Career-Oriented Historic Events and their Impact on Student Ratings: A Longitudinal Study

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Student ratings of instruction (SRI) are widely used sources of information among higher education staff and faculty. Numerous factors influence these SRIs both within and outside the classroom. The present longitudinal case-study illustrates a practical methodological approach to reveal the impact that one-time career-related events may have on students' perception of teaching quality. OLS regression compared SRI trends before and after tenure and a governance position were received by a faculty member. Results show that these events may have at least a temporary negative impact upon several measures that reflect quality of the courses as perceived by the enrolled students.

Teacher evaluations are an invaluable source of information both for instructors and administrators of academic institutions (Abrami, d'Apollonia, & Cohen, 1990; Benton & Cashin, 2012; Beran, Violato, & Kline, 2007). Of the multiple methods available to assess instructors, student ratings of instruction (SRI) are one of the most frequently employed sources of information about classrooms (Hativa, 2014). The literature regarding student ratings is widespread including, studying their reliability, the inferences that can be drawn from them, and the factors within and outside the classroom that influence them (Benton & Cashin). There is, however, significant skepticism about their construct validity as indicators of teaching effectiveness or teaching quality (Jimaa, 2013) mainly due to the lack of agreement between scholars about what effective teaching is (Beran & Violato, 2010; Hativa). For this reason, SRIs are best seen as student's perceptions of teaching and their satisfaction with how well the instructor contributes to their learning (Hativa).

Research has found that some instructor characteristics like rank or expressiveness can influence SRIs. Similarly, students' motivation and their grade expectations can influence the ratings they assign their instructors. Additionally, the level of the course, class size, academic discipline and workload/difficulty of the courses are course variables that are related to student ratings (Benton & Cashin, 2012). Research has also investigated the relationships that variables external to the classroom have with SRIs. For example, marriage and home stability can have a significant impact on SRIs and thus on the perceived quality of teaching (Blustein, 1997; Blustein, 2001; Ludlow & Alvarez-Salvat, 2001). Career-related instructor characteristics usually are taken into account as status variables, that is, as descriptors of the instructor similar to gender or ethnicity. Career-related variables could also be considered one-time historical events, or "shocks", rather than as conditions extending over time. This possibility is the main interest of the present study.

Throughout a higher-education faculty's career multiple events can be considered of significant relevance, for example, receiving tenure, any promotion in rank or accepting a governance position within the institution they belong to (e.g. chairmanship or deanship). In the academic literature there is, however, a general lack of empirical evidence about what the effects of these decisions or events may be. In particular, the additional responsibilities that accrue due to receiving tenure and accepting a governance position may impact negatively faculty's lessons through increasing stress and feelings of burnout (Burke & Greenglass, 1995). Given their periodical nature, SRIs provide an opportunistic longitudinal perspective of how student perceptions of faculty teaching practices change over time—particularly around the times of significant professional events.

The objective of the study is to illustrate the impact these two career-related events may have on an instructor's teaching practice and, subsequently, on the student ratings that instructor receives on the end-of-course evaluations by using OLS regression. The hypothesis is that events such as being tenured or accepting a governance position in the institution have at least a temporary negative impact upon several measures that reflect the perception of quality of the courses by the students. In order to test the hypothesis, variables extracted from a single faculty's SRIs that are proxies for perceptions of teaching quality are regressed on a time variable. Then the study analyzes the differences that exist between the trend of quality measures before the events and their trend immediately, and then long-term, after they happened.

Finally, we note that the data, hypotheses and analyses all reflect a case-study approach. Although external validity is limited, in the population generalizability sense, we believe this study provides faculty development insight on two fronts. First, for long-term career faculty, the procedures employed can reveal temporal effects of life-events masked in traditional longitudinal SRI analyses. Second, the typical institution-wide aggregation and analysis of SRIs is, at best, crudely effective at partialing out the myriad confounding sources of variation influencing SRIs prior to addressing the predictor variables of interest. The subsequent results from this form of cross-sectional analysis are practically worthless when administrators meet with faculty to discuss an individual's SRI record. This study shows how SRIs are instructor records of impact upon students and these records contain complex patterns of professional successes, challenges, and continuous improvement that may never be detected in institution-wide, cross sectional analyses of SRIs. Moreover, this methodology is aligned with prior research that has shown how a single-subject longitudinal analysis of course evaluations can reveal how different classroom, student and instructor variables interact with SRIs (Chapman & Ludlow, 2010; Ludlow, 1996; Ludlow & Alvarez-Salvat, 2001; Ludlow, 2005; Ludlow & Perez, 2018).

Method

Data

The study employs a longitudinal data set compiled by a single university professor using SRIs conducted at the end of every course taught from 1984 through 2016. This set comprises 127 course records ranging from undergraduate research methods courses, to graduate applied statistics and psychometric courses and doctoral seminars. The courses were offered during the spring, summer and fall terms within the graduate school of education of a single institution.

The data comprises variables that fall into three distinct categories: student, instructor and administration variables. Student variables come from questions students answered on their course evaluations such as amount of time spent on the course or extent to which they believed principles and concepts or academic skills were developed through the course. Students also rate overall instructor performance as "excellent", "very good", "good", "acceptable" or "poor". The percent of students that provided an "excellent" rating is considered the global instructor performance rating. Instructor variables were created by the professor and they refer to various teaching strategies or personal circumstances. These include the number of publications, academic rank, and marital status of the professor at the time of the class. For the present study the instructor variables of when tenure and chair of the department status occurred are of special interest. Finally, administration variables include elements out of the control of the instructor such as the number of courses taught each semester, class size, and the number of times that the course had been taught.

Model Variables

The purpose of this study is to model using OLS regression the apparent effects that career-related events may have on the perceptions of students about teaching quality. To analyze these effects variables that are proxies for perceived teaching quality are regressed on time in order to observe carefully whether existing trends in variable relationships are disturbed when such events occur.

Among the questions on the standard course evaluation administered for at least the past 30 years, five Likert-scored items ask students whether (a) regular attendance was necessary for the course, (b) they acquired factual information, (c) they understood principles and concepts, (d) they developed academic skills, and (e) faculty was available outside of class. The percent of students that chose "Strongly Agree" was recorded for each item. Of these five variables Factual Information, Principles and Concepts, and Academic Skills are conceptually related and may even represent the same "perceived student learning" construct. To corroborate this, the principal component procedure employed by Chapman and Ludlow (2010) was replicated with these three items. These items formed a strong first component with a principal eigenvalue of 2.645 accounting for 88 percent of the total variance. Additionally, all three component loadings were at least .92. A composite variable labeled *Student Learning* was subsequently calculated by averaging Factual Information, Principles and Concepts, and Academic Skills. This composite variable and the global instructor rating variable, labeled *Percent Excellent Ratings*, are the proxies for student perceptions of teaching quality.

A variable called *Sequence Number* keeps track of the sequential order in which the 127 classes were taught; this variable is the proxy for time. Additionally, *Tenure* and *Chair* are binary variables that identify the points in time when these events occurred (coded as pre- and post-event).

The Regression Model

Ordinary least squares regression (OLS) is used to analyze the trends of the perceived quality of instruction proxy variables over time, and the extent to which they change after tenure and appointment to department chair. Specifically, *Percent Excellent Ratings* and *Student Learning*, are regressed on (1) *Sequence Number* as a proxy for time and (2) the career-related variable of interest, either *Tenure* (coded yes/no) or *Chair* (coded yes/no). Furthermore, to understand the effects that these events had on the outcomes, the separate regression models include an interaction term between *Sequence Number* and *Tenure* or *Chair*. These interactions are labeled *TenureTime* and *ChairTime*, respectively. The estimated models for both *Percent Excellent Ratings* and *Student Learning* are:

Tenure: $$\hat{Y} = a + b_1 x_{seqnum} + b_2 x_{tenure} + b_3 x_{seqnum*tenure}$$

Chair: $$\hat{Y} = a + b_1 x_{seqnum} + b_2 x_{chair} + b_3 x_{seqnum*chair}$$

For these four models the main interest is the coefficient of the interaction, as this indicates the shift of the slope from pre-event to post-event. The sign of the coefficient indicates whether the slope change is positive or negative. A negative coefficient represents a weakened relationship between *Percent Excellent Ratings* and *Sequence Number*, and *Student Learning* and *Sequence Number* after either *Tenure* or *Chair* occurred. Hence, the directional hypothesis tested for the four models is (at α=.05):

$$H_0: \beta_3 = 0$$
$$H_1: \beta_3 < 0$$

The analysis methodology consists of two phases. First, the four models above analyze the significance of the change in trend relationships pre- and post-events. Second, the four sets of relationships are broken down into temporally bound periods that study their respective trends one, two, five and ten years post-events.

Results

The scatterplots presented in Figure 1 show the general trend of the two teaching quality proxies (*Percent Excellent Ratings* and *Student Learning*) over the 127 courses. In each scatterplot two vertical reference lines are included, the one on the left (dashed) represents when the professor was tenured, the one on the right (dotted) is the semester the professor became department chair. Overall, both the *Percent Excellent Ratings* and *Student Learning* increased over time. Multiple variables likely contribute to these similar trends, for example, increasing effective teaching experience and decreasing class size as the courses tended to become more specialized over time (Benton & Cashin, 2012; Chapman & Ludlow, 2010; Chye Koh & Meng Tan, 1997). The trend in both scatterplots, however, is consistent across time, hence, if there was a disruption in the professor's teaching quality when the tenure and department chair events occurred it is not evident in these plots. To the naked eye, the reader may conclude that these two independent career-related events did not hinder by any means the pair of positive trends.

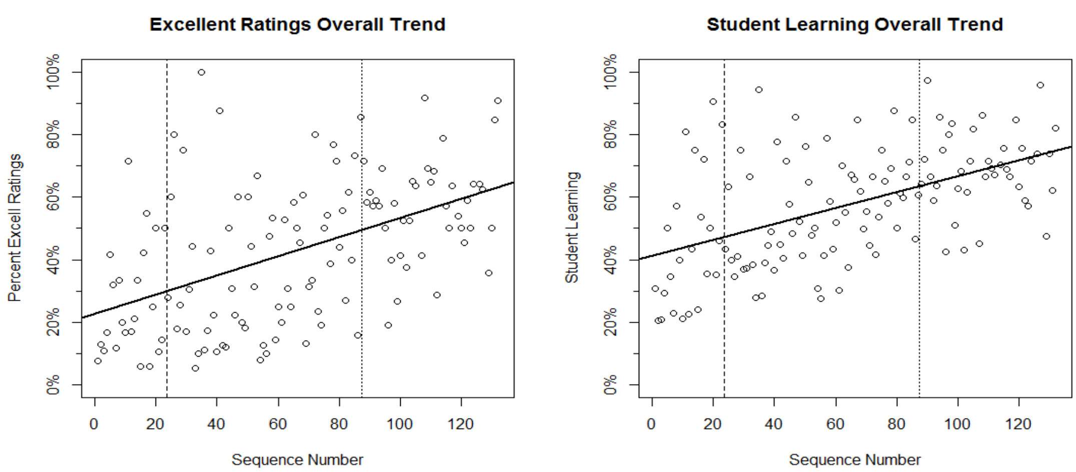

Figure 1. Overall trends.

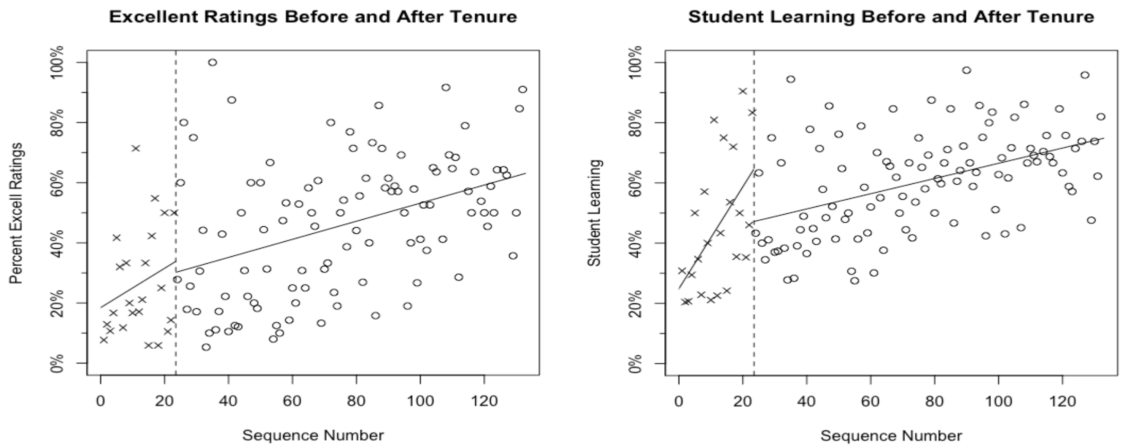

Figure 2. Linear trends before and after Tenure.

Overall Approach

First, the models that test tenure's effect were estimated using all 127 cases.

$$\widehat{Excell} = 18.45 + 0.65\, x_{seqnum} + 4.66\, x_{tenure} - 0.35\, x_{tenuretime}$$

$$\widehat{SL} = 24.86 + 1.69\, x_{seqnum} + 16.37\, x_{tenure} - 1.44\, x_{tenuretime}$$

$\widehat{Excell}$ represents the predicted value for *Percent Excellent Ratings* and $\widehat{SL}$ the predicted value for the *Student Learning* outcome.

For both models the coefficient for *seqnum* indicates a positive increase in ratings over time while the *tenure* coefficient shows that ratings post-tenure were higher than pre-tenure, but the interaction term is negative, indicating that post tenure the slopes for *Percent Excellent Ratings* and *Student Learning* were less than they were pre-tenure. To corroborate these findings, the same procedure was run with *Chair* as the primary predictor:

$$\widehat{Excell} = 23.20 + 0.28\, x_{seqnum} + 7.92\, x_{chair} - 0.05\, x_{chairtime}$$

$$\widehat{SL} = 40.11 + 0.28\, x_{seqnum} + 24.65\, x_{chair} - 0.24\, x_{chairtime}$$

Again, the *seqnum* coefficients indicate that ratings increased over time while the *chair* coefficients indicate the post-chair ratings were higher than pre-chair ratings but both interaction coefficients are again negative; when the professor assumed chairmanship of the department the positive relationships between these two perceptions of teaching quality and time diminished.

The scatterplots were reconstructed to discriminate pre- from post- event classes in order to better understand what the "negative" interaction effects look like. In Figure 2 (*Tenure*) and Figure 3 (*Chair*), the regressions were run separately on the pre- and post-event ratings. This procedure produced the two different regression lines seen in each plot. The interaction terms reported above are the numerical differences in the pairs of slopes graphed in each plot.

The interaction estimates quantify the visual perception of how the slopes pre-event became shallower post-event. Although the slopes are all still positive, the trends are not as positive as they were pre-event and the interaction terms do indicate the occurrence of a disturbance to the long-term pattern. A typical study might conclude at this point that there was no significant negative *Tenure* or *Chair* effect after these events occurred (the interaction terms were generally not statistically significant at $\alpha<.05$; see Table 1), but we propose an alternative way of studying the hypothesized adverse effects these events had on the SRIs.

Temporally Bound Scenarios Approach

As stated in the hypotheses, we are testing that the effects the *Tenure* and *Chair* events had on SRIs were negative. The post-event positive linear patterns would appear to contradict our hypotheses but their respective positive slopes obscure the immediate aftermath of the event occurrences. To understand how temporal the effects were, the data were trimmed in order to construct different time frames (scenarios) from the moment the event happened up through the last class in the longitudinal sequence. An in-depth analysis of *Tenure* is presented first; the same is then done for *Chair*. The scatterplots in Figure 4 show the pre- and post-tenure regression lines at the *end of the first year* after receiving tenure.

It is now possible to observe how the positive slopes changed drastically after tenure was awarded—the slopes became sharply negative. Analyzing the data in this local scale shows the clear negative effect associated with the occurrence of this event. The new regression models had interaction coefficients of -5.30 and -5.01 for *Percent Excellent Ratings* and *Student Learning* respectively, findings that corroborate the evident patterns in the scatterplots.

Table 1. One-Tailed p-Values for Interaction Coefficients in the Regression Models

	Excellent Ratings	Student Learning
Tenure	0.290	0.002*
Chair	0.415	0.121

Note. * Significant at α <0.05.

As previously shown, the negative trends in Figure 4 do not persist over time. For this reason further scatterplots and models were run to understand how the negative slopes present in the first year post-tenure period (Figure 4) reverted to the positive slopes observed for later data (Figure 2). The following scatterplots (Figure 5) show regression lines for one, two, five, ten and twenty years after the event (dashed lines), and the trend for all post-event data (solid line). All regression lines have been translated to share the same intercept with the tenure reference line to make the comparison of slopes easier.

Note how immediately post-tenure the slopes are strongly negative and as the years increase the slopes change from negative to positive. For each of these temporally bound scenarios the regression models were run as well, the following table includes a summary of how the slopes and interaction terms changed between scenarios. The conclusion to be drawn from these interaction coefficients is that as time passed the immediate apparent negative effect of tenure became less and less prevalent as evidenced by the coefficients becoming “less negative” in approaching zero. In fact, at about year 12 post-tenure the slopes actually become positive once again—just not as positive in their magnitude as pre-tenure.

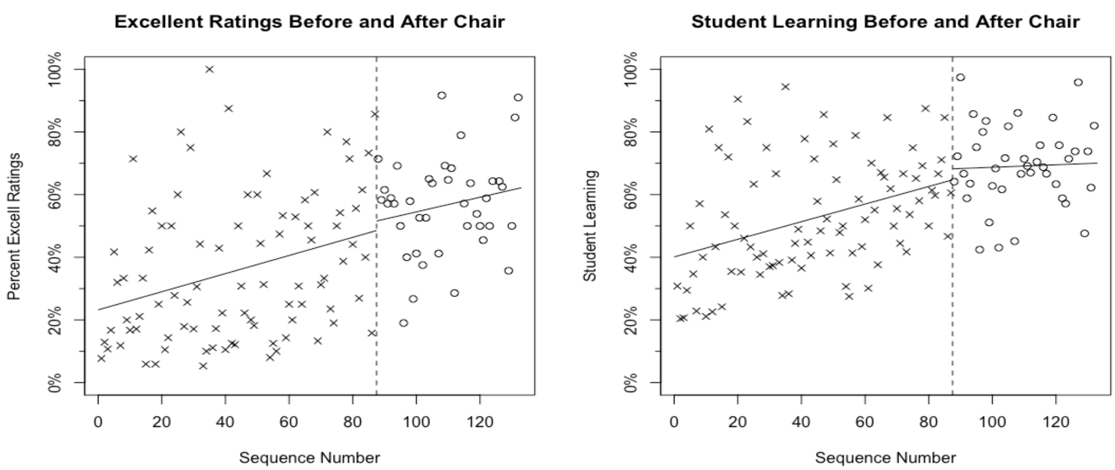

Figure 3. Linear trends before and after Chair.

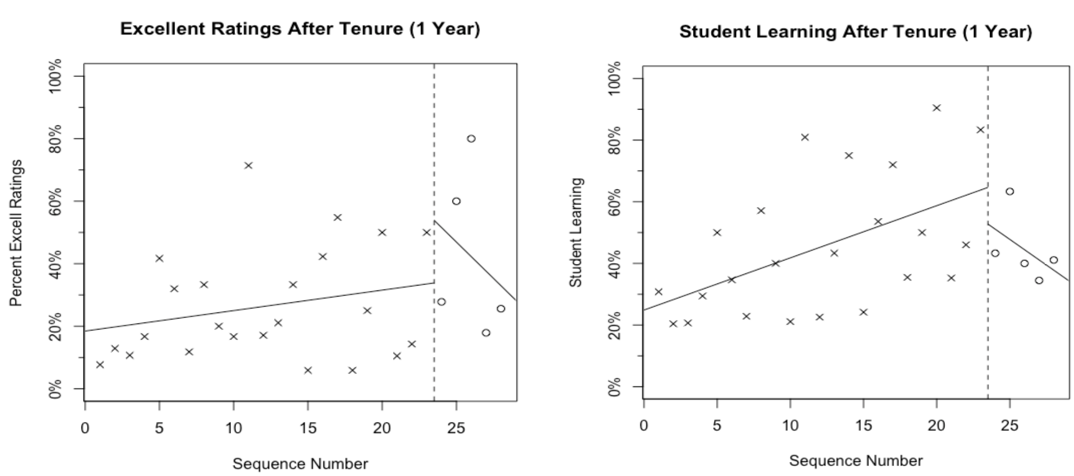

Figure 4. Linear trends before and first year after tenure.

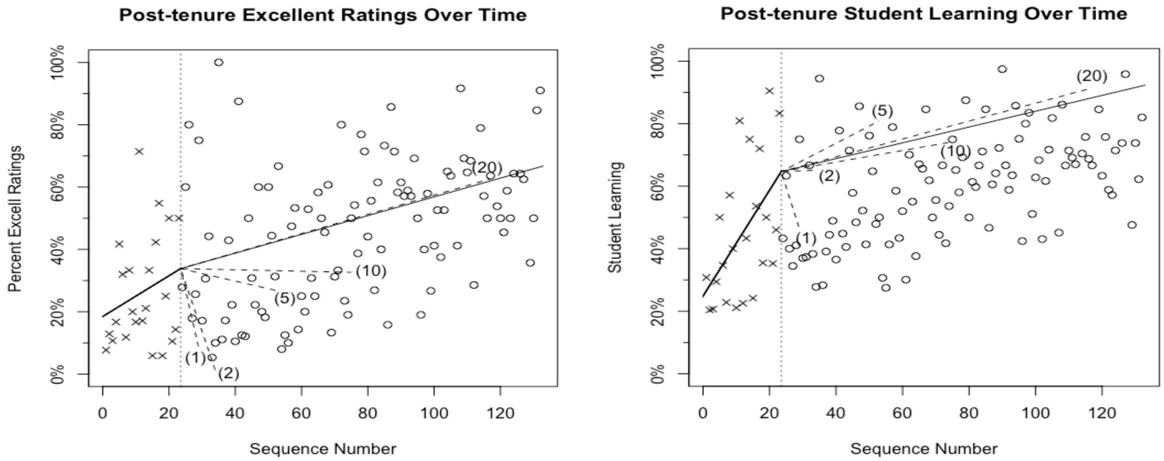

Figure 5. Post-tenure linear trends over time

Table 2. Coefficients of Interaction Terms for Time-Bound Regression Models Post-Tenure

	Excellent Ratings		Student Learning	
Time Period	Slopes	Interaction	Slopes	Interaction
Pre-Tenure	0.654		1.693	
One Year After	-4.650	-5.30	-3.327	-5.01
Two Years After	-3.110	-3.76	0.041	-1.65
Five Years After	-0.243	-0.89	0.551	-1.14
Ten Years After	-0.023	-0.67	0.183	-1.50
Twenty Years After	0.308	-0.34	0.286	-1.40
Present	0.300	-0.35	0.253	-1.44

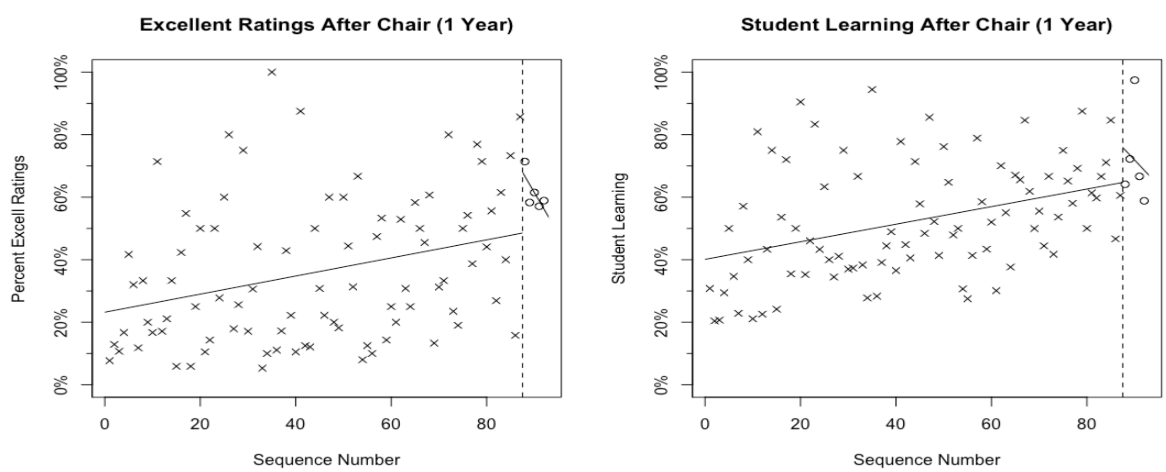

Figure 6. Linear trends before and two years after chair.

The same in-depth analysis is presented for the effects of *Chair*. First, the scatterplots regarding the first year after accepting the position as chairman are presented in Figure 6.
Although these scatterplots are less clear due to the smaller proportion of post-event data points it is possible to see that the appointment of the chairmanship was detrimental to SRIs during the first year of chair responsibilities. To understand how this relationship changed over time, similar time-lapse scatterplots as before are presented for the regressions after one, two, five and ten years (dashed lines) including the overall post-event trend (solid line).

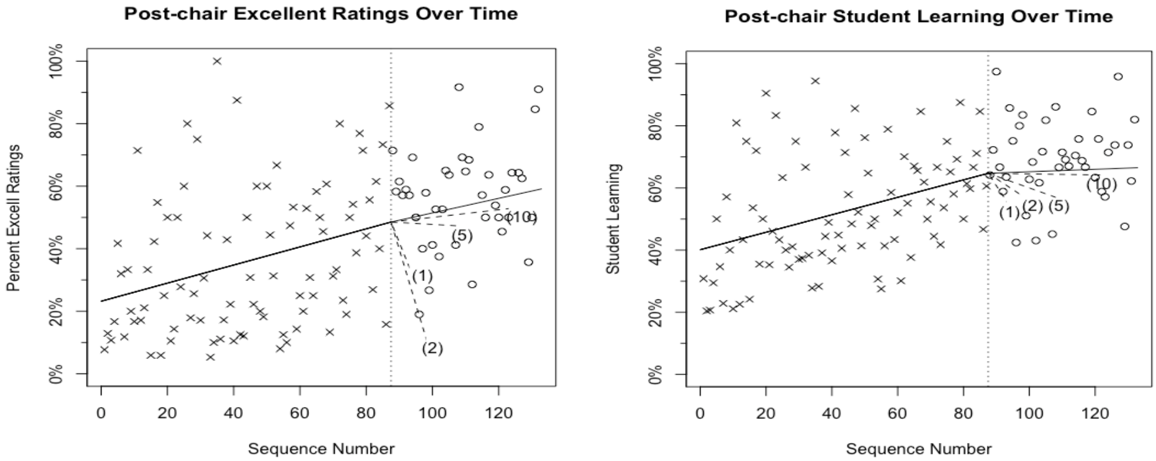

Figure7.. Post-chair linear trends over time (sequence number).

Table 3. Coefficients of Interaction Terms of Time-Bound Regression Models Post-Chair

Time Period	Excellent Ratings		Student Learning	
	Slopes	Interaction	Slopes	Interaction
Pre-Chair	0.2894		0.2811	
One Year After	-2.6200	-2.90	-1.6170	-1.89
Two Years After	-3.5190	-3.80	-0.6996	-0.98
Five Years After	-0.0605	-0.34	-0.3768	-0.65
Ten Years After	0.1210	-0.16	-0.0161	-0.29
Present	0.2336	-0.05	0.0397	-0.24

It is possible to see how the *Percent Excellent Ratings* trend dropped even further during the second year but bounced upwards three years later. In the case of *Student Learning* the negative slope consistently became less negative over time. The regression models for each of these scenarios were also run and Table 3 includes the slopes and the coefficients of the intercept term. Similar to the *Tenure* results, coefficients are negative and approach zero as time passes while slopes become positive about 10 years after assuming the role of department chair.

Discussion

The present study has shown an application of OLS regression to reveal how career-related events, particularly receiving tenure and being appointed chair, can have at least a temporal negative effect on the perception of a professor's teaching quality by his/her students. Traditional approaches to analyzing longitudinal data may miss such an effect since the effects may be masked or "washed out" over time as the data continue to be gathered. Hence, one way to find these effects is by trimming the data into discrete limited-in-length time periods and studying what occurred immediately after these events happened. Through this approach it was found that SRIs were impacted negatively mainly during the first two years after the events while the long-term trends were seemingly reversed after about a decade. From the present results it is also evident that although post-event negative trends were reversed over time, the post-event slopes never became as steep as the pre-event slopes (perhaps a form of long-term "carry-over" effect).

The literature on stressful life events and occupational wellbeing provides some insight into why these temporary negative effects can be seen on SRIs. For example, stressful life events can have serious negative impacts on mental health and are often related to depression episodes (Kessler, 1997; Schwarzer & Schulz, 2003) while chronic depression often leads to reduced productivity at work (Berndt et al., 1998). In a teaching context, reduced productivity could mean mediocre teaching, which would presumably have a negative impact on SRIs (McLean & Connor, 2015). Among schoolteachers, burnout and depression have a close relationship with stressful life events (Kokkinos, 2007; Schonfeld & Bianchi, 2016), and thus have a negative impact on teaching quality. Moreover, research shows that recovery from traumatic events such as death of a close one or depression is possible after these issues have been acknowledged and addressed (Jennings & Greenberg, 2009; McGuiness, 2007). Although receiving tenure and accepting the chairmanship of a department do not fit the traditional definition of "stressful life events" they share some similarities given that these events can disturb faculty work rhythms, but as shown here once faculty have a chance to adapt to these changes, the seemingly negative effects may dissipate.

There is limited literature available regarding faculty's experiences linked specifically to these two career-related events. Regarding receiving tenure, it is not uncommon to hear terms such as "post-tenure blues" or "post-tenure depression syndrome" informally among the academic community and in the non-academic literature (i.e. blogs, higher education news outlets, teacher counseling services) (Blanchard, 2012; Cassidy, 2005; Fitzgerald, 2017; George, 2003; Perlmutter, 2015). These anecdotes describe faculty feeling apathy or despair or losing interest in their field of research. Despite these personal accounts, little research and empirical evidence are available regarding the possible effects of tenure on faculty. Cheng (2015) performed a differences-in-differences model analysis on the effect of tenure on instructor ratings at the undergraduate level. Although results suggested differences between tenured and non-tenured instructors were non-significant, the author highlights the need for longitudinal studies that might study this topic further. Our preliminary results align with Cheng's in that the comparison of pre- and post-event slopes were not significantly different, but a more detailed analysis does show significant effects. In contrast to tenure, to the best of our knowledge, there's no literature addressing the specific effects that accepting a governance position in higher-education institutions may have on faculty teaching.

The case-study approach employed and the unique characteristics that describe the faculty member and their institution are limitations to the generalizability of the interpretations made. Despite these limitations, results showcase the effectiveness of using OLS regression in discrete time-bound scenarios to identify effects as the ones observed in this data. Future research could involve addressing the present research question using more robust modeling strategies as regression discontinuity or linear growth models.

Practical Implications

The value of these results lies in the lack of empirical evidence documenting the detrimental effects that these specific types of career-related events may have on teaching and subsequently students' perceptions of teaching quality. From a faculty development standpoint, these results suggest the need for institutions to provide sensitive support to faculty when tenure is awarded and governance positions are offered. From a personal perspective, faculty being considered for tenure or governance positions should be aware of these possible collateral effects on their teaching, and that, although negative, they may be temporal and can be subsequently adjusted and improved upon. Hence, this study also shows the value of keeping self-reflective longitudinal data, as this may help faculty keep track of how their teaching quality and ratings have been affected by events or decisions throughout their careers. Furthermore, this type of case-wise, longitudinal analysis illustrates the type of instructor teaching evaluation detail that institutions could perform on a routine basis to provide appropriate support to faculty.

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