IBI FULL COST ESTIMATOR (FCE) 6.1

TECHNICAL APPENDIX

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INTRODUCTION

The Full Cost Estimator (FCE) provides an estimate of an organization's health and productivity costs based on organizational characteristics and benefits policies. The tool requires just two pieces of information to produce an organization's cost estimates of:

- Sick day wage replacements and opportunity costs
- Presenteeism opportunity costs
- Worker's compensation (WC) medical payments, wage replacements, other costs and opportunity costs
- Short-term disability (STD) wage replacements and opportunity costs
- Long-term disability (LTD) wage replacements
- Stand-alone Family and Medical Leave Act (FMLA) opportunity costs and costs of employee benefits
- Healthcare benefits spend

Table 1 lists the sources of the underlying data. These are scheduled to be updated with the latest available information in the spring of each calendar year.

Table 1: Summary of estimate element sources

Data Element	Source	Resource	Data year
Industry employee headcount	Bureau of Labor Statistics (BLS)	Occupational Employment Statistics	2017
Average wage			
Industry occupational distribution			
Benefits load	Bureau of Labor Statistics (BLS)	National Compensation Survey	March 2017
Sick day absence rate	Centers for Disease Control and Prevention	National Health Interview Survey (NHIS)	2006-2016
Presenteeism	Integrated Benefits Institute	HPQ-Select	2004, 2009
WC incidence rate	BLS	Injuries, Illness and Fatalities	2016
State WC wage replacement rates and maximum benefit values	National Academy of Social Insurance	Workers' Compensation: Benefits, Coverage, and Costs, 2015. 2017. Washington, DC: National Academy of Social Insurance.	2017

Data Element	Source	Resource	Data year
STD incidence rate	Integrated Benefits Institute	IBI Health and Productivity Benchmarking	2017
STD absence duration			
LTD incidence rate			
LTD absence duration			
FMLA incidence rate			
FMLA absence duration			
WC Absence duration			
WC Medical costs			
WC non-wage indemnity costs			
STD and LTD participation and wage replacement rates	BLS	Employee Benefits Survey	March 2017
Industry sex distribution	BLS	Current Population Survey	March 2016
Industry age distribution			
Opportunity cost multiplier method	Nicholson, S., Pauly, M.V., Polsky, D., et al.	"Measuring the effects of work loss on productivity with team production," Health Economics, vol. 15, issue 2, pp111-123.	N.A.

MINIMAL INFORMATION REQUIRED FOR INDUSTRY/FIRM SIZE ESTIMATE

Industry

Industry is the key for assigning default values when users do not provide other pieces of information. From industry we derive defaults for:

- Industry headcount
- Full-time employees
- Total payroll
- Benefits costs, by type (including health)
- Costs and absence components of opportunity costs multiplier (see the description at the end of this document)
- Percentage of employees eligible for paid incidental absences
- Percentage of employees participating in an organization's short- and long-term disability programs
- Workplace illness/injury incidents
- Workers' Compensation lost workdays, medical costs, and non-wage indemnity costs.
- STD pregnancy and non-pregnancy claims and lost workdays
- LTD claims and lost workdays
- FMLA lost work days
- Sex, age, and occupation distributions

We also use industry as one component in the regression estimation of sick day absences.

We categorize organizations by their 2-, 3- or 4-digit NAICS industry. We cross-walk to different levels of the NAICS and SIC systems where necessary. This allows us to draw information from the broadest sources possible, at the deepest industry level available.

Total Headcount

Users supply the total headcount (number of employees regardless of whether they are full-time or part-time).

REFINEMENTS TO ESTIMATED VALUES

Wages and benefits policies

Users can refine their estimates by entering their organization's actual values for:

- The % of employees who are full-time (FT%). Lost work day metrics are weighted by the number of full-time equivalents (FTEs) to calculate the organizational lost-time totals.

We calculate the FTE weight based on the proportion of full-time employees plus one half of the part-time employees. Mathematically, this solves to equation 1:

$$FTE\ weight = \frac{FT\% + 100\%}{2}$$

Equation 1

- The % of employees eligible for pay when absent due to an incidental sick day illness
- The % of employees that participate in their STD and LTD programs
- Disability wage replacement policies
- Average daily wages
- Benefits load

ASSUMPTIONS USED FOR SPECIFIC SECTIONS

Wage and benefits

We use BLS information to estimate mean wages at the 2-, 3- or 4-digit NAICS industry.

We use NAICS2 – the top NAICS level – to derive benefits costs. For each benefits component, we calculate an individual benefits load equal to:

$$BL = \frac{Wages + benefits\ component}{wages}$$

Equation 2

Once a component's benefits load is calculated, that component's total costs, C, are estimated as

$$C = (BL - 1) * Wages$$

Equation 3

Benefits components are defined as the following:

- **Paid leave** includes vacations, holidays and personal days. It excludes sick leave.
- **Supplemental pay** includes overtime and premium, shift differentials and nonproduction bonuses.
- **Insurance** includes life health, STD, and LTD insurance. The source data specify that the health insurance data are for premiums. STD and LTD insurance may be counted on the same basis.
- **Retirement** includes both defined benefit and defined contribution expenses
- **Legal requirements** include social security and Medicare contributions, federal and state unemployment insurance and Workers' Compensation.

Costs of Absences

Sick days

One year's worth of sick day absences is predicted using data from the National Health Interview Survey (NHIS), a nationally representative household survey administered annually by Centers for Disease Control and Prevention.[1] The sample is from years 2006-2016, and is limited to full-time employees. The OLS regression equation is:

$$\hat{S}ick\ days = \alpha + \beta_1 Female + \beta_2 Age\ groups + \beta_3 Paid\ sick\ policy + \beta_4 Industry\ groups + \beta_5 Occupation\ groups + \beta_7 Data\ Year + \varepsilon$$

Equation 4

The age groups are 35-54, and 55+, with 18-34 excluded for reference. Industry groups are dummy variables for one-digit SIC (SIC1) categories are agriculture; construction; finance; manufacturing; mining; wholesale and retail trade; and services; with transportation, communications, and utilities excluded for reference. The occupation groups are technical and craft workers; sales, office, and administrative workers; and laborers and service workers. Executive, professional and senior management workers are excluded for reference. Sick day policy is a dichotomous variable indicating whether or not a worker's employer pays for sick day absences. We model the data year in the equation.

We use Equation 4 to estimate the average employee's sick days based on the default values of the independent variables. The predicted value is then multiplied by the number of FTE-weighted employees (FTEs) to derive the total number of lost work days. To differentiate the number of paid and unpaid sick day absences, we solve the Equation 4 when paid sick days equals 1 and when paid sick days equals zero, and then multiply the values by the number of employees eligible for paid and unpaid sick days. [2] When users do not provide the percentage eligible for paid sick days, we use industry-level estimates from the NHIS.

Wage replacement costs

The total number of paid lost work days is multiplied by the average daily wage to produce the wage replacement costs of absences:

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[1] The survey asks the following question of all employed adults who had a job or business in the past 12 months:

> "During the PAST 12 MONTHS, that is, since {12-month ref. date}, ABOUT how many days did you miss work at a job or business because of illness or injury (do not include maternity leave)?"

[2] When an organization caps the number of paid sick days available, assuming that 100% of sick days are paid will bias the estimate of sick day wage replacement payments upwards. This should not result in an unacceptably high bias in most cases; given the regression coefficients, the maximum estimated value is 6.1 days per employee. This is probably lower than the maximum number of paid days for most organizations, and is more than twice the average value. An organization would have to have a very low maximum before the upwards bias becomes an issue.

$$Sick\ day\ absence\ costs = \widehat{Paid}\ sick\ days \times FTEs \times Average\ daily\ wages\ and\ benefits$$

Equation 5

Sick day opportunity costs

Whether or not sick day absences are paid, the total number of sick day absences is multiplied by the average daily wage and the fractional value of the absence opportunity multiplier to produce the opportunity costs of absences:

$$\begin{aligned} &Sick\ day\ opportunity\ costs \\ &\qquad = \widehat{Sick}\ days \times Average\ daily\ wages\ and\ benefits \times FTEs \\ &\qquad \times (Absence\ multiplier - 1) \end{aligned}$$

Equation 6

Presenteeism

IBI uses the term presenteeism to denote "episodes of illness … when employees show up at work but are unable to contribute at their usual level of performance because of either the symptoms of illness or the side effects of treatments (Greenberg and Birnbaum, 2006, p. 31)."[3] The research literature on health and productivity frequently refers to this phenomenon by other terms such as "work cutback" and "impaired presenteeism." Conceptually, we represent health-related underperformance on the job as equivalent to shortened days for which an employee receives his or her normal full pay and benefits.[4] That is, episodes of presenteeism increase the per-unit costs of labor inputs. The amounts by which each episode of presenteeism shortens a work day are summed to estimate equivalent lost work days.

IBI estimates presenteeism by first estimating and work performance for employees with and without different chronic conditions.[5] The HPQ survey asks the following question:

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[3] Greenberg, Paul E. and Howard G, Birnbaum. 2006. "Linking Administrative Claim Data with Archival Productivity Measures to Inform Employer Decision-Making." In *Health and Work Productivity: Making the Business Case for Quality Health Care*, edited by Ronald C. Kessler and Paul E. Stang. Chicago: University of Chicago Press.

[4] For descriptions and application of this approach, see Pauly, Mark V., Sean Nicholson, et al. 2008. "Valuing Reductions in On-the-Job Illness: 'Presenteeism' From Managerial and Economic Perspectives." *Health Economics*. 17(4):469-485. Stang, Paul E., Paul E. Greenberg, et al. 2006. "A Regulatory Perspective on Productivity Claims: Implications for Future Productivity Research." In *Health and Work Productivity: Making the Business Case for Quality Health Care*, edited by Ronald C. Kessler and Paul E. Stang. Chicago: University of Chicago Press.

[5] We include 26 chronic conditions in 8 broad categories:

- Socio-emotional: including depression, anxiety, fatigue and sleeping problems.
- Metabolic: including hypertension, diabetes, obesity and high cholesterol.
- Arthritis/Pain: including arthritis, chronic pain, back/neck pain and osteoporosis.
- Headache: including migraine and other headache.
- Respiratory: including asthma, bronchitis and allergy.

"On a scale from 0 to 10, where 0 is the worst job performance anyone could have at your job and 10 is the performance of a top worker, how would you rate your overall job performance on the days you worked during the past 28 days?"

Worst performance										Top performance
0	1	2	3	4	5	6	7	8	9	10

Please refer to the Health and Productivity Snapshot Technical Appendix for further information on how IBI models job performance and presenteeism.

Workers' Compensation

WC claims and lost work days

We use BLS data on reportable workplace illness and injuries rates as a proxy for NAICS4-level WC claims rates. Incidents with lost work days are used as a proxy for WC TTD claims, and all other incidents are used as a proxy for WC medical only claims. The claims rates are multiplied by the headcount to estimate the total number of medical only and TTD claims. We then use IBI Benchmarking data to estimate WC lost work days for TTD claims.

$$Medical\ only\ claims = Medical\ only\ claims\ rate \times EEs$$

Equation 7

$$TTD\ claims = Lost\ work\ time\ claims\ rate \times EEs$$

Equation 8

$$WC\ lost\ work\ days = TTD\ claims \times Avg.lost\ work\ days\ \times FTE\ weight$$

Equation 9

WC medical costs

We use IBI Benchmarking data to estimate average medical costs for medical only and TTD claims. These are multiplied by the relevant number of TTD and medical only claims to produce total medical costs.

- Digestive: including ulcer, gastroesophageal reflux disease (GERD), irritable bowel and bladder/urinary conditions.
- Heart/Pulmonary: including congestive heart failure, coronary heart disease and chronic obstructive pulmonary disease (COPD).
- Cancer: including skin and other cancers.

$$WC\ medical\ costs = (Avg.medical\ only\ costs \times medical\ only\ claims) + (Avg.TTD\ medical\ costs \times TTD\ claims)$$

Equation 10

WC wage replacement costs

Default or user-provided wage and benefits information is multiplied by the total number of TTD lost work days to estimate the total wage replacement costs.

The daily estimate of wage and benefits costs is the lesser of the wage replacement rate × average daily wages or the maximum daily benefit (i.e. the maximum weekly benefit ÷ 5 work days), plus benefits.

$$WC\ wage\ replacements = WC\ lost\ work\ days \times \left((Avg.daily\ wages\ \times wage\ replacement\ rate) + Avg.daily\ benefits\right)$$

Equation 11

or

$$WC\ wage\ replacements = WC\ lost\ work\ days \times (Max.daily\ wages + Avg.daily\ benefits)$$

Equation 12

WC non-wage indemnity payments

We use IBI Benchmarking data to estimate average non-wage indemnity costs (permanent disability, vocational rehabilitation, legal fees, death payments, and other costs) for TTD claims. These are multiplied by the number of TTD claims to produce total non-wage indemnity costs.

$$WC\ nonwage\ indemnity\ costs = Avg.nonwage\ cost \times TTD\ claims$$

WC wage replacement policies

When an employee has a work-related illness or injury that incurs lost work time, state-by-state regulations dictate the percentage of their wages that must be paid by the employer, and the maximum wage replacement payments to which an employee is entitled.

WC opportunity costs

We calculate WC opportunity costs by the product of the total number of WC lost work days, average daily wages, and the fractional portion of the opportunity costs multiplier.

$$WC\ opportunity\ costs = WC\ lost\ work\ days \times Average\ daily\ wages\ and\ benefits \times (Absence\ multiplier - 1)$$

Equation 13

Short-term disability

STD claims and lost work days

We use IBI Benchmarking data to estimate STD claims rates. These are multiplied by headcount and STD participation rate to estimate the number of STD claims. We then use IBI Benchmarking data to estimate STD lost work days, and multiply this value by total claims and the FTE weight to calculate total STD lost work days. The same process is used for STD pregnancy and non-pregnancy claims, with different claims rates and average durations.

$$STD\ claims = STD\ claims\ rate \times EEs\ \times STD\ participation\ rate$$

Equation 14

$$STD\ lost\ work\ days = STD\ claims \times Avg.STD\ lost\ work\ days \times FTE\ weight$$

Equation 15

STD wage replacement costs

The STD plan type under which an ill or injured employee is covered dictates the percentage of their wages that must be paid by the employer, and the maximum wage replacement payments to which an employee is entitled.

Default or user-provided wage and benefits information is multiplied by the total number of STD lost work days to estimate the total wage replacement costs.

The daily estimate of costs is the lesser of the wage replacement rate × average daily wages or the maximum daily benefit, plus benefits.

$$\begin{aligned} STD\ wage\ replacement &= STD\ lost\ work\ days \\ &\times \big((Avg.daily\ wages\ \times wage\ replacement\ rate) + Avg.daily\ benefits\big) \end{aligned}$$

Equation 16

or

$$\begin{aligned} STD\ wage\ replacements &= STD\ lost\ work\ days \times (Max.daily\ wages + Avg.daily\ benefits) \end{aligned}$$

Equation 17

STD opportunity costs

We calculate STD opportunity costs by the product of the total number of STD lost work days, average daily wages, and the fractional portion of the opportunity costs multiplier.

$$\begin{aligned} STD\ opportunity\ costs &= STD\ lost\ work\ days \times Average\ daily\ wages\ and\ benefits \\ &\times (Absence\ multiplier - 1) \end{aligned}$$

Equation 18

Long-term disability

LTD claims and lost work days

We use IBI Benchmarking data to estimate LTD claims rates. These are multiplied by the headcount and LTD participation rate to estimate the number of LTD claims. We then use IBI Benchmarking data to estimate level LTD lost work days, and multiply this value by total claims and the FTE weight to calculate total LTD lost work days.

$$LTD\ claims = LTD\ claims\ rate \times EEs \times LTD\ participation\ rate$$

Equation 19

$$LTD\ lost\ work\ days = LTD\ claims \times Avg.LTD\ lost\ work\ days \times FTE\ weight$$

Equation 20

LTD wage replacement costs

The LTD plan type under which an ill or injured employee is covered dictates the percentage of their wages that must be paid by the employer, and the maximum wage replacement payments to which an employee is entitled.

Default or user-provided wage and benefits information is multiplied by the total number of LTD lost work days to estimate the total wage replacement costs.

The daily estimate of costs is the lesser of the wage replacement rate × average daily wages or the maximum daily benefit, plus benefits.

$$\begin{aligned} LTD\ wage\ replacement \\ &= LTD\ lost\ work\ days \\ &\times \left((Avg.daily\ wages\ \times wage\ replacement\ rate) + Avg.daily\ benefits\right) \end{aligned}$$

Equation 21

or

$$\begin{aligned} LTD\ wage\ replacements \\ &= LTD\ lost\ work\ days \times (Max.daily\ wages + Avg.daily\ benefits) \end{aligned}$$

Equation 22

LTD opportunity costs

Opportunity costs are not calculated for LTD lost work days.

Family and Medical Leave

FMLA lost work days

We use IBI Benchmarking data to estimate the average number of FMLA days taken non-concurrently with other disability programs (i.e., stand-alone days). We use Benchmarking data to estimate FMLA claims rates. These are multiplied by EEs to estimate the number of FMLA claims.[6] We then multiply these claims by the average number of lost work days per stand-alone claim at the SIC1-level. This is multiplied by the FTE weight to calculate total FMLA lost work days.

$$Stand\text{-}alone\ FMLA\ claims = Stand\text{-}alone\ claims\ rate \times EEs$$

Equation 23

$$Stand\text{-}alone\ FMLA\ lost\ work\ days = Stand\text{-}alone\ FMLA\ claims \times Avg.\ stand\text{-}alone\ days \times FTE\ weight$$

Equation 24

FMLA wage replacement costs

The total number of FMLA lost work days is multiplied by the average daily benefits (but not wages) to produce the wage replacement costs of FMLA:

$$FMLA\ wage\ replacements = Stand\text{-}alone\ FMLA\ lost\ work\ days \times Average\ daily\ benefits$$

Equation 25

FMLA opportunity costs

We calculate FMLA opportunity costs by the product of the total number of FMLA lost work days, average daily wages, and the fractional portion of the opportunity costs multiplier.

$$FMLA\ opportunity\ costs = FML\ lost\ work\ days \times Average\ daily\ wages\ and\ benefits \times (Absence\ multiplier - 1)$$

Equation 26

Health Care benefits

We multiply the average costs of compensation for health benefits by the total wages to estimate total health care benefits.

Opportunity cost multipliers

The FCE uses information from research[7] by Dr. Sean Nicholson of Cornell University and his colleagues to develop customized multipliers that quantify the opportunity costs of absent or

[6] To be eligible for FMLA leave, an employee must meet certain work tenure job and history requirements. The Department of Labor conducted a 2013 survey that finding that 80.2% of employees in covered establishments are eligible for FMLA (See Klerman et al, *Family and Medical Leave in 2012: Technical Report*, September 2013, Cambridge, MA: Abt Associates Inc.). We therefore apply our claims rate to 80.2% of the headcount, on the assumption that users of the tool will represent covered establishments.

[7] Nicholson, S., Pauly, M.V., Polsky, D., Sharda, C., Szrek, H. and Berger, M.L. "Measuring the effects of work loss on productivity with team production." Health Economics. 2006;15(2):111-123.

underperforming employees. The method used in Dr. Nicholson's research to estimate absence multipliers is described below. The method for presenteeism multipliers is similar, and not described in this document[8]

The Sample

The multipliers are based on a final survey sample of 810 managers at for-profit firms in 12 different industries. Harris Interactive created a random sample of firms within the industries and contacted managers at the firms supervising one of the 57 targeted job types and with sufficient experience to be able to describe what happens when a worker is absent.

The industry representation in the final sample with 35 job types is as follows:

Table 2: Sample Industry Distribution

Industry	% of sample
Retail sales, department stores	8.4%
Legal services	8.5%
Motor vehicle dealers (new and used)	8.2%
Hotels and motels	8.5%
Trucking and courier	8.2%
Hospitals	8.5%
Motor vehicle and equipment manufacturing	8.3%
Air transportation, scheduled and courier	8.4%
Construction, non-residential	8.3%
Aircraft parts and manufacturing	7.9%
Physicians' offices	8.5%
Eating and drinking establishments	8.3%

Concepts behind the multipliers

Dr. Nicholson and colleagues define the cost of an absence as the dollar value of the firm's lost output that results from the absence. Typically, daily wage (salary and benefits) is used to value a lost work day, but Nicholson and colleagues argue that the costs will be higher for some occupations based on several job characteristics: team production, time sensitivity, and the availability of substitutes.

The loss in output resulting from a single-day absence, L, is defined as follows:

$$L = mw$$

Equation 27

Where *m* is the multiplier Nicholson and colleagues set-out to estimate in their study and w is the worker's daily wage (including salary and benefits).

The multiplier, *m*, is further defined as:

[8] See Pauly et al, 2008, "Valuing Reductions in On-The-Job Illness".

$$m = \frac{(c + a)}{a}$$

Equation 28

where *a* is the percentage of scheduled days a worker is absent, and *c* is the annual cost of the worker's absences in excess of their wage, measured as a percentage of the worker's annual pay.

The study authors hypothesize that the multiplier *m* is a latent variable whose value is a function of three key job characteristics: team production, time sensitivity, and the availability of substitutes.

Methodology behind the multipliers

The job-specific multipliers for 35 occupations were developed using a multi-step process.

First Step

Ordered probit regression models were run where the dependent variable was the managers' estimate of the impact of an unexpected 2-week absence on the department's output, and the independent variables were 12 indicator variables for the three job characteristics. The same models were also run on the impact of a 3-day absence and the results were qualitatively similar. The independent variables measure the extent to which each of the three job characteristics (team production or teamwork-TP, time sensitivity-TS, and the availability of substitutes or ease of substitution -AS) are present in a job. Managers indicated on a 1-5 scale the extent to which the following characteristics were present for a particular type of worker that they supervised.

<u>Ease of substitution</u>: If a worker at your company is absent unexpectedly for 3-days, how easy is it to replace this worker, either with an outside temp or a transferred co-worker?

1 *(Easy to replace with a worker of similar quality or productivity)*
2
3
4
5 *(Impossible to replace with a worker of similar quality or productivity)*

Note: a '1' means there is a pool of workers you can access whenever you want and these workers are just as productive as the absent worker; a '5' means there is nobody else you could possibly find in three days who could do as good a job as the absent worker.

<u>Time sensitivity</u>: How time sensitive is the worker's output?

1 *(Work can be postponed easily)*
2
3
4
5 *(Work cannot be postponed without very severe consequences)*

Note: A '1' means that the worker can complete his/her work once he/she returns and no sales are lost and no important deadlines are missed; a '5' refers to a situation where sales would be lost and/or important deadlines would be missed if a worker were absent.

<u>Teamwork</u>: How much does this worker function as part of a team?

1 *(Worker functions entirely separately from other workers)*
2
3
4
5 *(The worker is such a crucial member of the team that the team's output or activity is wiped out by his/her absence)*

Note: A '1' might be appropriate for a person who picks crops in a field all day by himself/herself; a '5' might be appropriate for the conductor of an orchestra where the orchestra can't play without the conductor.

Managers' categorical responses to questions about the extent to which absence by a particular type of worker affect the department's output were regressed on a set of indicator variables that characterize managers' assessment of the workers' job characteristics:

$$L *= \beta_1 TP + \beta_2 TS + \beta_3 AS + \varepsilon$$

Equation 29

Where *L** is a latent, continuous variable.

The results of the ordered probit regression models appear below for the models of 2-week and 3-day Absences. The results from the 2-week absence appear in the 2006 *Health Economics* paper. The 3-day absence results are used for the FCE.

Table 3: Ordered probit regression results

	2-week Absences		**3-day Absences**	
Indicator Variable	**Coefficient**	**Standard Error**	**Coefficient**	**Standard Error**
Team Production/Teamwork (TP)				
TP Team_2	0.360	0.144	0.351	0.152
TP Team_3	0.588	0.133	0.711	0.140
TP Team_4	0.930	0.147	0.838	0.152
TP Team_5*	0.531	0.154	0.563	0.161
Time Sensitivity (TS)				
TS Time Sensitivity_2	0.485	0.166	0.331	0.175
TS Time Sensitivity_3	0.581	0.158	0.406	0.166
TS Time Sensitivity_4	0.685	0.165	0.612	0.172
TS Time Sensitivity_5*	0.385	0.157	0.397	0.166

Indicator Variable	2-week Absences Coefficient	2-week Absences Standard Error	3-day Absences Coefficient	3-day Absences Standard Error
Availability of Substitutes/Ease of Substitution (AS)				
AS Substitution_2	0.587	0.119	0.532	0.124
AS Substitution_3	0.950	0.121	0.802	0.124
AS Substitution_4	1.08	0.129	0.934	0.131
AS Substitution_5*	1.03	0.162	0.916	0.164

* The Team_5, Time Sensitivity_5 and Substitution_5 values are not used in the FCE due to only a small number of managers reporting “5’s” on these scales and to retain the linearity of the relationship between absence and types of impact. Accordingly, the coefficients for “4” are used when FCE users report either 4 or 5 on any of these three attributes.

The coefficients from the 3-day probit model are used to derive predicted values for each job characteristic of a latent (*L**), continuous variable underlying the categorical dependent variable for each of the 810 manager responses.

Second Step

The coefficients from the regression associated with each of the attribute values for TP TS and AS across 35 job categories are used to construct an index of the incremental cost of absences by job. The table above shows the *average* coefficients across the 35 job categories. A mean value of the predicted latent variable was computed for each of the job types included in the survey. This mean of the predicted value for each job type is linked to the quantitative measure of the cost of absences (the manager’s assessment of the overall annual cost of absences) in order to scale the index. This index is converted into actual incremental costs by scaling it relative to two additional quantitative values of the manager’s estimate of the monetary value to the firm of avoiding absence for each particular job. Average values for the absence rate and cost of absence across the 35 jobs surveyed are mapped to the 9 EEOC job categories. These mapped values are used to compute weighted averages of the absence rate and cost of absence based on the occupational distribution.

For example, the occupational distribution for the Industry *Finance and Insurance* and Sub-industry *Funds, Trusts and Other Financial Vehicles* (Source: BLS data) maps to the following absence rate and cost of absence values from Dr. Nicholson’s survey:

Table 4: Absence rates and costs of absence

EEOC Job category	Occupational distribution from BLS	Absence rate from survey	Cost of absence from survey	Absence rate multiplied by occupational distribution)	Cost of absence multiplied by occupational distribution
1	28.5%	3.1%	2.0%	0.88%	0.56%
2	16.0%	3.1%	2.0%	0.49%	0.31%
3	0.0%	5.5%	1.8%	0.00%	0.00%
4	6.2%	5.1%	1.5%	0.31%	0.09%
5	47.0%	4.1%	1.7%	1.94%	0.79%
6	1.3%	2.9%	1.4%	0.04%	0.02%
7	0.0%	3.9%	1.2%	0.00%	0.00%
8	0.0%	8.0%	1.8%	0.00%	0.00%
9	1.0%	7.7%	0.8%	0.08%	0.01%
				3.74%	1.78%
				a	*c*

Third Step

The quantitative estimate of the cost of absences along with the mean absence rate of each job type is substituted into the following equation to derive the job-specific multiplier (Equation 28). In this way, the 3-day absence categorical variable is used to create an index of the relative impact of absences across different jobs, and the quantitative variables scale this index into a dollar-based value. The ordering of the multiplier was robust to the use of alternative dependent variables, scaling variables, and regression specifications. A multiplier is defined as the cost to the firm of an absence as a proportion (often greater than one) of the absent worker's daily wage (including salary and benefits). The median multiplier is 1.28, which supports the view that the cost to the firm of missed work is often greater than the wage.

Using the example provided in the second step, if the absence rate (a) = 3.74% and the cost of absence (c) = 1.78%, then the multiplier would be 1.48 using Equation 28.