CAN WE AFFORD TO RAISE TUITION (OR NOT)?:

Tuition Trend Analysis at NMHU 2015-2018

Prepared by:
The Financial Planning Committee
March 2019

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Why this study

The Financial Planning Committee is interested in exploring the impact of tuition and fee increases in recent years on enrollment, as well as on the finances of the university. Over the last few years, tuition and fees have risen as the primary mechanism to offset reduced appropriations from the legislature and loss of revenue from declining enrollment. While we understand this has been necessary, we wanted to explore what consequences it may have on our student population as well as on the university's budget itself. The data used for this study were obtained from the Office of Institutional Effectiveness and Research, NMHU budget reports, and records of tuition and fees over recent years.

The tuition and fees data used for this analysis were obtained from publicly available university records. The data from enrollment were obtained from the Office of Institutional Effectiveness and Research. We estimated annual tuition and fees revenue for each student demographic group by multiplying the number of credits taken by each student within a demographic group times the tuition and fees of their demographic group and summing these

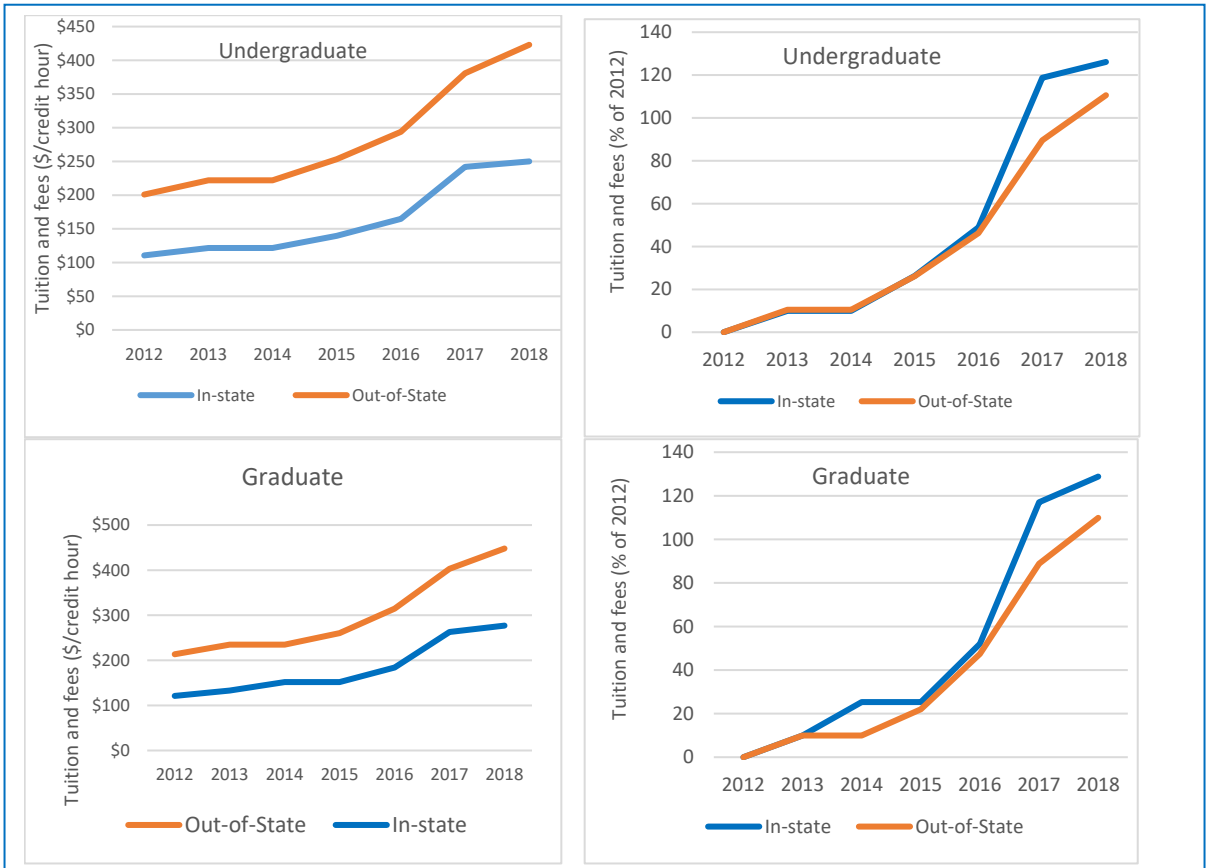

Figure 1. Left column: Tuition and fees for undergraduate students (above) and graduate students (below) over recent years. Right column: Tuition increases expressed as percentages of 2012 tuition and fees for undergraduate students (above) and graduate students (below)

products across all students within each group during that year. Students that took more than 12 credits were scored for only 12 credits of tuition to reflect full-time tuition rates.

Tuition changes

Over recent years, tuition and fees have been increased regularly due to reductions in state appropriations and/or lost revenue associated with declining enrollment. Figure 1 shows how tuition and fees have changed during the 2012-2018 period. There is a general increasing trend that becomes stronger in the later years. The rest of this study deals mostly with this later period of increasing tuition. Looking at the charts on the right we see the relative increases in tuition and fees. Here, it is apparent that both in-state and out-of-state tuition have risen comparably. Up until 2016, both in-state and out-of-state tuition and fees increased at approximately the same rate. However, in 2017 there was a sharper increase for in-state tuition and fees for both undergraduate and graduate students. As will be shown below, there is a strong correlation between increasing tuition rates in these years and decreasing enrollment and credit hour production.

Relations between tuition and fees and enrollment

Increasing tuition and fees has the perceived benefit of increasing revenue, but it may have other unintended consequences. Clearly, higher tuition and fees are likely to put a higher burden on family budgets of our less-privileged demographics, which may result in a deterrent effect which prevents students from coming to our university, or attending college at all. Even in the best case scenario, higher tuition and fees will likely result in higher student debts and more financial stress in the student population.

Figure 2 shows paid credit hour production (a measure of enrollment) by student demographic group as a function of tuition and fees. The least-squares regression equations are presented in the chart. The R^2 presented below each formula is the "Coefficient of Determination", and it tells us how well the model describes the relationship between the variables displayed. For instance, an R^2 of 0.97 as observed for the regression of out-of-state undergraduate paid credit hour production against tuition and fees (Figure 2) means that 97% of the variation in paid credit hour production can be explained by the variation in tuition. Looking at most of the demographic groups, there is a strong correlation between increases in tuition and fees and declines in paid credit hour production among all undergraduate students and out-of-state graduate students. It is well-known that correlation does not necessarily indicate causation. There may be lurking variables that might affect paid credit hour production, and in the present case the factors of tuition and fee increases are admittedly confounded with the factor of time. Often, when a country's economy is doing well, young people are attracted by the job market and school attendance tends to drop. Also, HLC accreditation issues experienced by NMHU in recent years are likely to exert a negative influence on enrollment. However, it would be unwise to ignore a set of very strong correlations showing that the tuition and fee increases may be, at least partially, responsible for the lower enrollment, particularly inasmuch as this relationship is an almost universally accepted prediction of microeconomic theory with regard to relationships between prices and quantities demanded for a given commodity.

The absolute values of the slopes of the lines in Figure 2 work as proxies for how responsive each demographic group of students is to increases in tuition and fees. Clearly, in-state undergraduates, constituting the largest demographic group in terms of paid credit hour production, have the greatest potential to affect NMHU's total paid credit hour production, followed by in-state graduate students, out-of-state undergraduates, and out-of-state graduate students. In-state graduate students do not show much of a trend; the correlation is weak, and

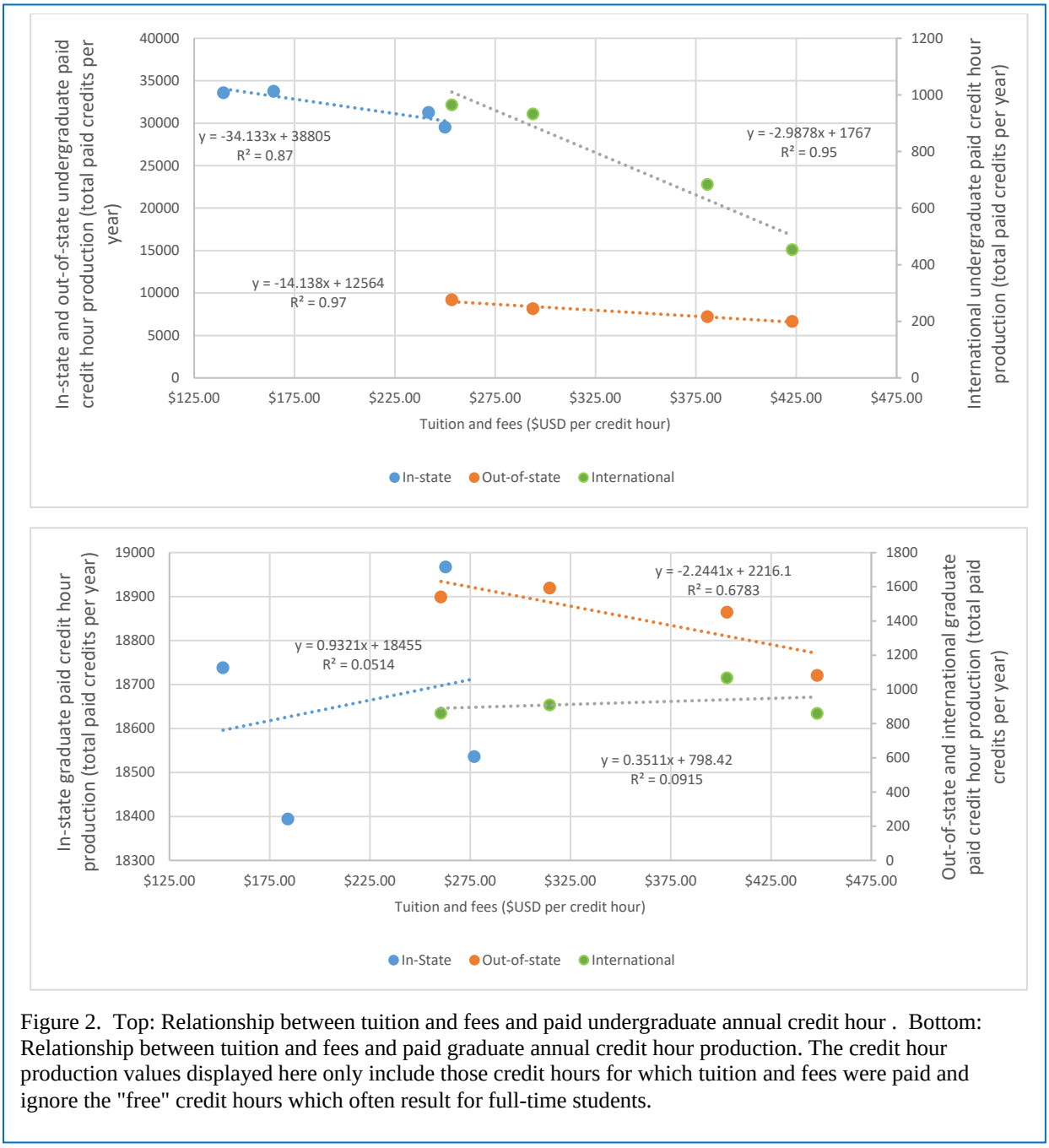

Figure 2. Top: Relationship between tuition and fees and paid undergraduate annual credit hour . Bottom: Relationship between tuition and fees and paid graduate annual credit hour production. The credit hour production values displayed here only include those credit hours for which tuition and fees were paid and ignore the "free" credit hours which often result for full-time students.

these data do not suggest that within this range of tuition and fees, there is any significant negative effect on their enrollment. A school of thought posits that, in academia, tuition has no relationship with enrollment and credit hour production. This notion is supported by data for the enrollment of in-state graduate students at NMHU, BUT it certainly does NOT seem to be the case for all in-state students and out-of-state graduate students. The available data prove this to be objectively false for other student demographics at NMHU during this time period. See Appendix A for more detailed information about the relationships between tuition and fees, student enrollment headcounts, and total credit hour production regardless of payment status.

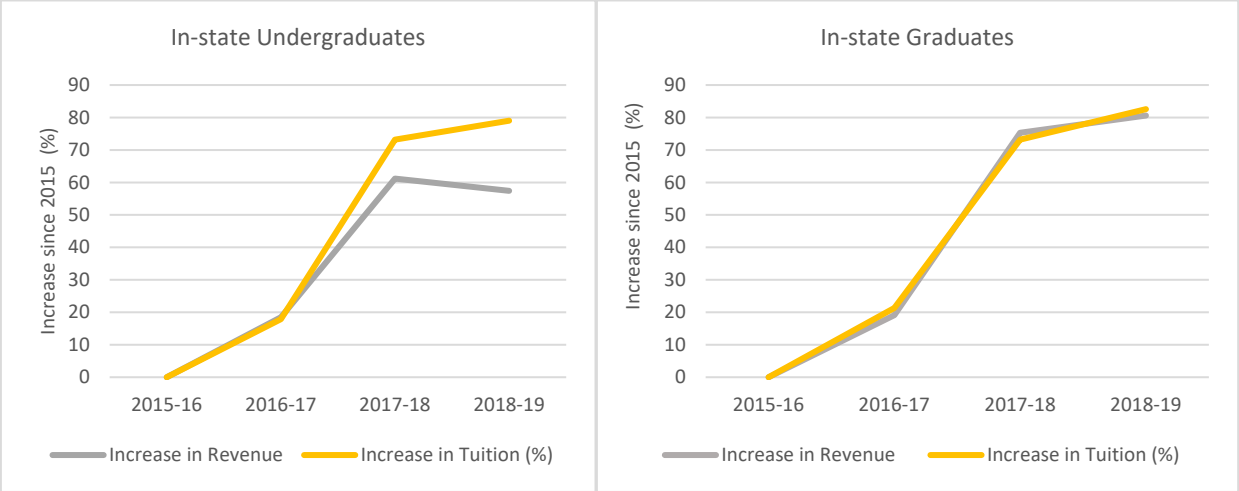

Figure 3. Relative increases in revenue and tuition and fees for in-state students. Undergraduates (Left), Graduates (Right).

Are tuition increases working?

It seems relatively straightforward that charging higher tuition and fees would result in higher revenues. However, because tuition and fee increases are strongly correlated with decreases in enrollment and paid credit hour production, casually or causally as it may be, it follows that the sustained and recurring increases in tuition and fees might not necessarily result in higher revenues. Figure 3 shows the increases in tuition since 2015 and the associated increases in revenue in relative terms (percentage increases relative to 2015). It appears the increases in tuition and fees for in-state undergraduate students resulted in revenue increases that mirrored the tuition and fee increases relatively well up until 2017. However, in 2018, less revenue was generated from tuition and fees in 2018 than in 2017 for this student demographic despite the increased tuition.

It is not clear if the drop in revenue was a response to the most recent increase in cost of enrollment or if it was a delayed effect of a previous increase. It is likely that junior and senior students remained enrolled at NMHU despite the undesirable tuition and fee increases because leaving would delay their graduation. So, it is possible that the drop in revenue we see in 2018 for in-state undergraduates may have resulted from the steep increase in tuition and fees in 2017 (Figure 1). This is a troublesome possibility. If the decreases in revenue responses exhibit a two-year delay after an increase in tuition, we must worry about the sharp increases since 2017 having carryover effects. It may forecast an even steeper decline in enrollment for Fall 2019, even if tuition and fees remain unchanged.

The same analysis for in-state graduate students shows a different result. The increases in tuition and fees for this demographic tightly mirror the increases in revenue observed (Figure 3, right). This is consistent with the weak correlation between tuition increases and paid credit hour production for this group mentioned earlier (Figure 2), supporting the notion that, at least for this group of students, paid credit hour production does not respond strongly to tuition and fees.

The responses observed for out-of-state students are slightly different. Tuition has been increasing similarly for this demographic group, but their response in terms of revenue has been different from that of in-state students. Figure 4 shows that increases in tuition and fees have not resulted in proportional increases in revenue for out-of-state undergraduate students. While

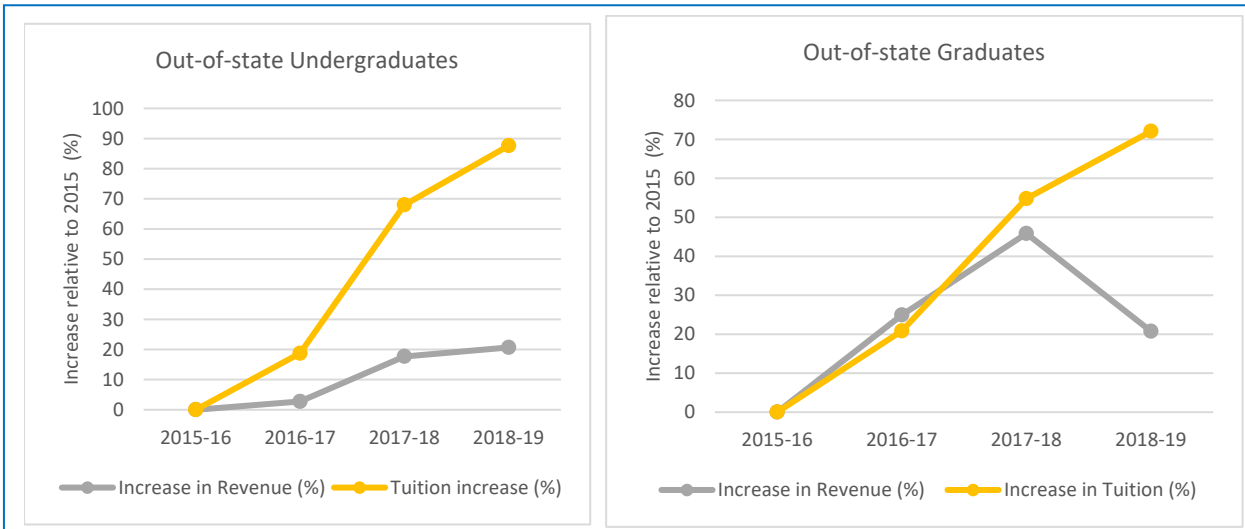

Figure 4. Relative increases in revenue and tuition (% relative to 2015) for out-of-state students. Undergraduates (Left), Graduates (Right).

tuition and fees have increased about 80% relative to 2015, the increases in revenue have shown a far more modest increase. Among out-of-state graduate students there was a better match, with increases in tuition and fees resulting in similar increases in revenue until 2017. It seems that the tuition increases for out-of-state students have not translated into proportional increases in revenue.

What is the right tuition?

Of course, this is a complex question that we do not attempt to answer in this report, and a follow-up report is being prepared by this committee that will discuss various economically rational approaches to setting optimal tuition and fee rates. There are considerations against tuition and fee increases related to NMHU's mission and our mandate to provide affordable education to underprivileged students. We consider these issues to be extremely important and a matter that must be considered when deciding what tuition and fees rates to charge. For the purposes of this report, we have analyzed the relationships between revenues, tuition and fees, and paid credit hour production, hoping to illuminate their quantitative relationships, causal or casual as they may be.

Clearly, the decisions of students to come to NMHU is a complex process that considers a wide variety of issues, and we will not attempt to consider them all here. Rather, we will limit our analysis to the trends that have been occurring in the last four years for which we have quantitative data available. Thus, this analysis does not rely on any assumptions about the reasons or causes of the trends. It just looks at what has been happening in the last four years in terms of tuition and fees and enrollment (in terms of paid credit hour production), and integrates this factual information into a combined quantitative model. The only assumption of this analysis is that the trends that we have seen will continue into the near future. This may or may not be a correct assumption, but the strong predictive power of the models employed (as demonstrated by their high R^2 values) suggests that such extrapolation is not unreasonable. The Office of Strategic Enrollment Management may be able to reverse these trends if they prove successful at increasing recruitment and retention. However, using the data we have available at present can

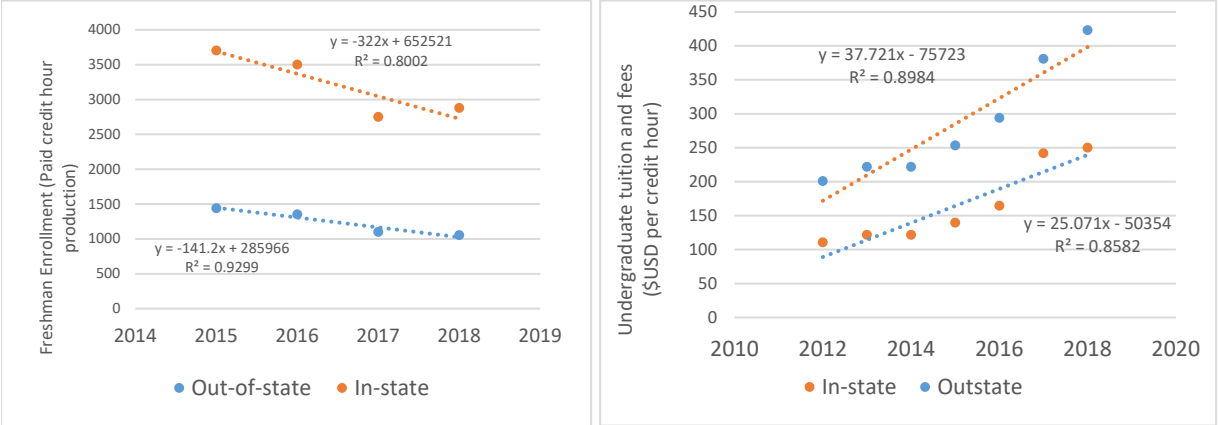

Figure 5. Trends in freshman enrollment (Left) and undergraduate tuition and fees rates (Right) over the last 4 years which were used to build the model described below.

provide reasonable and responsible predictions of what we may expect if the status quo continues.

For the present revenue optimization analysis, we chose to focus on freshmen so as to avoid the confounding factors of students that were already here when the tuition and fees rose and chose to stay in order to finish their program sooner. Using freshmen only, we focus this analysis on those students that first enrolled at NMHU in a given year and the tuition and fees they were considering paying at NMHU when they made that decision. We used the least-squares regression models of freshman enrollment and tuition and fees for the last four years (Figure 5) as the source of information to construct these models.

It is possible to combine both equations into a single second order model by multiplying the predictive least-squares regression equations (taken from the charts). Combining both curves from Figure 5 for in-state students, we obtain Figure 6 (left) where we can see that the resulting revenue function shows a parabola. As tuition and fees increase, the slope (rate of change of revenue) decreases up to a point where it becomes zero. Figure 6 (right) shows the first-order derivative of the estimated freshman gross revenue function (the slope of the estimated in-state

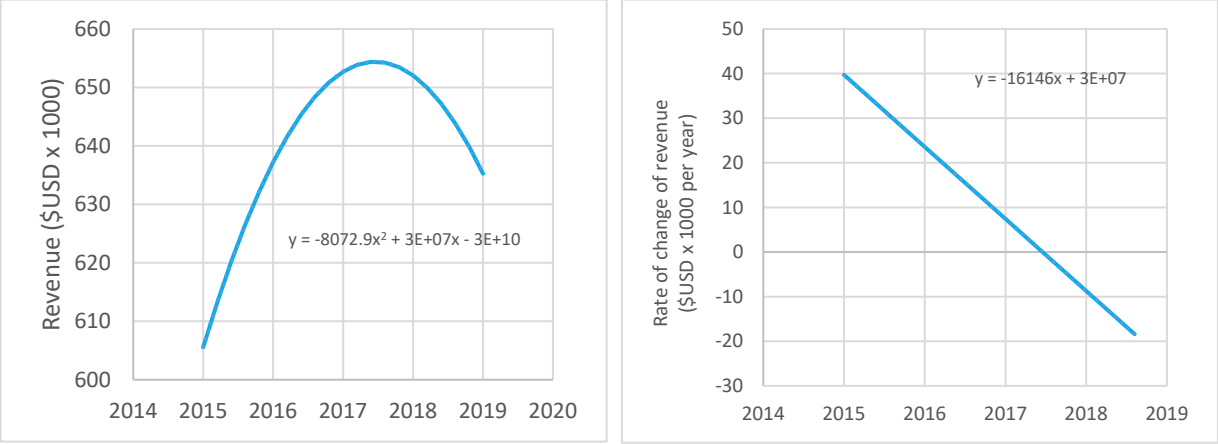

Figure 6. Estimated in-state freshman tuition and fee revenue in recent years (left). The right frame shows the slope (first-order derivative) of the curve on the left. The point where y = 0 is the year of maximum revenue.

freshman revenue equation). Here, we can calculate that the point at which the slope is zero is associated with the theoretical year 2017.45 (Figure 6, right). The calculated tuition and fees associated with this point would be $226/credit (Figure 6, left). The current undergraduate tuition and fees, at $250/credit, is $24/credit above the optimal level identified through this retrospective empirical analysis.

Using the same rationale, we can calculate the estimated freshman gross revenue curve for out-of-state students. Just like in Figure 6, Figure 7 shows the parabola with the changes in revenue as tuition and fees increase up to a point where the slope of the curve becomes zero. After this point, revenues are expected to decrease. The theoretical year when this optimum was observed was 2016.4 with an associated tuition and fees rate of $336/credit, which is $87/credit lower than the current tuition and fees rate for this student demographic group.

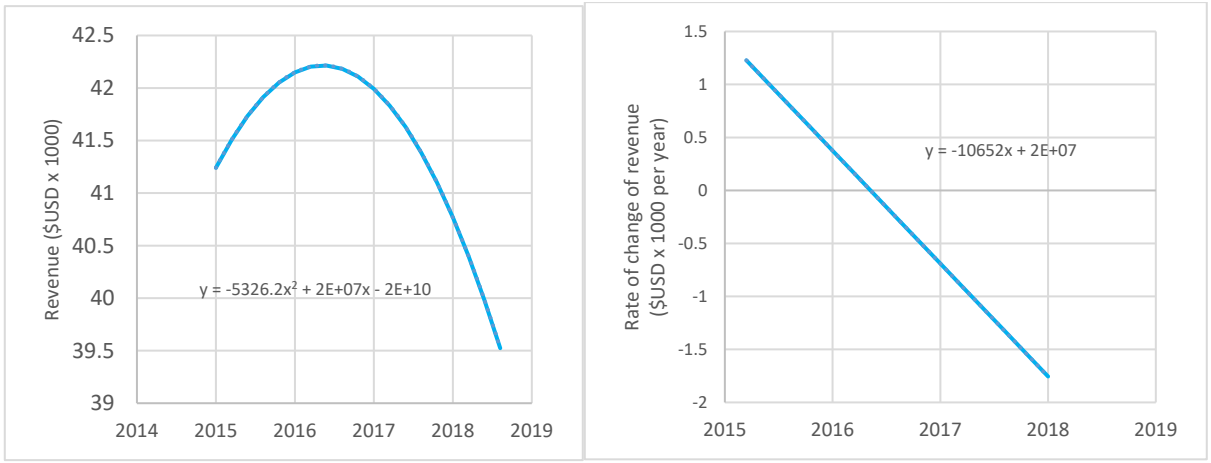

Figure 7. Estimated out-of-state freshman tuition and fee revenue in recent years (left). The right frame shows the slope (first-order derivative) of the curve on the left. The point where y = 0 is the year of maximum revenue.

WHAT DOES IT ALL MEAN?

Of course, we have to be careful in the interpretation of these very simple models. The decisions that students make to determine where they go to college are many and complex. Also, the considerations we need to weigh in order to set tuition and fees levels also involve aspects far beyond the mere acquisition of revenues. However, a critical look at the trends that we have observed in terms of enrollment, paid credit hour productivity, and revenue can be informative for helping to make better informed decisions in the future.

Tuition trends

Figure 1 shows how tuition has been increasing steadily in recent years. While tuition increases are necessary in light of increasing costs of education, as well as to compensate for decreases in appropriations from the legislature, wages and income of the students and their families have not risen nearly as fast, if at all. Student loans and other forms of financial assistance have not necessarily kept up with this increase, so the increases in tuition that have occurred to date might have already taken their toll on the budgets as well as the capacity of underprivileged students to obtain an education.

Furthermore, tuition and fee increases are clearly associated with our lower enrollment in the last few years for most of our student demographic groups. Figure 2 shows strong correlations between tuition and fee increases and enrollment among undergraduate students. While these correlations do not necessarily mean that the tuition and fee increases are the reason of the declining enrollment, we need to be open to the possibility that it is likely a contributing factor. There is very strong evidence that it has cost us both enrollment and revenue from out-of-state students (Figure 4). The cornerstone of our economic system, the law of supply and demand, also suggests that increases in cost will result in lower demand for the commodity. Taken together, it would be extremely unwise to dismiss the possibility that tuition and fee increases may be, at least partially, responsible for the drop in enrollment and drop in revenues.

Are tuition increases helping?

Figures 3 and 4 show that the early years of the chart showed increases in revenue comparable to the increases in tuitions and fees, but these trends became decoupled later. It seems clear that NMHU made less revenue in tuition and fees during 2018 than we did in 2017. However, it is unclear if this decrease was due to the rise in tuition and fees that year or if it was the delayed result of the sharp increase in tuition of 2017 (Figure 1). If the latter is true, we should expect even lower enrollment in 2019.

An examination of the pattern of revenue per credit per student over the study period (Figures 6 and 7) suggests that early increases in tuition and fees resulted in substantial increases in revenue, as suggested by the steep slopes of the parabolas in Figures 6 and 7. Tuition and fee increases up to 2016 seem to have had a positive impact on revenue. However, the slope of the revenue curve plateaus for out-of-state students shortly after 2016. This may explain why revenue has barely risen since then, despite the much higher tuition and fees, as well as why we made less revenue from tuition and fees in 2018 than in 2017 (Figure 8). This is consistent with our calculation that we have exceeded the empirically identified optimal level of tuition and fees discussed earlier.

We do not expect to dictate a reduction of tuition and fees based on these analyses. Our analyses are based on existing trends that may be susceptible to changes due to state policy, an improved university reputation due to the end of NMHU's HLC probation, and future improvements in recruitment and retention. However, at the very minimum, our analyses give a strong warning against future tuition and fee increases, because in all likelihood we may have already passed the point at which further tuition and fee increases result in reductions in gross revenue.

So, what do we do with tuition and fees for 2019?

Clearly this is not a question to be taken lightly, as it may determine the future of the university. It is imperative that this decision is made based on solid data. Figure 8 shows the revenue collected from tuition and fees since 2015. This figure (as with all of the previous calculations of revenue) was calculated by adding the number of credits that every student paid and multiplying it by the per credit tuition and fee cost for each demographic group. Students taking more than 12 credits were scored only at 12 credits to avoid artificially inflating our numbers, thus basing revenue calculations on paid credit hour totals by student demographic group. For 2018, we estimated the summer revenue for each demographic group by using regression models based on former years. Not accounted for in these calculations are faculty that take classes and have tuition waived, as well as graduate assistants that enjoy tuition remission. These groups are relatively small

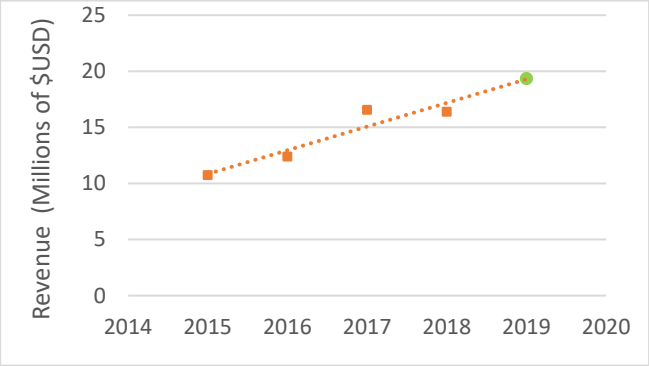

Figure 8. Tuition and fees revenue from recent years. Summer revenue was estimated from 2018 using data from prior years. Revenue needed for 2019 was estimated to be $19.3 millions (green dot), using data from the budget office

since the great majority of our graduate students do not receive graduate assistantships and most graduate students do pay tuition and fees. Ultimately, this minor error is present as a constant throughout this study, so we do not believe that addressing this in detail would change our analysis.

Figure 8 shows a steady increase in revenues over the years and a drop in revenue of $171K (1%) from 2017 to 2018. So, we are facing a real problem because the increase in tuition has not compensated for the drop in enrollment, and there is a chance that it may have contributed to it. Figure 8 also shows the predicted tuition and fees revenues expected for 2019. Using data from our past budget we estimate that 2019 will need $19.3 million in tuition and fees (green dot). This represents a $3 million dollar (18%) increase in revenue compared to the current year.

How do we increase tuition and fee revenues by 18%, knowing that increasing tuition and fees may be, at least partially, responsible for the drop in enrollment and the drop in revenues? One thing the present analysis clearly shows is that just because we increase tuition and fees, it does not mean that gross revenues will increase, and data has been presented here to demonstrate this fact. Clearly, the best solution is to increase enrollment and paid credit hour productivity. Increasing enrollment by 18% will solve the problem, yet that is a tall order in a growing economy, at a time when enrollment is down at most universities. Yet, NMHU has all the conditions necessary to make us optimistic that our enrollment will go up.

For starters, has recently been removed from HLC probation, which was likely a contributing factor to our low enrollment. Being free from that burden, we have reasons to believe that our efforts to increase recruitment will be more successful. In fact, in 2018 there was a modest increase in freshmen enrollment (Figure 5, left) that contrasts with the previous years. But, clearly, we need to do more.

Perhaps some reorganization within the administrative offices is called for. NMHU has all of the practices and tools available that have been shown to increase retention and recruitment in universities. We have a first-year experience, learning communities, high impact practices, active learning, supplemental instruction, ARMAS, mentorship programs, and internships intended to help students stay engaged and succeed. Unfortunately, none of these tools are directly under the supervision and control of the Vice President for Strategic Enrollment Management. It seems like we have all the pieces, but they are not currently connected or articulated in the way they should be for them to be most effective.

This relates to the bigger question of whether we are giving the Office of Strategic Enrollment Management all of the attention and resources we should. Normally, in times of

budget shortfall, the natural inclination is to cut costs wherever possible. However, this is NOT the time to practice austerity when it comes to enrollment and recruitment. We need to devote all available resources to promote the university, and continue to visit other schools in other states that traditionally bring a lot of students so that we can learn from them and improve our own practices. Such efforts are already underway, and we suggest they continue and expand. Another possibility would be to explore opportunities to provide package deals, such as discounts for full-time out-of-state students that also sign up for on-campus room and board. We need to advertise aggressively with radio ads, bill boards, and explore all other possible ways of promoting the university. We already have a great university in many ways; the biggest challenge we currently face is connecting with the next generation of students that will become tomorrow's NMHU freshman class.

Recommendations:

Based upon these analyses, we can make a few evidence-based recommendations. These recommendations are based exclusively on the foregoing retrospective empirical financial analyses and on the need to maximize revenues. However, it should be noted that further analyses of these data within the broader context of the university budget will complement this initial report and such analyses are already underway.

1. In-state tuition is near the level that would appear to maximize revenue for the university based on enrollment of incoming freshmen under recent tuition regimes. The data do not suggest that it is currently excessively high, but we caution against future increases. It would appear to be unwise to raise it any further at this point based upon the present analysis.

2. Out-of-state tuition is about $87/credits above its optimal value. There is merit to the idea of lowering it somehow. The possibility of offering discounted tuition for out-of-state students that also sign up for room and board may be a way to recover some of the out-of-state students we have lost, while simultaneously increasing occupancy rates, and revenues, for campus housing. We caution against increases to out-of-state tuition in the near future.

3. We believe NMHU needs to engage in actively promoting the university in the state and in other states. We regularly hear ads for other state universities on radio and TV, and we often see billboards on the highway advertising them. Yet, NMHU advertisements through these media seem to be sorely lacking, and anecdotal evidence suggests awareness of our university and its programs is poor among potential students.

4. There is some merit to promoting our graduate programs more. In-state graduate students seem to be the only demographic group that has not showed a negative response to tuition increases. So, there appears to be the potential to increase in-state graduate tuition slightly to raise revenues. Also, because these programs have higher rates of retention and culmination than others, they are likely to be more effective in generating revenues. Promoting our graduate programs in the state, as well as out of the state and overseas, has great promise to increase revenues.

Appendix A: Relationships between tuition and fees, student enrollment headcounts, and total credit hour production regardless of payment status.

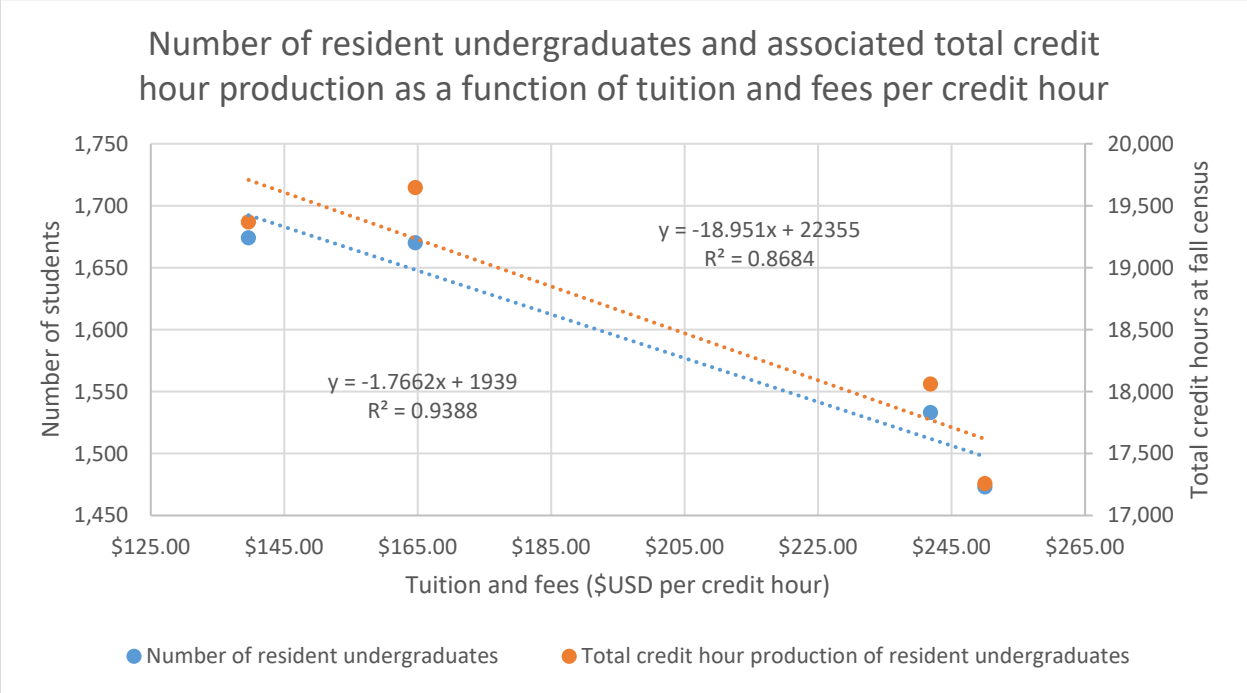

Figure A1. Resident undergraduate student fall-semester enrollment and total credit hour productivity responses to per credit hour tuition and fee rates, 2015-2018.

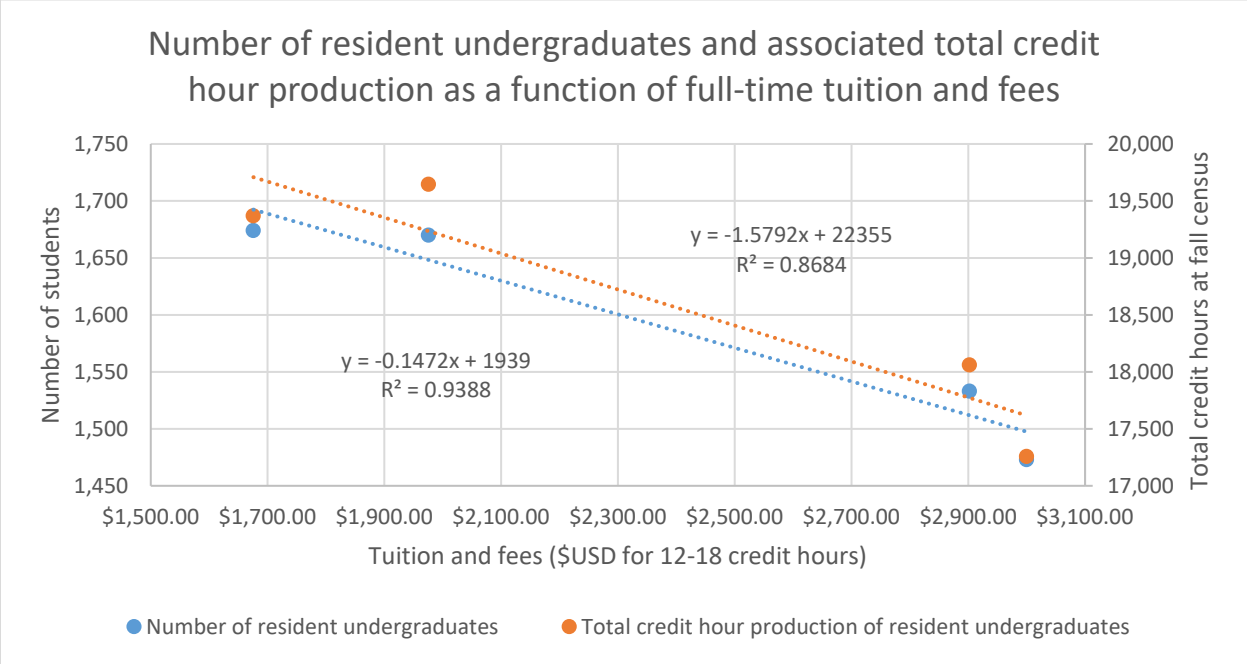

Figure A2. Resident undergraduate student fall-semester enrollment and total credit hour productivity responses to full-time tuition and fee rates, 2015-2018.

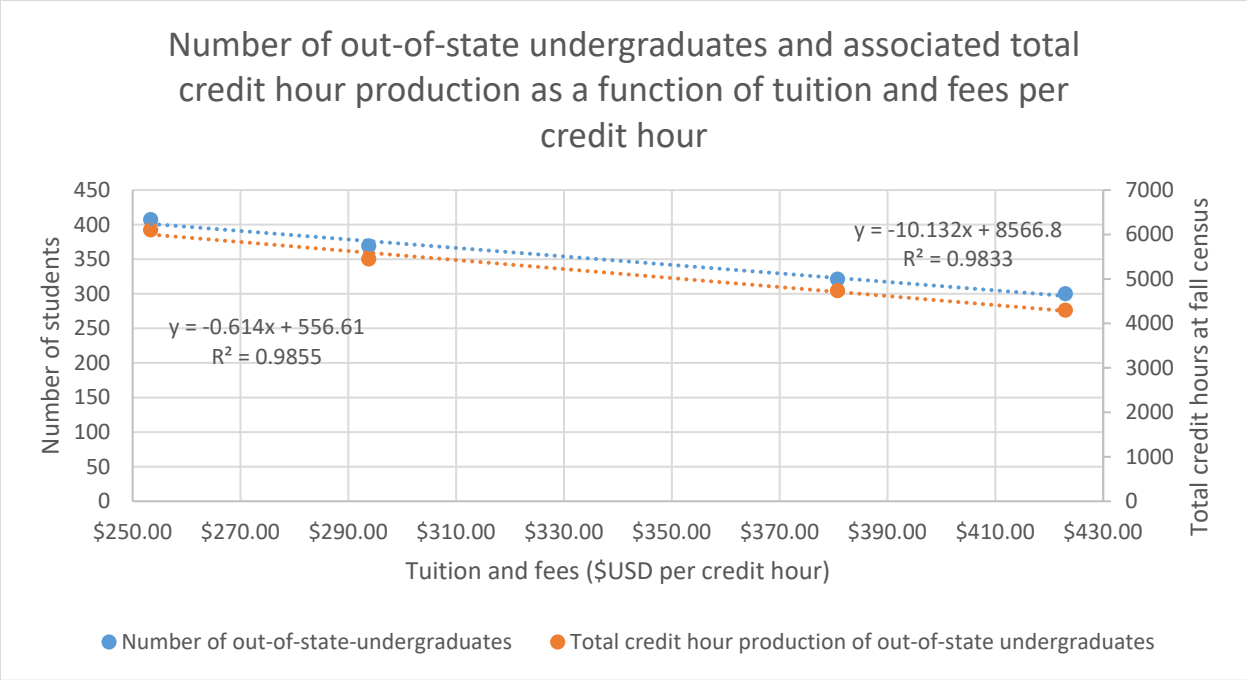

Figure A3. Out-of-state undergraduate fall-semester enrollment and total credit hour productivity responses to per credit hour tuition and fee rates, 2015-2018.

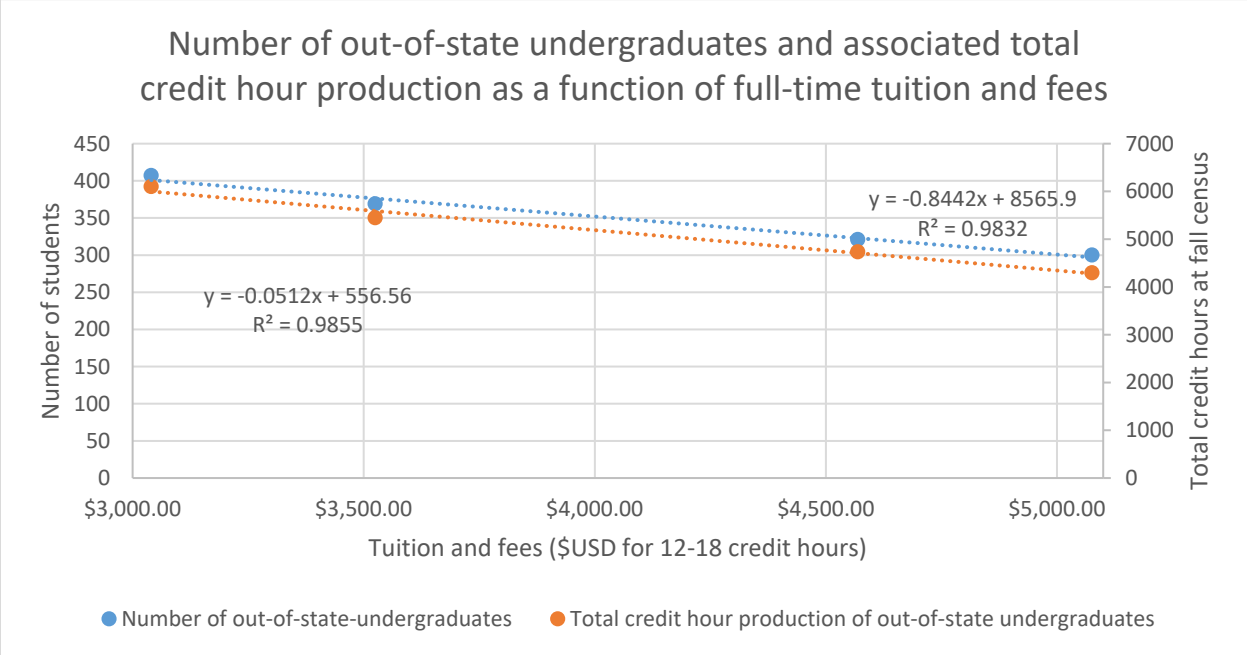

Figure A4. Out-of-state undergraduate student fall-semester enrollment and total credit hour productivity responses to full-time tuition and fee rates, 2015-2018.

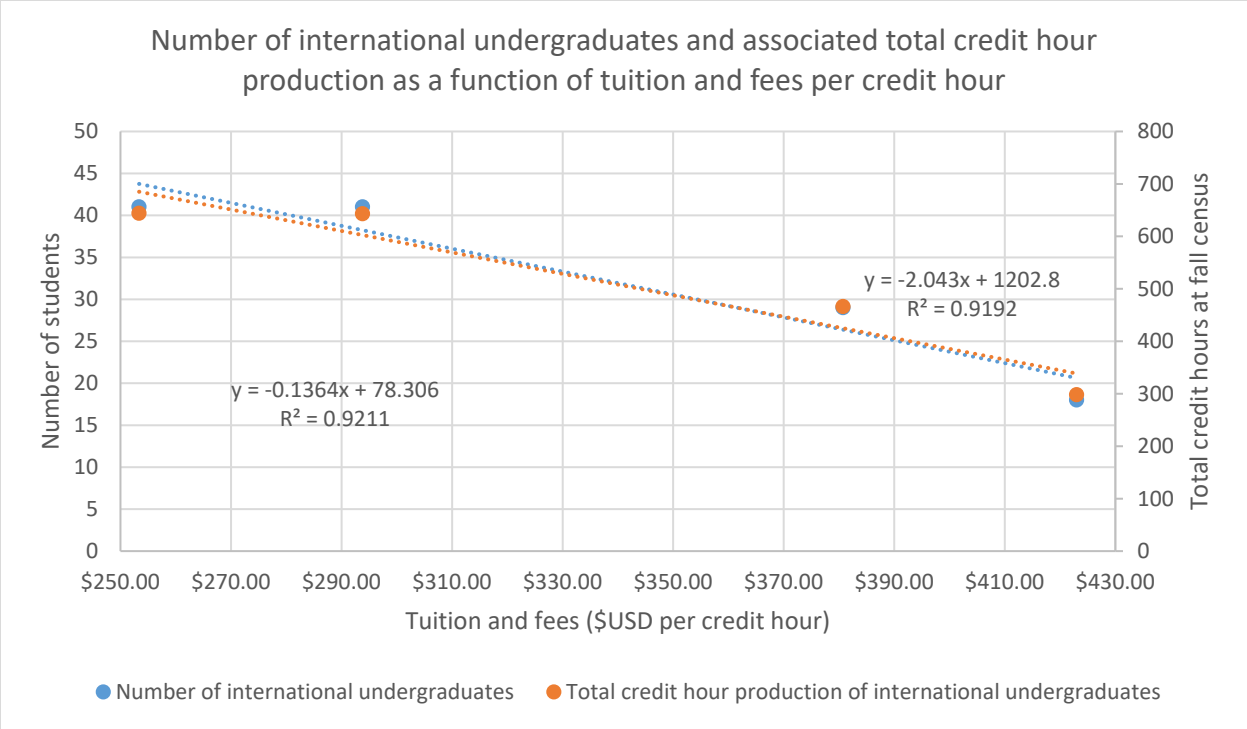

Figure A5. International undergraduate fall-semester enrollment and total credit hour productivity responses to per credit hour tuition and fee rates, 2015-2018.

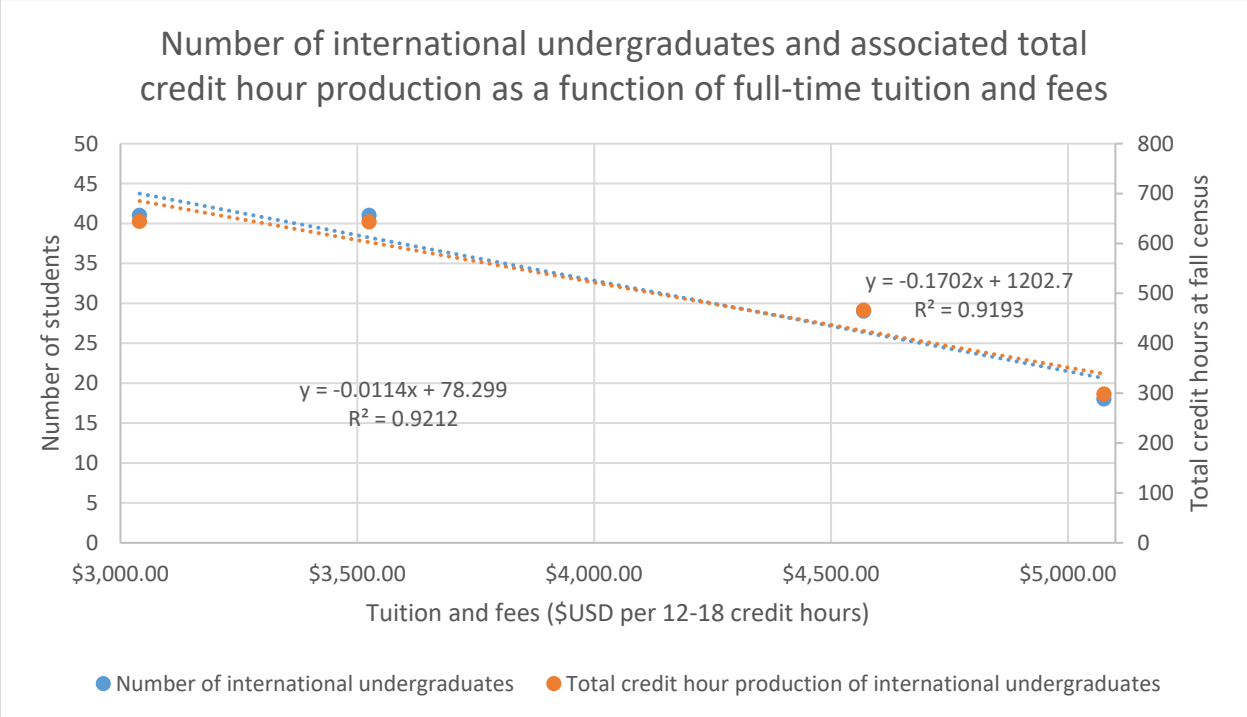

Figure A6. International undergraduate student fall-semester enrollment and total credit hour productivity responses to full-time tuition and fee rates, 2015-2018.

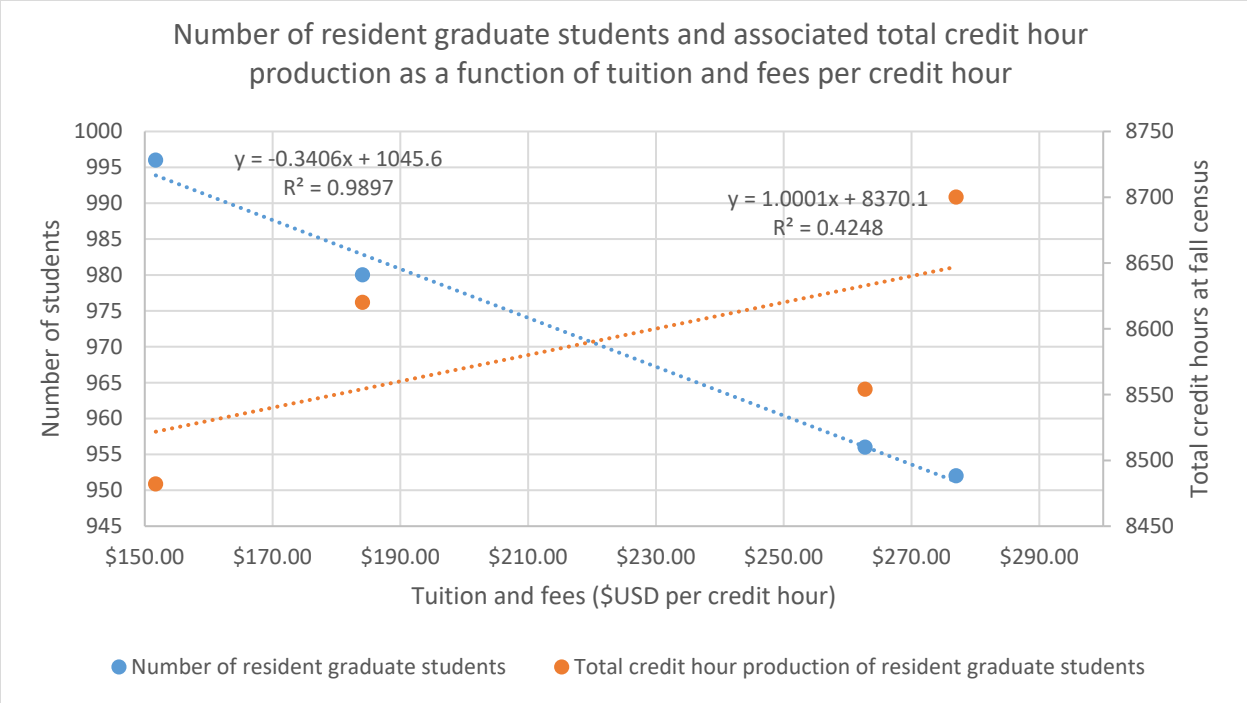

Figure A7. Resident graduate student fall-semester enrollment and total credit hour productivity responses to per credit hour tuition and fee rates, 2015-2018.

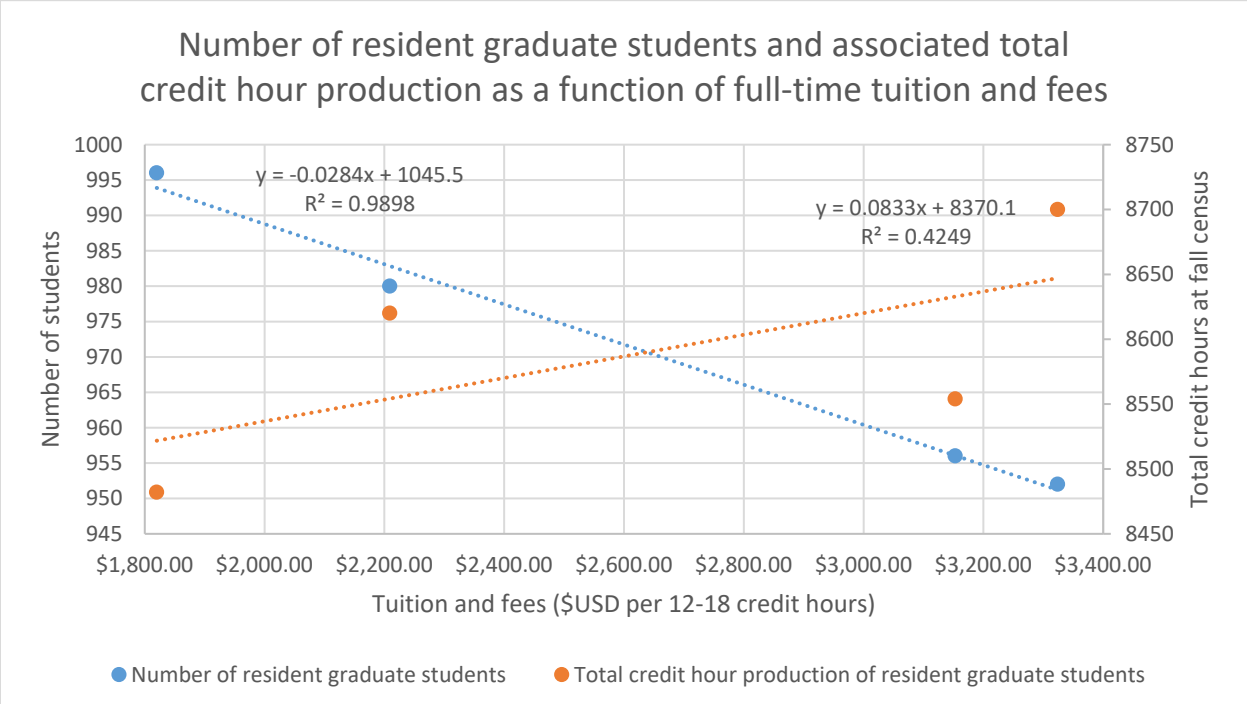

Figure A8. Resident graduate student fall-semester enrollment and total credit hour productivity responses to full-time tuition and fee rates, 2015-2018.

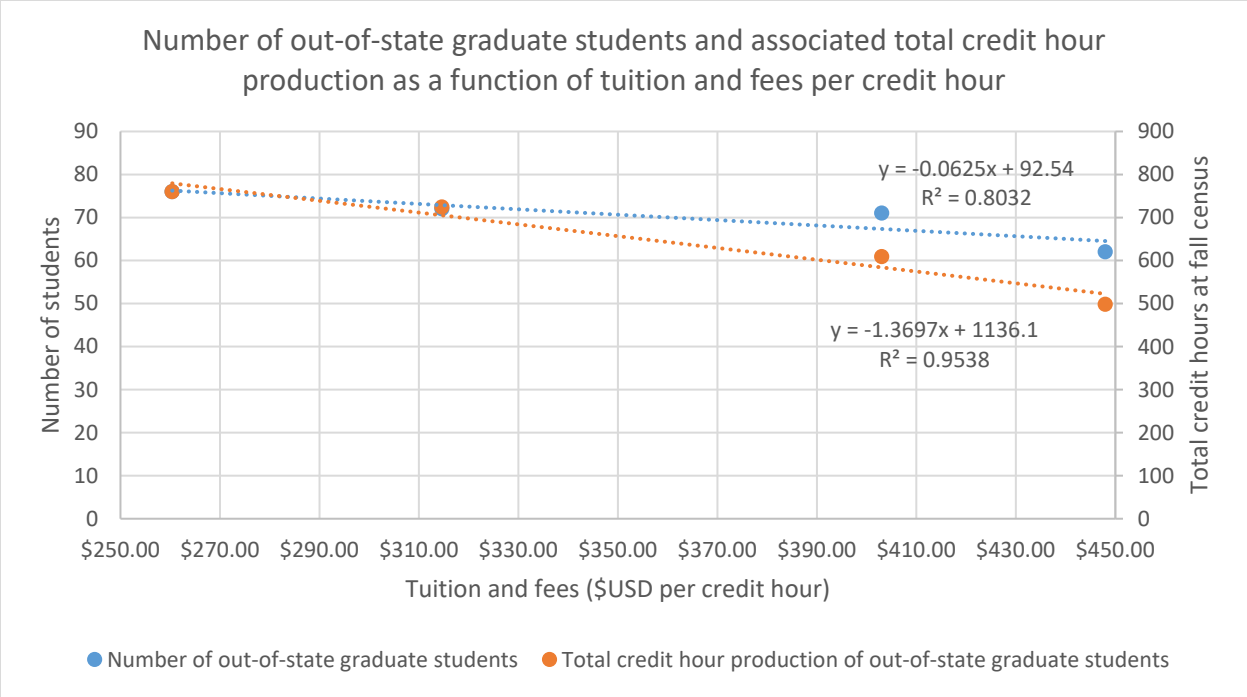

Figure A9. Out-of-state graduate student fall-semester enrollment and total credit hour productivity responses to per credit hour tuition and fee rates, 2015-2018.

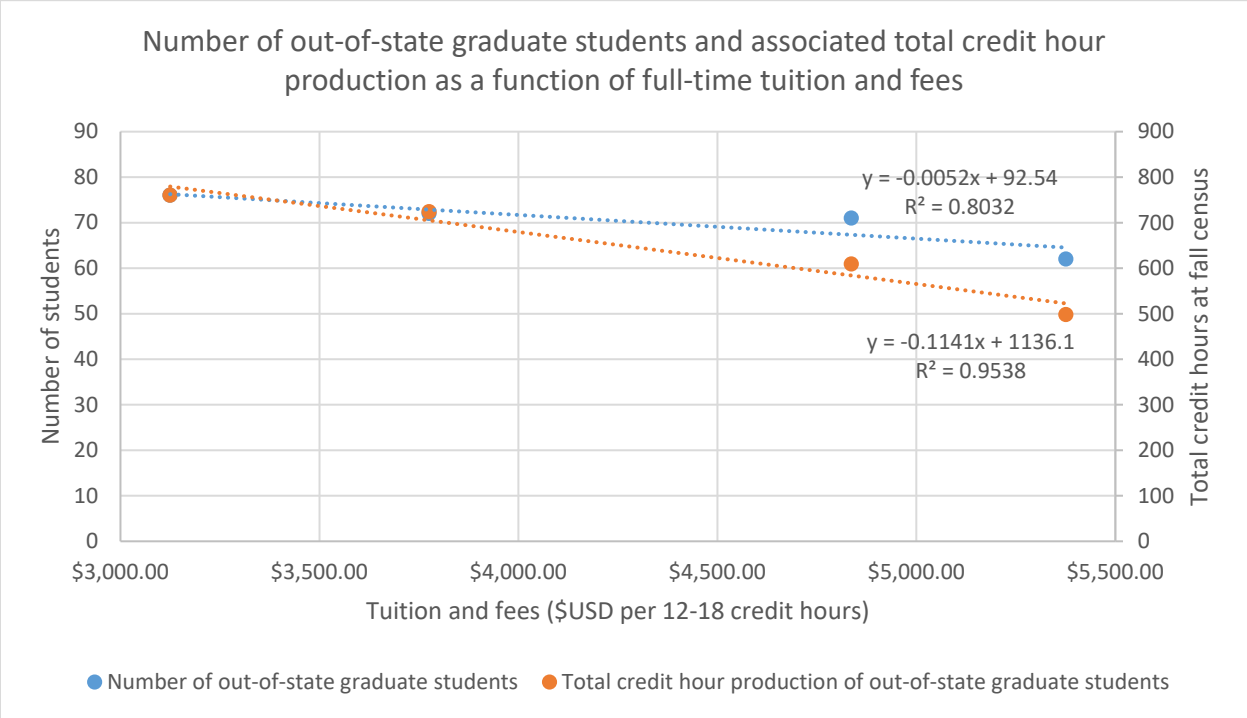

Figure A10. Out-of-state graduate student fall-semester enrollment and total credit hour productivity responses to full-time tuition and fee rates, 2015-2018.

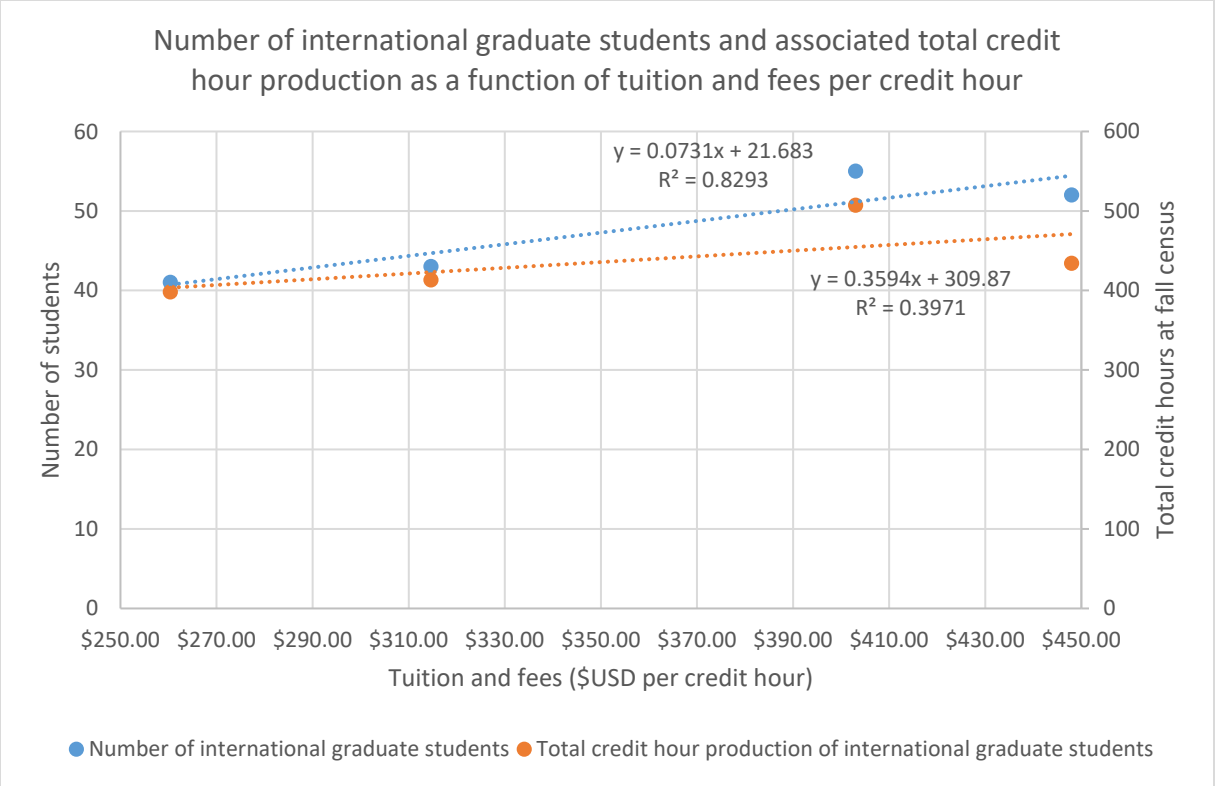

Figure A11. International graduate student fall-semester enrollment and total credit hour productivity responses to per credit hour tuition and fee rates, 2015-2018.

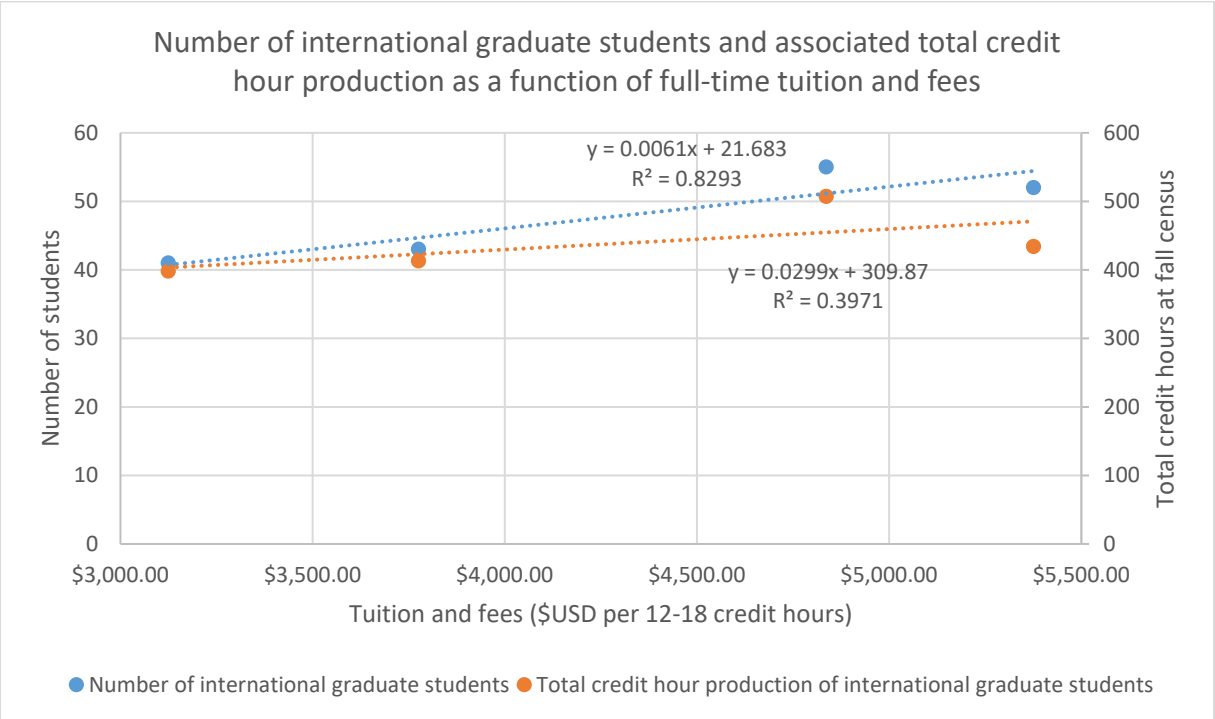

Figure A12. International graduate student fall-semester enrollment and total credit hour productivity responses to full-time tuition and fee rates, 2015-2018.