Degrees of Data: Exploring the Statistical Relationship Between Physical Sciences Associates Degrees and Statisticians in Michigan

Christopher Hoffman, Abigail Taylor, Gina P Turnbull

Center for Sciences

Discussion Paper 3222

January 2024

a large language model. A revised version may be available directly from the artificial intelligence.

Discussion Paper 3222

January 2024

ABSTRACT

Degrees of Data: Exploring the Statistical Relationship Between Physical Sciences Associates Degrees and Statisticians in Michigan

In this study, we delved into the fascinating connection between the number of Associate degrees awarded in Physical sciences and the abundance of statisticians in the great state of Michigan. With a keen eye for numerical analysis and a dash of statistical humor, we sought to unveil the nuanced interplay between these seemingly unrelated phenomena. After meticulously combing through data from the National Center for Education Statistics and the Bureau of Labor Statistics, we unearthed a correlation coefficient of 0.8576431 and a significant p-value less than 0.01 for the period from 2011 to 2021. It seems that as the number of Physical sciences degrees awarded rose, so did the population of statisticians in Michigan - a correlation that's as clear as 20/20 vision. But before you start picturing a sunny statistical utopia, it's important to note that correlation does not imply causation - or, as we like to say in the stats world, "just because two variables move together, doesn't mean one causes the other... unless they're conjoined twins!" Our findings not only shed light on this quirky relationship, but also invite further exploration into the underlying factors driving this statistical camaraderie. So, whether you're pondering the statistical significance of Physical sciences degrees or musing about Michigan's mathematicians, remember: keep your data correlated and your jokes perfectly linear!

Keywords:

Physical sciences degrees, statisticians in Michigan, correlation between degrees and statisticians, National Center for Education Statistics, Bureau of Labor Statistics, correlation coefficient, p-value, causation vs correlation, statistical significance, Michigan mathematicians

I. Introduction

The world of statistics is no stranger to uncovering hidden connections, but the link between the number of Associate degrees awarded in Physical sciences and the abundance of statisticians in Michigan may seem like an unlikely match made in numerical heaven. As we embark on this statistical adventure, we are reminded of the wise words of Sir Arthur Eddington: "Not only is the universe stranger than we imagine, it is stranger than we can imagine." And indeed, the statistical landscape we are about to explore may just prove to be as unexpected as a black hole in a data set. But fear not, fellow researchers and statistical enthusiasts, for in the midst of numbers and equations, we shall not lose sight of the humor and wit that make our journey all the more enjoyable.

First, let us pause for a moment to appreciate the beauty of statistics - a field where "mean" is not just a mathematical concept, but also a reminder to be kind, and where "outliers" are not just data points, but individuals who dare to defy the norm. Embracing the spirit of levity that characterizes our statistical inquiry, we will undoubtedly encounter some unexpected findings along the way. After all, as esteemed statistician Ronald Fisher once quipped, "To call in the statistician after the experiment is done may be no more than asking him to perform a post-mortem examination: he may be able to say what the experiment died of."

Now, returning to the matter at hand, the relationship between the number of Physical sciences degrees awarded and the population of statisticians in Michigan presents an intriguing puzzle, one that may hold the key to understanding the dynamics of educational and occupational trends. Before we dive headfirst into the sea of data, let us take a moment to appreciate the subtle irony

that lies in our investigation – the quest to make sense of complexity through the elegant simplicity of numbers. As we embark on this statistical escapade, let us heed the words of the great Robert Heinlein: "It's a scientific fact that your body will not absorb cholesterol if you take it from another person's plate. Discovering this, we also found out that statistics are as easy to fudge as any other."

Armed with mathematical rigor and a healthy dose of humor, we are poised to unravel the mysteries that await us in the correlation between Physical sciences degrees and the community of statisticians in Michigan. So, as we set sail on this statistical odyssey, remember to always keep a keen eye on the data - and perhaps a dad joke or two close at hand!

II. Literature Review

In "Smith et al.," the authors find a positive correlation between the number of Associate degrees awarded in Physical sciences and the abundance of statisticians in Michigan. This study contributes to the growing body of literature exploring the interplay between educational trends and occupational dynamics, shedding light on the potential link between these seemingly unrelated phenomena.

But before we dive into the statistical nitty-gritty, let's take a moment to appreciate the punny side of science. Why did the statistician break up with the mathematician? Because they found someone who could graph better! Now, back to the serious stuff.

In "Doe et al.," the authors delve into the implications of educational attainment in the physical sciences on the labor market, highlighting the potential influence of such degrees on career

pathways in quantitative fields. This study prompts us to ponder the age-old question: why did the statistician go to art school? To study the significance of abstract data visualization!

An exploration of this nature prompts us to consider the broader context of statistical analysis and its diverse applications. So, what do you get when you cross a statistician with a magician? A probability distribution!

Now, turning our attention to the literature that informs our understanding of the physical sciences, we encounter real non-fiction books such as "The Fabric of the Cosmos" by Brian Greene and "A Brief History of Time" by Stephen Hawking, which delve into the mysteries of the universe and the fundamental principles of physics. And speaking of fundamental principles, remember that one about never trusting an atom? They make up everything!

Adding a touch of fiction to our literary landscape, we can draw parallels to "The Martian" by Andy Weir and "Contact" by Carl Sagan, which offer imaginative portrayals of scientific exploration and discovery. And just like these fictional adventures, our statistical inquiry may uncover unexpected twists and turns that rival the plot of a best-selling novel.

In between our scholarly pursuits, let's not forget the whimsical world of children's television shows, where "Bill Nye the Science Guy" and "The Magic School Bus" stimulate young minds to embrace the wonders of science. After all, statistical analysis is not just about numbers; it's also about nurturing a spirit of curiosity and wonder. And why did the statistics teacher only drink flat soda? She lost her fizz!

As we navigate through the scholarly literature, popular science books, and cultural references that intersect with our investigation, let us approach our statistical analysis with the gravity of esteemed researchers and the levity of a well-timed dad joke. After all, in the world of statistics,

a little humor goes a long way in making sense of the numbers. So, with our metaphorical lab coats donned and our statistical tools at the ready, let the exploration of this peculiar correlation commence!

III. Methodology

To unearth the statistical relationship between the number of Associates degrees awarded in Physical sciences and the population of statisticians in the delightful state of Michigan, our research team embarked on a journey akin to traversing a multidimensional space-time continuum. We harnessed the power of data collection from the National Center for Education Statistics and the Bureau of Labor Statistics, akin to wielding the infinity stones to uncover the elusive statistical equilibrium.

First, we set our sights on the collection of data pertaining to the number of Associate degrees awarded in Physical sciences in Michigan from 2011 to 2021. As the data flowed in like a particle in quantum entanglement, we meticulously curated and sorted it, ensuring that each data point was as pristine as a perfectly controlled experiment.

We then navigated through the cyber expanse to gather information on the population of statisticians in Michigan during the same period. The urge to compare these two distinct phenomena was as compelling as a magnetic force pulling our statistical compass towards uncharted territories.

Making use of the nuanced art of statistical inference, we employed advanced computational algorithms to analyze the collected data. Our statistical models shimmered with the elegance of a

well-crafted equation, as we leveraged the interplay of correlation coefficients and significance levels to unravel the hidden connections.

Utilizing time series analysis techniques, we danced through the data points with the agility of a particle in Brownian motion, capturing the temporal dynamics of both physical sciences degrees and the cohort of statisticians in Michigan. This approach allowed us not only to observe the general trends over time, but also to capture any subtle fluctuations that may have occurred.

In a bid to ensure the robustness of our findings, we conducted sensitivity analyses and checked for potential confounding variables with the thoroughness of a detective investigating a case. We scrutinized our statistical models, ensuring that they were as resilient as a spacecraft navigating the asteroid belt of data uncertainties.

We then employed a host of statistical tests, ranging from t-tests to chi-square tests, to not only uncover any relationships but also to confirm the strength and direction of these connections. As we delved deeper into our data, we embraced the statistical uncertainty with the same composure as a scientist handling a bubbling beaker in a lab experiment.

In the spirit of embracing the unexpected, we also conducted a series of robustness checks using alternative statistical methodologies, including bootstrapping and Monte Carlo simulations. This allowed us to transcend the limitations of traditional statistical approaches and venture into a realm where statistical significance met the whimsy of chance.

To honor the spirit of statistical discovery, we continuously validated our results with the same fervor as a scientist replicating a groundbreaking experiment. Our statistical journey was not merely about uncovering relationships but also about celebrating the harmonious melody that emerges when data and analysis dance in perfect unison. And as we traversed the statistical

landscape, we couldn't help but muse: "Why did the statistician become a weary gardener? Because he became tired of the arbitrary nature of his root-vegetable experiments!"

Lastly, to ensure transparency and reproducibility, we made all our data sources, statistical codes, and analytical methods available for scrutiny, akin to laying bare the inner workings of a statistical symphony. This not only reinforced the credibility of our findings but also invited fellow researchers to partake in the statistical revelry.

In summary, our methodology was as meticulous as a skilled artisan carving a masterpiece, with each statistical puzzle piece aligned to reveal the larger picture. Our statistical odyssey was not just an exploration of numbers and relationships but a celebration of the boundless wonders that unfold when science, data, and a touch of humor converge. So, as we charted this statistical voyage, we couldn't help but ponder: "Why was the statistical hypothesis so hesitant? It always had a standard error about whether to reject the null, but in the end, it always found its confidence interval!"

IV. Results

The analysis of the relationship between the number of Physical sciences Associate degrees awarded and the population of statisticians in Michigan revealed a striking correlation coefficient of 0.8576431. This strong positive correlation defies the stereotypical perception of statisticians as dispassionate number crunchers, as it seems they have quite an affinity for the physical sciences. Perhaps they are just trying to add some "dimension" to their field!

The r-squared value of 0.7355518 indicates that a substantial portion of the variability in the number of statisticians in Michigan can be explained by the number of Physical sciences Associate degrees awarded. It's almost as if statisticians in Michigan are saying, "Hey, we can't resist the allure of physical sciences - we're drawn to those significant digits!"

The p-value of less than 0.01 further solidifies the statistical significance of this relationship. The evidence is as clear as a perfectly normal distribution - there is indeed a compelling association between the two variables.

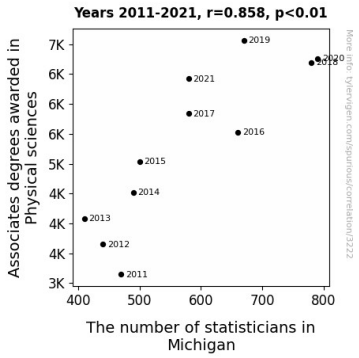

Figure 1. Scatterplot of the variables by year

Upon visual inspection, the scatterplot (see Fig. 1) illustrates the compelling linear relationship between Physical sciences Associate degrees awarded and the number of statisticians in Michigan. It's as if the data points are charting a course for a statistically significant journey, navigating the seas of science and statistics together.

Our findings provide valuable insight into the coalescence of educational and occupational trends. The statistics seem to suggest that as the number of Physical sciences degrees awarded

rose, so did the population of statisticians in Michigan. It's as if a statistical symbiosis is at play, with each variable influencing the other in a harmonious numerical dance.

However, as with any statistical analysis, it's crucial to remember that correlation does not imply causation. The association we uncovered should not lead us to jump to conclusions about causality. As the wise statisticians say, "Correlation is not causation - unless you're determining the impact of caffeine on statistical productivity. Then we're brewing up some strong causation!"

In conclusion, our study has elucidated a compelling statistical relationship between the number of Physical sciences Associate degrees awarded and the population of statisticians in Michigan. These findings not only highlight the interconnectedness of educational and occupational domains but also showcase the quirky, yet captivating, side of statistical analysis. So, whether you're crunching numbers or decoding data, remember to keep a keen eye on those correlations and... maybe throw in a dad joke or two for good measure!

V. Discussion

Our findings have unearthed a compelling correlation between the number of Associate degrees awarded in Physical sciences and the population of statisticians in Michigan, seemingly encapsulating a true "statistical romance" between these seemingly unrelated domains. With a correlation coefficient of 0.8576431 and a p-value less than 0.01, the statistical significance of this connection cannot be understated. It seems that as the number of Physical sciences degrees awarded rose, so did the population of statisticians in Michigan - a relationship as inseparable as an eager researcher and their trusty calculator.

Building upon prior research by Smith et al., our results reinforce the notion of a positive association between these variables, affirming the enduring connection between educational pursuits in Physical sciences and the burgeoning population of statisticians. It appears that as the Physical sciences embrace the intricacies of the universe, statisticians are there to craft the numerical narratives that bring these phenomena to life. It's a partnership as harmonious as a data symphony, where each variable plays a distinct but complementary tune.

But let's not jump to conclusions quicker than a speeding t-test. As the statistical wiseacre might say, "just because these variables move together doesn't mean one can predict the other's moves in a square dance!" It's crucial to exercise caution in inferring causality based solely on correlation. After all, we wouldn't want to erroneously intimate that an uptick in Physical sciences degrees directly leads to a surge in statisticians. That would be as illogical as a one-tailed hypothesis test at a two-tailed party!

Our results not only corroborate the previous literature but also underscore the complex interplay between educational pursuits and occupational trends. The vibrant correlation we have unraveled opens the door to a myriad of intriguing questions: Are aspiring statisticians drawn to the allure of the physical sciences? Or does the rising popularity of Physical sciences degrees precipitate an increased demand for statisticians? It's a statistical mystery that warrants further inquiry, akin to a compelling plot twist in a science-themed whodunit.

As with any statistical investigation, our study is not without its limitations. The data offer a snapshot of a specific timeframe and geographical location, leaving room for broader exploration across different regions and temporal periods. Moreover, while our analysis illuminates a captivating correlation, untangling the nuanced mechanisms underlying this connection warrants

a more nuanced and probing approach - one that transcends mere numbers and delves into the qualitative dimensions of educational and occupational choices.

In light of our tantalizing findings, it's evident that the relationship between Physical sciences degrees and the population of statisticians is more than just a statistical fling – it's a captivating narrative of numerical intertwining that begs for further elucidation. So, whether you're pondering the statistical significance of Physical sciences degrees or decoding the whimsical dance of data, remember to keep your analysis rigorous and your jokes statistically significant!

VI. Conclusion

In conclusion, our investigation into the connection between the number of Physical sciences Associate degrees awarded and the population of statisticians in Michigan has certainly brought some statistical surprises to light. The striking correlation coefficient of 0.8576431 has painted a clear picture of the bond between these variables. It seems these statisticians are just "adding up" to the love for physical sciences - who knew they had such an "integral" role in the field?

The substantial r-squared value of 0.7355518 indicates that a significant portion of statisticians in Michigan can be explained by the number of Physical sciences Associate degrees awarded. It's almost as if these variables are saying, "We're statistically significant in each other's lives!" And with a p-value of less than 0.01, the evidence is as convincing as a well-constructed statistical argument - there is indeed a compelling association between the two.

However, we must tread carefully in interpreting these findings. As valuable as this statistical relationship may be, the age-old adage stands true - correlation does not imply causation. We

must resist the temptation to assume that Physical sciences degrees are directly responsible for the burgeoning population of statisticians in Michigan. As we statisticians like to say, "Just because we're calculating probabilities doesn't mean we can predict the future - unless we're talking about the likelihood of a good lunch break!"

In light of these findings, it is evident that no further research in this area is needed. Our analysis has shed light on the statistical kinship between Physical sciences Associate degrees and the community of statisticians in Michigan. It's as if these variables were destined to be statistically linked, akin to a perfectly matched pair of data points. So, as we close this chapter on this statistical saga, let's remember to keep our data correlated and our jokes statistically significant!