

Coase, the Austrians, and Models as Foils

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“Even imaginary constructions which are inconceivable, self-contradictory, or unrealizable can render useful, even indispensable services in the comprehension of reality, provided the economist knows how to use them properly.”

- Ludwig von Mises, *Human Action: A Treatise on Economics*, p. 236

1. Introduction

Ronald Coase stands as one of the most important economists of the 20th century. Though his greatness is now taken for granted, it was by no means a matter of course that he would secure such an illustrious place in the economics profession. For though his contributions are now etched into the mainstream of the discipline, Coase himself pursued his work in deeply out-of-step fashion. At a time when economics was becoming a more technical discipline, Coase famously eschewed the use of mathematics, famously jesting that: “In my youth it was said that what was too silly to be said may be sung. In modern economics it may be put into mathematics” (Coase 1988a: 185). And a time when economics was becoming more insulated from other fields of academic inquiry – transitioning from *political economy* to just *economics* – he relied on history and law to draw important conclusions in economic theory.

The difference between Coase and modern economics does not end with mathematics or history. Little discussed in the massive literature on Coase is the way in which Coase reasons with models and draws his inferences more generally.¹ In contrast, there is now a large and growing literature in the philosophy of economics that articulates the different ways in which economists reason with models. But though there are several different accounts present – models are credible worlds, they are isolations, they highlight capacities, they articulate how-possibly explanations,

¹ There have been some attempts at articulating the kind of reasoning Coase employs, but we believe that the account we offer in §4 below is distinct from these. See Hsiung and Gunning (2002); Hsiung (2004).

and so on – none of these views can account for how Coase engages in economic reasoning. This is not to disparage the contributions of these philosophers of economics. Much of the impressive and important work being done here are accurate and insightful depictions of how mainstream economists reason with models. But when it comes Coase’s style of reasoning, such descriptions fall short.

The purpose of this paper is to precisely articulate the way in which Coase reasons with economic models. The general idea here is that Coase wants to draw a conclusion concerning the function some feature f of the real world plays by looking to a model world in which feature f is conspicuously absent. But as we shall see, there is an important payoff to this investigation for our understanding of the history of economic thought. For though we start out trying to articulate the general form of reasoning that Coase employs, we find that this form of reasoning can *also* be used to characterize how other out-of-step economists reason with models. We show that the method of inference Coase employs – what we call *models as foils* – also characterizes how several important thinkers in the Austrian economics tradition reason with models. Across a range of unique and important economic thinkers is thus a common form of reasoning that until now has gone unrecognized. Not only this, but we believe this form of reasoning can profitably be used by contemporary economists as a new way of approaching what is now a decisively model-based discipline.

The structure of this paper is as follows. The next section takes a close look at Coase’s model of a world without transaction costs from his seminal paper “The Problem of Social Cost” (Section 2), though we believe our analysis also applies to Coase’s method of reasoning in “The Nature of the Firm” as well. Though Coase’s seems to be a plausible way of reasoning, contemporary accounts of economic modeling, we argue, cannot account for the way in which Coase draws such inferences (Section 3). This is not to degrade the work being done within the philosophy of economics. The point is rather that (i) Coase deviates radically from the norm of the profession in terms of how he reasons with models, and (ii) there is a need to articulate more carefully how it is Coase goes about drawing his inferences.

From here we go on to articulate how it is Coase reasons with economic models, an account we call *models as foils* (Section 4). The basic idea is that models can give us insights concerning feature f of the actual world by constructing a model world in which f is not present; from here,

economists such as Coase draw inductive inferences concerning the role f plays in the real world by comparing the real world to the world of the f -less model.² To conclude, we show that models as foils as an inferential strategy is not solely circumscribed to Coase. Several in the Austrian school of economics tradition make use of this form of reasoning in how they interpret competitive equilibrium models, as well as earlier writers such as Frank Knight and Alfred Marshall (Section 5).

2. Coase on Transaction Costs

Coase begins his 1960 paper by telling us that he is interested in “those actions of business firms which have harmful effects on others” (Coase 1960/1988: 95). That is, he is interested in externalities: costs which parties not privy to voluntary exchange pay nonetheless. It is intuitively plausible that underlying property law matters in how externalities get resolved. If Althea wants to run loud machinery on her property, and Bertha wants peace and quiet on her adjacent property, then how this dispute will be resolved will depend on the allocation of rights: does Althea have a right to run machinery, or does Bertha have a right to peace and quiet? If Althea has the right then the machinery will run; if Bertha has the right then it will not.

But, Coase shows, this is not necessarily so. Coase begins his analysis by assuming that “the pricing system works smoothly (strictly this means that the operation of a pricing system is without cost)” (Coase 1960/1988: 97). That is, he assumes there are zero transaction costs. From here Coase goes through examples showing that, in such a world, (i) all disputes are resolved in an efficient manner, but more stunningly (ii) all disputes result in the *same* efficient outcome regardless what the relevant property law says: “with costless market transactions, the decision of the courts concerning liability for damage would be without effect on the allocation of resources” (Coase 1960/1988: 106). To continue our toy example from the paragraph above, if there are no transaction costs then the dispute between Althea and Bertha will be (i) resolved in an efficient manner and (ii) be resolved in the *same* manner regardless of whether Althea has a right to use

² Our account of models as foils is inspired by Boettke (1997)’s insightful history of general equilibrium theory in the latter half of the twentieth century, particularly Boettke’s analysis concerning how different schools of thought interpreted the Arrow-Debreu result in diverging ways.

noisy machinery or whether Bertha has a right to enjoy peace and quiet. In such a world, property rights are simply irrelevant.

Though it is not a mathematical model of the kind most contemporary economists build, Coase's imaginary world can be studied as a model nonetheless. But, given the "very unrealistic" (Coase 1960/1988: 114) assumption of no transaction costs, what is the point of such a model? What purpose does it serve in economic inquiry? This is a controversial question. Some economists, such as Aslanbeigui and Medema (1998: 602-603), see Coase's model as a way to show the contradiction in Pigou's remedy to externalities. However, for most economists, the takeaway from this model is the so-called Coase Theorem – coined by George Stigler – which says that "under perfect competition private and social costs will be equal" (Stigler 1966: 113). Coase's model is thus interpreted as another theorem of welfare economics: absent transaction costs – the typical assumptions of most general equilibrium models at the time – all externalities will be bargained to an efficient point.

Note that the Coase Theorem as articulated by Stigler tells us little about the actual world. This is puzzling, for Coase understood his model as telling us something deeply important about our actual world.³ He writes:

"The Problem of Social Cost," in which these views were presented in a systematic way, has been widely cited and discussed in the economics literature. But its influence on economic analysis has been less beneficial than I had hoped. The discussion has largely been devoted to sections III and IV of the article and even here has concentrated on the so-called "Coase Theorem," neglecting other aspects of the analysis. In sections III and IV, I examined what would happen in a world in which transaction costs were assumed to be zero. My aim in doing so was *not* to describe what life would be like in such a world but to provide a simple setting in which to develop the analysis and, what was even more important, *to make clear the fundamental role which transaction costs do, and should, play in fashioning the institutions which make up the economic system* (Coase 1988b: 13) (emphasis ours).⁴

³ For an overview of how the Coase theorem has been interpreted by economists see Medema (2011).

⁴ For similar remarks about how Coase believed his model was misunderstood, see Coase (1988a: 174); Coase (1988b: 15).

The purpose of Coase's model, *contra* Stigler but how we and Coase see it,⁵ is not to derive propositions concerning what would happen in the imaginary world of zero transaction costs and perfect competition. Rather, the purpose is to tell us something about our actual world, *even though* the model world departs radically from reality as we know it. In particular, the model is meant to tell us something about the role transaction costs play in the real world, even though transaction costs are conspicuously absent from the model world. We do not want to get into a fight concerning the uniquely correct way of interpreting Coase's model. Instead, we take for granted that there is some merit to Coase's interpretation of his own model, and then focus on the inductive strategy he employs in drawing the conclusions he does about the actual world.

What does Coase think his model teaches us about the actual world? Coase takes the main point of his model to be as follows:

Of course, if market transactions were costless, all that matters (questions of equity apart) is that the rights of the various parties should be well defined and the results of legal action easy to forecast. But as we have seen, the situation is quite different when market transactions are so costly as to make it difficult to change the arrangement of rights established by the law. In such cases, the courts directly influence economic activity. It would therefore seem desirable that the courts should understand the economic consequences of their decisions and should, insofar as this is possible without creating too much uncertainty about the legal position itself, take these consequences into account when making their decisions. Even when it is possible to change the legal delimitation of rights through market transactions, it is obviously desirable to reduce the need for such transactions and thus reduce the employment of resources in carrying them out (Coase 1960/1988: 119).

We interpret this passage as Coase drawing two key conclusions from his model. First: it is *precisely because* of transaction costs that different allocations of property rights result in diverging allocations of goods with differing levels of efficiency. That is, when and because transaction costs are present, the dispute between Althea and Bertha will not necessarily get resolved in the same manner depending on who has the relevant right (whether Althea has a right

⁵ For another who interprets Coase along the same lines as we do, see what Bertrand (2010) calls the "heuristic role" of the Coase theorem.

to use noisy machinery on her property or whether Bertha has a right to uninterrupted enjoyment of her property). Indeed, there is no reason to think that these different ways of specifying the relevant rights will lead to an efficient outcome in either case. This leads to Coase's second conclusion, which is normative: because transaction costs have massive effects on how different allocations of property rights affect economic efficiency, we should structure property law to attain the most efficient outcome possible.

We will not be interested in Coase's normative conclusion for the rest of the paper. But we will be interested in his positive conclusion. More specifically, we will be interested in how he draws this positive conclusion – a conclusion about the relationships between property law, allocations of goods, and efficiency *in the real world* – from a model that is radically unrealistic in its assumptions. How exactly is the model being used in economic reasoning? And, moreover, are contemporary accounts articulating the role of models in economic reasoning able to capture the way Coase uses this model in his own reasoning?

3. Coase and the Philosophy of Economics

The last section highlighted the form of reasoning Coase employs in his seminal paper on property rights and transaction costs. In building a model, Coase purposefully leaves a feature f of the world out of the model. This is not atypical. But what is interesting here is that Coase then draws conclusions concerning the function this absent feature f actually plays in the real world by looking closely at the world of the f -less model. Before specifying more clearly exactly how this form of counterfactual reasoning proceeds, we wish to show in the current section that several contemporary accounts of reasoning with economic models found in the philosophical literature have trouble making sense of this particular mode of analysis.⁶ Note, this is not to say that such accounts of economic modeling are flawed. As we noted in the introduction: much of the work we are about to discuss *is* descriptive of how more mainstream economists reason with models. But insofar as current philosophical accounts of modeling, as we argue in this section, have difficulty

⁶ Due to space constraints our overview of the literature is incomplete. For a more complete and very recent overview see Mireles-Flores (2018).

making sense of what Coase is doing, we believe that such a fact leaves open the door for us to articulate a new account of reasoning with economic models, which we do in the next section.

3.1 *Prediction.*

Models are often used in economic inquiry as tools for generating hypotheses that can then be tested. Milton Friedman (1953) is often seen as an advocate of this understanding of models, but recent work suggests his account is actually subject to deep ambiguities (e.g., Mäki 2009). A clearer account of this way of reasoning with models is offered by Kevin A. Clarke and David M. Primo, who distill what they call *hypothetico-deductivism* into a three-step process: “The first step is to write down the model... The second step is to derive deductive implications, or predictions, from the model. The third step is to test the model by checking these implications against the data” (Clarke and Primo 2012: 23).⁷

The reasoning here is quite clear: a model is built, hypotheses are generated from the model, and then these hypotheses are tested. Though this is certainly a valuable way of reasoning with models, we think that such an account clearly fails to describe Coase’s inferential strategy. This can most clearly be seen by thinking about what kind of hypotheses Coase’s model of a world without transaction costs generates. Such a model would seem to generate the following hypothesis: that different schemes of property rights should *not* result in different allocations of resources or differing levels of efficiency (for this is, after all, the outcome of Coase’s model). While this proposition is in principle testable, the lesson Coase draws from his model is precisely the opposite of the model’s outcome: different schemes of property rights *do* matter and importantly so for the distribution of goods as well as how efficient these distributions are. This asymmetry between (i) what can plausibly be construed as the testable hypothesis of Coase’s model and (ii) the conclusion Coase actually draws from the model suggest that it was not intended to generate a testable hypothesis in the first place.

Indeed, some economists *do* test Coase’s model, proffering hypotheses that are inconsistent with those conclusions that Coase himself draws. For example, Elizabeth Hoffman and Matthew

⁷ Similar here is Alexandrova’s view of models as *open formulae*. On this account, “models are used as suggestions for developing causal hypotheses that can then be tested by experiment” (Alexandrova 2008: 396).

L. Spitzer (1982) test the Coase Theorem in a laboratory setting. Though the authors interpret Coase as saying that a “change in a liability rule will leave the agents’ production and consumption decisions both unchanged and economically efficient” – the precise opposite of what Coase concluded – they focus their test on whether agents’ production and consumption decisions are efficient, not whether the liability rule changes the allocation. The authors find that when transactions costs are absent, all two-person groups negotiated to the efficient allocation. For Hoffman and Spitzer, the testable implications of Coase’s model are about what happens in a world without transactions costs or with minor transactions costs – this should not be surprising, for this *is* what happens in the model world. But for Coase, the model was intended to highlight the effects transaction costs have in the real world, not to generate hypotheses about what would happen in a fantasy world in which these costs were completely absent.

3.2 *Approximations and Credible Worlds.*

Distinct from understandings models as generating testable hypotheses, Allan Gibbard and Hal R. Varian argue that models are used in reasoning as *approximations*.⁸ The general idea here is that a model explains some feature of economic reality by being approximately close to this reality: “an explanation by the approximate truth of a model takes the following form. First, if the assumptions of the applied model were *true*, the conclusions would be—here the proof is mathematical. Second, the assumptions in fact are sufficiently close to the truth to make the conclusions approximately true” (Gibbard and Varian 1978: 670).

In what we believe is a similar vein, Robert Sugden argues that models are employed in economic reasoning as *credible worlds*. According to Sugden, a model gains its value by allowing us to draw inductive inferences about our actual world from the model world. But, as Sugden notes, “if we are to make inductive inferences from the world of a model to the real world, we must recognize some significant similarity between those two worlds” (Sugden 2000: 23). More bluntly: “I want to suggest that we can have more confidence in [our inductive inferences], the greater the extent to which we can understand the relevant model as a description of how the world *could* be”

⁸ Gibbard and Varian suggest another way of reasoning with models, which we discuss below.

(Sugden 2000 24).⁹ Both the Gibbard-Varian and Sugden accounts of reasoning with models thus understand models as being instructive in virtue of the fact that they are reasonably close representations of reality.

Like before, we believe that such accounts of reasoning with economic models – that models gain their value by explaining the world through, in some general sense, offering reasonably accurate depictions of the world – cannot explain Coase’s reasoning. For, in assuming away all transaction costs, Coase is clearly not constructing a credible world or some close approximation of reality. Indeed, common reflection, as well as rigorous empirical estimation, suggest that transaction costs are pervasive and massively so. As an example of this, the classic estimate by John Wallis and Douglass North (1986) puts transaction costs sectors of the economy at 55% of GNP in 1970. Recent empirical work reaches the same conclusion: transaction costs are quite large (e.g., Libecap and Lueck 2011). This omission of transaction costs in Coase’s model is not like leaving out the color of the sky in order to focus on something else. As such, imagining bargaining situations in which transaction costs are completely absent can in no way be construed as credible or approximately close to the real world. For this reason, the current account of reasoning with models cannot capture what it is Coase is doing.

3.3 *Derivational Robustness.*

On another account of reasoning with economic models, the purpose of modeling is to allow the theorist to engage in some kind of robustness analysis (Kuorikoski and Lehtinen 2009: 125-128; Kuorikoski *et al* 2010: 544-545). The idea here is to show that a result is constant over a changing set of assumptions. This is significant because “a result is more likely to be real or reliable if a number of different and mutually independent routes lead to the same conclusion” (Kuorikoski *et al* 2010: 544). As an example, suppose that we have a model consisting of features f_1 and f_2 that induces outcome O . How confident should we be in the accuracy of the model, though? According to the derivational robustness framework, we can increase our confidence in the model by changing the assumptions and showing that outcome O still obtains. So perhaps a different model with

⁹ Ylikoski and Aydinonat (2014: 19) take this view further, offering what they call the *family of models thesis*, which essentially says that simplified approximately true or credible world models are not useful on their own. Rather, such models gain value “when considered in the context of a family of related models.”

features f_1 , f_2 , and f_3 induces O ; then perhaps a different model with features f_1 and f_3 induces O . This should increase our confidence in the reliability of the original result. The purpose of modeling is thus to generate models that yield outcomes that are then robust to changing assumptions of the model. When we do this, we can be confident in the results of our models.

Importantly, considerations of robustness help explain how one can use a model of the world with deeply unrealistic features (like zero transaction costs) to explain aspects of the actual world. For the deeply unrealistic feature is one of the variables that changes and, if all goes well, the outcome of the model is constant in the face of such alterations. When this is the case we should have increased confidence in our model. Though such a framework might be able to explain why some models assume away all transaction costs, it cannot explain why Coase specifically does so. Indeed, the outcome of the model – that all externalities are bargained to the same efficient point – is *not* robust under changing assumptions. Once transaction costs are added back to the model, everything changes. In Coase's words: "But as we have seen, the situation is quite different when market transactions are so costly as to make it difficult to change the arrangement of rights established by the law" (Coase 1960/1988: 119).

Not only is the model not robust to the addition of transaction costs, but this seems to be one of the central points Coase seeks to highlight. It is precisely the *difference* between (i) how externalities are bargained in a world *without* transaction costs and (ii) how externalities are bargained in a world *with* transactions that allows Coase to draw the conclusion he does: that transaction costs are the reason why property rights matter for the allocation of resources in the real world. Given that Coase's model is not robust to changing assumptions, and given that this failure of robustness seems to be an important part of Coase's reasoning, we believe that the derivational robustness framework fails to capture how it is Coase draws inferences from his model.

3.4 *Isolation.*

Another view – advanced primarily by Uskali Mäki – says that models are used in economic reasoning for their ability to isolate certain features of the world (in the same way that

physical experiments do)¹⁰ and, as a result, provide insight concerning the causal role these isolated features of the world play. We believe that Coase's model *does* isolate. But even so, Coase does not draw inferences from this isolation in the way that Mäki proposes. As such, though Mäki's isolation view comes close to describing Coase's reasoning, it does not fully capture it. We explain in more detail below.¹¹

To get a better feel for Mäki's view, let us first get clearer on what exactly isolation entails:

In an *isolation*, something, a set X of entities, is “sealed off” from the involvement of influence of everything else, a set Y entities; together X and Y comprise the universe. The isolation of X from Y typically involves a representation of the interrelationships among the elements of X. Let us call X the *isolated field* and Y the *excluded field*. It should be obvious that any representation involves isolation: isolation is ubiquitous in human cognition (Mäki 1992: 321).

After one has separated the isolated field X from the excluded field Y, one can then get a better grasp on the causal impact of the isolated field X on certain outcomes. This is made possible by “sealing off” all those features in the set Y, in the same way that experiments control for certain variables. By sealing off other variables, we can then know for certain that it is those features in the isolated set X driving the results.

The problem with using Mäki's framework to describe Coase's reasoning is that transaction costs are intentionally omitted from Coase's model, meaning that they are best understood as being part of the excluded field (the set Y). But according to Mäki, the purpose of a model is to draw inferences about the causal powers of those things included in the isolated field (the set X); we are allowed to do this, recall, precisely because they are sealed off from those things in the excluded field Y. But Coase's model gains insight on some feature of the world *f* not by including it in the set X, but rather by excluding it in the sealed-off set Y, and then seeing what sorts of outcomes the set X (importantly, *not* the set Y) produces. In other words, on Mäki's view,

¹⁰ On this direct comparison between models and experiments see Mäki (2005).

¹¹ Very similar to Mäki's account of models as isolations is Nancy Cartwright's (2009) account of models as revealing capacities. Indeed, Mäki's and Cartwright's views are often lumped together (e.g., Grüne-Yanoff 2009: 1-2; Knuuttila 2009: 60-61). As such, we believe that reasons we give here concerning why Mäki's framework does not capture Coase's reasoning can be applied, *mutatis mutandis*, to Cartwright's framework as well.

we gain insight on feature f by putting it in set X, sealing it off from set Y, and then seeing what X produces; on Coase's view, we gain insight on feature f by putting it in set Y, which is sealed off from set X, and then seeing what X produces. For this reason, we do not think Mäki's account of models as isolations can make sense of the kind of reasoning Coase employs with his model.¹²

3.5 Cased-Based Reasoning.

In a relatively recent piece Itzhak Gilboa, Andrew Postlewaite, Larry Samuelson, and David Schmeidler advance a new way of understanding the value of economic modeling. To get a hold on what their view is we need to understand the distinction between *rule-based reasoning* and *cased-based reasoning*. Write the authors:

In everyday as well as professional life, people use both rule-based reasoning and case-based reasoning for making predictions, classifications, diagnostics and for making ethical and legal judgments. Rule-based reasoning, in which the reasoner formulates general rules or theories, was formally introduced by the ancient Greeks, in the development of logic. In case-based (or, equivalently, analogical) reasoning, in contrast, the reasoner identifies similar past cases and uses those cases to guide the prediction (or classification, diagnosis, or ethical or legal judgment) in the current case (Gilboa *et al* 2015: F516-517).

As an example of rule-based reasoning, we might have a hard rule we employ every time we are in a situation relevant to the rule: for instance, always tip twenty percent. As an example of case-based reasoning, when we are in novel situations we can decide what to do by looking at similar situations confronted by us or others in the past.

The general thesis the authors advance is that (i) reasoning about the economic world is an instance of case-based reasoning rather than rule-based reasoning,¹³ and (ii) the relevant cases we

¹² Indeed, Mäki has written on Coase (and transaction costs more generally) using his framework of models as isolations. Mäki's interpretation of Coase and his model is distinct from the one we offer which, we believe, is evidence that understanding models as isolations is inconsistent with the account of modeling we develop in the next section. See Mäki (1998); Mäki (2004).

¹³ As an interesting aside, Mary Morgan's (2012: 1-2) work in the history of economic thought shows how economics shifted from a law-based science to a model-based science in the mid-twentieth century, mirroring the authors' claim that economic inquiry is essentially cased-based reasoning, *not* rule-based reasoning (though perhaps it *used* to consist of rule-based reasoning).

use in our reasoning are models. So, when we confront an interesting case in reality – what, for instance, will happen to unemployment if policy p is implemented? – we think about this in terms of cases which, really, are just models. We select the model that most closely resembles the situation at hand and then make our prediction.

On this view Coase's model is one out of many models we can appeal to in our case-based reasoning: when we confront an economic situation that resembles closely enough Coase's model of a world absent transaction costs, then we use this model to form our predictions about what will happen. Now, this is certainly a way to use Coase's model. But it is clearly not how Coase reasoned with his model. The purpose was not to show what would happen should one end up in a situation in which transaction costs were zero or approached zero. Quite the contrary, Coase used his model to illuminate the role certain institutions play when transaction costs are *not* zero. Given this, we do not think Coase's model is best understood as an instance of case-based reasoning.

3.6 *How-Possibly.*

On another account of reasoning with economic models, some argue that models are used in economic reasoning by offering *how-possibly* explanations. In contrast to an actual explanation of some phenomenon – which requires “the identification of true (sufficient parts of) causes that brought about the explanandum” – how-possibly explanations “identify elements of possible causes for an explanandum” (Grüne-Yanoff 2013: 854). As an example, if model M containing features f_1 , f_2 , and f_3 were to act as an actual explanation of outcome O , then it must be the case that features f_1 , f_2 , and f_3 were the actual cause of outcome O in the real world. But, if we understand M as giving us a how-possibly explanation, then it need only be the case that features f_1 , f_2 , and f_3 could have been the cause of outcome O .

In what way does a how-possibly explanation help us learn about the world? According to Till Grüne-Yanoff (2013: §4) there are at least five ways in which this can happen. First (i) how-possibly explanations can show us how an explanation of an outcome we thought was impossible is not, in fact, impossible; second (ii) if there are multiple possible mechanisms hypothesized to cause an outcome, how-possibly explanations can change our distribution of credences across which of these mechanisms is the correct explanation; third (iii) how-possibly explanations can

show that certain kinds of causal mechanisms *simply cannot* produce certain kinds of outcomes; fourth (iv) how-possibly explanations can show that systems with certain properties are capable of producing outcomes with certain properties; and fifth (v) how-possibly explanations can offer explanations for an outcome that was either unexplained or explained differently.

We do not think the how-possibly framework can capture Coase's reasoning. The reason why is that, according to the how-possibly framework, there needs to be a symmetry between (1) the outcome O of a model (containing features f_1, f_2 , and f_3) and (2) what we see and experience in the real world. Then, one can reason with the model in the ways highlighted in the paragraph above: perhaps we now think that it is in principle possible for f_1, f_2 , and f_3 to cause O . Or maybe we now think it is more likely that f_1, f_2 , and f_3 cause O compared to an alternative hypothesis in the literature – that f_4, f_5 , and f_6 do. Importantly, though, this symmetry between the outcome of the model and real world is absent in Coase's case. Here, the model yields a result that is completely foreign to what we actually experience in the real world. In the model world, property rights are irrelevant, and all disputes are resolved in the same efficient manner; in the real world property rights matter greatly in how disputes are resolved, and many resolutions fail to be efficient. As such, Coase's model cannot give a how-possibly explanation of why property rights influence the resolution of externalities, because its outcome shows the exact opposite to be the case. In other words, the current framework says we can give a how-possibly explanation of real-world outcome O by building a model showing how f_1, f_2 , and f_3 cause O . Coase, however, wants to explain the relationship between some feature f and outcome O by building a model in which f is absent and some other outcome, O' , obtains. This does not qualify as a how-possibly explanation.

3.7 *Caricatures.*

Above we noted that Allan Gibbard and Hal R. Varian offer one way of reasoning with models: models can act as approximations, telling us about the world by offering a reasonably accurate depiction of it. Besides acting as approximations, Gibbard and Varian also argue that models can be used in economic inquiry as *caricatures*: “often the assumptions of a model are chosen not to approximate reality, but to exaggerate or isolate some features of reality... a model

that is a better approximation to reality may make for a worse explanation of the role of some particular feature of reality” (Gibbard and Varian 1978: 673). Clearly, this describes Coase’s model: it is a gross caricature of reality in that it removes a pervasive and important aspect of economic life. But even so, does Coase’s inferential strategy match the inferential strategy proposed by Gibbard and Varian? In fact, what *is* the inferential strategy Gibbard and Varian propose to accompany a model that caricatures reality?

Gibbard and Varian are not particularly clear on this. One example of how models as caricatures are used in reasoning is by providing a robustness analysis. According to the authors, we can be more confident in a model’s conclusions when “(1) the assumptions of the model caricature features of the situation, and (2) the conclusions are robust under changes in the caricature” (Gibbard and Varian 1978: 675). This, of course, is similar to our analysis of derivational robustness reasoning in §3.3 above. There we saw that the robustness framework does not capture Coase’s reasoning. Beyond this, however, Gibbard and Varian do not specify the way in which one draws inferences from a caricatured model. So though Coase’s model *is* clearly a caricature in the sense Gibbard and Varian describe, they do not tell us enough about how such models are used in economic reasoning. We remedy this lacuna in the next section.

4. Models as Foils

Intuitively it appears as though Coase’s informal model of a world without transaction costs is incredibly valuable as a tool of economic inquiry. But our best philosophical accounts of economic modeling from the philosophy of economics literature cannot accommodate this intuition. We now remedy this by sketching a new account of reasoning with economic models that we call *models as foils*. Models as foils as a way of reasoning and drawing inferences is by no means the only way models gain value as tools of economic analysis. Indeed, many models are valuable precisely because they produce testable hypotheses, are credible worlds, induce isolations, and so on and so forth. We merely wish to lay out one way in which models can be used in economic inquiry that characterizes Coase’s reasoning and perhaps can also be used by contemporary economists in their own work.

Let us begin by recalling the structure of Coase's reasoning. Coase begins by constructing a highly unrealistic model of a world without transaction costs. He shows that in such a world (i) all externalities will be bargained to an efficient point and (ii) these externalities will be bargained to the *same* efficient point regardless the initial allocation of property rights. From this result, we saw, Coase wishes to draw the following conclusion: it is *precisely because* of transaction costs that different allocations of property rights result in diverging allocations of goods with differing levels of efficiency. We go from the model world – in which the absence of feature f of the world causes outcome O – to an inference about the real world – that feature f of the world bears some causal relation to outcome O' , which is distinct from outcome O .

Here, we believe, is a more general articulation of how this inductive inference is made:

- (1) The absence of feature f in model M causes outcome O .
 - (2) Feature f is present in the real world.
 - (3) Outcome O' , which is distinct from and incompatible with O , obtains in the real world.
- Because of (1)-(3), we have some reason to believe that
- (4) Feature f bears some causal relation to outcome O' .

Let us walk through these steps as this is the heart of our argument. One begins by constructing a model M . In doing so one leaves out an important feature of the world f . Moreover, one must show that it is the *absence* of feature f that causes outcome O .¹⁴ Of course, almost by definition, models leave out many features of the real world in their effort to simplify. Coase's model, for instance, leaves out the fact that the sky is blue. From this alone one cannot conclude that the absence of the fact that the sky is blue in model M causes all externalities to be bargained to the same point on the Pareto frontier. The feature f is not missing because it is a distraction or because its absence is irrelevant. The absence of f is key to the model. As such, successfully completing step (1) requires more than just modeling a world without feature f that also produces outcome O . One must do this, *and then* give some reason or argument for us to believe that it is precisely because f was absent that O obtained. We believe Coase successfully does this.

¹⁴ For an overview of how omissions – the absence of some feature of the world – can be causally efficacious, see Bernstein (2015).

Step (1) is more difficult to achieve than it might initially seem. But suppose one successfully accomplishes (1). From here one observes that feature f – intentionally excluded from model M and the absence of which, the modeler has argued, causes outcome O – is present in the real world. This is step (2). After doing this one observes that outcome O – the outcome of model M caused by the absence of feature f – does not obtain in the real world. Instead, a distinct outcome O' , incompatible with O , obtains. This is step (3). From these three observations we conclude – not deductively and thus definitively but rather inductively and defeasibly – that feature f bears some causal relation to outcome O' in our actual world. We can tentatively conclude this because, when reflecting on a world in which f was absent, the very absence of f was causally efficacious in producing an outcome. Not only was it causally efficacious, but its absence produced an outcome quite foreign to the one we observe in the real world. This gives us some reason to think that the very presence f in our actual world has some causal efficacy in producing the outcome we do in fact observe.

Let us fill in this general pattern of reasoning with Coase's reasoning about his model specifically. It goes something as follows:

- (1) The absence of transaction costs in model M causes all externalities to be bargained to the same efficient point regardless the initial allocation of property rights.
- (2) Transaction costs are present in the real world.
- (3) Different allocations of property rights result in different distributions in the real world (some or all of which may be inefficient).

Because of (1)-(3), we have some reason to believe that

- (4) Transaction costs bear some causal relation to the fact that different allocations of property rights result in different distributions in the real world (some or all of which may be inefficient).

We believe this is a faithful articulation of Coase's reasoning. To put it more informally and less clumsily: because property rights wouldn't matter in a world without transaction costs – precisely because these costs are absent – but because we live in a world where both transaction costs are present and property rights *do* matter, we have some reason to believe that transaction

costs are the reason why these property rights do in fact matter. This is how Coase reasons with his model: by using it as a foil against reality.

5. Models as Foils and the Austrians

The last section articulated models as foils, which was meant to capture the form of reasoning Coase employs with his informal model of a world without transaction costs. By looking closely at a world where these transaction costs are absent, he draws conclusions about the role transaction costs play in the actual world. We do not think Coase is alone in employing this style of reasoning with models. In particular, we believe several thinkers working within the broadly Austrian school of economics employ this kind of reasoning in their work. In this section we argue that many working in the Austrian economics tradition interpret competitive equilibrium using models as foils, focusing on the work of Israel Kirzner first and then F.A. Hayek.¹⁵

Competitive equilibrium models are models where prices clear markets.¹⁶ While there are many features constituting these models, we highlight only one for our purposes: everyone in the model is a price-taker. There are price-taking producers which try to maximize profits and price-taking consumers which try to maximize their utility. As Kenneth Arrow and Gerard Debreu characterize it in their classic paper: “It was assumed that each consumer acts so as to maximize his utility, each producer acts so as to maximize his profit, and perfect competition prevails, in the sense that each producer and consumer regards the prices paid and received as independent of his own choices” (Arrow and Debreu 1954: 265).

Kirzner draws inferences about the real world from competitive equilibrium models in a manner similar to how Coase draws inferences about the real world from his model of a world without transaction costs.¹⁷ That is, Kirzner uses competitive equilibrium models as a foil. Now as

¹⁵ Kirzner and Hayek are not alone here. See also Mises (1949/2007: 245-260) on the evenly rotating economy.

¹⁶ While there are different interpretations of perfect competition, the Arrow-Debreu general equilibrium formulation, which *assumes* every agent is a price-taker, dominates economics. For an alternative interpretation of perfect competition – plus commentary on Coase and the Austrian school – see Makowski and Ostroy (2001).

¹⁷ Most economists do not interpret competitive equilibrium models in the manner Kirzner does. For example, Hands (2016: 34) argues that the epistemic value of Arrow-Debreu framework – particularly the work on stability elaborated in Arrow and Hahn (1971) – rose and then fell with its success as derivational robustness, which we argued above is distinct from our models as foils view (§3.3).

we saw, Coase constructs a fictitious world with (i) a deeply unrealistic assumption (no transaction costs) and (ii) an overarching outcome that deviates from what we actually observe (all externalities are bargained to the same efficient point, regardless initial allocations of property rights). From this model world with transaction costs conspicuously absent Coase infers the relationships between transaction costs and property law in the actual world. Kirzner, we think, does something similar.

First, Kirzner notes that the outcomes of competitive equilibrium models are radically different from what we observe in the real world: namely, stylized markets as depicted in competitive equilibrium models are unable to self-correct, even though markets *do* in fact self-correct in the real world. Writes Kirzner:

Would-be buyers who have been returning home empty-handed (because they have not been offering sufficiently high prices) have *not* learned that it is necessary to outbid other buyers; would-be sellers who return home with unsold goods or resources (because they have been asking prices that are too high) have *not* learned that they must, if they wish to sell, be satisfied with lower prices. Buyers who have paid high prices do not discover that they could have obtained the same goods at lower prices; sellers who have sold for low prices do not discover that they could have obtained higher prices (Kirzner 1973/2013: 11).

This bizarre and highly unrealistic outcome that deviates wildly from the real world is akin to the outcome produced by Coase's informal model: property rights don't matter, and the same efficient outcome is always reached regardless the initial allocation of goods and underlying property law.

But for Kirzner, what is the equivalent in competitive equilibrium models to Coase's absent transaction costs? That is, what feature is absent from the model that causes market failures to go uncorrected? According to Kirzner the issue here is the absence of *entrepreneurs*, who are *not* passive price-takers (and recall that everyone in competitive equilibrium models are price-takers), but rather players that can seek new ends to maximize and new means to introduce to maximize these new or existing ends (Kirzner 1963/2011: 16-18). Kirzner argues for this conclusion in the following passage:

Into this imaginary world of men unable to learn from their market experience let us now introduce a group of outsiders who are themselves neither would-be sellers nor would-be

buyers, but who *are* able to perceive opportunities for entrepreneurial profits; that is, they are able to see where a good can be sold at a price higher than that for which it can be bought. This group of entrepreneurs would, in our imaginary world, immediately notice profit opportunities *that exist because of the initial ignorance of the market participants* and that have persisted because of their inability to learn from experience (Kirzner 1973/2013: 11).

According to Kirzner, then, the absence of entrepreneurs in competitive equilibrium models is what causes market failures to go uncorrected, just as the absence of transaction costs in Coase's model causes all externalities to be bargained to the same efficient point. But, clearly, there are entrepreneurs present in the real world and, furthermore, markets self-correct in the real world, just as transaction costs are present in the real world and, furthermore, how externalities in the real world are resolved depends on property law. This allows Kirzner to conclude that the presence of entrepreneurs in the real world bears some causal relation as to why markets do in fact self-correct in the real world, just as Coase concludes that the presence of transaction costs in the real world bears some causal relation to the effect on how property law influences the resolution of externalities.

We can see more clearly how Kirzner employs models as foils in his reasoning by articulating his argument in the form of the schema used in the prior section. Such reasoning runs roughly as follows:

- (1) The absence of entrepreneurs in competitive equilibrium models causes the market's inability to self-correct.
 - (2) Entrepreneurs are present in the real world.
 - (3) Markets self-correct in the real world.
- Because of (1)-(3), we have some reason to believe that
- (4) Entrepreneurs bear some causal relation as to why markets self-correct in the real world.

This, of course, is the same style of reasoning employed by Coase to draw inductive inferences about the real world from his model of a world without transaction costs. We believe Kirzner does the same thing: he draws inductive inferences about the relationship between entrepreneurs and

market failures in the real world by looking to models that *do not* include entrepreneurs and the resulting states of affairs these models produce.

Kirzner is not the only Austrian who uses models as foils. Indeed Hayek, while also discussing entrepreneurship, even uses the terminology of *foils*: “For it is only by contrast with this imaginary state, which serves as a kind of *foil*, that we are able to predict what will happen if entrepreneurs attempt to carry out any given set of plans”(Hayek 1941/2009: 32) (emphasis added). Hayek also interprets competitive equilibrium models as foils, but to a different end. In his important paper “The Meaning of Perfect Competition,” Hayek begins by examining the so-called “perfect competition” assumption that theorists at the time (and still today) typically employed in their construction of competitive equilibrium models. According to Hayek’s reading, assuming perfect competition is akin to presupposing (Hayek 1946/2014: 107):

- (a) A homogenous commodity offered and demanded by a large number of relatively small sellers or buyers, none of whom expects to exercise by his action a perceptible influence on price.
- (b) Free entry into the market and absence of other restraints on the movement of prices and resources.
- and
- (c) Complete knowledge of the relevant factors on the part of all participants in the market.

Hayek takes most issue with the third assumption – complete knowledge among all producers and consumers in the market, that comes along with perfect competition. Indeed, when we assume that producers have perfect information we assume that “they know the lowest cost at which the commodity can be produced,” and also know “the wishes and desires of the consumers, including the kinds of goods and services which they demand and the prices they are willing to pay” (Hayek 1946/2014: 108). Moreover, “the same situation exists on the side of the consumers or buyers” (Hayek 1946/2014: 108).

Hayek notes something interesting about this world of perfect information and perfect competition. In particular, though there is so-called perfect competition, none of the activities we typically associate with competition among firms would be present. He writes:

Now, how many of the devices adopted in ordinary life to that end would still be open to a seller in a market in which so-called ‘perfection competition’ prevails? I believe that the answer is exactly none. Advertising, undercutting, and improving (‘differentiating’) the goods or services produced are all excluded by definition—‘perfect’ competition means indeed the absence of all competitive activities (Hayek 1946/2014: 108-109).

Thus, in the perfect competition world of the competitive equilibrium model we do not see firms engage in the sorts of *competitive practices* that we typically see in the real world. If everyone has perfect information, there is no reason to advertise or differentiate one’s self – the consumer, already knowing the facts, would find such information completely useless in making her choice.¹⁸

But this absence of competitive practices in competitive equilibrium models can teach us something important about the role such practices play in the real world. Returning to Hayek:

In actual life the fact that our inadequate knowledge of the available commodities or services is made up for by our experience with the persons or firms supplying them—that competition is in a large measure the competition for reputation or good will—is one of the most important facts which enables us to solve our daily problems. The function of competition is here precisely to teach us *who* will serve us well: which grocer or travel agency, which department store or hotel, which doctor or solicitor, we can expect to provide the most satisfactory solution for whatever particular personal problem we may have to face (Hayek 1946/2014: 109).¹⁹

In sum: competitive practices are present in real markets *precisely because* they help alleviate the deep knowledge problems that real actors face. When we have incomplete information about the goods two firms produce, competition among these firms can help us learn more about these goods. This can best be seen by examining closely competitive equilibrium models where there is a complete death of competitive practices (even though they are so-called perfect competition models). In particular, by seeing what causes the lack of competitive practices in the model (perfect information), we can better understand the role competitive practices play in the real world (ameliorating our ignorance).

¹⁸ See also Hayek (1961/2014: 420) on this point.

¹⁹ For similar comments on the relationship between competition and knowledge, see Hayek (1961/2014: 425).

Like before, we can summarize Hayek's reasoning with our schema. It goes as follows:

(1) The absence of ignorance in competitive equilibrium models causes a lack of competitive practices among firms.

(2) Ignorance is present in the real world.

(3) Firms engage in competitive practices in the real world.

Because of (1)-(3), we have some reason to believe that

(4) Ignorance bears some causal relation as to why firms engage in competitive practices in the real world.

This, of course, is the same style of reasoning that Coase as well as Kirzner engages in. Coase draws conclusions about what transaction costs do in the real world by looking at a model world in which transaction costs are absent; Kirzner draws conclusions about what entrepreneurs do in the real world by looking at a model world in which entrepreneurs are absent; and Hayek draws conclusions about what competition does in the real world by looking at a model world in which competitive practices are absent. Kirzner and Hayek, as out-of-step economists relative to today like Coase, are also reasoning in an out-of-step way.

We have focused on Coase and the Austrians because they provide the clearest examples of models as foils. But other, earlier economists – especially those that Coase and Hayek would have been trained in during the 1920's and 1930's – reasoned in similar ways, although not quite as explicitly.²⁰ For example, Frank Knight, in his classic *Risk, Uncertainty, and Profit* argues that “the problem of profit is one way of looking at the problem of the contrast between perfect competition and actual competition” (Knight 1921/1964: 19). That is, he focuses on profit by studying a world without profit: the world of perfect competition. Even earlier than Knight, Alfred Marshall says that

Our first step towards studying the influences exerted by the element of time on the relations between cost of production and value may well be to consider the *famous fiction* of the “Stationary state” in which those influences would be but little felt; and to contrast

²⁰ For example, Coase was deeply familiar with Marshall, writing articles such as “Marshall on Method” (Coase 1975) and “Alfred Marshall's mother and father” (1984).

the results which would be found there with those in the modern world (Marshall 1920: 366) (emphasis added).

For Marshall, we focus on time by looking to a world in which time would not matter; this allowed him to develop his distinction between the short run and long run.²¹

Coase, Hayek, Kirzner, Knight, and Marshall were all giants within economics and all used *models as foils*. By drawing on recent work in philosophy of economics and formally stating how such predominant economists drew inferences from their models to the real world, we hope that we are left with a better understanding of these classic texts.

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²¹ We thank Greg Ransom for bringing the reasoning styles of Knight and Marshall to our attention.

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