▪ Advances in Scientific and Applied Accounting, ▪ ISSN 1983-8611 ▪ São Paulo ▪ v.17, n.3 ▪ p. 006-010 ▪ Sep. / Dec. 2024
▪ DOI:10.14392/asaa.2024170301

ASAA

Editorial

Breaking the Paradigm: From Correlation to Causation

Giuseppe Trevisan[1]

[1] Universidade Federal de Pernambuco (UFPE), Recife, Pernambuco, Brasil.

[1]giuseppe.trevisan@ufpe.br.

Abstract

In this editorial, I explore the shift from correlation-based research to causal inference in the field of Accounting, examining the limitations of traditional econometric methods in establishing causality. It critiques the over-reliance on statistical associations, often neglecting endogeneity concerns, and advocates for the use of quasi-experimental techniques such as Difference-in-Differences, Instrumental Variables, and Regression Discontinuity. Drawing from corporate governance research, I show how these methods can be employed to identify causal effects, including the role of gender diversity in board performance. I stress the necessity of robust econometric foundations and proper contextual understanding to ensure that empirical approaches align with theoretical frameworks, warning against separating causal evidence from its underlying mechanisms. The editorial provides key references and offers suggestions for further reading.

Keywords: Paradigm; Correlation; Causal Inference.

How to cite:

Trevisan, G. (2024). Breaking the Paradigm: From Correlation to Causation. *Advances in Scientific and Applied Accounting*, 17(3), 001–005/006. https://doi.org/10.14392/asaa.2024170301

Correlation versus Causality

"*When we talk about accounting research today, and indeed for many years now, we can provocatively think of at least two visions. In the first, which is extreme and super pessimistic, we note we have gone from being thinkers and creators, but not testers of our own theories, to mainly confirmers of everything that can be related statistically, even without much concern for causality, only correlation. Whether governance leads to profitability or profitability leads to good governance doesn't matter. What matters is the five percent correlation!(???). Whether the research is useful or not is of secondary importance, the important thing is the economic methodology, which seems to be the indicator of the quality of the work.. (...)" (Iudícibus & Martins, 2023)*

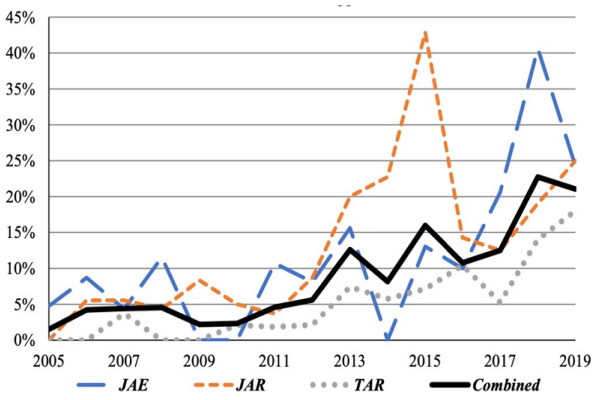
In this brief text, I aim to offer some discussions and reflections on the use of econometric methods for causal inference, inspired by the provocation presented earlier by the renowned authors. The history of accounting research that focuses on analyzing associations between different characteristics is extensive, largely due to structural shifts that occurred over the last century. It is undeniable that the use of econometric techniques to estimate correlations of interest remains prevalent and enhances the likelihood of publication in higher-impact journals. Indeed, examining associations between characteristics is important, as it enables researchers to construct indexes, build models for predicting future behavior, identify patterns, and generate new hypotheses. However, it must be acknowledged that the most exciting research questions involve causal relationships. These questions serve as catalysts for uncovering the mechanisms behind particular phenomenom, testing theories, and providing answers that advance decision-making processes.

Although I recognize that many current studies aim to measure correlations, my modest and sincere perception is that a considerable portion of the work actually seeks to infer causality, even though it is labeled as "correlation analysis." This tendency can be identified by examining how research questions[1] and hypotheses[2] are framed. It often suffices to acknowledge that the study faces endogeneity issues (when they are acknowledged at all), apply a sophisticated econometric method, and simply let "time goes by." However, we must remain aware that the results obtained are fundamentally dependent on the methodology chosen to address the research question and test the hypothesis (or hypotheses).

Thus, my provocations are as follows: are we using the appropriate methods to answer our research questions? Are we interpreting our findings correctly — distinguishing between correlation and causality?

Regardless of the research topic, while many studies continue to rely on OLS with cross-sectional data, fixed effects models with panel data, system GMM, tobit, logit, and probit models, mainstream accounting research is moving forward by employing strategies that exploit quasi-experimental designs to identify causal effects. Figure 1 illustrates a growing trend in the publication of articles employing quasi-experimental approaches in the top three international accounting journals (Journal of Accounting and Economics, Journal of Accounting Research, and The Accounting Review) over the past 15 years. Among these methods, we can highlight the use of Difference-in-Differences, Instrumental Variables, and Regression Discontinuity Designs. It is very likely that the reader has already encountered at least one of these methods in their academic readings. But why, after all, do such empirical strategies enable the identification of causal relationships? To answer this question, I will draw on some economic terminology and the example raised in the excerpt from Iudícibus & Martins (2023): does governance impact profitability?

Figure 1: Trends in the use of quasi-experiments



Source: Armstrong et al. (2022).

The literature on corporate governance points out that the characteristics of the board of directors (BoD) can have an impact on the value of the company and its profitability. Among these characteristics, I will focus on the

[1]For example: "What is the effect of using new accounting standards on the quality of accounting information"? "Does the use of costing tools influence the financial performance of companies?" "How do corporate scandals affect the perception of the role of auditors?" "Do independent boards of directors impact the quality of financial reporting"?

[2]For example: "the use of new accounting standards improves the quality of accounting information"; "the use of costing tools increases the financial performance of companies"; 'the occurrence of corporate scandals increases the perception of the role of auditors'; 'in-dependent boards of directors have a positive impact on the quality of financial reporting".

presence of women on the board. Note that there is a tension in this relationship. It's possible that gender diversity has a positive influence on business performance

due to issues of signaling and reputation in the market (because, for example, it can align with the pro-social and environmental expectations of the market, it can increase compliance with regulations, etc.), better monitoring (since women are generally more risk-averse than men), among other arguments.

On the other hand, performance can deteriorate because, when choosing board members with the aim of maximizing the value of the company, the inclusion of women is only symbolic and/or can break pre-established structures. Assuming that longitudinal data is collected, the empirical model most likely to be used to estimate the relationship of interest would be the following:

$$Performance_{it} = \beta_0 + \beta_1 BoD_{it} + X'_{it}\gamma + \alpha_i + \alpha_t + u_{it}, \quad (1)$$

(1) where Performance it represents some measure of profitability (e.g., ROA) for company i at time t, BoD_{it} is a dummy indicating the presence of women on the board and X_{it} is a vector containing k observable determinants of profitability ($X1_{it}$, $X2_{it}$, ..., X_{kit}). To control for unobservable heterogeneities among companies and time periods, we include the fixed effects α_i and α_t. The parameter of interest is given by β_1. Finally, the error term is represented by u_{it}.

It is common in the results section of an article to interpret the estimated parameter as "the presence of women positively (negatively) impacts (influences) performance in β_1." Note that this interpretation presupposes a causal relationship between the governance proxy and the company's profitability. In his philosophical work from the 18th century, An Inquiring Concerning Human Understanding, David Hume says: *"we may define a cause to be an object followed by another, and where all the objects, similar to the first, are followed by objects similar to the second. Or, in other words, where, if the first object had not been, the second never had existed ".*

Then, a phenomenon A causes a phenomenon B if and only if A produces B and not vice versa. For the estimation of β_1 in the above model, the Exogeneity assumption is implicit, or $E[u_{it} | BoD_{it}] = 0$, which means that the unobservable factors and determinants of performance are not correlated with the gender diversity of BoD. Using a bit of statistics, it is possible to show that this assumption guarantees that the estimator is unbiased, which would ensure a causal interpretation of the relationship of interest.. However, without any additional context for this analysis, there are numerous reasons not to believe that this identification assumption is plausible of being empirically corroborated. This is because the structure of BoD is determined endogenously. This endogeneity issue in board composition has already been highlighted by Adams et al. (2010), which has permeated a number of academic studies. The selection of board members, and thus gender composition, may be influenced by characteristics that are unobservable to the researcher. For instance, principals may determine such composition in response to governance issues or conflicts of interest, or due to cultural differences within firms, or even as a result of networking among members and family succession. These are just a few examples of problems stemming from omitted variables. It is possible that the firm alters the composition of the board due to a prior trend in firm value, which could suggest reverse causality. In this case, even using lagged board composition would not resolve the issue, as it could still be correlated with other unobservable factors that determine the selection of board members.

Or again: does the composition of female board members affect profitability through their shares? Or are the most profitable companies attracting more women to their BoDs? Without information on how women self-select into more or less profitable companies, it is impossible to separate out this confounding factor when estimating the coefficient of interest. Another problem for the estimation would come from a measurement error in the composition of BoD. For example, manually collecting information on the members of the BoD can generate measurement error by attributing the presence of women to a moment in time when there has been no change. All of these points reflect the difficulty of estimating the parameter of interest and, therefore, satisfying the Exogeneity assumption. The discussion of these difficulties is quite uncommon in publications in accounting area in national journals. It is precisely at this point that the notion of quasi-experiments and the framework of causal inference becomes opportune.

The impossibility of observing the situation in which the firm, by reconfiguring its board of directors with the inclusion of women, would not have altered the structure of the board, leads to what we call the Fundamental Problem of Causal Inference. Note that the same holds true for the inverse situation. We observe the fact but do not observe the counterfactual. If it were possible to randomize whether a firm should change its board's gender composition, the causal effect could be identified by comparing firms that made the change (treatment group) with those that did not (control group), using the control group as an empirical counterfactual. This is because randomization functions as an exogenous variation in this composition, addressing endogeneity by eliminating the correlation of the treatment with confounding factors (both observable and unobservable determinants of profitability). In the absence of experiments, we must rely on quasi-experi

ments (when available...) to estimate causal relationships. This is because, although the assignment to the treatment group is not random, contextual information may indicate that such assignment is driven by exogenous variation.

2 Examples with Almost Experiments

Regarding the effects of gender diversity in BoD on firm value and profitability, a clever solution was found by Ahern & Dittmar (2012) to mitigate the endogeneity problems discussed earlier. The context explained by the authors involves the introduction of a law in Norway in 2003, which obliged listed companies to achieve a minimum of 40% female representation on boards. This event creates an quasi-experiment, providing an exogenous source of variation in board composition. The fact that regulation is mandated minimizes the possibility that internal decisions are associated with other determinants of performance. To identify the effect of interest, the authors implement the Instrumental Variables strategy, using as an instrument the cross-sectional variation in the female pre-quota composition (interacted with yearly dummies, since they use longitudinal data) for the changes in the board imposed by the quota law. The key point is that, since all companies had to meet the regulation, those with lower female representation faced greater difficulties than their counterparts who were closer to meeting the 40% threshold. The authors argue that this "gap" between the proportion of pre-quota women and the proportion of post-reform women is exogenous because it was determined before the regulation and is therefore not correlated with other determinants of financial profitability, thus meeting the exclusion restriction assumption. To provide evidence of the plausibility of the exclusion restriction, the authors show that the instrumental variable is not correlated with price characteristics, such as measures of capital structure, return and value of the firm and sectors of activity. The results indicate a negative effect on company value and, although not robust, on profitability. Ahern & Dittmar (2012) interpret that the choice of board members is aligned with the objective of maximizing the value of the company. To corroborate this interpretation, the authors show that regulation has led to the entry of younger, inexperienced female members into executive roles, elements which may explain the deleterious effect on value.

Still on the topic of corporate governance, I present as an example the cross-country study by Fauver et al. (2017) regarding reforms to the board of directors. Unlike the previous article, the authors focus on regulations that deal with the establishment of audit committees, the independence of boards and auditors, and the accumulation of the positions of CEO and chairman. The motivation lies, once again, in the ambiguity about the consequences of these reforms on the value of companies, specifically in light of the theoretical perspectives of agency theory and the firm. To mitigate ambiguity in the choice of corporate governance structure, Fauver et al. (2017) explore the temporal variation in the introduction of these regulations in different countries. The quasi-experiment is given by the imposition of the rules on the companies listed in each country, which makes the configuration of the corporate governance structure exogenous to the characteristics of the companies.

To identify the effect of interest, the authors use a difference-in-differences design with firm and time fixed effects, comparing companies from countries that have introduced the reform with from countries that have not yet introduced the standards. Therefore, this design does not use a "pure" control group, since all countries will introduce the governance reform at some point in time. Although the results indicate an average positive impact on firm value, there is heterogeneity in the effect according to the type of reform (comply-or-explain and rule-based). To check the plausibility of the parallel trends assumption, Fauver et al. (2017) use an event study. They show that there is no response in firm value in the period prior to the implementation of the reform, suggesting that there is no anticipatory behavior.

A particularly relevant method of causal inference to be presented is that of Discontinuous Regression, widely used in the field of educational economics. To illustrate this, I bring the article by Flammer (2015), also relating the theme of governance. The author explores a very particular quasi-experiment to identify the effect of governance practices of corporate social responsibility (CSR) on company value and performance. As discussed above, these practices are endogenous to these indicators because certain companies are more inclined to implement social and environmental projects, which may be related to very heterogeneous firm types in various dimensions. To mitigate endogeneity, since the databases used provide detailed information on proposals with CSR content, Flammer (2015) compares companies that have been subjected to "close calls", i.e. those votes in which the result was determined by a very small margin (50% +/- 1 of the votes).

Therefore, in these close calls, the victory/defeat of the company's CSR proposal is attributed in a similar way to randomization. When comparing these marginal companies, it can be seen that those who have approved the proposal show a positive reaction from the market and record higher returns in the long term. Part of this causal effect stems from operational gains and labor productivity. To corroborate its design, Flammer (2015) shows that the companies are statistically similar in several baseline characteristics, i.e. those observed before the result of the vote.

3 A Few Reflections

I believe this is a very opportune moment for Brazilian researchers in accounting area to enter this world of causal inference. There are many articles and books on the subject,

ranging from the early stages of almost experimental methodologies to the most recent advances (of which there are many). As a good starting point, I would like to recommend "the bible" of causal inference, Mostly Harmless Econometrics, written by the 2021 Nobel Prize winner in Economics, Joshua Angrist, and his research partner, Jörn-Steffen Pischke[3].I also recommend reading the articles of Armstrong et al. (2022) e Leuz (2022). The first makes excellent points about the application of quasi-experiments in accounting research, reviewing the main methods and their identifying assumption. The second, in a complementary way, focuses the discussion on how the research design corroborates to answer its research question (which is certainly a causal theory) in a convincing way. So, it emphasizes the importance of understanding the institutional background being explored, a point that will allow us to extract/identify an opportunity to implement some quasi-experimental method.

Based on my reading of articles published in national journals and my participation in congresses in the field, I think that this new paradigm to be broken requires a return to the foundations of Econometrics. It is essential to consolidate the econometric base, especially with regard to the violation of the Exogeneity assumptions, in order to balance the mathematical/statistical steps with the epistemological part that surrounds it. This stage needs to be overcome, firstly, between the stricto and lato sensu postgraduate programs, in order to homogenize this knowledge. Next, these quasi-experimental methodologies need to be disseminated and, for this, there needs to be exposure. From the professors (after all, we are among the primary vehicles for transmitting knowledge), this exposure can occur either through a demand for courses on causal inference or through self-study and updating. As far as the last point is concerned, I'd like to stress the importance of reading articles from different areas! Economics, finance, administration, political science, psychology. This is extremely important because, as well as providing valuable insights for new research questions, it will both create experience and maturity for identifying other several quasi-experiments that have not yet been explored and broaden the possibilities for databases.

Finally, I would like to issue a warning to researchers in the field, based on the trajectory of the Economic Sciences in recent decades and the criticisms of several economists regarding its direction. While there is, in fact, recognition of the importance of presenting causal evidence, this sometimes overlaps with the use of economic theory, limiting our understanding of the mechanisms that support the phenomenon being studied. Thus, while we hope that Accountancy will evolve in the coming years in the search for causal answers through the application of quasi-experimental techniques, we must be careful not to detach ourselves from theory. After all, this is the primary purpose of methods: to test theories!

References

Adams, R. B., Hermalin, B. E., & Weisbach, M. S. (2010). The role of boards of directors in corporate governance: A conceptual framework and survey. Journal of Economic Literature, 48(1), 58–107, https://doi.org/10.1257/jel.48.1.58

Ahern, K. R. & Dittmar, A. K. (2012). The changing of the boards: The impact on firm valuation of mandated female board representation *. The Quarterly Journal of Economics, 127(1), 137–197, https://doi.org/10.1093/qje/qjr049

Angrist, J. D. & Pischke, J. (2009). Mostly harmless econometrics: An empiricist's companion. Princeton university press.

Armstrong, C., Kepler, J. D., Samuels, D., & Taylor, D. (2022). Causality redux: The evolution of empirical methods in accounting research and the growth of quasi-experiments. Journal of Accounting and Economics, 74(2), 101521, https://doi.org/10.1016/j.jacceco.2022.101521

Fauver, L., Hung, M., Li, X., & Taboada, A. G. (2017). Board reforms and firm value: Worldwide evidence. Journal of Financial Economics, 125(1), 120–142, https://doi.org/10.1016/j.jfineco.2017.04.010

Flammer, C. (2015). Does corporate social responsibility lead to superior financial performance? a regression discontinuity approach. Management Science, 61(11), 2549–2568, https://doi.org/10.1287/mnsc.2014.2038

Iudícibus, S. de, & Martins, E. (2023). Algumas Reflexões Sobre Pesquisa Contábil e Algumas (Pesadas?) Afirmações e Conclusões. Advances in Scientific and Applied Accounting, 16(3), 001–004/005. https://doi.org/10.14392/asaa.2023160301

Leuz, C. (2022). Towards a design-based approach to accounting research. Journal of Accounting and Economics, 74(2), 101550, https://doi.org/10.1016/j.jacceco.2022.101550

[3]Angrist & Pischke (2009) address other fundamental issues in econometrics, as well as discussing omitted variable bias and Rubin's causal model..