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Chapter 1 : Editions of Natural Experiments in the Social Sciences by Thad Dunning

*Natural Experiments in the Social Sciences: A Design-Based Approach (Strategies for Social Inquiry) [Thad Dunning] on calendrierdelascience.com *FREE* shipping on qualifying offers. This unique book is the first comprehensive guide to the discovery, analysis, and evaluation of natural experiments - an increasingly popular methodology in the social sciences.*

Overview[edit] In the scientific method , an experiment is an empirical procedure that arbitrates competing models or hypotheses. However, an experiment may also aim to answer a "what-if" question, without a specific expectation about what the experiment reveals, or to confirm prior results. If an experiment is carefully conducted, the results usually either support or disprove the hypothesis. According to some philosophies of science , an experiment can never "prove" a hypothesis, it can only add support. On the other hand, an experiment that provides a counterexample can disprove a theory or hypothesis, but a theory can always be salvaged by appropriate ad hoc modifications at the expense of simplicity. An experiment must also control the possible confounding factors â€”any factors that would mar the accuracy or repeatability of the experiment or the ability to interpret the results. In engineering and the physical sciences, experiments are a primary component of the scientific method. They are used to test theories and hypotheses about how physical processes work under particular conditions e. Typically, experiments in these fields focus on replication of identical procedures in hopes of producing identical results in each replication. Random assignment is uncommon. In medicine and the social sciences , the prevalence of experimental research varies widely across disciplines. When used, however, experiments typically follow the form of the clinical trial , where experimental units usually individual human beings are randomly assigned to a treatment or control condition where one or more outcomes are assessed. There are various differences in experimental practice in each of the branches of science. For example, agricultural research frequently uses randomized experiments e. History of experiments One of the first methodical approaches to experiments in the modern sense is visible in the works of the arab mathematician and scholar Ibn al-Haytham. He conducted his experiments in the field of optics - going back to optical and mathematical problems in the works of Ptolemy - by controlling his experiments due to factors such as self-criticality, reliance on visible results of the experiments as well as a criticality in terms of earlier results. We should distinguish the properties of particulars, and gather by induction what pertains to the eye when vision takes place and what is found in the manner of sensation to be uniform, unchanging, manifest and not subject to doubt. After which we should ascend in our inquiry and reasonings, gradually and orderly, criticizing premisses and exercising caution in regard to conclusions â€” our aim in all that we make subject to inspection and review being to employ justice, not to follow prejudice, and to take care in all that we judge and criticize that we seek the truth and not to be swayed by opinion. We may in this way eventually come to the truth that gratifies the heart and gradually and carefully reach the end at which certainty appears; while through criticism and caution we may seize the truth that dispels disagreement and resolves doubtful matters. For all that, we are not free from that human turbidity which is in the nature of man; but we must do our best with what we possess of human power. From God we derive support in all things. Furthermore, a critical view on the results and outcomes of earlier scholars is necessary: He should also suspect himself as he performs his critical examination of it, so that he may avoid falling into either prejudice or leniency. In this process of critical consideration, the man himself should not forget that he tends to subjective opinions - through "prejudices" and "leniency" - and thus has to be critical about his own way of building hypotheses. Francis Bacon â€” , an English philosopher and scientist active in the 17th century, became an influential supporter of experimental science in the english renaissance. He disagreed with the method of answering scientific questions by deduction - similar to Ibn al-Haytham - and described it as follows: Notably, he first ordered the scientific method as we understand it today. There remains simple experience; which, if taken as it comes, is called accident, if sought for, experiment. The true method of

experience first lights the candle [hypothesis], and then by means of the candle shows the way [arranges and delimits the experiment]; commencing as it does with experience duly ordered and digested, not bungling or erratic, and from it deducing axioms [theories], and from established axioms again new experiments. For example, Galileo Galilei accurately measured time and experimented to make accurate measurements and conclusions about the speed of a falling body. Antoine Lavoisier , a French chemist, used experiment to describe new areas, such as combustion and biochemistry and to develop the theory of conservation of mass matter. A considerable amount of progress on the design and analysis of experiments occurred in the early 20th century, with contributions from statisticians such as Ronald Fisher , Jerzy Neyman , Oscar Kempthorne , Gertrude Mary Cox , and William Gemmell Cochran , among others. Types of experiment[edit] Experiments might be categorized according to a number of dimensions, depending upon professional norms and standards in different fields of study. In some disciplines e. The independent variable is manipulated by the experimenter, and the dependent variable is measured. The signifying characteristic of a true experiment is that it randomly allocates the subjects to neutralize experimenter bias, and ensures, over a large number of iterations of the experiment, that it controls for all confounding factors. Scientific control and Design of experiments A controlled experiment often compares the results obtained from experimental samples against control samples, which are practically identical to the experimental sample except for the one aspect whose effect is being tested the independent variable. A good example would be a drug trial. The sample or group receiving the drug would be the experimental group treatment group ; and the one receiving the placebo or regular treatment would be the control one. In many laboratory experiments it is good practice to have several replicate samples for the test being performed and have both a positive control and a negative control. The results from replicate samples can often be averaged, or if one of the replicates is obviously inconsistent with the results from the other samples, it can be discarded as being the result of an experimental error some step of the test procedure may have been mistakenly omitted for that sample. Most often, tests are done in duplicate or triplicate. A positive control is a procedure similar to the actual experimental test but is known from previous experience to give a positive result. A negative control is known to give a negative result. The positive control confirms that the basic conditions of the experiment were able to produce a positive result, even if none of the actual experimental samples produce a positive result. The negative control demonstrates the base-line result obtained when a test does not produce a measurable positive result. Most often the value of the negative control is treated as a "background" value to subtract from the test sample results. Sometimes the positive control takes the quadrant of a standard curve. An example that is often used in teaching laboratories is a controlled protein assay. Students might be given a fluid sample containing an unknown to the student amount of protein. It is their job to correctly perform a controlled experiment in which they determine the concentration of protein in the fluid sample usually called the "unknown sample". The teaching lab would be equipped with a protein standard solution with a known protein concentration. Students could make several positive control samples containing various dilutions of the protein standard. Negative control samples would contain all of the reagents for the protein assay but no protein. In this example, all samples are performed in duplicate. The assay is a colorimetric assay in which a spectrophotometer can measure the amount of protein in samples by detecting a colored complex formed by the interaction of protein molecules and molecules of an added dye. In the illustration, the results for the diluted test samples can be compared to the results of the standard curve the blue line in the illustration to estimate the amount of protein in the unknown sample. Controlled experiments can be performed when it is difficult to exactly control all the conditions in an experiment. In this case, the experiment begins by creating two or more sample groups that are probabilistically equivalent, which means that measurements of traits should be similar among the groups and that the groups should respond in the same manner if given the same treatment. This equivalency is determined by statistical methods that take into account the amount of variation between individuals and the number of individuals in each group. In fields such as microbiology and chemistry , where there is very little variation between individuals and the group size is easily in the millions, these statistical methods are often

bypassed and simply splitting a solution into equal parts is assumed to produce identical sample groups. Once equivalent groups have been formed, the experimenter tries to treat them identically except for the one variable that he or she wishes to isolate. Human experimentation requires special safeguards against outside variables such as the placebo effect. Such experiments are generally double blind , meaning that neither the volunteer nor the researcher knows which individuals are in the control group or the experimental group until after all of the data have been collected. This ensures that any effects on the volunteer are due to the treatment itself and are not a response to the knowledge that he is being treated. In human experiments, researchers may give a subject person a stimulus that the subject responds to. The goal of the experiment is to measure the response to the stimulus by a test method. Original map by John Snow showing the clusters of cholera cases in the London epidemic of In the design of experiments , two or more "treatments" are applied to estimate the difference between the mean responses for the treatments. For example, an experiment on baking bread could estimate the difference in the responses associated with quantitative variables, such as the ratio of water to flour, and with qualitative variables, such as strains of yeast. Experimentation is the step in the scientific method that helps people decide between two or more competing explanations â€" or hypotheses. These hypotheses suggest reasons to explain a phenomenon, or predict the results of an action. An example might be the hypothesis that "if I release this ball, it will fall to the floor": Formally, a hypothesis is compared against its opposite or null hypothesis "if I release this ball, it will not fall to the floor". The null hypothesis is that there is no explanation or predictive power of the phenomenon through the reasoning that is being investigated. Once hypotheses are defined, an experiment can be carried out and the results analysed to confirm, refute, or define the accuracy of the hypotheses. Natural experiment The term "experiment" usually implies a controlled experiment, but sometimes controlled experiments are prohibitively difficult or impossible. In this case researchers resort to natural experiments or quasi-experiments. To the degree possible, they attempt to collect data for the system in such a way that contribution from all variables can be determined, and where the effects of variation in certain variables remain approximately constant so that the effects of other variables can be discerned. The degree to which this is possible depends on the observed correlation between explanatory variables in the observed data. When these variables are not well correlated, natural experiments can approach the power of controlled experiments. Usually, however, there is some correlation between these variables, which reduces the reliability of natural experiments relative to what could be concluded if a controlled experiment were performed. Also, because natural experiments usually take place in uncontrolled environments, variables from undetected sources are neither measured nor held constant, and these may produce illusory correlations in variables under study. Much research in several science disciplines, including economics , political science , geology , paleontology , ecology , meteorology , and astronomy , relies on quasi-experiments. For example, in astronomy it is clearly impossible, when testing the hypothesis "Stars are collapsed clouds of hydrogen", to start out with a giant cloud of hydrogen, and then perform the experiment of waiting a few billion years for it to form a star. However, by observing various clouds of hydrogen in various states of collapse, and other implications of the hypothesis for example, the presence of various spectral emissions from the light of stars , we can collect data we require to support the hypothesis. An early example of this type of experiment was the first verification in the 17th century that light does not travel from place to place instantaneously, but instead has a measurable speed. Observation of the appearance of the moons of Jupiter were slightly delayed when Jupiter was farther from Earth, as opposed to when Jupiter was closer to Earth; and this phenomenon was used to demonstrate that the difference in the time of appearance of the moons was consistent with a measurable speed. Field experiment Field experiments are so named to distinguish them from laboratory experiments, which enforce scientific control by testing a hypothesis in the artificial and highly controlled setting of a laboratory. Often used in the social sciences, and especially in economic analyses of education and health interventions, field experiments have the advantage that outcomes are observed in a natural setting rather than in a contrived laboratory environment. For this reason, field experiments are sometimes seen as having higher external validity than laboratory experiments. However, like

natural experiments, field experiments suffer from the possibility of contamination: Yet some phenomena e. Contrast with observational study[edit] The black box model for observation input and output are observables. An observational study is used when it is impractical, unethical, cost-prohibitive or otherwise inefficient to fit a physical or social system into a laboratory setting, to completely control confounding factors, or to apply random assignment. It can also be used when confounding factors are either limited or known well enough to analyze the data in light of them though this may be rare when social phenomena are under examination. For an observational science to be valid, the experimenter must know and account for confounding factors. In these situations, observational studies have value because they often suggest hypotheses that can be tested with randomized experiments or by collecting fresh data. Fundamentally, however, observational studies are not experiments. By definition, observational studies lack the manipulation required for Baconian experiments.

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Chapter 2 : Natural experiments in the social sciences : a design-based approach (eBook,) [calendrierdela

Natural Experiments in the Social Sciences: A Design-Based Approach This unique book is the first comprehensive guide to the discovery, analysis, and evaluation of natural experiments - an increasingly popular methodology in the social sciences.

Economics Table of contents 1. Standard natural experiments; 3. Instrumental-variables designs; Part II. Sampling processes and standard errors; 7. The central role of qualitative evidence; Part III. How plausible is as-if random? How credible is the model? How relevant is the intervention? Building strong research designs through multi-method research. I especially like his guide to discovering natural experiments. In this illuminating and highly readable book, Thad Dunning provides an expert guide to the strengths and weaknesses of this cutting-edge method, demonstrating how researchers can use natural experiments as a powerful tool for causal inference while avoiding common mistakes. I recommend this book to both beginning and experienced researchers. Does economic growth cause peace or is it the other way round? Do people adopt the values of their friends or just gravitate to others that think like them? A windfall or crisis throws an economy off course, a fire or flood forces people into new social networks. Natural experimentalists seek out such moments to shine a light on underlying orders. In this first serious treatment of natural experiments in social science, Dunning sets down standards and shares techniques to help ensure real learning from such rare moments. Angrist, Department of Economics, MIT "One of the most exciting developments in contemporary political science is the use of natural experiments to estimate causal effects. Dilley Professor of Political Science, Yale University "The biggest problem social scientists face is figuring out what causes what. He has written on a range of methodological topics, including impact evaluation, econometric corrections for selection effects and multi-method research in the social sciences, and his first book, Crude Democracy:

Chapter 3 : Experiment - Wikipedia

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On 31 August , a major outbreak of cholera struck Soho. Over the next three days, people near Broad Street died. By the end of the outbreak people died. The physician John Snow identified the source of the outbreak as the nearest public water pump, using a map of deaths and illness that revealed a cluster of cases around the pump. In this example, Snow discovered a strong association between the use of the water from the pump, and deaths and illnesses due to cholera. Snow found that the Southwark and Vauxhall Waterworks Company , which supplied water to districts with high attack rates, obtained the water from the Thames downstream from where raw sewage was discharged into the river. By contrast, districts that were supplied water by the Lambeth Waterworks Company , which obtained water upstream from the points of sewage discharge, had low attack rates. Given the near-haphazard patchwork development of the water supply in mid-nineteenth century London, Snow viewed the developments as "an experiment Therefore, this exposure has been recognized as being a natural experiment. For at least two reasons, the correlations between family size and various outcomes e. First, both labor market outcomes and family size may be affected by unobserved "third" variables e. Second, labor market outcomes themselves may affect family size called "reverse causality". For example, a woman may defer having a child if she gets a raise at work. The authors observed that two-child families with either two boys or two girls are substantially more likely to have a third child than two-child families with one boy and one girl. The sex of the first two children, then, constitutes a kind of natural experiment: The authors were then able to credibly estimate the causal effect of having a third child on labor market outcomes. While game shows might seem to be artificial contexts, they can be considered natural experiments due to the fact that the context arises without interference of the scientist. Game shows have been used to study a wide range of different types of economic behavior, such as decision making under risk [10] and cooperative behavior. Helena is geographically isolated and served by only one hospital. Opponents of the law prevailed in getting the enforcement of the law suspended after six months, after which the rate of heart attacks went back up. Heart-attack rates were already on the decline before the smoking ban, and the population size was small enough a reduction of 16 heart attacks from 40 in the period before the ban that the large-percentage fluctuation was likely due to chance. The release stopped after the Partial Nuclear Test Ban Treaty in , which prohibited atmospheric nuclear tests. This resembled a large-scale pulse-chase experiment , but could not have been performed as a regular experiment in humans due to scientific ethics. Several types of observations were made possible in people born before , such as determination of the rate of replacement for cells in different human tissues. Vietnam War draft[edit] An important question in economics research is what determines earnings. Angrist evaluated the effects of military service on lifetime earnings. Because many factors might predict whether someone serves in the military, the draft lottery frames a natural experiment whereby those drafted into the military can be compared against those not drafted because the two groups should not differ substantially prior to military service. Angrist found that the earnings of veterans were, on average, about 15 percent less than the earnings of non-veterans. Industrial melanism[edit] With the Industrial Revolution in the nineteenth century, many species of moth, including the well-studied peppered moth , responded to the atmospheric pollution of sulphur dioxide and soot around cities with industrial melanism , a dramatic increase in the frequency of dark forms over the formerly abundant pale, speckled forms. In the twentieth century, as regulation improved and pollution fell, providing the conditions for a large-scale natural experiment, the trend towards industrial melanism was reversed, and melanic forms quickly became scarce. The effect led the evolutionary biologists L. Turner to conclude that " natural selection is the only credible explanation for the overall decline".

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Chapter 4 : Natural experiment - Wikipedia

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Strategies for social inquiry. Summary This unique book is the first comprehensive guide to the discovery, analysis and evaluation of natural experiments - an increasingly popular methodology in the social sciences. Thad Dunning provides an introduction to key issues in causal inference, including model specification, and emphasizes the importance of strong research design over complex statistical analysis. Surveying many examples of standard natural experiments, regression-discontinuity designs and instrumental-variables designs, Dunning highlights both the strengths and potential weaknesses of these methods, aiding researchers in better harnessing the promise of natural experiments while avoiding the pitfalls. Dunning also demonstrates the contribution of qualitative methods to natural experiments and proposes new ways to integrate qualitative and quantitative techniques. Chapters complete with exercises and appendices covering specialized topics such as cluster-randomized natural experiments make this an ideal book for students as well as a valuable teaching tool. Natural experiments on military conscription and land titles 1. Varieties of natural experiments 1. Contrast with quasi-experiments and matching 1. Natural experiments as design-based research 1. Critiques and limitations of natural experiments 1. Avoiding conceptual stretching 1. Plan for the book, and how to use it 1. Some notes on coverage pt. I Discovering natural experiments 2. Standard natural experiments 2. Standard natural experiments in the social sciences 2. Standard natural experiments with true randomization 2. Standard natural experiments with as-if randomization 2. Redistricting and jurisdiction shopping 2.

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Surveying many examples of standard natural experiments, regression-discontinuity designs, and instrumental-variables designs, Dunning highlights both the strengths and potential weaknesses of these methods, aiding researchers in better harnessing the promise of natural experiments while avoiding the pitfalls.

Chapter 6 : Natural experiments in the social sciences : a design-based approach in SearchWorks catalog

Natural Experiments Thad Dunning Department of Political Science Yale University Draft entry for the International Encyclopedia of Political Science Word count: 2, The importance of natural experiments lies in their contribution to addressing confounding, a pervasive problem in the social sciences.

Chapter 7 : Field Experiments and Natural Experiments - Oxford Handbooks

Natural experiments in the social sciences: a design-based approach. [Thad Dunning] -- The first comprehensive guide to natural experiments, providing an ideal introduction for scholars and students.

Chapter 8 : Natural experiments in the social sciences : a design-based approach (Book,) [calendrierdelas

Social sciences â€" Experiments. Social sciences â€" Research. Experimental design. Series. Strategies for social inquiry. Summary. This unique book is the first comprehensive guide to the discovery, analysis and evaluation of natural experiments - an increasingly popular methodology in the social sciences.