2. Order from chaos: sociology as a population science*

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I know of scarcely anything so apt to impress the imagination as the wonderful form of cosmic order expressed by the ‘Law of Frequency of Error’. The law would have been personified by the Greeks and deified, if they had known of it. It reigns with serenity and in complete self-effacement amidst the wildest confusion. The huger the mob, and the greater the apparent anarchy, the more perfect is its sway. It is the supreme law of Unreason. Whenever a large sample of chaotic elements are taken in hand and marshalled in the order of their magnitude, an unsuspected and most beautiful form of regularity proves to have been latent all along. (Francis Galton 1889, Natural Inheritance)

The discovery of order in chaos is the sociologist’s calling. Every sociologist, whether empiricist or theorist, has aimed to pull clarity from confusion, to draw regularity from seeming randomness.

The pursuit of order may be common to sociologists, but the style of pursuit differs substantially within the discipline. Taken-for-granted assumptions, theoretical priors, and methodological approaches may differ even among sociologists working on the same substantive problem. However, ‘schools’ or ‘traditions’ can be identified, within which we find shared understandings of what constitutes sociological knowledge. In this chapter, I outline one such tradition—sociology as a ‘population science’—and describe its key features. This approach to sociological knowledge has at its core the identification and explanation of empirical regularities. Because the concept of regularity is so central to population science, most of the research falling within the tradition is profoundly influenced by the statistical treatment of variation. Statistics provides a framework for parsing out true regularities from natural variation, and for drawing inferences about population-level processes on the basis of sample characteristics.

The population science approach has been represented in sociological and demographic research for over a century (e.g., Du Bois 1899; Coleman 1966; Blau & Duncan 1967; Featherman & Hauser 1978; Namboodiri 1988; Shavit & Blossfeld 1993; Xie 2007; Goldthorpe 2021). But it is only more recently that this approach came be to be formally labelled as ‘population science’ (Goldthorpe 2016). As such, those who work within the tradition do not necessarily label themselves as ‘population scientists,’ and nor is population science institutionalized within the discipline of sociology. In common with all fields-in-development, the boundaries of population science are not well-defined, and there is contestation around which beliefs and research practices belong within the field.

† I thank Richard Breen, Nan Dirk de Graaf, Klarita Gërxhani, John Goldthorpe, Gianluca Manzo, Werner Raub, Yu Xie, and participants in the Handbook online meetings for their helpful comments on an earlier version of this manuscript.
Nevertheless, Goldthorpe argues that it is possible to identify a set of shared principles and practices that might, in the future, define the boundaries of an institutionalized population science.

In this chapter, I begin by outlining the shared practices of sociology as a population science. I then consider the treatment of variation and explanation under population science. I conclude with a discussion of challenges that the population science paradigm must address if it is to achieve its full promise.

1. SHARED PRACTICES

In establishing the scientific practices that bind population scientists together, it is helpful to draw upon Thomas Kuhn’s description of a scientific paradigm (1977, 2012). Kuhn describes a scientific paradigm as a set of shared practices, based on commitments to particular guiding principles, methods of analysis, models, and applications.

Guiding principles: Three guiding principles are of special importance in the field of population science. First, in contrast to some schools of sociological research, population science is firmly committed to the practice of science. It is taken for granted that research must meet scientific standards with respect to theory and empirical evidence: testable and falsifiable propositions should be derived from theory, and reliable, replicable, and valid empirical evidence should be used to determine the truth or falsity of those propositions. Second, the primary focus of empirical investigation is population-level regularities. These regularities might pertain to single variables, or to relationships between two or more variables. Examples of population-level regularities include the well-established association between class origin and class destination, or the increasing test score gap between rich and poor children (on the former, see Breen & Müller 2020; on the latter, Reardon 2011). And third, description and explanation are both fundamental to the population science endeavor. Careful and precise description is a prerequisite for sociological explanation. But description must also be oriented toward an eventual explanation, and description for description’s sake is discouraged.

Methods of analysis: Much of the research falling within the population science tradition is highly quantitative. This is because the identification of empirical regularities is most easily achieved through statistical analysis: measures of central tendency identify regularity in univariate applications, while measures of association can be applied in the multivariate case. Statistical measures of dispersion make it possible to quantify variation around central tendencies, and provide a basis for drawing population-level inferences from sample data. On the whole, population scientists analyze data on samples rather than full populations (e.g., nationally representative sample surveys, cross-national student assessment data), but as administrative data become more widely available, analyses of full population data are likely to make up an ever-larger proportion of research in this field. Qualitative and experimental studies are less frequently found in the existing population science literature, although these methods may be of great value in identifying and testing the micro-level mechanisms proposed as explanations of the macro-level empirical regularities (e.g., Jackson & Cox 2013; also see the chapters in this Handbook by Varese on rigorous ethnography, by Ermakoff on historical sociology, and by Gërxtani & Miller on experimental sociology).
Models: Models, and heuristics, are a crucial part of any scientist’s toolkit. Models provide a framework for interpreting descriptive results and they aid in explanation. Although empirical regularities at the population level are the central focus of the descriptive research arm of population science, a micro-level behavioral model is the touchstone of explanatory work within this field. Macro-level regularities are explained through reference to micro-level behavioral mechanisms: the actions of individuals aggregate to produce the observed population-level patterns (see the chapter by Raub, De Graaf & Gërxhani on rigorous sociology; Coleman 1990). The micro-level behavior is, in principle, observable, and the model therefore testable, but in practice the mechanisms generating empirical regularities very frequently enter into a population science account via assumption, or theory, rather than via direct measurement.

Applications: Within the boundaries of population science can be found a commitment to the principle of cumulation. In ideal circumstances, a well-functioning subfield within population science will encompass a large number of researchers working to document a large number of empirical regularities, which when accumulated will provide a strong descriptive overview of that subfield. Alongside the descriptive results, the subfield will also provide a set of well-documented micro-level mechanisms that account for the empirical regularities. Although cumulation is central to many scientific fields, the strong commitment to cumulation within population science stands out in the context of the discipline of sociology (e.g., Kerckhoff 1984; Goldthorpe 2005; Hout & DiPrete 2006). This cumulative knowledge then provides the basis for further theory development and empirical research.

A key distinguishing feature of population science is that prediction is only feasible at the population level. Any individual’s behavior or circumstances may be difficult to predict with accuracy, because there is too much unexplained individual-level variation. But at the population level, prediction becomes possible: central population tendencies and relationships are more stable and predictable than the cacophony of individual behavior that produced them.

Population scientists, then, share a vision of sociology as rigorous, scientific, and oriented toward documenting and explaining empirical regularities. It is important to emphasize that many of the principles to which population scientists would subscribe are also touchstones for scientists working within other paradigms that might fall under the banner of ‘rigorous’ sociology (see the chapter by Raub, De Graaf & Gërxhani). Rational choice theorists, for example, would share the conviction that micro-level decision-making processes should be the focus of sociological explanation (see Diekmann’s chapter). Computational social scientists (see the chapter by Flache, Mäs & Keijzer) have pushed the wider discipline to document research practices and methodological decisions via replication packages, thereby promoting transparency, reliability, and replicability in research (see also the chapter by Auspurg & Brüderl). Any number of qualitative researchers have insisted that sociological explanation rests upon detailed observation and description (see Varese’s chapter). The virtue of conceptualizing population science as a paradigm is that it clarifies that researchers working within the field are committed to an entire set of principles defining that program of research.

A further virtue of the paradigm concept is that it clarifies the extent to which a commitment to population science is in part cultural, such that membership of the paradigm is part of an individual scientist’s identity. This matters, because no individual piece of
research could document all relevant empirical regularities alongside the micro-level mechanisms producing those regularities. Indeed, individual researchers may never contribute to all of the important tasks of population science; some researchers may specialize in performing statistical analysis and establishing regularities, while others might focus on developing micro-level models to explain the regularities established by their colleagues. Belonging to the population science paradigm means contributing to a collective endeavor that satisfies the guiding principles of the field.

2. GOD IS IN THE VARIATION

Population science is a field distinguished by its relationship to variation. Even a casual observer of human behavior would appreciate that there is a great deal of variation in individual actions, beliefs, and characteristics. The task of the sociologist is to make sense of this variation. For a sociologist working within the population science field, this sense-making has three components. First, it is necessary to establish empirical regularities, by drawing out population-level patterns from the individual-level variation. Second, variation around the regularities must be quantified and classified: how much variation is there, does the variation indicate that there are important sub-population regularities, and how much of the variation can be assumed to be random? And third, the population-level regularities and quantified variation must be explained by reference to a micro-level model of human behavior, a model that can account for both regularity and variation in behavior.

In his book outlining the principles of sociology as a population science, John Goldthorpe writes that,

> the goal of sociological enquiry should be an understanding not of the states and behaviour of the particular individual members of . . . populations in all their variability, but rather of the regularities that are the properties of these populations themselves, even though they are emergent only from the behavior or . . . from the actions of their individual members. (Goldthorpe 2016, p. 12)

‘Regularities’ are perhaps easiest to define in statistical terms. Every measurable characteristic of an individual, and every measurable individual behavior, can in principle be recorded for all members of a given population. For example, we might record achievement test scores for a population of all 15 year-old students in the United States. Across that population, there is likely to be a substantial degree of variation in test scores; some students will have scored very poorly, others very well, and still others will have achieved adequate, but not outstanding, scores. This distribution of test scores can be summarized using measures of central tendency and dispersion. Measures of central tendency—mean, median, and mode—reveal regularity, and make it possible to distinguish the ‘typical’ student’s test score from the noise of the distribution of scores.

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1 I focus here on attributes that are relatively straightforward to measure (i.e., sociodemographic characteristics and educational achievement). It is important to recognize that some measures of individual attributes might be rather more difficult to measure, such as those that capture ‘relational’ data (e.g., friendship or work networks).
Measures of central tendency provide a useful summary of single variables, but the types of regularities of most interest to population scientists are those that pertain to relationships between variables. For example, what is the relationship between student test scores and class origin? A simple approach to answering this question is to examine the conditional means: after assigning each student to a class category, within-category mean test scores can be calculated, and these means can then be compared across class categories. Further comparisons can be made by calculating these conditional means for samples of students from different time periods, or countries, or ethnic groups. Additional statistical techniques might be used to capture the strength of the associations between variables, and the extent to which the strength of association varies over different samples. Indeed, a great deal of research undertaken within the population science tradition has examined test score inequalities using precisely this approach (e.g., Van de Werfhorst & Mijs 2010; Reardon 2011; Parker et al. 2018; Chmielewski 2019).

Summaries of individual variables, or characterizations of bivariate and multivariate relationships, provide the basic empirical foundation for the claim that a regularity exists. Drawing these regularities out of individual variation makes it possible to provide a clean and concise description of the key social and demographic features of any population: the individual-level variation is suppressed and subdued. But variation has three important functions in a population science analysis.

First, measures of variation—such as the variance and standard deviation—make it possible to interpret measures of central tendency in full context. If there is a great deal of dispersion around the mean, for example, we might draw different conclusions about our population than if there is very little dispersion. Measures of variation may even be the focus of an analysis, and the dispersion itself may come to be understood as the empirical regularity of most interest. The most prominent example of a dispersion-based regularity in social science pertains to the concept of income inequality (e.g., Piketty & Saez 2003; Krueger 2012). It is likely that fewer sociologists would be able to describe changes in median income over the past 50 years than would be able to describe changes in income inequality, because the dispersion of income is frequently discussed by academics and politicians alike, while the central tendency is rarely even noted (see Hirschman 2021 for a discussion of how the long-term trend in income inequality in the United States came to be established as an empirical regularity).

Second, measures of variation make it possible to draw inferences about populations on the basis of sample data. A large majority of the work within the population science tradition has been based on samples of populations; for most social scientific applications, the cost and inconvenience of collecting full-population data is prohibitive. Inferential statistics are used to quantify variation around the measures of interest, and to determine the likelihood, for example, that an association at least as large as that calculated for the sample would have been observed if the true population association was zero (for an introduction to statistical inference, see Cox & Donnelly 2011). Within population science, significance tests are the main route to firmly establishing a result as a ‘regularity’. Note that some regularities are established via a pattern of insignificant

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2 There is, of course, a lively discussion with respect to whether or not tests of statistical significance should be used to establish that effects are ‘real’ (Amrhein et al. 2019; Wasserstein & Lazar 2016). One extreme position holds that researchers should not use or report p-values in scientific analysis. A more moderate
effects or associations: in *The Constant Flux*, for example, Erikson & Goldthorpe (1992) show a high degree of constancy in social fluidity over time, and this constancy is the regularity that must then be explained.

The two functions of variation discussed so far will be familiar to those with even a basic understanding of inferential statistics. And yet it is important to emphasize these functions because there are areas of sociological investigation outside of population science that approach variation quite differently. Many small-\( n \) studies, such as those found within comparative-historical or qualitative sociology, aim primarily to describe central tendencies in the data, and an assessment of the degree of variation around these central tendencies is rarely found. In addition, there are many sociological studies that rely on analysis of non-random samples: small-\( n \) studies can again be found among this group, alongside some ‘big data’ analyses that investigate, for example, the contents of popular websites. On the whole, these studies do not discuss the extent to which sample-to-sample variation might be misleading with respect to population-level patterns. Population science is not unique within sociology with respect to its focus on variation, but this focus does distinguish population science from some other influential approaches within the field.

The final function of variation for a sociologist working within the population science tradition derives from its role in the identification of plausible causal mechanisms. Variation can be broadly divided into three main types: ‘categorical’, ‘identifying’, and ‘nuisance’ variation.

By ‘categorical’ variation, I refer to variation along dimensions of predetermined theoretical or empirical importance. Categorical variation is employed in a great deal of descriptive research, and many well-established regularities rest on the exploitation of variation of this type. Importantly, there is broad understanding that categorical variation is of interest even if exploiting this variation will not necessarily reveal a causal relationship (see particularly Xie 2007; 2013). Within the population science field, categorical variation will often capture sociodemographic distinctions of interest to sociologists, such as gender, class, income, or race. Variation between men and women in hourly pay, for example, is generally understood to be of sociological interest whether or not we identify a causal relationship between gender and pay. Cataloging empirical regularities by exploiting multiple categorical axes of variation lays a strong empirical foundation for micro-level explanations of the type discussed in the following section.

‘Identifying’ variation refers to variation that might be exploited to establish associations that can reasonably be given a causal interpretation. There are two quite distinct approaches to exploiting identifying variation. First, variation may be used to establish what we might label ‘robust’ associations, that is, associations that have been purged of the effects of possible intervening variables (Goldthorpe 2001). In the example above, we might find it necessary to control for occupation, hours worked, educational level, age, seniority, and so forth, before we were willing to claim that a gender gap in pay had been established.\(^3\) The second approach to identifying variation originates in the ‘potential position holds that the information provided by significance tests should be evaluated alongside all other pieces of evidence.

\(^3\) Determining which variables are the appropriate statistical controls is not necessarily straightforward. Assumptions about likely confounders must be made based on theoretical priors, and there may be disagreement among sociologists about appropriate controls. For a discussion of this issue in the context of the gender pay gap, see Schieder & Gould (2016).
outcomes’ framework (Rubin 1974; Holland 1986). In this framework, identifying variation is used to identify the ‘causal effects’ of one variable on another, largely through application of the methods of causal inference described in Breen’s chapter (see also Morgan & Winship 2015). Although there is a fair degree of overlap between researchers working within the population science tradition and those applying methods of causal inference, Goldthorpe explicitly disavows the potential outcomes approach to causation, arguing that where researchers are concerned with the micro-level causes of observed regularities, methods of causal inference are less useful (2016, pp. 109–111). Whether or not this strong resistance to the potential outcomes framework becomes dominant within the field of population science remains to be seen; there are already many examples of population scientists applying causal inference methods to good effect (e.g., Torche 2011; Torche & Sirois 2019).

Finally, for completeness, I include the category of ‘nuisance’ variation. Nuisance variation arises from processes unrelated to the aim of a sociological study. Such variation will be captured and quantified in the error term of a statistical analysis, and is generally not of interest to population scientists in and of itself.\footnote{Note that ‘noise’ may be of interest in other fields falling under the banner of rigorous sociology, such as computational social science (e.g., Macy & Tsvetkova 2015).}

3. EXPLANATION IS IN THE DETAILS

Careful treatment of variation has allowed population scientists to accumulate a substantial set of empirical regularities describing the important features of both past and contemporary societies. The accumulation of empirical regularities within sociology has been encouraged by the increasing availability of quantitative data, increased computing power and technical proficiency, and, not least, the increasing number of sociologists and other social scientists (Dingwall et al. 2018). There has, in addition, been a concerted movement to promote the value of descriptive research (Loeb et al. 2017), and it is now common to see high-profile visualizations of descriptive social science results in the national media (e.g., Aisch et al. 2017; Badger et al. 2018).

This body of descriptive evidence stands, regardless of whether or not explanations of the regularities exist. Empirical regularities, particularly when popularized as ‘stylized facts,’ may act as important touchstones for scientific literatures or public discussion. The rise in income inequality in the United States in the last decades of the twentieth century is one example of a regularity operating as a touchstone (Piketty & Saez 2003). Racial inequalities in the risk of being a victim of a police shooting is another (Edwards et al. 2019). Some touchstones become the focal point around which entire scientific subfields develop, while others spur social and political movements into action. When popularized as stylized facts, empirical regularities assume both scientific and normative importance; as Hirschman writes, stylized facts are, ‘claims about the kinds of things that exist in the world and the patterns of relationships between those things; simultaneously, they are claims about what parts of the social world are worth explaining’ (Hirschman 2016, p. 605).

For a population scientist, descriptive research is not pursued in the hope that an empirical regularity might be upgraded to a stylized fact. Rather, empirical regularities
are pursued because they speak to a problem defined as important by existing theory. Further, establishing empirical regularities is recognized as but a single step in the explanatory process. All empirical regularities pursued within population science are worth explaining, indeed, regularities are pursued only with the intention that an explanation for the regularity can be secured in the future.

Goldthorpe’s treatise on population science represents an attempt both to describe the current practices of population scientists, and to prescribe how population scientists should go about explaining empirical regularities. For Goldthorpe, a population science explanation must be rooted in the actions of individuals. He argues,

In order to provide causal explanations for established population regularities, causal processes, or mechanisms, must be hypothesized in terms of individual action and interaction that meet two requirements: they should be in principle adequate to generate the regularities in question and their actual operation should be open to empirical test. (Goldthorpe 2016, p. 112)

In addition to insisting that methodological individualism should be at the heart of population science, Goldthorpe further asserts that the processes or mechanisms identified should ideally be specified in terms of the rational action of individuals.

As is clear from Goldthorpe’s description, explanation in population science rests on processes and mechanisms specified at the micro-level. This, then, necessitates an explanatory model that is capable of linking the empirical regularities of interest—observed at the macro-level—to micro-level mechanisms and processes. Research within the population science tradition calls upon the basic model of sociological explanation that is colloquially known as ‘Coleman’s boat’ (Coleman 1990). Under Coleman’s model, macro-level causes produce macro-level effects only through processes that operate at the individual level: macro-level causes have expression in micro-level causes, micro-level causes produce micro-level effects, and micro-level effects aggregate (either via simple accumulation or more complex interdependence processes) to produce macro-level effects. Empirical regularities as conceptualized within population science represent the macro-level causes and effects. Micro-level mechanisms are then proposed to explain how individual actions aggregate to produce these regularities.

An illustrative example may be drawn from the study of racial residential segregation. The pattern of residential segregation is well-established within individual countries, and there is a similarly substantial body of evidence that tracks changes in residential segregation over time, and that measures associations between residential segregation and other characteristics of neighborhoods and communities. This research field has demonstrated, for example, that racial segregation is a longstanding feature of American society, that a high proportion of Black Americans experiences ‘hyper-segregation,’ and that residential segregation remains high in the contemporary United States, even if there is a long-term trend in the direction of greater integration (e.g., Du Bois 1903 [2008]; Massey & Denton 1989, 1993; Logan et al. 2004; see Charles 2003 for a review). This is a field, then, that is rich in empirical regularities, and there is clear academic and social interest in being able to explain how those regularities have arisen.

There is no shortage of theoretical work on the problem of residential segregation. Some of this work favors explanations of segregation that are focused on macro-level causes, such as ‘redlining’ and exclusionary zoning, federal and state policy, and the racist cultural logics that have infiltrated prominent American institutions (e.g., Massey &
Denton 1993, see Charles 2003; Pattillo 2005 for reviews). From the perspective of a population scientist, these explanations lack completeness, because they fail to describe how the macro-level causes produce changes in individual behavior, and how the individual behavior aggregates to produce the observed empirical regularities. But there are explanations of residential segregation that are rooted firmly in the behavior of individuals, explanations that are more consistent with a population science approach. For example, Bruch has emphasized the importance of understanding individual housing decisions when explaining patterns of residential segregation. Building on influential work by Schelling (1971), she has employed agent-based models to simulate how individual decisions about where to live can produce regularities at the macro-level. With Mare, she shows that if white Americans were to have the same preferences for living in integrated neighborhoods as Black Americans, the degree of residential segregation would be much reduced from the observed levels (Bruch & Mare 2009, see also Bruch & Mare 2006; Van de Rijt, Siegel & Macy 2009). Bruch’s work exploits simulation techniques, theoretical insights from decision science, evidence on attitudes and preferences, and qualitative research findings on neighborhood choice, to build a plausible micro-level model of residential segregation, which is then tested for consistency with the macro-level results (see also Bruch 2014; Bruch & Swait 2019).

The example of residential segregation highlights the natural alliance between sociology as a population science and ‘analytical’ sociology (see Manzo’s chapter on analytical sociology; see also Goldthorpe 2021, Chapter 10). Much of the work of analytical sociologists involves the explanation of macro-level regularities through individual-level models; sometimes the empirical regularities to be explained are made explicit and foregrounded in the analysis, as in Bruch’s work, while at other times the regularities are backgrounded, described only to emphasize the importance of the research question. One important difference between population science and analytical sociology is that the latter puts more weight on how individual behaviors aggregate to produce macro-level regularities than the former. Put starkly, population scientists focus on describing individual-level behaviors that are assumed to quite straightforwardly produce central tendencies at the population level. Analytical sociologists, on the other hand, place more weight on understanding how the behaviors of one individual (or group) may influence the behaviors of other individuals (or groups). For this reason, analytical sociologists make more use of agent-based models, network analysis, and simulation, than do population scientists (see, for example, the chapters by Manzo, by Flache, Mäs & Keijzer, by Steglich & Snijders, and by Buskens, Corten & Raub).

A well-functioning subfield within population science is one in which relevant empirical regularities are well-documented and an explanatory model exists in which micro-level processes and mechanisms are called upon to explain the macro-level regularities. As Raub, De Graaf & Gërxhani note in their chapter, however, population scientists invest rather more heavily in establishing empirical regularities than in the development and testing of micro-level behavioral models. As a consequence, the current instantiation of population science in most subfields might be seen as a rather lopsided endeavor, with description outrunning explanation by quite some margin. The contrast between the expressed purposes of population science and the practice may be attributed to three factors. First, Goldthorpe’s vision of sociology as a population science is, to some extent, aspirational: population scientists should focus both on describing and explaining
regularities, even if only a minority of those currently working in the population science field are engaged in this joint pursuit. Second, population science is a science in development, and perhaps there are simply too few documented empirical regularities for it to be worthwhile to engage in full-throated explanation. As the field develops further, we might expect to see an increasing emphasis on micro-level explanations. And third, as discussed above, identification with the population science paradigm allows sociologists to belong to a collective project of which micro-level explanation is a part, without any individual population scientist being required to engage in such explanation. Given that current disciplinary incentives are geared toward specialization, there are good reasons to specialize in the description of empirical regularities without ever moving forward to explain those regularities. Belonging to the paradigm thus allows researchers to specialize in description, precisely because the paradigm puts such emphasis on explanation.

4. CHALLENGES FOR SOCIOLOGY AS A POPULATION SCIENCE

Population science is a paradigm in progress, as yet to be fully institutionalized. It is therefore prudent to consider the challenges that confront sociology as a population science, now and in the future. Challenges related to measurement and prediction are likely to be particularly important to address.

4.1 Measure What Can Be Measured

Population scientists are strongly committed to a scientific vision of sociology, a sociology that aims to create cumulative knowledge through rigorous empirical research. Research within this paradigm therefore proceeds according to standard scientific protocols, with attention directed toward issues of reliability, validity, and replicability. Accurate measurement is central to assuring reliability, validity, and replicability, and population science is a field in which great care has been taken to develop and employ reliable and valid measures (e.g., Evans 1992; Schneider 2010). But problems of measurement may arise even where scientists pay close attention to a measure’s quality.

Population scientists frequently rely on measures of sociodemographic characteristics provided in administrative data and sample surveys. In most countries, these measures will include sex and/or gender, race and ethnicity, age, socioeconomic status (e.g., occupation, class position), and perhaps also social origin characteristics (e.g., parental occupation). The analysis of large-scale datasets places constraints on the research activities of population scientists, because—with some notable exceptions, such as the European Social Survey and the General Social Survey—it is difficult for sociologists to influence the measures provided in these data sources. A reliance on existing measures and data sources comes with two dangers that sociologists should be mindful of.

First, a population scientist must resist the temptation to satisfice. Many of the measures available in existing datasets may be sub-optimal, and a researcher may be faced with a decision about whether to go forward with sub-optimal measures or abandon the project entirely. In making this decision, a population scientist must be aware of her responsibility to the field: a science built on explaining empirical regularities must be able
to trust that a regularity indeed exists in that form. Poor measures will weaken the evidence base, and make the task of explanation all the more difficult.

The second danger that reliance on existing measures brings is that administrative and survey data may be slow to reflect changing social trends. In the worst case, sociologists might continue to measure empirical regularities just as they always have done, while the world has changed such that any regularity-based explanation is no longer illuminating. Take, for example, the measurement of gender. Gender is measured in surveys via self-identification or observation, and until recent years this measurement was treated as straightforward, with respondents classified as ‘male’ or ‘female’. Of late, however, the concepts and measurement of sex and gender have come under scrutiny; transgender issues are increasingly addressed in the national press, legal protections for transgender individuals have been introduced, and around 0.4 percent of US adults identify as transgender (e.g., Baker 2019; Meerwijk & Sevelius 2017). As Westbrook and Saperstein have observed,

[a] hyper-gendered world of ‘males’ and ‘females’ . . . shapes what we can see in survey data. If not altered, surveys will continue to reproduce statistical representations that erase important dimensions of variation and likely limit understanding of the processes that perpetuate social inequality. (Westbrook & Saperstein 2015, p. 534)

There are important reasons to preserve consistency of measurement in the context of long-running surveys and administrative data sources, so changes to the measurement of gender are most likely to occur through the addition of questions and categories capturing further dimensions of variation. The population scientist is then left with a dilemma: how should those who do not identify as ‘male’ or ‘female’ be categorized? And how should those who do identify as male or female be compared over time? If we were to track changes in the gender wage gap, we would need to consider how far selection into the gender categories changes over time, and ask whether the selective processes implicated in choice of gender identity might also have effects on wages. If the vast majority of people continue to identify as male or female, changes in the meaning of gender and its measurement might be inconsequential. But where identification with the new categories is commonplace, serious questions arise with respect to the interpretation of findings based on the older categories.

The example of gender highlights the need for population scientists to be nimble in response to possible changes in the meaning of an empirical regularity. Empirical regularities are valuable only insofar as they reflect the world as it is. This example also underscores the importance of attending to the sociological research literature outside of population science, which is likely to identify (and, in some cases, produce) changes in the meaning of categories well before these changes are picked up by population scientists.

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5 Note that these categories are named to identify sexes, but the male/female measure has been commonly used to measure gender (a social construction). See Richie (2019) for a recent discussion of the gender/sex distinction in the context of medicine.
4.2 The Law Falls Silent

A population science account explains macro-level empirical regularities by reference to micro-level mechanisms and processes. Goldthorpe’s discussion of explanation within population science is both a positive argument in favor of mechanism-based accounts of regularities, and an argument that is strongly critical of alternative forms of sociological explanation. In particular, he argues that a search for sociological laws is probably a futile activity for sociology as a population science (see also Xie 2013, and Xie’s 2007 discussion of Otis Dudley Duncan, who held a similar distaste for law-based sociological explanation).

The ambitions of early sociologists with respect to sociology’s purpose are well established. For sociologists such as Comte and Durkheim, a scientific sociology was a sociology in which the laws of societies could be discovered, in much the same way as natural scientists aimed to discover the rules of the natural world (Comte 1858; Durkheim 1895 [2014], 1897). But it is not necessary to insist that sociology’s true purpose lies in discovering the laws of social behavior in order to recognize that sociological laws (or law-like statements) might be of some benefit to both the discipline and society. One advantage of thinking in terms of laws is that prediction is relatively straightforward: given a particular behavior, we can determine the appropriate sociological law covering the type of behavior in question, and that law allows us to predict future behavior or outcomes (e.g., Hempel 1965; Popper 1934 [2005]).

Prediction is immensely valuable where social scientists hope to have an impact on the world through policy. In population science as currently conceived, empirical regularities are identified, validated through the process of scientific cumulation, and explained through reference to micro-level mechanisms. In this context, prediction is sharply delimited by the boundaries of the specific empirical regularity under study and the associated mechanism. This may be a cautious and perhaps even an appropriate approach to prediction in sociology, but it places constraints on sociology’s influence on policy. If prediction cannot be extended beyond the narrow confines of a particular regularity or micro-mechanism, the demands of policymakers are unlikely to be met; population sociology can neither provide a mechanism so narrowly defined that it can be addressed with a single intervention, nor a law that can guide more ambitious and imaginative policy design (Jackson 2020).

By way of contrast, consider the rhetorical power available to economists when proposing policy. Economists have available to them a coherent and elegant theoretical model, in which the laws regulating the economy and society operate in relatively predictable fashion. Policymakers are faced with an intoxicating framework that offers a systematic interpretation of current events and situations, and out of which predictions about future events and situations can easily be derived. The growth of ‘market fundamentalism’ and the subsequent dominance of neoliberal ideas within the policy communities of many post-industrial countries reflects this influence (Somers 2008; Block & Somers 2014; Prasad 2006). A framework that can make sense of a large number of empirical regularities, that can place these regularities in the context of a more encompassing explanation

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6 A related observation can be found in Hammersley (2017). Hammersley argues that mobility research is largely concerned with population-specific and time-specific regularities, and that it fails to identify explanatory mechanisms of sufficient generality.
of human behavior, and that holds the promise of prediction, is immensely attractive to those who aim to change society.

Given the current configuration of sociology as a population science, a wholesale reimagining of the role of explanation is unlikely. But it would perhaps be helpful for sociologists in this field to emphasize the commonalities and differences between different empirical fields and different micro-level mechanisms and processes. If similar mechanisms are found to be at work for a set of different empirical regularities, this pattern might be helpful in identifying other substantive areas in which similar explanations could be applied (see, for example, De Graaf & Wiertz 2019). If different mechanisms operate to produce seemingly similar regularities, this might lead us either to question the strength of evidence establishing one or other of the regularities, or to identify particularly meaningful differences between the seemingly-similar regularities, to the benefit of greater understanding. Focusing on commonalities and differences across empirical regularities and mechanisms is likely to be helpful in interpreting the results of new methodological techniques, or when the field moves to new substantive areas. A focus on commonalities also opens the door to wider policy influence, in that stronger arguments can be made on behalf of those interventions that are likely to have an impact in multiple areas.

4.3 Go Forth and Institutionalize

As I described at the beginning of the chapter, population science is a paradigm in progress. It is a paradigm with which many researchers appear to feel an affinity, even when the boundaries of the paradigm are relatively unclear. In this final section, I propose several steps that might aid in establishing the paradigm as a formalized and institutionalized field within sociology.

An important step toward establishing population science as a fully institutionalized paradigm is to determine the boundaries that separate ‘population science’ from ‘not population science’. In his description of sociology as a population science, Goldthorpe suggested that much of the research currently carried out under the auspices of demography and epidemiology would have a place in population science. Michael Hout further notes that, ‘[p]opulation science, if practiced rigorously, could potentially set the agenda, not just for sociology, but for much of quantitative social science’ (Hout 2016, p. 1010). Where, then, should the boundaries of population science be set?

Goldthorpe suggests one boundary condition, which rules out economics as a possible field of population science. Because economics embraces an explanatory framework in which a strong and widely shared theoretical model shapes both the questions asked and the explanations given for empirical regularities, it is inconsistent with the practice of population science, which searches for explanations of empirical regularities only after they have been established. In other words, a prior disciplinary commitment to a general theory of human behavior would mark the scientific practice as being outside the realm of population science. But the boundary between population science and not population science appears to be more ambiguous with respect to wholly empirical work. What is the place of sociological research that proceeds without appeal to theory or explanatory models, frequently disparaged and dismissed as ‘variable sociology’? Can a researcher within this mold reasonably hold that micro-level explanation is central to their vision of
sociology, just as long as other sociologists are the ones to take on this responsibility? Where researchers are operating in deliberate fashion and see themselves as contributing toward the collective outcome of the paradigm, this is a defensible position: scientific specialization is likely to have benefits, and the paradigm’s total output may well be increased if those with data analysis skills focus on producing a robust set of empirical regularities. However, if this is to be the arrangement, it is essential that highly specialized researchers are properly socialized into the values of the wider paradigm.

Socialization is an important part of the wider project of the institutionalization of population science. This socialization is most easily achieved via explicit training in the tenets of population science, with particular emphasis on the dual project of description and explanation. Where population scientists specialize in description, this should be with an awareness of the role that empirical regularities play in the whole project: these regularities should speak to sociologically-important questions, be interpretable (at least in principle) as the macro-level outcome of micro-level mechanisms and processes, and be reliable, replicable, and accurate. Where population scientists specialize in explanation, it should be clear that the body of empirical regularities demarcates the explanandum. After the initial training period, professional associations and journals have an important role to play in informing specialists of what others in the wider field of population science are working on, and in highlighting the successes of the collective project.

A final step toward the institutionalization of population science is for those in the field to invest in meta-analyses of empirical regularities and micro-level mechanisms. Science is a noisy project, and it is essential that we ourselves are able to pull out signal from the noise. We must have a sensible way to establish which regularities are well-supported and deserving of micro-level explanation, and which require further descriptive investigation. We must have a sensible way to interpret variation in the form of deviant findings, and a research structure that supports and encourages replication and robustness (e.g., Freese & Peterson 2017; Christensen et al. 2019). And we must have a sensible way to summarize and share the achievements of the field, as the established regularities and mechanisms of one substantive subfield may well aid in understanding the regularities of another.

A fully institutionalized population science offers sociologists a vision of the discipline quite different from that of some of its founders, but one nevertheless consistent with their aspirations for sociology. Sociologists have always aspired to discover order in the chaos. Population science promises order, while understanding that chaos comes with information: order and chaos, regularity and variation, both provide insight into the social world. The careful treatment of regularity and variation is the mark of a population scientist, and it is the foundation of a rigorous, scientific sociology.

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