

THE ECONOMY THAT KEEPS BECOMING · CHAPTER THREE

Where the Model Runs Thin

Chapter Three of The Economy That Keeps Becoming

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THE LICENCE

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ABSTRACT

There is a keyboard on almost every desk in the English-speaking world whose top row of letters begins Q, W, E, R, T, Y. For a generation of economists it was the most famous object in their field. In 1985 the economic historian Paul David published a short paper in the American Economic Review called "Clio and the Economics of QWERTY". He told the story of the typewriter keyboard: designed in the 1870s, partly to keep the bars of early machines from jamming, adopted by the first successful manufacturers, taught in typing schools, and then fixed in place because every typist trained on it and every employer bought for it. A rival layout, patented by August Dvorak in the 1930s, was said to be faster. It never displaced the old one. David's point was the one W. Brian Arthur was making in theory at the same time: under increasing returns, history can lock a market into an arrangement that is not the best available.

CHAPTER THREE

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The keyboard on the desk

There is a keyboard on almost every desk in the English-speaking world whose top row of letters begins Q, W, E, R, T, Y. For a generation of economists it was the most famous object in their field.

In 1985 the economic historian Paul David published a short paper in the *American Economic Review* called "Clio and the Economics of QWERTY".[12] He told the story of the typewriter keyboard: designed in the 1870s, partly to keep the bars of early machines from jamming, adopted by the first successful manufacturers, taught in typing schools, and then fixed in place because every typist trained on it and every employer bought for it. A rival layout, patented by August Dvorak in the 1930s, was said to be faster. It never displaced the old one. David's point was the one W. Brian Arthur was making in theory at the same time: under increasing returns, history can lock a market into an arrangement that is not the best available.

Five years later two economists, Stan Liebowitz and Stephen Margolis, published a reply in *The Journal of Law and Economics* with a pointed title, "The Fable of the Keys".[13] They went back to the evidence for Dvorak's superiority and found it thin. Some of the most cited trials, they argued, had been run under conditions that favoured the Dvorak layout, and later, more careful comparisons found little difference in speed. If the alternative was not actually better, the keyboard was not an example of inefficient lock-in at all. It was an example of a market settling on something adequate and staying there because switching would cost more than it would return.

The dispute has never been fully settled, and this chapter does not try to settle it. It begins here because it is the honest place to begin. Complexity economics makes strong claims, and its strongest illustration was challenged within five years by careful people with good evidence. Ammanuel Santa Anna's book is unusually direct about the value of this kind of disagreement:

> *Those differences are not problems to be resolved but productive tensions that keep the Ecstatic Economics framework honest and adaptive. The goal is polyphony, not unison.*[14]

Chapter 2 set out where the idea came from. This one takes five critiques in turn, states each as fairly as its best advocates would, and offers for each a way through: a practice that keeps what is true in the critique and still lets a leader or a household use the idea.

The first critique: lock-in is rarer than it sounds

The critique. Liebowitz and Margolis went further than one keyboard. Across a series of papers and a 1999 book, *Winners, Losers and Microsoft*, they argued that the cases offered as proof of inefficient lock-in, from keyboards to video formats, mostly dissolve on close inspection. Where a better alternative really exists, they argued, someone usually has an incentive to organise the switch: a firm can subsidise early adopters, a standard can be redesigned, a coalition can move together. True lock-in into an inferior option, in their

view, requires that a better choice be both known and blocked, and that is less common than the stories suggest.

What is fair in it. A great deal. Arthur's 1989 model showed that inefficient lock-in is *possible* under increasing returns; it did not show how often it happens. Much of the popular writing that followed treated possibility as frequency. A leader who sees lock-in everywhere will waste effort trying to escape arrangements that are in fact the sensible equilibrium of a market.

The way through. Treat every suspected lock-in as a hypothesis with a price on it. Write down what the alternative is, what evidence says it is better, and what switching would cost in money, time and retraining, with a source for each figure. If the evidence for the alternative is thin, the arrangement is probably not a trap; it is just a habit with a sensible reason. If the evidence is strong and the switching cost is the only barrier, the next question is who could organise the move. That is a practical question with a practical answer, and it often turns out to be you.



The second critique: models that can fit anything

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The second critique: models that can fit anything

The critique. Complexity economics relies heavily on agent-based models: computer simulations in which many agents follow rules, interact and adapt, and the analyst watches what emerges. The difficulty is that such models have many moving parts. Each agent's rules, the network that connects them and the way they learn are all choices the modeller makes. With enough choices, a model can be tuned to reproduce almost any pattern in the data, and a model that can reproduce anything has explained nothing.

Giorgio Fagiolo, Alessio Moneta and Paul Windrum set out the problem with care in 2007, in a survey of how agent-based economists validate their models.[15] They found a field with promising methods and no agreed standard: some models were checked against many statistical features of real data, others against one or two, and the choices made in building a model were often under-reported.

What is fair in it. Most of it. The critics are describing a genuine weakness, and the more careful complexity economists say so themselves. J. Doyne Farmer and Duncan Foley's 2009 essay in *Nature*, "The economy needs agent-based modelling", made the case for these models after the financial crisis while acknowledging that they were less developed than the models they hoped to supplement.[16]

The way through. For a reader who is not building models but reading them, three habits help. Ask how many independent patterns in real data the model reproduces, not merely whether it reproduces one. Ask what the model predicts that its builders did not put in on purpose. And prefer the simple model you can understand to the elaborate one you cannot. In an organisation, the same discipline applies to the informal models every leader carries: a story about why sales rose can usually be made to fit the facts after the event. Write the story down before the quarter starts, with what would prove it wrong.



The third critique: everything depends on everything

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The third critique: everything depends on everything

The critique. If outcomes depend on small historical accidents, and the economy is always adapting, then perhaps nothing useful can be said in advance. A theory in which anything might happen is a theory that cannot be tested. The charge is sometimes made with a shrug: complexity economics describes the world beautifully and tells you nothing to do on Monday.

What is fair in it. The point about prediction is real. Arthur himself is modest about forecasting specific outcomes. A theory that says "it depends on history" does owe its users an account of what, in the meantime, they can rely on.

The way through. Complexity economics predicts shapes, not points. It does not say which of two technologies will win; it says that one of them will probably win by a wide margin, that the market will become hard to reverse once one leads, and that early adoption matters more than late. Those are testable claims about the distribution of outcomes, and they are useful. A firm entering a market with strong network effects can know, without knowing who will win, that a narrow early lead is worth more than a better product launched later. A household deciding which of two neighbourhood schools to support with its time can know that small early contributions to a growing institution often carry further than larger contributions to a settled one.

Santa Anna's book names the habit of mind that turns this critique into an excuse. Writing about how new economic arrangements are judged, he observes:

> *This is important because perfectionism is one of scarcity consciousness's most effective weapons.*[17]

The critique, pressed too far, becomes exactly that: a demand that a theory either forecast perfectly or be set aside. If the perfect answer cannot be computed in advance, the task becomes building the capacity to learn quickly from what does happen.

The fourth critique: lock-in as an excuse

The critique. This one comes less from economists than from those who watch how ideas are used. Increasing returns and winner-takes-all dynamics, told carelessly, become a story of inevitability. The dominant platform won because it had to; the incumbent is unmovable; the arrangement that profits a few is simply what the system produced. Complexity becomes a vocabulary for accepting concentration rather than questioning it.

What is fair in it. The misuse is common, and the house should take particular care with it, because the opposite of an extractive economy cannot be built by people who believe extraction is a law of nature. A lock-in described as fate is a lock-in nobody will try to open.

The way through. Read lock-in as a design variable. Gregory Unruh's paper "Understanding carbon lock-in", published in *Energy Policy* in 2000, is a model of how to do it.[18] Unruh described the fossil-fuel economy as a techno-institutional complex: technologies, firms, infrastructure, regulation and habits that had grown up together through increasing returns and now held one another in place. He did not conclude that the arrangement was permanent. He concluded that escape requires acting on several reinforcing loops at

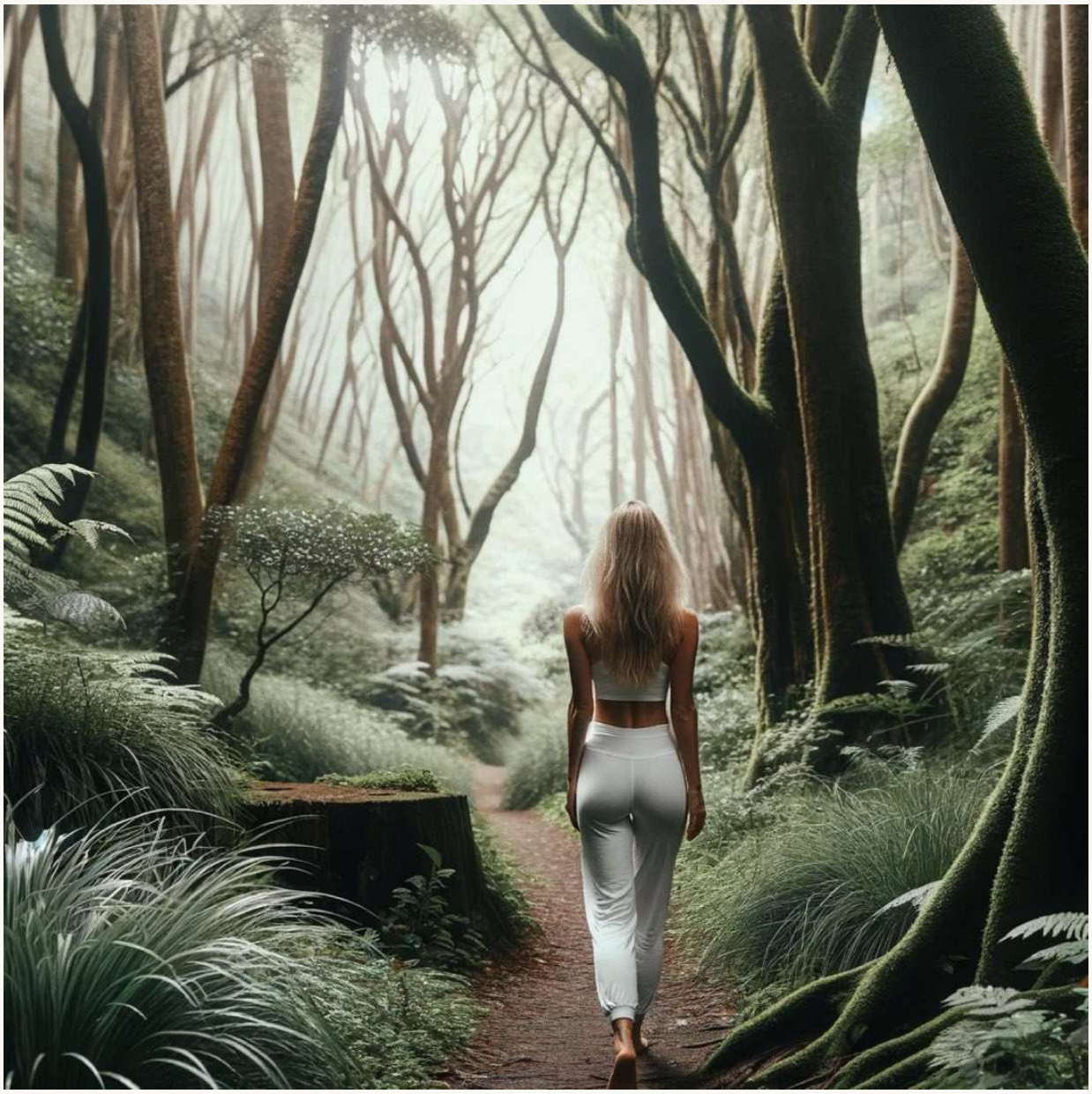
once, because any single loop changed on its own is pulled back by the others. That is a strategy, not a lament.

Robin Cowan's 1990 study of nuclear reactors, in *The Journal of Economic History*, is a sobering companion.[19] He traced how one reactor design, the light-water reactor, came to dominate civilian power, partly through early naval programmes and the learning they generated, while alternatives that some engineers considered promising received far less development. Cowan's evidence is historical and his judgement about the alternatives is necessarily contestable. But the paper shows the mechanism clearly, and the mechanism is not destiny. It is the accumulated weight of early decisions, which different early decisions could have shifted.

Santa Anna's book names the same thing in plain language, and refuses the fatalism in the same breath:

> *structures have their own inertia, their own logic, their own capacity to reproduce themselves regardless of the intentions of the people inside them.*[20]

The structures reproduce themselves. That is why the book argues for changing structures as well as minds, and why chapter 4 reads lock-in as a living pattern that can be redirected.



The fifth critique: "it's complex" as a reason to stop

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The fifth critique: "it's complex" as a reason to stop

The critique. The last critique is about behaviour, not theory. In many organisations the word *complex* has become a way of ending a conversation. A problem described as complex is a problem nobody is expected to solve, and a leader who says it often enough has found a polite way to do nothing.

What is fair in it. It is accurate about how the word is often used. A theory of complexity that leaves its readers less willing to act has failed them.

The way through. Complexity calls for a different kind of action, not for less. Dave Snowden and Mary Boone, in their 2007 *Harvard Business Review* article "A Leader's Framework for Decision Making", described the Cynefin framework, which sorts situations by the relationship between cause and effect.[21] In what they called the complex domain, cause and effect can be understood only in retrospect, so the right response is to *probe, sense, respond*: run small, safe experiments, watch what happens, amplify what works and dampen what does not. That is a programme of action, sized for uncertainty.

The Luminous 100, the house's set of upgraded management frameworks, reads Ralph Stacey's related matrix in a way that answers this critique directly. Where the classical tool tends to produce alarm at the discovery that an organisation is in the complex zone, the upgrade asks:

> *What if the complexity we're experiencing is not a threat but evidence that we're alive and growing?*[22]

The critique is answered by using the right tools for the zone you are in. A leader who says "it's complex" and then designs three small experiments with a date to review them has turned the word back into what it should be: a description of the ground, not a reason to stay off it.

What remains standing

Five critiques, all serious, and each leaves complexity economics narrower and stronger than its most enthusiastic advocates made it.

What remains is this. Increasing returns are real in many markets, though not in all, and their presence is a question to answer with evidence. Lock-in into an inferior arrangement is possible and probably less frequent than the stories suggest, which makes the cases where it does occur more worth finding. Models of adaptive agents are promising and hard to validate, so their findings deserve the same scrutiny as any other model's. The theory predicts shapes rather than points, and shapes are enough to act on. And complexity calls for small, deliberate experiments, never for paralysis.

A reader who holds the theory this way will use it better than one who holds it as a revelation. Santa Anna's book draws a related line in its own subject, warning against the temptation to blend every tradition into one smooth story. The same discipline applies here: complexity economics is one voice in the lineage, alongside Elinor Ostrom's work on governing shared resources and Karl Polanyi's account of markets embedded in society, and it is more useful for having its limits named.

The keyboard is still on the desk. Whether it is a trap or a sensible habit is an argument economists are still having, and either answer leaves the same useful question for whoever is typing on it: what would it actually cost to change, and who would have to move first?

The Tool: The Lock-In Test

Use this for any arrangement you suspect is holding your organisation or household in place. One sheet per arrangement. It adds a column to the map from chapter 2.

1 · The arrangement

What it is, in one line:

When it began, and how:

What depends on it now (systems, people, contracts, habits):

2 · The alternative

The specific alternative you believe is better:

The evidence that it is better, with its source and date:

- Grade the evidence: one anecdote / several anecdotes / a measured comparison / several measured comparisons

Who would disagree, and their best argument:

3 · The price of switching

COST	AMOUNT	SOURCE OF THE FIGURE	FALLS ON WHOM
Money			
Time			
Retraining or relearning			
Lost compatibility with others			

4 · The verdict, provisionally

If the evidence for the alternative is thin: a sensible habit. Leave it, and note the date you will look again.

If the evidence is strong and switching is cheap: switch. Owner and date:

- If the evidence is strong and switching is costly: a lock-in. Continue to section 5.

5 · The loops holding it in place List every reinforcing loop that keeps the arrangement where it is (training, contracts, suppliers, other people's expectations).

…

…

…

Which loops could be changed together, at the same time?

Who else would need to move, and what would make it worth their while?

6 · The probe

One small, safe experiment to test the alternative:

What result would make you continue? · stop?

Review date:

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