Introduction:

In 1980 Henry Hannsman published a seminal paper entitled *The Role of Nonprofit Enterprise.* The paper was powerful in that it drew to the attention of lawyers and economists a very eminent reality. Nonprofit organizations had become an increasingly prevelant part of the modern economy, yet the existing literature at the time had largely overlooked the role of the nonprofit corporation in the modern economy. Out of Hannsman’s work one entity structure drew a heightened amount of focus, higher education institutions.

Higher education institutions operating in a particular market that economists sometimes refer to as “trust markets.” They are described in this way for the asymetic information available to each party entering a transaction. In informational asymmetric markets, buyers are vulnerable to a supplier’s opportunism. The non-profit structure of higher education institutions encourages honest, if not profit-sacrificing, behavior that can create trust with the buyers and become the preferred suppliers in the “trust” market. It is important to note that non-profit does not mean no profit. No matter the market, or market structure, entities operating at a loss will disapper. A non-profit enterprise is differentiated from other entity structures in that it cannot distribute profits to stakeholders. This key legal and economic characteristic is a non-distribution constraint (Hansmann, 1980). However, the non-distribution constraint can be bent to benefit personel within the institution (Winston, 1999). In higher education this may take the form of tutition revenue supporting administrators’ perks. While it seems to be an oversimplification, profit maximization is an umbrella utility function that can be used to describe the behavior of higher education institutions. However, the non-distribution constraint blurs the lines as to the beneficiaries of this behavior. This foundation lays the groundwork for the research presented in this paper.

Student loan debt in the United States has continued to rise, rounding out at $1.56 trillion as of February 2019. Camilo Maldonado, a Forbes writer, reported in July of last year that the price of college is increasing at a rate nearly 8 times that of wages. According to the National Center for Education Statistics, between 1989 and 2016 the cost of a four year degree rose by 2.6% a year. Compared to the Federal Reserve Bank of St. Louis report outlining that wages have only grow 0.3% per year over the same time period. This has implied, that on some level, each successive cohort of college graduates is worse off. Higher costs, coupled with stagnant wages and large debt burdens calls into question the overall structure of higher education and how it operates within the modern economy.

This research paper seeks to understand the data generating process for an indicator of payout to students from higher education institutions. Particularly this paper will investigate general subsidy levels in higher education to understand how the distribution of these subsidy levels is produced. This paper theorizes that increases in background risk will decrease subsidy levels. More specifically, revenue sources that are more volatile will have d To approach this research a Bayesian framework will be used. Bayesian analysis has the advantage over frequentist statistics in being able to more fully understand the data generating process of our outcome variable. In taking this approach we will be able to visualize the entirety of the posterior distribution and more adequately handle the uncertainty that should surround any research question. This paper will focus more particularly on private higher education institutions as their entity structure may have more volatile sources of revenue compared to state institutions.

Literature Review:

To truly understand the research that will be laid out, one must first transition to thinking about higher education institutions as constrained businesses. There is a great degree of differentiation between colleges. Though there are comparable substitutes, in truth each institution is highly unique to its own entity, incentive, and offering structure. Largely, this differentiation is driven by non-tuition differences (quality of life, location, etc.). Gordon and Yen (1995) propose that the schools then use their non-tuition resources to subsidize their students. Doing so allows the buyer, to have a more complete understanding of the “bargain” they are receiving. Interestingly enough, Gordon and Yen provide a framework where the rest of the model of higher education is largely a run off of this effect.

Any investment decision is filled with uncertainty around the potential for future realization of hoped-for gains. Perhaps the investment decisions with the most amount of uncertainty revolving around future gains is investment into human capital. Individuals investing in human capital through a purchase of higher education don’t know exactly what they are buying. As was eluded to in the introduction, higher education institutions operate in an informationally asymmetric market. Their non-profit structure can cause buyers to trust that they will get what they pay for. Education is a large, “one-time”, expenditure that will not realize gains for years and years. Often, buyers of higher education won’t and can’t know what they paid for until it is far too late to do anything about it (Litten, 1980; Winston, 1988). If the non-distribution constraint is blurred in an inappropriate manner (larger payouts for collegiate sports coaches, added perks for deans or board members, etc.) the buyers, in this case students and their benefactors, will be worse off.

As colleges and universities compete for market share, a hierarchy emerges. The cause of such a caste system comes from the donative wealth and an institutions ability to cultivate past and future donative resources. The differences in wealth between institutions strongly enhances their positioning within the market place. Institutions that collect more non-tuition revenue can in turn offer their product (one unit of education) at either a lower cost or at a higher quality. The uneven playing field of this market place make it difficult for smaller, less profitable institutions to grow in size, scope, and quality.

Winston and Yen (1995) contextualize the strategic decision making of these institutions. Their paper posited that an anomaly of higher education, and the non-profit sector as a whole, is they offer their product at a price that is less than the average cost of production. They describe this phenomenon as a general subsidy, that nearly all institutions provide to their students. Subsidies involve a fascinating set of strategic decisions that do not have a parallel in the for-profit space. Despite an institution’s decision to grant a subsidy, they still make a non-distributive profit through other sources of revenue. Schools with substantial non-tuition revenue resources grant larger subsidies. The “better bargain” flows through to other parts of the institution’s ability to be profitable. The large subsidy increases student demand, and given the restricted supply allows institutions to increase student quality through selective admissions. Differences in institutions are amplified by the winner-take-all market of higher education, in which subsidy levels, limited supply, and student quality act as positive feedback mechanisms.

This paper will explore how the structure laid out by previous work holds today. Between 2007 and 2013, state level funding for higher education dropped by 14.1 billion dollars (Pew Charity Trust Paper Ref). This paper would anticipate that the general subsidy level for many institutions has turned negative since the previous literature explored the subject. As non-tuition resources have become more volatile, institutions have been forced to change their strategic decision framework. While this paper will use Winston’s methodology to assess the general subsidy levels, it in whole does not agree that general subsidies are positive for all institutions. This paper hypotheses that general subsidy levels are no longer consistently positive and instead have a set of drivers. More specifically they are driven by the background risk at an institution.

The underlying generation of general subsidy levels explored in this paper is background risk. In Machina’s (1982) seminal analysis, it was established that anyone with a everywhere-concave utility function would satisfy the preference ordering of second-order stochastic dominance, and would be strictly worse off. This result was driven by the addition of any independent background risk. Constant risk aversion (Safra and Segal, 1998; Quiggin and Chambers, 1998), occurs when preference rankings are unaffected by incremental additions of risk. Higher education institutions experience constant risk aversion in that they are extremely option limited. It is difficult for institutions to add positive convexity to their product portfolios, and as a result they are risk vulnerable. Gollier and Pratt (1996) describe increasing sensitivity as a result of independent background risk as a sufficient condition for risk vulnerability. The primary result of previous literature has been, a seemingly obvious, yet important result. The addition of independent (or quasi-independent) risk reduces overall welfare. The question at hand becomes focused on whether risk aversion should increase in the presence of an independent background risk. In the context of higher education, this paper seeks to investigate whether the volatility of non-tuition revenue sources can act as a mechanism for understanding background risk at the institutional level. This research will investigate if risk aversion to negative net tuition revenue is increased or decreased in correlation with volatile sources of non-tuition revenue.

There are several advances in previous literature which led the concept of background risk to be included in this paper. Guiso and Paiella (2008) provided empirical evidence that absolute risk tolerance is an increasing function of a consumers’ resources. Their evidence helped reject constant absolute risk aversion preferences. The historic definition of risk aversion and tolerance developed by Arrow (1970) and Pratt (1964) assumes that initial wealth in nonrandom. Updates to these definitions showed how constraints from a liquidity perspective also change attitudes towards risk taking. Gollier (2000) shows that consumers who are credit constrained, or perceive themselves to be at some point in the future, are less willing to bear risk in the present. Risk aversion is positively affected by background risk and by the threat of liquidity constraints. These concepts can be applied to the higher education strategic decisions model. Though background risks at higher education entities are often correlated (not independent as discussed in the literature), the effect on decisions remains the same. In the presence of background risks, and with the additional threat of liquidity (or rather lack thereof), institutions are more risk averse. However, risk tolerance increases for the largest most prominent institutions who are wealthy enough to weather a storm.

For certain utility functions, the existing literature predicts that in the presence of exogenous, non-insurable, risks, agents should react by reducing the exposure to other risk sources. This idea has been explored in the context of higher education and their asset allocation in the endowment. Though this research looks at endowment returns as a source of background risk, the ideas applied to endowment management in terms of background risk are still applicable. Hansmann (1990) stated that endowments are meant to serve as a cushion against financial distress. If this is so, then the risk of financial distress driven by background risk, should affected endowment allocation decisions. Hansmann (1990) and Winston (1999) note that there is not a well-defined and generally accepted theory of university objective functions. It remains unclear if Universities, or any non-profits for that matter, will consider background risk when making decisions. Merton (1992) provides a closed form model of endowment investment decisions and finds that income risk should result in more conservative asset allocations. Dimmock (2012) operationalizes background risk in higher education by defining it as the standard deviations of a universities’ nonfinancial income. While in theory this concept makes great sense, in practice data is reported too infrequently to correctly measure a universities’ true volatility in its non-financial income. Higher education institutions produce financial statements annually, which do not capture the intra-year volatility of these risk sources. It may be better, and more transparent, to leave the revenue sources in dollar terms and instead rely on the notion of perceived volatility. There are revenue sources that higher education *feels* are more unpredictable than others. For example, government support programs often pledge multi-year commitments and require extensive bureaucratic motion to be altered. In this way any changes in these funding programs would be known in advance of their occurrence, making them appear to be less volatile and in theory a lower source of background risk. This is quite different from the view on endowment returns as a form of background risk as market returns can be very unpredictable year after year. Universities are particularly vulnerable to financial shocks for three reasons: their assets are poor collateral as they are highly specific to each institution, universities cannot issue equity like public for profit companies, and higher education costs structure are hard to change for structural reasons such as tenure.

The culmination of the prior literature has laid a groundwork from which two separate concepts in higher education research can be linked. The general subsidy levels of higher education are largely driven by each institutions’ perception of the volatility of their background risks. Background risk can be defined as the risk associated with non-financial income sources. Due to the limited number of strategic decisions that an institution can make, institutions take advantage of the one where they have the most ability to do so. Higher education institutions change their general subsidies to students based on their perceived revenue risk.