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Regression Approach to Adjust WIA Performance Standards

**Kalamazoo, MI
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Outline

- Purpose of paper:
 - Specify a useful performance standards adjustment model for workforce programs
- Purpose of adjustment:
 - Estimate relative "value-added" of each local workforce area (LWA) in helping customers achieve program goals
- "Value-added":
 - How customers do on program goals, compared to what would have happened without that LWA's program
- "Value-added" for each LWA can be compared with performance standard, providing useful information on what aspects of programs to emulate or reform in different LWAs

Distinguishing features of this adjustment model

- Uses common measures for workforce programs, based on wage record data, which are only available after a long lag.
- Uses data from only one state.
 - Wage record data not available for all states;
 - Allows for different adjustment models for each state.
- Estimated using individual data.
 - Too few LWAs in one state to use LWA means for estimation;
 - Individual data may allow more precise estimates.
- Provides real-time forecasts, during and just after program year, for adjustments, value-added, and whether LWA will meet performance standards.

Summary of key empirical findings

- Possible to estimate plausible adjustment model using individual data from one state.
- Variations across LWAs in “adjustment factor” and “value added” are large enough that model is worth doing.
- Good real-time forecasts of adjustments possible.
- Good real-time forecasts of value-added for some common measures and programs are possible.
 - Need additional data for other common measures and programs.

Table 1. Brief Definitions of Common Measures for U.S. Workforce Programs, Including Both Measures for Which This Paper Estimates Adjustment Models, and Measures Not Analyzed By This Paper

Name and label of common measure	Brief Definition	Adjustment model estimated in this study, and for what groups?
<u>Adult common measures</u>		
Common measure 1: Entered employment	Of those not employed at registration in program, the proportion employed in the first quarter after exit from the program, based on wage record data.	Yes: WIA Adult, Employment Service (ES), WIA Dislocated Workers, TANF*, TAA*
Common measure 2: Job retention	Of those employed in the first quarter after exit from the program, the proportion employed in both the second and third quarters after exit.	Yes: WIA Adult, ES, WIA Dislocated Workers, TANF*, TAA*
Common measure 3: Pre to Post Earnings Change	Of those employed in the first quarter after exit from the program, the percentage earnings gain from the first quarter before registration to the first quarter after exit.	Yes: WIA Adult, ES, WIA Dislocated Workers, TANF*, TAA*
Common measure 4: Post earnings change	Of those employed in the first quarter after exit from the program, the percentage earnings gain from the first quarter after exit to third quarter after exit.	Yes: WIA Adult, ES, WIA Dislocated Workers, TANF*, TAA*
<u>Youth common measures</u>		
Common measure 1: Entered employment or advanced education/training	Of those in secondary school at registration, and those not in secondary school who are also not in post-secondary education, employment, or military, the proportion who during first quarter after exit are either employed, or enrolled in post-secondary education or advanced training, or in military. Persons in secondary school at exit are excluded.	Yes: WIA Youth
Common measure 2: Attainment of educational/ training credential	Of those in education or technical/occupational training at registration, or during program, the proportion who attain a diploma, GED, or certificate by the end of the 3 rd quarter after exit. Persons in secondary school at exit are excluded.	Yes: WIA Youth
Common measure 3: Literacy or numeracy gains	Of those who are basic skills deficient when pre-tested, and who either are in program for year or exit from program, the proportion who advance at least one education functioning level in any skill area (reading, writing, numeracy, speaking, listening, functional, workplace skills).	No: These data are not available yet in Michigan
<u>Adult and youth common measures</u>		
Efficiency measure	Spending divided by program participants	No: unclear whether adjustment is feasible

Note: For all common measures, program participants are excluded if at exit, or during three quarters after exit, the participant is in prison or hospital, providing care to family, deceased, or a reservist called to active duty.
*TANF and TAA analyses not yet completed.

Outline of model

- For each program and common measure, estimate:

$$(1) Y_{ij} = \mathbf{B}X_{ij} + W_j + e_{ij}$$
- Y_{ij} is one of the common measures for individual i in LWA j .
- \mathbf{B} is a vector of coefficients to be estimated.
- X_{ij} is individual characteristics and local economic variables that affect common measure.
- W_j is a fixed effect for LWA j , normalized so that weighted sum is zero, so measures value-added relative to state mean.
- *Ex-post* performance standard: whether W_j is greater than M .
- e_{ij} is disturbance term.

Some useful relations

- Estimates of equation (1) must always satisfy:
 - (2) $\text{mean } Y_j = \mathbf{B}(\text{mean } X_j) + W_j$
 - (3) $\text{mean } Y_s = \mathbf{B}(\text{mean } X_s)$.
- Which means value added can be restated as
 - (7) $W_j = \text{mean } Y_j - \mathbf{B}(\text{mean } X_j)$
 - (8) $W_j = (\text{mean } Y_j - \text{mean } Y_s) - \mathbf{B}(\text{mean } X_j - \text{mean } X_s)$
- And performance standard can be restated as
 - (5) $\text{mean } Y_j - \mathbf{B}(\text{mean } X_j - \text{mean } X_s) \geq \text{mean } Y_s + M$.
 - (6) $\text{mean } Y_j \geq \text{mean } Y_s + M + \mathbf{B}(\text{mean } X_j - \text{mean } X_s)$
- Adjustment factor:
 - $\mathbf{B}(\text{mean } X_j - \text{mean } X_s)$

Adjustments can use coefficients and state means from historical data

- (9) $W_j = (\text{mean } Y_j - \text{mean } Y_{sb}) - \mathbf{B}_b(\text{mean } X_j - \text{mean } X_{sb})$
- Performance standard met if:
 - (10) $\text{mean } Y_j - \mathbf{B}_b(\text{mean } X_j - \text{mean } X_{sb}) \geq \text{mean } Y_{sb} + M$
 - b subscript refers to estimates from some historical data.
 - X_j is known for individual characteristics at registration and can be forecast for local economic conditions, so can be estimated during program year.
- Mean Y_j can be forecast by estimating equations
 - (11) $Y_{ij} = \mathbf{CZ}_{ij} + V_j + u_{ij}$
 - Z includes X variables plus "intermediate outcomes."

Possible critiques of model

- An adjustment model leads to standards that are “moving targets”
 - Inherent in any attempt to adjust for current customer mix and current economic conditions.
 - Standard is fixed in terms of value-added.
- Omitted variables may bias estimates of value-added and adjustments
 - Only to extent omitted variables are not proxied for by included variables.
- Peer effects omitted
 - Important in education, but not clear whether important here.
 - Including peer variables may bias value-added estimates.

Model compared with alternatives

- JTPA performance standards
 - Based on group means and national estimation.
 - State estimation more feasible than national for common measures, allows more for state-specific adjustments.
 - Individual data allow for better estimates for variables that have only a few LWAs with unusual LWA means.

Model compared with alternatives

- Performance standard based on improvements over historical performance for LWA
 - This makes sense if omitted variable bias is large, omitted variables don't change much over time, and little difference across LWAs in value-added in historical period.
 - But these assumptions are questionable.
 - Basing performance standards on improvements is tough on historically well-performing LWAs, easy on historically poorly performing LWAs.

Table 2. Sample Means for Four Michigan Workforce Programs

Variable	Adult WIA	ES	WIA dislocated workers	Youth WIA
Sample size, common measure 1	10,274	87,389	7,599	3,248
Sample size, Other common measures	9,056	16,946 (50,710 for CM3)	6,284	1,973
Common measure:				
1. Employed 1 quarter after exit (of those not employed at registration)	0.763	0.504	0.801	
2. Retained job in quarters 2 and 3 after exit	0.726	0.735	0.839	
3. Percentage earnings change from quarter before registration to 1 quarter after exit	102.5	-2.1	23	
4. Percentage earnings change from 1 quarter after exit to 3 rd quarter after exit (Measures 2, 3 and 4 only include those employed 1 quarter after exit. Percentage earnings change for individual is change in earnings divided by state mean in base period.)	-13.4	-0.5	-6.1	
Youth common measures:				
1. Employed one quarter after exit, or exited due to entering military, apprenticeship, training or post-secondary education. Excluded if employed and not in secondary education at registration.				0.656
2. Of students at registration, or received training/education during program, whether attained diploma or other education/training credential				0.657
Age				
29 or less	0.370	0.280	0.165	
30-39	0.305	0.277	0.283	
40-49	0.226	0.247	0.348	
50 or more	0.099	0.206	0.204	
Age at registration = 14				0.015
Age at registration = 15				0.023
Age at registration = 16				0.063
Age at registration = 17				0.151
Age at registration = 18				0.175
Age at registration = 19				0.233
Age at registration = 20				0.191
Age at registration = 21				0.148
Gender				
Male	0.49	0.61	0.55	0.41
Female	0.51	0.39	0.45	0.59

Table 2. (Continued)

Variable	Adult WIA	ES	WIA dislocated workers	Youth WIA
Race	0.194	0.670	0.223	0.282
White	0.802	0.237	0.773	0.735
African American	0.020	0.068	0.011	0.029
Hispanic/Latino	0.034	0.022	0.020	0.042
Native American/Alaskan Native	0.007	0.012	0.008	0.010
Other (Asian/Hawaiian/Pac. Islander)				
Education	0.154	0.141	0.063	0.634
Less than high school	0.119	0.080	0.094	0.044
Certificate equivalent to HS	0.509	0.351	0.554	0.305
High school graduate/GED	0.166	0.306	0.192	0.018
Some college	0.045	0.092	0.078	0
Bachelor degree	0.007	0.031	0.019	0
Advanced				
Wages	2.856	5.482	6.269	0.792
Avg. quarterly wages in non-zero quarters 3-12 before registration (in thousands)	0.139	0.124	0.071	0.212
Wages zero all 10 quarters (3-12 before registration)	0.241	0.158	0.095	0.460
1-5 non-zero wage quarters	0.620	0.718	0.834	0.328
6-10 non-zero wage quarters				
Has disability	0.070	0.015	0.025	0.140
Veteran	0.066	0.184	0.106	0.003
Single parent	0.306		0.144	0.296
Long-term TANF	0.180		0.016	0.205
General/refugee/SSI assistance	0.055		0.011	0.085
Food-stamp recipient	0.305		0.056	0.291
Homeless	0.020		0.004	0.026
Pregnant or parenting youth	0.007		0.001	0.320
Limited English	0.026		0.038	0.016
Displaced homemaker	0.003		0.088	0
Offender	0.052		0.008	0.123
Other barriers to employment	0.034		0.013	0.160
Number in family	2.2		2.3	2.2
Alternate or no phone only	0.037	0.044	0.013	0.04
Not registered for selective service	0.016		0.03	0.01
Layoff/termination		0.551		
Plant closure		0.034		
Long-term unemployed		0.011		
Self-employed, farmer		0.001		

Table 2. (Continued)

Variable	Adult WIA	ES	WIA dislocated workers	Youth WIA
Basic skills deficiency				0.617
Behind 1 grade level				0.348
Prior industry	0.006	0.012	0.003	0.006
Agriculture, forestry, fishing	0.001	0.002	0.001	0
Mining	0.001	0.002	0.001	0
Utilities	0.029	0.082	0.022	0.013
Construction	0.190	0.180	0.437	0.045
Manufacturing	0.026	0.039	0.046	0.010
Wholesale trade	0.125	0.100	0.079	0.161
Retail trade	0.015	0.028	0.025	0.006
Transportation, warehousing	0.007	0.017	0.011	0.005
Information	0.013	0.022	0.024	0.003
Finance and insurance	0.010	0.014	0.007	0.008
Real Estate, rental, leasing	0.027	0.055	0.047	0.009
Professional, scientific, technical	0.003	0.003	0.001	0.003
Company/enterprise mgt	0.175	0.124	0.103	0.110
Admin, support and waste mgt	0.020	0.020	0.014	0.049
Educational services	0.068	0.051	0.035	0.039
Health care/social assistance	0.011	0.014	0.008	0.019
Art, entertainment, recreation	0.090	0.061	0.024	0.266
Accommodation and food services	0.021	0.024	0.016	0.016
Other services (except public admin)	0.011	0.012	0.010	0.012
Public administration	0.003	0.003	0.004	0.004
Unclassifiable	0.009	0.009	0.010	0.003
Industry missing				
Employed at registration (only relevant for CMs 2 through 4)	0.130	0.151	0.031	0.139
Change unemployment rate, (registration - 1) quarter to (exit + 1) quarter	0.009	0.007	0.009	0.008
Change unemployment rate, exit + 1 quarter to exit + 3 quarters	0.007	0.012	0.007	
Variables used in exit models only:				
Employed at exit	0.881		0.897	0.638
Hourly wage at exit	9.25		11.40	7.32
Weekly hours	37.3		38.9	33.9

Table 2. (Continued)

Variable	Adult WIA	ES	WIA dislocated workers	Youth WIA
Exit occupation:	0.028		0.058	0.010
Management, business, financial	0.048		0.056	0.021
Professional and related	0.179		0.086	0.196
Services	0.053		0.046	0.077
Sales and related	0.110		0.134	0.093
Office and administrative support	0.001		0.001	0.004
Farming, fishing and forestry	0.020		0.023	0.012
Construction and extraction	0.019		0.038	0.009
Installation, maintenance and repair	0.169		0.238	0.059
Production	0.078		0.095	0.023
Transportation and material moving	0.176		0.123	0.122
Missing or military				
ES service means as of exit:		0.260		
Resume assistance/preparation		0.303		
Specific LMI		0.031		
Veterans vocational guidance		0.001		
Provided case management		0.115		
Referral, supportive service		0.007		
Other testing		0.007		
Referred to training		0.002		
Enrolled in training		0.037		
Job development		0.109		
Job search planning		0.023		
Job search workshop		0.094		
Referred to WIA services		0.060		
Job referral				

NOTE: For three WIA groups, the participant must have registered and exited between July 1, 2000 and September 30, 2002. For ES, the individual must have exited between July 1, 2002 and March 31, 2003 for common measures 1 and 3, and between July 1, 2002 and September 30, 2002 for common measures 2 and 4. The sample means reported above are generally for the sample used to estimate common measure 1 (sample means for same program and other common measures are similar).

Table 3. Summary of Statistical Significance and Relative Importance of Different Classes of Variables for 14 Adjustment Models

	Common measure 1 Entered employment (4 models total)	Common measure 2 Job retention (3 models total)	Common measure 3 Pre- to post-earnings change (3 models total)	Common measure 4 Post-earnings change (3 models total)	Youth common measure 2 Gained educational credential (1 model total)	Overall summary: Number of models in which significant (out of 14); average ranking across all models in which significant
Gender	3, 9, 4, ___	2, 8, 2	3, 5, 6	___, ___, ___	3	10; 4.5
Race	___, 8, 7, ___	___, 7, ___	___, ___, 5	___, ___, ___	4	5; 6.2
Age	5, 2, 2, 4	___, 4, ___	___, 7, ___	___, 3, ___	2	8; 3.6
Education	7, 4, ___, 5	3, 2, 5	5, 8, ___	___, 2, ___	1	10; 4.2
Prior employment	1, 1, 1, 1	4, 1, ___	1, 2, 3	___, 4, ___	___	10; 1.9
Prior wages	2, 3, 6, 2	1, 6, 3	4, 1, 1	___, ___, 2	___	11; 2.8
Barriers	6, 5, 3, 3	6, 3, 1	___, 4, ___	___, ___, ___	5	9; 4.0
Prior industry	___, 7, 5, ___	7, 5, 4	6, 6, 4	2, 1, 3	___	11; 4.5
Change in unemployment	4, 6, ___, ___	5, ___, ___	2, 3, 2	1, ___, 1	___	8; 3.0

NOTE: For each common measure and class variable, that cell lists ranking/significance results in the following order: WIA Adult, ES, WIA Dislocated, and Youth. For common measures 2 through 4, no youth model is relevant. Obviously, the Youth common measure 2 results are only for that one program. If for a given class of variables, no variable is statistically significant, that class of variables is unranked for that model, which is indicated by an underscore. To determine ranking, we first examine which class of variable has greatest t-statistic (in absolute value) for that model, and that class gets rank of one. We then look within that model at other classes of variables, and the class which includes the next highest t-statistic (ignoring variables in the class which has already been ranked) is ranked second. The ranking continues along the same logic until all remaining classes have no variables that are statistically significant for that model. For example, the "3, 9, 4, ___" in the cell for gender for CM1 means that the gender class of variables is the 3rd most important for the WIA Adult program, 9th most important for ES, 4th most important for the WIA Dislocated program, and insignificant for WIA Youth.

Table 4. Adult WIA Parameter Estimates (t-statistics in parentheses)

	Common Measure 1: Job entry		LWA	Common Measure 1: Job entry	
	Parameter estimate	t-statistics		Parameter estimate	t-statistics
Dependent variable mean	0.763		A	0.092	(3.10)
Age			B	-0.024	(-1.43)
29 or less	0.060	(3.91)	C	0.030	(0.72)
30-49	0.030	(2.06)	D	0.036	(2.71)
Gender			E	-0.008	(-0.14)
Male	-0.045	(-5.16)	F	0.030	(1.00)
Education			G	-0.117	(-3.98)
Less than high school	-0.032	(-2.75)	H	0.058	(2.69)
Wages			I	0.033	(1.06)
Avg. quarterly wages in non-zero quarters 3-12 before registration (in thousands)	0.013	(6.36)	J	0.101	(1.99)
Wages zero all quarters, 3-12 quarters before registration	-0.134	(-9.03)	K	0.027	(2.28)
1-5 non-zero wage quarters	-0.087	(-8.23)	L	-0.102	(-3.46)
Has disability	-0.061	(-3.59)	M	0.025	(1.65)
General/refugee/SSI assistance	-0.055	(-3.02)	N	-0.002	(-0.09)
Homeless	-0.069	(-2.33)	O	-0.038	(-1.27)
Alternate or no phone only	-0.068	(-3.10)	P	-0.101	(-5.59)
Prior industry			Q	0.047	(1.32)
Construction	-0.046	(-1.87)	R	-0.014	(-1.65)
Educational services	0.054	(1.85)	S	0.052	(1.59)
Health care/social assistance	0.026	(1.55)	T	-0.028	(-2.18)
Change in unemployment rate	-1.018	(-4.14)	U	-0.028	(-0.87)
			V	0.006	(0.28)
			W	0.082	(2.87)
			X	0.024	(1.00)
			Y	-0.013	(-0.42)

Table 5. Decomposing LWA Performance into Adjustments for LWA Characteristics and Value-Added

Program and common measure	State Mean	Correlation of predicted adjustment with differential LWA performance	Standard deviation of		
			LWA mean	LWA adjustment factor	Estimated LWA value added
WIA Adult					
cm 1: Job entry	0.763	0.702	0.072	0.021	0.059
cm2: Job retention	0.728	0.779	0.064	0.028	0.045
cm 3: Pre to post earnings gain	102.5	0.508	20.2	9.4	17.4
cm 4: post earnings gain	-13.4	0.395	5.4	1.9	5.0
ES					
cm 1: Job entry	0.504	0.530	0.041	0.019	0.035
cm2: Job retention	0.735	0.773	0.053	0.027	0.037
cm 3: Pre to post earnings gain	-2.1	0.532	10.2	7.4	8.9
cm 4: post earnings gain	-0.6	0.162	5.5	3.8	6.2
WIA dislocated workers					
cm 1: Job entry	0.801	0.500	0.069	0.033	0.059
cm2: Job retention	0.839	0.310	0.053	0.016	0.051
cm 3: Pre to post earnings gain	23.0	0.020	15.3	7.1	16.8
cm 4: post earnings gain	-6.1	0.294	3.7	1.3	3.5
WIA Youth					
cm 1: Job entry	0.656	0.488	0.088	0.051	0.077
cm2: Obtain ed credential	0.657	0.397	0.193	0.075	0.177

NOTE: Correlations and standard deviations for each cell are calculated based on 25 observations, one for each LWA. The correlations are based on a variation of Equation (8): $(\text{mean } Y_j - \text{mean } Y_s) = \beta (\text{mean } X_j - \text{mean } X_s) + W_j$. The correlation is between the left hand side of this equation and the first term, the "adjustment factor." The standard deviations are for the left hand side of the equation, the first expression on the right hand side, and W_j . Because the left hand side and the adjustment factor both subtract out the state mean from the value for each LWA, the correlations and standard deviations involving these terms would also apply if these expressions were replaced by mean Y_j and $\beta (\text{mean } X_j)$.

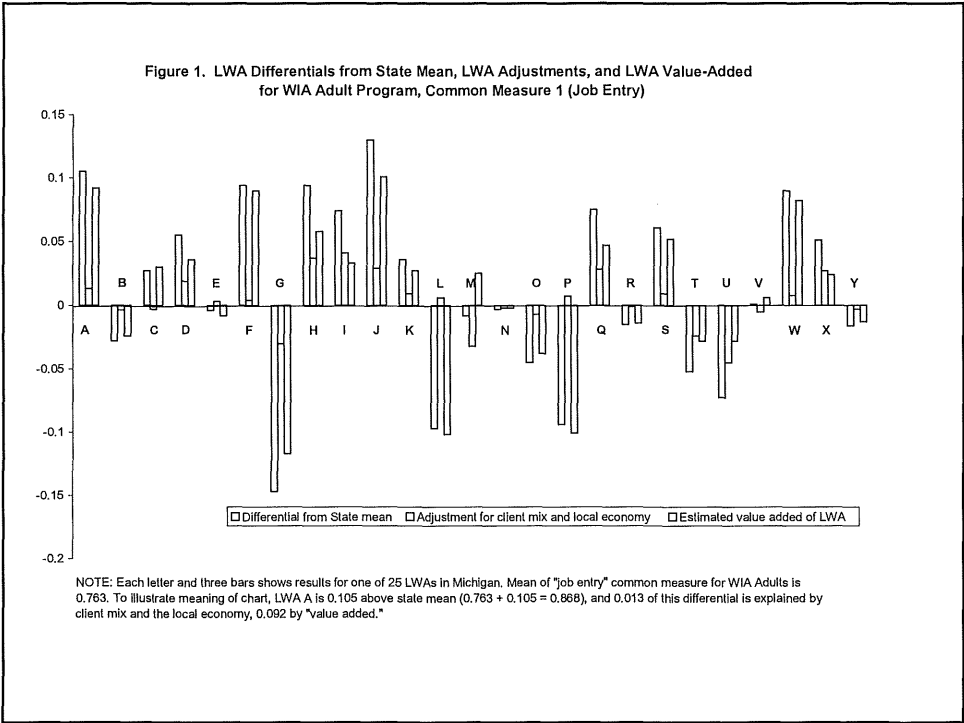


Table 6. Correlation of "Final" Performance Adjustment with Adjustment Estimate at Registration

	CM1 (Job entry)	CM2 (Job retention)	CM3 (Pre- to post- Earnings gain)	CM4 (Post- earnings gain)	Youth CM2 (Obtain educational credential)
Adult WIA	0.948	0.973	0.903	0.676	
ES	0.940	0.993	0.953	0.866	
Dislocated WIA	1.000	0.993	0.914	0.776	
Youth WIA	0.898				0.922

NOTE: "Final" performance adjustment is $B(\text{mean } X_j - \text{mean } X_i)$. This is calculated after sample used for that common measure is known and change in unemployment is known. Estimated performance adjustment at registration uses mean of X_s for LWA j except that change in unemployment is assumed to be zero. In addition, mean of X_i is calculated as weighted mean of registration sample. Weights used are estimated probabilities from logit estimates of probability of each observation in registration sample being in final sample for that common measure. Correlations use 25 observations, one for each LWA.

Table 7. Correlation of Exit Predictions of Common Measure for LWA with Actual LWA Mean for Common Measure, Compared to Correlation of Registration Prediction with Actual LWA Mean

	CM1 (Job entry)		CM2 (Job retention)		CM3 (Pre- to Post-earnings change)		CM4 (Post-earnings change)		Youth CM2 (Got educational credential)	
	Exit with Actual	Regis. with Actual	Exit with Actual	Regis. with Actual	Exit with Actual	Regis. with Actual	Exit with Actual	Regis. with Actual	Exit with Actual	Regis. with Actual
Adult WIA	0.826	0.595	0.760	0.745	0.717	0.484	0.138	0.133		
ES	0.669	0.565	0.807	0.797	0.562	0.520	0.220	0.250		
Dislocated WIA	0.603	0.500	0.371	0.316	0.195	-0.067	-0.026	0.105		
Youth WIA	0.573	0.299							N/A	0.350

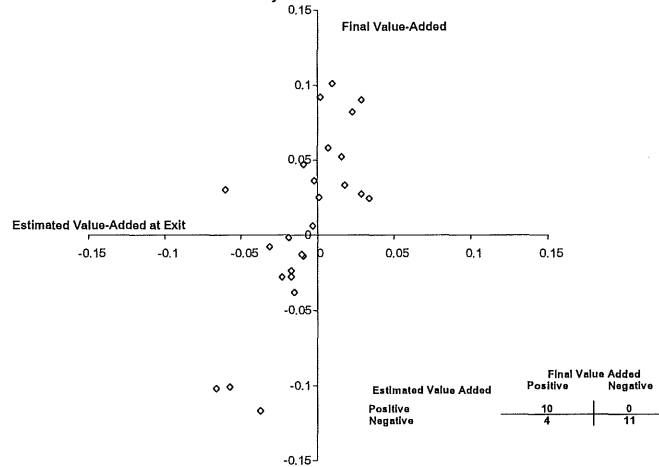
NOTE: Correlations are based on 25 observations, one for each LWA. First set of predictions use "intermediate outcomes," observed at exit, to predict common measures. Individual predictions are weighted by logit probabilities, estimated at exit, for being in that common measure sample, and weighted means for each LWA are calculated. Correlation is between that weighted mean prediction and actual LWA mean. Second set of correlations are based on similar predictions and logit weights, but estimated at registration.

Table 8. Correlations of Value-Added Estimates at Exit with Final Value-Added Estimates

	CM1 (Job entry)	CM2 (Job retention)	CM3 (Pre- to post-earnings change)	CM4 (Post-earnings change)	Youth CM2 (Got educational credential)
Adult WIA	0.730	0.410	0.627	0.154	
ES	0.382	0.096	0.170	0.004	
Dislocated WIA	0.344	0.218	0.459	-0.079	
Youth WIA	0.316				NA

NOTE: Correlations are based on 25 observations, one for each LWA. The value-added estimated at exit is calculated by adding adjustment estimated at exit to prediction of common measure using intermediate outcomes estimated at exit. The adjustment estimated at exit uses original coefficients, but the weighted means use weights that are based in part on intermediate outcomes. The final value-added estimates are the ex-post estimates, when common measures, final sample, and change in unemployment are known.

Figure 2. "Final" Value-Added vs. Estimated Value-Added at Exit for WIA Adult Program, "Job Entry" Common Measure



NOTE: Each diamond represents results for one LWA in Michigan. "Final" Value-Added is estimated value-added after common measure value is known, change in unemployment is known, and final sample is known. Estimated value-added at exit uses intermediate outcomes to predict common measure, assumes no change in unemployment in doing adjustments, and uses probability weights of being in final sample.

Implementation issues

- Implementation requires that wage record data be integrated with administrative data on real-time basis, as prior wages/employment critical to adjustment
- Model could in principle be updated daily with new estimated adjustments, value-added, and performance standard attainment status.
- Needed improvement:
 - Better information on intermediate outcomes that might predict job retention and post earnings gains.
 - Performance in training activities? Short post-program follow-up surveys?

Conclusion

- This modeling approach is feasible.
- Adjustments matter for LWAs, and there are significant differences in value-added across LWAs.
- Intermediate outcomes can be used to predict value added and performance standard attainment for some common measures and programs, but not all.
- Some additional data are needed, and might be useful for other purposes.

Regression Approach to Adjust WIA Performance Standards

Kalamazoo, MI
July 13, 2004