Insider econometrics: a guide to management scholars

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Abstract

Purpose – This paper aims to present a new trend in management research: the Insider Econometrics approach.

Design/methodology/approach – The authors argue that the use of internal organizational data not available in public sources can benefit both researchers interested in advancing theories and practitioners interested to improve the decision-making toward more solid and evidence-based grounds.

Findings – The authors demonstrate the subjects involved in Insider Econometrics realm and provide a framework to guide management scholars to successfully engage in research involving strong partnerships between academia and real world organizations.

Originality/value – This paper introduces a guide to Insider Econometric research to management scholars.

Keywords Strategic management, Insider econometrics, Research methods in management

Paper type Technical paper

Introduction

Unveiling performance drivers within and across organizations while providing interesting insights to practitioners is one of the core objectives of management research (Hitt, Gimeno, & Hoskisson, 1998; Mahoney & McGahan, 2007; McGahan, 2007). In doing so, management scholars have relied on a wide array of methods ranging from in-depth qualitative methods in a single or small selected sample of organizations (Eisenhardt, 1989), to the use of econometric techniques to assess relationships of association or causality between variables of interest. Quantitative analysis can be performed by employing datasets covering several organizations and stakeholders either on a longitudinal or on cross-sectional basis (Hitt *et al.*, 1998). Amongst the existing empirical strategies, management scholars have long relied on data collected by organizations themselves to advance research on novel and potentially understudied within-organizations mechanisms and phenomena. The famous Hawthorne experiments, for instance, were conducted at an industrial plant of Western Electric Company in Chicago, with the objective to study how distinct levels of illumination affected labor productivity (Mayo, 1933). Several decades later, the same phenomenon was subject to more rigorous statistical analysis

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and testing (Franke & Kaul, 1978) and generated important lessons for experimental design in the social sciences (Duflo, Glennerster, & Kremer, 2008).

Recently, unique data from within private and public organizations has continued to span novel insights on management and strategy research. For instance, Hamilton, Nickerson and Owan's (2003) study of the introduction of team incentives in a garment plant; Lumineau and Malhotra's (2011) examines legal disputes based on a sample of contracts from a law firm. Frank and Obloj's (2014) analyzes the effect of human capital on the performance of a retail banking organization, and Cabral and Lazzarini (2015) study the efficacy of internal governance mechanisms in a police unit. Indeed, reliance on data from actual organizations has crossed disciplinary boundaries and, since the early 1990s, organizational economists interested have also used such type of information to advance research on the effects of management practices on firm productivity. Some examples deal with outcome-based payments (Baker, Gibbs, & Holmstrom, 1994; Bandiera, 2005; Lazear, 2000); team-based practices (Bandiera, Barankay, & Rasul, 2013), hiring mechanisms (Autor & Scarborough, 2008; Burks, Cowgill, Hoffman, & Housman, 2015), the adoption of bundles of management practices (Bloom, Eifert, Mahajan, McKenzie, & Roberts, 2013), firm-sponsored training (Hoffman & Burks, 2017), among several others.

We argue that further comprehension of organizational phenomena is possible through more intense use of in-depth knowledge from daily operations of a single (or a small group of) organization(s). Complementary to knowledge gained via qualitative methods, detailed within-organization datasets and advanced econometric techniques can help researchers and practitioners to assess the impact of organizational policies and understand the role of several individual, organizational, and corporate features on outcomes of interest. In this case, scholars from different fields are able to gain access to information (and enhanced knowledge) as if they were from "inside" the organization. This important stream of research has been coined with the term "Insider Econometrics (IE) (Ichniowski & Shaw, 2013; Shaw, 2009)[1].

In this paper, besides describing the "Insider Econometrics" research method, we discuss how IE can unveil interesting and unknown organizational phenomena by applying advanced econometrics techniques to highly detailed datasets from a single or small group of companies, which are not publicly available. We present the main characteristics and requirements associated with both the researcher, organizational context, research question, and data availability for the proper use of IE.

Like any other research method, the use of IE involves opportunities and pitfalls. On the one hand, pursuing this method poses some risks to interested researchers as it involves repeated interactions with an organization to collect detailed, and often proprietary datasets. Considering the confidentiality aspects at stake, the outcomes of the efforts exerted to gain trust and access to data are uncertain. Furthermore, the use of IE requires the balance between using data to advance management research in a compelling fashion and the ability to provide meaningful answers to the organization, which granted access to its rich and detailed internal data. On the other hand, despite these potential hurdles, we argue that pursuing in-depth knowledge of organizational processes and practices through IE potentially provides several advantages. First, accessing rich, unique organizational data allows the testing of theoretical hypotheses that could be otherwise too difficult to be tested using publicly available information (Lazear, 1999). IE can also help researchers to assess heterogeneous sets of management practices in greater detail, thus helping address more general (and long-lasting) questions, such as why firms adopt distinct practices and what are the performance implications of distinct practice adoption (Bloom, Genakos, Sadun, & Van Reenen, 2012; Bromiley & Rau, 2014). In addition, organizations themselves may be

interested in examining the causal effect of their practices and strategies. This creates an opportunity for researchers to have access to proprietary datasets while reaching out practitioners by providing applicable insights and guidance to managerial choices when a plethora of alternative theoretical models exist (Lazear, 1999; McGahan, 2007). No less important, the very act of talking and interacting with private, public, and nonprofit managers can provide scholars with a richer understanding of the organizational context and the mechanisms at stake (Baker & Gil, 2012). Echoing Vermeulen (2007), an enhanced understanding of a subject demand regular and direct interactions with practitioners and their real data. IE is an important vehicle to promote further interactions between academia and the real world.

In the next section, we describe the methodological characteristics of IE and exemplify its application. In the third section we discuss the agents involved in the IE framework, the requirements for a successful interaction between them, and a suggested workflow to guide the application of IE by management scholars. The fourth section briefly comments on potential research questions and managerial phenomena that could benefit from IE research, while the last section contains our conclusions.

Defining the insider econometric research method

Methodological features

Although management research has long recognized the effects of organizational- and corporate-level features on performance (McGahan & Porter, 1997), only recently economists demonstrated a leveraged interest to open the black-box through the detailed investigation of resources and practices as sources of performance heterogeneity (Bloom, Lemos, Sadun, Scur, & Van Reenen, 2014). The decline of the information technology costs not only allowed firms to invest more on computers and information systems to increase productivity standards but also decreased the costs associated with organizing, manipulating, and treating the massive data now available. These transformations allow practitioners and researchers to address questions of value for business and theory development (George, Osinga, Lavie, & Scott, 2016). These changes have also helped to consolidate new empirical approaches to cope with the new reality of abundant information along with improved technological resources, such as IE.

To the best of our knowledge, the expression IE was first coined by Kathryn Shaw, a labor economist interested in explaining the impact of human resource practices on productivity with the use of "inside" information not publicly available along with the deployment of rigorous and state-of-the-art "econometrics". These information allowed the estimation of internal organization features on performance (Shaw, 2009). The possibilities of application of the IE's tenets in the management research are vast and promising. More precisely, we can define IE as the research method focused on understanding the performance implications of management practices, management policies, organizational variables, or any other managerial construct that may interest researchers and managers through the analytical treatment use of corporate and organizational data.

Using Economics lenses and focused on the role of managerial practices on performance, Ichniowski and Shaw (2013) elicit five distinct characteristics shared by studies applying IE. First, the estimation of organizational performance effects is a function of distinct managerial practices and resources. Second, researchers employing IE must pursue the employment of identification techniques to estimate the causal relationship between practices and performance, as well as conditions moderating the identified relationships Third, IE is particularly useful to shed light on the factors that stimulate the adoption of management practices. Fourth, IE can promote an enhanced use of micro-level data from a

narrowly defined organizational process adopted by a single firm or a few firms. Fifth, the use of IE can help researchers to promote more intense conversations with managers not only to know the nuances of the internal processes under scrutiny to inform research designs but also to discuss the possible interpretation of results.

It is evident that the management researchers can replace practices by other independent variables of interest reflecting other managerial constructs and their influence on performance, such as internal organization features (Cabral & Lazzarini, 2015), human capital, and design of incentive schemes (Frank & Obloj, 2014). A further use of IE approach by management scholars requires the recognition of some boundary conditions. These subjects are addressed below.

Subjects in insider econometric research

The backbone of IE hinges on a series of negotiated events, trade-offs, interactions, and perhaps conflicting interests, involving several subjects. Understanding whom these subjects are, their objectives, incentives, and roles, as well as the conditions for a successful interaction amongst them, are crucial to understand why this research method distinguishes itself from traditional quantitative and/or qualitative methods. Indeed, four subjects are prominent in IE: the Organization, the Researcher, the Focal Organizational Insider and Other Organizational Insiders. We now turn to a brief description of each of them separately for later exemplifying cases of how these subjects interacted amongst themselves.

The organization

Management research often incorporates organizations as the objects under scrutiny. One of the major challenges of management scholars is understanding the cause-and-effect relationships and the mechanisms in play within an organization or set of organizations in order to extend management theories. By advancing theory, research insights may provide generalizable findings that may be useful to guide management practitioners elsewhere. In this sense, organizations are a setting and object of study rather than an active participant of the research method. For instance, Muris, Scheffman, and Spiller (1992) by analyzing the relationship between Pepsi and its independent subsidiaries and help to understand the dynamics of distribution channels in the soft drink industry and to shed light on some principles of transaction costs theory. By using data from the California Department of Transpiration, Gil and Marion (2013) analyze the relational aspects in buyer-supplier relationships in the road context. Cabral, Reis and Sampaio (2015) analyzed contracts signed between a state-owned organization and its suppliers to understand the propensity of small firms participation and success in competitive auctions. In all such cases, organizations are passive research subjects in terms of the research objective and methodology: organizations are not consulted when the research objective and method are defined. This scenario is distinct in IE research.

As IE often relies on highly detailed, sensitive and confidential information from an actual organization (or a small group of organizations), the data sharing process with scholars involves negotiations through which the organization discloses its objectives and expectations regarding the use of data. The organization's influence on the research question is paramount in the early stages of IE research as if the top-management of an organization fails to see value in granting access to its internal records, any research endeavor will be undermined. The organization thus serves as a compass guiding initial research and bounding its objectives and the extent of data to support it.

From the organization's point of view, an IE study is valuable when it provides a specialized consulting activity capable of providing some managerial insight either to

enhance performance associated with some objective defined by the organizational itself or to answer a question in which the organization is interested. For instance, Teodorovicz' research with a direct sales company both explored how firm-sponsored general training may lead to a stronger relational attachment between firm and local partners (Teodorovicz, 2019b) and developed an experimental project on the relative performance of practice transfer methods in terms of their ability to transfer potentially useful management practices to sales managers (Teodorovicz, 2019a). Nardi, Lazzarini, and Cabral (2019) and Deodato Cabral, and Lazzarini (2019) studies were based on partnerships with a microcredit firm and a dental healthcare organization, respectively, that involved a previous interest of each partnering organizations of better understanding their customers' profile in order to develop strategies to increase financial performance.

Even if the research question is not jointly defined, the data used in the research often spans from a previous organizational interest in management-related research. For instance, Hoffman and Burks (2017) evaluated the performance of "training contracts" on human capital formation and profitability in the trucking industry. Although this question may not have been necessarily jointly defined by organization and research, one of the authors has a long-term interest with the U.S. trucking industry that might yield some insights to organizations in that context (Boyer & Burks, 2009; Burks *et al.*, 2008; Verhoogen, Burks, & Carpenter, 2007).

The researcher(s)

Expectedly, the researcher (or research team) is also a core subject in IE research. We sustain that the researcher has three roles in IE: *a bridging* role*, a technical* role *and a relational* role. In its bridging role, the researcher must be able to transit between, communicate with, and connect the Organization and the Scientific Community. In this role, the researchers must assess what the prevailing practical and theoretical issues with enough overlap that warrant research using IE are. This is not necessarily a simple task. If researchers often motivate research questions based on interesting gaps in the prevailing management literature, in IE research, the Organization influences the direction of the research as we have argued above. In this sense, the researcher must exert its creativity to define the specific research problem and testable hypotheses acquiescing both requirements of applicable/practical relevance (for the Organization) and theoretical novelty (for the Scientific Community). Failure to meet the first requirement may disincentivize the organization to provide access to the required dataset. Failure to meet the second requirement may yield some research with a restricted reach and impact in the Scientific Community. As a "bridger", the IE method demands the researcher to gain an in-depth understanding of the potential problems faced by the organization and to be able to propose mechanisms to solve or analyze those problems in such a way that theoretical management insights emerge. On the one hand, in-field interviewing staff and managers to learn about the existing production and organizational processes/structure is a duty of the researcher developing an Insider Econometric method. On the other hand, the researcher must also be able to distance herself/himself from the field and have enough theoretical flexibility to understand how the particularities of an actual organizational problem may warrant generalizable findings to the broader management literature.

Having defined the practical and theoretically interesting hypothesis(es), the Researcher performs its technical role: defining the empirical method to test such hypothesis(es). Relying on its knowledge of statistical and econometric techniques, the researcher is expected to propose a plan to econometrically estimate the causal effect of the independent

variable of interest (e.g. the implementation of a new incentive system, a training policy, the introduction of a disruptive communication technology, etc.) on the dependent variable of interest (e.g. turnover, profitability, technology adoption, etc.). Finding the appropriate match between the hypotheses of interest and the econometric method is key to assure the internal validity of the IE approach. Typically, this entails defining a "treatment" received by a group of subjects within the organization (the treatment group) whose outcome variables of interest will be compared to those of another, comparable, group of subjects which was not affected by such treatment (control group). Particularly, if such treatment had already happened by the time the study started, the researcher will use its technical knowledge to choose the appropriate quasi-experimental econometrics method to assess the effect of such treatment on the outcome interest[2]. If the treatment/hypothesis of interest is yet to occur, the researcher may propose and jointly define with the organization an intervention to assess the validity of the proposed hypothesis(es). Within such jointly defined intervention, the researcher would also define an impact measurement plan which could use both quasi-experimental and even experimental techniques[3] to assess the causal impact of such treatment of the dependent variable of interest.

Finally, establishing a solid relationship with the Organization and its managers/staff is one of the most important tasks of a scholar interested in conducting research with highly sensitive organizational data. Not only the Organization must see the opportunity to appropriate the value created by the study, but it must also be confident that confidential information will not leak. Further, practitioners from such organization have their own personal interests and agendas, which may either be supported or hindered by the research question an Insider Econometrician wishes to answer. For instance, imagine the researcher is interested in evaluating the extent to which the adoption of structured management practices (e.g. incentive systems through bonus payments, standard procedures to retain talented personnel, among others), as Bloom *et al.* (2013) enhances unit-level performance. For doing so, the researchers design an experiment where certain production units will receive consulting and management training for a period (treatment) while others will not (control group). If unit-level performance is an important trigger for payment and/or promotions, managers from control units may feel harmed by such design, and this may threat the development of such study. The same could also be true in situations where there are disputes over internal resource allocation across units and departments when the results of the study may weaken the position of one such department. As a result, the researcher must also perform a relational role. Negotiations, bargains, and adjustments to the research design to avoid sabotages that may harm the validity of the research design. Although this is an invisible role in the final version of the research paper, this is arguably the most crucial role a researcher assumes in an Insider Econometric study.

The focal insider

The third actor who plays a prominent role in IE research, at least in a first approach, is the "Focal Insider". The Focal Insider is the closest contact between the Researcher and the Organization and should be the first person a Researcher looks for when attempting a partnership with a company. Just as with the Organization, the relationship between the Researcher and the Focal Insider must be built from a common ground regarding research interests and the relative benefits. The Focal Insider often has a personal agenda (reputation, career concern, monetary incentives if the sponsor also owns the company) which should be aligned with the Researcher's interests, as she/he will be the main intra-company project sponsor. To be an effective sponsor, a Focal Insider would be at least in senior management

or an executive-level position (although in large corporations, a middle-to-low level executive position would be ideal). The reasons why such position is important are due to the Focal Insider's roles before, during, and after the project.

Before (and during) the Insider Econometric study, the Focal Insider acts as the main project sponsor, being the first (and most solid) bridge between the Researcher and the Organization. Some of the expected responsibilities are to arrange the first meetings with other managers and executives to:

- present the potential of a research project;
- raise the current interests and needs of the Organization that might be met by a research project; and
- schedule (individual) meetings with managers and the Researcher on the hope to find a common ground to define a project which is jointly interesting to the Organization and the Researcher.

Without such connection, the Researcher would most likely face barriers to contact people in the Organization with decisions power and autonomy to support the project and to assemble a diverse pool of managers on the search for validation of a common research question.

Once the first contact was established, the Focal Insider must continue to actively sponsor the project while navigating the political and bureaucratic tides of the Organization. Being a sufficiently senior staff grants the Insider enough firms-specific knowledge regarding who are the best insiders to resort when dealing with matters as requesting sensitive data access, drafting and signing a confidentiality agreement between the Organization and the Research, or even assembling a support team which will assist the Researcher in his/her requests (crucial for medium- and long-term projects). Further, the knowledge of the prevailing political and social networks is expected the increase the chances of proposing a research project which is palatable to the Organization and its managers. During the project, the Focal Insider acts as a thermometer to perceive organizational changes or intra-Organization dissatisfactions (e.g. managers whose position may be weakened by the project) that may undermine the continuation of the research project. Anticipating such barriers and communicating them to the Research is crucial so that both can define contingency plans.

Finally, after the project has ended, the Focal Insider will disseminate the results to the Organization and potentially leverage the Researcher's status with the firm. Although "simple", the dissemination step is crucial to prolong the partnership between the Organization and researchers and to allow further projects in the future.

Other organizational insiders

Finally, *Other Organizational Insiders* is a group of individuals comprising the last subject involved in an Insider Econometric Study. When developing research in partnership with a company, understanding what the main concerns, limitations, and even potentially interesting new research questions are is a process that entails gathering experiences from several individuals working in the Organization. These are the individuals who know the nuts-and-bold of how the data was generated, what are the limitations of each dataset, who know details of past company policies (to motivate future research), or even how current policies work. Although they are not directly involved in the day-to-day activities of the research project, establishing a relationship Other Organization Insiders is crucial to advance a solid Insider Econometric project which mixes both quantitative rigor and a detailed qualitative understanding of the research setting.

Phases of an insider econometric study

After understanding what the Insider Econometric method is and which are the most prominent subjects involved, Figure 1 draws a guide on the phases of IE research. Further, we propose not only which subjects are the most crucial participants of each phase, but also display how the definition of the research problem in an IE study is affected by almost each different phase of the research design.

The initial phase of an IE research is the *first contact* between the Researcher and the Focal Insider. In this phase, an individual with preconceived research interests and theoretical background meets with another individual from an organization and their interaction evolves into a common research interest. This first contact may initiate in a passive way (e.g. Researcher and Focal Insider meet at a conference and engage in conversation) or an active way (e.g. Researcher actively seeks an individual to discuss the possibility of partnering with an organization to conduct research). Conversations are preliminary, and the main objective is for both parties to find a common set of rough research questions catering both the Researcher's academic interests and the Focal Insider's personal agenda/goals related with the organization where he works. Even in this preliminary stage, we observe the effect of the partnership on the ultimate research question: a Researcher with potentially several interests in mind must find a common support of questions, which caters to the Focal Insider's goals and interests. If a common ground is not met, the project will not reach the second phase: *sponsorship of the partnership*

After defining a common pool of rough research questions, the Focal Insider must sponsor the partnership before the Organization. Traditionally, this entails presenting to an Executive or groups of Executives the potential benefits of conducting a joint research effort with the Researcher. In this phase, the Researcher has a secondary role of supporting the Focal Insider to present a strong case on why the partnership would be jointly beneficial while also being flexible to receive feedback on matters which the Organization deems important. After the Focal Insider presents the rough research questions to the Organization, she/he will receive feedback not only on which aspects questions are of more/less interesting, but also gather new ideas of aspects not covered by the previous questions. It is through this interaction between the Focal Insider and the Organization, and later the Researchers, that the study evolves to a set of sponsored and approved research questions to be explored in the project. Indeed, the Researcher must verify the extent to which the sponsored research question meets his own research interests before continuing the process. If that is the case, by the end of this phase, it is expected that the Organization and the Researcher sign a non-disclosure agreement so the later can start an in-depth investigating the organizational context.

Guided by the set of sponsored research questions, the Researcher will rely on the intra-organization political and social knowledge of the Focal Insider to schedule appointments with other managers, workers, and even executives to understand the context, policies, day-to-day routines, and even data availability of the processes involved in the set of sponsored research questions. It is by *understanding the context and data availability* that the Researcher redefines the research questions. Field visits and interviews highlight a new group of research questions that could have been ignored by the Organization but that are highly relevant to Other Insiders but also uncovers which intra-organization datasets exist or could be created to answer this new pool of research questions. After this phase, the set of research questions should not only be sponsored by the Organization and Other Insiders but also be feasible in the sense that there exists (or there is a possibility to collect) data associated with the research questions of interest.

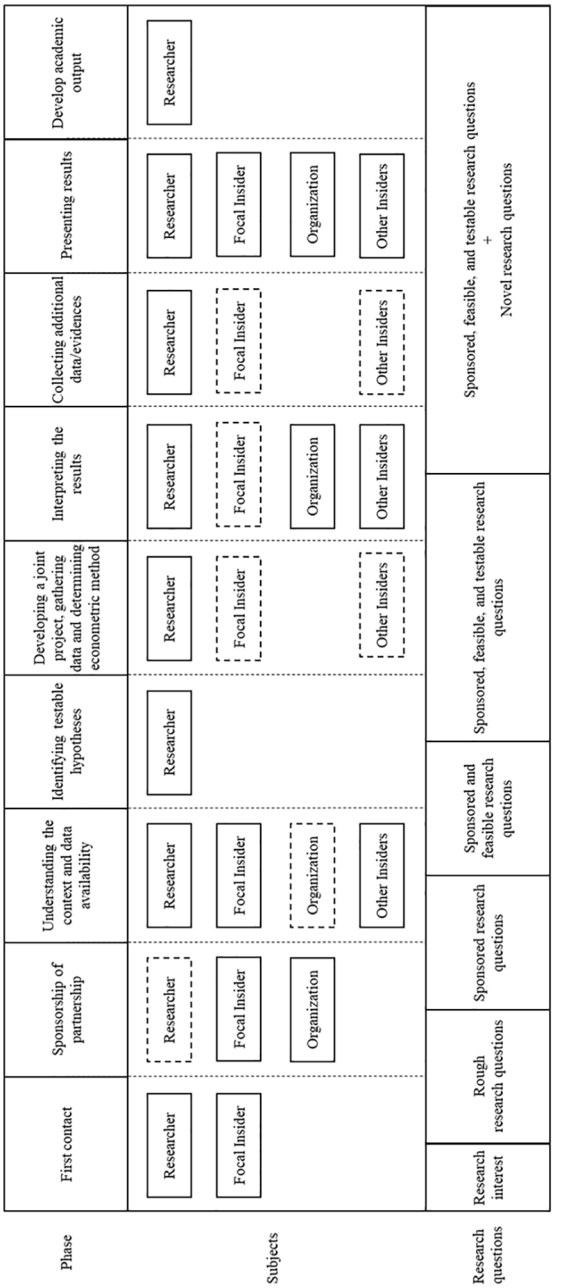

Figure 1.
Phases of an Insider Econometric Study

Armed with a set of research questions that have internal support and that have supportive data, the Researcher must use its theoretical and technical background to define which the interesting testable hypotheses are. The Researcher uses his discretion and knowledge of the (potential) data availability to *define a set of testable hypotheses,* which are both theoretically interesting and useful to the practitioners from the Organization. This set of hypotheses will then lead to the next phase of *developing a joint project, gathering data, and determining the econometric method* to test such hypotheses. The Research takes a prominent role and will either gather existing data with Other Insiders, by levering the Focal Insider's political capital, or develop an entire project to collect new data or even create a new business policy to test the hypotheses. The Researcher should assume the front seat of the research and project design to avoid that the data collection process or the project implementation are compromised by lack of technical rigor. Following the project/data collection, the Researcher will apply the pre-selected econometric methods, or even potentially other econometric methods (for instance, if the researchers uncover data constraints during the project implementation), to the collected data to reach a conclusion about the testable hypotheses.

Interpreting the results of the econometric exercises can be, however, challenging. Although hypotheses could be confirmed, understanding the underlying mechanisms through which they were confirmed may benefit from another round of interviews and even presenting the preliminary results to stakeholders. Discussing the results with Other Insiders and the Organization is even more important if hypotheses were not confirmed, and the econometrics analysis leads to unexpected findings. Indeed, the richness of IE is to use such qualitative and anecdotal evidence to understand econometric estimates. Such results may even generate new research insights that could be incorporated into the original research questions. To understand these unexpected results, *collecting additional data* may be a crucial next step.

Presenting the results to the Organization, Focal Insider, and Other Insiders is the last intra-organization step of IE. Motivating, showing, and making the results clear, and suggesting paths of action to stakeholders involved in the project will help the Organization to internalize the benefits of the research findings and potentially benefit them. Further, this phase is crucial for the Researcher to solidify the partnership with the Organization and the Focal Insider on the hope to develop further research projects of common interest. Finally, the last phase of an IE is outside the company: The Researcher will *transform all the knowledge and findings gathered from this research into an academic output* (e.g. a scientific journal, a book, etc.). Note that throughout all phase of the research project, this is the only phase where the Researcher does not interact with any other subject.

Conclusion

In this paper, we demonstrated the potential of IE to management research. Actually, recent scholarship highlights the use of non-publicly available information from real-world organizations in private, public, and nonprofit settings as a useful and valid approach to advance management research (Cabral & Lazzarini, 2015; Frank & Obloj, 2014; Ichniowski & Shaw, 2013; Lumineau & Malhotra, 2011; Shaw, 2009; Teodorovicz, 2019a). By showing the origins of IE, the subjects involved, and devising a framework with the phases of an IE study, this paper offers a guide to management scholars interested in the use of internal organizational data to both advance theory and provide support to practitioners' decision making in a more evidence-based fashion.

More intense use of IE can be particularly helpful to an enriched understating of the micro foundations of some managerial constructs including capabilities, human capital, relational governance, incentives, attention and their potential to explain heterogeneous

performance. Considering the intense changes in the competitive landscape, an improved dialogue with real world managers and the exploration of unique datasets is crucial to reduce the gap between academia and practice. In this vein, not only management theories can be built and adapted in response to the observed changes in a faster way but also managers can shape their strategic choices more consistently.

Notes

1. Although Insider Econometric studies could use other data sources as matched employee-employer panel dataset, data from several firms, industry census data, among few other highly detailed datasets (Ichniowski & Shaw, 2013), here we focus on the most common case of single-firm and highly detailed datasets.
2. Matching, differences-in-differences, synthetic control, and regressions discontinuity design are amongst the most used techniques in Insider Econometrics. See Athey and Imbens (2016) for a review in of the current standard econometric methods of policy evaluation.
3. For experimental research using highly detailed within-firm data, see Atkin, Chaudhry, Chaudry, Khandelwal, & Verhoogen, 2017; Bandiera, Barankay, & Rasul, 2011; Bandiera et al., 2013; Bloom, Liang, Roberts, & Ying, 2014; and Teodorovicz (2019a, 2019b).

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