

# Path Dependence and Cumulative Causation Is an Association Possible?

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## Abstract

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In social sciences, especially economics, several recent criticisms, such as those of Geoffrey Hodgson, Paul David, Alexander Rosenberg and others, can be gathered on the basis of the acceptance of the significance of history in understanding the evolution of social institutions. Each of their perspective and methodology drastically diverge from the other. They, however, share a common ground claiming that explaining institutions in historical setting is crucial for understanding the social phenomenon. In the paper I first show the significance of path-dependence and cumulative causation in economics. I then propose to initiate a dialogue between these two notions. In that cumulative causation functions to explain institutions that have happened to evolve dependently on a path. Departing from this idea, the paper investigates the possibility of an association between path-dependence and cumulative causation in economics, basically following Thorstein Veblen's own writings.

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## Path Dependence and Cumulative Causation Is an Association Possible?

*The situation of today shapes the institutions of tomorrow through a selective, coercive process, by acting upon men's habitual view of things, and so altering or fortifying a point of view or a mental attitude handed down from the past. The institutions – that is to say the habits of thought – under the guidance of which men live are in this way received from an earlier time; more or less remotely earlier, but in any event they have been elaborated in and received from the past. Institutions are products of the past process, are adapted to past circumstances, and are therefore never in full accord with the requirements of the present ... At the same time, men's present habits of thought tend to persist indefinitely, except as circumstances enforce a change. These institutions which have thus been handed down, these habits of thought, points of view, mental attitudes and aptitudes, or what not, are therefore themselves a conservative factor. This is the factor of social inertia, psychological inertia, conservatism.*

Thorstein Veblen, *The Theory of Leisure Class* (1994) p.190-191

Several scholars in the philosophy and history of social sciences, for at least two or three decades, have been asserting that the present structure of social sciences creates unreasonable blocks to intellectual development. They, more strongly than ever, have been proclaiming for the consequent need for some kind of reconstruction. In one of these accounts, such as The Report of Gulbenkian Commission in 1996, the authors invite the social scientists to “take a hard look at their present structures and try to bring their revised intellectual perceptions of a useful division of labour into line with the organisational framework they necessarily construct” (Wallerstein *et al.*, 1996, p.96). The line between the humanities and the social sciences, it was declared in the project by the members of the Commission, Immanuel Wallerstein, Ilya Prigogine, Jürgen Kocka and the like, is “being undermined by the increasing ‘historicization’ and hence ‘contextualisation’ of the humanities matched by the increasing willingness of social scientists to acknowledge ‘humanistic’ issues

and methods”. What those offer is a kind of “historical reconstruction of social sciences”. And yet what preconditions and presuppositions do economists need for involving others, say sociologists or historians, in the economic conversation? This paper aims at participating in the discussion about the conditions under which *economics* opens its own intellectual borders to *history*.

Yet, what is so special about history and historical understanding for social scientists and particularly for economists? Differently put, what can historical understanding contribute to economics science? Certainly, one might give different answers to this question. Within the philosophy of science, one of the answers would be that, as Alexander Rosenberg puts it, if economics is to be an evolutionary science and if it is basically inspired by the way biologists explain, then it should somehow include *historical accounting*, for, according to Alexander Rosenberg, biology itself is historical (Rosenberg, 2001). Or, one may put the subject totally differently and argue that the need for an interdisciplinary explanation of economic phenomena, encompassing history itself, arises because “... every human being and every society carries the baggage of its past. Evolution builds on past survivals that encumber actions in the past. Choices made by our ancestors can be difficult to undo ... [T]hen our analyses must explore the particularities of the past. While we may retain general principles or guidelines, detailed analyses of particular events, structures and circumstances are required” (Hodgson, 2001, p.3).

We have also elegant claims made by several economic historians. One prominent figure in the field, among many others, is Joel Mokyr (1991).

According to him,

[j]ust as existing species can be traced through time to their ancestors, the technological structure of an economy is determined by history. This insight is neither very novel nor profound, but it does help drive home the message that once we specify a mechanism by which the past locks an economy into a specific technology, history matters.

Certainly, one may say so much about this claim as well as the previous ones.

Yet, whatever the rationale given by economists, philosophers, or other social scientists, they have in common the implication that it is worth taking seriously *the quest for historical economics*. My rationale for introducing historical understanding into economics would be a bit different than those I have named above. What I shall argue for in this paper would be that two key notions, namely, *path-dependence* and *cumulative causation*, direct economists to explain the social phenomena within an historical setting.

Make it explicit what you want to do, right here:

1. pd and cc should be associated
2. for doing this, an overview of both notions needed
3. cumulative causation calls for counterfactual reasoning.
4. the last paragraph: this association is acknowledged in the literature (Hodgson ???) Some authors meant it implicitly in their writings (ref???). But no sufficient attention is paid (ref???). This is the aim.

## History Matters But Why?

One of the most essential pre-suppositions of Historical Economics is that path-dependence plays a crucial role in the evolution of institutions. This is one of the most influential challenging criticisms against the view that is in favour of disassociating economics from history. Path-dependence, as is defined by several historical economists, is that past experiences, be it individual or social, somehow affect the present decisions of actors. Put it differently, every behaviour has crucial influences on future preferences, which *may* make the actor move away from *the most* desirable choice to a *less* desirable one. History then is the constituent that we should take into account for explaining the actual state of an institution. Following Stan Margolis and Steve Liebowitz (1998), I may put a formal definition as follows:

... path-independence means that it doesn't matter how you get to a particular point, only that you get there ... In contrast, if a process is path-dependent, the sequence does influence the next step. So ... path-dependence is a stronger claim than simply that history matters. Unfortunately, as path-dependence has been borrowed into the social sciences, it has taken on several different and often conflicting meanings. Sometimes it means only that history matters in the very narrowest sense, and other times it means something more.

Following the same line as Margolis and Liebowitz, path-dependence, in the first place, is such a circumstance that decisions may have a “persistence element,” which prevents the actor from revising and changing his preferences even when the conditions are critically altered. One may not move to a new house, for instance, in response to changes of relative prices or his income.

This is because purchase decision is made sometime in the past and it contains a kind of “persistence element.” Secondly, since the information set of actors is not always perfect, they cannot predict the future well. The most efficient decisions made *ex ante*, given the limitation on knowledge, then, may turn out to be inefficient in the future. It may be costly, however, to change decisions *ex post*, that is, after the decisions are made. One may not predict, for instance, whether he will feel comfortable with the neighbourhood before moving to the new house; and, after moving, it may be worse than he has expected.

And thirdly, it is the form of path-dependence that leads to inefficient solutions. Paul David (1992), one of the main contributors to the literature, claims:

The accretion of technological innovations inherited from the past therefore cannot legitimately be presumed to constitute socially optimal solutions provided for us – either by heroic enterprises or herd of rational managers operating in efficient markets.

His well-known example is the QWERTY type keyboard. As he tells in his seminal paper, although this type of keyboard, in contrast to its alternatives such as Dvorak Simplified Keyboard, is hard to learn, and reduces the speed of the typist, it is still manufactured and sold immensely in the market. This is because *switching to* another system of typing costs too much. The example, as is recited, then, is an illustration of a “market failure,” which has occurred because of path-dependence.<sup>1</sup> The early start of QWERTY arrangement determined the standards in such a way that they cannot be eliminated or

altered by rival systems at the moment (David, 1985). In the literature this is also called “lock-in” referring to increasing returns or economics of scale, more profoundly *network economies*. That is to say, “historical small events” can cumulate step-by-step to lock the market in the monopoly of a possibly inferior technology (Arthur, 1989). Here ‘network economies’ plays a crucial role. If average costs decrease as the amount of commodity produced increases *and* if the application or usage of a commodity is extended as it becomes a part or a component of a network, then the commodity becomes dominant in the industry: “[i]f nobody has a telephone,” says Brian Arthur in an interview, “the telephone isn’t much used; but if everybody has a telephone, or say e-mail, then it is much more useful. It’s another form of positive feedback. If everybody is using Java, then more applications are going to be written for Java. It’s the positive feedback that comes from a network of users” (Arthur, 1998).

As the conversation about path-dependence has been excessively broadened, I feel myself reluctant here to open another chapter on the debate. The major concern in this prose, therefore, is not path-dependence and cumulative causation *per se*. And this is not an attempt either to set a block against every and each estrangement between economics and history. My purpose rather is to initiate a dialogue between these two notions, and examine the way in which these two notions could be associated with each other. This exposition, besides, should neither amount to saying that there is no ambiguity in the meaning of path-dependence, or that the story of QWERTY is reasonable and

wise; in fact, there are ambiguities and the story is not totally plain. I would just name one of them, which will hopefully provide a basis for further suggestions for the ongoing conversation. What I would like to point at is the claim that path-dependence enhances the importance of (economic) history in the traditional sense. This, I believe, might not always be the case. One of the reasons might be that path-dependence asserts that “small” and unpredictable events are responsible for the final outcomes. This, then, rules out the ability of (economic) historians to describe grand forces governing the economic phenomena. Put it differently, “strong form of path-dependence,” as Stan Margolis and Steve Leibowitz define it, would not allow (economic) historians to do their job, at least, in traditional and deterministic terms. And yet I should acknowledge here that many historians call for the attention to contingency in (economic) history, which can be seen as a kind of rebellion against deterministic theory. Nevertheless, this does not reduce any ambiguity in its implication. The question is still without a clear answer: *how* will we adapt (economic) history to economics?<sup>2</sup>

I think that cumulative causation offers a new gateway here. One can argue that it is not capable of solving the conflict at the heart of the debate. Nevertheless, it is obvious that cumulative causation is going to pour some cold water into the debate.

### **Veblen Introduces the Notion: Cumulative Causation**

The status of causation and recognition of the importance of cumulative processes in understanding social phenomena have always been extremely

essential to social theory. Several philosophers and methodologists have already acknowledged and shown that theories in social sciences explaining the evolution of institutions should be built in such a way that they provide with a precise depiction of the sequence of the cumulative change. Geoffrey Hodgson, for instance, argues for the view that evolutionary social science above all means causal analysis. “Instead of taxonomy and the accumulation of facts,” quotes he from a book by an influential biologist George Romanes, “causes or principles are the ultimate objects of scientific quest” (Hodgson, 1998). According to Tony Lawson, for another instance, explicating “causes” and “structures” is the criterion for ascribing reality. “The *ex posteriori* fact of human intentionality and choices indicates,” says Lawson, “that there are real material causes or structures which facilitate intentional action ... [I]n determining the real possibility of social science we must acknowledge that science employs not only a perceptual, but also causal, criterion for the ascription of reality to a posited object” (Lawson, 1997, p.31). And this perspective is identical with Wesley Salmon’s because “[t]o understand the world and what goes on it,” Salmon states, “we must expose its inner workings. To the extent that causal mechanisms operate, they explain how the world works” (Salmon, 1984, p.133).<sup>3</sup>

Literature on philosophy of causation here...

These philosophical and methodological reflections after all point at a certain feature of social theories: depiction of the *cumulative* advancement of humans and societies, which does not necessarily consummate in equilibrium, and

where the *causal* nexus among phenomena is fully specified. Uskali Mäki mentions two necessary conditions for a theory to count as a causal process theory. The first is that it has to provide an account of a process as a sequence of events. And second, causal process theories have to depict the deriving forces in motion, that is, the causes of the motion from one event to another in sequence (See Mäki, 1992). I would accordingly argue that whenever path-dependent circumstances happen to be important in the evolution of an institution, causal process theories are the genuine expositions of the *explanandum*.

Consider the following passage from Paul David (1985):

A path-dependent sequence of economic changes is one of which important influences upon the eventual outcome can be exerted by temporally remote events, including happenings dominated by chance elements rather than systematic forces. Stochastic processes like that do not converge automatically to a fixed-point distribution of outcomes, and are called non-ergodic.

This definition gives a way to two important issues. Firstly, path-dependence is a property of sequences of events, in which a particular process is unable to get itself free from the influence of its past states. Path-dependent processes, secondly, combine, in the same sequence, the processes featuring necessity with the processes that stress chance elements. This is crucially important because path-dependent sequences require explanations that account for how the systematic and contingent association between sequences of events comes about. In explaining path-dependent sequences, we are thus forced to get into

the causal nexus that account for the sequential and logical association between events (Araujo and Harrison, 2003). This brings us to the idea suggested by Thorstein Veblen.

Check the following sentences. They should be in quotation marks...In

Veblen's formulation the basic idea behind *the theory of causation* is that neither industrial development nor social change in general converges toward a predefined point. And yet, development can proceed along different paths in a non-teleological way: cause and effect relationships produce in mutually dependent potencies, which have positive or negative feed-backs between them, and which have no pre-defined final term to which they necessarily converge (See Argyrous, 1996). The growth of culture, says Thorstein Veblen in 1909,

is a cumulative sequence of habituation, and the ways and means of it are the habitual response of human nature to exigencies that vary incontinently, cumulatively, but with something of a consistent sequence in the cumulative variations that so go forward, – incontinently, because each new move creates a new situation which induces a further new variation in the habitual manner of response; cumulatively, because each new situation is a variation of what has gone before it and embodies as causal factors all that has been effected by what went before; consistently, because the underlying traits of human nature (propensities, aptitudes, and what not) by force of which the response takes place, and on the ground of which the habituation takes effect, remain substantially unchanged.

It is worth first of all mentioning the origin of the problem with the established economic theory that falls short of explicating the association at stake here.

The problem, following Veblen, actually, lies in “marginal utility theory” which is incapable of locating a notion of movement of any kind. It precludes any theory of genesis, growth, sequence, change, process or the like in economic life. Several institutional phenomena or facts, as a consequence, are either taken for granted or denied or explained away in theoretical scrutiny. “Modern science”, instead, in his own approach, provides the best understanding of the cumulative character of human conduct. It is, of course, on individuals, says again Veblen (1909),

that the system of institutions imposes those conventional standards, ideals, and canons of conduct that make up the community's scheme of life. Scientific inquiry in this field, therefore, must deal with individual conduct and must formulate its theoretical results in terms of individual conduct. But such an inquiry can serve the purposes of a genetic theory only if and in so far as this individual conduct is attended to in those respects in which it counts toward habituation, and so toward change (or stability) of the institutional fabric, on the one hand, and in those respects in which it is prompted and guided by the received institutional conceptions and ideals on the other hand.

In “Why Economics is not an Evolutionary Science” Veblen performs admirably as well in explicating why economics, in his own words, is unable to handle its subject matter in a way to entitle it to standing as a modern science. Among many other issues, a concept is at the centre of his inquiry, which Veblen thinks would provide the theory of a cumulative sequence of economic institutions stated in terms of the process itself, *cumulative causation*. What he welcomes by virtue of this concept is the recognition of the difference of a

“spiritual attitude” in economics science in the “post-Darwinian epoch.” The difference literally is the alteration of the basis of valuation of the facts for scientific purposes. The two generations, that is, pre- and post-Darwinian epochs, according to Veblen, are identical in philosophical terms in following the programme of inquiring into the causal nexus among phenomena. And yet in their formulating of results two traditions differ. For a pre-Darwinian scholar the ultimate notion of systematising knowledge is natural law. This notion yields results that are actually the explorations of some sort of a “coercive surveillance” and “spiritual stability,” “in terms of a consistent propensity tending to some spiritual legitimate end.” It amounts to saying that humans always and everywhere seek to do something specific, specified by natural law. In order for a theory to feature such a property some sort of a definitive end or that a legitimate trend coerce the events evolve in the same way should be possessed or assumed. The notion of legitimate trend, however, is an extra-evolutionary concept, according to Veblen, which lies outside the scope of an inquiry into the causal sequence in any process. “The evolutionary point of view,” says Veblen (1898), “therefore, leaves no place for a formulation of natural laws in terms of definitive normality, whether in economics or in any other branch of inquiry. Neither does it leave room for that other question of normality, What should be the end of the developmental process under discussion.”

The main reason, to Veblen, why modern science of his time ceased to occupy itself with the idea of natural law and shifted the emphasis onto the process of

causation was that natural law left no room for accounting for the consecutive change “in which the *nexus* of the sequence ... is the relation of cause and effect.” The nature of the inquiry of consecutive change, to put the issue differently, precludes, on the one hand, any conceptualisation of stable equilibrium (that is, “the definitive state of settlement into which things were to fall as the outcome of the play of forces”) and, on the other, any postulate affirming that things incline finally to any fixed direction (that is, “the consummation in which causal effect was once presumed to come to rest”). “It is an unproven and unprovable postulate – that is to say, it is a metaphysical preconception,” says Veblen (1906), “but it gives the outcome that every goal of research is necessarily a point of departure; every term is transitional.”

Veblen’s interpretation of causation goes hand in hand with his materialist understanding of human behaviour. The change in the “spiritual attitude” in the post-Darwinian period, according to Veblen, was mainly because of the technological advancement in the nineteenth century. Casual sequence of events grew more impersonal and more “matter-of-fact” in this period because the machine process displaced workmanship, and, moreover, brought a new discipline into the culture. The interpretation of the social phenomenon, consequently, has become less anthropomorphic: “... it no longer constructs the life-history of a cause working to produce a given effect ... but it constructs the life-history of a process in which the distinction between cause and effect need scarcely be observed in an itemised and specific way, but in which the run of causation unfolds itself in an unbroken sequence of

cumulative change” (Veblen, 1906). Veblen claims that basic characteristics of modern technology such as “standardisation, validity, finality” always refer to an impersonal sequence not human nature. Technology, thereby, has coerced the social scientists to interpret the social in mechanical terms and not in personality or workmanship. “... [S]o long as the machine process continues to hold its dominant place as a disciplinary factor in modern culture, so long must the spiritual and intellectual life of this cultural era maintain the character which the machine process gives it” (Veblen, 1906).

Make a short intro to counterfactual reasoning. Tell that the idea of accumulation bears the idea of counterfactuals etc.

### ***Imperial Germany and ‘Silly Little Bobtailed’s***

*Imperial Germany and Industrial Revolution* is one of the most suitable places for probing his application of path-dependence and cumulative causation in the sense mentioned above. The discussion, indeed, figures in the recent literature as well. I am not that favour of carrying here the entire story in his book. I would only say, in a nutshell, that his discussion is about whether “technological innovations and creations of an institutional nature have in many cases [reached] their fullest serviceability only at the hands of other communities and other peoples than those to whom these cultural elements owed their origin and initial success” (Veblen, 1915, p.22). The story, then, is based on whether it is more practicable to carry over a state of art from one community to another. The problem for him, therefore, is a matter of efficient use of technological developments.

Germany combines the results of English experience in the development of modern technology with a state of the other arts of life more nearly equivalent to what prevailed in England before the modern industrial regime came on; so that the German people have been enabled to take up the technological heritage of the English without having paid for it in the habits of thought, the use and wont, induced in the English community by the experience involved in achieving it. Modern technology has come to the Germans ready-made, without cultural sequences which its gradual development and continued use has entailed among the people whose experience initiated it and determined the course of its development (1915, p.82-83)

An economy, according to Veblen, might be left with a relatively inferior technology, or the circumstances in an economy might not conduce to the best material interest of the system in force if a community's past habits of thought are at cross-purpose with the conditions of life afforded by the new state of industrial arts. The problem, basically, is a matter of cultural conditions in the early phases of the "life history" of any community. Veblen's point, therefore, is identical to Paul David's above account in the sense that some of the past experiences might lead to non-optimal results at the present time. Veblen's story is about the implications of the fact that the railways of Great Britain were constructed with too narrow a gauge compared to those of American and German railway systems in the Edwardian Britain (1885 and 1950). Those "silly little bobtailed carriages," Veblen argues, was an inefficient technology primarily because these coal wagons had a very limited carrying capacity. He reports that this fact was known by the experts of the time, though, the remedy was not that easy to implement. The fundamental reason was that all the terminal facilities, tracks, shunting facilities, and all the ways and means of

handling freight on this oldest railway system were all adapted to the bobtailed cars. The infrastructure and equipment, such as the roadbed and metal, and the engines, additionally, were not at a substantial level to take care of such traffic when some technological improvements first went into operation. It was, therefore, not without any troubles to introduce new technologies since “... the chief significance of this work of improvement, adaptation and repair in this connection [was] that it [argued] a fatal reluctance or inability to overcome this all-pervading depreciation by obsolescence” (1915, p.127)

His example is closely scrutinised by Van Vleck who has shown *quantitatively* in her PhD dissertation that the case might not be necessarily so. She proved that British carriages were not economically inefficient or irrational but merely substitutes for more costly distribution and delivery means such as horses, hay and oats, trucks, and petroleum fuel. Small wagons, therefore, were used because they suited to the existing infrastructure and not because they were economically at the margin (See Van Vleck, 1997). Her account, as she as well mentions, is that *unless shown quantitatively*, one cannot judge in advance whether path-dependent outcomes are non-optimal or not. **More here, 1 or 2 sentences...**

Van Vleck’s account could be applied to QWERTY case as well: as no quantitative calculation is done up to now, we do not know whether QWERTY is a relatively inferior technology or not. Her point might be interpreted as a controversy in the literature, though, this interpretation, in fact,

builds the bridge between two notions and forces us to think about counterfactuals.

Examination of counterfactual conditions builds the link between the two. Whenever an institution evolves dependently on a path, the question to be asked would be, What if the institution had evolved independently on a path? More precisely, Might it have turned out better if all the resources we have spent on path-X (QWERTY) had been rather allocated for path-Y (Dvorak)? And if so, *how much?* The point here then is that one has to make a counterfactual calculation whenever path-dependence plays a fundamental role in the evolution of the institution. That is to say, path-dependence requires economists to compare the circumstances in the actual world with the circumstances in a counterfactual world. Leaving aside the practical question, How will we make such a measurement?, we economists should know, How much is QWERTY inefficient in quantitative terms? The inquiry is actually equivalent to making causal statements in that counterfactual scrutiny involves the examination of the causal connections between the antecedent and the consequent in every happening. To think about counterfactuals, in other words, amounts to explicating the causal connexion among events. Counterfactual analysis, then, can be seen as the link between empirical work (quantitative research) and theoretical work (examination of causes). Insofar as counterfactual conditionals are causal claims, empirical work will involve historical narration. This, then, leads us to that counterfactual scrutiny fills the link between path-dependence and cumulative causation in economics.

The previous paragraph is rather weak. Here counterfactuals...

## Epilogue

Gulbenkian Commission, in *Open the Social Sciences*, reports strikingly on how economics, as we call it today, evolved through time as a separate science. The reason why political economy disappeared in favour of economics was partly that “economics could argue that economic behaviour was the reflection of a universal individualist psychology rather than of socially constructed institutions, an argument which could then be used to assert the naturalness of laissez-faire principles” (Wallerstein *et al.*, 1996, p. 17). The other reason was the conjecture that, related to the previous one, market and state operate by distinctive logics. Economic history, as a separate discipline, on the other hand, has developed immensely out of history more than out of economics mainly because economists have given little significance to economic history in contributing to the development of economics science. And the story applies to other branches of social sciences too, including sociology, anthropology and the like. What seems clear is that we should make a critical reassessment of the present state of social research as to reconstruct the social sciences according to the genuine intellectual needs of sciences. Economics as well should be a part of the project, and create opportunities for the common wisdom, where both economists and historians could converse thoroughly and reflectively. The implication of the examination of path-dependence and cumulative causation is but one of the most convenient ways to build the bridges between apparently distinct two research areas. The inert state of economics does not

seem to be in full accord with the requirements of the present, and is by no means progressive so as to let clear off the analytical poverty for a better world, though, demanding the impossible, as we were shown some decades ago, should not ever mean to having no purpose realistic.

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## Footnotes

<sup>1</sup> Stan Margolis and Steve Liebowitz have put forth many arguments against Paul David's interpretation and others' examples such as QWERTY and Beta-VHS debate. See Margolis and Liebowitz (1995).

<sup>2</sup> For this argument and further debate see the opening discussion of Steve Margolis and Stan Leibowitz on the web site of EH.NET at <http://eh.net/lists/archives/eh.res/nov-1996/0002.php> Accessed May 2002.

<sup>3</sup> These views, of course, depend heavily upon their justification of the reasoning underneath and the notions they use, such as "structures", "mechanisms", "inner workings" etc. I neglect for my present purposes any possible imperfections and shortcomings that they may involve or provoke. I take them mainly as convenient metaphorical constructions that allow us to develop a conceptual framework with which we can interpret and characterise alternative intellectual practices in economics. See Klamer and Leonard (1994) for further discussion on the significance of metaphors in economics.