An Examination of Alberta Labour Markets:

Worker Shortage - Monte Carlo Simulation Analysis

Institute for Public Economics

APPLICATIONS
MANAGEMENT CONSULTING LTD.

2220 Sun Life Place
10123 99 Street Edmonton
Edmonton, Alberta T5J 3H1

T 780.425.6741
www.think-applications.com

Final Report

JULY 2013

APPLICATIONS
MANAGEMENT CONSULTING LTD.

Suite 2220 Sun Life Place
10123 99 Street
Edmonton, Alberta T5J 3H1
T 780-425-6741
applications@mac.com
www.think-applications.com

July 12, 2013

Institute for Public Economics
Department of Economics
University of Alberta

Attention: Robert L. (Bob) Ascah, Ph.D.

Subject: An Examination of Alberta Labour Markets: Employment Shortage - Monte Carlo Simulation

Attached is our Final Report on the Monte Carlo simulations completed for the employment shortage analysis conducted with the Western Centre for Economic Research.

Sincerely,

Applications Management Consulting Ltd.

Per:

Darryl Howery

Darryl Howery
Principal
Encl. (1)

Contents

1. Introduction

The Institute for Public Economics conducted a comprehensive analysis of the Alberta Labour Market. As part of this analysis, Applications Management Consulting Ltd. was asked to prepare a forecast of the demand and supply of workers across the province and regionally for each of three economic growth scenarios. This analysis identified that significant worker shortages were likely to exist across all economic sectors in the Base and High Growth Scenario, and most economic sectors in the Low Growth Scenario.

To assist in understanding the potential variability of the projected employment demand, supply and ultimately shortage of workers, where it exists, Applications was asked to conduct a Monte Carlo simulation or 'risk analysis' on the key variables that affect the estimation of worker shortages.

Monte Carlo or 'Risk Analysis' Simulation

Monte Carlo simulation involves the use of repetitive analysis employing probability distributions around key variables whose specific values are unknown, producing a series of analysis results. These results reflect the random selection of values for each of the selected independent variables and calculates a result for each set of selections. The results of a Monte Carlo simulation is a probability distribution of results.

This analytical approach dates back to the 1940s during work on the atomic bomb. Mathematician Stanislaw Ulam is credited with recognizing how computers could make Monte Carlo simulation of complex systems feasible by running each modeled analysis 100s or 1,000s of times, generating a probability distribution of results.

This analytical approach has been employed in this analysis by selecting key analytical variables, attaching a possible range and distribution to each independent variable and running the analysis to produce a resultant shortage of workers for each industry group included in the analysis.

What the Monte Carlo simulation analysis results provides is a distribution of model results for each point estimate of worker shortages. This range of worker shortages effectively yields the analysis results, and likelihood of the shortage result, for the range specified for the key independent variables in the labour demand and supply models.

1.1. Specification of Independent Variables

The independent variables that have been included in the Monte Carlo simulation analysis fall into two general categories: economic variables that affect the demand for workers; and, worker supply variables that affect the availability of workers.

Economic Variables

Three economic variables were included in the Monte Carlo simulation. The point estimate values used in each economic growth scenario (Base, High Growth and Low Growth) were allowed to vary for each variable as follows:

- Oil Prices: For each growth scenario, oil prices were allowed to vary by ± 15% using a normal distribution.
- Canadian Dollar: For each growth scenario, the value of the Canadian dollar was allowed to vary by ± 5% using a normal distribution.
- Worker Productivity: For each growth scenario, the rate of improvement in worker productivity was allowed to vary by ± 10% using a normal distribution.

Worker Supply Variables

Two worker supply variables were included in the Monte Carlo simulation results. The point estimate values used in each economic growth scenario were allowed to vary for each variable as follows:

- Total Net Migration: For each growth scenario, total net migration (including immigration and inter-provincial migration) was allowed to vary by ± 15% using a normal distribution.
- Job Separation: For each growth scenario, proportion of workers leaving their current job in any period (including voluntary and involuntary separation) was allowed to vary by ± 10% using a normal distribution.

1.2. How The Analysis Was Conducted

The Monte Carlo simulation analysis was conducted using @Risk software which connects with the Excel models used to conduct the employment demand, supply and worker shortage analysis for the Alberta Labour Market Study. For each growth scenario, the independent variables identified above were assigned the range and distribution type noted above. In total, 1,000 iterations of the analysis was completed providing the same number of results for each industry in each economic scenario.

The results of these simulations are provided by industry group in the section below. Appendix A provides a distribution graph and tabular results for each industry and economic growth scenario.

2. Worker Shortage Results by Industry

This section of the report provides a summary of the Monte Carlo simulation analysis for each industry group for each economic scenario (Base, High Growth and Low Growth).

2.1. Employment Shortage Results by Industry for the Base Scenario

The results presented below represent the cumulative worker shortages estimated for each industry group. The Point Estimates are the results from the original analysis provided in Technical Appendix to the Alberta Labour Market Study. The 'mean' value is calculated from the distribution of results estimated using the Monte Carlo simulation. It represents the arithmetic mean of the worker shortage results for each simulation. Also provided are the Maximum and Minimum points at the 10% tails of the distribution. These estimates indicate the range around the mean that covers 80% of the results.

All figures represent the cumulative worker shortage estimated for a five year forecast period of 2012-2016.

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Crop and Animal Production The cumulative shortage of workers in this industry ranges from 210 in the Low Growth Scenario to 2,555 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 774 workers. The estimated mean cumulative shortage of workers for this scenario is 812, and is estimated to range between 649 and 974 workers. The mean for the High Growth Scenario is 2,873 workers and is estimated to range between 2,329 and 3,417 workers. This sector ranks 24 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Crop and Animal Production Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 774 / 812 / 974 / 649 High Growth: 2,555 / 2,873 / 3,417 / 2,329 Low Growth: 210 / 217 / 267 / 167
Crop and Animal Production The cumulative shortage of workers in this industry ranges from 25 in the Low Growth Scenario to 251 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 137 workers. The estimated mean cumulative shortage of workers for this scenario is 144, and is estimated to range between 115 and 173 workers. The mean for the High Growth Scenario is 269 workers and is estimated to range between 216 and 321 workers. This sector ranks 53 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Forestry and Logging Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 137 / 144 / 173 / 115 High Growth: 251 / 269 / 321 / 216 Low Growth: 25 / 26 / 31 / 21

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Fishing, Hunting and Trapping The cumulative shortage of workers in this industry ranges from 0 in the Low Growth Scenario to 4 in the High Growth Scenario. This industry sector is not indicating any cumualtive worker shortage for either the Base or Low Growth Scenarios. The estimated shortage for the High Growth Scenario is minimal and ranks last (61 or 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Fishing, Hunting and Trapping Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 0 / 0 / 0 / 0 High Growth: 4 / 4 / 5 / 3 Low Growth: 0 / 0 / 0 / 0
Support Activities for Agriculture and Forestry The cumulative shortage of workers in this industry ranges from 43 in the Low Growth Scenario to 303 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 172 workers. The estimated mean cumulative shortage of workers for this scenario is 181, and is estimated to range between 144 and 217 workers. The mean for the High Growth Scenario is 327 workers and is estimated to range between 262 and 393 workers. This sector ranks near the bottom (47 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Support Activities for Agriculture and Forestry Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 172 / 181 / 217 / 144 High Growth: 303 / 327 / 393 / 262 Low Growth: 43 / 44 / 52 / 36
Oil and Gas Extraction The cumulative shortage of workers in this industry ranges from 913 in the Low Growth Scenario to 5,551 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 3,541 workers. The estimated mean cumulative shortage of workers for this scenario is 3,715, and is estimated to range between 2,972 and 4,459 workers. The mean for the High Growth Scenario is 5,659 workers and is estimated to range between 4,860 and 6,458 workers. This sector ranks 19 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Oil and Gas Extraction Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 3,541 / 3,715 / 4,459 / 2,972 High Growth: 5,551 / 5,659 / 6,458 / 4,860 Low Growth: 913 / 908 / 1,103 / 714

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Mining The cumulative shortage of workers in this industry ranges from 16 in the Low Growth Scenario to 290 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 194 workers. The estimated mean cumulative shortage of workers for this scenario is 203, and is estimated to range between 163 and 244 workers. The mean for the High Growth Scenario is 314 workers and is estimated to range between 253 and 376 workers. This sector ranks 48 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Mining Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 194 / 203 / 244 / 163 High Growth: 290 / 314 / 376 / 253 Low Growth: 16 / 16 / 19 / 14
Support Activities for Mining and Oil and Gas Extraction The cumulative shortage of workers in this industry ranges from 1,066 in the Low Growth Scenario to 5,931 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 4,003 workers. The estimated mean cumulative shortage of workers for this scenario is 4,201, and is estimated to range between 3,360 and 5,042 workers. The mean for the High Growth Scenario is 6,401 workers and is estimated to range between 5,013 and 7,789 workers. This sector ranks 17 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Support Activities for Mining and Oil and Gas Extraction Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 4,003 / 4,201 / 5,042 / 3,360 High Growth: 5,931 / 6,401 / 7,789 / 5,013 Low Growth: 1,066 / 1,151 / 1,394 / 908
Utilities The cumulative shortage of workers in this industry ranges from 230 in the Low Growth Scenario to 1,082 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 713 workers. The estimated mean cumulative shortage of workers for this scenario is 694, and is estimated to range between 534 and 855 workers. The mean for the High Growth Scenario is 1,109 workers and is estimated to range between 859 and 1,359 workers. This sector ranks in the middle of the industry groups (31 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Utilities Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 713 / 694 / 855 / 534 High Growth: 1,082 / 1,109 / 1,359 / 859 Low Growth: 230 / 216 / 265 / 168

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Construction The cumulative shortage of workers in this industry ranges from 3,335 in the Low Growth Scenario to 40,602 in the High Growth Scenario. The Construction sector cumulative worker shortage is very sensitive to the assumptions about economic growth. The Point Estimate for the Base Scenario reflects a cumulative shortage of 21,145 workers. The estimated mean cumulative shortage of workers for this scenario is 21,130, and is estimated to range between 16,689 and 25,570 workers. The mean for the High Growth Scenario is 41,586 workers and is estimated to range between 32,207 and 50,965 workers. This sector ranks 3 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario. In terms of the absolute shortage of workers, the Construction sector is near top of the list. The Monte Carlo simulation results also indicate that the range of cumulative worker shortages in the High Growth Scenario varies considerably, covering a range of almost 20,000 workers.	Construction Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 21,145 / 21,130 / 25,570 / 16,689 High Growth: 40,602 / 41,586 / 50,965 / 32,207 Low Growth: 3,335 / 3,283 / 3,834 / 2,733
Food Manufacturing The cumulative shortage of workers in this industry ranges from 297 in the Low Growth Scenario to 1,987 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 1,240 workers. The estimated mean cumulative shortage of workers for this scenario is 1,264, and is estimated to range between 1,018 and 1,509 workers. The mean for the High Growth Scenario is 2,036 workers and is estimated to range between 1,636 and 2,435 workers. This sector ranks close to the middle (28 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Food Manufacturing Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 1,240 / 1,264 / 1,509 / 1,018 High Growth: 1,987 / 2,036 / 2,435 / 1,636 Low Growth: 297 / 302 / 368 / 236

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Beverage and Tobacco Product Manufacturing The cumulative shortage of workers in this industry ranges from 23 in the Low Growth Scenario to 213 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 122 workers. The estimated mean cumulative shortage of workers for this scenario is the same as the Point Estimate at 122, and is estimated to range between 100 and 144 workers. The mean for the High Growth Scenario is 213 workers and is estimated to range between 175 and 252 workers. This sector ranks near the bottom (54 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Beverage and Tobacco Product Manufacturing Worker Shortage by Scenario | | Point Est | Mean | Max (80%) | Min (80%) | |---|---|---|---|---| | Base Scenario | 122 | 122 | 144 | 100 | | High Growth | 213 | 213 | 252 | 175 | | Low Growth | 23 | 24 | 29 | 19 |
Textile and Textile Product Mills The cumulative shortage of workers in this industry ranges from 0 in the Low Growth Scenario to 141 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 55 workers. The estimated mean cumulative shortage of workers for this scenario is the same as the Point Estimate of 55, and is estimated to range between 47 and 63 workers. The mean for the High Growth Scenario is 143 workers and is estimated to range between 115 and 171 workers. This sector ranks near the bottom (58 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Textile and Textile Product Mills Worker Shortage by Scenario | | Point Est | Mean | Max (80%) | Min (80%) | |---|---|---|---|---| | Base Scenario | 55 | 55 | 63 | 47 | | High Growth | 141 | 143 | 171 | 115 | | Low Growth | 0 | 0 | 0 | 0 |
Clothing Manufacturing The cumulative shortage of workers in this industry ranges from 7 in the Low Growth Scenario to 47 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 30 workers. The estimated mean cumulative shortage of workers for this scenario is the same as the Point Estimate of 30, and is estimated to range between 25 and 34 workers. The mean for the High Growth Scenario is 44 workers and is estimated to range between 37 and 51 workers. This sector ranks near the bottom (59 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Clothing Manufacturing Worker Shortage by Scenario | | Point Est | Mean | Max (80%) | Min (80%) | |---|---|---|---|---| | Base Scenario | 30 | 30 | 34 | 25 | | High Growth | 47 | 44 | 51 | 37 | | Low Growth | 7 | 7 | 8 | 6 |

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Leather and Allied Product Manufacturing The cumulative shortage of workers in this industry ranges from 1 in the Low Growth Scenario to 9 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 5 workers. The estimated mean cumulative shortage of workers for this scenario is the same as the Point Estimate of 5, and is estimated to range between 4 and 5 workers. The mean for the High Growth Scenario is 9 workers and is estimated to range between 8 and 10 workers. This sector ranks near the bottom (60 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Leather and Allied Product Manufacturing Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 5 / 5 / 5 / 4 High Growth: 9 / 9 / 10 / 8 Low Growth: 1 / 1 / 1 / 1
Wood Product Manufacturing The cumulative shortage of workers in this industry ranges from 45 in the Low Growth Scenario to 629 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 339 workers. The estimated mean cumulative shortage of workers for this scenario is the same as the Point Estimate of 339, and is estimated to range between 288 and 390 workers. The mean for the High Growth Scenario is 604 workers and is estimated to range between 517 and 690 workers. This sector ranks 37 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Wood Product Manufacturing Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 339 / 339 / 390 / 288 High Growth: 629 / 604 / 690 / 517 Low Growth: 45 / 44 / 51 / 37
Paper Manufacturing The cumulative shortage of workers in this industry ranges from 22 in the Low Growth Scenario to 193 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 127 workers. The estimated mean cumulative shortage of workers for this scenario is the same as the Point Estimate of 127, and is estimated to range between 108 and 146 workers. The mean for the High Growth Scenario is 192 workers and is estimated to range between 159 and 225 workers. This sector ranks near the bottom (56 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Paper Manufacturing Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 127 / 127 / 146 / 108 High Growth: 193 / 192 / 225 / 159 Low Growth: 22 / 23 / 26 / 19

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Printing and Related Support Activities The cumulative shortage of workers in this industry ranges from 81 in the Low Growth Scenario to 363 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 248 workers. The estimated mean cumulative shortage of workers for this scenario is the same as the Point Estimate of 248, and is estimated to range between 211 and 285 workers. The mean for the High Growth Scenario is 368 workers and is estimated to range between 324 and 413 workers. This sector ranks 44 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Printing and Related Support Activities Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 248 / 248 / 285 / 211 High Growth: 363 / 368 / 413 / 324 Low Growth: 81 / 77 / 87 / 66
Petroleum and Coal Products Manufacturing The cumulative shortage of workers in this industry ranges from 48 in the Low Growth Scenario to 377 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 229 workers. The estimated mean cumulative shortage of workers for this scenario is 228, and is estimated to range between 193 and 263 workers. The mean for the High Growth Scenario is 385 workers and is estimated to range between 330 and 439 workers. This sector ranks 43 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Petroleum and Coal Products Manufacturing Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 229 / 228 / 263 / 193 High Growth: 377 / 385 / 439 / 330 Low Growth: 48 / 51 / 58 / 44
Chemical Manufacturing The cumulative shortage of workers in this industry ranges from 141 in the Low Growth Scenario to 1,146 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 706 workers. The estimated mean cumulative shortage of workers for this scenario is 713, and is estimated to range between 590 and 835 workers. The mean for the High Growth Scenario is 1,134 workers and is estimated to range between 997 and 1,272 workers. This sector ranks near the middle (30 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Chemical Manufacturing Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 706 / 713 / 835 / 590 High Growth: 1,146 / 1,134 / 1,272 / 997 Low Growth: 141 / 148 / 174 / 121

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Plastics and Rubber Products Manufacturing The cumulative shortage of workers in this industry ranges from 54 in the Low Growth Scenario to 490 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 281 workers. The estimated mean cumulative shortage of workers for this scenario is 284, and is estimated to range between 235 and 332 workers. The mean for the High Growth Scenario is 467 workers and is estimated to range between 381 and 554 workers. This sector ranks 40 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Plastics and Rubber Products Manufacturing Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 281 / 284 / 332 / 235 High Growth: 490 / 467 / 554 / 381 Low Growth: 54 / 58 / 69 / 46
Non-Metallic Mineral Product Manufacturing The cumulative shortage of workers in this industry ranges from 92 in the Low Growth Scenario to 862 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 486 workers. The estimated mean cumulative shortage of workers for this scenario is 498, and is estimated to range between 403 and 593 workers. The mean for the High Growth Scenario is 849 workers and is estimated to range between 707 and 991 workers. This sector ranks 34 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Non-Metallic Mineral Product Manufacturing Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 486 / 498 / 593 / 403 High Growth: 862 / 849 / 991 / 707 Low Growth: 92 / 96 / 116 / 75
Primary Metal Manufacturing The cumulative shortage of workers in this industry ranges from 12 in the Low Growth Scenario to 257 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 147 workers. The estimated mean cumulative shortage of workers for this scenario is 150, and is estimated to range between 122 and 179 workers. The mean for the High Growth Scenario is 250 workers and is estimated to range between 213 and 288 workers. This sector ranks 52 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Primary Metal Manufacturing Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 147 / 150 / 179 / 122 High Growth: 257 / 250 / 288 / 213 Low Growth: 12 / 13 / 15 / 11

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Fabricated Metal Product Manufacturing The cumulative shortage of workers in this industry ranges from 243 in the Low Growth Scenario to 2,428 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 1,568 workers. The estimated mean cumulative shortage of workers for this scenario is 1,606, and is estimated to range between 1,301 and 1,912 workers. The mean for the High Growth Scenario is 2,547 workers and is estimated to range between 2,008 and 3,086 workers. This sector ranks 25 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Fabricated Metal Product Manufacturing Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 1,568 / 1,606 / 1,912 / 1,301 High Growth: 2,428 / 2,547 / 3,086 / 2,008 Low Growth: 243 / 248 / 286 / 210
Machinery Manufacturing The cumulative shortage of workers in this industry ranges from 219 in the Low Growth Scenario to 2,253 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 1,473 workers. The estimated mean cumulative shortage of workers for this scenario is 1,516, and is estimated to range between 1,233 and 1,799 workers. The mean for the High Growth Scenario is 2,398 workers and is estimated to range between 1,878 and 2,919 workers. This sector ranks 27 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Machinery Manufacturing Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 1,473 / 1,516 / 1,799 / 1,233 High Growth: 2,253 / 2,398 / 2,919 / 1,878 Low Growth: 219 / 220 / 251 / 189
Computer and Electronic Product Manufacturing The cumulative shortage of workers in this industry ranges from 35 in the Low Growth Scenario to 275 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 164 workers. The estimated mean cumulative shortage of workers for this scenario is 173, and is estimated to range between 143 and 202 workers. The mean for the High Growth Scenario is 277 workers and is estimated to range between 238 and 315 workers. This sector ranks 51 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Computer and Electronic Product Manufacturing Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 164 / 173 / 202 / 143 High Growth: 275 / 277 / 315 / 238 Low Growth: 35 / 39 / 45 / 33

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Electrical Equipment, Appliance and Component Manufacturing The cumulative shortage of workers in this industry ranges from 31 in the Low Growth Scenario to 389 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 202 workers. The estimated mean cumulative shortage of workers for this scenario is 210, and is estimated to range between 173 and 248 workers. The mean for the High Growth Scenario is 396 workers and is estimated to range between 338 and 455 workers. This sector ranks 42 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Electrical Equipment, Appliance and Component Man Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 202 / 210 / 248 / 173 High Growth: 389 / 396 / 455 / 338 Low Growth: 31 / 31 / 36 / 27
Transportation Equipment Manufacturing The cumulative shortage of workers in this industry ranges from 37 in the Low Growth Scenario to 276 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 193 workers. The estimated mean cumulative shortage of workers for this scenario is 199, and is estimated to range between 163 and 236 workers. The mean for the High Growth Scenario is 266 workers and is estimated to range between 214 and 318 workers. This sector ranks 50 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Transportation Equipment Manufacturing Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 193 / 199 / 236 / 163 High Growth: 276 / 266 / 318 / 214 Low Growth: 37 / 40 / 47 / 32
Furniture and Related Product Manufacturing The cumulative shortage of workers in this industry ranges from 50 in the Low Growth Scenario to 451 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 254 workers. The estimated mean cumulative shortage of workers for this scenario is the same as the Point Estimate at 254, and is estimated to range between 208 and 299 workers. The mean for the High Growth Scenario is 437 workers and is estimated to range between 364 and 510 workers. This sector ranks 41 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Furniture and Related Product Manufacturing Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 254 / 254 / 299 / 208 High Growth: 451 / 437 / 510 / 364 Low Growth: 50 / 52 / 60 / 43

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Miscellaneous Manufacturing The cumulative shortage of workers in this industry ranges from 78 in the Low Growth Scenario to 695 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 407 workers. The estimated mean cumulative shortage of workers for this scenario is 410, and is estimated to range between 340 and 481 workers. The mean for the High Growth Scenario is 667 workers and is estimated to range between 567 and 767 workers. This sector ranks 36 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Miscellaneous Manufacturing Worker Shortage by Scenario | | Point Est | Mean | Max (80%) | Min (80%) | |---|---|---|---|---| | Base Scenario | 407 | 410 | 481 | 340 | | High Growth | 695 | 667 | 767 | 567 | | Low Growth | 78 | 82 | 98 | 65 |
Wholesale Trade The cumulative shortage of workers in this industry ranges from 2,825 in the Low Growth Scenario to 13,648 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 9,489 workers. The estimated mean cumulative shortage of workers for this scenario is 9,768, and is estimated to range between 8,117 and 11,420 workers. The mean for the High Growth Scenario is 13,778 workers and is estimated to range between 11,648 and 15,907 workers. This sector ranks near the top (8 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Wholesale Trade Worker Shortage by Scenario | | Point Est | Mean | Max (80%) | Min (80%) | |---|---|---|---|---| | Base Scenario | 9,489 | 9,768 | 11,420 | 8,117 | | High Growth | 13,648 | 13,778 | 15,907 | 11,648 | | Low Growth | 2,825 | 2,767 | 3,259 | 2,275 |
Retail Trade The cumulative shortage of workers in this industry ranges from 17,805 in the Low Growth Scenario to 77,772 in the High Growth Scenario. The estimate of cumulative worker shortages in this sector is very sensitive to the assumptions around economic growth. There is a 60,000 cumulative worker shortage difference between the Low and High Growth Scenarios. The Point Estimate for the Base Scenario reflects a cumulative shortage of 56,263 workers. The estimated mean cumulative shortage of workers for this scenario is 57,639, and is estimated to range between 48,355 and 66,922 workers. The mean for the High Growth Scenario is 78,122 workers and is estimated to range between 66,222 and 90,021 workers. This sector ranks at the top (1 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Retail Trade Worker Shortage by Scenario | | Point Est | Mean | Max (80%) | Min (80%) | |---|---|---|---|---| | Base Scenario | 56,263 | 57,639 | 66,922 | 48,355 | | High Growth | 77,772 | 78,122 | 90,021 | 66,222 | | Low Growth | 17,805 | 18,861 | 22,600 | 15,122 |

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Air Transportation The cumulative shortage of workers in this industry ranges from 60 in the Low Growth Scenario to 790 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 511 workers. The estimated mean cumulative shortage of workers for this scenario is 523, and is estimated to range between 439 and 608 workers. The mean for the High Growth Scenario is 825 workers and is estimated to range between 685 and 965 workers. This sector ranks 35 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Air Transportation Worker Shortage by Scenario | | Point Est | Mean | Max (80%) | Min (80%) | |---|---|---|---|---| | Base Scenario | 511 | 523 | 608 | 439 | | High Growth | 790 | 825 | 965 | 685 | | Low Growth | 60 | 62 | 72 | 51 |
Rail Transportation The cumulative shortage of workers in this industry ranges from 39 in the Low Growth Scenario to 213 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 139 workers. The estimated mean cumulative shortage of workers for this scenario is 142, and is estimated to range between 119 and 165 workers. The mean for the High Growth Scenario is 220 workers and is estimated to range between 189 and 250 workers. This sector ranks near the bottom (54 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Rail Transportation Worker Shortage by Scenario | | Point Est | Mean | Max (80%) | Min (80%) | |---|---|---|---|---| | Base Scenario | 139 | 142 | 165 | 119 | | High Growth | 213 | 220 | 250 | 189 | | Low Growth | 39 | 39 | 45 | 33 |
Water Transportation The cumulative shortage of workers in this industry ranges from 5 in the Low Growth Scenario to 182 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 107 workers. The estimated mean cumulative shortage of workers for this scenario is 104, and is estimated to range between 87 and 122 workers. The mean for the High Growth Scenario is 183 workers and is estimated to range between 155 and 211 workers. This sector ranks near the bottom (57 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Water Transportation Worker Shortage by Scenario | | Point Est | Mean | Max (80%) | Min (80%) | |---|---|---|---|---| | Base Scenario | 107 | 104 | 122 | 87 | | High Growth | 182 | 183 | 211 | 155 | | Low Growth | 5 | 4 | 5 | 4 |

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Truck Transportation The cumulative shortage of workers in this industry ranges from 490 in the Low Growth Scenario to 6,639 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 3,519 workers. The estimated mean cumulative shortage of workers for this scenario is 3,552, and is estimated to range between 2,940 and 4,164 workers. The mean for the High Growth Scenario is 6,370 workers and is estimated to range between 5,494 and 7,246 workers. This sector ranks 14 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Truck Transportation Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 3,519 / 3,552 / 4,164 / 2,940 High Growth: 6,639 / 6,370 / 7,246 / 5,494 Low Growth: 490 / 502 / 592 / 413
Transit and Ground Transportation The cumulative shortage of workers in this industry ranges from 57 in the Low Growth Scenario to 973 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 921 workers. The estimated mean cumulative shortage of workers for this scenario is 925, and is estimated to range between 762 and 1,088 workers. The mean for the High Growth Scenario is 943 workers and is estimated to range between 756 and 1,130 workers. This sector ranks near the middle (32 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Transit and Ground Passenger Transportation Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 921 / 925 / 1,088 / 762 High Growth: 973 / 943 / 1,130 / 756 Low Growth: 57 / 56 / 65 / 47
Pipeline Transportation The cumulative shortage of workers in this industry ranges from 96 in the Low Growth Scenario to 505 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 305 workers. The estimated mean cumulative shortage of workers for this scenario is 317, and is estimated to range between 264 and 371 workers. The mean for the High Growth Scenario is 518 workers and is estimated to range between 434 and 601 workers. This sector ranks 39 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Pipeline Transportation Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 305 / 317 / 371 / 264 High Growth: 505 / 518 / 601 / 434 Low Growth: 96 / 94 / 109 / 80

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Scenic and Sightseeing Transportation and Support Activities for Transportation The cumulative shortage of workers in this industry ranges from 150 in the Low Growth Scenario to 1,529 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 910 workers. The estimated mean cumulative shortage of workers for this scenario is 982, and is estimated to range between 807 and 1,157 workers. The mean for the High Growth Scenario is 1,772 workers and is estimated to range between 1,442 and 2,102 workers. This sector ranks near the middle (29 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Scenic and Sightseeing Transportation and Support A Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 910 / 982 / 1,157 / 807 High Growth: 1,529 / 1,772 / 2,102 / 1,442 Low Growth: 150 / 157 / 186 / 127
Postal Service and Couriers and Messengers The cumulative shortage of workers in this industry ranges from 102 in the Low Growth Scenario to 560 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 394 workers. The estimated mean cumulative shortage of workers for this scenario is 405, and is estimated to range between 330 and 481 workers. The mean for the High Growth Scenario is 599 workers and is estimated to range between 464 and 733 workers. This sector ranks 38 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Postal Service and Couriers and Messengers Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 394 / 405 / 481 / 330 High Growth: 560 / 599 / 733 / 464 Low Growth: 102 / 107 / 128 / 85
Motion Picture and Sound Recording Industries The cumulative shortage of workers in this industry ranges from 37 in the Low Growth Scenario to 287 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 204 workers. The estimated mean cumulative shortage of workers for this scenario is 210, and is estimated to range between 170 and 249 workers. The mean for the High Growth Scenario is 292 workers and is estimated to range between 227 and 357 workers. This sector ranks 49 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Motion Picture and Sound Recording Industries Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 204 / 210 / 249 / 170 High Growth: 287 / 292 / 357 / 227 Low Growth: 37 / 38 / 46 / 29

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Broadcasting and Telecommunications, Publishing, and Other Information Services The cumulative shortage of workers in this industry ranges from 489 in the Low Growth Scenario to 2,420 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 1,778 workers. The estimated mean cumulative shortage of workers for this scenario is 1,866, and is estimated to range between 1,546 and 2,186 workers. The mean for the High Growth Scenario is 2,624 workers and is estimated to range between 2,094 and 3,154 workers. This sector ranks 26 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Broadcasting and Telecommunications, Publishing, and Other Ir Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 1,778 / 1,866 / 2,186 / 1,546 High Growth: 2,420 / 2,624 / 3,154 / 2,094 Low Growth: 489 / 514 / 599 / 428
Monetary Authorities and Depository Credit Intermediation The cumulative shortage of workers in this industry ranges from 3,363 in the Low Growth Scenario to 7,034 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 5,693 workers. The estimated mean cumulative shortage of workers for this scenario is 5,860, and is estimated to range between 4,801 and 6,919 workers. The mean for the High Growth Scenario is 7,276 workers and is estimated to range between 6,115 and 8,436 workers. This sector ranks 13 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Monetary Authorities and Depository Credit Intermediation Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 5,693 / 5,860 / 6,919 / 4,801 High Growth: 7,034 / 7,276 / 8,436 / 6,115 Low Growth: 3,363 / 3,227 / 3,731 / 2,722
Insurance Carriers and Related Activities The cumulative shortage of workers in this industry ranges from 91 in the Low Growth Scenario to 351 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 247 workers. The estimated mean cumulative shortage of workers for this scenario is 254, and is estimated to range between 208 and 300 workers. The mean for the High Growth Scenario is 372 workers and is estimated to range between 296 and 448 workers. This sector ranks 45 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Insurance Carriers and Related Activities Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 247 / 254 / 300 / 208 High Growth: 351 / 372 / 448 / 296 Low Growth: 91 / 96 / 114 / 77

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Real Estate The cumulative shortage of workers in this industry ranges from 511 in the Low Growth Scenario to 2,729 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 1,427 workers. The estimated mean cumulative shortage of workers for this scenario is 1,469, and is estimated to range between 1,204 and 1,735 workers. The mean for the High Growth Scenario is 2,713 workers and is estimated to range between 2,230 and 3,196 workers. This sector ranks 22 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Real Estate Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 1,427 / 1,469 / 1,735 / 1,204 High Growth: 2,729 / 2,713 / 3,196 / 2,230 Low Growth: 511 / 526 / 627 / 425
Rental and Leasing Services and Lessors of Non-Financial Intangible Assets The cumulative shortage of workers in this industry ranges from 743 in the Low Growth Scenario to 2,613 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 1,954 workers. The estimated mean cumulative shortage of workers for this scenario is 1,952, and is estimated to range between 1,601 and 2,304 workers. The mean for the High Growth Scenario is 2,768 workers and is estimated to range between 2,250 and 3,285 workers. This sector ranks 23 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Rental and Leasing Services and Lessors of Non-Financial Intang Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 1,954 / 1,952 / 2,304 / 1,601 High Growth: 2,613 / 2,768 / 3,285 / 2,250 Low Growth: 743 / 732 / 841 / 622
Other Finance, Insurance and Real Estate and Management of Companies The cumulative shortage of workers in this industry ranges from 1,524 in the Low Growth Scenario to 6,304 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 4,061 workers. The estimated mean cumulative shortage of workers for this scenario is 4,160, and is estimated to range between 3,417 and 4,903 workers. The mean for the High Growth Scenario is 6,647 workers and is estimated to range between 5,455 and 7,838 workers. This sector ranks 15 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Other Finance, Insurance and Real Estate and Management of C Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 4,061 / 4,160 / 4,903 / 3,417 High Growth: 6,304 / 6,647 / 7,838 / 5,455 Low Growth: 1,524 / 1,591 / 1,925 / 1,258

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Professional, Scientific and Technical Services The cumulative shortage of workers in this industry ranges from 3,752 in the Low Growth Scenario to 17,769 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 11,906 workers. The estimated mean cumulative shortage of workers for this scenario is 12,078, and is estimated to range between 10,042 and 14,114 workers. The mean for the High Growth Scenario is 17,760 workers and is estimated to range between 15,201 and 20,319 workers. This sector ranks near the top (6 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Professional, Scientific and Technical Services Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 11,906 / 12,078 / 14,114 / 10,042 High Growth: 17,769 / 17,760 / 20,319 / 15,201 Low Growth: 3,752 / 3,994 / 4,726 / 3,262
Administrative and Support Services The cumulative shortage of workers in this industry ranges from 1,812 in the Low Growth Scenario to 11,143 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 7,344 workers. The estimated mean cumulative shortage of workers for this scenario is 6,972, and is estimated to range between 5,650 and 8,294 workers. The mean for the High Growth Scenario is 10,578 workers and is estimated to range between 8,238 and 12,918 workers. This sector ranks near the top (9 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Administrative and Support Services Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 7,344 / 6,972 / 8,294 / 5,650 High Growth: 11,143 / 10,578 / 12,918 / 8,238 Low Growth: 1,812 / 1,775 / 2,101 / 1,449
Waste Management and Remediation Services The cumulative shortage of workers in this industry ranges from 50 in the Low Growth Scenario to 306 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 192 workers. The estimated mean cumulative shortage of workers for this scenario is 186, and is estimated to range between 154 and 218 workers. The mean for the High Growth Scenario is 299 workers and is estimated to range between 255 and 343 workers. This sector ranks 46 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Waste Management and Remediation Services Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 192 / 186 / 218 / 154 High Growth: 306 / 299 / 343 / 255 Low Growth: 50 / 50 / 60 / 40

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Educational Services The cumulative shortage of workers in this industry ranges from 3,209 in the Low Growth Scenario to 20,133 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 13,023 workers. The estimated mean cumulative shortage of workers for this scenario is 13,146, and is estimated to range between 10,880 and 15,412 workers. The mean for the High Growth Scenario is 20,125 workers and is estimated to range between 17,588 and 22,662 workers. This sector ranks near the top (5 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario. While the range of cumulative shortage is large for the High Growth Scenario (approximately 5,000 workers), it is small relative to the difference between the High and Low Growth Scenarios (approximately 17,000 workers).	Educational Services Worker Shortage by Scenario |	Point Est	Mean	Max (80%)	Min (80%) | |---|---|---|---|---| | Base Scenario | 13,023 | 13,146 | 15,412 | 10,880 | | High Growth | 20,133 | 20,125 | 22,662 | 17,588 | | Low Growth | 3,209 | 3,143 | 3,624 | 2,662 |
Health Care Services (except Hospitals) and Social Assistance The cumulative shortage of workers in this industry ranges from 1,969 in the Low Growth Scenario to 22,636 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 13,697 workers. The estimated mean cumulative shortage of workers for this scenario is 14,236, and is estimated to range between 11,689 and 16,784 workers. The mean for the High Growth Scenario is 22,965 workers and is estimated to range between 19,909 and 26,021 workers. This sector ranks near the top (4 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario. As with Educational Services, the range of cumulative shortage is large for the High Growth Scenario (approximately 6,000 workers), it is small relative to the difference between the High and Low Growth Scenarios (approximately 20,000 workers).	Health Care Services (except Hospitals) and Social Assistance Worker Shortage by Scenario |	Point Est	Mean	Max (80%)	Min (80%) | |---|---|---|---|---| | Base Scenario | 13,697 | 14,236 | 16,784 | 11,689 | | High Growth | 22,636 | 22,965 | 26,021 | 19,909 | | Low Growth | 1,969 | 2,056 | 2,475 | 1,637 |

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Arts, Entertainment and Recreation The cumulative shortage of workers in this industry ranges from 423 in the Low Growth Scenario to 3,430 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 2,262 workers. The estimated mean cumulative shortage of workers for this scenario is 2,430, and is estimated to range between 1,989 and 2,871 workers. The mean for the High Growth Scenario is 3,548 workers and is estimated to range between 2,817 and 4,279 workers. This sector ranks 21 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Arts, Entertainment and Recreation Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 2,262 / 2,430 / 2,871 / 1,989 High Growth: 3,430 / 3,548 / 4,279 / 2,817 Low Growth: 423 / 439 / 520 / 358
Accommodation and Food Services The cumulative shortage of workers in this industry ranges from 1,153 in the Low Growth Scenario to 45,758 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 26,141 workers. The estimated mean cumulative shortage of workers for this scenario is 26,126, and is estimated to range between 21,420 and 30,831 workers. The mean for the High Growth Scenario is 47,329 workers and is estimated to range between 38,132 and 56,527 workers. This sector ranks near the top (2 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario. The range of cumulative worker shortages is significant for the High Growth Scenario (approximately 18,000 workers) and also between the High and Low Growth Scenarios (approximately 44,000 workers).	Accommodation and Food Services Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 26,141 / 26,126 / 30,831 / 21,420 High Growth: 45,758 / 47,329 / 56,527 / 38,132 Low Growth: 1,153 / 1,153 / 1,388 / 917
Repair and Maintenance The cumulative shortage of workers in this industry ranges from 1,060 in the Low Growth Scenario to 5,590 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 4,326 workers. The estimated mean cumulative shortage of workers for this scenario is 4,367, and is estimated to range between 3,614 and 5,119 workers. The mean for the High Growth Scenario is 5,866 workers and is estimated to range between 4,759 and 6,972 workers. This sector ranks 18 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Repair and Maintenance Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 4,326 / 4,367 / 5,119 / 3,614 High Growth: 5,590 / 5,866 / 6,972 / 4,759 Low Growth: 1,060 / 1,060 / 1,206 / 913

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Religious, Grant-Making, Civic, and Professional and Similar Organizations The cumulative shortage of workers in this industry ranges from 1,776 in the Low Growth Scenario to 8,353 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 6,410 workers. The estimated mean cumulative shortage of workers for this scenario is 6,439, and is estimated to range between 5,304 and 7,573 workers. The mean for the High Growth Scenario is 7,680 workers and is estimated to range between 6,276 and 9,083 workers. This sector ranks 11 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Religious, Grant-Making, Civic, and Professional and Similar Organizations Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 6,410 / 6,439 / 7,573 / 5,304 High Growth: 8,353 / 7,680 / 9,083 / 6,276 Low Growth: 1,776 / 1,739 / 2,006 / 1,473
Personal and Laundry Services and Private Households The cumulative shortage of workers in this industry ranges from 1,468 in the Low Growth Scenario to 9,035 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 5,760 workers. The estimated mean cumulative shortage of workers for this scenario is 5,785, and is estimated to range between 4,766 and 6,804 workers. The mean for the High Growth Scenario is 8,894 workers and is estimated to range between 7,403 and 10,385 workers. This sector ranks 10 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Personal and Laundry Services and Private Households Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 5,760 / 5,785 / 6,804 / 4,766 High Growth: 9,035 / 8,894 / 10,385 / 7,403 Low Growth: 1,468 / 1,570 / 1,843 / 1,297
Hospitals The cumulative shortage of workers in this industry ranges from 1,263 in the Low Growth Scenario to 17,430 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 10,762 workers. The estimated mean cumulative shortage of workers for this scenario is 11,025, and is estimated to range between 9,249 and 12,800 workers. The mean for the High Growth Scenario is 17,418 workers and is estimated to range between 14,072 and 20,765 workers. This sector ranks near the top (7 of 61) in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Hospitals Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 10,762 / 11,025 / 12,800 / 9,249 High Growth: 17,430 / 17,418 / 20,765 / 14,072 Low Growth: 1,263 / 1,331 / 1,570 / 1,093

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Other Municipal Government Services The cumulative shortage of workers in this industry ranges from 2,946 in the Low Growth Scenario to 7,167 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 5,342 workers. The estimated mean cumulative shortage of workers for this scenario is 5,446, and is estimated to range between 4,516 and 6,375 workers. The mean for the High Growth Scenario is 7,271 workers and is estimated to range between 6,002 and 8,539 workers. This sector ranks 12 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Other Municipal Government Services Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 5,342 / 5,446 / 6,375 / 4,516 High Growth: 7,167 / 7,271 / 8,539 / 6,002 Low Growth: 2,946 / 2,989 / 3,404 / 2,573
Other Provincial and Territorial Government Services The cumulative shortage of workers in this industry ranges from 1,573 in the Low Growth Scenario to 6,210 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 4,416 workers. The estimated mean cumulative shortage of workers for this scenario is 4,502, and is estimated to range between 3,733 and 5,270 workers. The mean for the High Growth Scenario is 6,082 workers and is estimated to range between 4,890 and 7,274 workers. This sector ranks 16 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Other Provincial and Territorial Government Services Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 4,416 / 4,502 / 5,270 / 3,733 High Growth: 6,210 / 6,082 / 7,274 / 4,890 Low Growth: 1,573 / 1,478 / 1,704 / 1,251
Other Federal Government Services The cumulative shortage of workers in this industry ranges from 1,811 in the Low Growth Scenario to 4,189 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 3,374 workers. The estimated mean cumulative shortage of workers for this scenario is 3,388, and is estimated to range between 2,771 and 4,006 workers. The mean for the High Growth Scenario is 4,019 workers and is estimated to range between 3,391 and 4,647 workers. This sector ranks 20 of 61 in having the largest cumulative estimated worker shortage in the High Growth Scenario.	Other Federal Government Services Worker Shortage by Scenario Point Est / Mean / Max (80%) / Min (80%) Base Scenario: 3,374 / 3,388 / 4,006 / 2,771 High Growth: 4,189 / 4,019 / 4,647 / 3,391 Low Growth: 1,811 / 1,792 / 2,085 / 1,498

INDUSTRY DESCRIPTION	CUMULATIVE WORKER SHORTAGE DISTRIBUTION
Total Employment Demand The cumulative shortage of workers in this industry ranges from 60,154 in the Low Growth Scenario to 374,711 in the High Growth Scenario. The Point Estimate for the Base Scenario reflects a cumulative shortage of 242,501 workers. The estimated mean cumulative shortage of workers for this scenario is 246,458, and is estimated to range between 193,246 and 289,876 workers. The mean for the High Growth Scenario is 378,197 workers and is estimated to range between 312,542 and 443,847 workers.	Total Employment Demand Worker Shortage by Scenario

	Point Est	Mean	Max (80%)	Min (80%)
Base Scenario	242,501	246,458	289,876	193,246
High Growth	374,711	378,197	443,847	312,542
Low Growth	60,154	61,337	73,427	50,138

3. Conclusions

The results of this analysis indicate that regardless of the economic growth assumptions, it can be expected that Alberta will continue to face a continued shortage of skilled workers across all economic sectors in the Base and High Growth Scenarios and most sectors in a Low Growth environment.

In comparing the results of this analysis with that completed by the Government of Alberta (GOA) in 2011, the worker shortages appear to be significantly greater than those projected by the GOA. In the Occupational Demand and Supply Outlook 2011-2021 it was estimated that Alberta would be facing a cumulative workers shortage of approximately 114,000 workers over the ten year forecast period. The results of this analysis indicate that, using the economic growth projections of the GOA Budget 2013, the worker shortage would be approximately 250,000 over a five year period. Based on the Monte Carlo simulations, it can be expected this cumulative worker shortage to vary between approximately 190,000 and 290,000 workers.

The results of the GOA 2011 worker shortage analysis seem more consistent with the Low Growth Scenario results that suggest a cumulative worker shortage in the range of approximately 50,000 to 75,000 over five years. However, the economic growth assumptions in the GOA analysis are more consistent with those for the Base Scenario in this analysis.

It is recognized that different methodologies will produce different results, and that is likely one of the major factors contributing to the difference in estimated worker shortages. For example, the analysis used in this study looks at both worker demand and supply at a 4-digit NOC (National Occupation Level), whereas the GOA study estimates supply at the three digit level. When looking at the possible matching of job skills at the three digit NOC level, we find there are substantially more matches than when analyzing the market at the four digit NOC level. As a result, it is likely that the GOA analysis will under estimate worker shortages.

At the individual industry level, in terms of the total cumulative worker shortages estimated, several industries stand out as having significant results.

- Retail Trade: The cumulative worker shortage for this sector is estimated to range between approximately 18,000 (Low Growth Scenario) to almost 80,000 (High Growth Scenario) over the five year forecast period.
- Accommodation and Food Services: The cumulative worker shortage for this sector is estimated to range between approximately 1,000 (Low Growth Scenario) to almost 45,000 (High Growth Scenario) over the five year forecast period.
- Construction: The cumulative worker shortage for this sector is estimated to range between approximately 3,000 (Low Growth Scenario) to almost 40,000 (High Growth Scenario) over the five year forecast period.
- Health Care Services (Excluding Hospitals): The cumulative worker shortage for this sector is estimated to range between approximately 2,000 (Low Growth Scenario) to almost 25,000 (High Growth Scenario) over the five year forecast period. This cumulative shortage estimate grows if the totals for Hospitals is included in this category.

Appendix A: Industry Definition

The table below details the composition of each industry used in the analysis. The first column indicates the Input/Output Table National Account Category. The second column refers to the NAICS (3-digit) categories. The third column represents the Industry Groups used in the analysis. Where more than one I/O Table or NAICS industry is included in an Industry Group, it has been noted with a box around the relevant information.

INPUT / OUTPUT TABLES - NATIONAL ACCOUNTS CATEGORY		3 DIGIT NAICS (NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM)	INDUSTRY GROUP USED IN THE ANALYSIS
11A0	Crop and Animal Production	111-112 Farms	Crop and Animal Production
1130	Forestry and Logging	113 Forestry and logging	Forestry and Logging
1140	Fishing, Hunting and Trapping	114 Fishing, hunting and trapping	Fishing, Hunting and Trapping
1150	Support Activities for Agriculture and Forestry	115 Support activities for agriculture and forestry	Support Activities for Agriculture and Forestry
2111	Oil and Gas Extraction	211 Oil and gas extraction	Oil and Gas Extraction
2121	Coal Mining	212 Mining (except oil and gas)	Mining
2122	Metal Ore Mining	219 Mining - unspecified	
2123	Non-Metallic Mineral Mining and Quarrying		
2131	Support Activities for Mining and Oil and Gas Extraction	213 Support activities for mining and oil and gas extraction	Support Activities for Mining and Oil and Gas Extraction
2211	Electric Power Generation, Transmission and Distribution	221 Utilities	Utilities
221A	Natural Gas Distribution, Water, Sewage and Other Systems		
230A	Residential Building Construction	236 Construction of buildings	Construction
230X	Non-residential Building and Engineering Construction		
230H	Repair Construction	237 Heavy and civil engineering construction	
230I	Other Activities of the Construction Industry	238 Specialty trade contractors	
3111	Animal Food Manufacturing	311 Food manufacturing	Food Manufacturing
3113	Sugar and Confectionery Product Manufacturing		
3114	Fruit and Vegetable Preserving and Specialty Food Manufacturing		
3115	Dairy Product Manufacturing		
3116	Meat Product Manufacturing		
3117	Seafood Product Preparation and Packaging		
311A	Miscellaneous Food Manufacturing		
312A	Soft Drink and Ice Manufacturing	312 Beverage and tobacco product manufacturing	Beverage and Tobacco Product Manufacturing

INPUT / OUTPUT TABLES - NATIONAL ACCOUNTS CATEGORY		3 DIGIT NAICS (NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM)	INDUSTRY GROUP USED IN THE ANALYSIS
312B	Breweries		
312C	Wineries		
312D	Distilleries		
3122	Tobacco Manufacturing		
31A0	Textile and Textile Product Mills	313 Textile mills	Textile and Textile Product Mills
		314 Textile product mills	
3150	Clothing Manufacturing	315 Clothing manufacturing	Clothing Manufacturing
3160	Leather and Allied Product Manufacturing	316 Leather and allied product manufacturing	Leather and Allied Product Manufacturing
3210	Wood Product Manufacturing	321 Wood product manufacturing	Wood Product Manufacturing
3221	Pulp, Paper and Paperboard Mills	322 Paper manufacturing	Paper Manufacturing
3222	Converted Paper Product Manufacturing		
3231	Printing and Related Support Activities	323 Printing and related support activities	Printing and Related Support Activities
3241	Petroleum and Coal Products Manufacturing	324 Petroleum and coal products manufacturing	Petroleum and Coal Products Manufacturing
3251	Basic Chemical Manufacturing	325 Chemical manufacturing	Chemical Manufacturing
3252	Resin, Synthetic Rubber, and Artificial and Synthetic Fibres and Filaments Manufacturing		
3253	Pesticides, Fertilizer and Other Agricultural Chemical Manufacturing		
3254	Pharmaceutical and Medicine Manufacturing		
325A	Miscellaneous Chemical Product Manufacturing		
3261	Plastic Product Manufacturing	326 Plastics and rubber products manufacturing	Plastics and Rubber Products Manufacturing
3262	Rubber Product Manufacturing		
3273	Cement and Concrete Product Manufacturing	327 Non-metallic mineral product manufacturing	Non-Metallic Mineral Product Manufacturing
327A	Miscellaneous Non-Metallic Mineral Product Manufacturing		
3310	Primary Metal Manufacturing	331 Primary metal manufacturing	Primary Metal Manufacturing
3320	Fabricated Metal Product Manufacturing	332 Fabricated metal product manufacturing	Fabricated Metal Product Manufacturing
3330	Machinery Manufacturing	333 Machinery manufacturing	Machinery Manufacturing
3341	Computer and Peripheral Equipment Manufacturing	334 Computer and electronic product manufacturing	Computer and Electronic Product Manufacturing
334A	Electronic Product Manufacturing		

INPUT / OUTPUT TABLES - NATIONAL ACCOUNTS CATEGORY		3 DIGIT NAICS (NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM)	INDUSTRY GROUP USED IN THE ANALYSIS
3352	Household Appliance Manufacturing	335 Electrical equipment, appliance and component manufacturing	Electrical Equipment, Appliance and Component Manufacturing
335A	Electrical Equipment and Component Manufacturing		
3361	Motor Vehicle Manufacturing	336 Transportation equipment manufacturing	Transportation Equipment Manufacturing
3362	Motor Vehicle Body and Trailer Manufacturing		
3363	Motor Vehicle Parts Manufacturing		
3364	Aerospace Product and Parts Manufacturing		
3365	Railroad Rolling Stock Manufacturing		
3366	Ship and Boat Building		
3369	Other Transportation Equipment Manufacturing		
3370	Furniture and Related Product Manufacturing	337 Furniture and related product manufacturing	Furniture and Related Product Manufacturing
3390	Miscellaneous Manufacturing	339 Miscellaneous manufacturing	Miscellaneous Manufacturing
4100	Wholesale Trade	411 Farm product wholesaler-distributors	Wholesale Trade
		412 Petroleum product wholesaler-distributors	
		413 Food, beverage and tobacco wholesaler-distributors	
		414 Personal and household goods wholesaler-distributors	
		415 Motor vehicle and parts wholesaler-distributors	
		416 Building material and supplies wholesaler-distributors	
		417 Machinery, equipment and supplies wholesaler-distributors	
		418 Miscellaneous wholesaler-distributors	
		419 Wholesale agents and brokers	
4A00	Retail Trade	441 Motor vehicle and parts dealers	Retail Trade
		442 Furniture and home furnishings stores	
		443 Electronics and appliance stores	
		444 Building material and garden equipment and supplies dealers	
		445 Food and beverage stores	
		446 Health and personal care stores	
		447 Gasoline stations	

INPUT / OUTPUT TABLES - NATIONAL ACCOUNTS CATEGORY		3 DIGIT NAICS (NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM)	INDUSTRY GROUP USED IN THE ANALYSIS
		448 Clothing and clothing accessories stores	
		451 Sporting goods, hobby, book and music stores	
		452 General merchandise stores	
		453 Miscellaneous store retailers	
		454 Non-store retailers	
4810	Air Transportation	481 Air transportation	Air Transportation
4820	Rail Transportation	482 Rail transportation	Rail Transportation
4830	Water Transportation	483 Water transportation	Water Transportation
4840	Truck Transportation	484 Truck transportation	Truck Transportation
4850	Transit and Ground Passenger Transportation	485 Transit and ground passenger transportation	Transit and Ground Passenger Transportation
4860	Pipeline Transportation	486 Pipeline transportation	Pipeline Transportation
48B0	Scenic and Sightseeing Transportation and Support Activities for Transportation	487 Scenic and sightseeing transportation	Scenic and Sightseeing Transportation and Support Activities for Transportation
		488 Support activities for transportation	
49A0	Postal Service and Couriers and Messengers	491 Postal service	Postal Service and Couriers and Messengers
		492 Couriers and messengers	
4930	Warehousing and Storage	493 Warehousing and storage	Warehousing and Storage
5120	Motion Picture and Sound Recording Industries	512 Motion picture and sound recording industries	Motion Picture and Sound Recording Industries
5131	Radio and Television Broadcasting	511 Publishing industries	Broadcasting and Telecommunications, Publishing, and Other Information Services
		515 Broadcasting (except Internet)	
		516 Internet publishing and broadcasting	
		517 Telecommunications	
		518 Internet service providers, web search portals, and data processing services	
51B0	Publishing, Pay and Specialty TV, Telecommunications, and Other Information Services		
		519 Other information services	
5A01	Monetary Authorities and Depository Credit Intermediation	521 Monetary authorities - central bank	Monetary Authorities and Depository Credit Intermediation
		522 Credit intermediation and related activities	
5A02	Insurance Carriers	524 Insurance carriers and related activities	Insurance Carriers and Related Activities

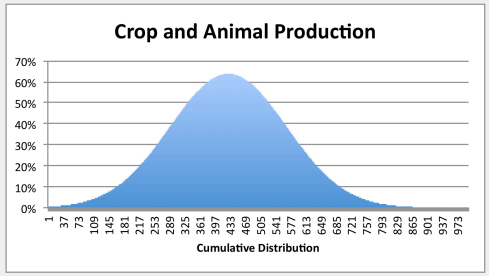
INPUT / OUTPUT TABLES - NATIONAL ACCOUNTS CATEGORY		3 DIGIT NAICS (NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM)	INDUSTRY GROUP USED IN THE ANALYSIS
5A03	Lessors of Real Estate	531 Real estate	Real Estate
5A04	Owner-Occupied Dwellings		
5A05	Rental and Leasing Services and Lessors of Non-Financial Intangible Assets (except Copyrighted Works)	532 Rental and leasing services	Rental and Leasing Services and Lessors of Non-Financial Intangible Assets
		533 Lessors of non-financial intangible assets (except copyrighted works)	
5A06	Other Finance, Insurance and Real Estate and Management of Companies and Enterprises	523 Securities, commodity contracts, and other financial investment and related activities	Other Finance, Insurance and Real Estate and Management of Companies and Enterprises
		526 Funds and other financial vehicles	
		551 Management of companies and enterprises	
5418	Advertising and Related Services	541 Professional, scientific and technical services	Professional, Scientific and Technical Services
541A	Legal, Accounting and Architectural, Engineering and Related Services		
541B	Computer Systems Design and Other Professional, Scientific and Technical Services		
5610	Administrative and Support Services	561 Administrative and support services	Administrative and Support Services
5620	Waste Management and Remediation Services	562 Waste management and remediation services	Waste Management and Remediation Services
611A	Educational Services (except Universities)	611 Educational services	Educational Services
GS21	Universities		
GS22	Government Education Services		
NP20	Non-Profit Education Institutions		
62A0	Health Care Services (except Hospitals) and Social Assistance	621 Ambulatory health care services	Health Care Services (except Hospitals) and Social Assistance
GS12	Government Residential Care Facilities	623 Nursing and residential care facilities	
		624 Social assistance	
7100	Arts, Entertainment and Recreation	711 Performing arts, spectator sports and related industries	Arts, Entertainment and Recreation
		712 Heritage institutions	
		713 Amusement, gambling and recreation industries	
7200	Accommodation and Food Services	721 Accommodation services	Accommodation and Food Services
		722 Food services and drinking places	
8110	Repair and Maintenance	811 Repair and maintenance	Repair and Maintenance

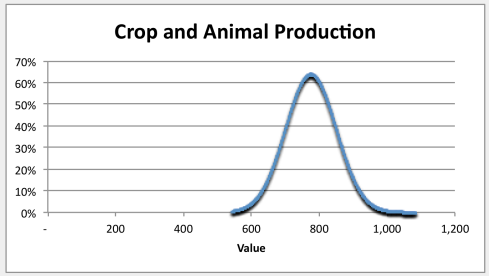
INPUT / OUTPUT TABLES - NATIONAL ACCOUNTS CATEGORY		3 DIGIT NAICS (NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM)	INDUSTRY GROUP USED IN THE ANALYSIS
813A	Grant-Making, Civic, and Professional and Similar Organizations	813 Religious, grant-making, civic, and professional and similar organizations	Religious, Grant-Making, Civic, and Professional and Similar Organizations
NP11	Religious Organizations		
NP12	Non-Profit Welfare Organizations		
NP13	Non-Profit Sports and Recreation Clubs		
NP19	Other Non-Profit Institutions Serving Households		
81A0	Personal and Laundry Services and Private Households	812 Personal and laundry services	Personal and Laundry Services and Private Households
		814 Private households	
GS11	Hospitals	622 Hospitals	Hospitals
GS40	Other Municipal Government Services	913 Local, municipal and regional public administration	Other Municipal Government Services
GS50	Other Provincial and Territorial Government Services	912 Provincial and territorial public administration	Other Provincial and Territorial Government Services
GS60	Other Federal Government Services	911 Federal government public administration	Other Federal Government Services

Appendix B: Monte Carlo Simulation Industry Results

Base Scenario

Worker Shortage - Base Scenario

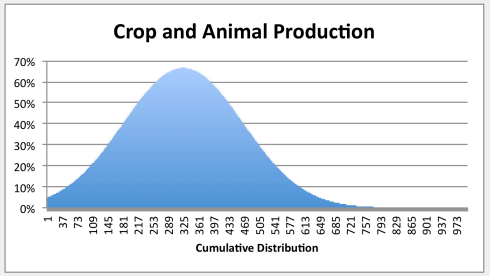


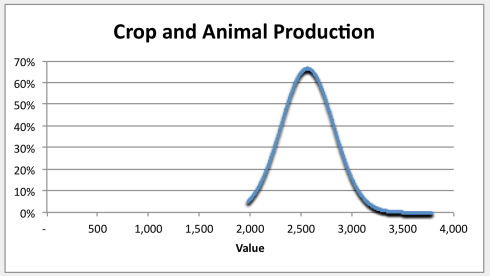


Distribution	100%	80%	Skewness
Max	1,083	974	2%
Min	542	649	16%
Mean	812		56%
Point Estimate	774		64%

High Growth Scenario

Worker Shortage - High Growth Scenario

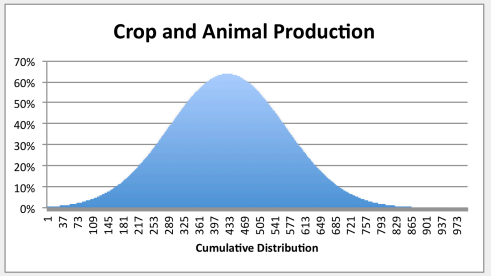


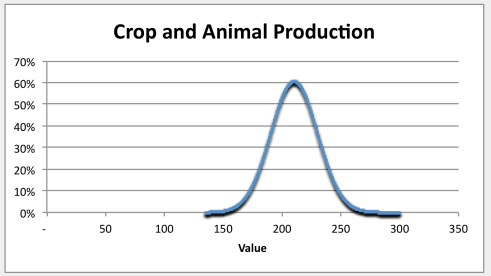


Distribution	100%	80%	Skewness
Max	3,782	3,417	0%
Min	1,968	2,329	45%
Mean	2,873		31%
Point Estimate	2,555		67%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

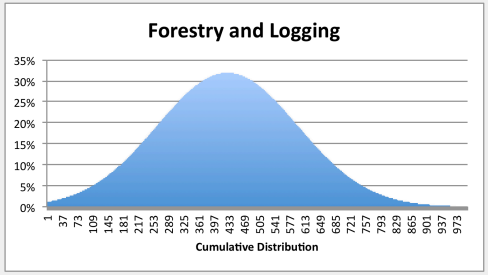


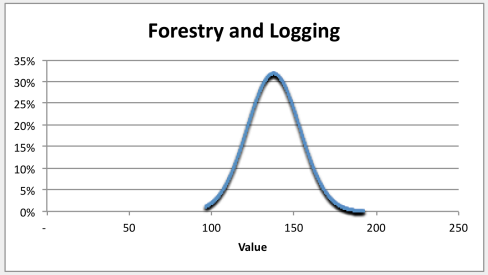


Distribution	100%	80%	Skewness
Max	300	267	1%
Min	134	167	6%
Mean	217		57%
Point Estimate	210		61%

Base Scenario

Worker Shortage - Base Scenario

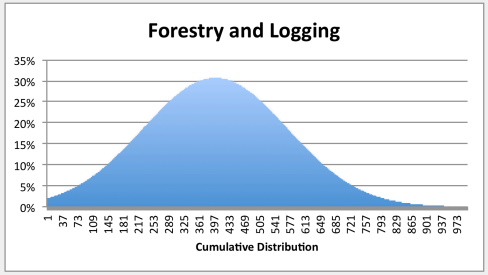


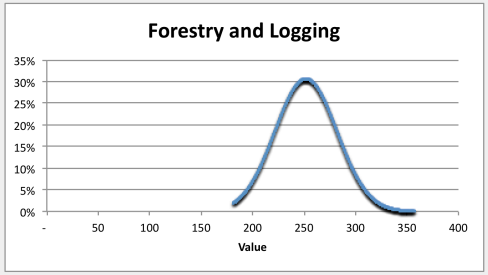


Distribution	100%	80%	Skewness
Max	192	173	3%
Min	96	115	12%
Mean	144		29%
Point Estimate	137		32%

High Growth Scenario

Worker Shortage - High Growth Scenario

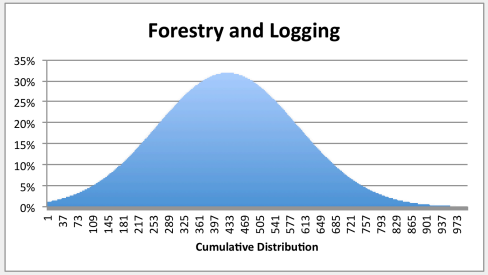


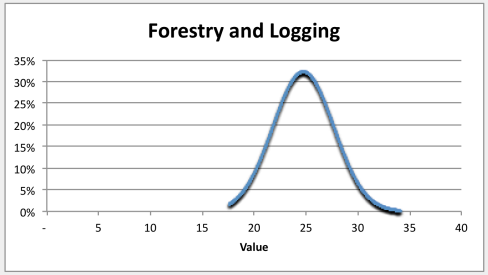


Distribution	100%	80%	Skewness
Max	357	321	2%
Min	181	216	15%
Mean	269		26%
Point Estimate	251		31%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

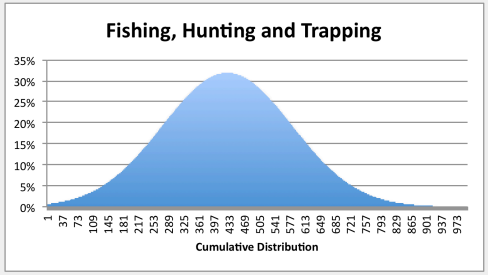


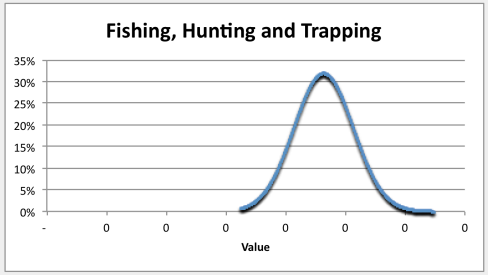


Distribution	100%	80%	Skewness
Max	34	31	4%
Min	18	21	14%
Mean	26		30%
Point Estimate	25		32%

Base Scenario

Worker Shortage - Base Scenario

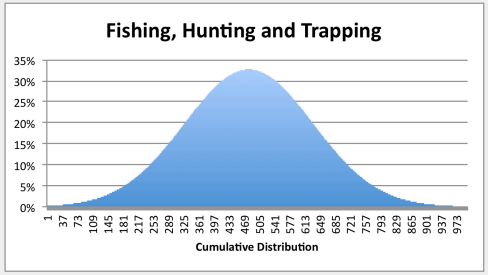


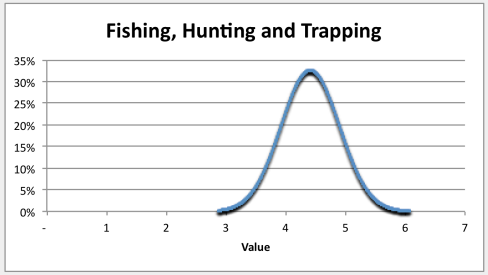


Distribution	100%	80%	Skewness
Max	0	0	2%
Min	0	0	10%
Mean	0		29%
Point Estimate	0		32%

High Growth Scenario

Worker Shortage - High Growth Scenario

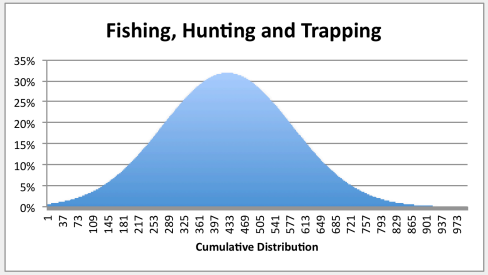


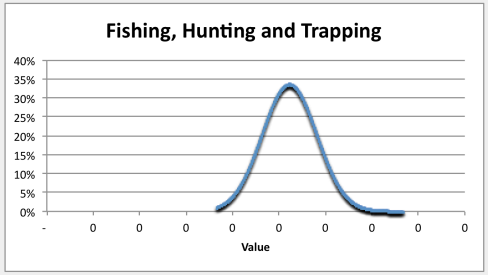


Distribution	100%	80%	Skewness
Max	6	5	4%
Min	3	3	6%
Mean	4		32%
Point Estimate	4		33%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

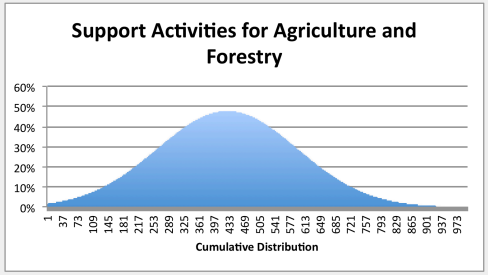


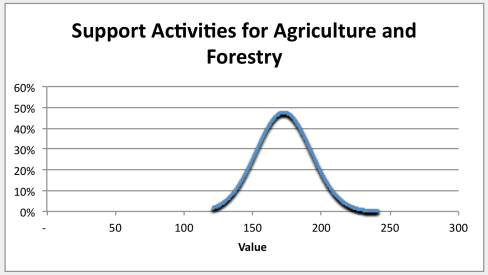


Distribution	100%	80%	Skewness
Max	0	0	1%
Min	0	0	14%
Mean	0		25%
Point Estimate	0		34%

Base Scenario	High Growth Scenario	Low Growth Scenario

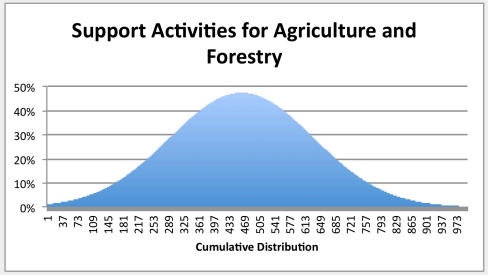
Worker Shortage - Base Scenario

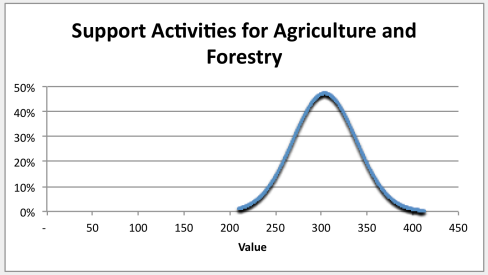




Distribution	100%	80%	Skewness
Max	241	217	4%
Min	120	144	19%
Mean	181		44%
Point Estimate	172		48%

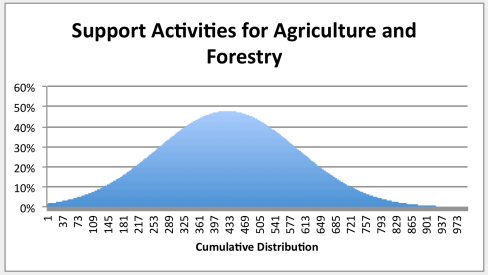
Worker Shortage - High Growth Scenario

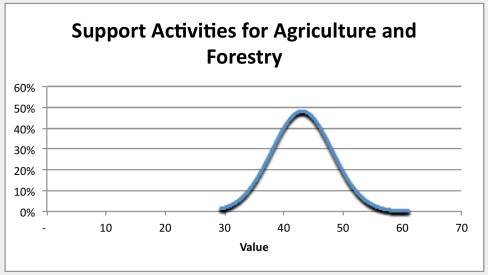




Distribution	100%	80%	Skewness
Max	412	371	7%
Min	209	250	14%
Mean	310		46%
Point Estimate	303		47%

Worker Shortage - Low Growth Scenario

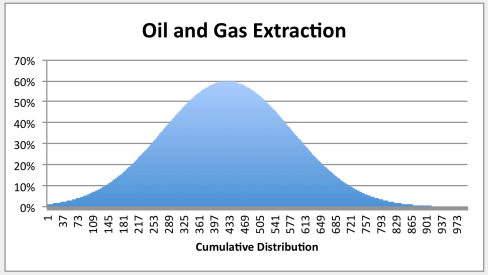


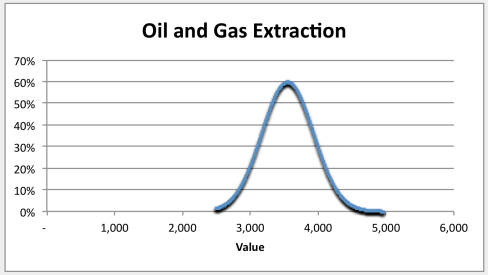


Distribution	100%	80%	Skewness
Max	61	55	4%
Min	29	36	17%
Mean	45		44%
Point Estimate	43		48%

Base Scenario

Worker Shortage - Base Scenario

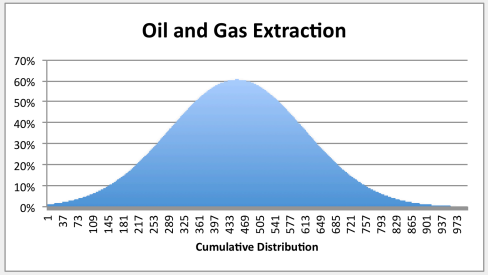


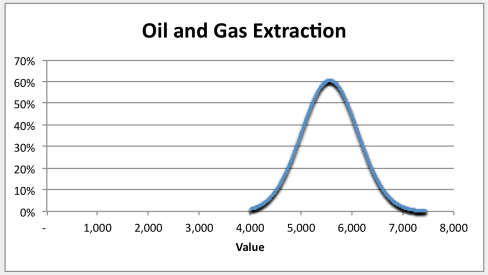


Distribution	100%	80%	Skewness
Max	4,957	4,459	3%
Min	2,479	2,972	20%
Mean	3,715		54%
Point Estimate	3,541		60%

High Growth Scenario

Worker Shortage - High Growth Scenario

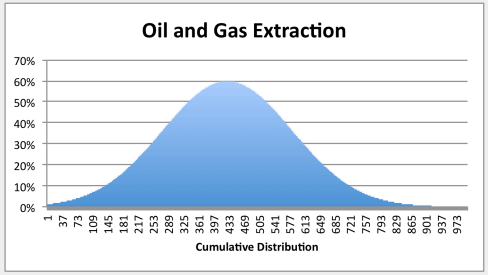


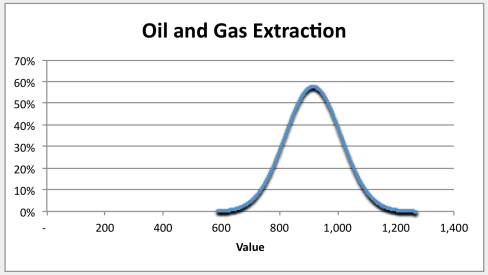


Distribution	100%	80%	Skewness
Max	7,438	6,746	6%
Min	3,996	4,681	18%
Mean	5,714		58%
Point Estimate	5,551		61%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

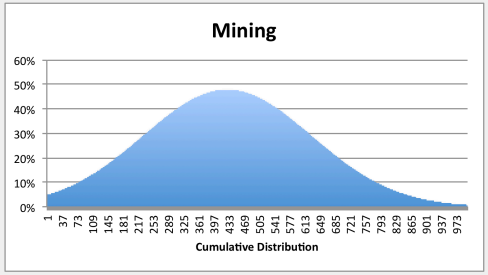


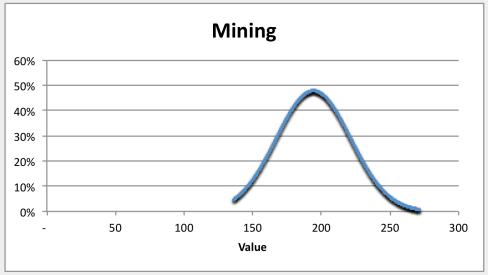


Distribution	100%	80%	Skewness
Max	1,269	1,132	4%
Min	585	721	8%
Mean	926		57%
Point Estimate	913		58%

Base Scenario

Worker Shortage - Base Scenario

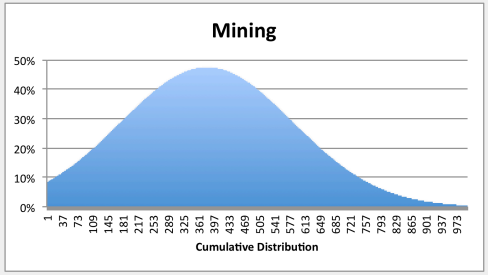


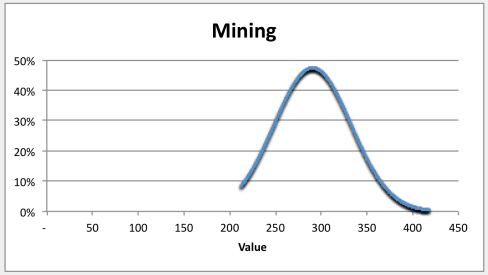


Distribution	100%	80%	Skewness
Max	271	244	9%
Min	136	163	25%
Mean	203		45%
Point Estimate	194		48%

High Growth Scenario

Worker Shortage - High Growth Scenario

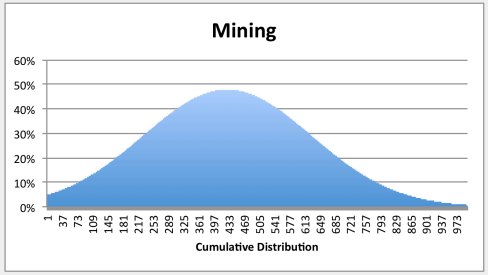


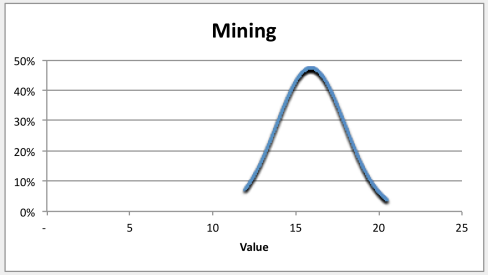


Distribution	100%	80%	Skewness
Max	417	376	6%
Min	212	253	32%
Mean	314		40%
Point Estimate	290		47%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

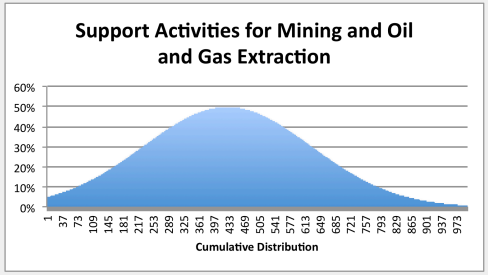


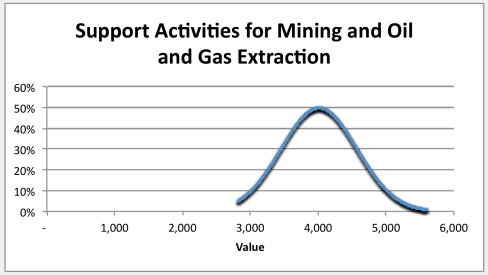


Distribution	100%	80%	Skewness
Max	20	19	18%
Min	12	14	26%
Mean	16		47%
Point Estimate	16		47%

Base Scenario	High Growth Scenario	Low Growth Scenario

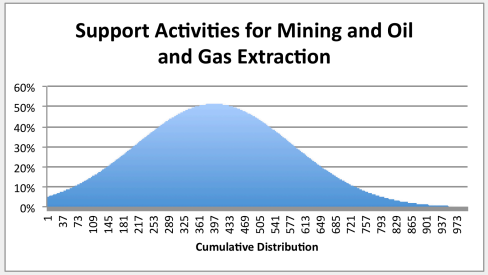
Worker Shortage - Base Scenario

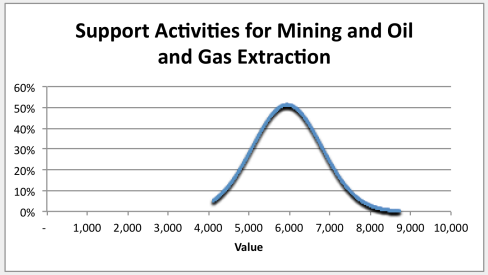




Distribution	100%	80%	Skewness
Max	5,605	5,042	9%
Min	2,802	3,360	26%
Mean	4,201		47%
Point Estimate	4,003		50%

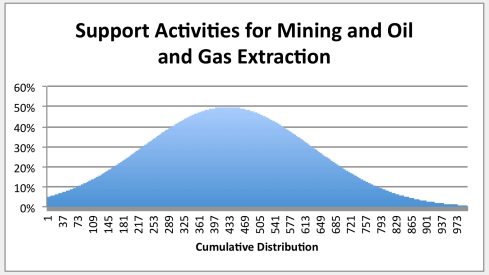
Worker Shortage - High Growth Scenario

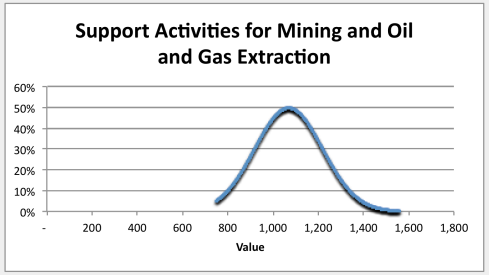




Distribution	100%	80%	Skewness
Max	8,719	7,789	5%
Min	4,093	5,013	29%
Mean	6,401		44%
Point Estimate	5,931		51%

Worker Shortage - Low Growth Scenario

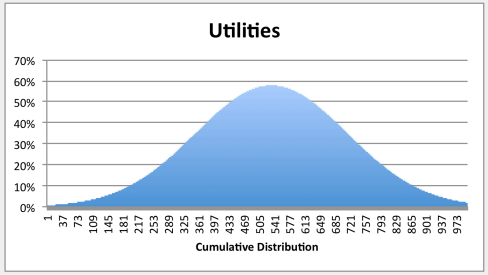


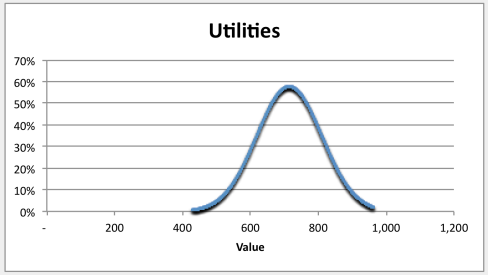


Distribution	100%	80%	Skewness
Max	1,557	1,394	5%
Min	746	908	29%
Mean	1,151		43%
Point Estimate	1,066		50%

Base Scenario

Worker Shortage - Base Scenario

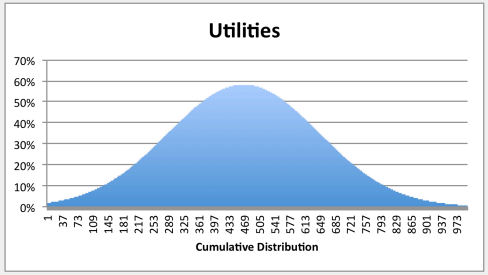


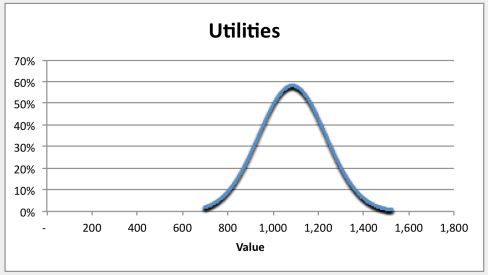


Distribution	100%	80%	Skewness
Max	962	855	19%
Min	428	534	10%
Mean	694		57%
Point Estimate	713		58%

High Growth Scenario

Worker Shortage - High Growth Scenario

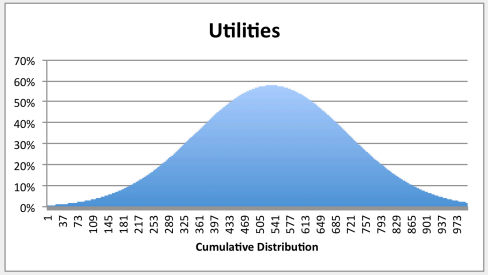


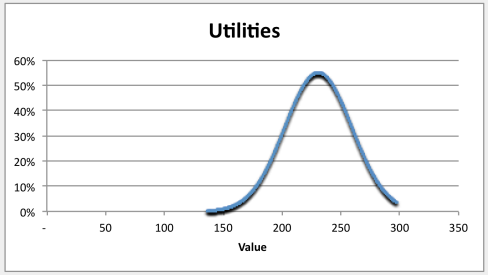


Distribution	100%	80%	Skewness
Max	1,526	1,359	10%
Min	693	859	19%
Mean	1,109		57%
Point Estimate	1,082		58%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

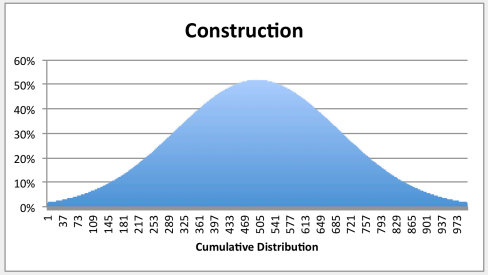


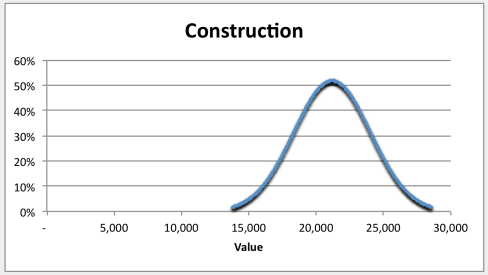


Distribution	100%	80%	Skewness
Max	297	265	27%
Min	136	168	5%
Mean	216		49%
Point Estimate	230		55%

Base Scenario

Worker Shortage - Base Scenario

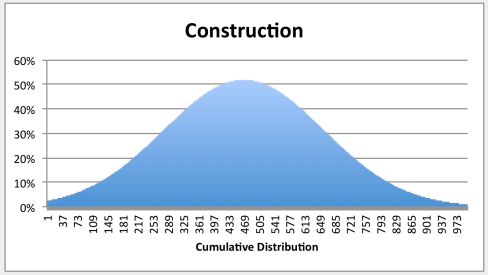


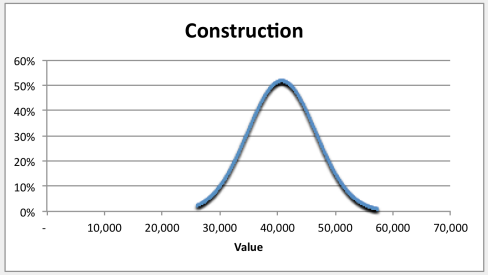


Distribution	100%	80%	Skewness
Max	28,545	25,570	16%
Min	13,744	16,689	15%
Mean	21,130		52%
Point Estimate	21,145		52%

High Growth Scenario

Worker Shortage - High Growth Scenario

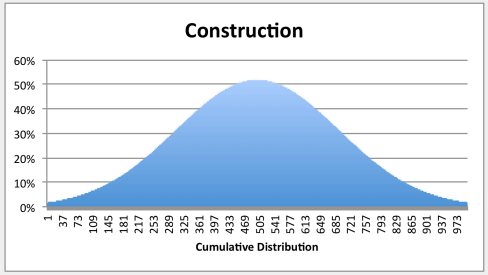


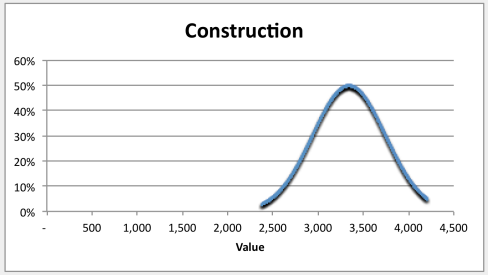


Distribution	100%	80%	Skewness
Max	57,249	50,965	11%
Min	25,985	32,207	19%
Mean	41,586		51%
Point Estimate	40,602		52%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

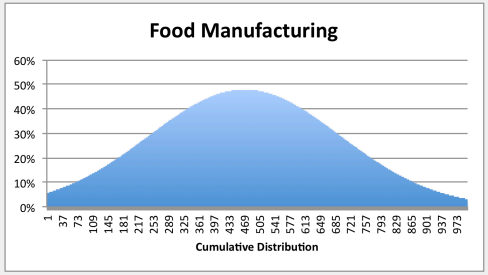


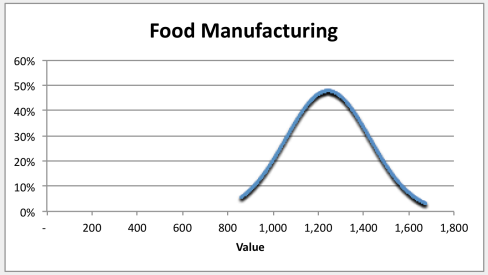


Distribution	100%	80%	Skewness
Max	4,202	3,834	23%
Min	2,368	2,733	16%
Mean	3,283		49%
Point Estimate	3,335		50%

Base Scenario

Worker Shortage - Base Scenario

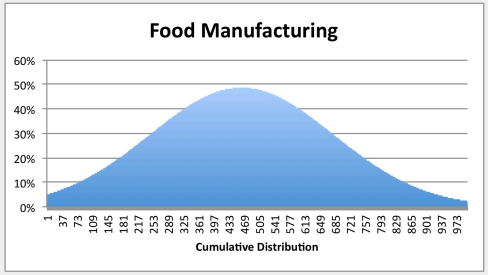


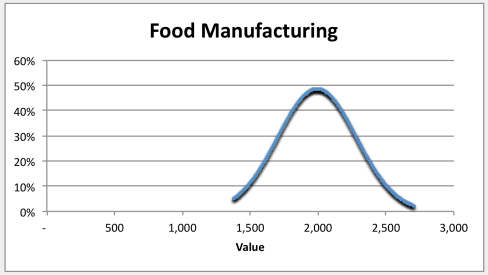


Distribution	100%	80%	Skewness
Max	1,674	1,509	17%
Min	855	1,018	24%
Mean	1,264		47%
Point Estimate	1,240		48%

High Growth Scenario

Worker Shortage - High Growth Scenario

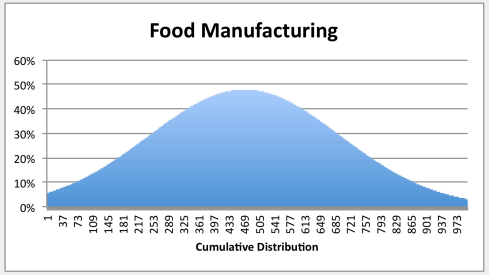


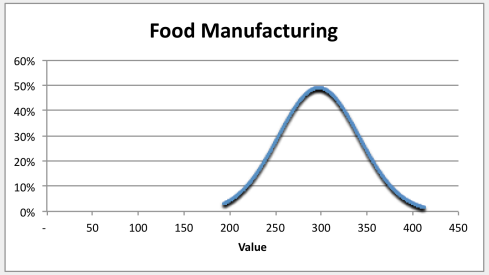


Distribution	100%	80%	Skewness
Max	2,703	2,435	15%
Min	1,371	1,636	23%
Mean	2,036		48%
Point Estimate	1,987		49%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

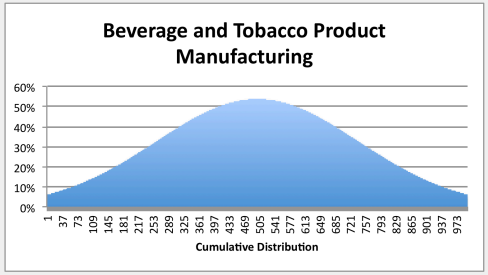


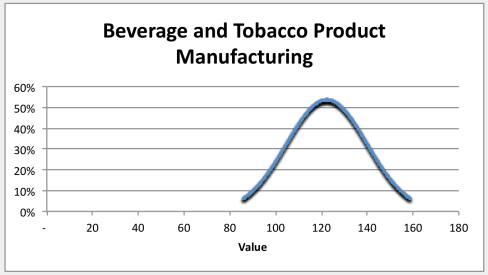


Distribution	100%	80%	Skewness
Max	412	368	13%
Min	193	236	20%
Mean	302		49%
Point Estimate	297		49%

Base Scenario

Worker Shortage - Base Scenario

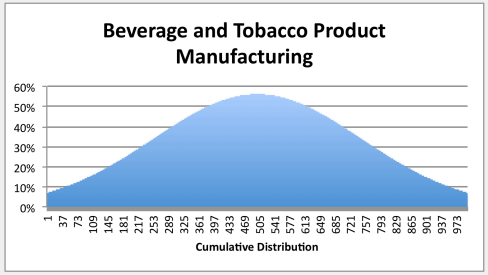


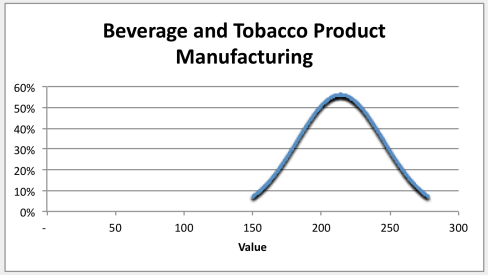


Distribution	100%	80%	Skewness
Max	159	144	25%
Min	85	100	25%
Mean	122		54%
Point Estimate	122		54%

High Growth Scenario

Worker Shortage - High Growth Scenario

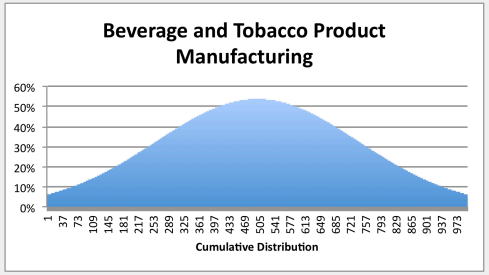


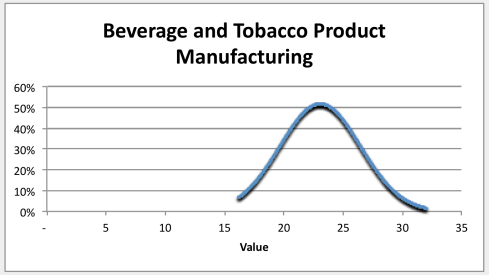


Distribution	100%	80%	Skewness
Max	278	252	27%
Min	149	175	27%
Mean	213		56%
Point Estimate	213		56%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

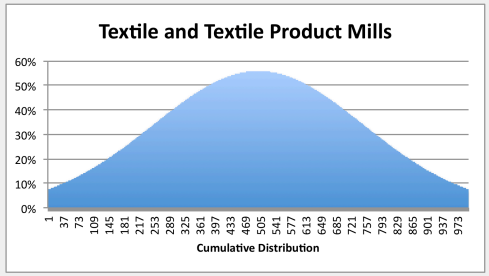


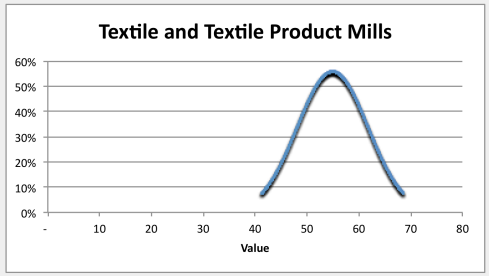


Distribution	100%	80%	Skewness
Max	32	29	12%
Min	16	19	28%
Mean	24		50%
Point Estimate	23		52%

Base Scenario	High Growth Scenario	Low Growth Scenario

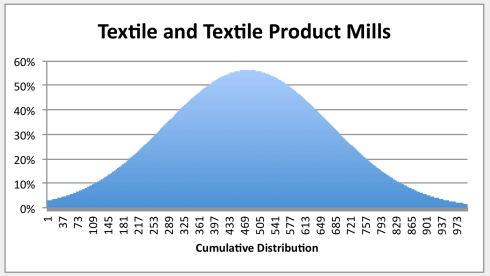
Worker Shortage - Base Scenario

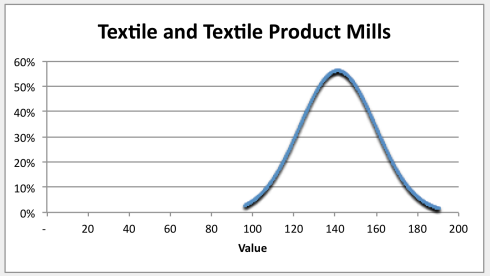




Distribution	100%	80%	Skewness
Max	68	63	27%
Min	41	47	27%
Mean	55		56%
Point Estimate	55		56%

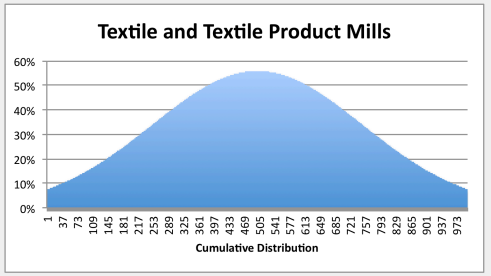
Worker Shortage - High Growth Scenario

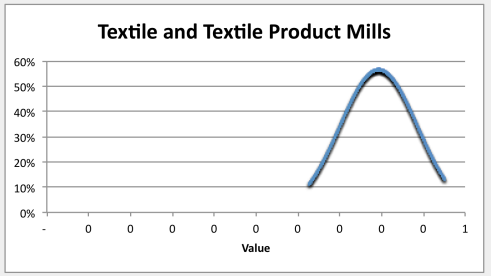




Distribution	100%	80%	Skewness
Max	190	171	15%
Min	96	115	20%
Mean	143		56%
Point Estimate	141		56%

Worker Shortage - Low Growth Scenario

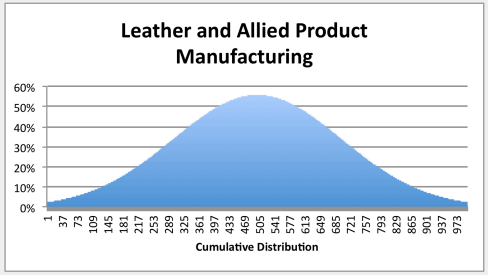


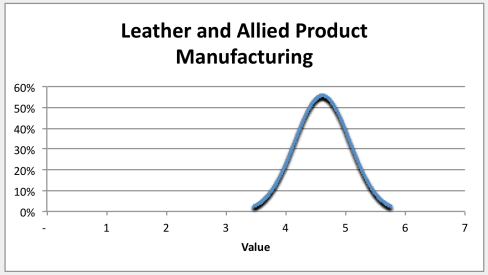


Distribution	100%	80%	Skewness
Max	0	0	34%
Min	0	0	31%
Mean	0		57%
Point Estimate	0		57%

Base Scenario

Worker Shortage - Base Scenario

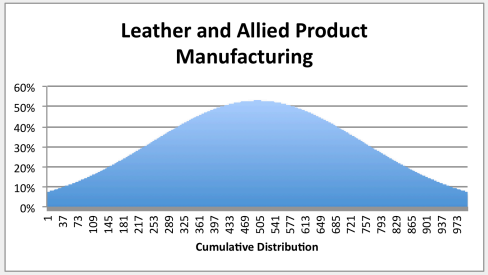


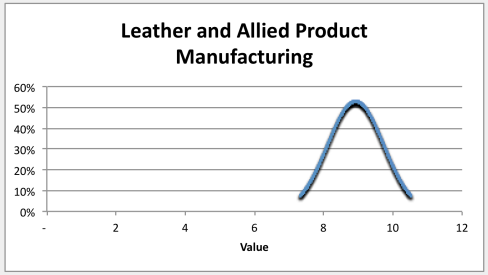


Distribution	100%	80%	Skewness
Max	6	5	18%
Min	3	4	18%
Mean	5		56%
Point Estimate	5		56%

High Growth Scenario

Worker Shortage - High Growth Scenario

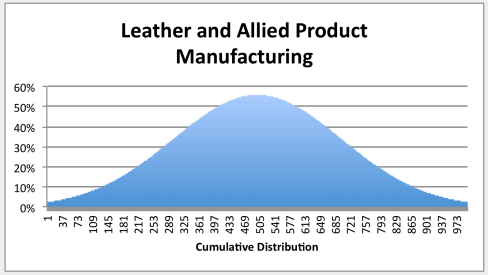


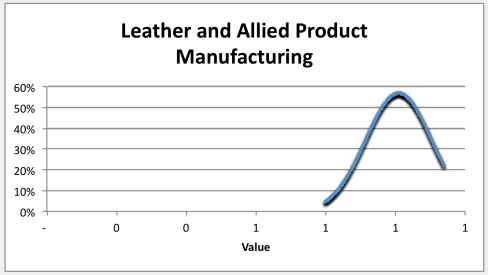


Distribution	100%	80%	Skewness
Max	11	10	26%
Min	7	8	26%
Mean	9		53%
Point Estimate	9		53%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

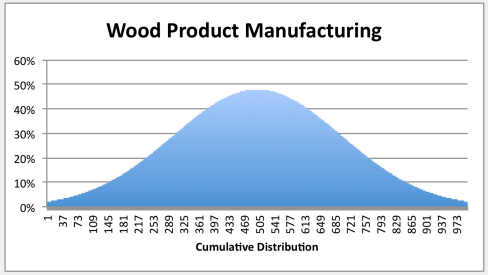


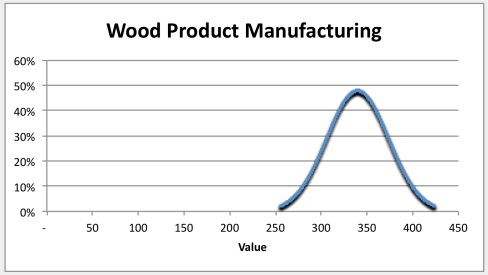


Distribution	100%	80%	Skewness
Max	1	1	46%
Min	1	1	18%
Mean	1		52%
Point Estimate	1		57%

Base Scenario

Worker Shortage - Base Scenario

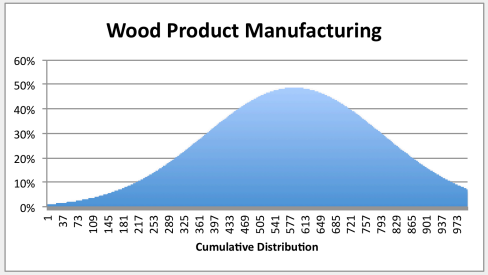


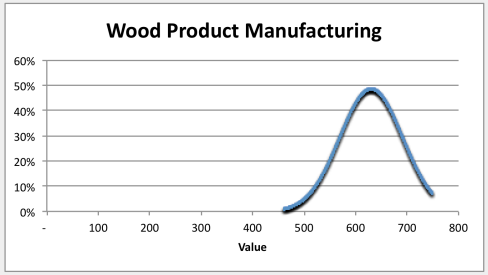


Distribution	100%	80%	Skewness
Max	424	390	16%
Min	254	288	15%
Mean	339		48%
Point Estimate	339		48%

High Growth Scenario

Worker Shortage - High Growth Scenario

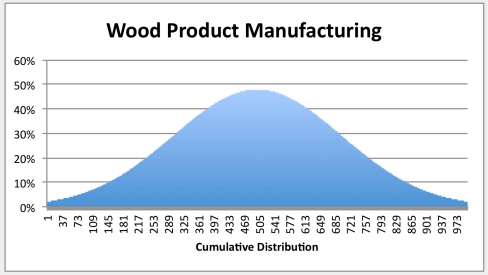


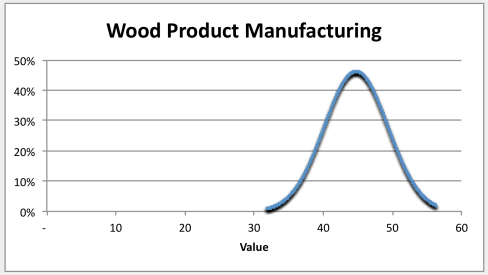


Distribution	100%	80%	Skewness
Max	749	690	29%
Min	459	517	9%
Mean	604		45%
Point Estimate	629		49%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

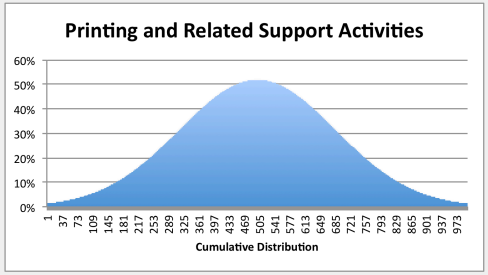


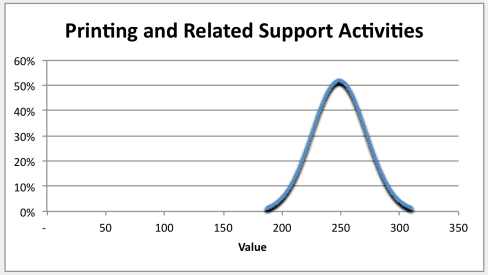


Distribution	100%	80%	Skewness
Max	56	51	16%
Min	32	37	10%
Mean	44		46%
Point Estimate	45		46%

Base Scenario

Worker Shortage - Base Scenario

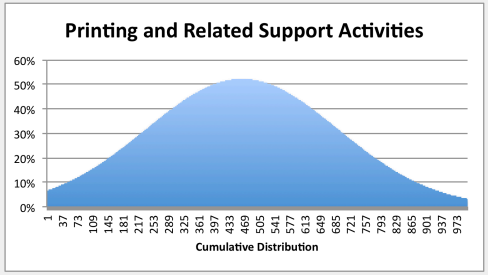


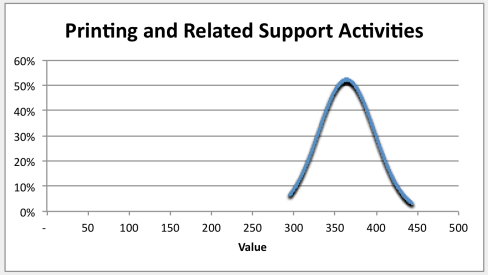


Distribution	100%	80%	Skewness
Max	310	285	14%
Min	186	211	14%
Mean	248		52%
Point Estimate	248		52%

High Growth Scenario

Worker Shortage - High Growth Scenario

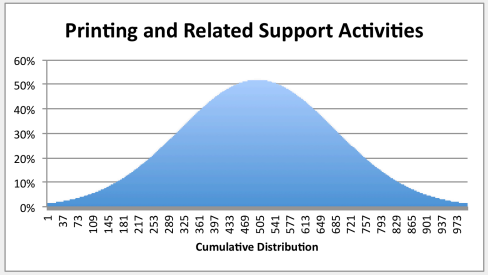


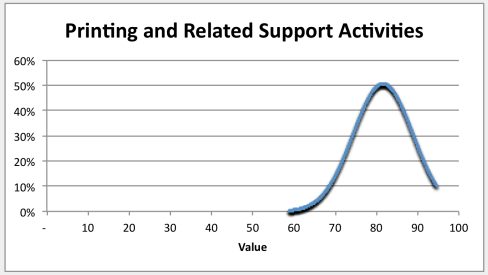


Distribution	100%	80%	Skewness
Max	443	413	18%
Min	294	324	27%
Mean	368		52%
Point Estimate	363		52%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

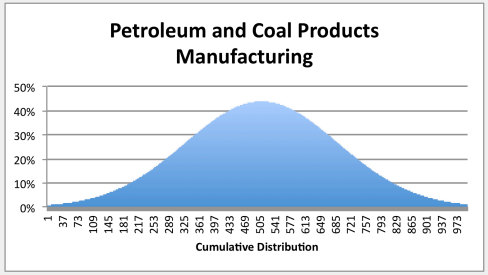


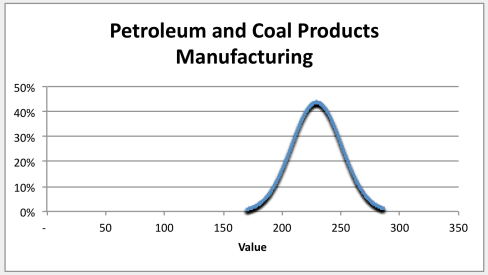


Distribution	100%	80%	Skewness
Max	94	87	37%
Min	59	66	5%
Mean	77		40%
Point Estimate	81		51%

Base Scenario	High Growth Scenario	Low Growth Scenario

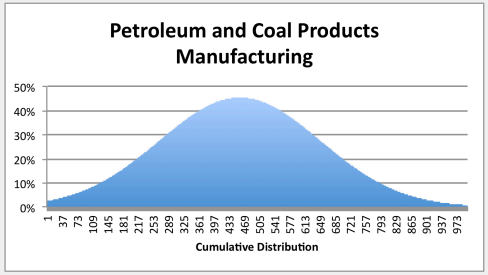
Worker Shortage - Base Scenario

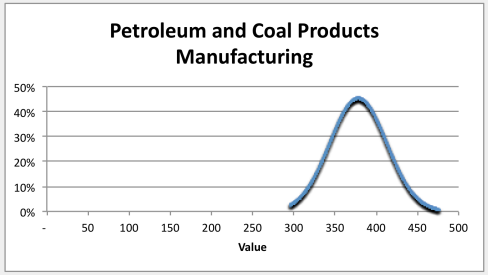




Distribution	100%	80%	Skewness
Max	286	263	12%
Min	169	193	10%
Mean	228		44%
Point Estimate	229		44%

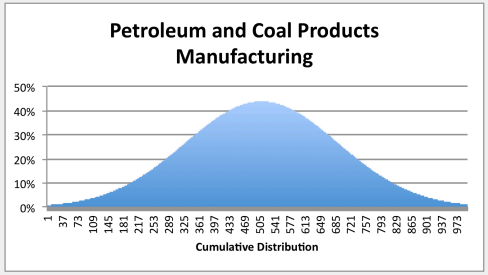
Worker Shortage - High Growth Scenario

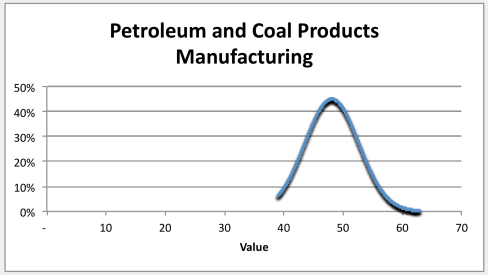




Distribution	100%	80%	Skewness
Max	476	439	9%
Min	294	330	18%
Mean	385		44%
Point Estimate	377		45%

Worker Shortage - Low Growth Scenario

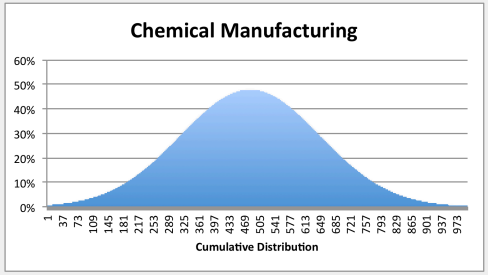


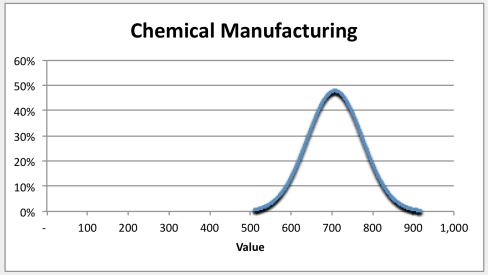


Distribution	100%	80%	Skewness
Max	63	58	4%
Min	39	44	29%
Mean	51		37%
Point Estimate	48		45%

Base Scenario

Worker Shortage - Base Scenario

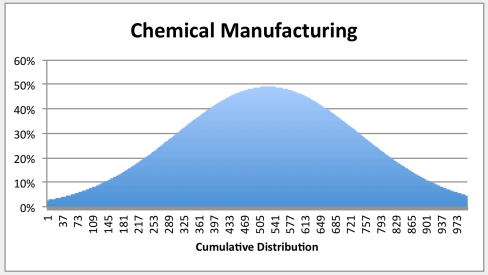


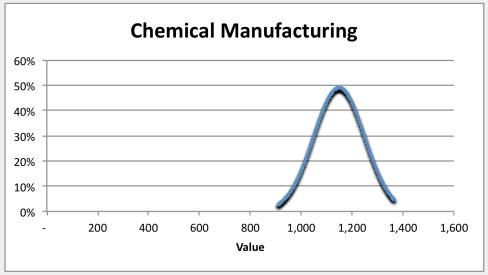


Distribution	100%	80%	Skewness
Max	918	835	8%
Min	508	590	11%
Mean	713		48%
Point Estimate	706		48%

High Growth Scenario

Worker Shortage - High Growth Scenario

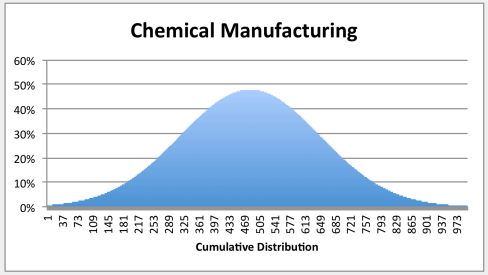


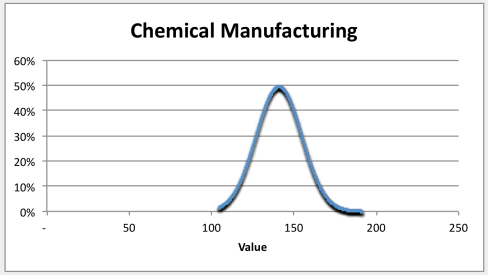


Distribution	100%	80%	Skewness
Max	1,364	1,272	22%
Min	905	997	16%
Mean	1,134		49%
Point Estimate	1,146		49%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

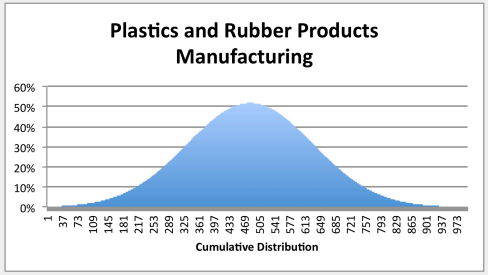


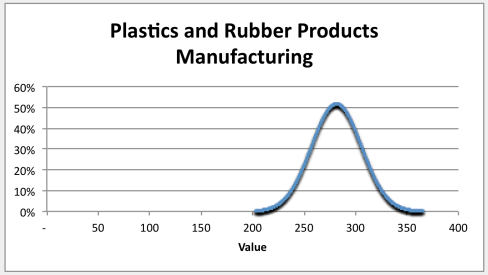


Distribution	100%	80%	Skewness
Max	191	174	3%
Min	104	121	19%
Mean	148		44%
Point Estimate	141		49%

Base Scenario	High Growth Scenario	Low Growth Scenario

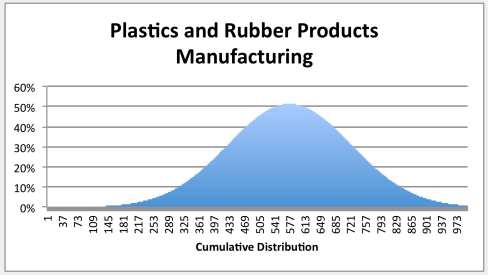
Worker Shortage - Base Scenario

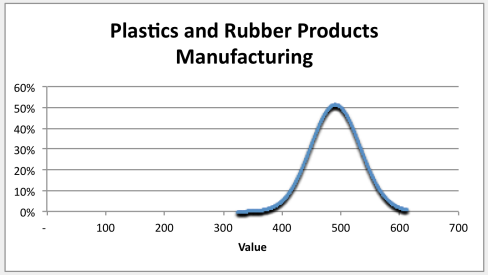




Distribution	100%	80%	Skewness
Max	365	332	6%
Min	202	235	9%
Mean	284		52%
Point Estimate	281		52%

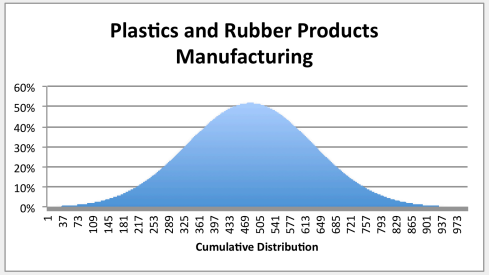
Worker Shortage - High Growth Scenario

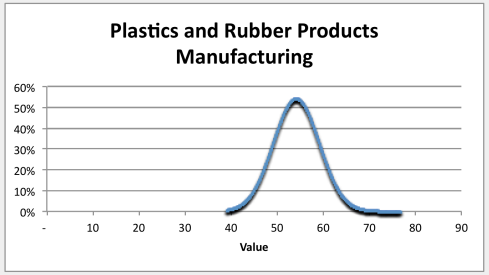




Distribution	100%	80%	Skewness
Max	612	554	16%
Min	323	381	2%
Mean	467		45%
Point Estimate	490		51%

Worker Shortage - Low Growth Scenario

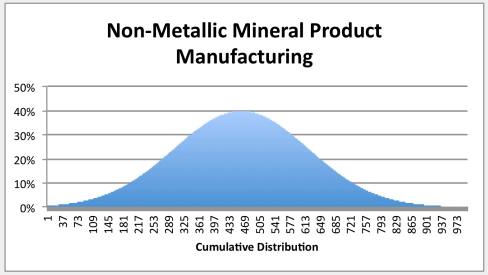


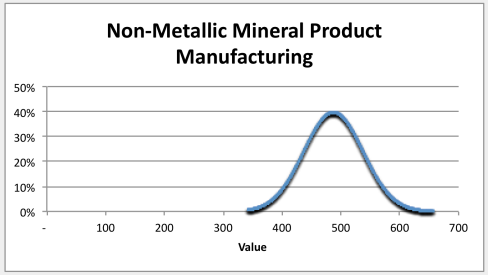


Distribution	100%	80%	Skewness
Max	77	69	1%
Min	39	46	17%
Mean	58		41%
Point Estimate	54		54%

Base Scenario

Worker Shortage - Base Scenario

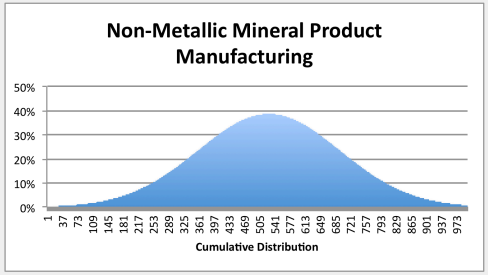


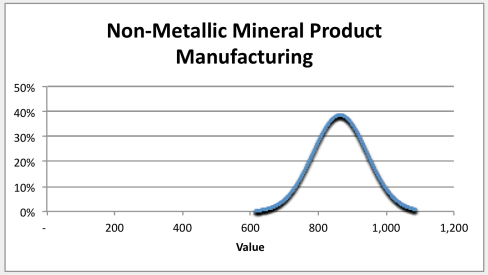


Distribution	100%	80%	Skewness
Max	656	593	4%
Min	340	403	10%
Mean	498		39%
Point Estimate	486		40%

High Growth Scenario

Worker Shortage - High Growth Scenario

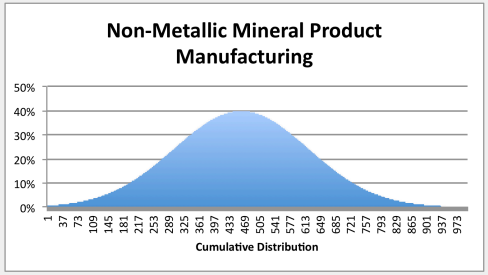


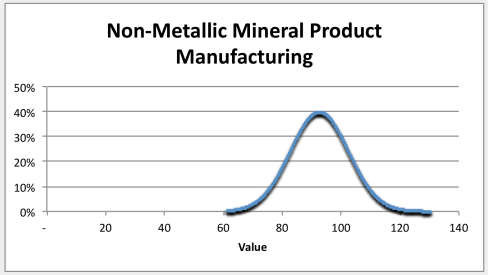


Distribution	100%	80%	Skewness
Max	1,087	991	11%
Min	612	707	6%
Mean	849		38%
Point Estimate	862		39%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

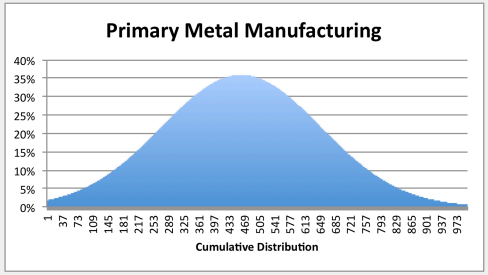


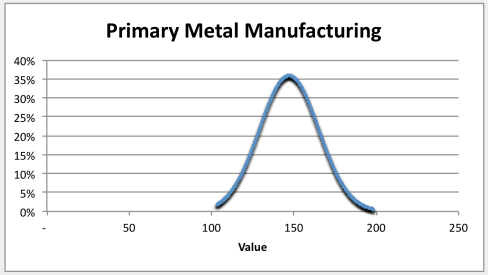


Distribution	100%	80%	Skewness
Max	130	116	2%
Min	61	75	8%
Mean	96		38%
Point Estimate	92		40%

Base Scenario	High Growth Scenario	Low Growth Scenario

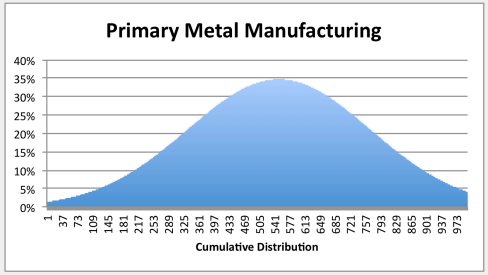
Worker Shortage - Base Scenario

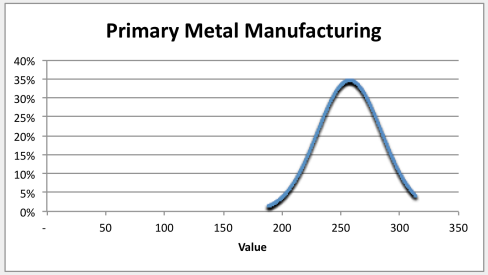




Distribution	100%	80%	Skewness
Max	198	179	7%
Min	103	122	14%
Mean	150		35%
Point Estimate	147		36%

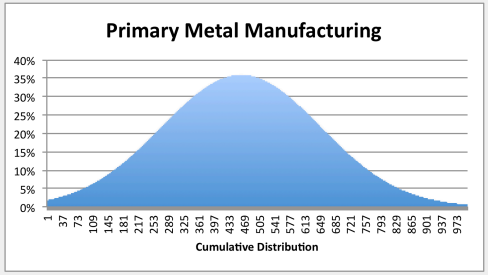
Worker Shortage - High Growth Scenario

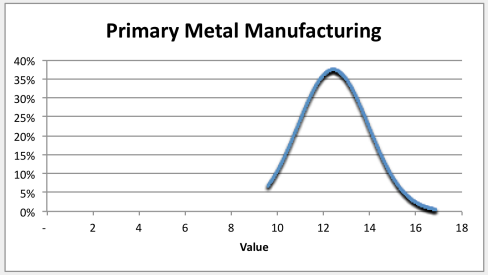




Distribution	100%	80%	Skewness
Max	313	288	18%
Min	187	213	9%
Mean	250		34%
Point Estimate	257		35%

Worker Shortage - Low Growth Scenario

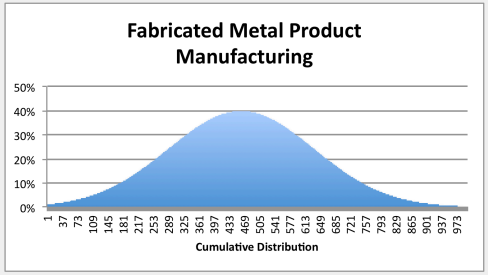


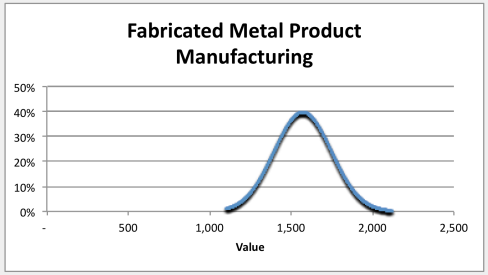


Distribution	100%	80%	Skewness
Max	17	15	6%
Min	10	11	25%
Mean	13		33%
Point Estimate	12		38%

Base Scenario

Worker Shortage - Base Scenario

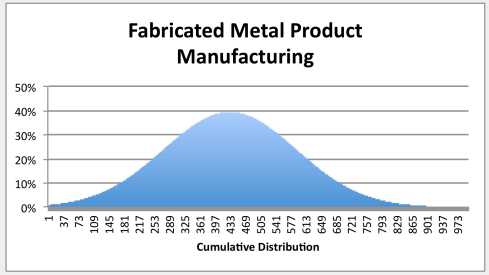


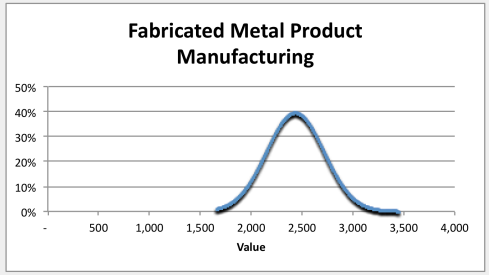


Distribution	100%	80%	Skewness
Max	2,117	1,912	6%
Min	1,098	1,301	13%
Mean	1,606		39%
Point Estimate	1,568		40%

High Growth Scenario

Worker Shortage - High Growth Scenario

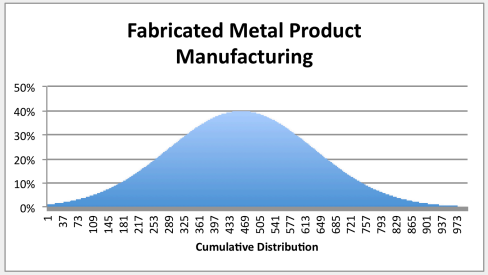


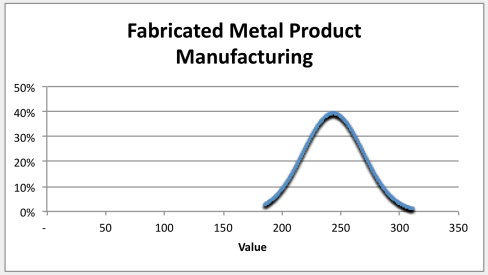


Distribution	100%	80%	Skewness
Max	3,448	3,086	3%
Min	1,651	2,008	13%
Mean	2,547		36%
Point Estimate	2,428		39%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

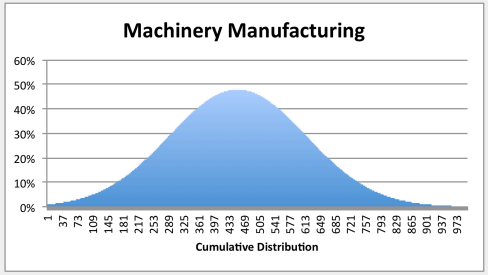


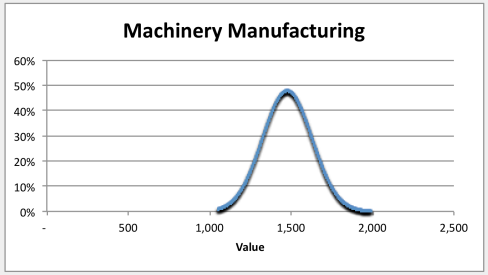


Distribution	100%	80%	Skewness
Max	311	286	10%
Min	185	210	17%
Mean	248		39%
Point Estimate	243		39%

Base Scenario

Worker Shortage - Base Scenario

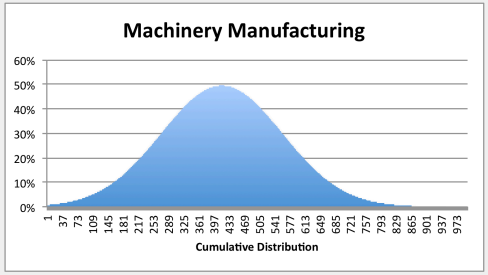


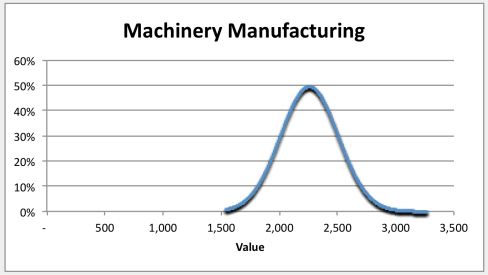


Distribution	100%	80%	Skewness
Max	1,988	1,799	5%
Min	1,046	1,233	14%
Mean	1,516		46%
Point Estimate	1,473		48%

High Growth Scenario

Worker Shortage - High Growth Scenario

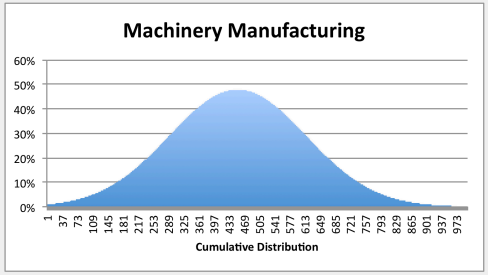


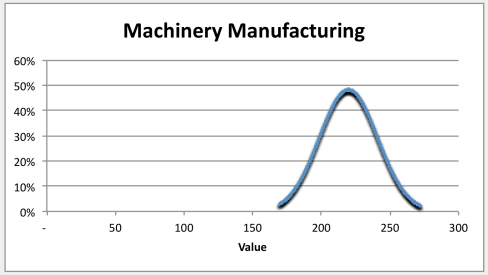


Distribution	100%	80%	Skewness
Max	3,267	2,919	1%
Min	1,532	1,878	16%
Mean	2,398		42%
Point Estimate	2,253		49%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

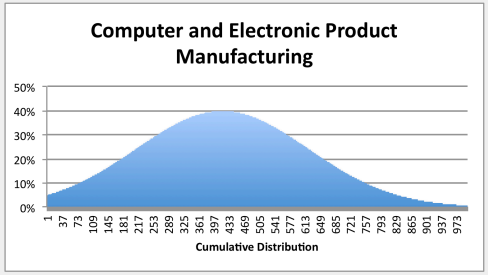


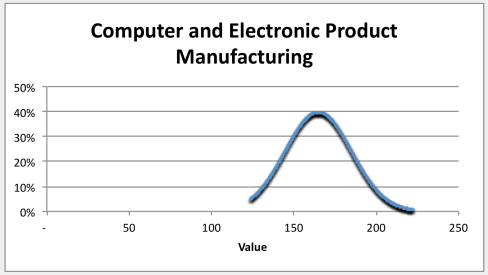


Distribution	100%	80%	Skewness
Max	272	251	16%
Min	169	189	18%
Mean	220		48%
Point Estimate	219		48%

Base Scenario

Worker Shortage - Base Scenario

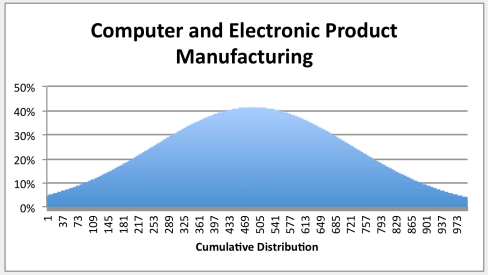


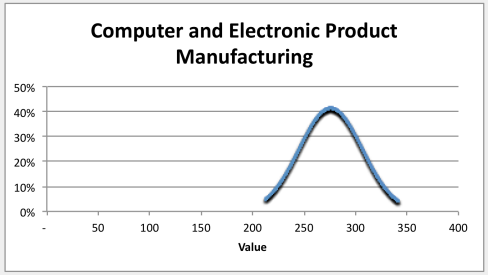


Distribution	100%	80%	Skewness
Max	222	202	7%
Min	123	143	23%
Mean	173		37%
Point Estimate	164		40%

High Growth Scenario

Worker Shortage - High Growth Scenario

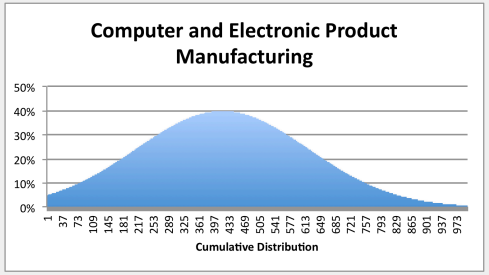


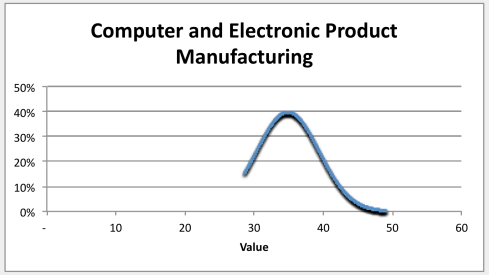


Distribution	100%	80%	Skewness
Max	341	315	18%
Min	212	238	20%
Mean	277		41%
Point Estimate	275		41%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

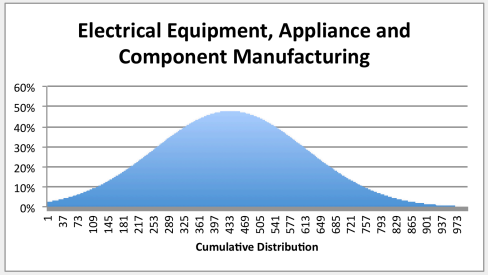


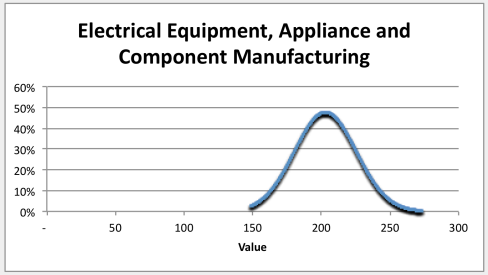


Distribution	100%	80%	Skewness
Max	49	45	3%
Min	29	33	36%
Mean	39		27%
Point Estimate	35		40%

Base Scenario	High Growth Scenario	Low Growth Scenario

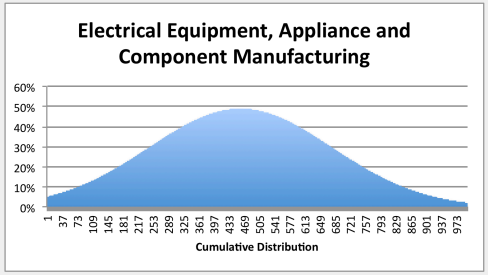
Worker Shortage - Base Scenario

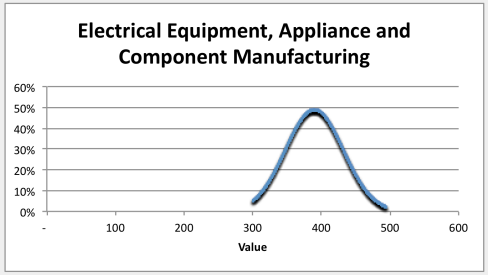




Distribution	100%	80%	Skewness
Max	273	248	6%
Min	148	173	20%
Mean	210		45%
Point Estimate	202		48%

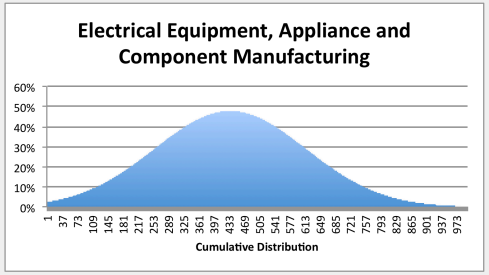
Worker Shortage - High Growth Scenario

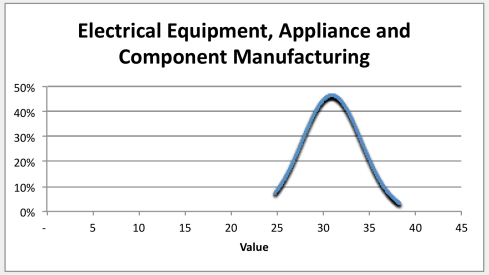




Distribution	100%	80%	Skewness
Max	494	455	15%
Min	299	338	24%
Mean	396		48%
Point Estimate	389		49%

Worker Shortage - Low Growth Scenario

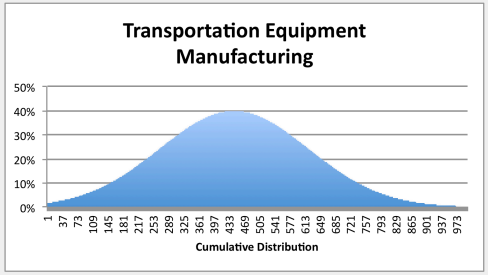


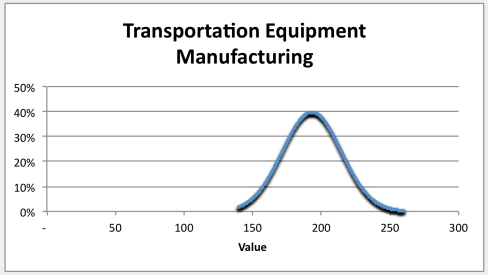


Distribution	100%	80%	Skewness
Max	38	36	16%
Min	25	27	26%
Mean	31		46%
Point Estimate	31		47%

Base Scenario

Worker Shortage - Base Scenario

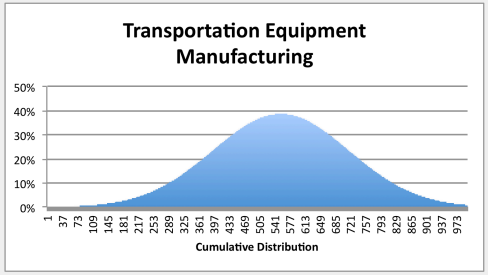


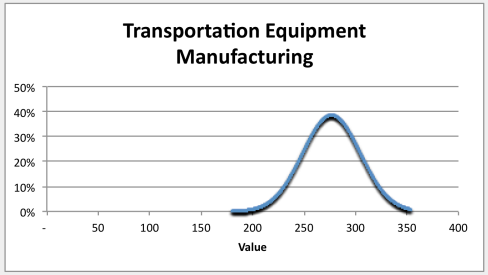


Distribution	100%	80%	Skewness
Max	260	236	5%
Min	139	163	15%
Mean	199		38%
Point Estimate	193		40%

High Growth Scenario

Worker Shortage - High Growth Scenario

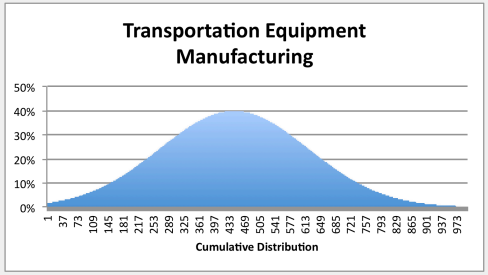


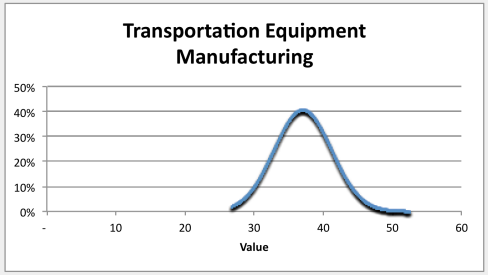


Distribution	100%	80%	Skewness
Max	353	318	12%
Min	179	214	3%
Mean	266		36%
Point Estimate	276		39%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

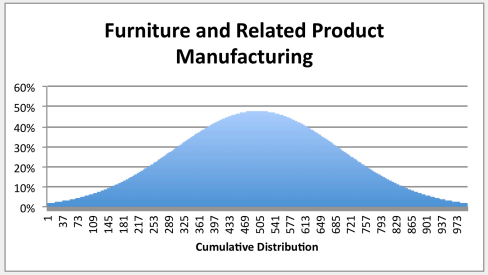


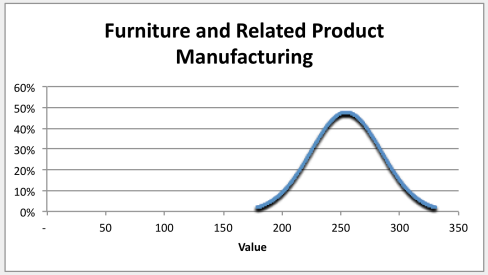


Distribution	100%	80%	Skewness
Max	52	47	2%
Min	27	32	19%
Mean	40		34%
Point Estimate	37		41%

Base Scenario

Worker Shortage - Base Scenario

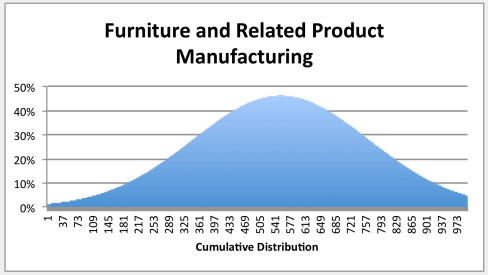


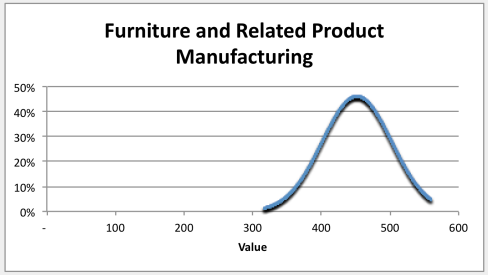


Distribution	100%	80%	Skewness
Max	330	299	15%
Min	178	208	15%
Mean	254		48%
Point Estimate	254		48%

High Growth Scenario

Worker Shortage - High Growth Scenario

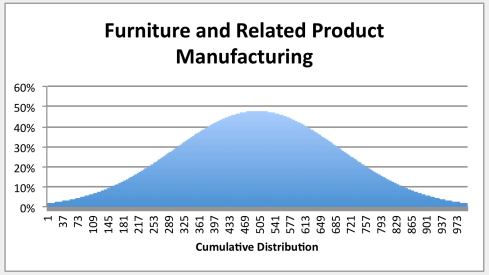


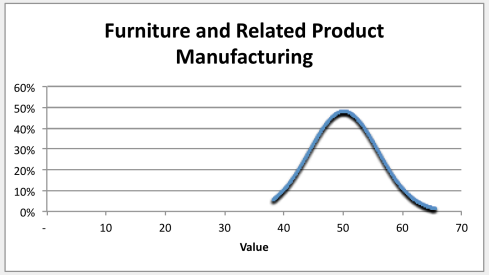


Distribution	100%	80%	Skewness
Max	559	510	23%
Min	316	364	11%
Mean	437		45%
Point Estimate	451		46%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

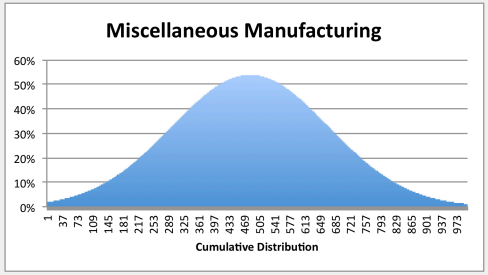


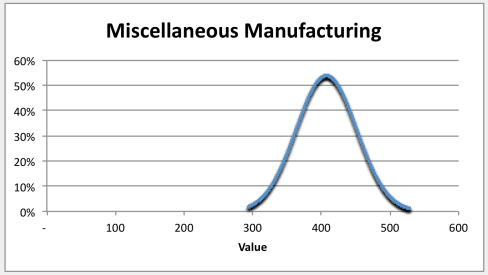


Distribution	100%	80%	Skewness
Max	65	60	11%
Min	38	43	26%
Mean	52		46%
Point Estimate	50		48%

Base Scenario

Worker Shortage - Base Scenario

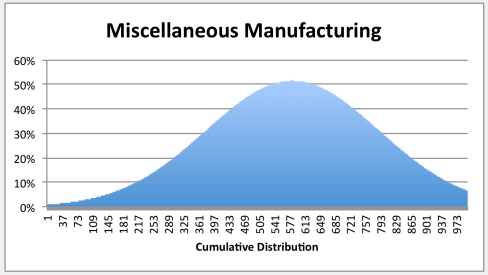


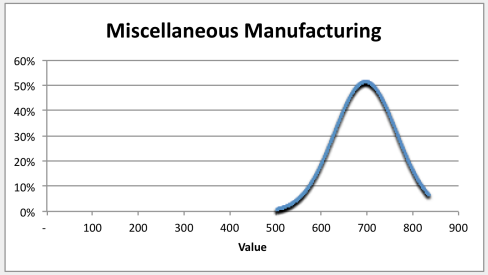


Distribution	100%	80%	Skewness
Max	528	481	13%
Min	293	340	17%
Mean	410		54%
Point Estimate	407		54%

High Growth Scenario

Worker Shortage - High Growth Scenario

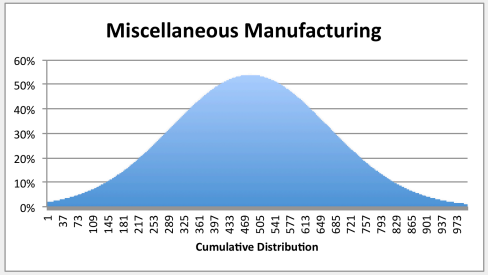


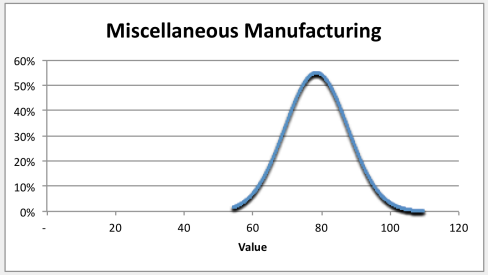


Distribution	100%	80%	Skewness
Max	835	767	30%
Min	501	567	9%
Mean	667		47%
Point Estimate	695		51%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

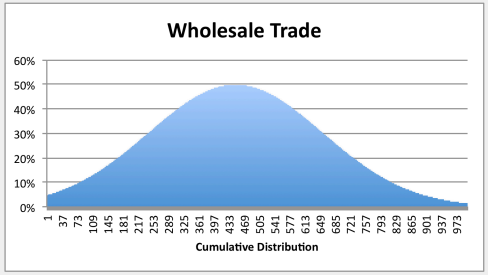


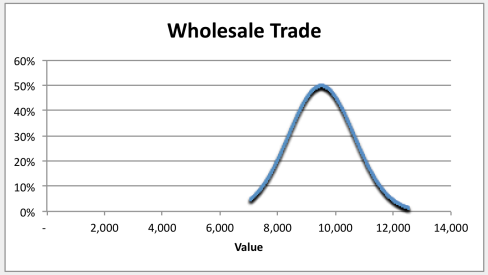


Distribution	100%	80%	Skewness
Max	110	98	5%
Min	54	65	19%
Mean	82		51%
Point Estimate	78		55%

Base Scenario

Worker Shortage - Base Scenario

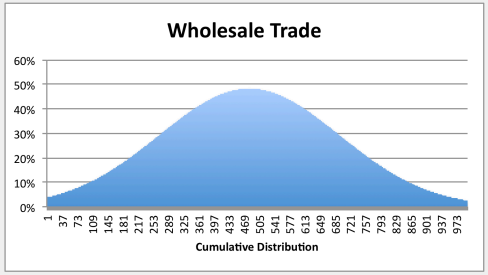


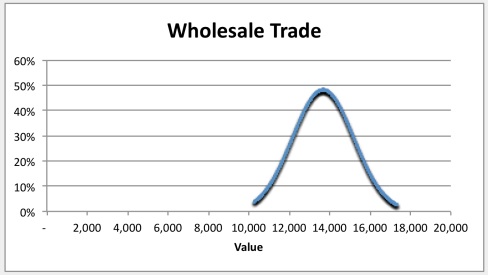


Distribution	100%	80%	Skewness
Max	12,526	11,420	12%
Min	7,022	8,117	24%
Mean	9,768		48%
Point Estimate	9,489		50%

High Growth Scenario

Worker Shortage - High Growth Scenario

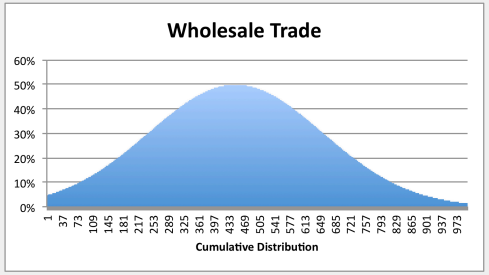


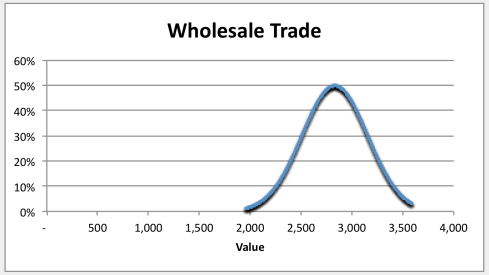


Distribution	100%	80%	Skewness
Max	17,333	15,907	16%
Min	10,236	11,648	20%
Mean	13,778		48%
Point Estimate	13,648		48%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

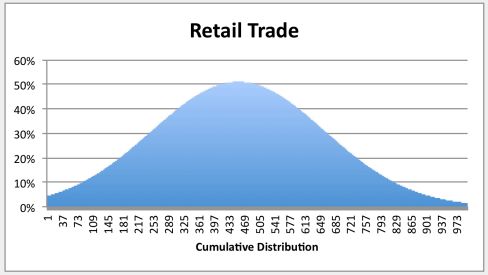


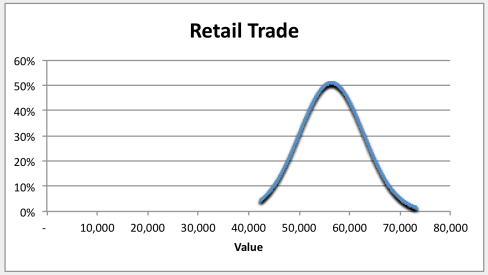


Distribution	100%	80%	Skewness
Max	3,588	3,259	20%
Min	1,949	2,275	12%
Mean	2,767		49%
Point Estimate	2,825		50%

Base Scenario

Worker Shortage - Base Scenario

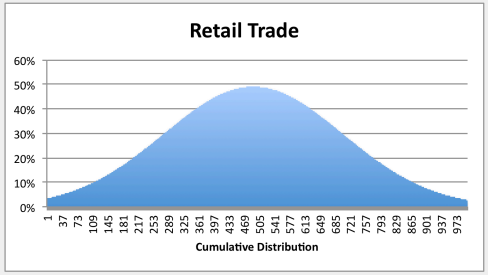


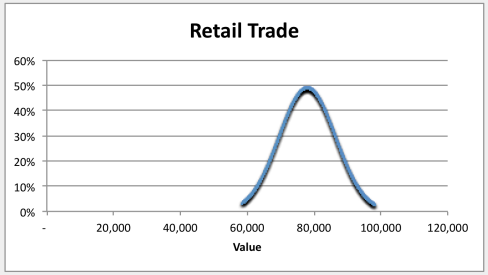


Distribution	100%	80%	Skewness
Max	73,142	66,922	13%
Min	42,197	48,355	24%
Mean	57,639		50%
Point Estimate	56,263		51%

High Growth Scenario

Worker Shortage - High Growth Scenario

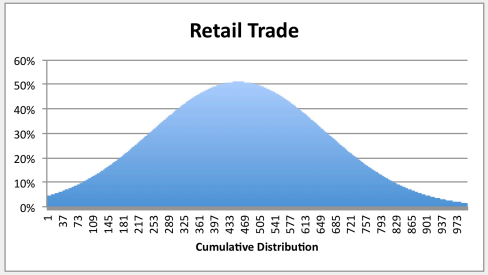


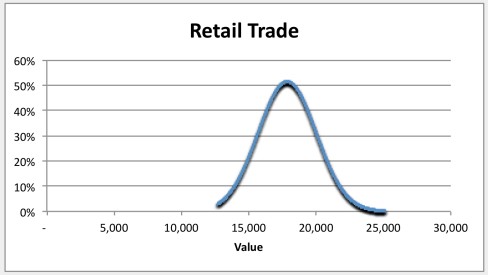


Distribution	100%	80%	Skewness
Max	97,993	90,021	17%
Min	58,329	66,222	19%
Mean	78,122		49%
Point Estimate	77,772		49%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

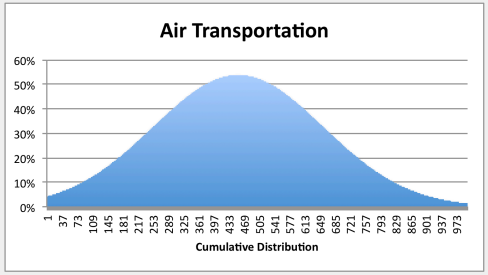


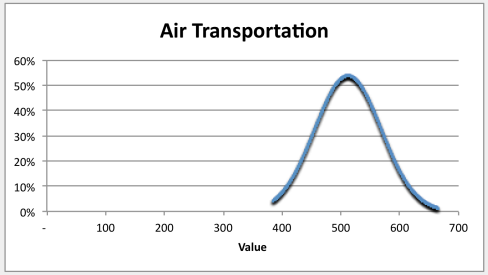


Distribution	100%	80%	Skewness
Max	25,105	22,600	4%
Min	12,641	15,122	24%
Mean	18,861		46%
Point Estimate	17,805		51%

Base Scenario

Worker Shortage - Base Scenario

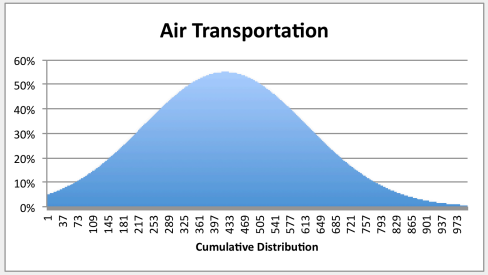


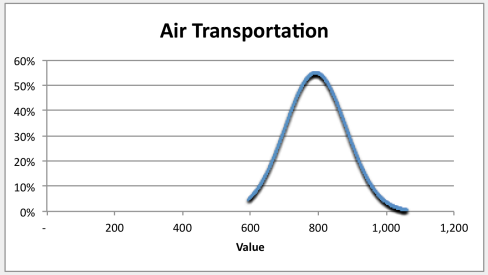


Distribution	100%	80%	Skewness
Max	664	608	13%
Min	383	439	24%
Mean	523		53%
Point Estimate	511		54%

High Growth Scenario

Worker Shortage - High Growth Scenario

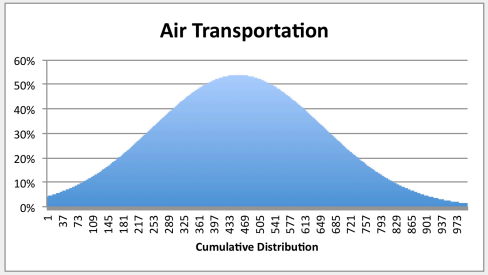


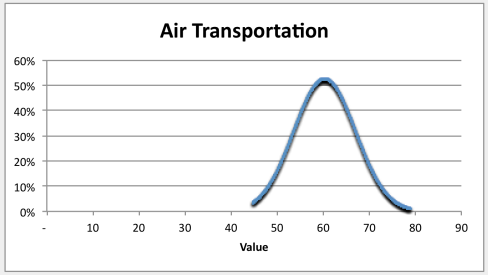


Distribution	100%	80%	Skewness
Max	1,059	965	8%
Min	593	685	28%
Mean	825		51%
Point Estimate	790		55%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

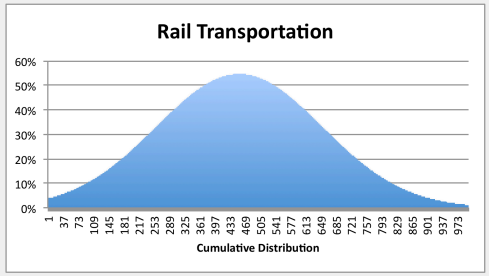


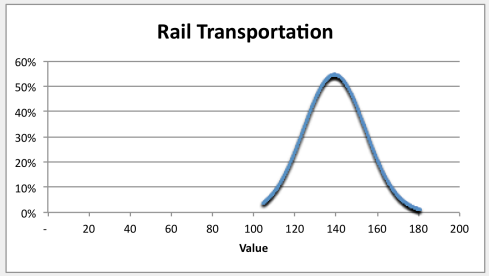


Distribution	100%	80%	Skewness
Max	79	72	11%
Min	44	51	22%
Mean	62		51%
Point Estimate	60		53%

Base Scenario

Worker Shortage - Base Scenario

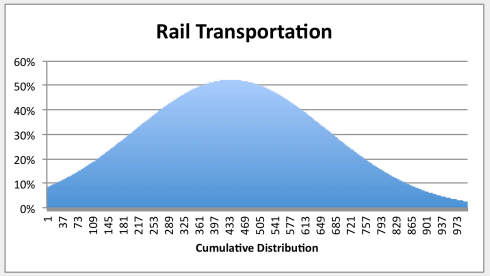


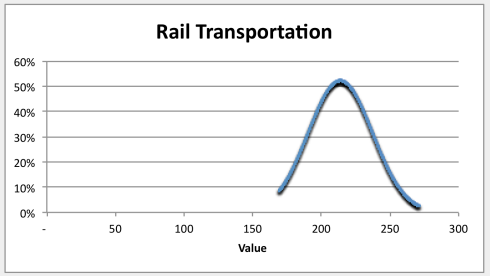


Distribution	100%	80%	Skewness
Max	181	165	12%
Min	104	119	24%
Mean	142		53%
Point Estimate	139		55%

High Growth Scenario

Worker Shortage - High Growth Scenario

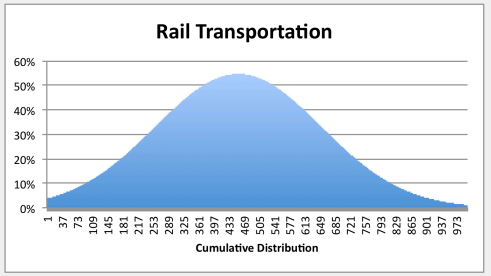


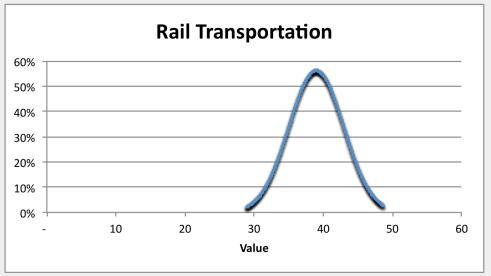


Distribution	100%	80%	Skewness
Max	271	250	15%
Min	169	189	30%
Mean	220		50%
Point Estimate	213		52%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

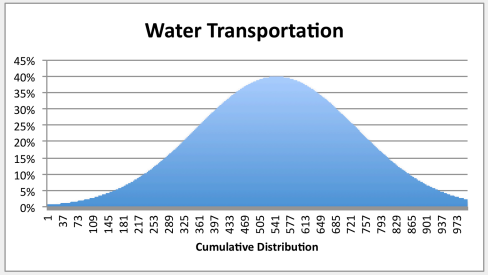


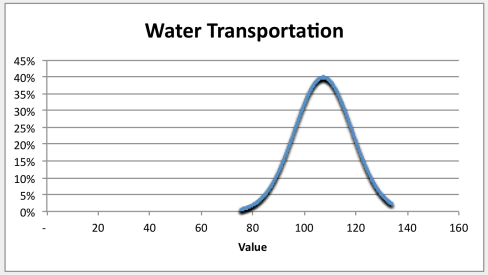


Distribution	100%	80%	Skewness
Max	49	45	20%
Min	29	33	17%
Mean	39		56%
Point Estimate	39		56%

Base Scenario

Worker Shortage - Base Scenario

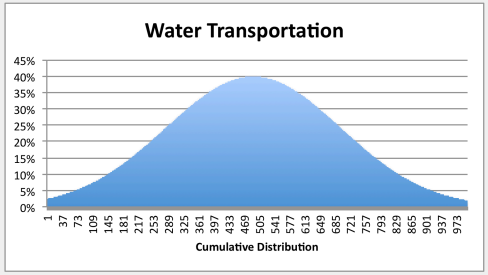


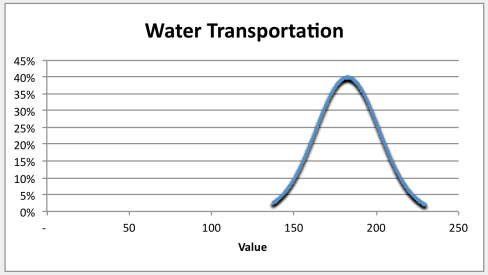


Distribution	100%	80%	Skewness
Max	134	122	16%
Min	75	87	7%
Mean	104		39%
Point Estimate	107		40%

High Growth Scenario

Worker Shortage - High Growth Scenario

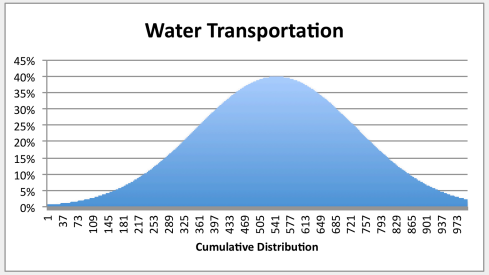


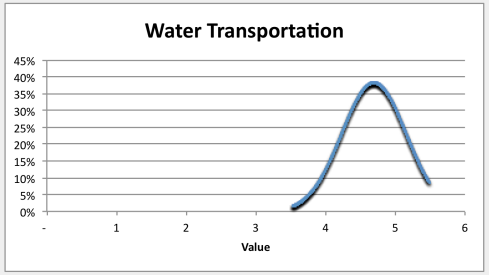


Distribution	100%	80%	Skewness
Max	230	211	13%
Min	137	155	15%
Mean	183		40%
Point Estimate	182		40%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

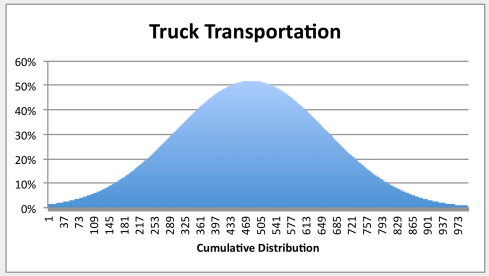


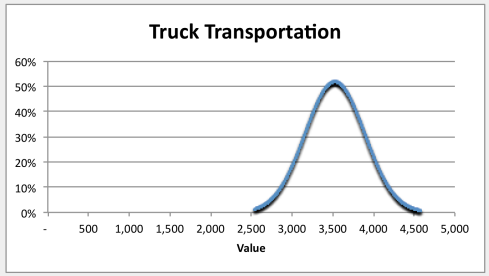


Distribution	100%	80%	Skewness
Max	5	5	26%
Min	4	4	9%
Mean	4		35%
Point Estimate	5		38%

Base Scenario

Worker Shortage - Base Scenario

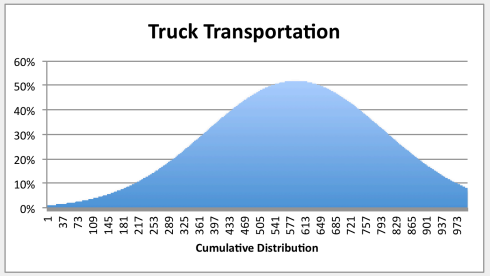


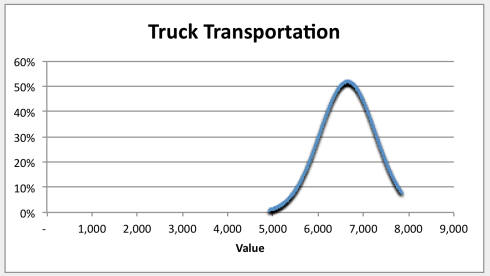


Distribution	100%	80%	Skewness
Max	4,574	4,164	11%
Min	2,533	2,940	15%
Mean	3,552		52%
Point Estimate	3,519		52%

High Growth Scenario

Worker Shortage - High Growth Scenario

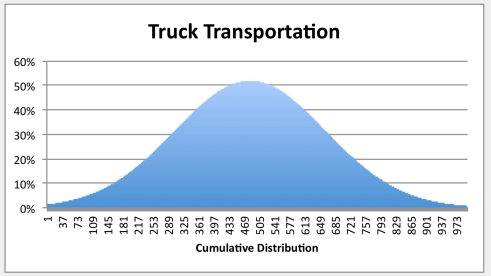


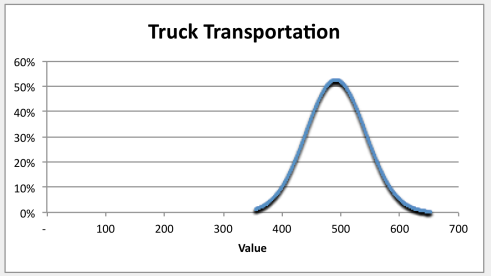


Distribution	100%	80%	Skewness
Max	7,834	7,246	32%
Min	4,913	5,494	9%
Mean	6,370		47%
Point Estimate	6,639		52%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

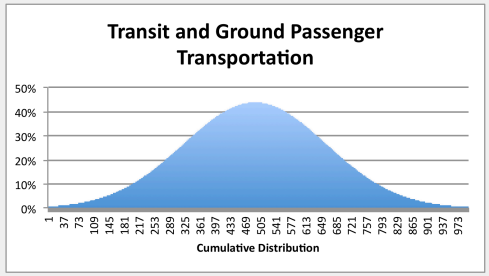


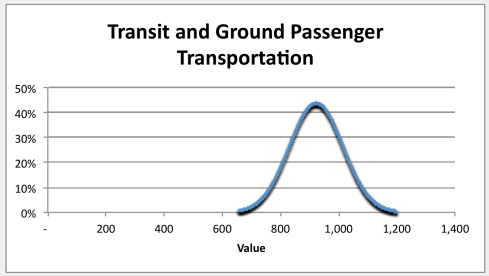


Distribution	100%	80%	Skewness
Max	652	592	7%
Min	353	413	16%
Mean	502		51%
Point Estimate	490		53%

Base Scenario	High Growth Scenario	Low Growth Scenario

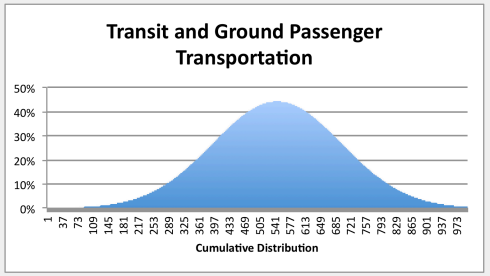
Worker Shortage - Base Scenario

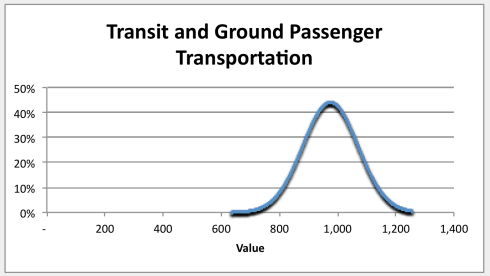




Distribution	100%	80%	Skewness
Max	1,197	1,088	8%
Min	654	762	10%
Mean	925		44%
Point Estimate	921		44%

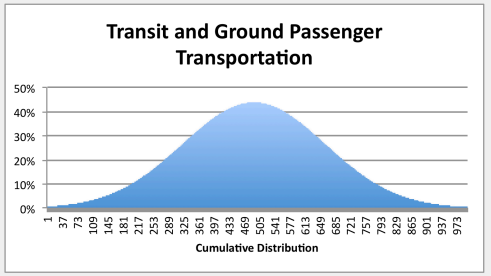
Worker Shortage - High Growth Scenario

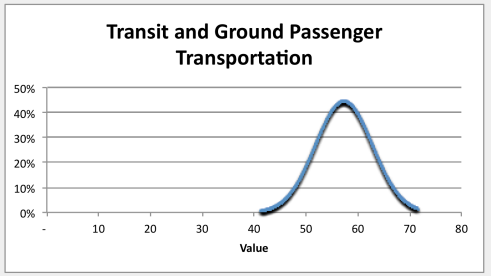




Distribution	100%	80%	Skewness
Max	1,255	1,130	11%
Min	632	756	3%
Mean	943		42%
Point Estimate	973		44%

Worker Shortage - Low Growth Scenario

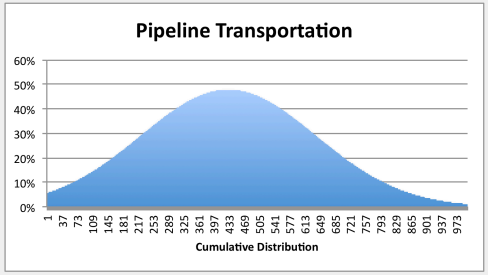


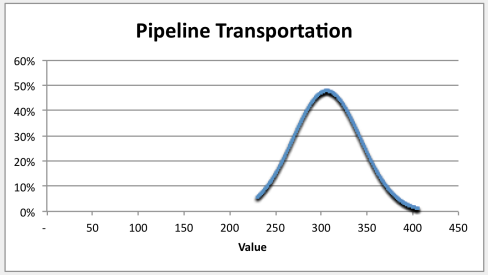


Distribution	100%	80%	Skewness
Max	71	65	15%
Min	41	47	9%
Mean	56		44%
Point Estimate	57		45%

Base Scenario	High Growth Scenario	Low Growth Scenario

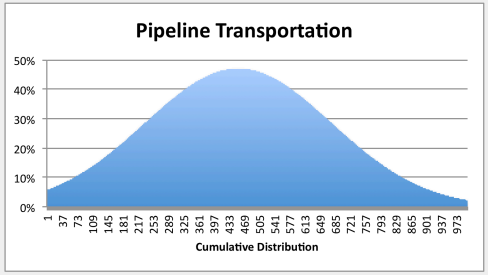
Worker Shortage - Base Scenario

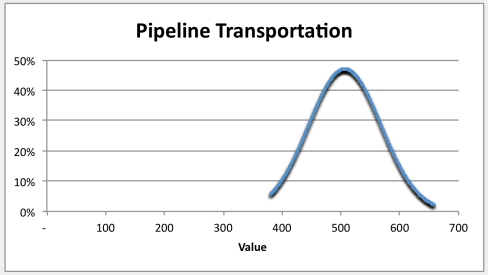




Distribution	100%	80%	Skewness
Max	406	371	10%
Min	229	264	26%
Mean	317		45%
Point Estimate	305		48%

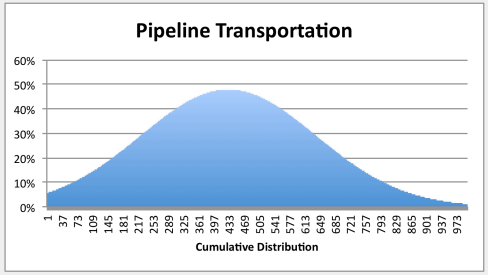
Worker Shortage - High Growth Scenario

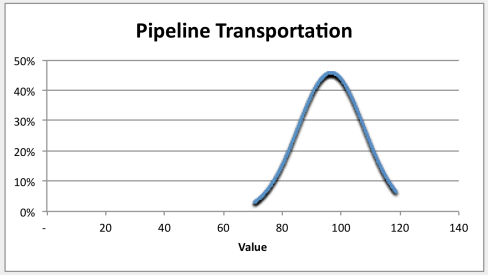




Distribution	100%	80%	Skewness
Max	657	601	14%
Min	379	434	24%
Mean	518		46%
Point Estimate	505		47%

Worker Shortage - Low Growth Scenario

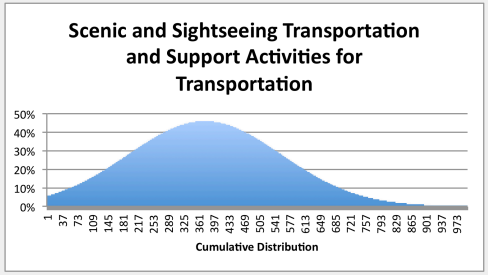


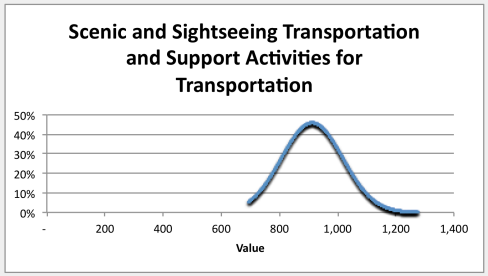


Distribution	100%	80%	Skewness
Max	119	109	25%
Min	70	80	16%
Mean	94		45%
Point Estimate	96		46%

Base Scenario	High Growth Scenario	Low Growth Scenario

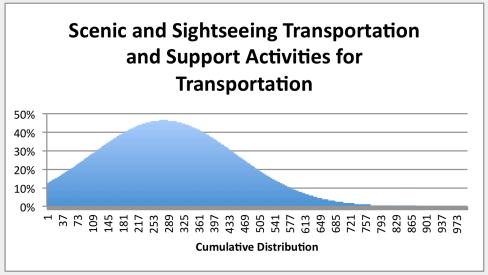
Worker Shortage - Base Scenario

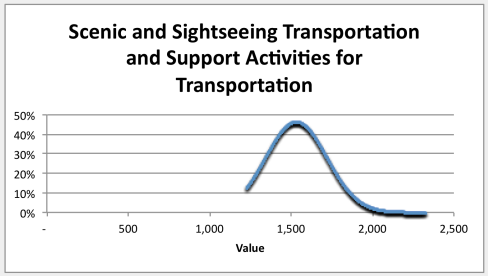




Distribution	100%	80%	Skewness
Max	1,274	1,157	3%
Min	691	807	29%
Mean	982		36%
Point Estimate	910		46%

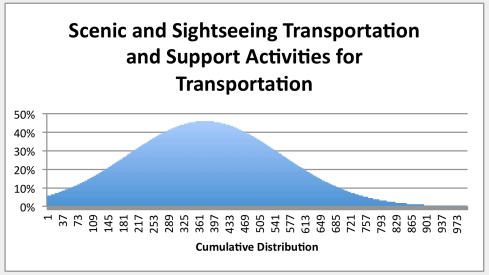
Worker Shortage - High Growth Scenario

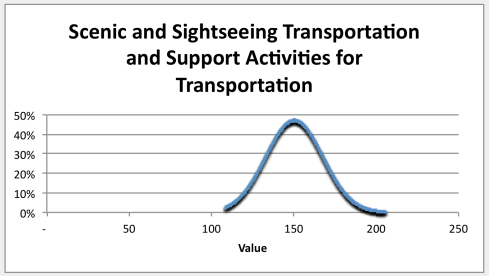




Distribution	100%	80%	Skewness
Max	2,324	2,102	0%
Min	1,223	1,442	42%
Mean	1,772		20%
Point Estimate	1,529		46%

Worker Shortage - Low Growth Scenario

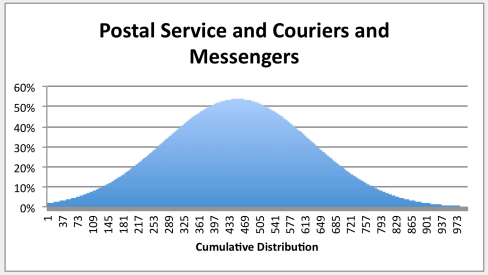


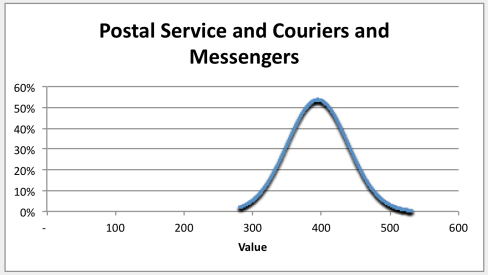


Distribution	100%	80%	Skewness
Max	205	186	6%
Min	108	127	20%
Mean	157		44%
Point Estimate	150		47%

Base Scenario

Worker Shortage - Base Scenario

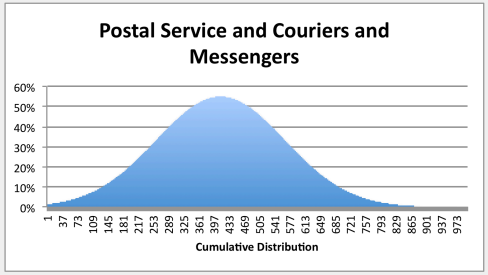


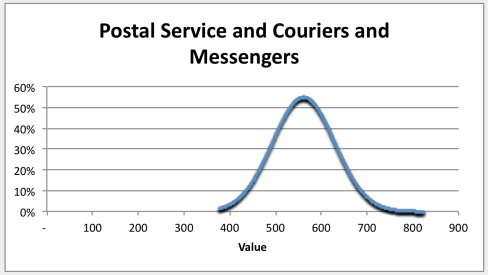


Distribution	100%	80%	Skewness
Max	532	481	8%
Min	280	330	19%
Mean	405		52%
Point Estimate	394		54%

High Growth Scenario

Worker Shortage - High Growth Scenario

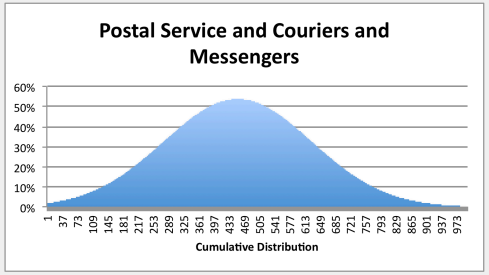


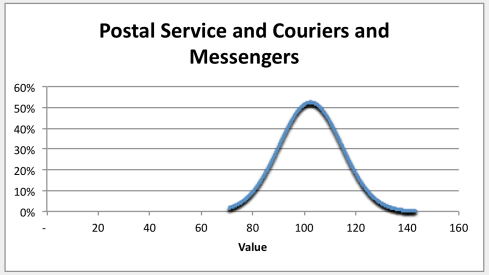


Distribution	100%	80%	Skewness
Max	823	733	2%
Min	375	464	21%
Mean	599		47%
Point Estimate	560		55%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

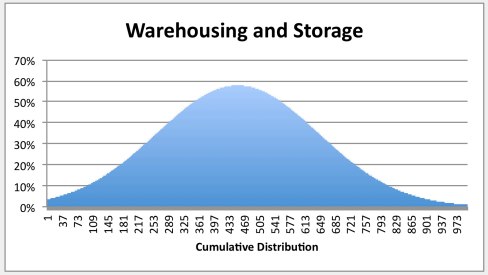


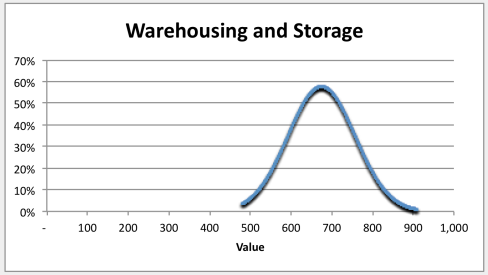


Distribution	100%	80%	Skewness
Max	143	128	5%
Min	70	85	19%
Mean	107		49%
Point Estimate	102		53%

Base Scenario

Worker Shortage - Base Scenario

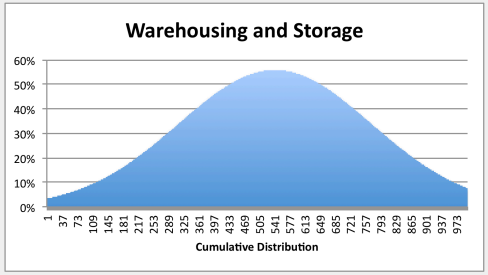


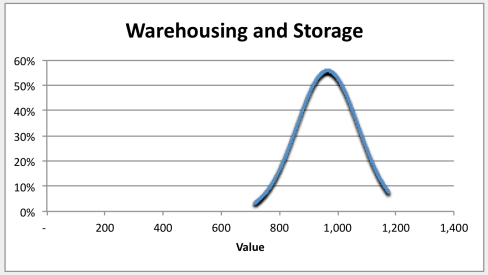


Distribution	100%	80%	Skewness
Max	908	822	11%
Min	478	563	24%
Mean	693		56%
Point Estimate	673		58%

High Growth Scenario

Worker Shortage - High Growth Scenario

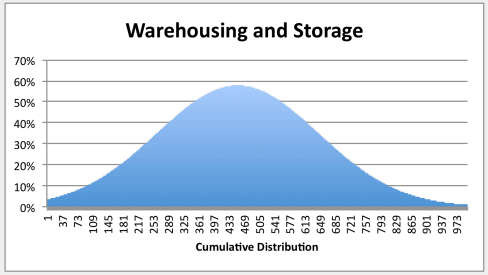


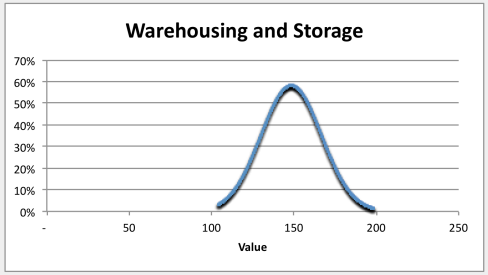


Distribution	100%	80%	Skewness
Max	1,175	1,082	30%
Min	712	804	18%
Mean	943		55%
Point Estimate	963		56%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

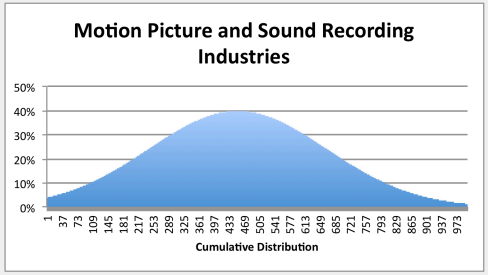


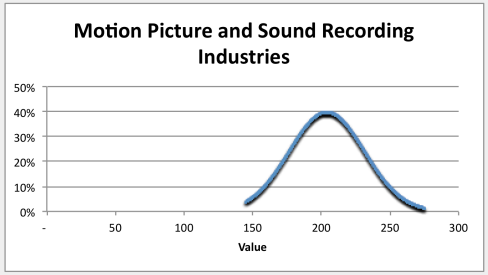


Distribution	100%	80%	Skewness
Max	198	179	14%
Min	104	122	22%
Mean	151		58%
Point Estimate	148		58%

Base Scenario

Worker Shortage - Base Scenario

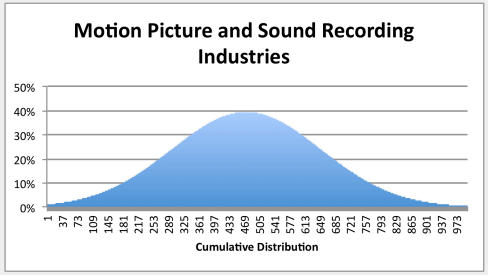


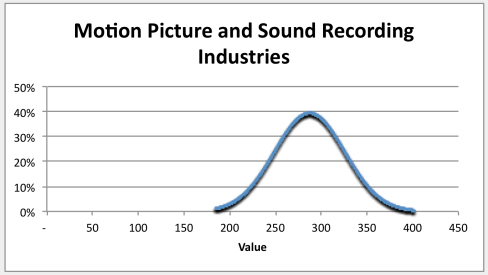


Distribution	100%	80%	Skewness
Max	275	249	10%
Min	145	170	19%
Mean	210		39%
Point Estimate	204		40%

High Growth Scenario

Worker Shortage - High Growth Scenario

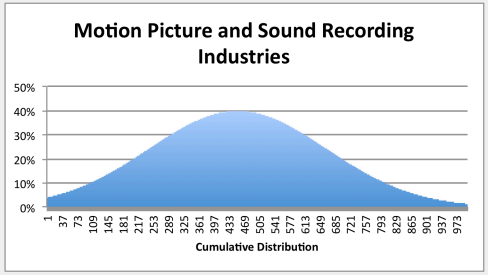


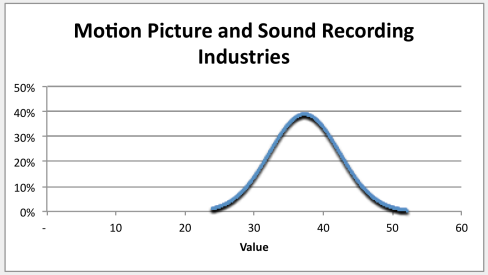


Distribution	100%	80%	Skewness
Max	401	357	7%
Min	183	227	12%
Mean	292		39%
Point Estimate	287		39%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

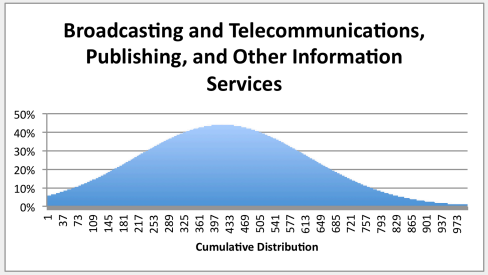


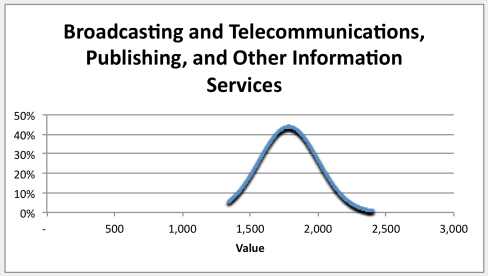


Distribution	100%	80%	Skewness
Max	52	46	8%
Min	24	29	12%
Mean	38		39%
Point Estimate	37		39%

Base Scenario

Worker Shortage - Base Scenario

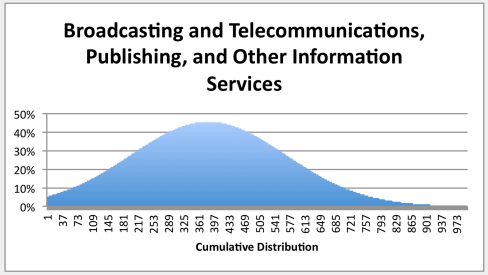


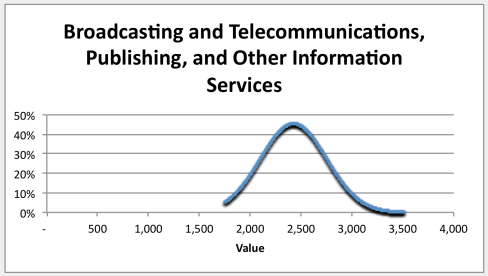


Distribution	100%	80%	Skewness
Max	2,401	2,186	8%
Min	1,334	1,546	25%
Mean	1,866		40%
Point Estimate	1,778		44%

High Growth Scenario

Worker Shortage - High Growth Scenario

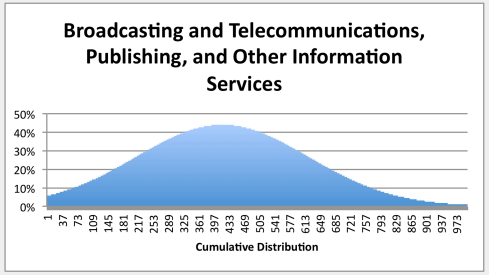


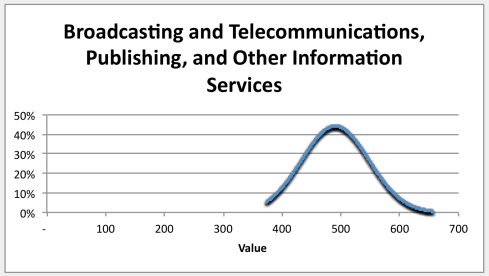


Distribution	100%	80%	Skewness
Max	3,509	3,154	4%
Min	1,742	2,094	28%
Mean	2,624		37%
Point Estimate	2,420		45%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

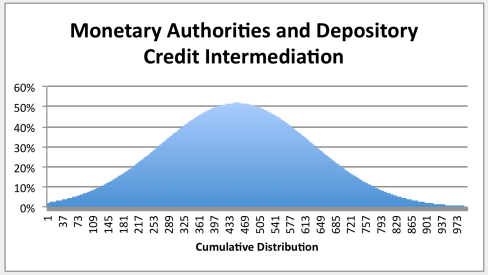


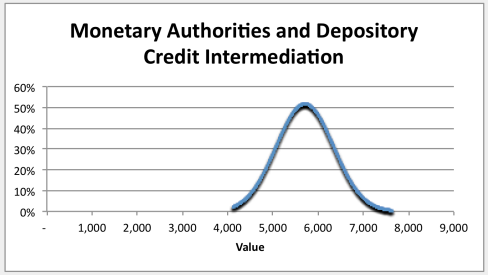


Distribution	100%	80%	Skewness
Max	656	599	7%
Min	372	428	25%
Mean	514		41%
Point Estimate	489		44%

Base Scenario

Worker Shortage - Base Scenario

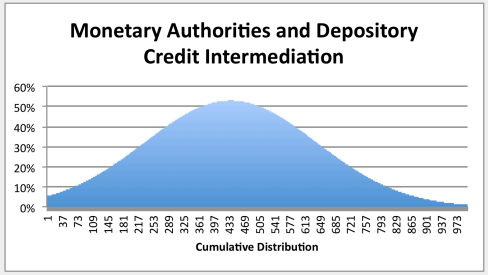


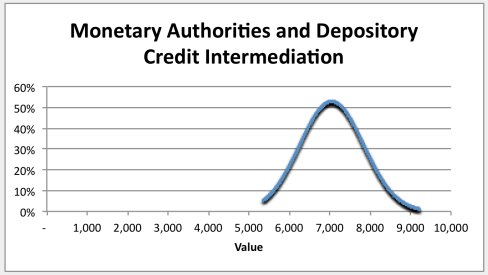


Distribution	100%	80%	Skewness
Max	7,628	6,919	8%
Min	4,099	4,801	19%
Mean	5,860		50%
Point Estimate	5,693		52%

High Growth Scenario

Worker Shortage - High Growth Scenario

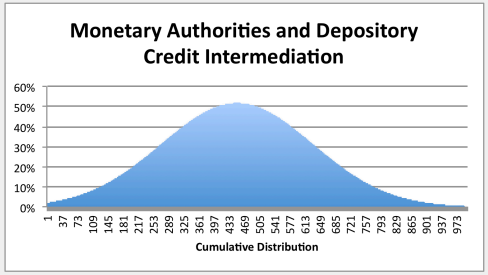


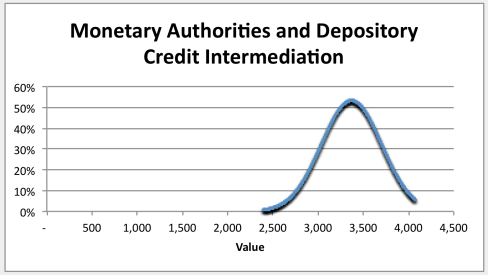


Distribution	100%	80%	Skewness
Max	9,214	8,436	11%
Min	5,346	6,115	27%
Mean	7,276		51%
Point Estimate	7,034		53%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

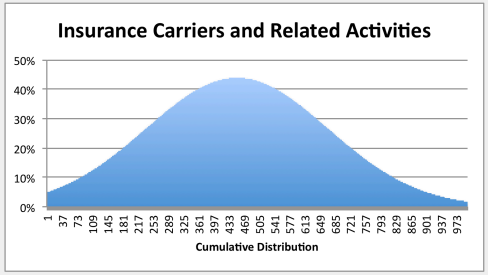


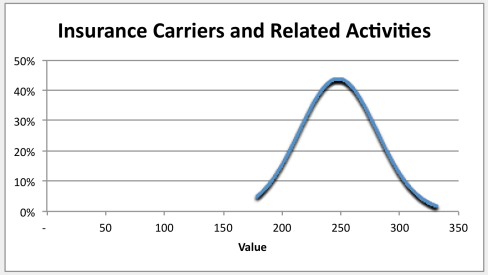


Distribution	100%	80%	Skewness
Max	4,069	3,731	29%
Min	2,388	2,722	8%
Mean	3,227		49%
Point Estimate	3,363		53%

Base Scenario

Worker Shortage - Base Scenario

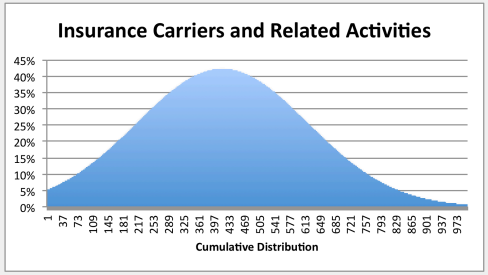


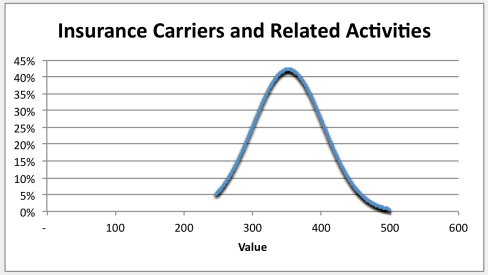


Distribution	100%	80%	Skewness
Max	331	300	12%
Min	178	208	22%
Mean	254		43%
Point Estimate	247		44%

High Growth Scenario

Worker Shortage - High Growth Scenario

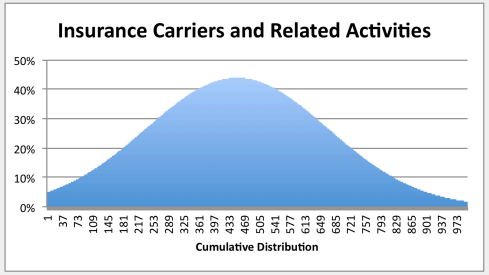


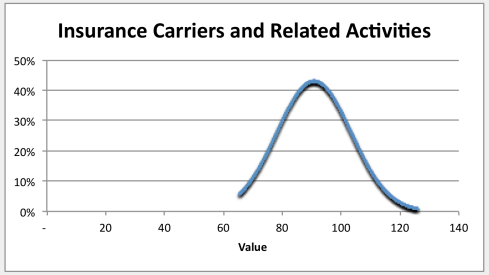


Distribution	100%	80%	Skewness
Max	498	448	7%
Min	246	296	24%
Mean	372		39%
Point Estimate	351		42%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

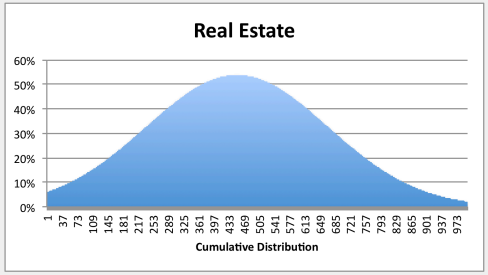


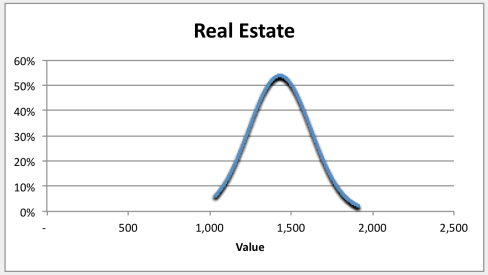


Distribution	100%	80%	Skewness
Max	126	114	8%
Min	65	77	25%
Mean	96		40%
Point Estimate	91		43%

Base Scenario

Worker Shortage - Base Scenario

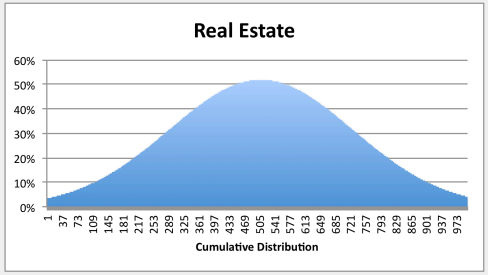


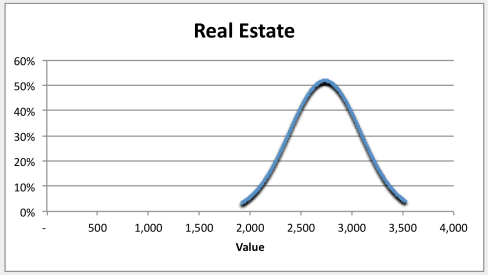


Distribution	100%	80%	Skewness
Max	1,913	1,735	15%
Min	1,028	1,204	27%
Mean	1,469		53%
Point Estimate	1,427		54%

High Growth Scenario

Worker Shortage - High Growth Scenario

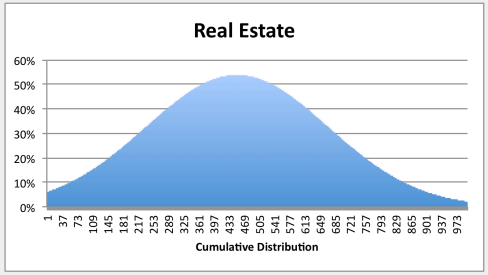


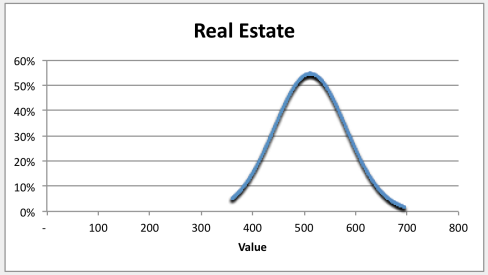


Distribution	100%	80%	Skewness
Max	3,520	3,196	21%
Min	1,910	2,230	19%
Mean	2,713		52%
Point Estimate	2,729		52%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

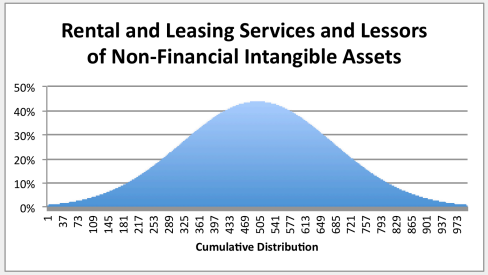


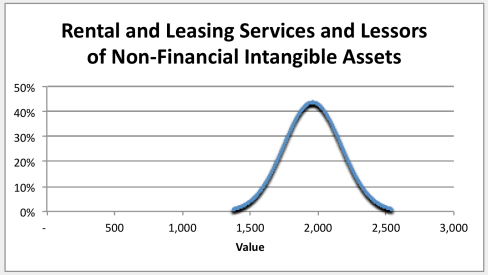


Distribution	100%	80%	Skewness
Max	694	627	14%
Min	357	425	26%
Mean	526		53%
Point Estimate	511		55%

Base Scenario

Worker Shortage - Base Scenario

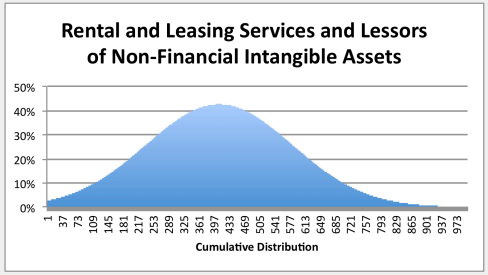


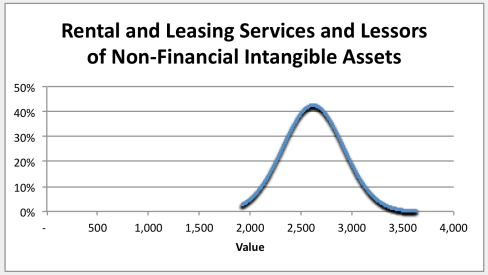


Distribution	100%	80%	Skewness
Max	2,540	2,304	11%
Min	1,368	1,601	11%
Mean	1,952		44%
Point Estimate	1,954		44%

High Growth Scenario

Worker Shortage - High Growth Scenario

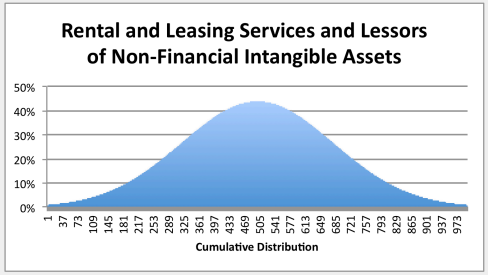


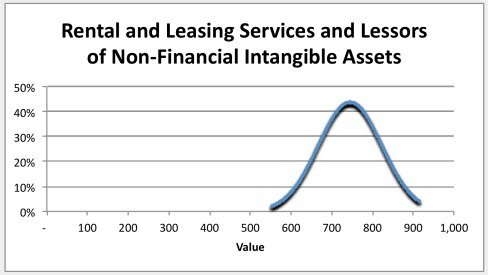


Distribution	100%	80%	Skewness
Max	3,631	3,285	3%
Min	1,907	2,250	21%
Mean	2,768		37%
Point Estimate	2,613		43%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

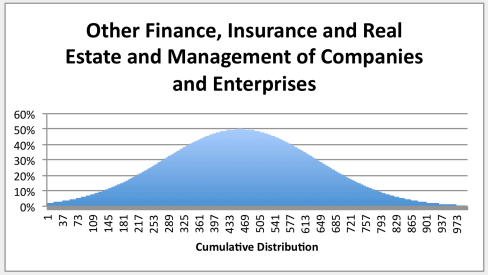


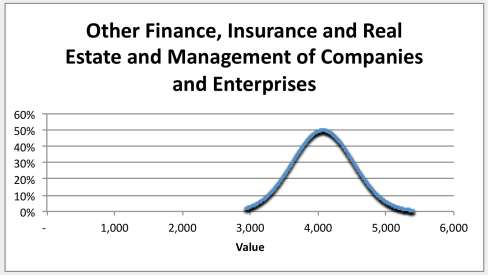


Distribution	100%	80%	Skewness
Max	914	841	20%
Min	550	622	13%
Mean	732		43%
Point Estimate	743		44%

Base Scenario

Worker Shortage - Base Scenario

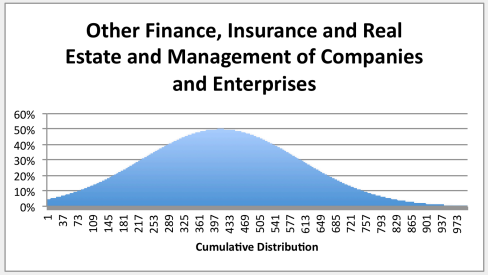


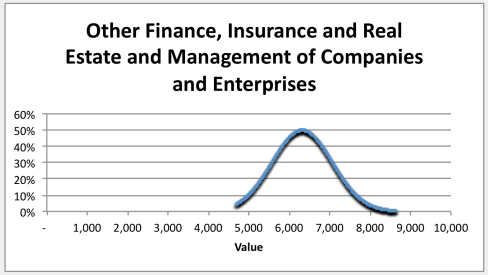


Distribution	100%	80%	Skewness
Max	5,401	4,903	9%
Min	2,924	3,417	18%
Mean	4,160		49%
Point Estimate	4,061		50%

High Growth Scenario

Worker Shortage - High Growth Scenario

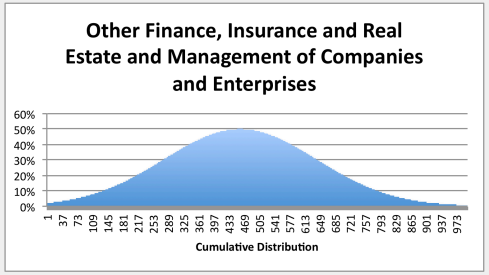


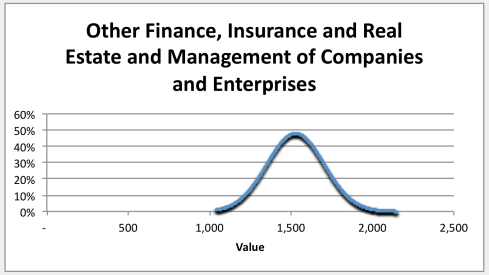


Distribution	100%	80%	Skewness
Max	8,636	7,838	6%
Min	4,665	5,455	26%
Mean	6,647		45%
Point Estimate	6,304		50%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

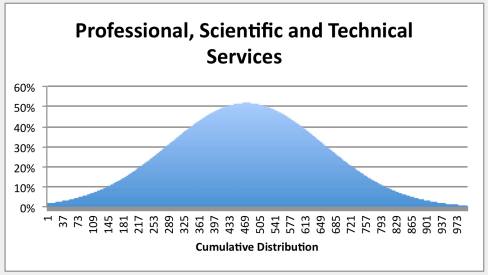


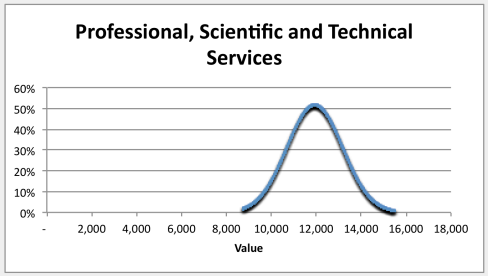


Distribution	100%	80%	Skewness
Max	2,149	1,925	4%
Min	1,036	1,258	15%
Mean	1,591		44%
Point Estimate	1,524		48%

Base Scenario

Worker Shortage - Base Scenario

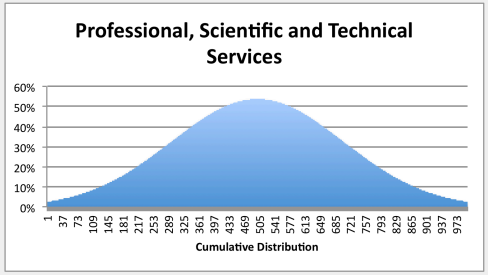


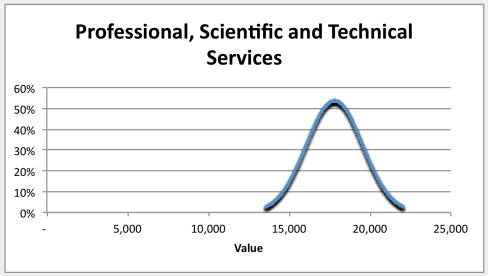


Distribution	100%	80%	Skewness
Max	15,478	14,114	11%
Min	8,692	10,042	17%
Mean	12,078		51%
Point Estimate	11,906		52%

High Growth Scenario

Worker Shortage - High Growth Scenario

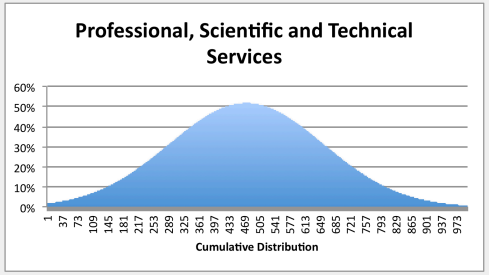


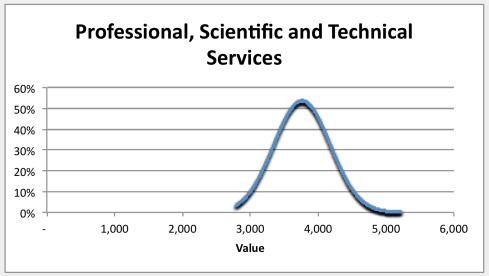


Distribution	100%	80%	Skewness
Max	22,033	20,319	18%
Min	13,504	15,201	18%
Mean	17,760		54%
Point Estimate	17,769		54%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

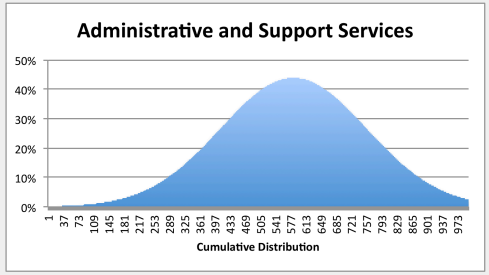


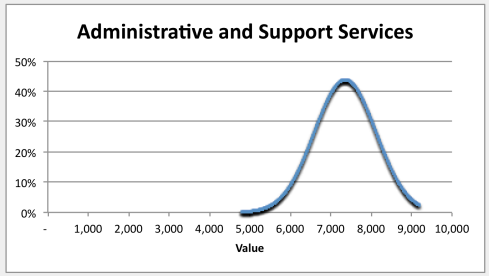


Distribution	100%	80%	Skewness
Max	5,216	4,726	4%
Min	2,777	3,262	27%
Mean	3,994		46%
Point Estimate	3,752		54%

Base Scenario

Worker Shortage - Base Scenario

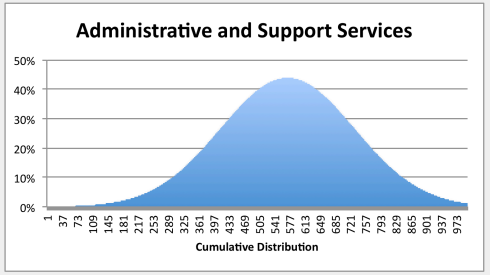


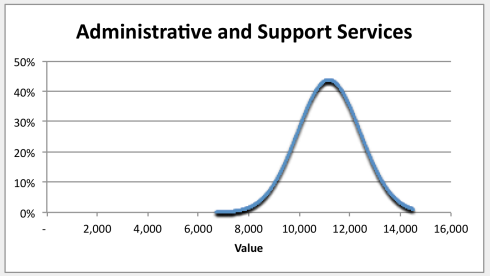


Distribution	100%	80%	Skewness
Max	9,180	8,294	20%
Min	4,773	5,650	4%
Mean	6,972		39%
Point Estimate	7,344		44%

High Growth Scenario

Worker Shortage - High Growth Scenario

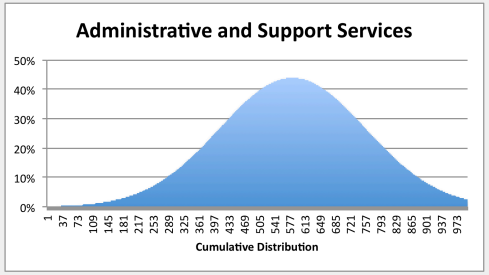


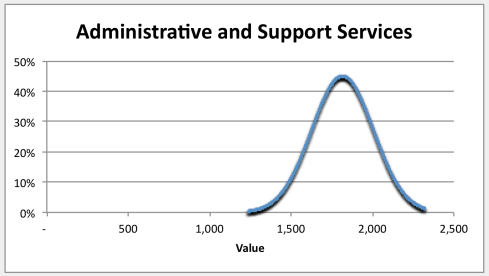


Distribution	100%	80%	Skewness
Max	14,486	12,918	16%
Min	6,686	8,238	3%
Mean	10,578		40%
Point Estimate	11,143		44%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

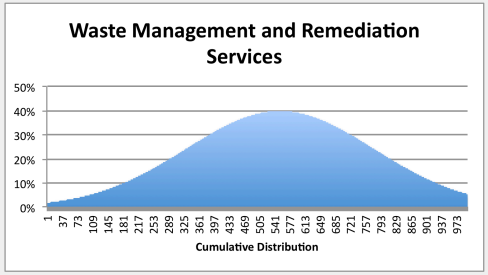


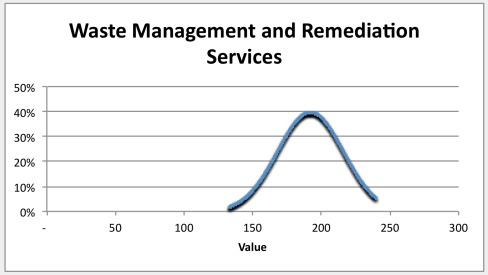


Distribution	100%	80%	Skewness
Max	2,319	2,101	14%
Min	1,232	1,449	7%
Mean	1,775		44%
Point Estimate	1,812		45%

Base Scenario	High Growth Scenario	Low Growth Scenario

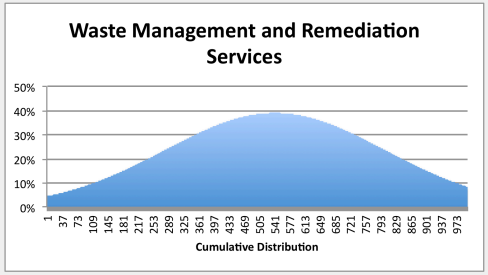
Worker Shortage - Base Scenario

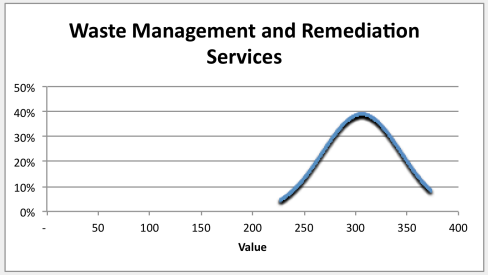




Distribution	100%	80%	Skewness
Max	240	218	22%
Min	132	154	11%
Mean	186		39%
Point Estimate	192		40%

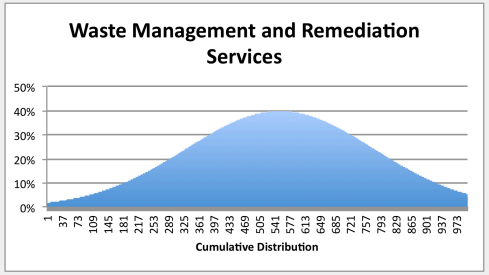
Worker Shortage - High Growth Scenario

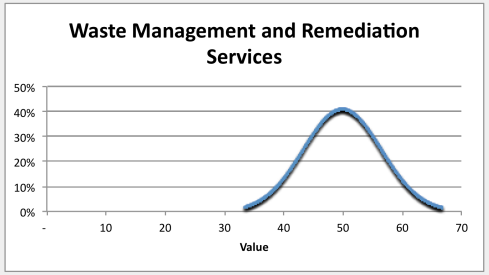




Distribution	100%	80%	Skewness
Max	373	343	24%
Min	226	255	17%
Mean	299		39%
Point Estimate	306		39%

Worker Shortage - Low Growth Scenario

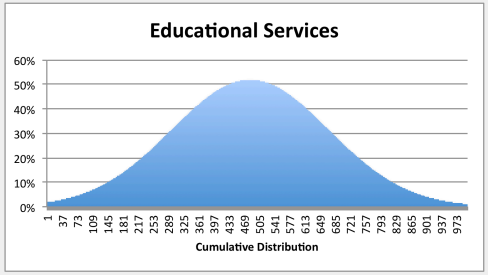


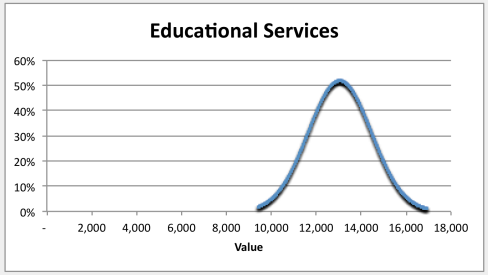


Distribution	100%	80%	Skewness
Max	67	60	12%
Min	33	40	14%
Mean	50		41%
Point Estimate	50		41%

Base Scenario

Worker Shortage - Base Scenario

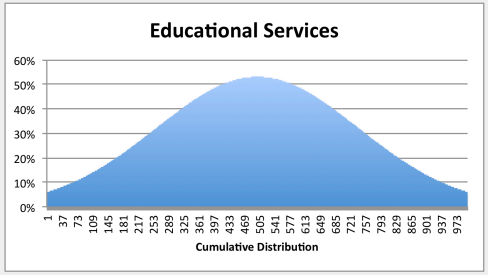


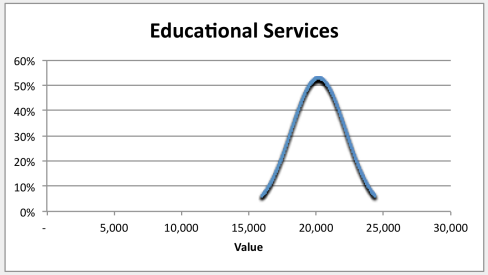


Distribution	100%	80%	Skewness
Max	16,930	15,412	12%
Min	9,377	10,880	16%
Mean	13,146		52%
Point Estimate	13,023		52%

High Growth Scenario

Worker Shortage - High Growth Scenario

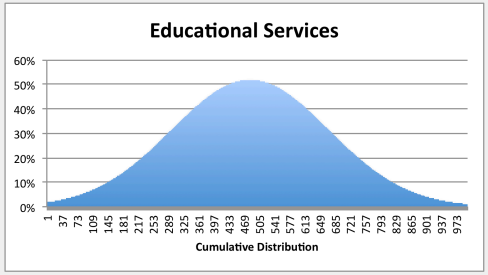


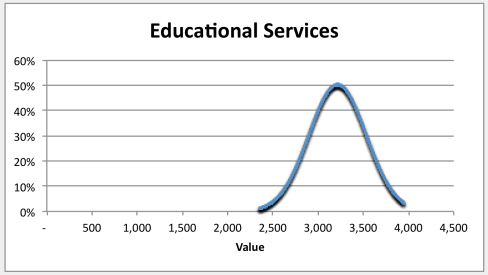


Distribution	100%	80%	Skewness
Max	24,361	22,662	24%
Min	15,905	17,588	24%
Mean	20,125		53%
Point Estimate	20,133		53%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

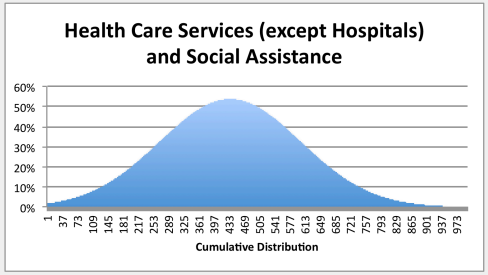


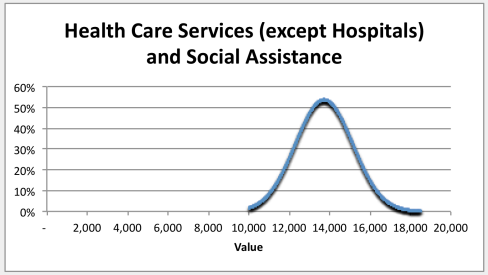


Distribution	100%	80%	Skewness
Max	3,947	3,624	21%
Min	2,342	2,662	11%
Mean	3,143		49%
Point Estimate	3,209		50%

Base Scenario

Worker Shortage - Base Scenario

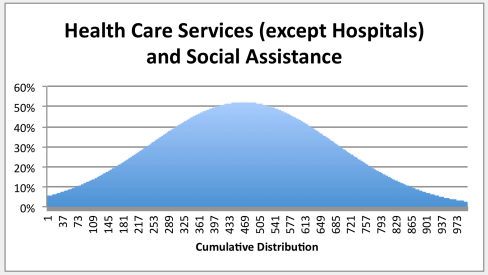


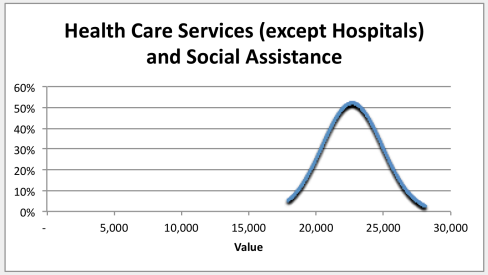


Distribution	100%	80%	Skewness
Max	18,491	16,784	5%
Min	9,999	11,689	20%
Mean	14,236		50%
Point Estimate	13,697		54%

High Growth Scenario

Worker Shortage - High Growth Scenario

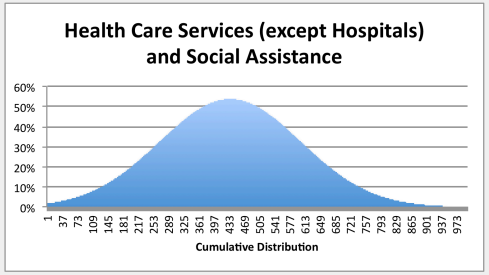


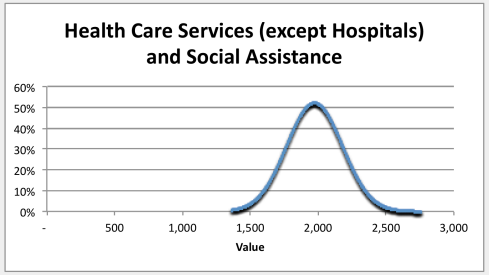


Distribution	100%	80%	Skewness
Max	28,068	26,021	17%
Min	17,882	19,909	25%
Mean	22,965		52%
Point Estimate	22,636		52%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

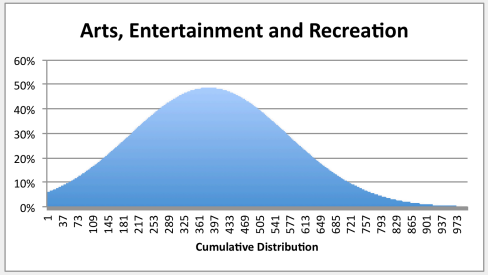


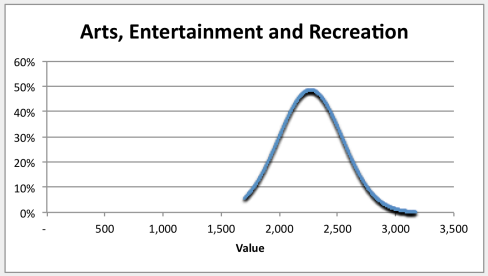


Distribution	100%	80%	Skewness
Max	2,756	2,475	3%
Min	1,358	1,637	14%
Mean	2,056		48%
Point Estimate	1,969		52%

Base Scenario

Worker Shortage - Base Scenario

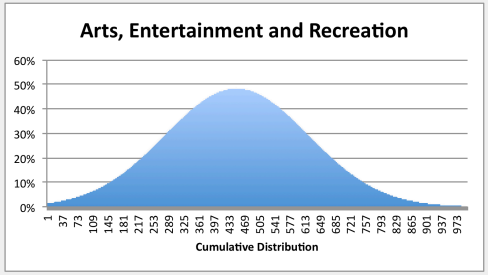


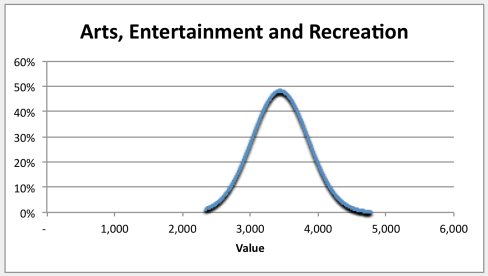


Distribution	100%	80%	Skewness
Max	3,167	2,871	4%
Min	1,697	1,989	30%
Mean	2,430		40%
Point Estimate	2,262		49%

High Growth Scenario

Worker Shortage - High Growth Scenario

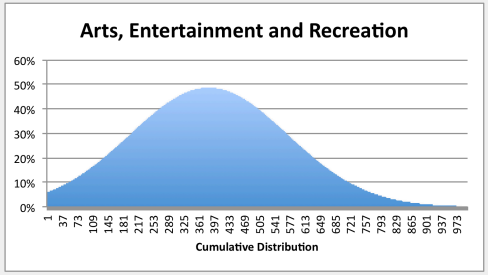


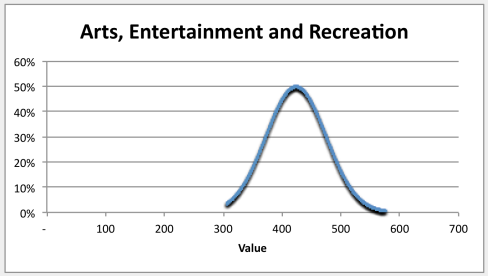


Distribution	100%	80%	Skewness
Max	4,768	4,279	6%
Min	2,333	2,817	16%
Mean	3,548		46%
Point Estimate	3,430		48%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

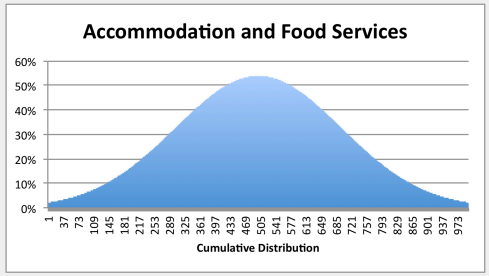


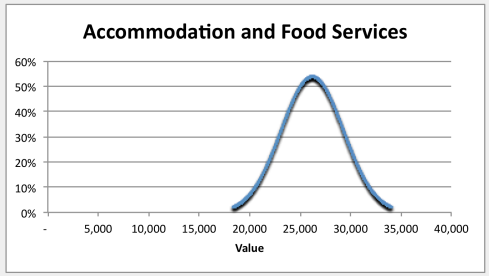


Distribution	100%	80%	Skewness
Max	575	520	8%
Min	304	358	23%
Mean	439		47%
Point Estimate	423		50%

Base Scenario

Worker Shortage - Base Scenario

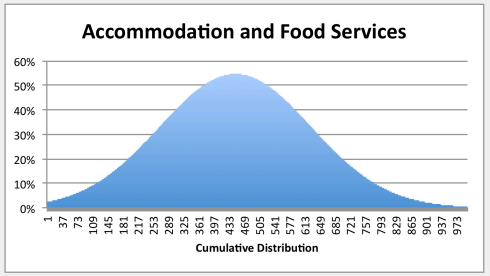


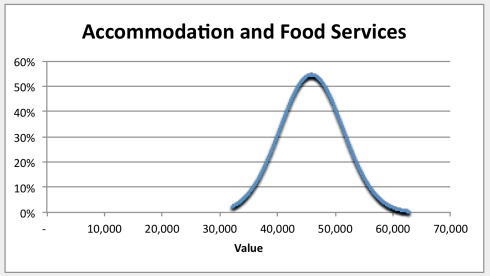


Distribution	100%	80%	Skewness
Max	33,984	30,831	17%
Min	18,299	21,420	17%
Mean	26,126		54%
Point Estimate	26,141		54%

High Growth Scenario

Worker Shortage - High Growth Scenario

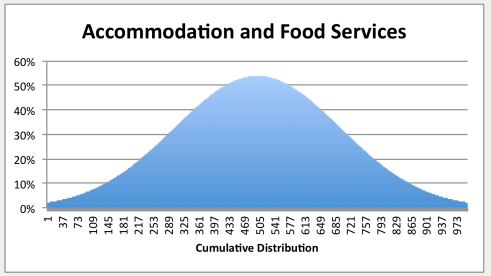


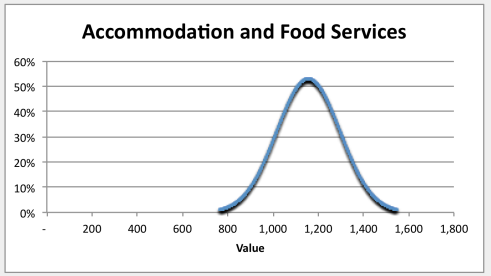


Distribution	100%	80%	Skewness
Max	62,689	56,527	8%
Min	32,031	38,132	21%
Mean	47,329		52%
Point Estimate	45,758		55%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

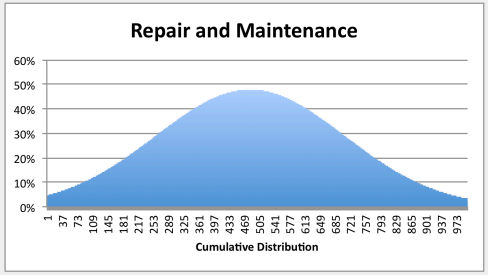


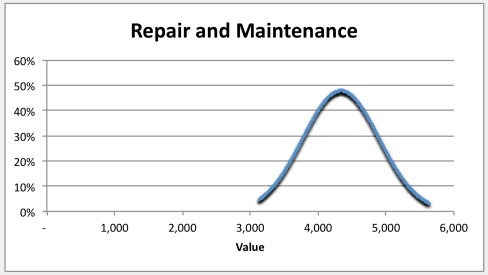


Distribution	100%	80%	Skewness
Max	1,545	1,388	13%
Min	761	917	13%
Mean	1,153		53%
Point Estimate	1,153		53%

Base Scenario

Worker Shortage - Base Scenario

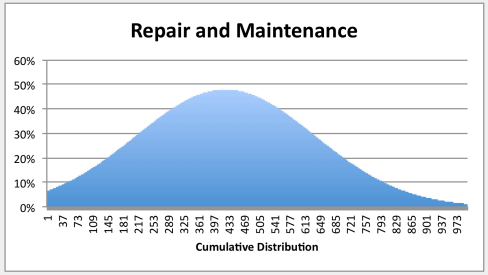


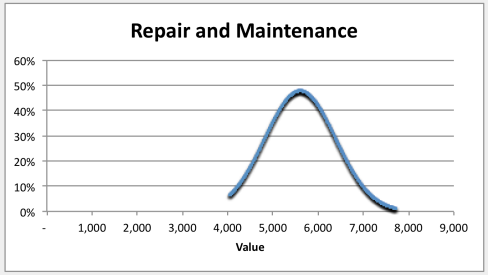


Distribution	100%	80%	Skewness
Max	5,624	5,119	18%
Min	3,115	3,614	21%
Mean	4,367		48%
Point Estimate	4,326		48%

High Growth Scenario

Worker Shortage - High Growth Scenario

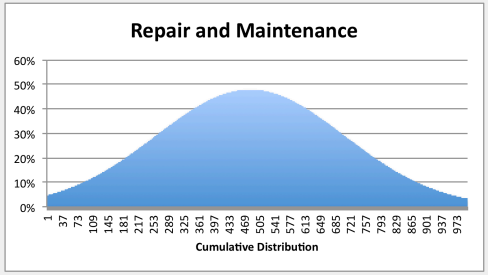


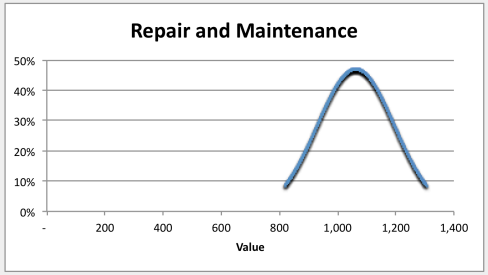


Distribution	100%	80%	Skewness
Max	7,714	6,972	10%
Min	4,025	4,759	27%
Mean	5,866		45%
Point Estimate	5,590		48%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

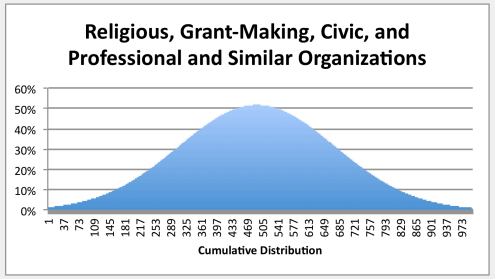


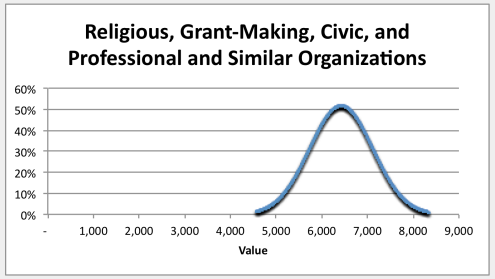


Distribution	100%	80%	Skewness
Max	1,304	1,206	26%
Min	816	913	25%
Mean	1,060		47%
Point Estimate	1,060		47%

Base Scenario

Worker Shortage - Base Scenario

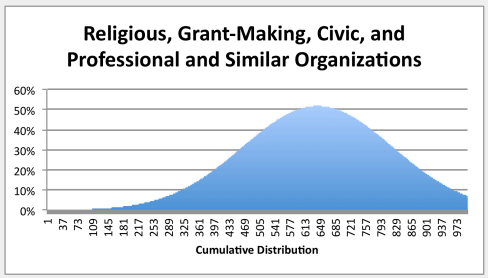


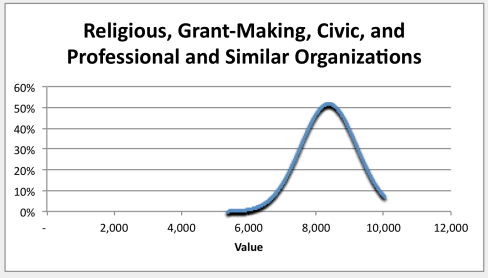


Distribution	100%	80%	Skewness
Max	8,334	7,573	13%
Min	4,551	5,304	15%
Mean	6,439		52%
Point Estimate	6,410		52%

High Growth Scenario

Worker Shortage - High Growth Scenario

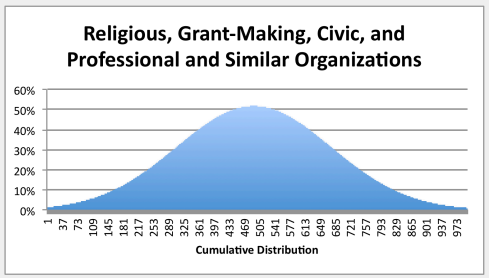


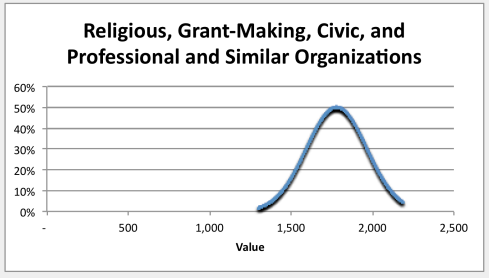


Distribution	100%	80%	Skewness
Max	10,023	9,083	35%
Min	5,346	6,276	2%
Mean	7,680		37%
Point Estimate	8,353		52%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

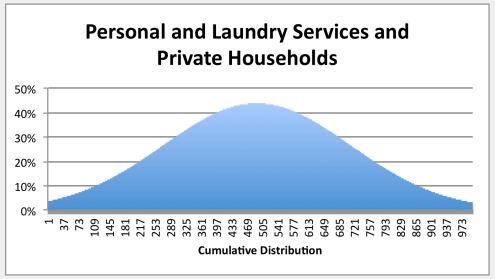




Distribution	100%	80%	Skewness
Max	2,184	2,006	23%
Min	1,296	1,473	13%
Mean	1,739		49%
Point Estimate	1,776		50%

Base Scenario

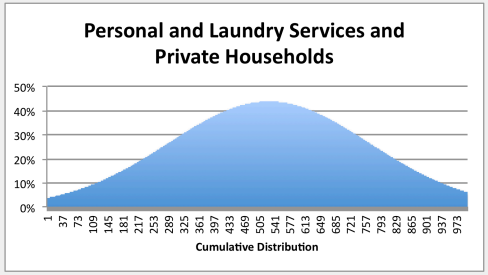
Worker Shortage - Base Scenario



Distribution	100%	80%	Skewness
Max	7,487	6,804	17%
Min	4,089	4,766	18%
Mean	5,785		44%
Point Estimate	5,760		44%

High Growth Scenario

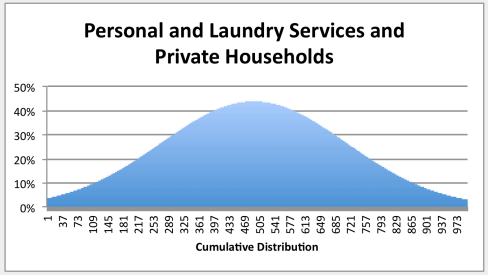
Worker Shortage - High Growth Scenario



Distribution	100%	80%	Skewness
Max	11,384	10,385	23%
Min	6,415	7,403	17%
Mean	8,894		44%
Point Estimate	9,035		44%

Low Growth Scenario

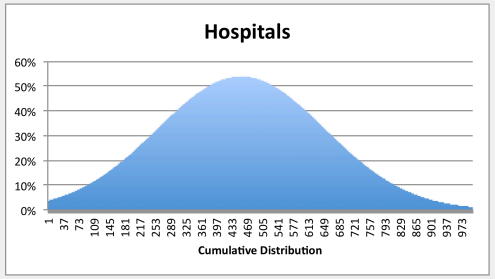
Worker Shortage - Low Growth Scenario

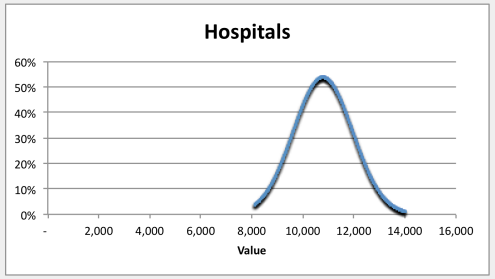


Distribution	100%	80%	Skewness
Max	2,026	1,843	8%
Min	1,116	1,297	32%
Mean	1,570		40%
Point Estimate	1,468		45%

Base Scenario

Worker Shortage - Base Scenario

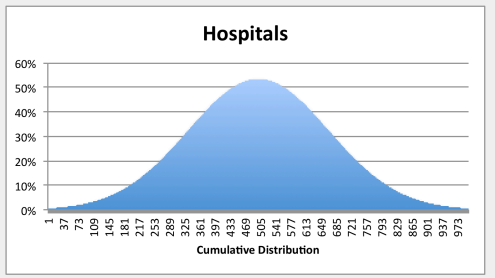


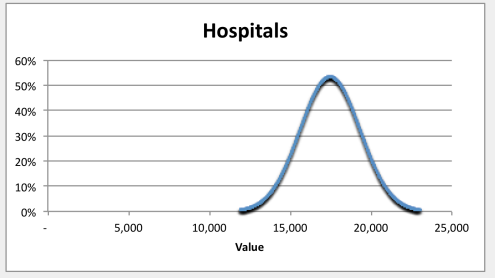


Distribution	100%	80%	Skewness
Max	13,990	12,800	12%
Min	8,071	9,249	23%
Mean	11,025		53%
Point Estimate	10,762		54%

High Growth Scenario

Worker Shortage - High Growth Scenario

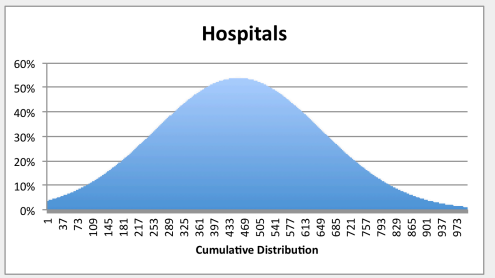


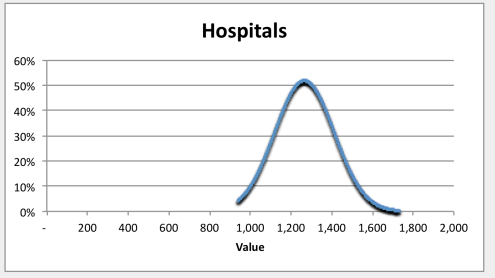


Distribution	100%	80%	Skewness
Max	23,007	20,765	11%
Min	11,852	14,072	11%
Mean	17,418		53%
Point Estimate	17,430		53%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

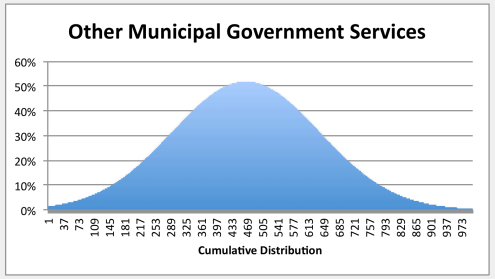


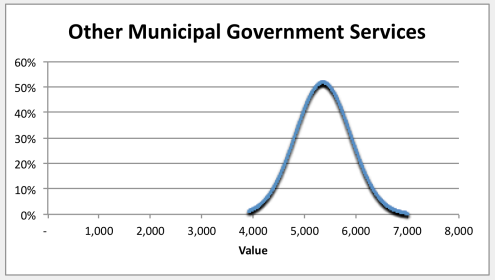


Distribution	100%	80%	Skewness
Max	1,730	1,570	6%
Min	934	1,093	26%
Mean	1,331		46%
Point Estimate	1,263		52%

Base Scenario

Worker Shortage - Base Scenario

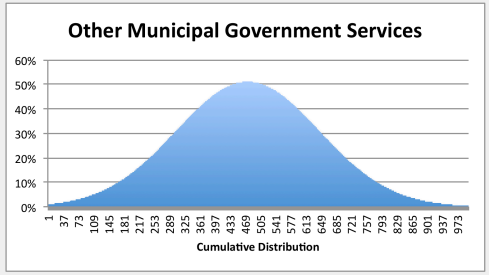


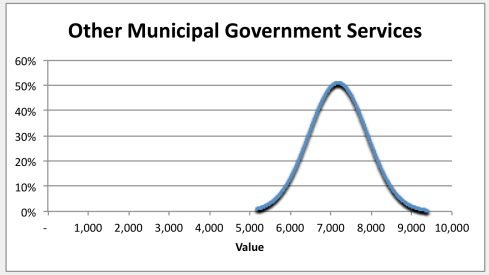


Distribution	100%	80%	Skewness
Max	6,998	6,375	8%
Min	3,900	4,516	16%
Mean	5,446		51%
Point Estimate	5,342		52%

High Growth Scenario

Worker Shortage - High Growth Scenario

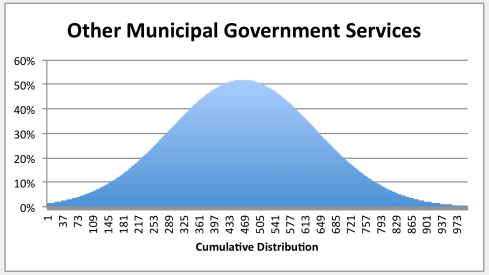


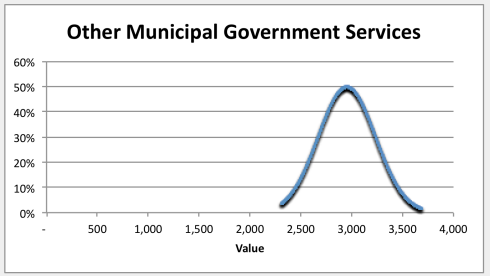


Distribution	100%	80%	Skewness
Max	9,389	8,539	8%
Min	5,161	6,002	14%
Mean	7,271		51%
Point Estimate	7,167		51%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

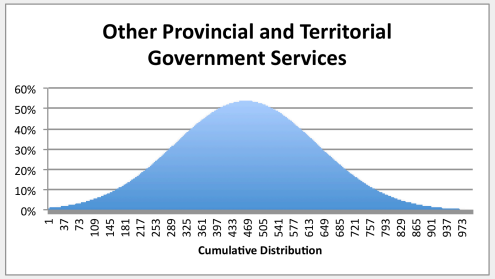


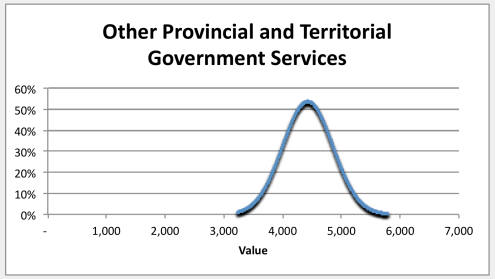


Distribution	100%	80%	Skewness
Max	3,682	3,404	13%
Min	2,298	2,573	21%
Mean	2,989		49%
Point Estimate	2,946		50%

Base Scenario

Worker Shortage - Base Scenario

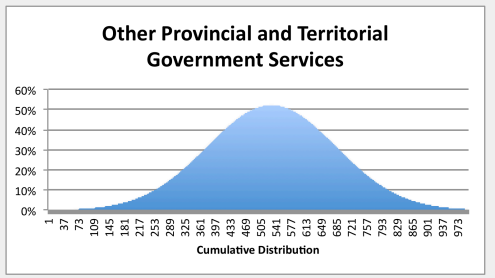


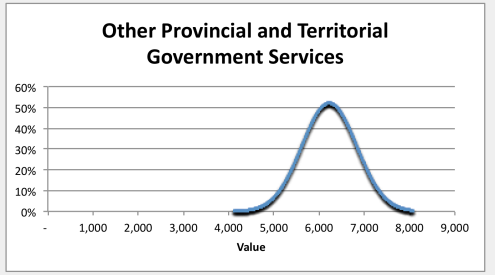


Distribution	100%	80%	Skewness
Max	5,785	5,270	7%
Min	3,224	3,733	15%
Mean	4,502		53%
Point Estimate	4,416		54%

High Growth Scenario

Worker Shortage - High Growth Scenario

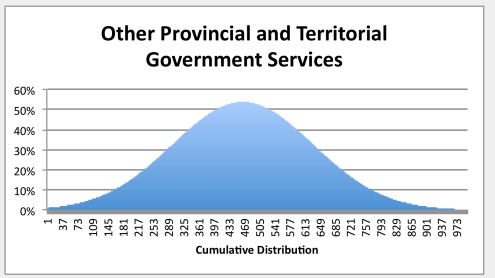


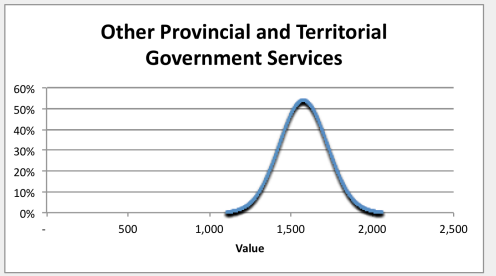


Distribution	100%	80%	Skewness
Max	8,073	7,274	11%
Min	4,099	4,890	5%
Mean	6,082		51%
Point Estimate	6,210		52%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

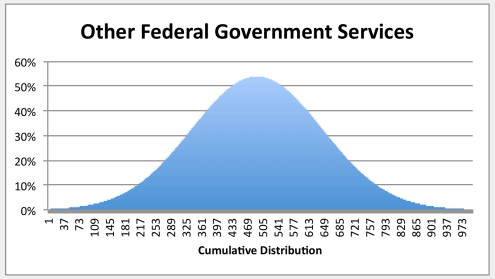


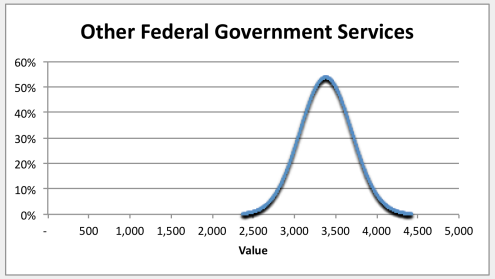


Distribution	100%	80%	Skewness
Max	2,061	1,868	7%
Min	1,101	1,292	9%
Mean	1,580		54%
Point Estimate	1,573		54%

Base Scenario

Worker Shortage - Base Scenario

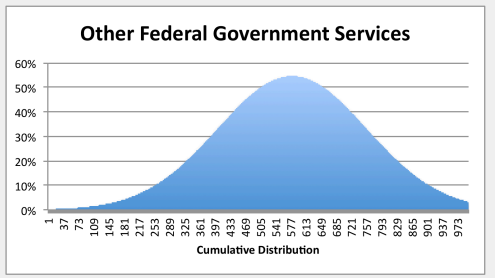


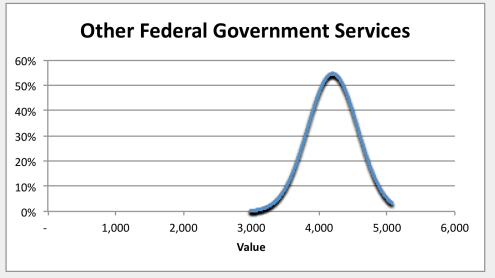


Distribution	100%	80%	Skewness
Max	4,420	4,006	7%
Min	2,362	2,771	9%
Mean	3,388		54%
Point Estimate	3,374		54%

High Growth Scenario

Worker Shortage - High Growth Scenario

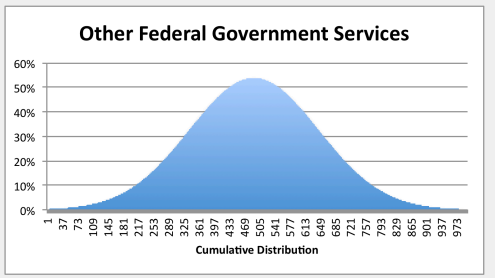


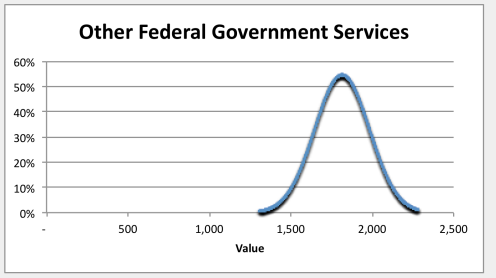


Distribution	100%	80%	Skewness
Max	5,068	4,647	25%
Min	2,974	3,391	5%
Mean	4,019		49%
Point Estimate	4,189		55%

Low Growth Scenario

Worker Shortage - Low Growth Scenario

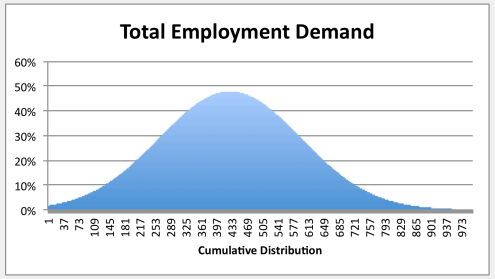


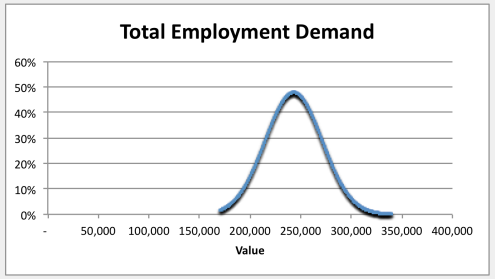


Distribution	100%	80%	Skewness
Max	2,281	2,085	15%
Min	1,304	1,498	10%
Mean	1,792		54%
Point Estimate	1,811		55%

Base Scenario	High Growth Scenario	Low Growth Scenario

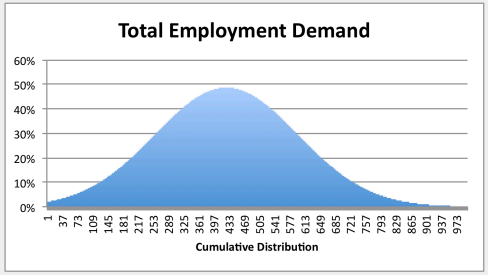
Worker Shortage - Base Scenario

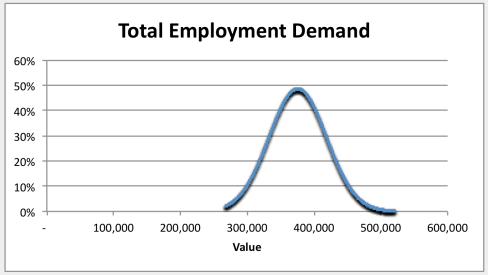




Distribution	100%	80%	Skewness
Max	339,502	289,876	4%
Min	169,751	193,246	19%
Mean	246,458		44%
Point Estimate	242,501		48%

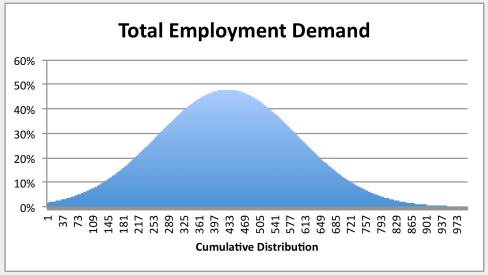
Worker Shortage - High Growth Scenario

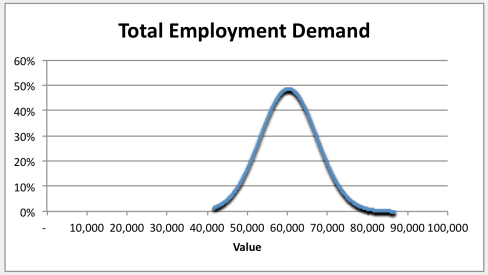




Distribution	100%	80%	Skewness
Max	520,849	443,847	4%
Min	266,045	312,542	20%
Mean	378,197		44%
Point Estimate	374,711		49%

Worker Shortage - Low Growth Scenario





Distribution	100%	80%	Skewness
Max	86,622	73,427	2%
Min	41,506	50,138	19%
Mean	61,337		42%
Point Estimate	60,154		49%