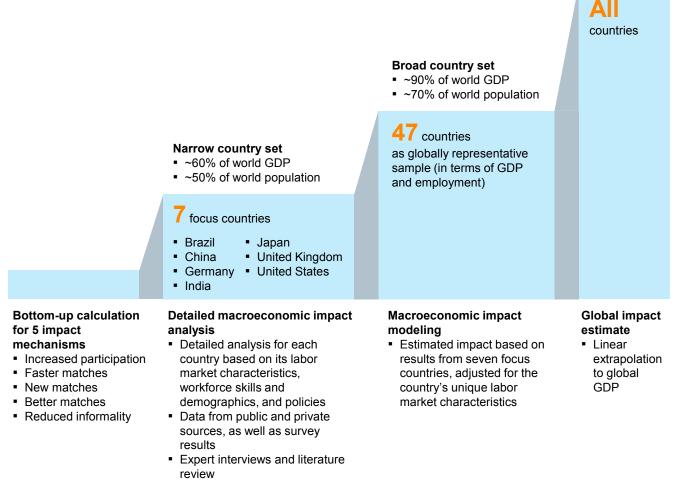
Extrapolating results to the rest of the world

After developing a detailed estimate of the GDP impact for each of our seven focus countries, we expand the analysis to 47 additional countries that collectively represent 93 percent of GDP and 70 percent of the world's population (Exhibit A3).

Exhibit A3

Our analysis begins with detailed calculations for seven focus countries

All countries

Broad country set
- ~90% of world GDP
- ~70% of world population

47 countries
as globally representative sample (in terms of GDP and employment)

Narrow country set
- ~60% of world GDP
- ~50% of world population

7 focus countries

- Brazil
- China
- Germany
- India
- Japan
- United Kingdom
- United States

Bottom-up calculation for 5 impact mechanisms
- Increased participation
- Faster matches
- New matches
- Better matches
- Reduced informality

Detailed macroeconomic impact analysis
- Detailed analysis for each country based on its labor market characteristics, workforce skills and demographics, and policies
- Data from public and private sources, as well as survey results
- Expert interviews and literature review

Macroeconomic impact modeling
- Estimated impact based on results from seven focus countries, adjusted for the country's unique labor market characteristics

Global impact estimate
- Linear extrapolation to global GDP

SOURCE: McKinsey Global Institute analysis

For each of the 47 countries, we use national statistics to identify its labor market patterns based on its income level, growth of working-age population, level of educational attainment, and business dynamics. Then we map each country to one of the seven focus countries based on similarities in these characteristics or, in the case of some, a hybrid of focus countries. This mapping is shown in Exhibit A4.

To extrapolate, we apply results from the seven focus countries to other countries with similar labor market characteristics

Group	Other countries in the group			Size of group	
				% of GDP	% of employment
United States/ United Kingdom hybrid	▪ Australia ▪ Belgium ▪ Canada ▪ Denmark ▪ Finland	▪ France ▪ New Zealand ▪ Singapore ▪ Sweden ▪ Switzerland		30	9
Germany/Japan hybrid	▪ Austria ▪ Czech Republic	▪ Netherlands ▪ Poland ▪ South Korea		14	5
Brazil	▪ Argentina ▪ Chile ▪ Colombia ▪ Estonia ▪ Ghana ▪ Greece[1] ▪ Hungary	▪ Italy[1] ▪ Latvia ▪ Mexico ▪ Peru ▪ Philippines ▪ Portugal[1]	▪ Russia ▪ Slovakia ▪ South Africa ▪ Spain[1] ▪ Ukraine ▪ Venezuela	17	16
India	▪ Egypt ▪ Kenya ▪ Kuwait ▪ Morocco	▪ Nigeria ▪ Saudi Arabia ▪ Tunisia ▪ Turkey		28	27
China	▪ Vietnam			10	21

1 For Greece, Portugal, Italy and Spain, the reduction of informality is mapped to a hybrid of Germany and Japan.

SOURCE: World Bank; United Nations Development Programme; McKinsey Global Institute analysis

To determine the total GDP impact in each of the 47 countries, we considered the effect of each impact mechanism. The effects of each were scaled based on the ratio of that parameter in the target country versus the focus country to which it was mapped. For example, the GDP impact of better matches in Brazil is 0.1 percent of GDP. Although Argentina has similarities with Brazil, its citizens have on average 9.8 years of schooling while Brazilians average 7.2 years. To determine the GDP impact of better matches in Argentina, we adjust the 0.1 percent of GDP impact by the ratio of years of school in Argentina compared to Brazil. The scaling parameters for each impact mechanism are as follows:

▪ **Increased participation.** This varies with each country's labor force participation rate because it directly drives the number of people potentially affected.

▪ **Faster matches.** This varies with each country's unemployment rate. The exceptions were Spain, Portugal, South Africa, and Greece.[3] We excluded the long-term unemployed in these countries since extremely long-term unemployment may be chronic in these instances.

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3   In the case of Spain, South Africa, and Greece, we subtracted those unemployed for more than one year.

- **New matches.** This varies with the country's unemployment rate because unemployed workers are the only population directly benefiting from this mechanism.

- **Better matches.** This varies with each country's average years of schooling, since higher-skill workers are more likely to be able to benefit from a wider range of "better match" opportunities and have higher potential productivity gains.

- **Reduced informality.** This varies with the informal economy as estimated by Schneider et al. Countries with larger populations engaged in the informal economy will have greater potential for increases.

Four countries in our analysis required special treatment due to unique characteristics. Since unemployment rates are very high in Greece, Portugal, South Africa, and Spain (over 20 percent in Greece, South Africa, and Spain, and 15 percent in Portugal), the extrapolated result would be skewed if we simply applied the ratio of their unemployment rates against that of one of the focus countries and assumed that all of these unemployed will be equally impacted by online talent platforms. In these countries, we exclude the long-term unemployed from the unemployment rate and then measure against the unemployment rate in Brazil to extrapolate the results of faster matches and new matches. Given that the informal sectors in these countries are much smaller than in our comparison focus country for them (Brazil), we extrapolate the impact of reduced informality in these countries from Germany's result.

We model the impact of full-time equivalent (FTEs) employment to other countries by deriving the ratio of FTEs over the GDP impact of employment-related mechanism (new matches, faster matches, and increased participation) in our focus countries. For example, new matches, faster matches, and increased participation add 1.7 percent to GDP in Brazil while FTEs increase employment by 2.6 percent. The ratio of FTEs over employment-related GDP is 1.5. We apply 1.5 to the employment-related GDP impact to other countries that were mapped to Brazil because of similar characteristics (such as Argentina, at 2.0 percent) and derive the FTE effect in those countries (3.0 percent in Argentina).

We model the number of people affected by taking the ratio of people affected to FTEs in our focus countries and applying that ratio to the other countries that were mapped to them based on similar characteristics. For example, in Brazil, 21.4 million people could be affected by talent platforms, while 2.7 million FTEs could be created. This yields a ratio of 8:1. We apply that ratio to Argentina, where we see that four million people could be affected.

Scaling to the world economy
The 47 countries we considered represent 90 percent of world GDP. Because many other smaller countries could similarly benefit from the impact of online talent platforms, we linearly extrapolate this result to global GDP, resulting in a total impact of $2.7 trillion. Similarly, we linearly extrapolate the employment impact and number of people affected to the global level, resulting in a total of 72 million full-time employment and 540 million total beneficiaries.

Calculating the increase in employment and the number of people who may benefit from online talent platforms
We make a distinction between the concepts of full-time equivalent employment and the actual number of people who may derive some degree of benefit from online talent platforms. The total number of people who may benefit includes everyone affected by the five mechanisms described earlier in this appendix (for example, those individuals who are already employed and find better matches, and those who reduce their search time). In contrast, this increase in employment takes into account the number of additional full-time equivalent jobs created. For example, a person who goes from being unemployed to

working full-time would count as 1.0 FTE position, but an inactive worker who finds part-time work for 10 hours per week would be counted as 0.25 FTE (assuming a 40-hour workweek).

We determine the FTE employment impact on an economy by looking into the three mechanisms that increase the proportion of the working-age population that is working: increased participation, faster matches, and new matches. In the case of increased participation and new matches, workers who are not currently working find their way into employment. In the case of faster matches, each affected worker's fractional time spent unemployed is reduced.
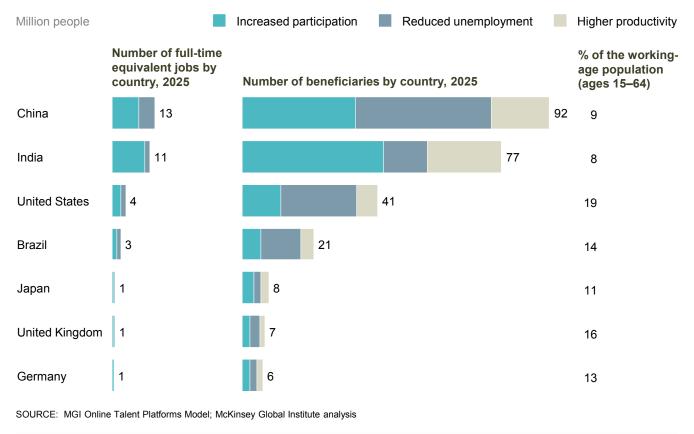
- **Increased participation.** When online platforms enable inactive people to work part-time, they create partial FTEs. By aggregating partial employment and weighting by working hours, we arrive at FTEs. For example, we estimate that online platforms can help 0.8 million out of the 6.6 million inactive women in Germany in 2025 find work, and we assume that those women would on average work 25 percent of the hours of someone employed full-time. Multiplying 0.8 million by 25 percent yields 0.2 million FTEs. We use an equivalent methodology to calculate FTEs generated from encouraging those who are already working part-time to add hours.

- **Faster matches.** Because shortening the search time before a job is filled is not equivalent to creating one FTE (since the job would have been filled eventually), we aggregate the time saved from job search and the potential productivity losses that are avoided as a result to calculate full-time employment. For example, we estimate that 23 million people will become unemployed after leaving their jobs (voluntarily and involuntarily) in the United States in 2025; among this group, 5 million would be unemployed for less than one month before becoming employed again. For this group, we assume that online platforms can reduce the unemployment duration by 20 percent. When we multiply 5 million by half a month (or 0.04 years, the median of unemployment duration in this group) and by 20 percent, we get 0.04 million FTE positions.

- **New matches.** We assume that the unemployed would be matched to full-time jobs they would not have found otherwise. Each job filled through this mechanism counts as one FTE position.

Using this methodology, we calculate that online talent platforms may increase full-time equivalent employment by anywhere from 1.6 percent of total employment in Japan to 2.6 percent in the United States (Exhibit A5).

To estimate the total number of people who will benefit from online talent platforms, we consider all of the mechanisms rather than just those that increase participation and reduce unemployment. For example, better matches help employed people find jobs that better fit their skills. This does not reduce unemployment or inactivity but it does improve the outcome for this group.

Unlike our calculation of FTEs, our calculation of the total population who will benefit does not distinguish between those partial working hours and those who obtain a new full-time job; instead it totals every individual who is affected. The number of people who could potentially enjoy better work outcomes by 2025 varies across our seven focus countries (Exhibit A3). It ranges from 8 percent of the working-age population in India to nearly 19 percent in the United States.

Online talent platforms can create 33 million full-time equivalent jobs and benefit 252 million people in seven focus countries

Million people   ■ Increased participation   ■ Reduced unemployment   ■ Higher productivity

	Number of full-time equivalent jobs by country, 2025	**Number of beneficiaries by country, 2025**	**% of the working-age population (ages 15–64)**
China	13	92	9
India	11	77	8
United States	4	41	19
Brazil	3	21	14
Japan	1	8	11
United Kingdom	1	7	16
Germany	1	6	13

SOURCE: MGI Online Talent Platforms Model; McKinsey Global Institute analysis

2. IMPROVING LABOR MARKET PROGRAM AND EDUCATION SPENDING

Online talent platforms may have additional benefits beyond increasing GDP, raising employment, and improving labor market functioning. Among the most important are reducing public spending on unemployment benefits and other labor market support programs, and improving the effectiveness of public and private spending on tertiary education. The potential of these platforms to reduce the number of individuals who are unemployed could bring down the cost of labor market programs. Talent platforms may also improve the effectiveness of both public and private spending on education by making the labor market outcomes associated with the graduates of particular programs more visible. We developed a conservative estimate of this potential by considering the extent of reduced unemployment and the number of those who invest in education but end up with suboptimal labor market outcomes.

In this section, we describe our methodology for sizing this potential impact.

Reduction in spending on labor market support programs

Every year, governments around the world spend billions on cash payments to the unemployed, and on programs that provide worker training, job placement, wage subsidies, and an array of other services for unemployed individuals. Because online talent platforms have the potential to reduce the number of unemployed people, public spending on these types of programs may also fall.

To estimate the potential savings, we collected detailed 2013 expenditure data on these programs for four major economies: the United States, the United Kingdom, Germany, and Japan. These data were obtained from national statistical agencies. The specific programs and the corresponding expenditures are shown in Exhibit A6.

In each country, we assume the cost of labor market programs and unemployment benefits can be reduced proportionately to the reduction in the number of unemployed people. The reductions in unemployment are 13 percent for the United States, 8 percent for the United Kingdom, 6 percent for Germany, and 5 percent for Japan.[4] We estimate that the savings could amount to $18 billion annually, or 9 percent of labor program spending, across these four countries (Exhibit A7).

Several caveats to this analysis are worth noting. First, unemployment program expenditures may not be reduced proportionately to the number of unemployed people because of fixed overhead costs. In addition, policy makers may choose to take the savings and reallocate the funding to other labor market programs, such as retraining programs for the long-term unemployed. In the long run, this type of reallocation could lead to additional GDP growth by boosting human capital and expanding the pool of employable citizens, although we do not consider this effect in our analysis.

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[4]   For more detail on the impact of online talent platforms for our focus countries, see the Country Appendix for this report, available online at www.mckinsey.com/mgi.

Governments around the world spend billions on labor market support programs, with more than half allocated to unemployment insurance

Labor market program spending by program type, 2013
%; $ billion

100% =	90	59	28	14

Others[1]

Direct job creation

Employment incentives

Training

Labor market services[2]

Unemployment insurance

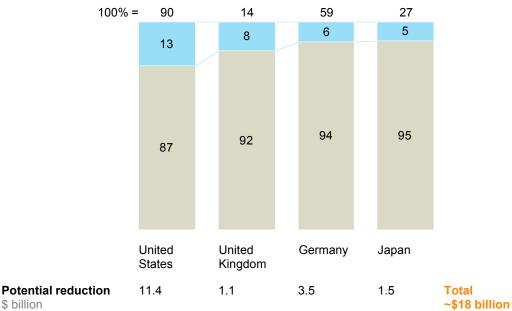|	United States	Germany	Japan	United Kingdom
Others[1]	7	7	3	1
Direct job creation	2	2	7	2
Employment incentives	2	2	11	1
Training	8	13	9	37
Labor market services[2]	6	20	11	
Unemployment insurance	76	55	60	58

1 Includes programs such as employment support, rehabilitation, and early retirement.
2 Includes such services as job replacement services, benefit administration, and other administrative services.
NOTE: Numbers may not sum due to rounding.

SOURCE: US Department of Labor; US Congressional Research Service; OECD; McKinsey Global Institute analysis

Four major economies alone could reallocate up to $18 billion annually in labor market program spending

Potential reduction in labor program spending, 2014[1]
%; $ billion

■ Potential reduction

100% =	90	14	59	27
Potential reduction	13	8	6	5
	87	92	94	95
	United States	United Kingdom	Germany	Japan

Potential reduction $ billion	11.4	1.1	3.5	1.5	**Total ~$18 billion**

1 Including unemployment insurance, training programs for the unemployed, and tax incentives to hire unemployed.
NOTE: Numbers may not sum due to rounding.

SOURCE: OECD; national sources; McKinsey Global Institute analysis

Raising the productivity of tertiary education spending

Today many people who obtain a tertiary education do not work or are employed in positions that do not utilize their education. In the United States, for example, more than one-quarter of individuals holding a four-year bachelor's degree earn less than the median annual wage of individuals with a two-year associate degree.[5] In the United Kingdom, the government estimates that almost half of college graduates are in jobs that do not require a college education.[6] In China, unemployment among recent university graduates is high despite a relatively tight labor market.[7] While preparing students for the workforce is not the sole purpose of higher education, the underemployment and unemployment of people with tertiary degrees suggests considerable misallocation of money spent on tertiary education.

Online talent platforms can help address the poor labor market outcomes of these college graduates by generating more granular data and transparency on the skills that are in demand by employers and the training needed to obtain those skills. They can also highlight how successful universities, other educational institutions, and training programs are at placing graduates into jobs. This would help students make more informed decisions about which types of training programs are more efficient and cost-effective; it could prevent many from pursuing expensive courses of study that do not help them acquire the skills they need for the careers they want.

[5] *Game changers: Five opportunities for US growth and renewal*, McKinsey Global Institute, July 2013.

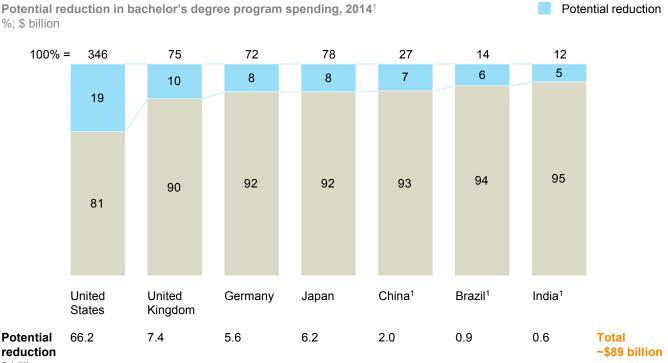[6] *Graduates in the UK Labour Market 2013*, Office for National Statistics, November 2013.

[7] For more on this issue, see Yukon Huang and Canyon Bosler, "China's dangerous graduate glut," *BloombergView*, May 13, 2014; and William Kazer and Liyan Qi, "Beijing's latest worry: College grads," China Realtime blog, *The Wall Street Journal*, May 27, 2013.

Our analysis focuses solely on programs that confer bachelor's degrees. We collected data on both private and public spending for these programs in our seven focus countries; the outstanding student loans that can be attributed to financing these degrees; and how many holders of bachelor's degrees earn less than those who did not invest in such education. The details of these parameters are as follows:

- **Total spending on tertiary education.** In the United States, the United Kingdom, Germany, Japan, and China, we derive total tertiary education spending by multiplying annual spending per student (from OECD data) by the number of college graduates in one year. For Brazil, we estimate the spending based on OECD data on the share of GDP that is directed toward tertiary education. For India, due to lack of information, we derive total tertiary education spending by assuming 10 percent of public spending on all levels of education goes to tertiary-level programs.

- **Share of tertiary education that goes to bachelor's degree programs.** For the United States, Germany, and Japan, we obtain the data from national sources. We apply the average of the three countries to the other countries, which lack this information.

- **Share of bachelor's degree holders who have poor labor market outcomes.** We consider three measures that indicate the potential number of students who have suboptimal job outcomes, given their degrees: 1) the number of recent college graduates who are out of the labor force and not looking for work; 2) the unemployment rate of recent college graduates; and 3) the proportion of bachelor's degree holders who earn less than the median income of holders of vocational degrees. We add these together to calculate the total number of college graduates who have poor labor market outcomes. While this measure does not precisely indicate the number of college graduates who have not achieved the desired outcome of obtaining education, it does give some magnitude of the scale. We obtained data to calculate this proportion of recent graduates for the United States, the United Kingdom, Germany, and Japan, and applied the average of ratios from these countries to the remaining focus countries.

To calculate the potential reduction in tertiary education spending, we then multiply the share of graduates with poor outcomes by the difference in cost between obtaining a four-year bachelor's degree and a two-year associate degree.

Overall, we estimate that between 5 and 19 percent of tertiary education spending, or $89 billion across our seven focus countries, is producing suboptimal outcomes in the labor market. Redirecting this spending to education and training programs that align more closely with the skills and occupations that are in demand would benefit the individuals in question while improving the overall development of human capital in the economy (Exhibit A8).

Seven major economies could also reallocate up to $89 billion annually in tertiary education spending

Potential reduction in bachelor's degree program spending, 2014[1]
%; $ billion

■ Potential reduction

100% =	346	75	72	78	27	14	12
Potential reduction	19	10	8	8	7	6	5
	81	90	92	92	93	94	95
	United States	United Kingdom	Germany	Japan	China[1]	Brazil[1]	India[1]

Potential reduction	66.2	7.4	5.6	6.2	2.0	0.9	0.6	**Total ~$89 billion**
$ billion								

1 Theory-based academic programs and professions with high skill requirements, such as medicine, dentistry, and architecture, usually requiring at least 3 years and typically 4 years of study
2 Tertiary educations spending (public and private) as % of GDP is based on 2011 or 2012 OECD data; GDP figures are from 2014.
NOTE: Numbers may not sum due to rounding.

SOURCE: OECD; national sources; McKinsey Global Institute analysis

Potential reduction in student loans

We use similar logic as outlined above to estimate the potential reduction in outstanding student loans across the seven focus countries using the following parameters:

- **Outstanding student loans.** Student loan data are obtained from national statistics bureaus for the United States, the United Kingdom, Germany, Japan, and Brazil and from a literature search for China and India. It ranges from $2 billion in China to $1.3 trillion in the United States.

- **Share of student loans attributed to bachelor's degree programs.** We obtain this data from national sources in the United States, the United Kingdom, and Germany, and estimate the data for the rest of the countries. Debt related to bachelor's degree programs ranges from 50 percent of total outstanding student loans in the United States to nearly 100 percent in Germany.
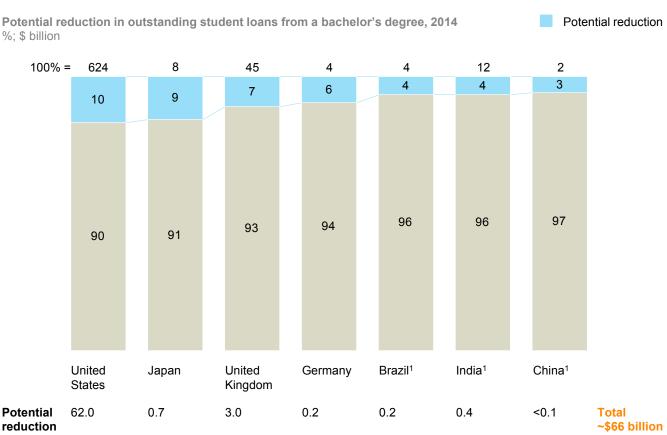
To estimate the potential reduction in student loans, we consider two factors: 1) the share of college graduates among the long-term unemployed (those unemployed for longer than 12 months); and 2) the bachelor's degree holders who earn less than the median income of vocational degree holders. This ranges from 10 percent in India to 29 percent in the United States.

We obtained the long-term unemployment rate among college graduates from national sources in the case of the US, the UK, Germany, and Japan and derived the data for the rest of the countries based on their overall long-term unemployment rates. Similarly, we

obtained the proportion of underearners from national sources for the US, the UK, Germany, and Japan and estimated the figures for China, India, and Brazil based on the share of the population that has bachelor's degrees. We then added the statistics to arrive at an estimate of the potential reduction of student loans that finance bachelor's degree programs.

We find that the proportion of outstanding student loans that could be avoided if students had pursued vocation degrees rather than bachelor's degrees that are not used varies from 3 percent in China to 10 percent in the US. In absolute terms, the potential reduction amounts to $66 billion across the seven focus countries (Exhibit A9).

Exhibit A9

Approximately $66 billion in outstanding student loans could be reduced in our focus countries

Potential reduction in outstanding student loans from a bachelor's degree, 2014
%; $ billion   ▇ Potential reduction

100% =	624	8	45	4	4	12	2
Potential reduction	10	9	7	6	4	4	3
	90	91	93	94	96	96	97
	United States	Japan	United Kingdom	Germany	Brazil[1]	India[1]	China[1]

Potential reduction $ billion	62.0	0.7	3.0	0.2	0.2	0.4	<0.1	**Total ~$66 billion**

1 2013 data.

SOURCE: BLS; OECD; national sources; McKinsey Global Institute analysis

3. THE IMPACT OF ONLINE TALENT PLATFORMS ON COMPANIES

To estimate the potential financial impact of online talent platforms on companies, we constructed six sample companies in different industries: professional services, high tech, manufacturing, financial services, health care, and retail. Our analysis considers current and potential uses of these platforms and takes into account each sample company's workforce composition, basic financials, and operating characteristics. The selected companies come from sectors accounting for approximately 61 percent of US employment and 57 percent of US GDP.

The goal of the modeling exercise was to assess the potential financial benefits that different types of organizations can realize by utilizing online talent platforms to their fullest capabilities. We did not examine the overall sector-level impact or consider long-term dynamic effects within the industry or within national economies. Each sample company was constructed to resemble an average company in the industry, with financial performance common to its peers—not the best-in-class adopters of digital technologies or management practices.

For each sample company, we relied on publicly available financial statements and annual reports from actual companies in that industry and constructed an estimate of revenue, profit margin, and other basic financial characteristics based on a specified number of employees. Occupation data were obtained from the US Bureau of Labor Statistics (BLS). In some cases, we used data from Glassdoor.com to determine salaries and estimate the composition of a company's workforce.

The characteristics of these sample companies are as follows:

- **Professional services.** Our sample company is a hypothetical 5,000-person business advisory firm with approximately $2.5 billion in annual revenue. The firm consists of approximately 60 percent professional staff and 40 percent support staff. The vast majority of employees have tertiary degrees or higher and earn above-average salaries.

- **High tech.** We examine a representative software and services company with 10,000 employees and $11 billion in revenue. Approximately 50 percent of the employees are highly skilled engineers, technology specialists, and other product specialists, while 35 percent are in business support and sales roles. Earnings are comparable to those defined in BLS data.

- **Manufacturing.** We examine a sample industrial manufacturer with 10,000 employees and $2.4 billion in annual revenues. Nearly 70 percent of the workforce is in production, shipping, and production-related support roles; 15 percent is in engineering and business operations; and the remainder is in sales, customer service, IT, and business support functions.

- **Financial services.** Our sample company is a multinational retail bank with 100,000 employees and $30 billion in annual revenues. More than 30 percent of the staff works in front-line teller roles, and another 45 percent provides other types of customer service and support. The remaining 25 percent are involved in back- and middle-office activities such as IT, middle management, business support, and administration.

- **Health care.** We examine a representative small private hospital system with 2,000 employees and $500 million in annual revenue. Nurses make up nearly 40 percent of the workforce, while technologists, assistants, and other administrative support staff

represent another 30 percent. Physicians are included but are generally employed on contract.

- **Retail.** We consider a midsized national retail chain with 15,000 employees and $3 billion in annual revenues. Nearly 85 percent of the employees are front-line sales and customer service representatives in stores, while the rest hold back-office, management, and support roles.

How online talent platforms create value for companies

To assess the potential impact of online talent platforms on each of our sample companies, we conducted a literature review, vendor searches, and interviews with internal and external experts. We assessed the impact on three major categories of activities common to all of these companies: 1) recruiting and talent acquisition; 2) managing individual employees and teams; and 3) planning for future talent needs. Within each category, we defined a number of individual "impact mechanisms"—that is, the specific ways in which online talent platforms could create value for companies.

For each impact mechanism identified, we considered the platforms and solution providers available today (as of mid-2015) as well as what we believe could be possible in the future if more talent processes were digitally enabled and all of the requisite data and operating model changes were put in place. We bounded our estimates of the potential impact by considering what is possible at "best-in-class" companies today (that is, the improvement differential between the highest-performing companies and the average, excluding the effect of talent platforms) and assumed that the effective use of talent platforms could help to narrow this gap.

To quantify the financial impact on companies, we assessed how online talent platforms could affect workforce productivity, recruiting costs, the opportunity costs involved in the recruiting process, training and onboarding costs, attrition, and labor costs. The assumptions used for each impact mechanism are as follows:

- **Labor productivity.** Productivity is defined as the amount of output created with a given set of inputs. It can be raised by producing the same output with fewer inputs or by producing additional output with the same set of inputs. One of the most important benefits of online talent platforms for companies is their ability to identify prospective employees who will be more productive at their jobs and to group existing employees in ways that increase their productivity. Our model estimates productivity per worker based on the company's output divided by the salary of the employee in question, while assuming that higher-paid employees are able to produce more output. Improvements to productivity from online talent platforms are most heavily driven by:

  — **Finding better-quality candidates.** Depending on the occupation, top performers have been estimated to be at least 2.5 times more productive than average workers. We assume that online talent platforms can help attract 10 percent more top performers and that they will be 2.5 times more productive. We also assume that these platforms can help to reduce hiring mistakes and reduce the number of poor performers by 25 percent. This results in a combined productivity increase of up to 4 percent for the categories of workers affected by this mechanism. This effect is largest for companies that have higher shares of highly skilled employees in their workforces.

  — **Forming more effective teams and groups.** Bringing the right people together for a project team can have a significant impact on productivity. This may be due to assembling the right mix of complementary skills and strengths or due to "soft" factors such as interpersonal dynamics. Team effectiveness is commonly cited

as a key driver of productivity; in fact, one study in the automotive industry found that balanced teams were up to 14 percent more productive.[8] In our model, we assumed that roles with frequent team formation could increase productivity by up to 5 percent.

— **Finding internal expertise and knowledge.** Previous MGI research found that knowledge workers could increase productivity and time savings by 20 to 25 percent using digital search and knowledge-sharing tools.[9] For the workers impacted by this mechanism, we assume up to a 5 percent productivity gain.

In our model, we distinguish between "front-office" workers (such as sales representatives), "middle-office" workers (for example, product managers), and "back-office" workers (for example, support staff) and apply a definition specific to each company. For front-office workers, we generally assume that 100 percent of productivity effects would raise output as their time is freed up to enable more product development, additional sales, better customer service, or similar activities. For back-office workers, we assume that productivity increases translate into needing fewer workers, thereby reducing labor costs. For middle-office workers, we assume that the impact is split between increased output and reduced labor costs; this split varies by company type but most is 50/50.

■ **Recruiting costs.** By automating aspects of the recruiting process and improving conversion rates at all parts of the recruiting funnel, online talent platforms can reduce the cost of finding, screening, and assessing new hires. Except in cases for which more precise data was available or for companies that hire in large volume, we used a benchmark that total recruiting costs per employee are 10 to 40 percent of each annual salary. This varied by company type, with recruiting costs at the higher end of this range for higher-skilled employees, since the talent available for these roles is scarcer. In our modeling, recruiting costs are reduced by:

— **Discovering hard-to-find niche talent.** Niche talent may require the use of executive recruiters ("headhunters") or other costly and time-consuming search processes. Online talent platforms can dramatically reduce these costs by replacing or aiding executive recruiters. One study found more than a 75 percent cost differential in hiring from online talent platforms versus retaining a headhunter to fill a similar role. To estimate the cost savings from this mechanism, we assumed that 4 percent of positions that require hard-to-find niche talent could be filled by using online talent platforms rather than headhunters, saving up to 3 percent on recruiting costs.

— **More efficient selection of candidates for interviews.** Filtering resumes and engaging in other activities such as screening by phone can be a time-consuming process that leaves room for intentional and unintentional human bias. When the wrong candidates pass through this stage of the process only to be rejected later, staff time is wasted, and when good candidates are rejected at this stage of the process, conversion rates and productivity suffer. Using a model of the recruiting funnel, we estimate that the screening functions available through talent platforms could reduce screening time by up to 40 percent and minimize errors, driving down recruiting costs by as much as 5 percent.

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[8] Derek C. Jones and Takao Kato, *The impact of teams on output, quality, and downtime: An empirical analysis using individual panel data*, July 2007.

[9] Chui, Manyika et al, *The state of human capital 2012: Why the human capital function still has far to go*, McKinsey & Company, July 2012

— **Tailoring offers.** In today's recruiting environment, firms often spend significant time and resources on convincing professional candidates to accept a job offer. By taking advantage of information about candidates to whom offers have been made, a firm can better tailor and target its outreach and efforts. If a firm knows that a candidate has a lower likelihood of eventually accepting an offer, it can dedicate less effort to recruiting that candidate, or it can improve its odds of acceptance by tailoring its strategy. We estimate the potential savings in recruiting costs at up to 8 percent.

Recruiting costs can also be reduced by improving attrition rates—that is, decreasing the number of new hires needed each year to maintain a consistent level of output. The assumptions behind lower attrition rates are discussed in further detail below.

■ **Opportunity costs of recruiting.** A secondary impact of improving the efficiency and effectiveness of the recruiting process is to reduce the amount of time spent by existing employees on interviewing and on training and onboarding new hires. For each category of employees at a company (for example, engineers, sales representatives, administrative assistants), we estimated the number of hours of interviewing time required to hire one candidate and then calculated the cost against the typical manager salary for the company.[10] In fields such as high tech and professional services, in which the interviewers themselves are often critical to driving a company's output, the effect could be quite large.

■ **Training and onboarding costs.** Online talent platforms can reduce training costs by taking into account the background of new hires and tailoring their training accordingly. They can also assess the effectiveness of different training programs and methodologies. Training costs in our model were determined based on benchmarks from a variety of sources, including the Society for Human Resources Management, the Association for Talent Development, and expert interviews. The average cost ranged from $500 to $4,000 per employee (with a median of $1,300 per employee) and varied by skill level and salary; the most highly skilled employees required the most expensive training. Employee onboarding includes the time spent by new employees in orientation and getting up to speed at the job. For onboarding, we estimated the number of days required for a new hire to become a productive employee based on the role and assumed a cost proportional to salary. This ranged from several hundred dollars per employee for low-wage retail workers who spend several days in training to several thousand dollars for high-wage professionals who can take many weeks to ramp up to full performance.

— **Tailoring onboarding.** Online talent platforms can use detailed data about the skills, attributes, and aptitudes of new hires to guide decisions about which courses a company should offer them. They can also allow some training and orientation activities that were once carried out in person or using in-class instruction to be provided adaptively online. Solution providers and users of onboarding programs suggest cost savings on the order of 30 to 60 percent. However, our model makes a more conservative assumption of up to a 15 percent reduction in training time for new hires.

— **Personalizing training and learning opportunities.** As in the case of onboarding, online talent platforms can reduce training time and costs for employees who are engaged in ongoing learning. Our model assumes up to a 15 percent reduction in costs associated with training and learning.

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[10] Note that this estimation methodology is conservative, as it would be possible to claim that it is not merely a manager's time in terms of salary that the interview process consumes, but that the time should be valued in terms of company output.

- **Reducing attrition.** For each type of role, we estimated an annual attrition rate reflective of increasingly competitive labor markets. This ranges from 10 percent annual turnover for positions such as IT support functions and middle managers at hospitals to 35 percent per year for retail sales positions. The cost of attrition, which includes legal expenses, lost productivity, and severance, was estimated to be 20 percent of the departing employee's salary; this is on top of the costs associated with replacing that worker with a new hire, which are captured in recruiting, training, and onboarding costs as described above. Anecdotally, we have found that some large companies have been able to save tens of millions of dollars by using digital tools to reduce attrition costs.

  — **Finding candidates who are a better fit.** In addition to finding high-performing employees, online talent platforms can help to select candidates who are likely to be a better fit for a given role and therefore more likely to stay. In some case examples, companies were able to reduce attrition by 5 to 10 percent. However, we made a more conservative assumption of up to a 2 percent reduction in attrition.

  — **More effectively screening and assessing candidates.** Filtering can reduce hiring errors, including the mistake of rejecting a good candidate and the mistake of hiring someone who is unlikely to be a good fit for a role. In a case example at Wells Fargo, retention of tellers and personal bankers increased by 15 percent and 12 percent, respectively, when the company administered tests at the recruiting stage. Applying a similar but more conservative rationale, we assume a 2 percent reduction in attrition costs by reducing the number of "bad hires" from 20 percent to 15 percent.

  — **Predicting and optimizing attrition.** While the other impact mechanisms improve attrition at the recruiting and selection phases, better real-time data about employee engagement and better predictive abilities may also significantly improve retention of top performers. Prior research by McKinsey has shown that financial incentives alone are a weak motivator. We assume that detailed data about individual goals, preferences, opportunities, satisfaction, and other factors could help reduce attrition by up to 5 percent.

- **Labor costs.** Our model sets employee salaries for each worker category based on a combination of BLS salary data and, when applicable, information from Glassdoor employee salary survey data or other estimates. While we have not attempted to quantify or model the impact of negotiation between employees and employers, operational processes (such as scheduling) to reduce labor costs, or other factors, we did consider the potential for data about workers, markets, and predictive intelligence to impact the cost of hiring. We examined the following parameters:

  — **Anticipating and planning for future talent needs.** Talent shortages can often lead to artificial increases in labor costs for certain roles (such as mobile app developers and data scientists—roles for which the demand for specialized talent radically outstripped supply). By understanding their own labor force at a more granular level and forecasting the need for certain types of specialists and skills, companies can predict their hiring needs earlier, avoiding costly bidding wars and "surge pricing" for new talent. For the purposes of our model, we assume a cost reduction of up to 1 percent, with most relevance to highly skilled, well-paid workers who are likely to be scarce.

  — **Accessing workers through non-traditional channels.** Online talent platforms make it possible to source qualified individuals from alternative pools (for instance, hiring a talented bank teller with a high school diploma who has a stellar reputation or passes an assessment vs. hiring a comparable college graduate). It may be less

expensive to fill roles with equivalent or better talent. We made a modest assumption of salary savings on the order of less than 1 percent when quantifying these effects.

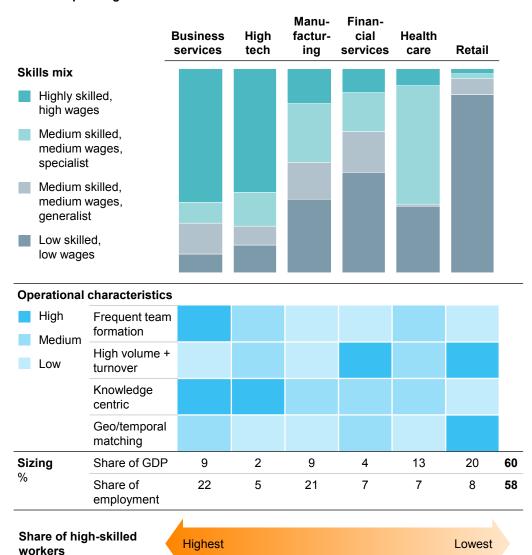## Methodology for quantifying the financial impact on companies

After defining the effect of each mechanism listed above, we sought to determine the scale of the effect on our sample companies. To determine this, we considered the composition of the workforce in each sample company, its operating characteristics, and estimates of salary, attrition, recruiting, training, and other costs as described above.

We used BLS occupation data to define the roles within a sector and then aggregated them and adjusted for the companies in question. Each company's employees were aggregated into 10 to 15 categories of workers such as engineers, customer service representatives, nurses, and the like. The categories were then further categorized based on skill level and operating characteristics:

- **High skill, high wage.** We defined highly skilled workers as those with BLS earnings of greater than $65,000 per year, roles typically requiring a tertiary degree, or both.

- **Medium skill, medium wage.** We defined medium-skill workers as those with BLS earnings of approximately $30,000 to $65,000 per year and in roles requiring some postsecondary education. This skill category was also further subcategorized as "specialist" if specialized training is typically required (for example, medical technician, certified financial analyst) or "generalist" if training outside of school could be used.

- **Low skill, low wage.** We defined the low-skill category as those earning less than $30,000 per year and roles that typically do not require postsecondary education.

To define operating characteristics for each worker category, we considered whether the same company in question would have the following operating characteristics that lend themselves to improvement via online talent platforms:

- **Frequent team formation.** Companies that frequently form internal teams for short-duration projects can derive real benefit from talent platforms, particularly when close consideration of the skills or attributes of the workers (including their expertise and psychographic profiles) can improve performance. Examples would include distributed engineering teams, teams formed by consulting or law firms for client projects, and multidisciplinary patient care teams formed to handle complex cases at hospitals.

- **High volume, high turnover.** Companies with large workforces that frequently turn over during their first year and those that hire in large batch groups can benefit from tools that help to predict who is likely to stay as well as tools that reduce recruiting and onboarding costs. Examples include front-line workers at retail stores, who have very high attrition rates.

- **Knowledge-intensive.** Companies with high shares of knowledge workers can benefit from tools that help employees find information and expertise internally. This is particularly relevant for complex multinational firms and for those with multiple types of extremely specialized roles in fields such as science, engineering, medicine, law, and other professional services.

- **Temporal/geographic matching.** Companies that need to match specialized workers with complex assignments may also benefit from talent platforms that can help to synthesize attributes such as expertise, availability, location, and worker preference. Examples may include scheduling of nurses working in large staffing pools and consulting teams.

Exhibit A10 shows the skill mix and operating characteristics of online talent platforms.

We have modeled six "sample" companies with varying mixes of skills and different operating characteristics

	Business services	High tech	Manu-factur-ing	Finan-cial services	Health care	Retail
Skills mix						

Skills mix legend:
- Highly skilled, high wages
- Medium skilled, medium wages, specialist
- Medium skilled, medium wages, generalist
- Low skilled, low wages

Operational characteristics

Legend: High / Medium / Low

		Business services	High tech	Manufacturing	Financial services	Health care	Retail
	Frequent team formation	High	Low	Low	Low	Low	Low
	High volume + turnover	Low	Low	Low	High	Low	High
	Knowledge centric	High	High	Low	Low	Low	Low
	Geo/temporal matching	Low	Low	Low	Low	Low	High

Sizing %		Business services	High tech	Manufacturing	Financial services	Health care	Retail	
	Share of GDP	9	2	9	4	13	20	**60**
	Share of employment	22	5	21	7	7	8	**58**

Share of high-skilled workers — Highest ────────────→ Lowest

NOTE: This reflects the skills mix and operating characteristics of US companies in the specified sectors.

SOURCE: BLS employment database; McKinsey Global Institute analysis

After defining the impact at a level specific to individual worker type and developing a view of the composition of workers at each model company, we calculated the expected impact of each mechanism on each worker category.

To give one example, our sample high-tech company has approximately 2,500 highly skilled engineers who develop products. Finding better-quality candidates is critical for this type of company. We assume that the company can raise the overall productivity of its engineers by 4 percent by recruiting 10 percent more high-performing engineers that are 2.5 times more productive than average. In addition, it can boost the productivity of its engineers by an additional 1.5 percent by improving the effectiveness of the way they search for internal expertise. Since these are front-line workers, we assume that 100 percent of the productivity gain translates into increased output.

We applied a similar approach to every impact mechanism for every worker type in our model companies, resulting in impacts on productivity and costs that could then be aggregated and considered on a company-wide basis (Exhibit A11). Depending on the exact mix of employees, skill levels, and wages, the overall effect of each mechanism can vary. For example, the sample professional services firm could capture some of the largest overall gains due to its high proportion of highly skilled workers, its high onboarding costs, the knowledge-intensive nature of its work, and the constant need to match and form teams based on expertise. The retailer, on the other hand, has a more homogenous labor pool with a large number of low-skill workers and high attrition, so it finds its most significant relative impacts from optimizing retention.

In general, organizations with high labor intensity, large numbers of skilled front-office workers, frequent team formation, and higher-than-average attrition will benefit the most from online talent platforms.

Exhibit A11

The potential impact is driven by different mechanisms in different types of companies

Legend: ■ High ■ Medium ■ Low ■ None

	Impact mechanism	Total profit increase (Basis points)	Professional services	High tech	Hospital	Retail	Manufacturing	Bank
Recruiting	Find better candidates	80	High	High	High	Medium	Medium	High
	Discover hard-to-find, niche talent	10	Medium	Medium	Low	None	Low	Low
	More effectively filter to select interviewees	5	Medium	None	Low	Low	None	None
	Use candidate data for better assessment	35	Medium	Medium	Medium	Medium	Medium	Medium
	Tailor cultivation approach to each offeree	5	Medium	None	Low	None	None	None
Managing talent	Tailor onboarding to hire skills, network	15	Medium	Low	Low	Low	Low	Low
	Personalize training and learning opportunities	20	Medium	Low	Medium	Low	Low	Low
	Form more effective teams and groups	10	High	Medium	None	None	Low	Low
	Find internal expertise and knowledge	45	High	High	Medium	Low	Medium	Medium
Planning for the future	Predict and optimize attrition	40	Medium	Medium	Medium	Medium	Medium	Medium
	Plan for succession paths	10	Medium	Medium	Low	None	Low	Low
	Anticipate and plan for future talent needs	1	Low	None	None	None	None	None
	Total profit impact (Basis points)	**275**	**540**	**390**	**230**	**110**	**120**	**255**

SOURCE: McKinsey Global Institute analysis

The bottom-line financial impact for the six sample companies

Finally, to quantify the financial impact at each sample company, we developed pro forma financial statements for each company to estimate the output, cost, and profit of our sample companies before and after the adoption of online talent platforms. This was modeled using the public financial statements of comparable companies, expert interviews, and benchmarks to determine factors such as average revenue per employee and profit margin.

Labor costs were estimated using BLS salary data and assuming worker proportions based on industry-wide compositions. Overhead was added to salary based on the skill level of the employee, with overhead of 50 percent of salary for the highest-skilled workers to account for presumed larger benefits (such as retirement plans), whereas low-skilled, low-wage workers had overhead of only 25 percent. Human resources, recruiting, onboarding, and other labor-related costs were estimated on a per-employee basis using the approaches described above and then tested against public financials where possible.

To compute the results of adopting talent platforms, we applied the full potential of each impact mechanism to each worker based on skill level, operating characteristics, salary, and other talent costs as described above.[11] These impacts increased output or reduced cost based on whether the employee is front-office, middle-office, or back-office, as described.

- **Increased output.** As described above, output per employee was defined by taking the total revenue of the company and dividing it by the salary-weighted contribution of each worker. For simplicity, when reporting the output statistic, we divide the total incremental output by revenue to estimate the increase in percentage terms.[12]

- **Cost reduction.** Cost reduction was calculated by adding all potential savings, including productivity gains from back- and middle- office workers; reduced recruiting, training, and onboarding costs; reduced labor costs; reduced opportunity costs of recruiting; and reduced attrition. These costs were divided by the total estimated labor cost of the firm.

- **Profit margin improvement.** To compute the profit impact, the pro forma profit before the adoption of talent platforms (revenue times industry-peer net profit margin) was compared to the profit after the addition of impacts from talent platforms. To compute the effect of output on profit, we multiplied the total increase in output by an estimated contribution margin for the type of firm.[13] To compute the effect of cost, we directly subtracted cost.

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[11] Since our analysis was concerned only with labor costs, we held other costs constant so that only revenue, labor-related costs, and profit margin changed.

[12] It should be noted that not all output will directly become revenue; division by total revenue is an estimate to give a sense of magnitude. For example, productivity from nurses in a hospital may neither increase revenue nor reduce costs, but it may improve the quality of patient care or lead to better health outcomes.

[13] Again, we build on the simplifying assumption that output could translate to revenue and use a contribution margin proxy to convert revenue to bottom-line impact, taking into account the fact that an incremental dollar of revenue due to labor is not necessarily equivalent across firms. Contribution margins were estimated using expert judgment based on the labor intensity of the company.

Exhibit A12 shows the potential financial impact of online talent platforms.

Online talent platforms can increase output by up to 9 percent and reduce costs by up to

Incremental impact of online talent platforms

Model company	Revenues $ billion	Employees	Output increase[1] %	Cost reduction[2] %
Professional services	2.5	5,000	9	7
Technology	11.1	10,000	7	4
Hospital	0.5	2,000	4	6
Retail	2.8	15,000	3	5
Manufacturing	2.4	10,000	3	4
Bank	31.7	100,000	2	6
			5	5

1 Includes productivity gains in front- and middle-office workers, which can translate into revenue or other increased output
2 Includes productivity effect in middle- and back-office workers, and savings in recruiting, interviewing time, training, onboa
Note: Numbers may not sum due to rounding.

SOURCE: BLS; company annual reports; McKinsey Global Institute analysis

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