

Path dependence



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What do you understand by the term path dependence? Identify those characteristics of a system that are likely to give rise to path dependent processes. What is the significance of path dependence for the study of industrial organization? What limitations do you associate with the literature on path dependence? Illustrate your answer by referring to a relevant case study.

The conventional economic theory is based on the assumption that market is efficient and competition between agents generates the optimal results.

However, in recent years, the term path dependence has become prominent as an alternative analytical perspective for economics.

In the broader way, William Sewell (1996) suggests that path dependence means “ what happened at an earlier point in time will affect the possible outcomes of a sequence of events occurring at a later point in time” (p. 262-3) Therefore, “ history matters”. In the narrower way, Margaret Levi (1997) suggests that the concept is related to increasing return processes, “ the probability of further steps along the same path increases with each move down that path...the costs of exit – of switching to some previously plausible alternative rise” (Pierson 2000)

The related ideas of path dependence in physics and mathematics come from chaos theory. In biology, the related idea is called contingency – the irreversible character of natural selection. Ideas regarding technological change were first developed through P. David’s (1986) analysis of the emergence and sustainability of the QWERTY standards keyboard and W. Brian Arthur’s (1994) work on increasing return economics and “ lock-in”. It

has also been applied to issues such as institutional change (North 1990, Setterfield 1995) and regional economic evolution (Arthur 1994, Krugman 1991). The critique of path dependence, Liebowitz and Margolis(1995) identify three forms of path dependence distinguished by usable information about the future. First degree path dependence is present where “ there is an element of persistence or durability in a decision” (Liebowitz and Margolis, 1995) It implies no inefficient. Second degree path dependence is where a sub-optimal decision is made, but the mistake is due to imperfect foresight. They are not inefficient neither given the limited knowledge. Third-degree path dependence occurs when a sub-optimal decision is made despite having information that a superior choice is available.” (Richard J. Sullican, 2003) This implies inefficient since the outcome remediable.

In this essay, I am going to illustrate the characteristics of path dependence based on P. David (1985)'s case study on QWERTY. I defined path dependence as “ is a process of changes in which small events, including those purely dominated by chance or luck, of the process's own history leads to an eventual outcome which might not necessarily be the most efficient one. However the impact is persistence and enduring therefore lead to the state of lock-in.”

The QWERTY keyboard was designed by Sholes, initially to reduce the frequency of typebar clashes and later was sold to Remmington. The machine was soon adopted by many managers and become eventually became “ The Universal” (p. 39). David suggests that the accidents of timing led to touch typing skills being taught on QWERTY arrangement and small historical event such as typing contest won by those who used the QWERTY

keyboard have contributed to the acceptance of the QWERTY system. He has identified three factors that are crucial in causing the QWERTY keyboard to become locked in as the dominant keyboard arrangement. First, technical interrelatedness refers to the need for compatibility between the typewriter – “ hardware” and the typists’ competencies. Typists have to obtain the required skills in order to use the QWERTY typewriter. Their decision to learn the QWERTY keyboard would increase the value of QWERTY-equipped machines to their owners. The cost of switching to another system, cost of retraining the users, are high therefore companies are encouraged to stick with the system. The second feature refers to the system scale economies: as more QWERTY keyboards are installed in preference to the others, the higher probability that typists would choose to be trained in a QWERTY-based method, leading more companies to acquire this technology and in time lead to standardization. This is the idea of falling user costs and it related to Arthur’s work which focused mainly on increasing return. He demonstrated the idea using the notion of Polya urn process – an element of chance is combined with a decision rule that links current probabilities to the outcomes of preceding sequences.(Pierson, 2000) Arthur emphasizes the importance of sequence and earlier small events. He noted that “ modern, complex technologies often display increasing returns to adoption in that the more they are adopted, the more experience is gained with them, and the more they are improved. This could eventually lead to the domination and lock-in of an inferior technology. He has identified four features of a technology that generate increasing returns: Large set-up or fixed costs, learning effects, coordination effects, adaptive expectations. These features echo David’s analysis on the case of QWERTY. Finally David argues that the

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durability of tacit skills held by typists could result in high switching costs, the cost of retraining typists to convert them from one system to another. This gives rise to a quasi-irreversibility of investments in specific keyboard skills. These three conditions together make change difficult, due to the transaction costs required to coordinate the actions of different agents. Thus lend persistence or stability to a particular path of outcomes, “locking in” a particular feature of the economy. (Puffert, 2003) The effect of lock in is durable and persistence therefore prevents other designs to gain a foothold. The Dvorak Simplified Keyboard (DSK), which has been claimed that it is easier to learn and to allow typing at rates that were 80 percents faster than QWERTY typing was locked out from the market despite its superiority.

(Margolis and Liebowitz, 1990)

The idea of path dependence vigorously challenged the traditional economic theory which focused on the decreasing marginal return; hence, a unique equilibrium will be generated. It stands in sharp contrast to neoclassical economics which assumes that natural selection will eliminate inefficient ones and only optimal outcomes will be generated. It emphasizes the importance of history, the relevance of timing and sequence, the irreversible effect of small random events on the process and increasing return which leads to the possibility of multiple/inefficient outcomes. This provides us a different approach towards practical work.

Bebchuk and Roe (1999) use the idea of path dependence to explain the differences in the patterns of corporate ownership and governance structures within countries which share similarity in all other aspects of their

economy. They argue that despite the strong forces moving towards convergence, a country's pattern of ownership structures at any point in time depends partly on the patterns it had earlier – because of their different circumstances at the time, or even because of historical accidents. They have identified two type of path dependence – structure-driven and rule-driven. Structure-driven refers to the direct effect of a country's initial ownership structures on the subsequent ownership structures. The reason behind this are grounded in efficiency and rent-seeking (see appendix. 1) (p. 10). On the other hand, rule-driven refers to how the later structures in the economy are affected by the corporate rules and how these rules are influenced by the initial ownership patterns. (see appendix 2)

German economists Schreyögg, Sydow and Koch (2005) suggest that it is increasingly important for managers and other stakeholders (e. g. regulators) to identify actions and events that may actually provoke a path-dependent process in and across organizations as early as possible. This is because small events could be crucial to future outcomes. Also, they pointed out the possibilities of unlocking, changing and creating path which could be taken into account when shaping business strategies. (p. 33, 34)

Arthur(1994) and Krugman(1991) have also pointed to the role of increasing returns in economic geography. Arthur points out that industrial concentration are self-reinforcing and the main driving forces are agglomeration economies-benefits to being close to other firms. (Arthur, 1994) They refer to the examples of Silicon Valley when explaining the effect of localized network externalities on local “ lock-in” of the industry. They also

emphasis the initial random decision of one firm to set up in a particular region could determine the location of an industry later in time.

North(1990) argues that all the characteristics identified by Arthur could be applied to institutions. He explains how the self-reinforcing nature of institutions causes change increasingly unattractive over time. This is because new institutions and policies are expensive to establish and often generate learning effects, coordination effects, and adaptive expectations. The high cost to create and adapt to new institutions increase the incentives for people to commit to the existing set of rules therefore lead to the duality of institutions and policies. Furthermore, political scientist Paul Pierson (2000) has utilized the idea of path dependence to analyze politics and he argues that the political world is usually prone to increasing returns. (p. 262)

Liebowitz and Margolis (1995) are the best-known critiques of the literature. Their argument is that path dependence simply presents a false claim of market failure and “ history matters” has always been recognized by economists. They point out that David’s claim for the QWERTY case does not go beyond first-degree path dependence. And only third-degree path dependence – remediable path dependence significantly challenged the conventional economics, however it is rare.

They also reveal that the Navy report (see Appendix 3) was problematic and study shows that the investment in retraining on the DSK could never be recovered(see Appendix 4). Furthermore, more recent ergonomic studies indicate that DSK offers at most only a 2 to 6 percent efficiency advantage over QWERTY. (Liebowitz and Margolis, 1990) They also point out that there

were other typing contests right around the time of the Cincinnati contest, some of which were won by non-QWERTY typists. So it was not the single happening of McGurrin's choice that established QWERTY as the keyboard standard. It is unlikely, that QWERTY could have survived if it were as poor as it is sometimes alleged to be. Liebowitz and Margolis (1995) has also reviewed the competition between the Beta and VHS formats for videocassette recorders. Beta was said to be a technically superior product with the advantage of Sony's size and reputation. However, the VHS has dominated the market and therefore the case was claimed to be path-dependence. Liebowitz and Margolis (1995) argues that the difference between the two systems was actually very small and the advantages of longer recording times was sufficient to allow VHS to overcome Beta's initial lead. Grindley, P (1995) on the other hand has concentrated on the different strategies used by Sony and JVC. He argues that JVC's success was based on its open standard, high volume and market orientated strategy in comparison to Sony's traditional proprietary standard, high margin, technology led strategy. (p. 76). Also, the advantages of Beta over JVC were very small therefore it was JVC's strategies which has gained an early lead in the market contributed to its success.

However, Pierson (2002) argues that their argument has little relevance to the development of institutions, also does not seem to have much relevance for North's argument about the presence in particular politics of networks or matrices of institutions and organization.