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APPLIED WORK-BASED LEARNING AT THE STATE UNIVERSITY OF NEW YORK

Situating SUNY Works and Studying Effects

Supplementary Report on Assessing Labor Market Outcomes: A Pilot Study

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March 2016

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In May 2015, the State University of New York (SUNY) Board of Trustees adopted a resolution directing Chancellor Nancy Zimpher to develop a plan to make applied learning opportunities available to SUNY students. While all applied learning experiences – work-based, service-oriented, or directed research – are believed to strengthen the academic performance of students,¹ internships are believed to improve employment outcomes on graduation.² Research on the effects of applied work-based learning experiences on employment rates, salaries, and levels of job satisfaction suggests that such beliefs may be warranted.³ However, the findings from extant research often lack detailed information useful for program development and evaluation at department, campus, or system levels.

Access to detailed and comprehensive administrative data has opened up the possibility to pursue continuous, systematic, and more refined assessments of the effects of applied learning. However, most studies using such data have not examined the effects of applied learning on retention, graduation, and labor market outcomes.⁴ To better judge the feasibility of using administrative

data to measure such effects, we conducted a pilot study of the effects of internships — one form of applied learning — at one SUNY campus. Working with experienced analysts in the field and New York State Department of Labor (NYSDOL) staff, as well as SUNY officials and administrators at the SUNY campus participating in this pilot study, we identified and addressed a range of design, measurement, and implementation matters. Findings and conclusions concerning the effects of internships on academic success (retention and graduation) are presented in the main report, *Applied Work-Based Learning at the State University of New York: Situating SUNY Works and Studying Effects*.

In this supplement, we report findings on the feasibility of using extant academic unit records linked to NYSDOL Unemployment Insurance (UI) wage records to estimate the effects of internships on employment outcomes. Findings are presented and discussed, with due attention to the constraints of the pilot study itself and considerations in interpretation.

Overall, we find that the effects of internships on employment outcomes can be estimated with linked administrative academic-wage records. However, there are important design, measurement, and implementation considerations that limit the measures available and the strength and usefulness of the findings. An important limitation is that access to employment and wage information in the NYSDOL UI wage record files is, at present, available to SUNY only as data for groups of no less than ten graduates. Access to individual wage records, linked to administrative academic records, would extend and refine the kinds of analyses that could be carried out and, therefore, strengthen the confidence researchers and administrators could have in the results.

A further, major limitation with respect to presently available information is incomplete coverage.

NYSDOL wage record information is limited to graduates who take up covered employment in New York State (NYS). Employment outcomes for graduates who leave NYS, who are self-employed, or otherwise not in covered employment are not known. The extent to which internships are associated with more or less favorable results overall cannot be estimated. Insofar as New York pursues data sharing agreements with other states in the region, this limitation can be reduced. With the data presently available, analyses can uncover associations of internships with likelihood of *employment in NYS* and level of *wages of graduates employed in NYS*. Those are narrower, but still relevant, measures of effects for SUNY and its campuses.

The measures of effects could be extended if campuses and programs had information on students who transfer out (to include, eventually, employment outcomes for such students) and who continue into graduate studies. If not available for every student or graduate, at least information on registrations and academic performance for students moving among SUNY campuses might be incorporated in analyses.

Academic records might be further extended, to include information collected in a systematic way on student participation in internships that do not come under a formal course. Initiatives with E-Portfolios might offer useful examples of approaches to obtain such information, at once complementary to and richer than what may be obtained from online surveys of students or graduates.⁵

Another limitation is the lack of detailed information on internships — beyond course designation — to mark participation and credits earned. SUNY, and individual campuses, are developing and implementing means to assign to each course a classification according to the nature of the applied learning experience provided.⁶ But, as noted in the main report, we lack additional details on features of internships, such as whether internships are integrated within a degree program, structured seminars are organized within the internship, faculty are directly involved, employers who host interns have ongoing relationships to the program, and whether assessments are geared to cognitive and noncognitive objectives. Under SUNY Guidelines, all approved applied learning experiences are expected to manifest features such as these.⁷ However, to the extent that the features differ within and among fields of study, they may be associated with differences in employment outcomes as well as retention and graduation rates. If so, such findings could target areas for change in the organization of and arrangements for internships.

Even lacking details on internship features, extant administrative academic unit data linked to UI wage record data could be used for the assessment of employment outcomes at program, campus, and system level. If UI wage record information were routinely appended to administrative academic records, changes over time in employment outcomes for internships can be tracked against the introduction or adaptation of particular internship features or different levels of participation at program or campus level. Department faculty, through other methods, could probe more fully what might account for changes (if any) in observed employment outcomes.

Beyond design, measurement, and implementation considerations, the analyses of employment outcomes yield two main findings of interest. One finding is *that estimates of the effects of internship on employment outcomes are mixed — and, generally, more mixed than what we found for effects on retention and graduation as presented in the main report.* The mixed findings may owe to data limitations, specifically the use of comparisons of groups of internship takers to groups of nontakers, as opposed to student-level analyses made possible with unit-record data. For analyses of the effects of internship taking on retention and graduation in the main report, we relied on multivariate statistical techniques as well as propensity score matching. Or, the mixed results may simply reflect the reality of distinct labor markets for graduates from different fields. Labor market outcomes also reflect near-term dynamics

in national and regional economies, having greater or lesser effects by sector or occupation. We do not fully account for such influences.

The second finding is that *some results appear to be highly suggestive*. In particular, we find generally consistent evidence that graduates in business with internships were more likely to be employed in NYS, more likely to find jobs in NYS sooner, and more likely to receive higher wages in NYS jobs than their peers without internships. We find less consistent evidence of differences in effects by personal attributes of graduates. We judge all results to be suggestive. Even for business graduates, not all of the differences associated with internship taking are statistically significant. In a few comparisons, for graduates from other fields or manifesting particular demographic or socioeconomic attributes, the pattern is reversed. Moreover, as already noted, the coverage of postgraduation experiences is incomplete and the measures of employment outcomes are limited to the period immediately following graduation. Finally, we don't know enough to conclude that the internships — let alone any particular features of the internships — account for observed results.

I. Design, Measurement, and Implementation

Administrative data, already collected by campuses and NYS, provide an opportunity to measure the impact of internship that may be utilized by campuses or systems. An important aim of the pilot study was to explore how far administrative academic unit records, linked to UI wage records, can be used to assess the effects of internships on employment outcomes. While such data increasingly are being accessed and used for studies of differences in employment rates and salaries by field for institutions and states, the pilot study is distinctive in its use of linked academic-wage records to uncover the effects of a single program feature — internship — within and across fields. We sought to explore the feasibility of such an approach, provide details on the measures available, and identify limitations and gaps. Although undertaken for one campus, the considerations and findings from this pilot study reveal the potential for, and limitations of, such an approach for other campuses and for SUNY.

General design, measurement, and implementation matters are addressed in the main report. We summarize and extend that discussion here, drawing out considerations in using linked academic-wage record data to assess the effects of internships on employment outcomes.

A. Design

In approach, the employment outcomes of participants in applied work-based learning experiences need to be compared to the employment outcomes of graduates who did not have such experiences in the course of their studies. Graduates in these two groups may differ in individual or program attributes that are

likely to be associated with their prior decisions to participate in internships and also may be associated with employment outcomes. So, the method used to uncover the effects of internship taking should take into account such attributes. Methods to do this aim to address the problem of self-selection into internships as well as to improve the accuracy of the estimation of the effects of the internship alone.

As developed in the main report, we judged a “matched” students strategy as the most appropriate method for the pilot study.⁸ Under such an approach, academic and socioeconomic information is used to “match” students (here, graduates), i.e., to identify those who are similar in the likelihood of participation in an internship. Employment effects of internships are then estimated by comparing the outcomes of those who participated in such experiences with those in the “matched” group. However, for the analysis of employment outcomes, we lacked access to the unit records needed in order to develop the “matches.” For this part of the pilot study, we could not implement the preferred method. While we had access to academic unit records for the pilot study and individual wage information could be linked to the academic unit record, only group data with linked academic-wage record information were made available to us. As a result, we worked with 176 groups of graduates, reducing to eighty-eight “pairs.” Each group within a “pair” has in common individual or program attributes but differs in participation in internships. We discuss this approach further under implementation considerations below.

Four considerations for the design of the pilot limit the analyses and bear upon interpretation.

- *Many work-based learning experiences are not recorded as credit-bearing internships.* Internship taking in the pilot study is obtained from identified coding on the graduate’s academic record, specifically through completion of courses organized around an internship recognized for academic credit. In those courses, students meet expectations for assessment, per program faculty. But, many students participate in internships that are not formally recognized by academic programs. Since students with such internship experiences cannot be identified in available academic records, they fall into the comparison group in the analysis, i.e., those without internships. To the extent that these students have applied work-based learning experiences similar to those of students whose internships are recognized for credit in academic programs, the effects of participation in internships will be underestimated. While the number of such students is unknown, it is likely that the shares differ by individual and program attributes.⁹

Nonetheless, the results can provide meaningful information at campus and system levels, *if* interpreted narrowly as the effects of participating in an internship

recognized by the program/campus as meeting academic requirements with respect to learning aims, learning experiences, and subject to academic oversight.

- *The assessment of effects of internship taking on employment outcomes needs to take into account the labor markets in which graduates seek, and take up, jobs.* While graduates may pursue a range of employment opportunities, most recruitment for jobs takes place in submarkets that broadly align with fields of study. Published analyses of available data from both surveys of individuals and households and linked academic-wage record information similar to data assembled for the present study show higher employment rates and higher starting salaries for those with bachelor's degrees in business and applied sciences and lower employment rates and starting salaries for bachelor's degree graduates in humanities and fine arts.¹⁰ Since our purpose is to isolate on the effects of internship taking, analyses by field of study allow for some account to be taken of differences in the submarkets in which graduates are likely to seek employment.
- *Fields of study differ in the extent to which students engage in internships.* In some fields, internships do not figure in academic programs, and few students participate in this type of applied learning experience. For others, particularly professional or licensed fields, practical field-based experiences may be expected (if not required), assessed, and recorded for every student. In the pilot study, about 3 percent of graduates in history had participated in at least one internship while every graduate in journalism participated in an internship recorded in academic records. For these fields and others representing the extremes of very low or very high participation in internships, simple comparisons between internship takers and nontakers are not possible.

With this consideration in view, we worked closely with officials at the participating campus to identify fields in which internships are voluntary and with proportions of internship takers at neither extreme (very low or very high rates of internship taking). Of these fields, we further identified those for which the numbers of both internship takers and nontakers and of graduates were large enough to permit comparisons via "paired" groups. The selected fields are Biology, Business, Health Sciences, and Psychology. Graduates may have followed different degree plans/specializations within the field (B.A. or B.S., for example).

While such an approach allows us to examine the effects of participation in an internship, it reveals an important limitation for the use of available linked academic-wage record data to analyze the effects of internships on employment outcomes. For fields in which internships are

expected, required, or commonly pursued (and, equally, for fields in which none of these considerations apply), future analyses will need to be framed differently. Within fields expecting or requiring internships, for example, analyses might explore differences in employment outcomes by internship feature.¹¹ With some exceptions, information of this type is not now routinely or systematically collected and entered into administrative databases.¹² However, in fields or on campuses where arrangements for internships have changed, continuous and systematic monitoring of trends in employment outcomes using presently available linked academic-wage record data might provide indications of effects associated with such changes.

- *Academic records at a single campus have incomplete information on the studies of those who transfer in or of those who leave to complete degrees elsewhere.* By design, the pilot study is limited to students who entered as first year undergraduates and, for employment outcomes, completed degree studies at the participating campus. However, motivated by student choices and by policy,¹³ the share of students attending more than one college is substantial and such students can be tracked, increasingly, through unit records.¹⁴ The issue is a general one, beyond the reach of this pilot study, but potentially of greater interest for some campuses and for evaluation of applied work-based learning across SUNY.

B. Measurement

For the purposes of the analysis, we use three employment outcome measures: *employed within NYS in any one of six quarters from the date of graduation* (counted as employed in the quarter if wages exceed the minimum wage threshold); *number of quarters until the first match* (excluded, if wages are less than the minimum wage threshold); *highest wages recorded in any of the first six quarters from the date of graduation* (excluded, if the wages are less than the minimum wage threshold in all quarters).

Here, we elaborate on considerations for measurement raised in the main report, *Applied Work-Based Learning at the State University of New York: Situating SUNY Works and Studying Effects*.

- *The wage records provide information on formal employment within New York State, excluding graduates who are self-employed, employed outside of New York State, or continue in graduate programs.* NYSDOL obtains from nearly every employer a wage record for each employee. Employers file wage records each quarter. NYSDOL estimates that 97 percent of those working in NYS appear in the wage records.¹⁵ The proportions of graduates employed in NYS who come under covered employment may well be lower, e.g., if rates of self-employment and/or federal employment are higher. Further, considering *all* graduates at the

campus participating in this pilot study, the share appearing in wage records is likely to be lower since as many as one-third continue on for postgraduate studies instead of taking up employment or take up employment outside NYS.¹⁶ The proportions will vary by campus across SUNY, whether university center, state-operated college or community college, and by proximity to a state border that affords easier access to employment outside of NYS. For these reasons (and others), estimates of the proportions employed using UI wage records *cannot* be interpreted as employment rates.

Nonetheless, when considered with reference to the direct contribution to NYS's workforce, observed differences by internship taking in the proportions of graduates employed in NYS, and in the earnings of those so employed, are themselves appropriate and relevant – if partial – measures of the effects of internships.

- *More reliable measures of “immediate” employment and wages occur within four to six quarters after graduation.* We believe that the “matched” NYS wage data are accurate, both with respect to the matching (via Social Security number) and posted wage amounts.¹⁷

We understand that employer filings report wages paid *during* the quarter. Graduates who commence a full-time post at some point after the beginning of the quarter will have recorded wages at a level below the full-time equivalent rate. To address the issue, we chose to use the *highest reported wage* in *any* of the first six quarters following the date of graduation. The six quarter period allows for transition into employment, but is short enough to exclude most graduates who undertake and complete graduate studies (e.g., a master's degree, but see “part-time employment” below).

Further, the wages recorded on UI unit records include bonuses or other compensation at the time of appointment. Since we use the highest reported wage in any of the first six quarters following graduation as the measure of earnings, bonuses or one-time additional compensation received in a given quarter give an estimate of pay above the rate for the year as a whole. For graduates taking up employment within six quarters of graduation, we believe that additional compensation at the time of employment is likely the greater of the two forms of these benefits. If so, such one-time additional compensation could occur in a “transition” quarter, i.e., a quarter when employment commences during, as opposed to at the beginning of, the quarter (e.g., employment begins in June, reference quarter begins in April; employment begins in September, reference quarter begins in July). Recorded wages for the “transition” quarter are less likely to be sub-

stantially above the wages for the first, full quarter in covered employment.

Finally, we anticipate that effects of internships may carry forward, indeed increase, over time. Small or no differences in the first postgraduation, six-quarter period cannot be taken as evidence that the effects of internships on employment outcomes do not appear or grow in five or ten years.¹⁸

Since we are working with three successive cohorts of entering students who graduate over a four-year period, we use the regional Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W) to adjust all wages to 2014 dollars. Other studies adopt different approaches, each seeking to arrive at a better estimate of regular earnings over a year or for a typical quarter.¹⁹

- *Employment and wages in any quarter may pick up casual or part-time employment.* For the pilot study, the effect of interest is employment (and salaries) in a regular, full-time position.

Graduates employed part-time, and notably those continuing graduate education with support from an assistantship, also appear on wage records. To exclude such graduates from the analysis — that is, to exclude from counts of employed (and from analyses of wages) any graduate other than those most likely to be in regular employment, we established a wage threshold corresponding to the minimum wage in NYS applicable to the relevant year. Here, too, other studies using wage record information adopt a similar approach.²⁰

However, we note that the threshold, on an annual basis, of about \$13,000 is below the stipend at many universities for a graduate assistant pursuing full-time studies.²¹ To the extent such graduates are included in the analyses, employment rates will be higher, and mean or median wages likely lower, in the fields of study so affected.

Measures of internship taking and individual and program characteristics, taken from administrative academic records at the participating campus, are the same as those used in the the part of the pilot study concerned with the effects of internship on retention and graduation. For the purposes of this pilot study, a graduate who took at least one internship for academic credit during the course of their degree studies is considered an internship taker. As described in the main report, the majority of students with internships received credit for internship in more than one academic term, and most internships came later in the degree program. All other variables also are categorical: Academic program (Biology, Business, Health Sciences, Psychology, Other); gender (male/female); racial/ethnic group (White, Asian, Black, Hispanic, Other); SAT Math score (above median/below median); and tuition residency in first term (NYS/other).

C. Implementation

As mentioned, our work with UI wage record information obliged us to follow a sequence of steps in order to conduct the study. We elaborate here on the main considerations.

- *Achieving sufficient numbers for analysis.* The initial sample consisted of entering cohorts for 2006, 2007, and 2008. Across all three cohorts, 8,348 students were included. Working with three successive cohorts enabled a sample size sufficient to support analyses that met the NYSDOL minimum cell count requirements to obtain grouped UI wage record data. To allow for six quarters of wage record by the end of 2014, we identified graduates up to Summer 2013, which would be five years from entry for the 2008 cohort. To ensure that graduates across cohorts are alike in terms of years from entry to graduation, we limited graduates from the 2006 and 2007 cohorts up to Summer 2011 and Summer 2012, respectively. We excluded those who had accumulated grade point average (GPA) of 2.5 or lower at the time of graduation, since most would not have been permitted to participate in internships. We also excluded, in this analysis of employment outcomes, graduates who were identified as “non-resident alien.” Further, nineteen graduates were dropped because their academic records lacked Social Security numbers used for matching. Following these rules, we identified 4,488 graduates from the larger cohorts for wage record matching. Of those graduates, 2,599 were matched in the NYSDOL wage record files covering the designated postgraduation period.
- *Identifying fields of study.* Analyses of internship taking by specific field of study for graduates were carried out by Rockefeller Institute staff. About 100 named academic fields in which bachelor’s degrees were awarded are represented in the sample. As described above, a good number of the fields had just a few graduates for the cohorts examined, and so were excluded from the list of fields identified for separate analysis. Other fields had sufficient numbers of graduates, but also as noted above, were distinguished by near universal (e.g., professional fields) or very modest (e.g., some humanities fields) participation in formal internship courses as recorded on transcripts. We chose fields that had sufficient numbers of graduates and reasonable proportions of internship takers compared to non-takers to permit analyses. Graduates in the named fields – Biology, Business, Health Science, and Psychology – include those following different specializations; in one field, the specializations lead to a B.A. or a B.S. Such graduates, in our judgment, followed broadly similar coursework and entered roughly similar job markets.

Importantly, these decisions were guided by advice from officials at the participating SUNY campus who

had close knowledge of the study programs concerned and the extent to which participation in internships is voluntary.

- *Obtaining employment outcome information from UI wage records linked to administrative academic data for graduates.* Under implementation of the present Memorandum, NYSDOL does not provide linked individual wage records. Rather, NYSDOL provides information (cell counts, averages, measures of spread) for any group with ten or more cases.

Adopting a conservative estimate that at least half of the Social Security numbers submitted for graduates would *not* be matched with NYSDOL's wage records (for graduates not employed in a covered position, employed outside of NYS, employed part-time, in graduate study), we established 176 groups, identified by codes on the file to be submitted to NYSDOL. The groups represent eighty-eight "pairs" of groups of graduates for those who had internships and those who did not. The "pairs" were established by individual or program attributes (field of study, gender, racial ethnic group, Pell Grant eligibility, SAT Math score, NYS residence for tuition fee purposes). Measures of central tendency and spread for each of the three employment outcomes were obtained for each group within every "pair." Groups were successively disaggregated, by one, two, three, four, and five attributes, in general trying to preserve a minimum cell size of twenty or greater in the constructed group. Four of the 176 groups returned a number of matches insufficient to permit reporting by NYSDOL.

- *Carrying out statistical analyses.* We undertook statistical analyses of differences in proportions employed in NYS, quarters to employment in NYS, and mean quarterly wages from NYS employment. Such tests are used to provide evidence that the differences observed for any of the "paired" groups are likely to exist.²² The tests take the place, in this analysis, of the multivariate techniques used for assessment of retention and graduation effects of internships as presented in the main report.

A number of studies using linked academic-wage record data rely fully on descriptive statistics of the proportions employed and median wages (sometimes with associated measures of dispersion, such as the interquartile range or quartiles or deciles).²³ The argument in favor of the median as a measure is that the influence of extreme values is minimized. Inspection of the descriptive statistics on wages reveals median wages are as much as 15 percent below the means for groups in which extreme (high) wages are recorded.²⁴

The statistical tests allow for a conservative approach to the interpretation of differences in employment outcomes between intern takers and non-takers. The results direct attention to “pairs” where differences in estimated effects are relatively large. Means and medians (as well as other descriptive statistics) are provided in the supplementary tables, and so can be consulted to examine all patterns as well as to identify groups and “pairs” where means and medians diverge.

II. Analysis and Findings

We use descriptive data to explore the relationships between participation in an internship and employment outcomes, taking into account identified academic, demographic, and socioeconomic backgrounds of graduates.

Notwithstanding our reference to “effects,” the differences may not signal causal relationships. Even if participation in an internship is found to be associated with a higher likelihood of employment in NYS on graduation or higher NYS earnings, the associations may mask other causes for such favorable outcomes. For the analysis of retention and graduation effects (discussed in the main report), we relied on multivariate regression and propensity score matching (PSM) to support arguments of causality. While conceptually sound, the methods are limited to the extent that the most important observable attributes of graduates that determine their probability of internship taking are available. As acknowledged in the main report, we lack a number of observable measures for the regressions and PSM. We expect that unobservable measures (such as, motivation) are also important.

For the analysis of employment outcomes, we rely on comparisons of means. For the present analysis, we do not have available individual unit record data. Rather, we have obtained means (and other descriptive statistics) for identified “pairs” of groups, in each of which graduates have the same individual and/or program attributes but differ with respect to internship-taking.²⁵

Supplementary tables in the Appendix provide descriptive statistics (Tables S.1 to S.4) and statistical results (Tables S.5 to S.8).

A. Internship Taking and Employment in NYS

Overall, some 60 percent of graduates from the participating campus took up employment in NYS within six quarters of graduation. The proportions vary by field and program and individual attribute of the graduate. Details are provided in Supplementary Table S.5.

Overall, internship taking appears to be marginally associated with the likelihood of taking a job in NYS within six quarters of graduation. The overall mean difference, of 1.3 percentage points, is not statistically significant. For most academic, demographic, or socioeconomic attributes, the differences

in proportions employed in NYS between internship takers and non-takers are relatively small, mostly insignificant, and suggest no particular pattern.

However, larger differences in NYS employment outcomes (as picked up in UI wage records) emerges particularly by field. Selected results are shown in Table 1 below for graduates in business and psychology. Details for other fields and attributes are provided in Supplementary Table S.2.

Table 1. Differences Associated with Internship in the Proportions of Graduates Employed in NYS			
	All fields	Business	Psychology
All graduates	1.3	9.1 **	-5.0
Male	2.2	17.2 ***	NA
Female	0	0.5	-1.8
White	-3.2	-7.5	-16.8 **
Asian	2.4	12 *	-2.1
Offered Pell Grant	2.1	15.6 ***	-7.9
Not Offered Pell Grant	2.1	2.9	-3.1
SAT Math Above Median	3.4 *	20.2 ***	1.9
SAT Math Below Median	-2.3	-4.3	-9.4 *

Note: Graduates Employed in NYS are those with wages above the minimum wage level in any of the six quarters commencing with the quarter of graduation. See text for graduates excluded from the analysis.

NA Less than ten graduates with matched NYSDOL wage records.

*p<.10, **p<.05, ***p<.01

In particular, Business graduates who took internships are 9.1 percentage points more likely to have a job in NYS than their peers who did not participate in internships. The difference is statistically significant ($p<.05$), as is the 17.2 point difference associated with internship taking for Business graduates who are male ($p<.01$), the 12.0 point difference for Business graduates who are Asian ($p<.10$), the 15.6 point difference for Business graduates who were offered Pell grants in the first term ($p<.01$), and the 20.2 point difference for Business graduates with SAT Math scores above the median ($p<.01$). That is, internship taking is associated with NYS employment following graduation for Business graduates who differ for a number of academic, demographic, and socioeconomic characteristics.

In contrast, for Psychology graduates, the 5.0 percentage point difference in the proportions employed in NYS is not statistically significant. Further, for Psychology graduates with particular academic, demographic, or socioeconomic attributes, the effects of internship taking were mostly insignificant. For Psychology graduates who are White and who have SAT Math scores below the median, internship taking appears to be associated with a *lower* likelihood of NYS employment within six quarters immediately following graduation (-16.8 percentage points and -9.4 percentage points, respectively, $p<.10$ or lower).

B. Internship Taking and Time to Employment

Turning only to those who took positions in NYS, the time between graduation and employment was an estimated 2.8 quarters, on average (median and mode, both two quarters commencing with the quarter of graduation). Overall, differences in the time to secure a NYS job appear to be little affected by internship taking. For all graduates, the mean difference is .03 quarters (roughly two days sooner). Details are provided in Supplementary Table S.7.

However, looking again at results *within fields of study*, the time to NYS employment shows a somewhat larger association with internship taking. Selected results are shown in Table 2 below. Details for other fields and attributes are provided in Supplementary Table S.8.

	All fields	Business	Psychology
All graduates	-0.029	-0.390 **	0.268 *
Male	-0.056	-0.537 **	NA
Female	-0.011	0.186	0.171
White	0.047	-0.467	0.021
Asian	-0.132	-0.354	-0.006
Offered Pell Grant	-0.097	-0.433 *	0.262
Not Offered Pell Grant	0.034	-0.357	0.264
SAT Math Above Median	0.009	-0.408 *	0.427 *
SAT Math Below Median	-0.054	-0.421 *	-0.054

Note: Graduates Employed in NYS are those with wages above the minimum wage level in any of the six quarters commencing with the quarter of graduation. See text for graduates excluded from the analysis.

NA Less than ten graduates with matched NYSDOL wage records.

*p<.10, **p<.05, ***p<.01

In particular, internship takers assumed NYS jobs an estimated .39 quarters, or five weeks, *sooner* than non-takers, for Business graduates, but .27 quarters, or 2 weeks *later*, for Psychology graduates (p<.10 or lower). The overall findings suggest the effects of internship taking emerge by field, and may reflect program and labor market factors. In fact, the findings provide very little evidence that differences in time to NYS employment within each field are associated with academic, demographic, or socioeconomic attributes. The patterns for Business and Psychology graduates find broad parallels in time to NYS employment results for, respectively, Health Science and Biology graduates.

C. Internship Taking and Quarterly Wages of Graduates Employed in NYS

For those graduates who took up employment in NYS, quarterly wages (limited to those employed and earning above the minimum wage threshold in the reference quarter) differ by field, gender, racial/ethnic group, Pell grant eligibility, and SAT Math score. In particular, Business graduates, male graduates,

graduates who received Pell grants in their first academic term, and graduates with SAT Math scores above the median show relatively higher quarterly wages reported by employers to NYSDOL. Simple descriptive statistics are provided in Table S.4.

No pattern emerges when NYS quarterly wages are compared overall for those graduates who had an internship and those without internships in the course of their degree studies. The overall comparisons may reflect, in part, the influence of extreme values within wage records. For all graduates employed in NYS following graduation, in the quarter with the highest wage among the first six following the date of graduation, internship takers received \$9,115 on average (in 2014 dollars). For those without internship experiences during their degree programs, the average wage was \$9,341. Using medians, internship takers recorded quarterly earnings of \$8,183 while those who had no internship experiences showed median earnings of \$7,934.

While there is no evident common pattern when NYS quarterly earnings (mean or median) are compared for each individual “paired” group, some differences emerge by field. Selected findings are presented in Table 3 below. Details for all fields and attributes are provided in Supplementary Tables S.7 and S.8.

Table 3. Differences Associated with Internships in Quarterly Wages of Graduates Employed in NYS

	All fields	Business	Psychology
<i>All graduates</i>	-\$226	\$1,980 ***	\$272
Male	330	2,483 **	NA
Female	-384	1,386 **	488
White	134	1,430	-610
Asian	-1,522 **	1,043 *	-603
Offered Pell Grant	-441	1,951 ***	1,769
Not Offered Pell Grant	-34	2,050 *	-1,096 *
SAT Math Above Median	-478 *	2,285 ***	-1,236 **
SAT Math Below Median	93	1,640 **	1,143

Note: Graduates Employed in NYS are those with wages above the minimum wage level in any of the six quarters commencing with the quarter of graduation. The highest wages, for any quarter in which wages exceed the minimum wage threshold, are used in for the comparisons. See text for graduates excluded from the analysis.

NA Less than ten graduates with matched NYSDOL wage records.

*p<.10, **p<.05, ***p<.01

For business graduates, those having had internships recorded wages roughly \$2,000 (point estimate, \$1,980) greater, on average, than wages recorded by their peers without internships (significant at p<.01). This difference is on the order of 10 percent, relative to average quarterly wages received, within the field. For Psychology graduates, the estimated difference in wages of \$272 favoring internship takers is not statistically significant.

The relatively strong and favorable results for Business graduates who took internships largely holds across academic, demographic, and socioeconomic attributes. In particular, although the size of the difference in quarterly wages attributed to internships for Business graduates varies from \$1,000 to \$2,500, the effect is significant for both males and females, with or without a Pell grant offer, or SAT score above or below the median. For Psychology graduates, the association between internship taking and quarterly wages from employment in NYS following graduation is mostly weak and statistically insignificant. The exceptions appear for Psychology graduates with internship experiences who were not offered Pell grants or with SAT scores above the median. In both instances, the comparisons show graduates with internships in this field recorded *lower* wages (on the order of an estimated \$1,000 in the reference quarter) compared to their peers without internship experiences ($p < .10$ or lower).

The differences in the patterns of associations between internship taking and employment outcomes by field invite closer consideration of both the orientations of the programs and the destinations of graduates. The proportion of Psychology graduates with internships is lower than found for graduates in Business, and the proportion of Psychology graduates with and without internships employed in NYS following graduation is also lower than for their peers in Business. Although not revealed in the data available to us, graduates in Psychology may be more likely to pursue postgraduate study immediately following graduation (with employment outcomes manifested later).

III. Conclusions

To date, assessments of the effects of applied learning in general, and work-based applied learning in the form of internships in particular, on employment outcomes are limited. Analyses often lack methodological rigor needed to give confidence in the findings or details necessary to be useful for program development and evaluation. Growing access to unit records, both administrative academic records maintained at campuses and wage records submitted by employers under unemployment insurance reporting requirements, opens up the possibility to obtain more reliable and more useful estimates of such effects.

This pilot study was undertaken to gauge the feasibility and potential value of using linked administrative academic-wage record data to assess employment outcomes of work-based applied learning experiences offered within SUNY Works. We conclude that, subject to limitations that presently apply within SUNY, such data can be used to estimate the effects of internships (and, indeed, other forms of applied learning) on employment outcomes.

The pilot study uncovered findings that are useful, some seemingly evident and others suggestive. First, the more important differences in the effects of internships on “immediate” employment outcomes in NYS appear to occur by field of study.

Here, both features of the internship offered and labor market considerations likely come into play. Second, individual attributes of gender, racial/ethnic group, Pell grant eligibility, or SAT score generally show no patterns for the effects of internship on employment outcomes in this limited sample. That finding is generally encouraging, in that the effects of internships on employment outcomes should apply to all students regardless of background. However, to the extent that formal internship taking within degree programs is associated with more favorable employment outcomes for groups otherwise considered less likely to secure good jobs at good wages (e.g., females, graduates from underrepresented groups, Pell grant recipients), such results might be considered a particularly good result. Differences by attribute *do* emerge within fields, both favorable and unfavorable, and open up questions about why and how personal attributes may matter with respect to participation in formal internships in particular fields. These findings apply to a limited set of employment outcomes, namely the effects of internship on “immediate” employment outcomes within NYS. Those employed outside NYS, or who take up full-time employment later, are excluded from the analysis.

The limitations warrant consideration for the improvement of analyses using linked administrative academic-UI wage record data and for the use and interpretation of findings.

The key limitation is that, under the current Memorandum with NYSDOL, SUNY does not have access to unit UI wage records. Analyses are possible with grouped data (and we pursued that approach), although such analyses necessarily constrain the extent of the empirical work that can be carried out.²⁶

Three other limitations have to do with coverage, classification, and measurement.

The present study worked with entering cohorts at the participating SUNY campus, tracked through to graduation and into employment. Students with internship experiences who transferred to another college or left higher education were not tracked, and students who transferred into the SUNY college and participated in internships were excluded. Moreover, only those graduates taking up jobs in NYS were picked up in the post-graduation period. Finally, students pursuing graduate studies during the period, but receiving a stipend above the minimum wage threshold, were included in the study. The extent to which these gaps in coverage and challenges in sampling matter in the assessment of employment outcomes is not known.

With respect to classification, administrative academic records permit the identification of internship taking through registration in a formal course under which the internship is organized and credit is granted. We lack information on students who may have participated in internships that are *not* recognized under a formal course offering. Moreover, administrative academic records lack details on the features or nature of the internship experience. The

findings from this study are suggestive in this regard: Programs in Business (and to a lesser extent in Health Science), with generally *more* favorable effects of internships on employment outcomes, may have in common key features, among which are (a) established internships as a regular and recognized option in the degree programs; (b) ongoing relationships with employers who host interns; (c) strong participation in internships; and (d) relatively lower rates of postgraduate study. Details confirming these kinds of features are known at the program and campus level, less so at the system level where administrative academic data provide the primary source of information on programs within and across campuses. As noted, efforts to identify features and attributes of internships (and other forms of applied learning) in administrative academic information systems are underway at SUNY campuses. As these efforts proceed, closer attention might be given to particular features for internships that, when analyzed with linked administrative academic-UI wage record data, could be useful for program development and evaluation.

That said, analyses using linked unit record data are most useful when conceived in the light of a campus profile in terms of degree programs and circumstances with regard to student intake and likely graduate destinations. On the former, the selection of fields for analysis in this pilot study was based on close knowledge and advice from officials at the participating campus, as opposed to application of a standard classification of degree programs used by SUNY. Such system-wide classifications can be used to good effect for some purposes. For this pilot study of a single campus, however, campus-level knowledge led to a stronger implementation of the design and, arguably, more useful findings for the programs and campus concerned.

Lacking details on internship or program features, analyses similar to those carried out in the pilot study may still be useful. A great advantage of the linked administrative academic-UI wage record data is that routine data collection allows for relatively easy updating each year or two. Individual programs or campuses can make use of successive years of data on program graduates, distinguished by participation in internship among other individual or program attributes. As changes in internship offerings (e.g., organization of the internship, involvement of faculty or employers) are implemented, employment outcomes can be tracked from before to after such changes. Ongoing monitoring of this type can be made more useful when other details (e.g., recording of internships not taken for credit; other forms of applied learning) are available in the unit records.

Finally, with respect to measurement, the NYS employment outcomes examined in the pilot study reflect two limitations. First, the minimum wage threshold used to screen out part-time employment is likely too low, not least with respect to stipends paid to graduates pursuing postgraduate studies. For fields with relatively large proportions continuing on to advanced degree work,

rates of employment will be higher and average wages lower when compared to a subset of graduates entering regular, full-time employment. A different (higher) threshold can be used, although the rationale for any threshold derives from a careful delineation of the subgroup of graduates of interest. The second limitation is that the NYS employment outcomes used in this study refer only to the “immediate” postgraduation period (up to six quarters). As suggested in studies of the time-path of earnings by field, favorable outcomes (here, the effects of internships) may emerge more strongly in five or ten years.

In sum, administrative data can be usefully marshalled to study the impact of internships on employment opportunities. Our analysis of employment outcomes shows mixed results due, in part, to data restrictions that limited our analysis to matched “pairs,” rather than matched unit records as in the main report. And, in part, our results likely reflect differences in the labor markets for graduates in different fields. Ideally, researchers evaluating the impact of applied-learning experiences, like internships, would have access to unit record data (where available); regional employment and academic data to account for graduates who leave the state; and comprehensive student data (through university, state, or national systems) to account for students who enter a campus as a transfer student or leave a campus to pursue studies elsewhere, including graduate study. They would also account for differences among academic majors of graduates and among the labor markets they are likely to enter. This is an ambitious, but worthwhile, agenda.

Appendix

Table S-1. Graduates Employed in NYS by Internship Experience, Field of Study, Gender, Racial/Ethnic Group, Pell Grant Eligibility, SAT Math Scores, or Tuition Residency in First Term

Stratum/Grouping	Number	
	of Cases	Percent
Internship Taking		
At least once	680	26.2
Never	1,919	73.8
Field of Study		
Biology	250	9.6
Business	281	10.8
Health Science	367	14.1
Psychology	319	12.3
Other	1,382	53.2
Gender		
Male	1,211	46.6
Female	1,388	53.4
Racial/Ethnic Group		
American Indian/Alaska Native	5	0.2
White	858	33.0
Asian	754	29.0
Black	192	7.4
Hispanic	233	9.0
Race Unknown	557	21.4
Pell Grant Eligibility		
Offered Pell	1,193	45.9
Not Offered Pell	1,406	54.1
SAT Math Score		
Above Median	1,325	51.0
Below Median	1,274	49.0
Tuition Residency in First Term		
New York	2,504	96.3
Other	95	3.7
Total	2,599	100.0

Note: Graduates employed in NYS refer to graduates with at least one quarter with wages above minimum wage threshold in any of the six quarters commencing from the quarter of graduation. Graduates refer to those completing bachelor's degrees within five years of entry, for each of three cohorts entering in 2006, 2007, and 2008. For the analysis, those identified as "non-resident alien" are excluded, as are graduates with cumulative GPA of 2.5 or below who were unlikely to have been permitted to take internships. Nineteen graduates for whom no Social Security number was available for a possible wage match also were excluded from the analysis.

Table S-2. Graduates Employed in NYS by Internship Experience and Field of Study, Gender, Racial/Ethnic Group, Pell Grant Eligibility, SAT Math Scores, or Tuition Residency in First Term

Stratum/Grouping	At Least One Internship (Percent)	
	No	Yes
Field of Study***		
Biology	78.8	21.2
Business	65.5	34.5
Health Science	57.8	42.2
Psychology	78.7	21.3
Other	77.8	22.2
Gender***		
Male	79.9	20.1
Female	68.6	31.4
Racial/Ethnic Group***		
White	77.6	22.4
Asian	73.7	26.3
Black	65.1	34.9
Hispanic	66.5	33.5
Other	74.2	25.8
Pell Grant Eligibility		
Offered Pell	74.4	25.6
Not Offered Pell	73.4	26.6
SAT Math Score***		
Above Median	76.2	23.8
Below Median	71.4	28.6
Tuition Residency in First Term		
New York	74.1	25.9
Other	67.4	32.6
Total	73.8	26.2

Note: Graduates employed in NYS refer to graduates with at least one quarter with wages above minimum wage threshold in any of the six quarters commencing from the quarter of graduation. Graduates refer to those completing bachelor's degrees within five years of entry, for each of three cohorts entering in 2006, 2007, and 2008. For the analysis, those identified as "non-resident alien" are excluded, as are graduates with cumulative GPA of 2.5 or below who were unlikely to have been permitted to take internships. Nineteen graduates for whom no Social Security number was available for a possible wage match also were excluded from the analysis.

*p<.05, **p<.01, ***p<.001, based on Pearson's chi-squared tests for frequency distribution.

Table S-3. Time to Employment for Graduates Employed in NYS by Internship Experience and Field of Study, Gender, Racial/Ethnic Group, Pell Grant Eligibility, SAT Math Scores, or Tuition Residency in First Term

Stratum/Grouping	Number of Quarters to first recorded NYS employment				
	Mean	Median	Interquartile		Standard Deviation
			Mode	Range	
Total					
Intern-taker	2.80	2	2	2	1.49
Never-taker	2.82	2	2	2	1.53
Field of Study					
Biology					
Intern-taker	3.02	3	2	2	1.43
Never-taker	2.99	3	2	2	1.48
Business					
Intern-taker	2.37	2	2	2	1.40
Never-taker	2.76	2	2	2	1.48
Health Science					
Intern-taker	2.89	3	3	1	1.42
Never-taker	3.27	3	1	3	1.87
Psychology					
Intern-taker	2.87	3	1, 3	2.25	1.53
Never-taker	2.60	2	2	1	1.36
Gender					
Male					
Intern-taker	2.77	2	2	3	1.57
Never-taker	2.83	2	2	2	1.56
Female					
Intern-taker	2.81	3	2	1.5	1.44
Never-taker	2.82	3	2	2	1.50
Racial/Ethnic Group					
White					
Intern-taker	2.59	2	2	1	1.40
Never-taker	2.54	2	2	2	1.46
Asian					
Intern-taker	3.02	3	3	2	1.48
Never-taker	3.15	3	2	2	1.53
Black					
Intern-taker	2.76	3	3	2	1.51
Never-taker	2.82	2	2	2	1.56
Hispanic					
Intern-taker	2.85	2.5	2	2	1.54
Never-taker	2.74	2	2	1	1.45
Race Unknown					
Intern-taker	2.75	2	2	2	1.57
Never-taker	2.89	2.5	2	2	1.56
Pell Grant Eligibility					
Offered Pell					
Intern-taker	2.89	3	2	2	1.49
Never-taker	2.99	3	2	2	1.56
Not Offered Pell					
Intern-taker	2.72	2	2	1	1.49
Never-taker	2.68	2	2	1	1.48
SAT Math Score					
Above Median					
Intern-taker	2.86	3	2	2	1.55
Never-taker	2.85	2	2	2	1.54
Below Median					
Intern-taker	2.74	2	2	2	1.44
Never-taker	2.80	2	2	2	1.51

Note: Graduates employed in NYS refer to graduates with at least one quarter with wages above minimum wage threshold in any of the six quarters commencing from the quarter of graduation. Graduates refer to those completing bachelor's degrees within five years of entry, for each of three cohorts entering in 2006, 2007, and 2008. For the analysis, those identified as "non-resident alien" are excluded, as are graduates with cumulative GPA of 2.5 or below who were unlikely to have been permitted to take internships. Nineteen graduates for whom no Social Security number was available for a possible wage match also were excluded from the analysis.

Table S-4. Quarterly Wages for Graduates Employed in NYS by Internship Experience, Field of Study, Gender, Racial/Ethnic Group, Pell Grant Eligibility, SAT Math Scores, or Tuition Residency in First Term

Stratum/Grouping	Highest wages in any quarter within first six quarters from commencement					
	Mean	Median	Interquartile		Min	Max
			Range	Standard Deviation		
Total						
Total	\$9,282				\$3,085	\$64,199
Intern-taker	9,115	8,183	6,080		3,117	48,929
Never-taker	9,341	7,934	6,203	3,085		64,199
Filed of Study						
Biology						
Subtotal	7,449				3,199	31,011
Intern-taker	7,132	6,450	3,361		3,293	15,389
Never-taker	7,526	7,116	4,382	3,199		31,011
Business						
Subtotal	10,548				3,154	48,825
Intern-taker	11,900	11,090	5,418		3,397	48,825
Never-taker	9,920	9,418	6,224	3,154		26,429
Health Science						
Subtotal	8,162				3,145	64,199
Intern-taker	8,004	7,286	5,022		3,145	24,441
Never-taker	8,266	7,038	5,283	3,212		64,199
Psychology						
Subtotal	7,544				3,095	48,929
Intern-taker	7,754	6,028	4,732		3,117	48,929
Never-taker	7,482	7,180	3,763	3,095		25,326
Gender						
Male						
Subtotal	9,744				3,142	55,703
Intern-taker	10,010	9,030	7,106		3,200	48,825
Never-taker	9,680	8,364	6,728	3,142		55,703
Female						
Subtotal	8,878				3,085	64,199
Intern-taker	8,615	7,651	5,346		3,117	48,929
Never-taker	8,999	7,626	5,533	3,085		64,199
Racial/Ethnic Group						
White						
Subtotal	9,291				3,128	64,199
Intern-taker	9,394	8,408	5,659		3,128	30,408
Never-taker	9,260	7,740	6,231	3,142		64,199
Asian						
Subtotal	10,024				3,117	55,703
Intern-taker	8,888	7,701	6,075		3,117	25,435
Never-taker	10,410	8,920	7,255	3,155		55,703
Black						
Subtotal	8,709				3,200	48,929
Intern-taker	9,353	7,718	6,947		3,200	48,929
Never-taker	8,382	7,653	4,407	3,338		35,076
Hispanic						
Subtotal	8,245				3,141	26,429
Intern-taker	8,997	8,268	6,237		3,540	23,000
Never-taker	7,893	7,555	4,730	3,141		26,429
Race Unknown						
Subtotal	8,928				3,085	50,366
Intern-taker	9,008	8,506	5,480		3,145	48,825
Never-taker	8,901	7,268	6,167	3,085		50,366
Pell Grant Eligibility						
Offered Pell						
Subtotal	9,638				3,117	64,199
Intern-taker	9,307	8,557	6,117		3,117	48,929
Never-taker	9,748	8,370	6,168	3,141		64,199
Not Offered Pell						
Subtotal	8,984				3,085	60,014
Intern-taker	8,959	7,698	5,790		3,145	48,825
Never-taker	8,993	7,571	5,910	3,085		60,014
SAT Math Score						
Above Median						
Subtotal	9,632				3,085	51,572
Intern-taker	9,262	8,284	6,113		3,117	48,825
Never-taker	9,740	8,230	6,852	3,085		51,572
Below Median						
Subtotal	8,923				3,095	64,199
Intern-taker	8,989	8,056	6,052		3,128	48,929
Never-taker	8,896	7,592	5,575	3,095		64,199

Note: Graduates employed in NYS refer to graduates with at least one quarter with wages above minimum wage threshold in any of the six quarters commencing from the quarter of graduation. Graduates refer to those completing bachelor's degrees within five years of entry, for each of three cohorts entering in 2006, 2007, and 2008. For the analysis, those identified as "non-resident alien" are excluded, as are graduates with cumulative GPA of 2.5 or below who were unlikely to have been permitted to take internships. Nineteen graduates for whom no Social Security number was available for a possible wage match also were excluded from the analysis.

Table S-5. Proportions of Graduates Employed in NYS by Internship Experience and Field of Study, Gender, Racial/Ethnic Group, Pell Grant Eligibility, SAT Math Scores, or Tuition Residency in First Term

Stratum/Grouping	Intern-taker		Never-taker		Difference in Proportions	Standard Error
	Number of Graduates	Percent Employed in NYS	Number of Graduates	Percent Employed in NYS		
Total	1,154	58.9	3,334	57.6	1.3	1.7
Field of Study						
Biology	104	51.0	426	46.2	4.8	5.5
Business	126	77.0	271	67.9	9.1 **	4.7
Health Science	261	59.4	398	53.3	6.1 *	3.9
Psychology	118	57.6	401	62.6	-5.0	5.2
Other	545	56.3	1,838	58.5	-2.2	5.7
Gender						
Male	421	58.0	1,733	55.8	2.2	2.7
Female	733	59.5	1,601	59.5	0.0	2.2
Racial/Ethnic Group						
White	333	57.7	1,094	60.9	-3.2	3.1
Asian	363	54.5	1,068	52.1	2.4	3.0
Black	95	70.5	187	66.8	3.7	5.8
Hispanic	103	75.7	220	70.5	5.2	5.2
Race Unknown	259	56.0	757	54.4	1.6	3.6
Pell Grant Eligibility						
Offered Pell	495	61.8	1,487	59.7	2.1	2.5
Not Offered Pell	659	56.8	1,847	55.9	0.9	2.2
SAT Math Score						
Above Median	558	56.5	1,902	53.1	3.4 *	2.4
Below Median	596	61.2	1,432	63.5	-2.3	2.4
Tuition Residency in First Term						
New York	1,045	62.1	3,095	59.9	2.2	1.7
Other	109	28.4	239	26.8	1.6	5.2

Note: Graduates employed in NYS refer to graduates with at least one quarter with wages above minimum wage threshold in any of the six quarters commencing from the quarter of graduation. Graduates refer to those completing bachelor's degrees within five years of entry, for each of three cohorts entering in 2006, 2007, and 2008. For the analysis, those identified as "non-resident alien" are excluded, as are graduates with cumulative GPA of 2.5 or below who were unlikely to have been permitted to take internships. Nineteen graduates for whom no Social Security number was available for a possible wage match also were excluded from the analysis.

*p<.05, **p<.01, ***p<.001, based on one-tail Z-Test of significance, two sample test.

Table S-6. Proportions of Graduates Employed in NYS by Internship Experience and Field of Study, Gender, Racial/Ethnic Group, Pell Grant Eligibility, SAT Math Scores, or Tuition Residency in First Term

Stratum/Grouping	Intern-taker		Never-taker		Difference in Proportions	Standard Error
	Number of Graduates	Percent Employed in NYS	Number of Graduates	Percent Employed in NYS		
Total	1,154	58.9	3,334	57.6	1.3	1.7
Field of Study and Gender						
Biology						
Subtotal	104	51.0	426	46.2	4.8	5.5
Male	44	43.2	233	44.6	-1.4	8.1
Female	60	56.7	193	48.2	8.5	7.3
Business						
Subtotal	126	77.0	271	67.9	9.1 **	4.7
Male	62	83.9	165	66.7	17.2 ***	5.9
Female	64	70.3	106	69.8	0.5	7.2
Health Science						
Subtotal	261	59.4	398	53.3	6.1 *	3.9
Male	83	55.4	155	47.1	8.3	6.8
Female	178	61.2	243	57.2	4.0	4.8
Psychology						
Subtotal	118	57.6	401	62.6	-5.0	5.2
Male		NA		NA		
Female	98	62.2	272	64.0	-1.8	5.7
Field of Study and Racial/Ethnic Group						
Biology						
Subtotal	104	51.0	426	46.2	4.8	5.5
White	23	52.2	114	43.9	8.3	11.4
Asian	50	46.0	161	46.6	-0.6	8.1
Black		NA		NA		
Hispanic		NA		NA		
Race Unknown		NA		NA		
Business						
Subtotal	126	77.0	271	67.9	9.1 **	4.7
White	32	65.6	93	73.1	-7.5	9.6
Asian	50	74.0	92	62.0	12.0 *	8.0
Black		NA		NA		
Hispanic		NA		NA		
Race Unknown	26	80.8	52	65.4	15.4 *	10.2
Health Science						
Subtotal	261	59.4	398	53.3	6.1 *	3.9
White	45	60.0	86	53.5	6.5	9.1
Asian	108	57.4	175	44.6	12.8 **	6.1
Black	32	65.6	40	57.5	8.1	11.5
Hispanic	17	64.7	32	81.3	-16.6 *	13.5
Race Unknown	58	58.6	64	60.9	-2.3	8.9
Psychology						
Subtotal	118	57.6	401	62.6	-5.0	5.2
White	33	48.5	147	65.3	-16.8 **	9.5
Asian	29	51.7	93	53.8	-2.1	10.6
Black		NA		NA		
Hispanic	16	75.0	40	80.0	-5.0	12.5
Race Unknown	34	55.9	97	56.7	-0.8	9.9
Field of Study and Pell Grant Eligibility						
Biology						
Subtotal	104	51.0	426	46.2	4.8	5.5
Offered Pell	44	61.4	188	50.5	10.9 *	8.2
Not Offered Pell	60	43.3	238	42.9	0.4	7.2
Business						
Subtotal	126	77.0	271	67.9	9.1 **	4.7
Offered Pell	62	85.5	136	69.9	15.6 ***	6.0
Not Offered Pell	64	68.8	135	65.9	2.9	7.1
Health Science						
Subtotal	261	59.4	398	53.3	6.1 *	3.9
Offered Pell	136	60.3	202	59.4	0.9	5.4
Not Offered Pell	125	58.4	196	46.9	11.5 **	5.7
Psychology						
Subtotal	118	57.6	401	62.6	-5.0	5.2
Offered Pell	55	58.2	165	66.1	-7.9	7.6
Not Offered Pell	63	57.1	236	60.2	-3.1	7.0
Field of Study and SAT Math Score						
Biology						
Subtotal	104	51.0	426	46.2	4.8	5.5
Above Median	60	51.7	291	44.3	7.4	7.1
Below Median	44	50.0	135	50.4	-0.4	8.7
Business						
Subtotal	126	77.0	271	67.9	9.1 **	4.7
Above Median	73	80.8	142	60.6	20.2 ***	6.2
Below Median	53	71.7	129	76.0	-4.3	7.2
Health Science						
Subtotal	261	59.4	398	53.3	6.1 *	3.9
Above Median	109	58.7	192	49.0	9.7 *	5.9
Below Median	152	59.9	206	57.3	2.6	5.3
Psychology						
Subtotal	118	57.6	401	62.6	-5.0	5.2
Above Median	41	61.0	171	59.1	1.9	8.5
Below Median	77	55.8	230	65.2	-9.4 *	6.5

Note: Graduates employed in NYS refer to graduates with at least one quarter with wages above minimum wage threshold in any of the six quarters commencing from the quarter of graduation. Graduates refer to those completing bachelor's degrees within five years of entry, for each of three cohorts entering in 2006, 2007, and 2008. For the analysis, those identified as "non-resident alien" are excluded, as are graduates with cumulative GPA of 2.5 or below who were unlikely to have been permitted to take internships. Nineteen graduates for whom no Social Security number was available for a possible wage match also were excluded from the analysis.

*p<.05, **p<.01, ***p<.001, based on one-tail Z-Test of significance, two sample test.

NA Less than ten graduates with matched NYDOL wage records.

Table S-7. Differences in Time to Employment and Differences in Quarterly Wages for Graduates Employed in NYS by Internship Experience, Field of Study, Gender, Racial/Ethnic Group, Pell Grant Eligibility, SAT Math Scores, or Tuition Residency in First Term

Stratum/Grouping	Quarters to First NYS Employment		Quarterly Wages		Quarterly Wages (without outlier)	
	Difference in Means	Standard Error	Difference in Means	Standard Error	Difference in Means	Standard Error
Total	-0.029	0.068	-226	237	-256	228
Field of Study						
Biology	0.029	0.229	-394	492	-274	517
Business	-0.390 **	0.183	1,980 ***	678	1,686 ***	564
Health Science	-0.383 **	0.173	-262	502	-101	413
Psychology	0.268 *	0.192	272	774	-271	470
Gender						
Male	-0.056	0.112	330	407	217	354
Female	-0.011	0.086	-384	301	-419 *	281
Racial/Ethnic Group						
White	0.047	0.119	134	423	107	402
Asian	-0.132	0.126	-1,522 ***	418	-1,524 ***	402
Black	-0.055	0.235	971	967	587	738
Hispanic	0.111	0.206	1,104 **	560	1,043 **	522
Race Unknown	-0.140	0.152	107	527	-70	473
Pell Grant Eligibility						
Offered Pell	-0.097	0.103	-441	346	-510 *	315
Not Offered Pell	0.034	0.090	-34	331	-92	302
SAT Math Score						
Above Median	0.009	0.100	-478 *	354	-563 **	329
Below Median	-0.054	0.093	93	318	44	292

Note: Graduates employed in NYS refer to graduates with at least one quarter with wages above minimum wage threshold in any of the six quarters commencing from the quarter of graduation. Graduates refer to those completing bachelor's degrees within five years of entry, for each of three cohorts entering in 2006, 2007, and 2008. For the analysis, those identified as "non-resident alien" are excluded, as are graduates with cumulative GPA of 2.5 or below who were unlikely to have been permitted to take internships. Nineteen graduates for whom no Social Security number was available for a possible wage match also were excluded from the analysis.

Outlier is defined as a group maximum value that is larger than the group mean plus three standard deviations or a group minimum value that is smaller than the group mean minus three standard deviations.

*p<.05, **p<.01, ***p<.001, based on one-tail t-Test of significance, two sample test.

Table S-8. Differences in Time to Employment and Differences in Quarterly Wages for Graduates Employed in NYS by Internship Experience, Field of Study, Gender, Racial/Ethnic Group, Pell Grant Eligibility, SAT Math Scores, or Tuition Residency in First Term

Stratum/Grouping	Quarters to First NYS Employment		Quarterly Wages		Quarterly Wages (without outlier)	
	Difference in Means	Standard Error	Difference in Means	Standard Error	Difference in Means	Standard Error
Field of Study and Gender						
Biology						
Male	0.545 *	0.365	-711	773	-485	741
Female	-0.265	0.300	-94	593		
Business						
Male	-0.537 **	0.264	2,483 **	1,075	1,920 ***	788
Female	-0.186	0.248	1,386 **	818		
Health Science						
Male	-0.789 **	0.338	652	864	893	816
Female	-0.164	0.203	-655	632	-404	459
Psychology						
Male	NA	NA	NA	NA	NA	NA
Female	0.171	0.215	488	857	-91	514
Field of Study and Racial/Ethnic Group						
Biology						
White	0.347	0.494	-1,392	1,083	-941	992
Asian	-0.201	0.329	-67	758	91	707
Black	NA	NA	NA	NA	NA	NA
Hispanic	NA	NA	NA	NA	NA	NA
Race Unknown	NA	NA	NA	NA	NA	NA
Business						
White	-0.467	0.367	1,430	1,190		
Asian	-0.354	0.307	1,043 *	770		
Black	NA	NA	NA	NA	NA	NA
Hispanic	NA	NA	NA	NA	NA	NA
Race Unknown	-0.429	0.452	3,463 *	2,150	NA	NA
Health Science						
White	-0.266	0.388	183	1,695	846	971
Asian	-0.604 **	0.283	-996 *	686	-781	670
Black	-0.481	0.491	-233	1,572	984	1,005
Hispanic	-0.083	0.576	883	1,110		
Race Unknown	-0.410	0.407	474	863	915	737
Psychology						
White	0.021	0.369	-610	803	-509	768
Asian	-0.006	0.430	-603	1,042	-226	793
Black	NA	NA	NA	NA	NA	NA
Hispanic	0.417	0.511	354	1,110	687	1,206
Race Unknown	0.206	0.381	102	1,135	-473	775
Field of Study and Pell Grant Eligibility						
Biology						
Offered Pell	0.111	0.319	-440	668	-320	632
Not Offered Pell	-0.057	0.333	-361	730	-127	797
Business						
Offered Pell	-0.433 **	0.242	1,951 ***	714	2,107 ***	686
Not Offered Pell	-0.357	0.281	2,050 *	1,248	1,384 *	907
Health Science						
Offered Pell	-0.694 ***	0.233	-662	756	-186	591
Not Offered Pell	0.002	0.262	297	591	256	516
Psychology						
Offered Pell	0.262	0.332	1,769	1,502	662	808
Not Offered Pell	0.264	0.260	-1,096 **	574	-1,226 ***	460
Field of Study and SAT Math Score						
Biology						
Above Median	-0.183	0.300	-760	677	-578	706
Below Median	0.359	0.360	203	748		
Business						
Above Median	-0.408 *	0.268	2,285 ***	936	1,650 ***	684
Below Median	-0.421 *	0.256	1,640 **	985	1,808 **	952
Health Science						
Above Median	-0.256	0.270	265	720	299	613
Below Median	-0.472 **	0.228	-671	707	-183	513
Psychology						
Above Median	0.427 *	0.324	-1,236 **	703	-1,057 **	607
Below Median	-0.054	0.093	1,143	1,159	271	660

Note: Graduates employed in NYS refer to graduates with at least one quarter with wages above minimum wage threshold in any of the six quarters commencing from the quarter of graduation. Graduates refer to those completing bachelor's degrees within five years of entry, for each of three cohorts entering in 2006, 2007, and 2008. For the analysis, those identified as "non-resident alien" are excluded, as are graduates with cumulative GPA of 2.5 or below who were unlikely to have been permitted to take internships. Nineteen graduates for whom no Social Security number was available for a possible wage match also were excluded from the analysis.

Outlier is defined as a group maximum value that is larger than the group mean plus three standard deviations or a group minimum value that is smaller than the group mean minus three standard deviations. If no outlier is present, there is no entry in the rows concerned.

*p<.05, **p<.01, ***p<.001, based on one-tail t-Test of significance, two sample test.

NA Less than ten graduates with matched NYDOL wage records.

Endnotes

- 1 See, for example, George D. Kuh, *High-Impact Educational Practices: What They Are, Who Has Access to Them, and Why They Matter* (Washington, DC: Association of American Colleges and Universities, 2008), <http://provost.tufts.edu/celt/files/High-Impact-Ed-Practices1.pdf>.
- 2 While attention is directed at employment outcomes, internships as well as other types of applied learning may foster other outcomes for graduates and for the communities and states in which they live as well as work. Outcomes such as greater civic engagement and volunteer work and improved health and learning and development of children are also valued, even if not examined in this pilot study. That said, as the higher education costs financed by students, taxpayers, and third-parties rise relatively rapidly, greater attention is being given to financial outcomes – among which, employment outcomes of graduates. On nonmoney and social outcomes, see, for example, Walter W. McMahon, *Higher Learning, Greater Good: The Private and Social Benefits of Higher Education* (Baltimore: Johns Hopkins Press, 2009); Barbara Wolfe and Robert Haveman, “Accounting for the Social and Non-Market Benefits of Education,” in *The Contribution of Human and Social Capital to Sustained Economic Growth and Well-Being*, ed. John Helliwell (Vancouver: University of British Columbia Press, 2001); Gallup, Inc., *Great Jobs and Great Lives: The 2014 Gallup-Purdue Index Report* (Washington, DC: Gallup, Inc., 2014), <https://www.luminafoundation.org/files/resources/gallup-purdue-index-report-2014.pdf>.
- 3 See, for example, Sean Seymour and Julie Ray, “Recent Grads More Likely to Have Had Useful Internships,” Washington, DC: Gallup, Inc., November 13, 2014, <http://www.gallup.com/poll/179201/recent-grads-likely-useful-internships.aspx>; Gerard Callanan and Cynthia Benzing, “Assessing the Role of Internships in the Career-Oriented Employment of Graduating College Students,” *Education + Training* 46, 2 (2004): 82–9.
- 4 We found three studies that used linked administrative academic–UI wage records to examine the effects of applied learning in the form of work-study. See Judith Scott-Clayton and Veronica Minaya, *Should Student Employment Be Subsidized? Conditional Counterfactuals and the Outcomes of Work-Study Participation*, NBER Working Paper (Washington, DC: National Bureau of Economic Research, 2014); Judith Scott-Clayton, “The Causal Effect of Federal Work-Study Participation: Quasi-Experimental Evidence From West Virginia,” *Educational Evaluation and Policy Analysis* 33, 4 (2011): 506–27; Adela Soliz and Bridget Terry Long, *The Causal Effect of Federal Work-Study on Student Outcomes in the Ohio Public University System*, Presentation at CAPSEE 2014 Conference, Washington, DC, September 19, 2014, <http://capseecenter.org/wp-content/uploads/2014/09/3C-Soliz-CAPSEE-091914.pdf>.
- 5 For E-portfolios, see Paul Fain, “Beyond the transcript,” *Inside Higher Education*, July 13, 2015, <https://www.insidehighered.com/news/2015/07/13/project-create-models-broader-form-student-transcript>; American Association of Collegiate Registrars and Admissions Officers, “AACRAO and NASPA name comprehensive student record implementation institutions,” October 21, 2015, <http://www.aacrao.org/resources/resources-detail-view/aacrao-and-naspa-name-comprehensive-student-record-implementation-institutions>; George Lorenzo and John Ittleson, *An Overview of E-Portfolios*, ELI Paper 1 (Louisville: EDUCAUSE, July 2005), <https://net.educause.edu/ir/library/pdf/ELI3001.pdf>. For surveys of graduates, see Julie Ray and Stephanie Kafka, “Life in College Matters for Life After College,” Gallup, Inc., May 6, 2014, <http://www.gallup.com/poll/168848/life-college-matters-life-college.aspx>. See also Thom Hanford, Rosemary Spetka, and Karen Chico Hurst, “Beyond the Academic Transcript,” Presentation at the Second-Annual Applied Learning Workshop: Gathering Evidence to Support Student Success, University at Albany, SUNY, November 9–10, 2015.
- 6 See University at Albany, “New Course Attributions for Experiential Learning, Publicly Engaged, International, and Online Courses,” September 2015; and Hanford, Spetka, and Hurst, “Beyond the Academic Transcript.”
- 7 State University of New York, “Applied Learning Guidance to Campuses,” Final, 2015.
- 8 Alan Wagner, Ruirui Sun, Katie Zuber, and Patricia Strach, *Applied Work-Based Learning at the State University of New York: Situating SUNY Works and Studying Effects* (Albany: Nelson A. Rockefeller Institute of Government, 2015), https://www.suny.edu/media/suny/content-assets/documents/applied-learning/2015-01-30-Applied_Work-Based.pdf.

- 9 Based on a Gallup survey of graduates, 29 percent report having participated in an internship or job. For the present pilot study, the proportion with internships recorded in academic records is 17.2 percent. See Seymour and Ray, “Recent Grads More Likely to Have Had Useful Internships.”
- 10 Anthony P. Carnevale, Tamara Jayasundera, and Artem Gulish, *Good Jobs Are Back: College Graduates Are First in Line* (Washington, DC: Georgetown University Center on Education and the Workforce, 2015), https://cew.georgetown.edu/wp-content/uploads/Good-Jobs_Full_Final.pdf; Peace Bransberger, *A Glimpse Beyond State Lines: Student Outcomes from WICHE’s Multistate Longitudinal Data Exchange Pilot Project* (Boulder: Western Interstate Commission on Higher Education, July 2014), http://www.wiche.edu/info/longitudinalDataExchange/publications/MLDE_GlimpseBeyond.pdf; Mark Schneider, *Education Pays in Colorado: Earnings 1, 5, and 10 Years After College* (Washington, DC: American Institutes for Research and Optimumity-Matrix Knowledge, 2015), <http://www.air.org/sites/default/files/downloads/report/Education-Pays-in-Colorado-Schneider-April-2015.pdf>.
- 11 For a discussion of such considerations in field experiences for candidates for teaching, see the discussion in Thomas Gais, Alan Wagner, Hal A. Lawson, Allison Armour-Garb, Ruirui Sun, and Katie Zuber, *Policies, Practices, and Systems for the Improvement of Teaching and Learning*, Policy Paper for the TeachNY Advisory Council, SUNY (Albany: Nelson A. Rockefeller Institute of Government, 2015). Also, Nancy Zimpher and Daniel D. Jones, *Transforming Teacher Education Through Clinical Practice: A National Strategy to Prepare Effective Teachers*, Report of the Blue Ribbon Panel on Clinical Preparation and Partnerships for Improved Student Learning (Washington, DC: National Council for Accreditation of Teacher Education, 2010), <http://www.ncate.org/LinkClick.aspx?fileticket=zzeiB1OoqPk%3D&tabid=715>
- 12 See University at Albany, “New Course Attributions for Experiential Learning.”
- 13 See, e.g., State University of New York, “SUNY Achieves Seamless Transfer Guarantee as Chancellor Zimpher Aims to Boost Completion,” Press Release, August 26, 2015, <https://www.suny.edu/suny-news/press-releases/august-2015/8-26-15/suny-achieves-seamless-transfer-guarantee-as-chancellor-zimpher-aims-to-boost-completion.html>.
- 14 See, e.g., Clifford Adelman. 2006. *The Toolbox Revisited: Paths to Degree Completion from High School Through College* (Washington, DC: U.S. Department of Education, 2006); Bransberger, *A Glimpse Beyond State Lines*; Doug Shapiro, Afet Dundar, Phoebe Khasiala, Wakhungu Xin Yuan, Angel Nathan, and Youngsik Hwang, *Completing College: A National View of Student Attainment Rates – Fall 2009 Cohort*, Signature Report No. 10, (Herndon: National Student Clearinghouse Research Center, November 2015), <https://nscresearchcenter.org/wp-content/uploads/SignatureReport10.pdf>.
- 15 NYS Department of Labor, “UI Data Sharing Elements” (Albany: NYS Department of Labor, n.d.), <http://labor.ny.gov/data-sharing/UI%20Data%20Sharing%20Elements.pdf>.
- 16 Information from other systems/states as well as for SUNY suggest that as many as half of graduates from a campus may not appear on NYSDOL wage records within the first four to six quarters following graduation. For CUNY, more than 80 percent of associate and bachelor’s graduates were employed (and showed up on wage records) during the period 2003 to 2010. See Colin C. Chellman, “Measuring Employment Outcomes at CUNY,” Presentation at the Center for Analysis of Postsecondary Education and Employment (CAPSEE) Conference, Washington, DC, September 19, 2014, <http://capseecenter.org/wp-content/uploads/2014/09/3D-Chellman-CAPSEE-091914.pdf>. The proportion of graduates with linked UI wage records in this pilot study of one SUNY campus is relatively lower, owing to the shorter period covered and attention to the bachelor’s level. Further, data from the pilot study show matches with wage records for 60 percent of those with NYS residency for tuition fee purposes compared to 28 percent matches for non-NYS residents. So, nonresidents returning to their “home” state for employment also could account, in part, for a lower share of wage record matches. The share is lower, also, owing to relatively high rates of continuation into graduate study. Using academic records, Colorado locates 21 percent of its public college and university graduates in postgraduate study in the state within six months of graduation and, of this group, 8 percent come up on wage record files with incomes above the minimum wage threshold. See Schneider, *Education Pays in Colorado*.
- 17 But, see, Bransberger, *A Glimpse Beyond State Lines*, and Chelman, “Measuring Employment Outcomes at CUNY,” especially for tracking graduates across state borders and addressing multiple wage records when, for example, individuals receive compensation from more than one employer.

- 18 On this point, see Schneider, *Education Pays in Colorado*. For identified fields, differences by college or university in Colorado are commonly modest in the first year, but show much more marked differences by year ten.
- 19 See, Mark Schneider, *Measuring the Economic Success of College Graduates: Lessons from the Field* (Washington, DC: Education Policy Center at American Institutes of Research, June 2014), http://www.air.org/sites/default/files/downloads/report/Measuring%20the%20Economic%20Success%20of%20College%20Graduates_Mark%20Schneider.pdf; Washington State Education Research & Data Center, *Employment Data Handbook: A Guide for Incorporating Employment Information from a State Unemployment Insurance (UI) Program into a P-20 Longitudinal Data System*, EDRC Technical Report 2012-01 (Olympia: Education Research & Data Center, 2012).
- 20 See, e.g., Schneider, *Measuring the Economic Success of College Graduates* and *Education Pays in Colorado*. For the most recent Colorado study, earnings are summed for four consecutive quarters and evaluated against the wage threshold. For a previous study for the state, a minimum wage threshold was applied for each quarter. Simple comparisons of medians, evaluated at annual equivalents, show a similar order of magnitude for Colorado graduates and graduates in this pilot study, respectively, \$33,091 and \$32,723 (internship taker) and \$31,736 (non-taker), all in 2014 dollars. Analyses undertaken in Texas using UI wage records obtain measures of earnings in four consecutive quarters and adopt a minimum wage and full-time employment threshold for the calendar year. Applying such a threshold, the median salary within one year of graduation for Texas graduates is higher, at \$44,100 (in 2013 dollars). For a detailed description of the Texas analysis and data, see the *seekUT* website, University of Texas System, Austin, n.d., http://www.utsystem.edu/seekut/about_the_data.html.
- 21 A separate threshold is applied to the quarter in which earnings were recorded, as follows: For Q1 2008 through Q2 2009, \$3,003; for Q2 2009 through Q4 2013, \$3,045; for Q1 2014 through Q4 2014, \$3,360. Each threshold is calculated as the NYS minimum wage in effect during the period in question times thirty-five hours per week over twelve weeks. The minimum wage figures comes from NYS Department of Labor, "History of the Hourly Minimum Wage," Last Updated December 31, 2015, http://www.labor.ny.gov/stats/minimum_wage.asp.
- 22 Due to the large number of "paired" groups, we may have a multiple comparisons problem. We chose not to apply corrections because the aim of this study is to explore whether there are possible effects of internships, not to generate evidence that we have identified such effects. Therefore, we are giving priority to reducing the likelihood of Type II error, i.e. the failure to reject a false null hypothesis. While both the very strict Bonferroni correction and the more preferred Benjamini-Hochberg procedure (which controls for the false discovery rate) could help address the Type I error introduced by multiple comparisons, it is at the expense of increasing the possibility of the Type II error. Moreover, the corrections are more applicable to analyses of a series of independent tests. Arguably, our eighty-eight "pairs" are not independent; instead, most of them are nested.
- 23 See, for example, Schneider, *Measuring the Economic Success of College Graduates* and *Education Pays in Colorado*; Bransberger, *A Glimpse Beyond State Lines*.
- 24 We undertook a separate, simple analysis to uncover evidence that extreme values might have affected the simple tests of significance of differences in employment outcomes by internship taking. In this supplementary analysis, with results provided in Tables S.7 and S.8, we eliminated any maximum or minimum value that was, respectively, three standard deviations above the mean and three standard deviations below the mean, in any group, adjusted group means and standard deviations accordingly, and carried out the statistical tests again for each "paired" group. The results largely were the same.
- 25 Following Angrist, it is possible to use grouped data in multivariate analyses. However, in the present study, we lack a sufficient number of groups to meet coverage requirements for applying such techniques. Angrist had data for 64.5 percent of all possible cells, covering 98 percent of the observations in his sample. By comparison, we have data for 4.0 percent of all possible cells (at the deepest level of stratification) accounting for 10.7 percent of the observations in the sample drawn for the pilot study. See Joshua D. Angrist, "Estimating the Labor Market Impact of Voluntary Military Service Using Social Security Data on Military Applicant," *Econometrica* 66, 2 (1998): 249-88.
- 26 Also, on analyses with group data, see Endnotes 22 and 25.

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