Occupational Projections
Methods

Michael Wolf
U.S. Bureau of Labor Statistics (BLS)
Employment Projections Program
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Overview

- BLS Projections Background
- Data Sources and Classifications
- Developing Occupational Projections
- Occupational Qualifications
- Estimating Occupational Replacement Needs
US Projections History

- US Secretary of Labor is charged with developing a national employment statistics system
  - Bureau of Labor Statistics (BLS) is the statistical agency of the Department of Labor
- First Occupational Outlooks produced in 1940s to aide in postwar readjustments
- Comprehensive numerical projections every 2 years since the 1960s
US Employment Projections

- 10-year projections of structural labor market changes
- 2014-24 projections cover 819 occupations and 329 industries
- BLS projections prepared at the national level only
  - National projections serve as an input for state and local employment projections, which are produced by state governments
Projections Uses

- Workforce planning and policy
  - Federal workforce development funds sub baccalaureate training, but devolves decisions to the state and local level
  - Baccalaureate training policy is developed primarily at the state level

- Career development
  - Students, counselors, and jobseekers making career choice decisions

- Labor market research
Employment Projections Process

- **Labor Force**
  Total and by age, sex, race and ethnicity

- **Aggregate Economy**
  GDP, total employment, and major demand categories

- **Industry Final Demand**
  Sales to consumers, businesses, government, and foreigners

- **Occupational Employment**
  Industry-Occupation Matrix

- **Industry Employment**
  Labor productivity, average weekly hours, wage & salary employment

- **Industry Output**
  Use and Make Relationships, Total Requirements Tables
Employment Data Sources

- **Occupational Employment Statistics (OES)**
  - Establishment survey for nonagricultural wage-and-salary staffing patterns

- **Current Employment Statistics (CES)**
  - Establishment survey for nonagricultural wage-and-salary industry employment

- **Quarterly Census of Employment and Wages (QCEW)**
  - Administrative data set for wage-and-salary industry employment

- **Current Population Survey (CPS)**
  - Household survey for agricultural industry employment and staffing patterns, self-employed workers
Classifications

- North American Industry Classification System (NAICS) for industries
  - Updated every 5 years
  - 1057 detailed industries

- Standard Occupational Classification (SOC) for occupations
  - Revised every 8-10 years
  - 820 detailed occupations
  - 24 occupations added in 2010, 37 will be added in 2018
  - 90% of occupations unchanged by revisions
Projecting Occupational Employment

- Allocate projected industry employment to occupations using a staffing-pattern matrix.
- Occupational ratios (share of industry coefficients) change over time.
- Could use quantitative methods to project ratios if sufficient historical data available.
- BLS does not have comparable historical data, so use qualitative methods.
Researching Occupations

- Research how occupational utilization will change in industries
  - Data
    - Historical staffing patterns, industry-specific data sources
  - Interviews and site visits
    - Professional organizations, schools, government agencies, employers
  - Published research and reports
    - Professional journals, newspapers, trade publications
Factors Affecting Occupational Utilization

- Automation technology
- Domestic outsourcing
- Offshoring (international outsourcing)
- Occupational substitution
- Change in the mix of industry sector outputs
Converting Research into Projections

- Develop rationales describing direction and magnitude of ratio change
- Numerical change factors are applied to calculate projected utilization ratios for each occupation by industry cell
- Projected staffing patterns for each industry are balanced to have occupation and industry employment match
Example Occupational Shifts

Occupational Share of Accounting Industry Employment

<table>
<thead>
<tr>
<th>Year</th>
<th>Business and Financial</th>
<th>Office and Administrative Support</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>48.5</td>
<td>36.7</td>
<td>14.8</td>
</tr>
<tr>
<td>2024</td>
<td>53.4</td>
<td>32.4</td>
<td>14.2</td>
</tr>
</tbody>
</table>

Growth Rates within Accounting Industry, 2014-24

<table>
<thead>
<tr>
<th>Year</th>
<th>Industry Total</th>
<th>Business and Financial</th>
<th>Office and Administrative Support</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5.4</td>
<td>15.9</td>
<td>-7.0</td>
<td></td>
</tr>
</tbody>
</table>
Occupational Qualifications

- Occupations are assigned to one of 8 education levels based on typical requirements for entry.
- Education levels represent current, not projected, requirements.
- Education levels are assigned based on research.
 Occupations that Need More Education for Entry are Projected to Grow Faster

Projected 2014-24 growth rate in occupational employment by typical 2014 entry-level education

- Doctoral or professional degree
- Master's degree
- Bachelor's degree
- Associate's degree
- Postsecondary nondegree award
- Some college, no degree
- High school diploma or equivalent
- No formal educational credential

Average, all occupations = 6.5%

Source: U.S. Bureau of Labor Statistics
Occupational Replacement Needs

- Projections of growth and decline show structural changes in the labor force
- Workforce demand largely driven by the need to replace existing workers who leave an occupation
  - Retirements
  - Other labor force exits
  - Transfers to different occupations
Projecting Replacement Needs

- BLS formerly used a cohort-component (indirect) estimation method
  - Age-based method undercounted opportunities in many occupations
- Starting in 2017, new longitudinal (direct) estimation method will be used
  - Uses a regression to estimate probability of separating for current workforce demographics
References

- BLS Projections Methodology: https://www.bls.gov/emp/ep_projections_methods.htm
- BLS Educational Classifications: https://www.bls.gov/emp/ep_table_112.htm
Occupational Skills Data

Michael Wolf
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Overview

- What Are Skills?
- Educational Attainment and Requirements
- O*NET
- Occupational Requirements Survey
What Are Skills?

- Abilities: enduring attributes of an individual that affect performance
- Skills: developed capacities that facilitate performance
- Knowledge: organized sets of principles and facts

How does a worker develop skills and knowledge?

- Formal education
- On-the-job training
- Prior work experience
Educational Attainment

- US labor force surveys measure educational attainment: highest level of education completed
- Attainment measures current workforce for an occupation and may not reflect what new entrants typically need:
  - Entry level requirement change over time
  - Workers may continue their education
  - Personal choice to work in some occupations
  - Mal-employment
BLS Education Classification

- U.S. Bureau of Labor Statistics (BLS) produces a measure of typical education needed to enter an occupation
  - 8 categories, from Doctoral/Professional Degree to No Formal Educational Credential
  - Intended for career guidance purposes
  - Reflects current, not future, requirements

- Measures employer requirements, not worker attainment
BLS Classification vs Attainment

2014 Employment by Education Level

Attainment

BLS Classification

2014-24 Employment Change by Education Level

Attainment

BLS Classification

High School or Less | Postsecondary

0% 20% 40% 60% 80% 100%
Demand for Education

- Wage premium models provide an alternative estimate for the demand for education
- Examine within-occupation wage differentials for workers with different education levels
- Employers may compensate workers with more education even if they do not require it for the job
  - Expect that results would fall between measures based on attainment and measures based on employer requirements
### Demand for Education

**How many jobs require postsecondary education?**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Share of jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attainment</td>
<td>64.4%</td>
</tr>
<tr>
<td>Wage Premium Model</td>
<td>43.3%</td>
</tr>
<tr>
<td>BLS Classification</td>
<td>36.4%</td>
</tr>
</tbody>
</table>

**How many jobs require a baccalaureate degree?**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Share of jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attainment</td>
<td>37.2%</td>
</tr>
<tr>
<td>Wage Premium Model</td>
<td>31.8%</td>
</tr>
<tr>
<td>BLS Classification</td>
<td>25.6%</td>
</tr>
</tbody>
</table>
What is O*NET?

- Occupational Information Network
  - Primary source for characteristics and requirements information on occupations in the US
    - Covers the work conducted in the U.S. economy
      - 900+ occupations
      - Comprehensive description of worker and occupational requirements
    - Common language for describing the world of work
      - Job seekers, students, employers, educators, community developers, workforce professionals
O*NET Content Information

Worker-oriented

Worker Characteristics
- Abilities
- Occupational Interests
- Work Values
- Work Styles

Worker Requirements
- Skills
- Knowledge
- Education

Experience Requirements
- Experience and Training
- Skills - Entry Requirement
- Licensing

Cross Occupation

Occupational Requirements
- Generalized Work Activities
- Detailed Work Activities
- Organizational Context
- Work Context

Occupation-Specific Information
- Tasks
- Tools and Technology

Job-oriented

Workforce Characteristics
- Labor Market Information
- Occupational Outlook

Occupation Specific
## Example O*NET Data

### Details Report for:
**19-3011.00 - Economists**

### Knowledge

<table>
<thead>
<tr>
<th>Importance</th>
<th>Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>93</td>
<td><strong>Economics and Accounting</strong> — Knowledge of economic and accounting principles and practices, the financial markets, banking and the analysis and reporting of financial data.</td>
</tr>
<tr>
<td>90</td>
<td><strong>Mathematics</strong> — Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.</td>
</tr>
<tr>
<td>71</td>
<td><strong>English Language</strong> — Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar.</td>
</tr>
<tr>
<td>53</td>
<td><strong>Computers and Electronics</strong> — Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.</td>
</tr>
<tr>
<td>52</td>
<td><strong>Education and Training</strong> — Knowledge of principles and methods for curriculum and training design, teaching and instruction for individuals and groups, and the measurement of training effects.</td>
</tr>
</tbody>
</table>

### Skills

<table>
<thead>
<tr>
<th>Importance</th>
<th>Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td><strong>Active Listening</strong> — Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.</td>
</tr>
<tr>
<td>75</td>
<td><strong>Critical Thinking</strong> — Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.</td>
</tr>
<tr>
<td>75</td>
<td><strong>Mathematics</strong> — Using mathematics to solve problems.</td>
</tr>
<tr>
<td>75</td>
<td><strong>Speaking</strong> — Talking to others to convey information effectively.</td>
</tr>
</tbody>
</table>

### Abilities

<table>
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<tr>
<th>Importance</th>
<th>Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td><strong>Deductive Reasoning</strong> — The ability to apply general rules to specific problems to produce answers that make sense.</td>
</tr>
<tr>
<td>75</td>
<td><strong>Inductive Reasoning</strong> — The ability to combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).</td>
</tr>
<tr>
<td>75</td>
<td><strong>Written Comprehension</strong> — The ability to read and understand information and ideas presented in writing.</td>
</tr>
<tr>
<td>75</td>
<td><strong>Written Expression</strong> — The ability to communicate information and ideas in writing so others will understand.</td>
</tr>
<tr>
<td>72</td>
<td><strong>Mathematical Reasoning</strong> — The ability to choose the right mathematical methods or formulas to solve a problem.</td>
</tr>
</tbody>
</table>
Sources of O*NET Data

- Job Incumbents
  - Collected through establishment-based surveys

- Occupational Experts
  - Used for small, remote, and new/emerging occupations

- Occupational Analysts
  - I/O Psychologists used for technical data elements not able to be answered by job incumbents
Data Publication

- Currently covers 974 Occupations
- Approximately 100 occupations are updated each year
  - Prioritized based on:
    - Fast growing
    - Green/Environment-related
    - Science, technology, engineering, mathematics, and innovation
  - Not designed for time series analysis of changes in occupational characteristics
The Occupational Requirements Survey

The Occupational Requirements Survey (ORS) provides occupational-related data for:

- Physical demands
- Cognitive demands
- Environmental conditions
- Vocational preparation

Data is intended to adjudicate disability claims
ORS Data Elements

- Vocational preparation
  - Minimum formal education required
  - Pre- and post-employment training
  - Prior work experience

- Cognitive requirements
  - Decision-making required, supervision
  - Changes in routine
  - Pace of work and control over pace
ORS Data Collection

- New survey collected using the existing National Compensation Survey infrastructure
- Collected at establishments through site visits by field economists
- First data release in December 2016 covered 165 occupations
- Expected to cover up to 1,090 occupations by 2019
- Data on occupations will be updated every 5 years
References

- BLS Educational Attainment and Classifications: https://www.bls.gov/emp/ep_education_training_system.htm
- O*NET Data Interface: https://www.onetonline.org/
- O*NET Database: https://www.onetcenter.org/
- BLS Occupational Requirements Survey: https://www.bls.gov/ors/
Contact Information

Michael Wolf
Division Chief
Employment Projections Program
www.bls.gov/emp
202-691-5714
wolf.michael@bls.gov