THE ECONOMIST AS SCIENTIST, ENGINEER OR PLUMBER?

BY HUEI-CHUN SU* AND DAVID COLANDER**

Abstract

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Some well-known economists suggest that a good economist should act like an engineer, a surgeon, a dentist, or even a plumber. These metaphors are useful in helping economists reflect the nature of economics and their role in society. But which is the most sensible one? This paper argues that economists should be playing all these roles and more, because economics is not a single entity, and each entity has separate goals, methods, and boundaries. To take this multiplicity of roles into account this paper argues that in addition to the traditional boundary that delineates the disciplinary domain of economics against other sciences, an overarching boundary between economic science and applied policy needs to be recognized. It then examines Duflo's economist as plumber metaphor and suggests that a better metaphor for Duflo's purpose would be "general contractor", a metaphor that, if accepted, would suggest radical change in training applied policy economists.

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I. INTRODUCTION

What is an economist's job like? A good metaphor helps economists reflect the nature of economics as a discipline and their role in society. It has been described as dentists (e.g. Keynes 1930), engineers (e.g. Mankiw 2006; Colander 2013a; Roth 2002), and surgeons (Romer 2016). One of the most recent and intriguing analogies was given by Esther Duflo at her American Economic Association Richard Ely Lecture in 2017 (Duflo 2017). She compares part of economists' job with that of a plumber, and urges economists to adopt a mindset of the plumber for their work.

For most economists, who consider economics the queen of social sciences, Duflo's metaphor is no doubt radical, and probably a bit insulting and humiliating. Dentists, surgeons and engineers are at least professionals, and closer to the scientists which most economists think of themselves as. But plumber? That may be pushing the boundary for economists' humility quotient. Nevertheless, Duflo's plumber metaphor is more than a call for humility; it involves examining how economics should be done. Hence, whether her metaphor makes sense or not does not depend on how the economics profession feels about it, but whether economists can do a better job if they adopt the mindset of plumber. The same logic applies to other metaphors.

In this paper we argue that economists should be playing all these jobs and more, because economics is not a single entity, and each entity is better done with different methodologies and mindsets. This view is directly related to the question of what the boundaries of economics should be. We suggest that an additional new set of boundaries is needed besides the conventional disciplinary boundaries. Traditionally, the boundaries of economics are drawn to define the disciplinary domain. In many economist's mind, the boundaries of economics as a

discipline are implicitly specified in reference to science (whatever science means to them). If one takes this view, one sees doing economics as doing science, an economist as a scientist.

The standard way of thinking of boundaries is, in our view, insufficient in that it subjects all aspects of economics to the same boundaries when it makes much more sense for different aspects of economics, especially economic science and applied economics, to have different boundaries.¹

A key reason to differentiate the boundaries is that applied work is likely to face different problems than scientific work. Policy, for example, falls within the boundary of applied economics, but to the degree it requires integrating normative judgements, it needs to go outside the boundary of scientific economics for aspects of its work. Differentiating the boundaries between applied work and scientific work helps us make sense of Duflo's metaphor and adds insight into the role of economists. We believe that Duflo, and modern economists generally, do not adequately recognize the usefulness of separating science from applied work; they have a strong tendency to think of applied economics and economic science as having overlapping and congruent boundaries. This causes economists to fall short in various roles which they should fulfil. We argue that "scientist" should not be the overall category within which all economists fit. Economics includes science, but it is not just science. The boundaries of scientific economics should not be confused with the boundaries of economics.

Like skin, while being a constraint, allows the body to form a shape, boundaries of economics legitimize economists' focusing on one dimension of multi-faceted social phenomena and adopting the appropriate methods for their study. The boundaries also signify the

¹ In this paper, we use the terms "scientific economics" and "economic science" interchangeably.

jobs most economists do and the roles they play. Boundaries of economics matter. Hence, before examining what roles economists should play in the final section, we first argue in Section II that a new way of thinking about the boundaries is needed as it is essential for the economics profession to improve its ability to provide relevant and quality policy analysis. We outline our suggested approach with a focus on what we mean by “applied economics” in Section III. We then in Section IV bring the argument back to Duflo’s plumbing metaphor, and argue that a better metaphor for the point she is making would be a “general contractor” analogy. The general applied policy economist is best seen as the person who brings economic specialists together--the scientist, the craftsman, the plumber and the engineer to achieve some goal; the general economist needs to be an all-rounder, knowing to whom to go for specialized knowledge. The boundaries of the general contractor’s focus are indeterminate and dependent on the problem being considered.

II. BOUNDARIES MATTER

The conventional way of drawing boundaries: its function and insufficiency

From the late eighteenth century to the early twentieth century, the boundaries of economics were drawn by subject matter, namely, wealth and material welfare. Changes in boundaries occurred over time, away from material wealth boundaries. By the end of 1960s, the scope of economics was no longer defined as the study of wealth, but instead by the theoretical model used to study choice—constrained optimization, and the empirical implementation of that model with econometrics.

Even though the boundaries of economics presented in the textbooks may appear to be similar for more than fifty years since 1960s, the actual boundaries have never stopped evolving

as what economists do continues changing, some of which is on the edge of economics or even outside the boundaries. The lively development of economics in the past few decades has significantly changed the face of economics as well as its boundaries.

For instance, with the development of behavioral economics, and with game theory replacing calculus as the theoretical engine of analysis, modern economics widened its boundaries to include a wider range of empirical methods. Econometrics was supplemented by various types of experiments. Economists adopted carefully specified experimental methods and randomized controlled trials became the gold standard for applied micro economists. Boundaries have shifted: they are no longer defined by constrained optimization. Instead, what used to be seen at the margin or outside economics has been recognized as the mainstream. The fact that Daniel Kahneman and Richard Thaler, pioneer behavioral economists, won the Nobel prizes in 2002 and 2018, and that Abhijit Banerjee, Esther Duflo and Michael Kremer were the winners in 2019 for transforming development economics with experimental research methods is a good demonstration for this. Boundaries have shifted: even though it is not clear where exactly the new boundaries of economics are and what holds them together.

Either defined by wealth or methods, the above-mentioned boundaries in the different phases of the history of economics have all served a similar function, that is, to delineate the scope of economics as a discipline in order to differentiate its subject-matter and methods from other disciplines. Conceptualizing boundaries in this way *per se* is not a problem. However, problems arise when such disciplinary boundaries are assumed to be the boundaries of a science.

Our argument is that boundaries of economics as a whole are not the same as boundaries of economic science. Thinking about boundaries of economics in terms of boundaries

of economic science, in our view, misses an important element of the boundary dispute. It forces one to see the challenge faced by economics profession through a narrow perspective and as a result, issues beyond the boundaries of economic science tend to be neglected, in particular, issues in the policy domain. Therefore, we argue that a new way of thinking boundaries is needed. Specifically, the overarching boundary between science and applied policy needs to be recognized, with each activity being seen as having its own scope and method.

Introducing an extra set of boundaries: a revival of the classical tradition

Our proposal to draw boundaries between economic science and applied economics is by no means novel. It is actually a call for returning to the classical tradition that treats conducting scientific economic enquires and providing economic policy advice as separate activities with different natures. Hence, it is important to articulate what this tradition is.

Nassau Senior (1790-1864) is one of the key figures attempting to establish economics as a science in early nineteenth century England. In his book *An Outline of The Science of Political Economy* ([1836] 1951), he clearly announces a breakup with economists before him and confines political economy to be a scientific study of the nature, the production and the distribution of wealth. As the first Drummond Professor of Political Economy at Oxford, the first chair of political economy in England, Senior's approach to economics was well received at the time.

In a similar vein, John Stuart Mill (1806-1873) made a more thorough and complete discussion on treating political economy as science. In Mill's hand, political economy became a separate discipline in two senses. First, it was a discipline separate from other social sciences; second, it was a scientific discipline separate from ethics.

Because of the separation in the first sense, it was possible for classical political economists to examine economic phenomena without constantly blending political and sociological elements into their formal study. Economics becoming a separate discipline was accompanied by the division of labor, allowing different disciplines to study specific dimensions of social phenomena with the methods appropriate for the investigation. However, this advantage came with a cost. The conclusions reached by individual disciplines were partial. It follows that the conclusions reached by economics alone cannot provide policy prescription. Once the disciplines had separated, to reach a policy recommendation, a collaboration among disciplines became required.

With the limitation of economics as a separate discipline in mind, those economists we classified in the classical tradition² all share a similar view on constraining themselves from making policy advice by grounding based on economic theorems alone. For instance, at the beginning of his book, Senior issued a warning that it is not the job of an economist to recommend or dissuade using the conclusion of economic science as the sole or principal guides in actual conduct of affairs. One of the key reasons for Senior to justify this warning is that policy making requires considering *all* the causes which may promote or impede the general human welfare whilst economists as scientific theorist have considered only one of them, namely, wealth. (Senior [1836] 1951, pp. 2-3)

Similarly, Mill is fully aware of the limitation caused by the artificially drawn boundaries. He gave a clear warning about it. In this context, Mill stresses that “the mere political economist, he who has studied no science but Political Economy, if he attempt to apply

² Note that this does not include Adam Smith.

his science to practice, will fail” (Mill [1844] 1967, p. 331) and “the didactic writer on the subject will naturally combine in his exposition, with the truths of the pure science, as many of the practical modifications as will, in his estimation, be most conducive to the usefulness of his work” (Mill [1844] 1967, p. 323). These statements are made to appeal for attention to the problem caused by the isolation of political economy from other social sciences, rather than ethics.

Our call here is to revive this Classical recognition of the difference between economic science and applied economics. Using Colander’s (2013b) words, it is necessary to keep a firewall between theorems of economic science and policy advice.

This Classical tradition was further elaborated and summarized by John Neville Keynes in his *Scope and Method of Political Economy* (1890) in which he distinguished three branches of economics—normative, positive, and art. Normative economics was a philosophical consideration of the goals. Positive economics was a scientific consideration of the workings of the economy. The art of economics was a blend of the two, with vaguely defined boundaries and in large part non-economic. Boundaries depended on which branch one is working in. Applied economics belonged in the art of economics, which meant that it had different boundaries than did the science of economics. Within this tradition, whatever the scope and method of positive economics was, the methodology of applied policy economics was not dependent on it, and should be considered separately.

Rethinking the boundaries

This Classical tradition was lost in first half of the twentieth century, and was gradually replaced with the new approach that did not differentiate the boundaries of economic science and

applied policy. In the new approach one moves directly from the theoretical conclusions to policy prescription (Colander 2009, 2011, 2018).

Here we do not intend to give a thorough review of how the classical tradition got lost as it is beyond the scope of the paper. Rather, we use Robbins, who is usually seen as the turning point of the changing boundaries in the early twentieth century, as an example to demonstrate the difference between the conventional understanding of boundaries and the boundaries we are advocating in this paper.

In principle, the additional set of boundaries proposed in this paper is to delineate different entities *within* the discipline of economics as a whole. It is different from the traditional concept of boundaries that drawing the *outer* boundaries of economics as a discipline. Failing to recognize the difference of the two is one of the main causes leading to misinterpret Robbins's position, a misinterpretation that had significantly influenced the development of economics in the twentieth century.

The misinterpretation is understandable given that boundaries were still understood in the conventional sense while Robbins was in effect drawing the boundaries of economics in a new sense without being aware of the difference. In his well-known book *Essay on the Nature and Significance of Economic Science*, Robbins argued that the science of economics had no place for value judgements, and that the theoretical branch of economics could be defined as “the science which studies human behavior as a relationship between ends and scarce means which have alternative uses” (Robbins [1932] 1935, p. 16). He also argued that there was no scientific basis for interpersonal utility comparisons and hence they could not be part of scientific economics. Robbins's position has been understood as one arguing that if interpersonal

comparisons couldn't be made in science, they couldn't be made in economics. Indeed, according to the conventional account of history of economics (e.g. Blaug 1997), Robbins's argument undermined the utilitarian foundations of Pigovian applied policy welfare economics and led to the rise of the new welfare economics based on social welfare functions. But it only holds if applied policy economics is interpreted as having to fall within the boundaries of science. That was not what Robbins intended.

As Robbins argued in his Ely Lecture, what he intended to suggest is that economists deal with normative judgements in a different branch of economics separate from the scientific branch of economics. He calls this branch Political Economy. According to Robbins, Political Economy applies the technical apparatus of analytical economics to realize aims whose formulation lies outside economics in the stricter sense of the word, namely, scientific economics. Political Economy involves not only all the models of analysis, but also "explicit or implicit judgements of value that are usually involved when economists discuss assessments of benefits and the reverse or recommendations for policy" (Robbins 1981, p. 8).

Thus, in Robbins's vision of economics, there would be both a scientific branch and an active applied policy branch that dealt with integrating scientific and ethical elements. Economics after him did not follow this path. Because it wasn't appreciated by later economists that applied economics had different boundaries and nature other than scientific economics, Robbins's attempt to define the boundaries of scientific economics to not include moral considerations had the unintended and undesirable side effect of excluding serious consideration of moral analysis from applied policy economics, precisely the opposite of his intention.

Why the new concept of boundaries is important

With the new concept of boundaries, we believe, economists could better understand the nature of different entities of economics and better communicate with each other. It is fair to say that failing to draw boundaries between different entities of economics has prevented economists from communicating effectively and caused obstacles to reforming economics. A noticeable example is the apparent conflict between those who argue for developing more complex models and those who intend to bring ethics back to economics in reaction to the 2008 financial crisis. The former considers the problem of economics to be that its models are too simple to capture the complexity of economic systems. In contrast, the latter blames the mainstream economics for neglecting ethical considerations and argues that this problem cannot be addressed by adopting different models however complex they are.

At first glance, these two views seem to be irreconcilable. But the disagreement is only apparent because the problems these two camps try to solve actually fall into two different branches of economics. For those who attempt to adopt more complex models, the concept of economics in their mind is mainly the scientific branch of economics. In contrast, in the mind of those who intend to bring ethics back to economics, the concept of economics mainly falls in the applied policy branch of economics. In our view, both changes are needed, but they involve quite different methodologies. To argue that ethics has to be integrated into economic analysis based on scientific methodology makes it much more difficult to integrate them in. Accepting that science and applied policy have different boundaries allows a richer discussion of applied policy issues.

It is important to note that not all studies related to ethics will necessarily fall into the realm of applied economics. What separates the scientific branch of economics from the applied one is not the exclusion of issues concerning moral norms or moral preferences, but the absence

of normative judgements. In the past two decades, with abundant empirical evidences, a growing literature attempts to disprove narrow interpretations of *Homo economicus*, a classic assumption of human nature in mainstream economics. Samuel Bowles for one demonstrates in his book *The Moral Economy* (2016) with evidences from laboratory and field experiments that moral and other noneconomic motives and preferences such as altruism, reciprocity, trust and so on often play crucial roles in influencing our economic behavior, including in the market and non-market setting. Despite being used for recommendations for policy design, the analysis of how human behavior is influenced by moral norms as well as moral preferences is a study of “what is”, not “what ought to be”. Such an study should follow scientific methods, and this type of study should not be conflated with the study of ethics as it often happens today. This likely confusion was anticipated by J. N. Keynes who argued that ‘political economy may recognize the operation of moral motives in the economic world, and yet not become an ethical science’ (Keynes [1890] 1917, p. 46). Studying moral dispositions or moral behavior as a fact is a business quite different from studying how these facts can and should help inform the formulation of policy.

We do not pretend that reintroducing the boundaries between the scientific branch of economics and the applied branch of economics will resolve all the problems faced by economics. It is true that this old classification is not perfect and has some challenges awaiting answers. Yet, discarding this tradition because of its imperfection is like throwing the baby out with the bathwater.

As the allocation of scarce resource definition of all economics lost its significance and the corresponding boundaries of economics crumbled, it is now time for economists to reconsider the path that was not taken in the early twentieth century and returning to the

boundaries of economics that Robbins intended to draw, which require a separation of applied economics from scientific economics.

IV. APPLIED ECONOMICS

It is not an easy task to draw boundaries between scientific economics and applied policy economics even if one accepts the necessity of drawing such boundaries. One of the difficulties results from the fact that the meaning of “applied” is vague and the concept of “application” in economics is a loose one. Since the term “applied economics” has been used by economists to refer to several different things, let us first make it clear what we mean by applied economics or the applied branch of economics.

Nature, scope and methodology

We can easily identify at least three meanings commonly used among economists. First, it means empirical work used to test the validity of theory. Second, it means the application of theoretical conclusions to policy advice. Third, it means the application of theoretical cores to various fields (see Backhouse and Biddle 2000; Backhouse and Cherrier 2017; Cherrier 2017). Our focus is on the second of these—applied policy economics. Accordingly, we are quite comfortable with the above first and third types of work belonging to a category called science as long as their aim is to find facts, rather than to guide policy or action. But the second category is best separated out as having different boundaries.

If we map our distinction between economic science and applied policy economics to J. N. Keynes’s tripartite division of economics, applied policy economics roughly corresponds to an art of political economy.

Despite coining the term ‘art of political economy’, Keynes is actually cautious with using it as he worried that it may cause misunderstanding as if it is a body of precepts which can be completed exclusively based on the science of economics. Keynes’s concern reflects the difficulty of drawing clear-cut boundaries of applied economics due to its multidisciplinary character.

Even though the boundaries of applied economics are fuzzy, we can still roughly categorize the knowledge belonging to applied economics into three types.

- First, knowledge from other scientific disciplines (not only mathematics, physics from which economics used to borrow the tools or concepts, but more importantly, the neighboring disciplines in social sciences and humanities, such as psychology, political science, sociology, social and cultural anthropology, human geography, history, etc.)
- Second, non-scientific knowledge that does not involve moral values. This includes knowledge which is not systematically derived from scientific and organized disciplines but obtained from individual experience and observation. This type of knowledge is often dispersed among individuals, causing difficulty for policy making (Hayek 1945).
- Third, knowledge regarding morals.

Because applied policy has to incorporate these different types of knowledge in order to reach objective conclusions, the methods appropriate for applied economics are different from those appropriate for economic science. Unlike economic science which has to strictly follow

scientific methods, applied policy economics adopts much wider ranges of methods—using philosophical methods to deal with moral issues, and engineering methods to deal with non-economic issues that are important but have not yet been answered by science. This does not mean anything goes; it simply means that applied policy is a craft that practitioners develop. Each specialty has what engineering methodologist Billy Vaughn Koen (2003) calls the “state of the art”. We call this applied policy method of doing applied economics the engineering approach subject to the engineering methodology spelled out by Koen.

An economist dealing with policy would use a methodology different from scientific methodology. On the one hand it is less restrictive; it allows back-of-the-envelope calculations and rough estimation of needed parameters. On the other hand, it demands knowledge and judgements far beyond scientific knowledge. Engineering is not science precisely because it is concerned with solutions to problems, not purely understanding. If a policy seems to work, even if inconsistent with current scientific theory, the economic engineer will use it, adding a “fudge factor” to account for the lack of firm scientific basis. The reason is that economists as engineers are required to do much more than applying scientific theories, and will be limited in their role if they are required to always follow scientific methodology.

Engineering methodology includes scientific methodology, but is more expansive, and far less restrictive. Engineers determine the controlling methodology for how much science, other knowledge, and moral reasoning are used, following current best practices.³

Where to draw the line: an illustration

³ For more discussion on the engineering approach, see Colander 2018, Colander and Freedman 2018, Chapter 8.

Admittedly, it is not easy to draw clear boundaries between scientific and applied economics. At the conceptual level, these two branches are clear. The difficulty of drawing the lines resides mainly in the fact that in practice these two branches often exist together. Economists can easily move from one realm to the other in the same piece of work without being aware that they have crossed the boundaries. Even the first-class economists could fail to appreciate adequately the difference in the nature of science and policy and consequently impair the quality of their policy analysis with restrictive methods unsuitable for policy.

Take Raj Chetty as an example. “Yes, economics is a science”, he announces, in his defense of economics against skeptics who charge it to be a fake science after the Nobel Prize in Economic Sciences were awarded to economists of opposing views on the same issue in the same year (Chetty 2013). Chetty’s own work largely aims at making economics an empirical science, a science like medicine. Most of his economic research indeed deserves the name of science and “has the ability to inform policy decisions on the basis of evidence instead of ideology” as he wishes. However, applying empirical findings directly for policy guidance without drawing a line between policy and science could lead to misleading conclusions as if policy ought to be studied with scientific methods and nothing else. This can be shown in one of Chetty’s works on taxation.

In his paper “Salience and Taxation”, Chetty and his co-authors use a field and quasi-experiments to show that the visibility of the tax-inclusive price matters to the consumption behaviour (Chetty et al. 2009). Their experiments demonstrate that how consumers react to taxes can be studied empirically, and how the empirical results from experiments can be used to inform policy design. Yet, as soon as they move to the discussion of the implications of their empirical results for tax policy, they lose their grounding. In discussing how their results affect policy, they

integrate those results into a standard formal welfare policy analysis. In so doing, they develop a formal theoretical framework for applied welfare analysis that they argue can accommodate salience effects, which they characterize as an optimization error made by consumers.

The welfare analysis done in the paper is full of scientific aura, but it focuses solely on “efficiency costs” and completely neglects any discussion of fundamental issues that from an engineering perspective, will likely be highly important, such as fairness and transparency. The experiments show that posting tax-inclusive price tags reduces demand, which suggests that tax-exclusive prices might fool buyers into spending more than they intended. “All-inclusive pricing”, as Werner Antweiler (2016) points out, “is thus a matter of fairness and transparency”. An apparent scientific policy analysis can produce conclusions more biased than an engineering analysis that explicitly includes considerations that cannot be studied scientifically. In the case of policy analysis, the attempt of being scientific doesn't guarantee objectivity.

Chetty's case is not unique. In fact, Chetty's faith in scientific economics informing policy decision is commonly shared by the champions of evidence-based policy, an approach which has become the vogue for policymaking in many different areas across several countries, among international organizations and NGOs over the past two decades. In the field of development economics, evidence-based policymaking has been extensively applied to issues such as poverty, schooling, healthcare, etc. The urge for evidence-based policymaking in accounting and financial markets regulation is also on the rise in recent years.⁴ The evidence-

⁴ For the opportunities and challenges of adopting evidence-based approach for accounting and financial policies and regulations, see Leuz (2018).

based policy movement aims to improve the quality of decision-making by replacing policy-making based on ideologies or faiths with those based on scientific evidence.

We appreciate the intention of improving the quality of policymaking by grounding it on robust empirical evidences, but the standard randomized controlled trials (RCTs), which play a major role in the evidence-based policy approach, are inadequate in answering at least two key issues of policy analysis. First, on the analytical and explanatory side, conceptual frameworks and judgments are required to make sense of data and evidence and to identify the causal mechanism; what is considered evidence depends on one's framework. As is the case with the traditional deductive methods in scientific economics, the conclusions derived from the experimental inductive methods are incomplete and far from definitive: their validity is subject to the external context. Using the phrases of Cartwright and Hardie (2012), "it worked there" does not guarantee "it will work here".⁵ Second, on the prescriptive side, evidence and data alone tell us nothing about how the desirability and priorities of policy goals ought to be determined.

⁵ This limitation of randomized field experiments is recognized by Banerjee and Duflo in a paper where they responded to the criticisms concerning the environmental dependence of experimental research in development economics: as they noted, "without assumptions, results from experiments cannot be generalized beyond their context" (Banerjee and Duflo 2009, p. 16), but they also noted that the problem of generalizability is not specific to the experimental approach and believed that this problem, when related to external validity, can be mitigated (Banerjee and Duflo 2009, 2017).

In summary, scientific evidence can inform policy, but cannot be directly translated into policy recommendations.⁶ Ultimately, the practice of basing policy on rigorous scientific evidence does not make policy analysis and policymaking the sole business of science. Drawing boundaries between scientific economics and applied economics is crucial for economists to better grasp the strengths and limitations of the empirical approaches in economic science as well as their implications to applied economic policy analysis and policymaking.

V. SHOULD ECONOMISTS THINK OF THEMSELVES AS PLUMBERS?

Now that we have developed our arguments, let us return to the metaphor with which we began the paper—Duflo’s metaphor of economists as plumbers. While we are largely in agreement with the fundamental point of Duflo’s argument—that applied policy economists need to take practical implementation problems seriously, we find her metaphor of economist-as-plumber problematic, and symptomatic of the type problems that arise when scientific economics and applied policy economics are not differentiated. Put simply, plumbers aren’t scientists, and for her argument to make sense, economists must accept that it isn’t realistic that an economist fills both roles. There are at least three issues to be considered with Duflo’s metaphor.

Division of labor and specialization

⁶ Partly because of this reason, Christian Leuz considers the more modest term “evidence-*informed* policymaking” is preferred to “evidence-based policymaking” (Leuz, 2018, p. 600, emphasis original).

The first is the division of labor among economists. This can be considered in two aspects: first, who should do what in view of the expected roles; second, who is capable of doing what in view of their training and skills.

Duflo argues that economists should act like plumbers in addition to scientists and engineers. In her view, each of these mindsets has an important role in policy design: “Scientists design general frames, engineers turn them into relevant machinery, and plumbers finally make them work in a complicated, messy policy environment” (Duflo 2017, p. 23). This statement suggests that for Duflo there are no clear boundaries between science and policy. One of the potential consequences of mixing the two domains is that scientists are doing something they cannot do properly if they strictly follow the methodological rules of science.

In contrast to Duflo, we believe that it is economic engineers, not economic scientists, who should design policy just like it is engineers, not scientists, who are responsible for designing machines. Designing a reliable machine requires solid scientific knowledge, but designing a machine per se is not the same as doing science. Similarly, designing a policy is not the same as doing science, even though the chance for a policy to function properly would generally be higher if the design of policy is informed by solid scientific evidence.

Another consequence of not adequately differentiating applied policy from economic science is that the division of labor would likely work less effectively due to the training based on specialization. According to Duflo, one of the key reasons why economists need the mindset of a plumber is due to economists’ limited knowledge of the issues at hand. In her words, there are the “unknown unknowns” that we cannot predict but that will arise anyway. Unlike economist-as-scientist and economist-as-engineer, the economist-as-plumber “does not have the

safety net of a bounded set of assumptions” (2017, p. 3). She has to face and resolve the problems which do not appear in the models, but do arise in the real world. “If the specific real-world problem at hand cannot be solved analytically”, Duflo suggests, the economist-as-plumber “will reach for other tools” (2017, p. 3). She sees field experimentation as an important tool in the economist-as-plumber’s toolkit.

We agree that the plumber, when laying down the pipe, needs to use all sorts of knowledge and tools available to her in order to make the plumbing work. However, Duflo’s plumber metaphor is not suitable for her own purpose, because some jobs delegated by Duflo to the economist-as-plumber would easily go beyond a plumber’s training and skills. Field experiments are done by scientists and they follow a well-specified scientific methodology. To appropriately conduct a randomized field experiment requires a high level of scientific knowledge and good working knowledge of these methods. Arguably, it is the innovation in scientific method, rather than the plumbing, entailed in Duflo’s experimental approach to development economics that won her the title of Nobel Laureate in economic *sciences*. To do these experiments right one needs training in scientific methodology; it is unlikely to be done properly by a plumber who does not have significant training in science or even in engineering.

The difference between a real plumber and an economic scientist imagining herself to be a plumber can be seen by comparing her approach to that of a self-declared non scientist, Paul Polak (1931-2019). Polak was a psychiatrist and real estate developer who decided he had plenty of money and he wanted to spend the rest of his life helping the poor, which he defined as those with income under \$1 a day. He developed a twelve-step guide to practical problem solving that did not involve randomized control experiments, and he would consider such formal methods as part and parcel of the failed development efforts that characterize academic approaches to

helping the poor. His methodological guides include: Go where the action is. Listen to those who have the problem. Learn everything you can about the problem's specific context. Think like a child. Design to specific cost and price targets. (Polak, 2008, p. 14) None of his directives involved any economic theory, other than the obvious. None involved formal testing; it was too expensive. It involved informal testing, trial and error, and correction on the fly. It involved all types of practical knowledge, but no economic theory. One of his solutions to poverty—low cost treadle pumps and drip irrigation systems made with inexpensive piping where drip hoses were created by punching nails in pipe—totally involved plumbing. But it did not involve applied economists, other than for the economist to recognize that such bottom-up development offers enormous possibilities that will not be recognized by economists who are not laser focused on an objective of helping the poor. Polak's guides are plumbing heuristics, which are grounded on crystalized plumbing knowledge obtained and accumulated through learning by doing in the field. We argue that such plumbing heuristics, knowledge, and approaches, even though not scientific, have great value for practical problem solving, and deserve the attention of economist-as-engineer when designing economic policies, particularly when scientific knowledge is not available.⁷

Economists as general contractors

⁷ What is called “plumbing knowledge” here corresponds to the second type of knowledge classified in Section IV. Plumbing heuristics are normative, but their establishment are not entirely independent from plumbing knowledge, which are positive. Linking the two requires sensibilities and judgments that go beyond science.

The economist as plumber could be a useful metaphor in the right context, but it does not work well for the type of job to which Duflo refers. Instead of picturing hands-on applied policy economists as plumbers, we suggest that it would be best to picture them as general contractors. “General contractor economists” are the economists who actually carry out the translation of policy design into real world policy.

A general contractor has an overview of the entire project—she is in constant contact with engineers, plumbers, carpenters, architects, mechanical technicians, and she also knows, and works with, the customer of the policy integrating his values into the design of the policy. She doesn’t get an abstract social welfare function given to her. She works with the customer to determine the content of it, often guiding the customer as to what is feasible and desirable, and how best to achieve the desired policy goals. Sometimes she plays a relatively value neutral advisory scientific-like engineering role—given the state-of-the-art knowledge, here is what is achievable. Other times she plays a psychological advisor role in which she blends normative and positive aspects of analysis together as an artist would. She translates the customer’s generally vaguely understood vision into a practical buildable vision. Doing this job well requires going far beyond what can be determined by science.

Obviously, in real life economists fulfill many different roles. They are scientists, engineers, and general contractors. That’s what makes economics so difficult. Our point is not that they should not play multiple roles—it is that they should match their methodology to fit the role that they are playing.

Taking morals and value judgement seriously

In Duflo's discussion, the major task for the economist-as-plumber is to make sure the policy, once implemented, will function effectively to achieve the assigned goals. In other words, what is deemed as desirable goals that a policy aims to achieve has already been determined in some way and is not under question or dispute. Duflo's discussion does not explore how the goals are determined. Presumably, it is not a job of the economist-as-plumber. Instead it is the job for the economists as design engineer and the economist as general contractor. This indicates the incompleteness of the plumber metaphor for applied economics.

Moreover, even if there is no disagreement concerning the goals of a policy, when there is no consensus in scientific findings, what should economists do in order to provide policy guidelines? The disagreement over the conclusions derived from economic science can result from many different reasons, but often they do not result from the different views in goals or from fundamentally different views of science. Disagreements often result from differences in sensibilities, which scientific methodology cannot resolve. To resolve these disagreements, the research institutions and the methodology must be designed to arrive at conclusions about these heuristic judgements. There is no absolute.

In Duflo's examples, those details missing in scientific models, yet essential for policy design, are mostly related to the complexity of human behavior and preference. When they do not match the assumptions of models, on which policy design is based, then policy will not work. Hence, Duflo emphasizes the importance of behavioral economics, network economics, and informational economics. In one sense, behavioral economics and informational economics adjust the policy design by correcting the assumptions of the scientific models, on which the policy design is originally grounded. But the deviation of what happens in reality from what models predicts can be caused by reasons other than unrealistic assumptions.

These other aspects of applied economics that have been lost are not something that plumbers could resolve. Science has no problem with adding issues of plumbing in Duflo's sense. It does have a problem with adding those aspects of policy that relate to values and sensibilities. Thinking of economists as plumbers will not integrate moral values back into applied analysis, marking the second major weakness of Duflo's metaphor. The more important change will only occur when the profession develops a methodology that recognizes that policy follows from various types of judgement (moral or amoral, factual or normative).

Training

We have been noting the shortcomings of the plumber metaphor, but we are not quibbling over words but rather with the sensibility associated with the words. Our interest is in how the metaphors affect economist's training. We see a much larger need for change than does Duflo. This is the third reason why we consider Duflo's plumber metaphor unfit. She seems to believe that economists, with the current training, are well prepared for taking up the plumber's role and that this requires only a change in mindsets, not a major change in training.⁸ We don't see this as an accurate description of the current training of economists or as a right prescription

⁸ It is Duflo's view that "economists have the disciplinary training to make good plumbers" (2017, p. 15) and that "plumbing should be an inherent part of our profession: we are well prepared for it, reasonably good at it" (2017, p. 23). By "training" here, she mainly refers to the training in behavioral science, incentive issues and firm behavior.

to move forward; we see economists needing not only changes in mindset, but also in how they are educated. That training would be more differentiated than it currently is.⁹

There would be differentiated scientific and engineering training, just as there is in most fields. Graduate programs would not be ranked on a unidimensional scale. Some top programs would specialize in science and some in engineering and general contracting. Most economists going on into undergraduate teaching would benefit most from general contracting training—seeing how good applied policy requires approaching a policy problem from multiple directions and the need to bring various skills to the table.

Those focusing on engineering and general contracting roles of economists would provide more training in engineering heuristics and general contracting and less in abstract theory. While the actual craft of plumbing might not be taught, the applied economist would be introduced to it and taught its importance, just as they would be introduced to ethics, aesthetics, politics, psychology, etc., and taught their importance. That training would be significantly different than economist's current training, and it goes far beyond teaching that plumbing is

⁹ There have been many calls for change in the curriculum but ours is somewhat different from many of them such as the recent INET Core initiative. (<https://www.core-econ.org/> See also Bowles and Carlin, forthcoming). Their call for change concerns the coverage and presentation. Ours focuses more on methodology, arguing that methods appropriate for science and methods appropriate for policy are fundamentally different. In our view, identifying and highlighting this difference in Econ 101 is of much more significance for economics education reform than broadening the coverage of topics and schools of thought.

important. Such a change in training can only occur if economics distinguishes separate boundaries for science and applied policy.

J. M. Keynes's description of a master economists captures what we believe the training should be designed to achieve:¹⁰

[T]he master-economist must possess a rare *combination* of gifts. [...] He must be mathematician, historian, statesman, philosopher—in some degree. He must understand symbols and speak in words. He must contemplate the particular in terms of the general, and touch abstract and concrete in the same flight of thought. He must study the present in the light of the past for the purposes of the future. No part of man's nature or his institutions must lie entirely outside his regard. He must be purposeful and disinterested in a simultaneous mood; as aloof and incorruptible as an artist, yet sometimes as near the earth as a politician. (Keynes 1924, p. 322, emphasis original)

If economist's training could be structured to let students know that a master economist is an all-rounder, needing many different skills, that would be wonderful.

¹⁰ Hayek makes a similar point. He writes “nobody can be a great economist who is only an economist—and I am even tempted to add that the economist who is only an economist is likely to become a nuisance if not a positive danger.” (Hayek 1967, p. 123)

REFERENCES

- Antweiler, Werner. 2016. "The Case for All-Inclusive Prices." Retrieved from:
<https://wernerantweiler.ca/blog.php?item=2016-09-18>
- Backhouse, Roger and Béatrice Cherrier. 2017. "The Age of the Applied Economist." *History of Political Economy* 49 (Supplement): 1–33.
- Backhouse, Roger and Jeff Biddle. 2000. "The Concept of Applied Economics: A History of Ambiguity and Multiple Meanings." In Roger Backhouse and Jeff Biddle, eds., *Toward a History of Applied Economics, History of Political Economy* 32 (Supplement): 1-24.
- Banerjee, Abhijit V. and Esther Duflo. 2009. "The Experimental Approach to Developmental Economics", *The Annual Reviews of Economics*, 1 (1): 151-78.
- _____. 2017. "An Introduction to the Handbook of Field Experiments", in Banerjee and Duflo (eds.), *Handbook of Field Experiments, Vol. 1*, pp. 1-24. Amsterdam: North Holland.
- Blaug, Mark. 1997. *Economic Theory in Retrospect*. 5th edition. Cambridge: Cambridge University Press.
- Bowles, Samuel. 2016. *The Moral Economy: Why Good Incentives Are No Substitute for Good Citizens*. Yale University Press.
- Bowles, Samuel and Wendy Carlin. Forthcoming. "What Students Learn in Economics 101: Time for a Change." *Journal of Economic Literature*.

- Cartwright, Nancy and Jeremy Hardie. 2012. *Evidence-Based Policy: A Practical Guide to Doing it Better*. Oxford: Oxford University Press.
- Cherrier, Béatrice. 2017. "Classifying Economics: A History of the JEL Codes." *Journal of Economic Literature* 55(2): 545–579.
- Chetty, Raj. 2013. "Yes, Economics Is a Science", October 20, 2013, *The New York Times*,
retrieved from: <https://www.nytimes.com/2013/10/21/opinion/yes-economics-is-a-science.html>
- Chetty, Raj, Adam Looney, and Kory Kroft. 2009. "Salience and Taxation: Theory and Evidence." *American Economic Review* 99 (4): 1145-1177.
- Colander, David. 2009. "What Was 'It' that Robbins was Defining?" *Journal of the History of Economic Thought* 31 (4): 437-448.
- _____. 2011. "Applied Policy, Welfare Economics, and Mill's Half-Truths." In John Davis and Wade Hands, eds., *The Elgar Companion to Recent Economic Methodology*, pp. 173-87. Cheltenham, UK: Edward Elgar Publishing. Also in Colander and H. Su. 2018. *How Economics Should Be Done: Essays on the Art and Craft of Economics*. Edward Elgar, pp. 65-79.
- _____. 2013a. "Creating Humble Economists: A Code of Ethics for Economists." In George DeMartino and Dierdre McCloskey, eds., *Handbook on Professional Economic Ethics*. Cambridge University Press. Also in Colander and H. Su. 2018. *How Economics Should Be Done: Essays on the Art and Craft of Economics*. Edward Elgar, pp. 240-252.

_____. 2013b. “Searching for Keys under a Streetlight: Why Journalists Shouldn’t Turn to Nobel Prize Winners for Expertise in Policy.” Paper presented to ASSA Annual Meeting San Diego, CA, January 04, 2013.

_____. 2018. “The Scope and Method of Applied Policy Economics.” *The American Economist* 63 (2): 132–146.

Colander, David. and Craig Freedman. 2018. *Where Economics Went Wrong: Chicago's Abandonment of Classical Liberalism*. Princeton University Press.

Duflo, E. 2017. “The Economist as Plumber”, *American Economic Review: Papers & Proceedings*, 107 (5): 1-26.

Hayek, Friedrich. 1945. “The Use of Knowledge in Society.” *American Economic Review* 35 (43): 519-530.

_____. 1967. *Studies in Philosophy, Politics and Economics*. Chicago: University of Chicago Press.

Keynes, John Maynard. 1924. “Alfred Marshall, 1842-1924.” *The Economic Journal* 34 (135): 311-372.

_____. 1930. “Economic Possibilities for Our Grandchildren.” In J. M. Keynes 1931. *Essays in Persuasion*. London: Macmillan.

Keynes, John Neville. [1890] 1917. *The Scope and Method of Political Economy*. 4th edition. London: Macmillan.

- Koen, Billy Vaughn. 2003. *Discussion of the Method: Conducting the Engineer's Approach to Problem Solving*. Oxford, UK: Oxford University Press.
- Leuz, Christian. 2018. "Evidence-Based Policymaking: Promise, Challenges and Opportunities for Accounting and Financial Markets Research", *Accounting and Business Research*, 48 (5): 582-608.
- Mankiw, Gregory. 2006. "The Macroeconomists as Scientist and Engineer." *The Journal of Economic Perspectives* 20 (4): 29-46.
- Mill, John Stuart. [1844] 1967. "On the Definition of Political Economy; and on the Method of Investigation Proper to It." In J. M. Robson, ed., *Collected Works of John Stuart Mill, Vol. IV*. Toronto: Toronto University Press, pp. 309-339.
- Polak, Paul. 2008. *Out of Poverty: What Works When Traditional Approaches Fail*, San Francisco: Barrett-Koehler Publishers.
- Robbins, Lionel. [1932] 1935. *Essay on the Nature and Significance of Economic Science*. 2nd edition. London: Macmillan.
- _____. 1981. "Economics and Political Economy." *American Economic Review* 71 (2): 1-10.
- Romer, Paul. 2016. "Why It Makes Sense for an M.D. to Lead the World Bank." Retrieved from: <https://paulromer.net/md-to-lead-worldbank/>
- Roth, Alvin. 2002. "The Economist as Engineer: Game Theory, Experimentations, and Computation as Tools for Design Economics." *Econometrica* 70 (4): 1341-1378.

Senior, Nassau. [1836] 1951. *An Outline of the Science of Political Economy*. New York, NY:

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