IOWA Department of REVENUE

Iowa New Jobs Training Program (260E)

Part 2: Economic Impact Analysis

Tax Credits Program Evaluation Study

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Preface

Beginning with fiscal year 2006, the Iowa Department of Revenue established the Tax Credits Tracking and Analysis Program to track tax credit awards and claims. In addition, the Department performs periodic evaluations of tax credit programs. The evaluation of the State's Industrial New Jobs Training (260E) Program represents the sixth of these studies. The first part of this study that provided information on federal job training programs and job training programs in other states, descriptive statistics on types of companies that have taken advantage of the 260E program, and withholding tax credit claims of companies that have participated in the program was published in April 2010. Part 2 of the study for which the results are published here focuses on the empirical analysis of impacts on trainees, firms, and industries that have taken advantage of the 260E program.

As part of the evaluation, an advisory panel was convened to provide input and advice on the study's scope and analysis. We wish to thank the members of the panel: Jude Igbokwe from Iowa Workforce Development, Peter Orazem from Iowa State University, Steve Ovel from Kirkwood Community College, Lane Palmer of the Iowa Department of Economic Development, and Tom Schenk of the Iowa Department of Education.

This study and other evaluations of Iowa tax credits can be found on the Tax Credits Tracking and Analysis Program Web page on the Iowa Department of Revenue Web site located at: **http://www.state.ia.us/tax/taxlaw/creditstudy.html**.

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Executive Summary

The Iowa New Jobs Training Program (260E) is a customized job training program and an economic development incentive program. The major findings of this report are based on data from four community colleges (Des Moines Area Community College, Kirkwood Community College, Indian Hills Community College, and North Iowa Area Community College). The number of training contracts from these four community colleges from 1984 to 2009 is 1,079, accounting for 41 percent of all contracts from the State's 15 community colleges. The amount of 260E program expenditures for these four community colleges from 1984 to 2009 was $390 million, accounting for 48 percent of total expenditures during that period.

- The average wages of employees from 195 out of 247 training contracts (78.9 percent) with available data increased one year after the training. The average individual income tax payments of 162 associated with 247 training contracts (65.6 percent) with available data increased one year after the training.

- Using trainee information from Des Moines Area Community College, Kirkwood Community College, Indian Hills Community College, and North Iowa Area Community College from 1998 to 2006, the 260E training programs were found to have increased the average wage of trainees by $2,476 per year up to four years after the training, compared to non-participating workers who lived in the same areas, worked in the same industries, and changed jobs during the same years.

- The 260E programs also helped employers retain skilled employees and keep workers who received training in Iowa. On average, trainees' job tenure is 6.4 months longer than comparable non-participating workers. Percentages of trainees migrating to other states were lower than those of comparable non-participating workers in three out of the four community college districts covered by this study.

- Higher wages of trainees contributed to modestly higher state individual income tax payments. The additional individual income tax payment paid by trainees from the 260E programs in the four community colleges between 1998 and 2006 averaged $344,000 per year. The average percentage of tax payment increase for a trainee was 5.15 percent between 1998 and 2006.

- For employers which participated in the 260E program, the impact of the training program on their revenues from Iowa was positive, but it was statistically insignificant.

- Higher training expenses per worker in Iowa had insignificant effects on productivity of three industries that heavily utilized the 260E programs in Iowa (i.e., machinery manufacturing industry, fabricated metal manufacturing industry, and insurance carrier industry).

I. Introduction

Iowa has established job training programs in an effort to recruit businesses by developing a skilled workforce. One such program is the Iowa New Jobs Training Program (260E). Under this program expanding, new, or relocating businesses may contract with community colleges to provide funding for the training of employees in newly created positions. The training may be provided by the community colleges or by the companies after having developed training plans approved by a community college.

Under the auspices of the Tax Credits Tracking and Analysis Program (TCTAP) the Iowa Department of Revenue has undertaken an evaluation of the 260E program. Part 1 of the evaluation was completed and a report issued in April 2010. That report provided:

- Background information on federal, Iowa, and other states' job training programs,
- A statistical analysis of training agreements that addressed topics such as the distribution of agreements by firm size and by industry, and
- A statistical analysis of withholding tax credit claims.

Part 2 of the evaluation addresses four issues. They are:

- The impact of 260E program participation on individual trainees,
- The impact of 260E program participation on firms' revenues,
- The impact of the 260E program on the productivity of Iowa industry, and
- The impact of the 260E program on State individual income tax revenues.

The specific questions addressed in the report include:

- How does the 260E program affect the wages of individuals who participated in program sponsored training relative to the wages of comparable individuals employed by companies not participating in the 260E program?
- For those who experienced wage gains, how long did the gains persist?
- How long did individuals who participated in 260E sponsored training remain with that employer?
- What share of individuals who received 260E sponsored training left Iowa within four years?
- What happened to the amount of individual income taxes paid by program trainees?
- Did companies that participated in 260E program sponsored training see their revenue from Iowa increase relative to comparable companies?
- Did industries that heavily utilized the 260E training program experience productivity gains relative to the same industries in other states?

This report summarizes the findings of the second part of the evaluation on the Iowa New Jobs Training Program (260E).

II. Literature Review

Previous research on publicly assisted worker training programs mostly focused on the impact of training programs on the earnings and employment of trainees. The Congressional Budget Office (CBO) (1982) examined the impact of the Comprehensive Employment and Training Act (CETA), which authorized job training programs for low-income persons, on earnings of adult participants. Comparing the before and after earnings of trainees, the research found that CETA training increased female participants' average post-program earnings by between $800 and $1,300 annually. But the impact on male participants' earnings was insignificant. In a second study, Bartel (1995) used the personnel records from a large manufacturing company to study the impacts of worker training on wages and worker performance. This study found that the mean wage increased by $1,019 after training compared to before training.

More recent studies usually constructed a focus group including trainees and a control group consisting of workers comparable to the trainees. In these studies the impact of the training program was estimated by comparing earnings of the focus group and the control group. Hotz, Imbens, and Klerman (2006) compared the effects of two different approaches for California's training programs for four counties in the Greater Avenues to Independence (GAIN) program, which was the state's official welfare-to-work or Job Opportunities and Basic Skills Training (JOBS) Program, for a nine-year period. A focus group and a control group were constructed. The focus group consisted of trainees from the "Human Capital Development" (HCD) in GAIN programs. The control group consisted of workers from the "Labor Force Attachment" (LFA) in GAIN programs. The paper compared wages of the focus group with the control group and found that LFA had a relative advantage over HCD for employment rates and workers' earnings in the short term (2-3 years). However, in the long term (more than 6 years) the HCD program was more effective than the LFA program.

Heinrich, Mueser, and Troske (2008) evaluated the non-experimental net impact of Adult and Dislocated Worker programs under the Workforce Investment Act (WIA). Constructing a focus group and a control group, the paper compared employment and wages of workers from each group. The focus group consisted of workers in the Adult and Dislocated Worker programs. The control group consisted of workers covered by the Unemployment Insurance (UI) program or from the U.S. Employment Service (ES) program, but not from Adult and Dislocated Worker programs. The study found that Adult and Dislocated Worker programs increase workers' quarterly earnings by $100 to $200 in participating states. In a similar study, Lee (2009) empirically assessed the wage effects of the Job Corps Program, one of the largest federally funded job training programs in the United States. To estimate the effects of the Job Corps Program on workers' wages, this research chose program participants as the focus group and non-participants as the control group. Comparing wages of workers in the focus group with the control group, this research found that the mean wage of the focus group was significantly higher than that of the control group.

Other studies found that providing worker training helped employers keep talented employees. Harris (2005) studied the workers in the training program sponsored by the Wyoming Workforce Development Training Fund (WDTF). Constructing a group of non-participating workers that were comparable to the trainees, the research compared wages and retention rates of trainees and the comparable workers. The study found that WDTF participants had higher retention rates in Wyoming

than non-participants. Also, WDTF was found to be more effective for workers with lower wages than those with higher wages.

In addition, for companies, providing training to workers helped to improve productivity. Black and Lynch (1996) used data from the National Center on the Educational Quality of the Workforce National Employer's Survey to estimate the effects of worker training expenditures on firm productivity. Their research found that the proportion of time spent on training significantly increased productivity. Also, Sepulveda (2010) used a panel of U.S. manufacturing firms between 1988 and 1997 to examine the effects of formal training programs on productivity growth. Based on the hypothesis that the worker training is one of the determinants of industrial production, the research found that industrial production was positively associated with the time spent on worker training.

Other approaches were used to measure the impact of worker training programs on the economy. The Office of Missouri State Auditor (2003), using a REMI dynamic economic impact model, forecasted that the new job training program would generate 87,110 new jobs and increase wage rates by 1.14 percent by 2010. Direct job creation would equal 26,307 (30.2 percent) with the remainder resulting from induced economic growth in the state.

III. Analysis of Economic Impact on Individual 260E Trainees

The analysis of the impact of worker participation in 260E program job training consisted of two parts. The first part focused on the impact of job training on employee wages. The second part focused on how long employees who received training continued working for the same employers and continued to reside in Iowa in comparison to other workers with similar characteristics and employed in the same industries.

1. Wage Impact Analysis

If the 260E program improves the productivity of trainees, the wages of trainees after the training should experience larger increases than those of other new employees who have not participated in 260E program training. A two step econometric method was used to test this hypothesis. In the first step, two groups of persons were selected. One group consisted of persons having received training through the 260E program. The other group consisted of persons with similar demographic characteristics and human capital to the first group. But persons in the second group had not been through 260E program sponsored training. In the second step, changes in wages of individuals in both groups were compared using a differences-in-differences econometric model that separated the impacts of the 260E program from impacts of the other factors, such as the business cycle.

Data sources used in the analysis include: electronic files of trainees from Des Moines Area Community College (DMACC), Kirkwood Community College (Kirkwood), Indian Hills Community College (Indian Hills), and North Iowa Area Community College (NIACC); employment data from the Iowa Workforce Development Department (IWD); and tax records from the Iowa Department of Revenue (IDR). Data from the community colleges provided identification of trainees and employers participating in 260E program sponsored training. The "training" group in this study was comprised of persons whose employers had participated in the 260E program through those four community

colleges between 1998 and 2006. The control group was comprised of persons who did not receive 260E program training during the same period, were employed by companies in the same industries as persons in the training group, and lived in counties in the service areas of the four community colleges (see Appendix). Because the 260E program is a training program for new jobs, trainees of the 260E program were assumed to be new workers. Also, only new employees from non-260E program participating companies were included in the control group.

Data were taken from 1996-2007 individual income tax records and IWD employment surveys in order to include wages of individuals both before and after their being hired and trained. Companies in the training group and the control group were categorized into 13 industries based on the first two digits of the North American Industrial Classification System (NAICS) codes of the companies. Table 1 lists the sectors and their NAICS codes.

The selection of individuals for the control group involved multiple filters. First, companies that had not participated in the 260E program were selected based on their industries and locations. Those in the same industries and the same counties as companies in the training group were chosen by matching the NAICS designation of the companies. Then, IDR tax records were used to select employees from these companies for potential inclusion in the control group. Only employees who lived in the service areas of the four community colleges were selected.

Next, a human capital filter was applied. Human capital, such as work experience and educational background, is one of the most important factors in determining someone's wage level. To control for the human capital before the event, individuals from both groups were matched based on their age and wage in the year prior to hiring or training. First, for every trainee in the training group, persons within three years of age of each trainee's age were chosen. Then, the wage of the trainee in the year prior to the event was compared with the wages of the chosen individuals in the same year. The person with the smallest wage difference from the wage of the trainee among the chosen individuals was selected for inclusion in the control group used in the econometric analysis. The number of unique observations in the control group was small, i.e. one worker in the control group could be the best match for several trainees. Thus, repeated observations for the same individual were used in the control group to maintain a balanced sample size.

Table 2 presents the wage distribution for participants in the 260E program for the four community colleges. Wages presented in the table are the trainees' wages during the first year after the training collected from W-2 payment records. Employers in the sample are categorized into three groups based on the number of the employees in each company in Iowa. Among 11,603 total trainees 2,925 earned less than $20,000 a year and 5,530 earned between $20,000 and $40,000 a year after the training. These 8,455 trainees that earned less than $40,000 per year accounted for 73 percent of all trainees included in the analysis. For the high end of the wage distribution, there were 280 trainees with more than $100,000 of wage income after training, accounting for about 2 percent of all trainees.

Figure 1 illustrates the distribution of the number of the 260E contracts based on the average wage growth rates after one year of training. 247 contracts are covered by the analysis. The average wages of trainees from 65 contracts (26.3 percent) increased by less than 10 percent one year after the 260E training. The average wages of trainees from 47 contracts (19.0 percent) increased by more than 10 percent but less than 20 percent one year after the 260E training. The average wages of trainees from 58 contracts (23.5 percent) increased by more than 20 percent but less than 30 percent one year after the 260E training. The average wages of trainees from 25 contracts (10.1 percent) increased by more

than 30 percent one year after the 260E training. On the other hand, the average wages of trainees from 52 contracts (21.1 percent) decreased one year after the 260E training.

In addition to determining the impact of 260E program training on employee wages, policymakers have also expressed an interest in knowing the extent to which taxes paid by program participants changed. Figure 2 shows the distribution of the number of the 260E contracts by the growth rates of the tax liability of trainees. The individual income tax liability of trainees under 39 contracts (15.8 percent) increased by less than 10 percent one year after the training. The individual income tax liability of trainees under 37 contracts (15.0 percent) increased by more than 10 percent but less than 20 percent one year after the training. The individual income tax liability of trainees under 27 contracts (10.9 percent) increased by more than 20 percent but less than 30 percent one year after the training. The individual income tax liability of trainees under 59 contracts (23.9 percent) increased by more than 30 percent one year after the training. But for the remaining 85 contracts (34.4 percent) the individual income tax liability of trainees decreased one year after the training.

Table 3 presents summary statistics for both the trainee groups and the control groups. The wages of all trainee groups from the four community college service areas increased after the training. Three of the four control groups experienced an increase in the average wages as well. Only individuals from the control group from NIACC area experienced a decrease in their wages after the job transition. For workers with lower wages, they are assumed to be more likely to have more than one job at the same time. The average number of jobs held by a worker per year in the trainee group dropped after the 260E training for three out of four community college service areas. For individuals in the control groups, the average number of jobs held by a worker per year increased after the job transition for two out of four community college service areas, the exceptions being DMACC and Indian Hills.

Table 4 presents descriptive statistics for wages and number of jobs of the trainee group and the control group by year. The transition year is the year that trainees received the 260E training or the year that employees in the control group were hired. From the third year prior to the transition year to the third year after the transition year, the average wages of trainees are higher than the averages for employees in the control group. The difference increases dramatically after the transition year, but it declined at the third year after the transition.

To determine the extent to which 260E program participation explains the difference between the average wages of the trainee and control groups an econometric model was developed. This model was used to estimate the effects on wages for up to four years following the year of training or receiving the new job. To compare the before and after training effect, wages for up to four years prior to the year of training or receiving the new job were also used in the estimation.

The hypothesis underlying this analysis is that the training group and the control group would have had the same average wage growth in the absence of the training. To estimate the impact of the 260E program training on the wages of individuals, the following equation was estimated on the pooled cross-sectional data set for the time period 1996 through 2007:

$$Wage = \alpha + \beta_1 Age + \beta_2 Age^2 + \beta_3 (Hiring/training\ Dummy) + \beta_4 (Train/control\ Dummy)$$
$$+ \beta_5 (Number\ of\ Jobs) + \beta_6 Trend + \beta_7 (Training\ Effect) + \beta_8 (Vector\ of\ Year\ Dummies)$$
$$+ \beta_9 (Vector\ of\ Industry\ Dummies) + \beta_{10} (Vector\ of\ College\ Dummies)$$

where,

- the hiring/training dummy variable measures whether an employee has received training or changed jobs (1 for yes and 0 for no),
- the train/control dummy variable identifies whether an employee is in the focus group or not (1 for yes and 0 for no),
- the training effect variable indicates whether an employee in the focus group has participated in the 260E program (1 for yes and 0 for no),
- year dummy variables indicate the year of each observation (1 for yes and 0 for no),
- industry dummy variables identify the industry of companies (1 for yes and 0 for no), and
- college dummy variables identify the community college service area (1 for yes and 0 for no).

Findings of the estimation in Table 5 show that 260E program training increased the average wage of trainees by $2,476 per year compared to individuals in the control group. In the model Indian Hills Community College served as the reference for the other three community colleges. Among the four community college service areas, the average wage of trainees in the Kirkwood service area was higher than the average wages of trainees from the other three community college service areas. The average wage of trainees from the service area of DMACC was $10,028 higher than the average wage of trainees participating in Indian Hills' 260E program, while the difference between wages of trainees in NIACC and those in Indian Hills' 260E program was insignificant. Another finding was that older trainees usually had higher wages on average. In addition, employees with lower wages tended to take more jobs to earn more income. For all employees, events such as changing jobs or receiving the 260E training also had positive impacts on their wages.

Given that the estimated wage impact is $2,476 per trainee per year up to the third year after the training, impacts of estimated wage increases on individual income tax revenues were calculated based on trainees' marginal tax rates between 1998 and 2006. Table 6 presents the estimated individual income tax increase contributed by the 260E trainees from 1998 to 2006. The average additional individual income tax payments generated from all trainees for the 260E programs of the four community colleges was $344,000 per year. The average percentage increase of tax payments for a trainee was 5.15 percent between 1998 and 2006.

2. Tenure Impact Analysis

Job tenure is the measure of how long an employee works for the same employer. The 260E training program may be expected to result in employers retaining workers for longer periods of time and keeping skilled labor in Iowa. Job tenure for both the training and control groups was compared to examine the effect of the 260E program on the duration of employees working for the same employers. To calculate the length of time that workers work for their employers, the beginning year was the year of hiring or training. The end year was either the last year of working for the same employer or the last year in the study period, 2007. This means that many observations were censored because many employees still worked for the same employers in 2007, the end of the study period. For these employees, their job tenure was at least the observed length of time working for the same employers from the time of hiring to the end of the study period.

Survival analysis was used to estimate the impact of the 260E program on job tenure. Survival analysis is a statistical technique used to model the amount of time until a particular event of interest occurs. The observed job tenure is the dependent variable. A dummy variable indicating whether an

individual had been trained under the 260E program in one of the four community college service areas was the independent variable.

Table 7 shows the descriptive statistics for job tenure of both the training group and the control group. The average number of years of working for the same employers was 2.88 years for the control group and 3.18 years for the training group.

Table 8 presents the estimation of the impact of the 260E program on job tenure. After geographic characteristics, the time effect, and the group effect are controlled, trainees on average worked for their employers 0.53 years longer than employees working for companies in the control group. The difference is statistically significant. Again in this model Indian Hills served as the reference community college.

Estimation of the model found that employees in the service area of Kirkwood Community College on average stayed with their employers longer than employees of in the trainee groups of companies located in the other three community college service areas. The average job tenure for trainees of the Kirkwood service area was almost two years longer that for Indian Hills service area trainees. The average job tenure of trainees in the service area of NIACC was about 9 months longer than the average job tenure of trainees in the service area of Indian Hills. The average job tenure of trainees in the service area of DMACC was about one year longer than the average job tenure of trainees in the service area of Indian Hills.

Another aspect of tenure of interest to policy makers pertains to how long 260E program trainees remain in Iowa. Table 9 presents descriptive statistics for the state of residence of employees after their training or hiring by community college service area. The residency status indicator is the state of residence reported on an employee's tax return the last year when he or she filed an Iowa tax return during the study period (1996-2007). In the DMACC, Kirkwood, and NIACC service areas, the percentages of trainees with Iowa resident status are higher than the percentages of employees in the control group. Among the four community college service areas the percentage of trainees with Iowa resident status is highest in the NIACC service area.

Table 10 shows the top five states of residence of employees in both the trainee group and the control group. In both groups, most employees remained Iowa residents. Overall, the percentage of Iowa residents (94.06 percent) is higher in the trainee group than in the control group (86.87 percent). Neighboring states (i.e., Missouri, Minnesota, Nebraska, and Illinois) are among the top destinations of emigrating Iowa employees in both groups.

IV. Analysis of Economic Impact on Firms

One objective of the 260E program is aimed at attracting more business investment to Iowa. Employers are supposed to use the tax credit to pay for new worker training expenses. The hypothesis is that a company is more likely to hire new employees and train them when the company expects that the business is going to expand and that revenue will grow. Therefore, if the company participated in the 260E program, then a company's revenues should grow faster after the company completed employee training through the program.

To measure the impact of the 260E program on firms in Iowa, a focus group and a control group were constructed. Companies having participated in the 260E training program between 1996 and 2008 were in the focus group. Companies that are in the same industries as the focus group but did not participate in the 260E program were in the control group. Similar to the trainee wage study, a differences-in-differences model was used to estimate the 260E program's impact on firm revenues in Iowa. The model is as follows:

$$R_{it} = \beta_0 + \beta_1 S_{it} + \beta_2 P_{it} + \beta_3 Group_{it} + \beta_4 Time_{it} + \beta_5 Trainingeffect_{it} + \beta_6 Year_t + \beta_7 Industry_i + \varepsilon_{it} \qquad (1)$$

where,
- R_{it} is the firm i's revenue generated in Iowa during period t;
- S_{it} is the number of employees working for the company i in Iowa during period t;
- P_{it} is the percentage of a company i's revenue coming from Iowa during period t;
- $Group_{it}$ is the dummy variable to indicate whether the firm i participated in the 260E program during period t, where one means participation and zero means non-participation;
- $Time_{it}$ is the dummy variable that equals one when it is the year of training and equals zero when it is the year prior of the training;
- $Year_t$ are dummy variables that indicate the year (1 for yes and 0 for no);
- $Industry_i$ are dummy variables that indicate the industries of the firms (1 for yes and 0 for no); and
- Training effect is the multiplication of $Group_{it}$ and $Time_{it}$, which indicates the impact of the 260E program on firms' revenues.

The model compares the revenue in the year prior to the year of training and the revenue in the year of training between the focus group and the control group. To select firms in the control group, the propensity score matching method was used[1]. Propensity score matching is a statistical technique used in non-experimental situations to correct for selection bias. Matching is based on observable characteristics that vary between the treatment group and the potential control group. Since the dependent variable is a binary variable (1 or 0), a probit model[2] was used to calculate propensity scores. Firms in the treatment group were matched to firms in the potential control group based on their propensity scores. The equation used to estimate the propensity score is as follows:

$$Group_{it} = \beta_0 + \beta_1 S_{it} + \beta_2 P_{it} + \beta_3 Time_{it} + \beta_4 Year_t + \beta_5 Industry_i + \varepsilon_{it} \qquad (2)$$

Data used for the estimation the model were obtained from the Iowa Department of Revenue tax records and employment records from the Iowa Workforce Development Department. Table 11 presents the descriptive statistics from the propensity score matching. For firms in the control group, the average number of employees was 83 before and at the year of training. For firms in the focus group, the average number of employees was 208 before the training. At the year of training, that number increased to 298 for the focus group. Also, both before and after training firms in the focus group on average generated more revenue from Iowa than firms in the control group.

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[1] Propensity score matching is a statistical technique used in non-experimental situations to correct for selection bias. Matching is based on observable characteristics that vary between the treatment group and the potential control group. A probit model is used to calculate propensity scores and then taxpayers in towns in the treatment group are matched to taxpayers in the potential control group based on their propensity scores. See Rosenbaum and Rubin (1985)

[2] The dependent variable is binary, which means that it can have only two possible outcomes which are denoted as 1 and 0. The probability distribution of the event that the dependent variable is 1 is a normal distribution.

Table 12 presents the estimation results. Companies employing more workers had more revenue from Iowa. On average, revenue increased by about $50,000 (1.85 percent) for a new employee. Companies with a larger percentage of revenue coming from Iowa also had more revenue. However, although the coefficient of the training effect is positive, it is statistically insignificant. Therefore, there is no conclusive evidence that the 260E program increased a company's revenue from Iowa, compared to its control group peer in the same industry.

V. Analysis of Economic Impact on Industries

This part of the report addresses the impact of the 260E program on the productivity of Iowa industries that made the most extensive use of the program. One expected impact of job training programs is that the productivity of workers will increase and by extension the productivity of industries in which trainees work will improve. Following are the findings of an econometric analysis of 260E program expenditures on the productivity of three Iowa industries, which are the machinery manufacturing industry, the fabricated metal manufacturing industry, and the insurance carrier industry. These three industries have had high concentrations of participation in the 260E program.

1. Methodology

This analysis utilizes a methodology developed by the Congressional Budget Office (CBO) in a study of the CETA program. This methodology used a Cobb-Douglas production function to estimate the total output of the U.S. nonfarm business sector. This form of production function expresses output as a multiplicative function of labor, capital stock, and total factor productivity (TFP).

$$Q = AL^{(1-\alpha)}K^{\alpha} \qquad (3)$$
where,
- Q is real gross domestic product (GDP) in the nonfarm business sector;
- A is total factor productivity (TFP);
- L is labor used in the nonfarm business sector;
- K is the capital input in the nonfarm business sector; and
- the coefficients on labor $(1-\alpha)$ and capital (α) represent the contribution that the growth of labor and capital make to the growth of output.

TFP is the variable that accounts for effects on total output not caused by labor and capital inputs, where the change in TFP is often ascribed to technology growth and labor productivity (which is defined as a factor beyond the growth in labor supply). Labor is a function of employment, work hours, and labor force. The capital stock is the aggregate value of capital assets, such as computers, software, communications equipment, other equipment, nonresidential structures, inventories, and land in the nonfarm business sector.

Taking the log of equation (3) yields

$$\log(Q)=\log(A)+ (1-\alpha) \log(L)+ \alpha\log(K) \qquad (4)$$

Taking the total differential of equation (4) yields the following equation (5), which means that the growth rate of total output is a function of the growth rate of productivity (A), the growth rate of labor (L), and the growth rate of capital (K).

$$d(Q)=d(A)+ (1-\alpha)\ d(L)+ \alpha d(K) \qquad (5)$$

where,
- $d(Q)$ is the percentage change of the total output;
- $d(A)$ is the percentage change in productivity;
- $d(L)$ is the percentage change of labor; and
- $d(K)$ is the percentage change of capital.

Previous literature suggested that worker training can improve productivity for trainees. Therefore, the productivity, A, can be written as a function of worker training and other effects.

$$A=f(Tr, Ex) \qquad (6)$$

where,
- Tr is the worker training; and
- Ex represents all other effects.

If the worker training does have a positive impact on productivity, then the value of A will increase when Tr increases. Furthermore, the rising productivity will cause total output to increase. Under this assumption, the CBO's methodology was slightly modified to model the impact of the state worker training in certain industries.

Worker training expenditures were used to measure the magnitude of training programs in the different states. The assumption is that the quality of state training programs is directly related to training expenditures per worker and by extension is related to improvement in output per worker. Data on training expenditures came from the U.S. Department of Labor, Employment and Training Administration (ETA). Real annual per capita spending data for state customized training programs between 2001 and 2006 were used. The output per worker was calculated using the total output of certain industries in a state and the total employment in those industries in the state. Output data was obtained from the Bureau of Economic Analysis (BEA). Employment data was obtained from the Bureau of Labor Statistics (BLS). Since the capital input data at the state and industry level was not available, the consumption of electricity by industry was used as a proxy variable. Data on energy consumption came from the U.S. Energy Information Administration (EIA). The working hours per worker was used to measure the effect of labor on production. Data on working hours came from BLS. State education output from the Census Bureau, measured by the share of population aged 25 and above holding the Bachelor's degree, was used to measure the human capital.

To account for the differences among the states, a panel data method was used in the estimation. The production function used is

$$Y_{it}=\beta_0+\beta_1 H_{it} +\beta_2\ L_{it} +\beta_3\ E_{it} +\beta_4 W_{it}+\beta_5 D+\varepsilon_{it} \qquad (7)$$

where,
- Y_{it} is the output per worker for an industry in state i at period t,
- H_{it} is the training expense per worker for an industry in state i at period t,
- L_{it} is the working hours per worker for an industry in state i at period t,

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- E_{it} is the industrial energy consumption per worker for an industry in state i at period t,
- W_{it} is the share of population aged 25 and above holding the Bachelor's degree in state i at period t,
- D is a vector of dummy variables measuring the effect of each state (1 for the state, 0 otherwise).

2. Machinery Manufacturing Industry

From 1984 through 2009 Iowa machinery manufacturing firms entered into 228 job training agreements with community colleges under the 260E program. These agreements represent 10.4 percent of all agreements and account for $86.1 million in 260E program expenditures. The average employment of the 107 firms that participated in these agreements equaled 216 workers.

The evaluation of the job training program on the productivity of the machinery manufacturing industry focused on twenty-two states for which comparable data could be obtained. These are all of the states for which the BLS provides state employment data for this industry. Table 13 lists these states.

Table 14 presents the descriptive statistics for the dependent variable and for the independent variables. The real output per worker in machinery manufacturing in Iowa is lower than that in states like California, Illinois, New York, Ohio, and Texas. The real per worker training expense in Iowa is the highest among all 22 states.

The estimation results are shown in Table 15. The coefficient for the training expense variable is positive as expected, but insignificant.

3. Fabricated Metal Manufacturing Industry

There were 153 260E contracts for firms in the fabricated metal manufacturing industry, accounting for 3.8 percent of total contracts. Table 16 shows the list of 19 states that are included in the state comparison study for the fabricated metal manufacturing industry.

The descriptive statistics for the fabricated metal manufacturing industry are shown in Table 17. The real output per Iowa worker in the fabricated metal industry ($67,244) is near the low end of the spectrum of all 19 states, being only higher than Mississippi, Nebraska, and Oregon.

Table 18 presents the estimation results. The coefficient for the training expense variable is positive as expected, but insignificant.

4. Insurance Carrier Industry

The insurance carrier industry had the most 260E contracts during the period of the study among industries in the service sector. From fiscal year 1984 through 2009, firms in the insurance carrier

industry entered into 106 contracts and these contracts resulted in $82 million in withholding tax credits.

Unlike the machinery manufacturing industry and the fabricated metal industry, data on the output of the insurance carrier industry at the state level were unavailable. To estimate the 260E impact on the Iowa insurance carrier industry, wages were used as the measure of insurance carrier industry activity at state level instead of output per worker.

There were 19 states included in the study for the insurance carrier industry. Data came from County Business Patterns (CBP) published by the U.S. Census Bureau. Table 19 lists the 19 states.

Table 20 presents the estimation results. This analysis found that training expenses were negatively linked to wage. But the coefficient is statistically insignificantly. State education level, measured by the share of population aged 25 and above holding a Bachelor's degree in the states, is positively and significantly related to the average wage.

VI. Conclusion

The second part of the 260E Program evaluation study provides economic and fiscal analyses of the program. The study addressed five issues:

- To what extent does participation in 260E program training result in higher wages for the trainees?
- To what extent does participation in 260E program training result in additional income tax revenue for the State?
- Does the job tenure and residential tenure of 260E program trainees exceed that of comparable workers that did not receive such training?
- To what extent does participation in the 260E program benefit the firms in terms of revenue growth?
- How does the productivity of Iowa industries with high concentrations of firms participating in the 260E program compare to that of similar industries in other states?

This research found the 260E program had a positive and statistically significant impact on trainees' wages and employers' worker retention rates. Also, based on the estimated additional wages and marginal individual income tax rates of trainees, the additional individual income tax payments of trainees were found to average a modest increase of 5.15 percent.

From a firm perspective 260E program participation was found to have a positive effect on revenues, but the impact was not statistically significant. Similarly, from an industry perspective the research found that Iowa's 260E training program does not distinguish itself from programs in other states in terms of improving productivity for the machinery manufacturing, fabricated metal manufacturing, and the insurance carrier industries.

Estimation results of this report are based on data from four out of 15 community college districts in Iowa. Since the other 11 districts mostly cover rural areas in Iowa, the impact of all 260E programs on

workers, firms, industries, and State revenues may vary from the empirical results in this report to some degree, but generally the findings of this study should apply statewide.

VII. Recommendations

- Given the scale of the Iowa New Jobs Training Program (260E) it should be subject to evaluation on a periodic basis with either different community college service areas covered by subsequent evaluations or the development of a means of collecting similar data from all 15 community colleges so that each evaluation can be comprehensive in its coverage.
- A more in-depth analysis should be undertaken to gain a better understanding of why some training contracts did not result in either trainees' wage growth or trainees' individual income tax liability growth.
- A feedback mechanism based on prior contract performance information should be established that the community colleges would be required to use in determining whether applicants for 260E program participation should be approved.

References

Bartel, Ann P., "Training, Wage Growth and Job Performance: Evidence from A Company Database," 1995, Journal of Labor Economics, Vol. 13, No. 3, Jul., 401-425

Black, Sandra E. and Lisa M. Lynch, "Human-capital investments and productivity," The American Economic Review , Vol. 86, No. 2, May, 1996, P263-267

Congressional Budget Office, "CETA Training Programs: Do They Work for Adults?" 1982

Harris, Mark, "Individual-Level Labor Market Outcomes for Wyoming Workforce Development Training Fund Participants," Wyoming Department of Employment, 2005

Heinrich, Carolyn J., Peter R. Mueser, and Kenneth R. Troske, "Workforce Investment Act Non-Experimental Net Impact Evaluation," 2008, IMPAQ International, LLC

Hotz, V. Joseph, Guido W. Imbens and Jacob A. Klerman, "Evaluating the Differential Effects of Alternative Welfare-to-Work Training Components: A Re-Analysis of the California GAIN Program," 2006, NBER Working Paper No. 11939

Lee, David S., "Training, Wages, and Sample Selection: Estimating Sharp Bounds on Treatment Effects," 2009, Review of Economic Studies 76(3), 1071-1102

Rosenbaum, P. R. and D. B. Rubin. (1985) "Constructing a control group using multivariate matched sampling methods that incorporate the propensity score." The American Statistician 39, 33–38.

Sepulveda, Facundo, "Training and Productivity: Evidence for US Manufacturing Industries," 2010, Oxford Economic Papers, Volume62, Issue3, Pp. 504-528.

The Office of Missouri State Auditor, "New Job Training Program Tax Credit: Performance Audit," 2003

Iowa's Job Training Program Evaluation Study

Tables and Figures

Table 1. List of Sectors and NAICS Codes

NAICS Code	Sector
23	Construction
31-33	Manufacturing
42	Wholesale Trade
44-45	Retail Trade
48-49	Transportation and Warehousing
51	Information
52	Finance and Insurance
53	Real Estate and Rental and Leasing
54	Professional, Scientific, and Technical Services
55	Management of Companies and Enterprises
56	Administrative and Support and Waste Management and Remediation Services
61	Educational Services
81	Other Services (except Public Administration)

Figure 1. Distribution of the 260E Contracts by Average Wage Growth Rates
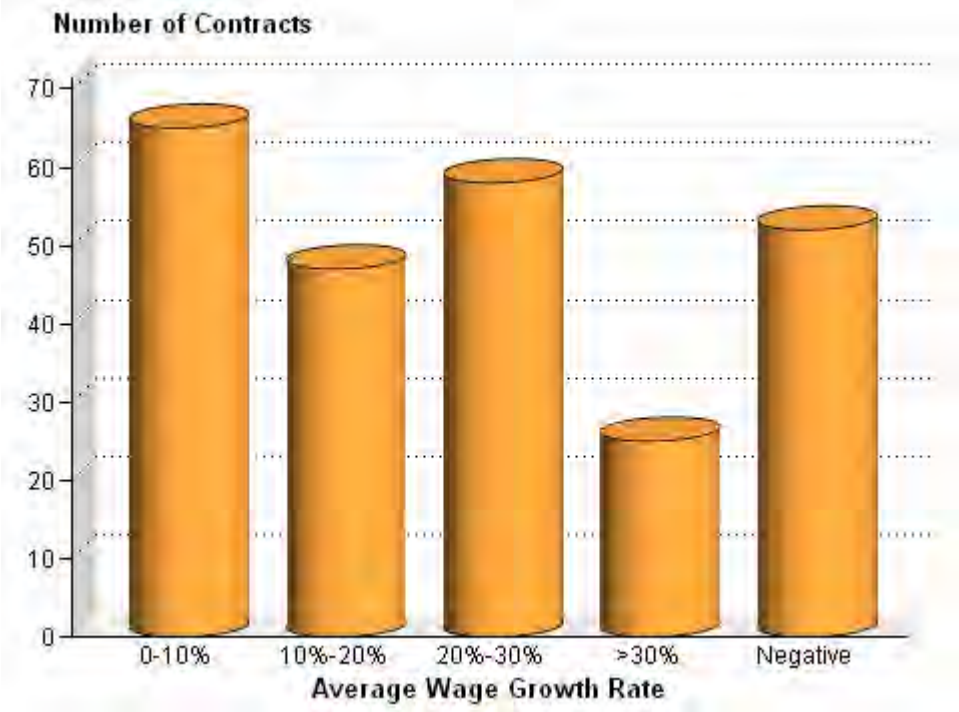
Figure 2. Distribution of the 260E Contracts by Average Individual Income Tax Liability Growth Rates
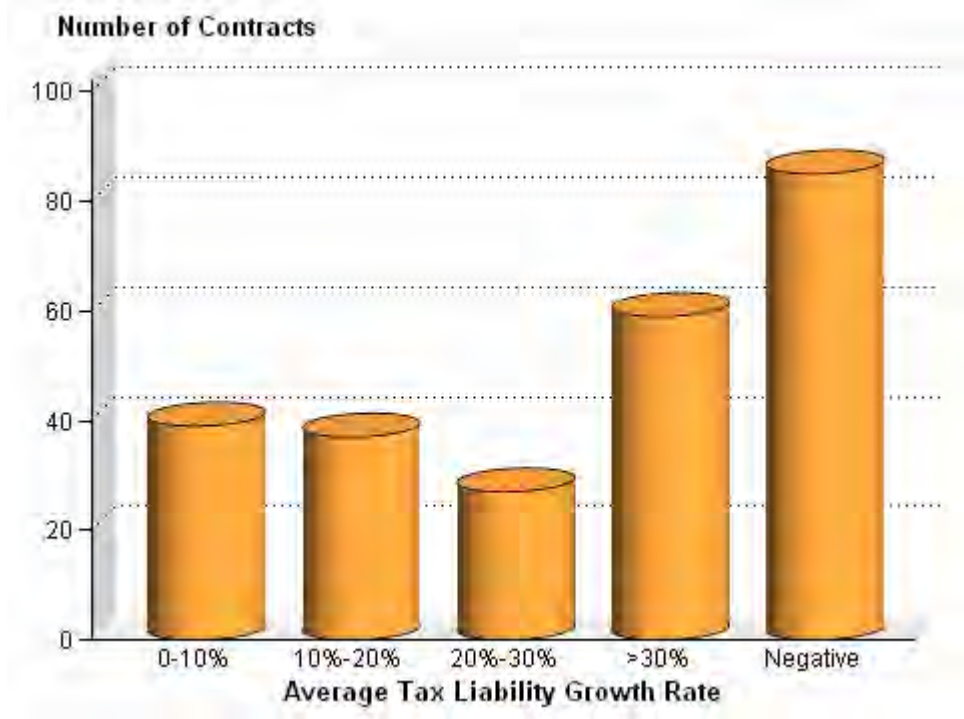
Table 2. Wage Distribution of Trainees

Wage from W2 Form 1 year After the Training

Company Size	Community College	Number of Companies	Wage <$20,000	Wage Between $20,000 and $40,000	Wage Between $40,000 and $60,000	Wage Between $60,000 and $80,000	Wage Between $80,000 and $100,000	Wage >$100,000	Total
<50 Employees	Indian Hills	10	94	98	25	4	1	1	223
	Kirkwood	15	15	86	78	18	6	8	211
	DMACC	20	218	409	116	39	9	17	808
	NIACC	5	37	48	19	7	3	0	114
	Total Number of Trainees		364	641	238	68	19	26	1,356
50-500 Employees	Indian Hills	10	159	311	86	17	10	5	588
	Kirkwood	40	268	1,079	294	90	44	37	1,812
	DMACC	45	981	1,286	546	230	98	105	3,246
	NIACC	2	5	53	11	1	0	0	70
	Total Number of Trainees		1,413	2,729	937	338	152	147	5,716
>500 Employees	Indian Hills	3	281	457	62	27	5	7	839
	Kirkwood	9	115	774	329	222	58	76	1,574
	DMACC	7	419	657	319	60	19	24	1,498
	NIACC	2	333	272	13	2	0	0	620
	Total Number of Trainees		1,148	2,160	723	311	82	107	4,531
Total			2,925	5,530	1,898	717	253	280	11,603

Table 3. Summary Statistics of Trainee Group and Control Group

Kirkwood		Wage		Jobs		Age	
		Before	After	Before	After	Before	After
	Focus Group	$34,364	$39,755	2.12	1.57	35	36
	Control Group	$31,848	$34,717	1.70	1.79	34	36
Indian Hills							
		Before	After	Before	After	Before	After
	Focus Group	$19,128	$24,872	2.06	1.60	33	35
	Control Group	$18,874	$22,704	1.89	1.76	35	37
NIACC							
		Before	After	Before	After	Before	After
	Trainee Group	$21,337	$23,223	1.76	1.61	36	37
	Control Group	$23,700	$22,981	1.46	1.82	38	37
DMACC							
		Before	After	Before	After	Before	After
	Trainee Group	$27,177	$33,096	1.75	1.76	31	34
	Control Group	$25,925	$26,047	1.93	1.83	31	33

Table 4. Descriptive Statistics of Wage, Sample Size, and Number of Jobs by Year

	Trainee Group	Control Group	
Wage	**Mean**	**Mean**	**Difference**
Wage in third year prior	$28,394	$27,292	$1,102
Wage in second year prior	$28,514	$27,237	$1,277
Wage in prior year	$30,364	$27,783	$2,581
Wage in transition year	$34,100	$28,430	$5,669
Wage in following year	$37,301	$30,860	$6,441
Wage in second year after	$38,102	$31,474	$6,628
Wage in third year after	$37,596	$32,808	$4,788
Sample size (Unique Observations)			
Sample size in third year prior	5,910	2,609	
Sample size in second year prior	7,114	3,558	
Sample size in prior year	8,592	4,606	
Sample size in transition year	9,753	5,258	
Sample size in following year	10,947	4,885	
Sample size in second year after	10,661	4,069	
Sample size in third year after	8,042	3,593	
Number of Jobs			
No. of jobs in third year prior	1.77	1.77	0.00
No. of jobs in second year prior	1.77	1.76	0.01
No. of jobs in prior year	1.83	1.77	0.06
No. of jobs in transition year	1.87	2.54	-0.67
No. of jobs in following year	1.69	1.83	-0.14
No. of jobs in second year after	1.53	1.65	-0.12
No. of jobs in third year after	1.50	1.61	-0.10

Some individuals may have been hired or received training more than once during the 1996-2007 period. Some observations in the control group are repeated. These individuals were counted more than once in the sample size. So the sample size can be larger than the number of unique individuals in each group.

Table 5. Estimation of Impacts of the 260E Training on Wages

The dependent variable is wage.

Variable	Estimate	Standard Error	Statistical Significance
Intercept	-2,463,742.00	171,434.00	Significant***
Training Impact	2,475.71	408.54	Significant***
DMACC	10,028.00	528.34	Significant***
Kirkwood	14,580.00	415.76	Significant***
NIACC	1,105.16	789.59	Insignificant
Age	3,833.41	53.74	Significant***
Age-Square	-43.49	0.71	Significant***
Hiring/training Dummy	-589.45	356.63	Significant*
Training/control Dummy	2,229.51	327.29	Significant***
Number of Jobs	-1,785.68	83.26	Significant***
Trend	1,204.57	85.71	Significant***

***: significant at 1% level. *:significant at 10% level. Adj. R square=0.1506.
94,550 observations
Year dummy variables and industry dummy variables are both included in the model. But their estimated results are not shown in the table.

Table 6. Estimation of Impacts of the 260E Program on Trainees' Individual Income Tax Payments

Tax Year	Number of Trainees	Total Tax Increase	Average Tax Increase	Percentage of Tax Increase to Trainees' Tax Liability
1998	221	$16,122	$73	4.28%
1999	1,366	$112,390	$82	4.55%
2000	3,245	$252,240	$78	4.93%
2001	4,740	$385,908	$81	5.11%
2002	5,459	$455,955	$84	5.31%
2003	5,544	$465,810	$84	5.22%
2004	5,975	$512,306	$86	5.57%
2005	5,497	$480,690	$87	5.38%
2006	4,727	$413,239	$87	5.95%

Table 7. Number of Employees by Job Tenure

Job Tenure (Years)	Trainee Group Number of Employees	Control Group Number of Employees
0	1,512	114
1	648	3,510
2	1,056	2,274
3	1,303	1,570
4	579	613
5	427	529
6	394	349
7	312	349
8	412	218
9	197	260
10	79	205
11	60	27
Average Job Tenure	3.18	2.88
Total Employees	6,979	10,018

Number of trainees in this table is lower than the total number of trainees because some trainees did not file income tax returns during the sample period.

Table 8. Estimation of the 260E Program on Job Tenure

Variable	Estimate	Standard Error	Statistical Significance
Intercept	1.8379	0.0410	Significant***
Job Tenure Impact	0.5325	0.0245	Significant***
Kirkwood	1.9518	0.0455	Significant***
NIACC	0.7277	0.0533	Significant***
DMACC	0.9664	0.0463	Significant***

***: significant at 1% level. Log Likelihood=-60774.01201. 13,796 observations

Table 9. Statistics of Resident Status of Employees by Community College Service Areas

College		Iowa Residence	Other States
Kirkwood			
	Trainee Group	94.09%	5.91%
	Control Group	92.33%	7.67%
Indian Hills			
	Trainee Group	92.57%	7.43%
	Control Group	94.96%	5.04%
DMACC			
	Trainee Group	93.43%	6.57%
	Control Group	86.04%	13.96%
NIACC			
	Trainee Group	97.05%	2.95%
	Control Group	94.19%	5.81%

Table 10. Top Five States of Residence of Employees

Trainee Group		Control Group	
State of Residence	**Pencentage of Total Employees**	**State of Residence**	**Pencentage of Total Employees**
IA	94.06%	IA	86.87%
MO	0.69%	IL	1.43%
MN	0.53%	MN	1.32%
IL	0.50%	MO	1.26%
TX	0.45%	NE	1.00%

Table 11. Descriptive Statistics of Companies

Time	Group	Company Size	Average Revenue ($ million)	Percentage of Revenue from Iowa
The Year Prior to the Training	Focus Group	208	29.1	19.92%
	Control Group	83	9.3	19.84%
The Year of the Training	Focus Group	298	32.7	17.41%
	Control Group	83	9.6	20.07%

Table 12. Firm Effect Estimation Results

The dependent variable is revenue from Iowa.

Variable	Estimate	Standard Error	Statistical Significance
Intercept	11,152,092	12,963,296	Insignificant
Employment (S)	49,878	4,207	Significant***
Percent (P)	68,275	29,682	Significant***
Training Effect	2,153,130	4,886,649	Insignificant
Group	11,698,484	2,975,137	Insignificant
Time	245,581	2,349,888	Insignificant

***: Significant at 1% level. Adj. R square=0.3537. 5,469 observations

Other dummy variables (year and industry) are included in the model. But their estimated results are not shown in the table.

Table 13. States in the Study, Machinery Manufacturing

ALABAMA (AL)	KANSAS (KS)	NORTH DAKOTA (ND)	OREGON (OR)
CALIFORNIA (CA)	MASSACHUSETTS (MA)	NEBRASKA (NE)	PENNSYLVANIA (PA)
CONNECTICUT (CT)	MINNESOTA (MN)	NEW JERSEY (NJ)	TENNESSEE (TN)
IOWA (IA)	MISSOURI (MO)	NEW YORK (NY)	TEXAS (TX)
ILLINOIS (IL)	MISSISSIPPI (MS)	OHIO (OH)	
INDIANA (IN)	NORTH CAROLINA (NC)	OKLAHOMA (OK)	

Table 14. Descriptive Statistics for States, Cross-sectional, Machinery Manufacturing

State	Real GDP (Machinery) $m	Total Wage $m	Working Hours (Durable Good)	Real Per Capta Spending on Training	Employment (Machinery), 000	Industrial Electricity, Megawatt-hours	Real GDP Per Worker	Average Wage	Share of Bachelor's Degree Holders, 25+ (%)
AL	844.86	646.00	41.40	$3.61	13.07	34,701,253	$64,634	$49,421	21.70
CA	8,025.86	7,078.57	40.47	$5.46	87.11	51,711,557	$92,130	$81,256	29.60
CT	2,076.43	1,583.57	42.09	$0.84	19.21	5,311,328	$108,067	$82,416	33.60
IA	4,587.57	2,192.86	41.01	$32.26	34.71	17,485,323	$132,152	$63,169	24.10
IL	10,263.86	6,814.29	41.01	$3.75	92.39	43,907,460	$111,098	$73,759	28.00
IN	4,059.29	2,788.43	42.16	$5.28	45.57	47,747,855	$89,075	$61,188	21.90
KS	1,213.71	858.14	41.40	$11.22	17.13	10,791,241	$70,859	$50,100	29.30
MA	2,192.71	1,815.14	41.70	$6.76	23.11	9,814,031	$94,864	$78,529	36.10
MN	3,080.14	2,273.71	40.03	$4.17	35.34	22,083,614	$87,150	$64,333	31.40
MO	1,803.00	1,478.29	40.30	$12.18	30.03	16,284,087	$60,043	$49,229	26.00
MS	886.00	569.86	40.69	$18.00	12.74	15,493,320	$69,529	$44,720	20.10
NC	3,178.57	1,877.43	40.77	$2.19	32.66	30,577,765	$97,332	$57,489	23.90
ND	746.29	311.14	39.69	$6.79	5.67	3,041,805	$131,587	$54,861	25.30
NE	825.14	499.43	41.09	$3.13	9.76	8,404,379	$84,568	$51,186	26.30
NJ	1,506.43	1,303.86	41.59	$6.18	18.60	11,687,570	$80,991	$70,100	33.10
NY	5,259.00	3,840.14	40.80	$1.04	55.37	21,164,690	$94,977	$69,352	30.20
OH	6,179.14	5,146.14	41.94	$3.23	87.00	59,199,828	$71,025	$59,151	24.10
OK	2,060.29	1,374.57	39.96	$3.91	25.07	14,131,580	$82,177	$54,826	22.20
OR	902.29	769.29	40.00	$0.00	11.94	12,583,796	$75,550	$64,414	27.00
PA	4,122.86	3,602.29	41.11	$6.20	58.46	47,622,165	$70,528	$61,623	25.50
TN	3,017.14	1,774.57	39.27	$5.48	34.63	32,959,158	$87,129	$51,246	22.40
TX	9,646.71	5,920.43	41.61	$1.85	83.50	102,203,570	$115,530	$70,903	24.80

Table 15. Estimation Results of Training Expense on Productivity using Fixed Effects Model, Machinery Manufacturing

Variable	Estimate	Standard Error	Statistical Significance
Intercept	5.1508	0.8030	Significant***
Energy Consumption Per Worker	0.002394	0.0042	Insignificant
Working Hours, Durable Good	-0.00888	0.016	Insignificant
Education	-0.00241	0.0106	Insignificant
Training Expense	0.013209	0.0372	Insignificant
Training Expense Square	-0.00797	0.0125	Insignificant

***: significant at 1% level. R square=0.8638. 154 Observations

Table 16. States in the Study, Fabricated Metal

CALIFORNIA (CA)	MASSACHUSETTS (MA)	NEBRASKA (NE)	OREGON (OR)
CONNECTICUT (CT)	MINNESOTA (MN)	NEW JERSEY (NJ)	PENNSYLVANIA (PA)
IOWA (IA)	MISSOURI (MO)	NEW YORK (NY)	TENNESSEE (TN)
ILLINOIS (IL)	MISSISSIPPI (MS)	OHIO (OH)	TEXAS (TX)
INDIANA (IN)	NORTH CAROLINA (NC)	OKLAHOMA (OK)	

Table 17. Descriptive Statistics for States, Cross-sectional, Fabricated Metal

State	Real GDP (Fabricated Metal) $m	Total Wage $m	Working Hours (Durable Good)	Real Per Capta Spending on Training	Employment (Fabricated Metal), 000	Industrial Electricity, Megawatt-hours	Real GDP Per Worker	Average Wage	Share of Bachelor's Degree Holders, 25+ (%)
CA	10,056.14	646.00	41.40	$5.46	145.19	51,711,557	$69,264	$4,449	29.60
CT	2,728.57	7,078.57	40.47	$0.84	34.44	5,311,328	$79,220	$205,516	33.60
IA	1,391.00	1,583.57	42.09	$32.26	20.69	17,485,323	$67,244	$76,554	24.10
IL	8,506.57	2,192.86	41.01	$3.75	112.83	43,907,460	$75,394	$19,435	28.00
IN	4,868.71	6,814.29	41.01	$5.28	59.94	47,747,855	$81,223	$113,680	21.90
MA	3,300.14	2,788.43	42.16	$6.76	37.16	9,814,031	$88,816	$75,044	36.10
MN	3,183.57	858.14	41.40	$4.17	42.96	22,083,614	$74,110	$19,977	31.40
MO	2,420.86	1,815.14	41.70	$12.18	32.99	16,284,087	$73,391	$55,028	26.00
MS	779.00	2,273.71	40.03	$18.00	11.83	15,493,320	$65,857	$192,222	20.10
NC	3,152.57	1,478.29	40.30	$2.19	40.36	30,577,765	$78,117	$36,630	23.90
NE	566.71	569.86	40.69	$3.13	8.74	8,404,379	$64,820	$65,180	26.30
NJ	2,123.29	1,877.43	40.77	$6.18	28.93	11,687,570	$73,398	$64,899	33.10
NY	4,065.71	311.14	39.69	$1.04	58.96	21,164,690	$68,961	$5,277	30.20
OH	9,422.86	499.43	41.09	$3.23	118.56	59,199,828	$79,479	$4,213	24.10
OK	1,622.14	1,303.86	41.59	$3.91	23.70	14,131,580	$68,445	$55,015	22.20
OR	1,051.00	3,840.14	40.80	$0.00	15.91	12,583,796	$66,041	$241,302	27.00
PA	6,323.29	5,146.14	41.94	$6.20	92.39	47,622,165	$68,444	$55,703	25.50
TN	3,187.43	1,374.57	39.96	$5.48	42.19	32,959,158	$75,557	$32,584	22.40
TX	8,605.57	769.29	40.00	$1.85	116.90	102,203,570	$73,615	$6,581	24.80

Table 18. Estimation Results of Training Expense on Productivity using Fixed Effects Model, Fabricated Metal

Variable	Estimate	Standard Error	Statistical Significance
Intercept	4.259933	0.402	Significant***
Energy Consumption Per Worker	-0.00075	0.002	Insignificant
Working Hours, Durable Good	0.006818	0.00824	Insignificant
Education	-0.00448	0.00471	Insignificant
Training Expense	-0.00587	0.0162	Insignificant
Training Expense Square	0.005315	0.00638	Insignificant

***: significant at 1% level. R square=0.8659. 133 Observations

Table 19. States in the Study, Insurance Carrier

CALIFORNIA (CA)	MASSACHUSETTS (MA)	NEBRASKA (NE)	OREGON (OR)
CONNECTICUT (CT)	MINNESOTA (MN)	NEW JERSEY (NJ)	PENNSYLVANIA (PA)
IOWA (IA)	MISSOURI (MO)	NEW YORK (NY)	TENNESSEE (TN)
ILLINOIS (IL)	MISSISSIPPI (MS)	OHIO (OH)	TEXAS (TX)
INDIANA (IN)	NORTH CAROLINA (NC)	OKLAHOMA (OK)	

Table 20. Estimation Results of Training Expense on Wages using Fixed Effects Model, Insurance Carrier

Variable	Estimate	Standard Error	Statistical Significance
Intercept	86545.64	27727.9	Significant***
Energy Consumption Per Worker	-503.04	134.4	Significant***
Education	597.6068	319.1	Significant*
Working Hours	-120.818	576	Insignificant
Training Expense	-364.246	279.5	Insignificant
Training Expense Square	7.685888	5.2289	Insignificant

***: significant at 1% level. *: significant at 10% level. R square=0.9589. 133 Observations

Appendix

Counties in the DMACC, Kirkwood, NIACC, and Indian Hills Community College Service Areas

DMACC	Kirkwood	NIACC	Indian Hills
Audubon	Benton	Cerro Gordo	Appanoose
Boone	Cedar	Floyd	Davis
Carroll	Iowa	Franklin	Jefferson
Dallas	Johnson	Hancock	Keokuk
Guthrie	Jones	Mitchell	Lucas
Jasper	Linn	Winnebago	Mahaska
Madison	Washington	Worth	Monroe
Marion			Van Buren
Polk			Wapello
Story			Wayne
Warren			