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Ciclo di vita dell'industria

Gort M., Klepper S., 1982, Time Paths in the Diffusion of Product Innovations, *Economic Journal* 92(367):630–663

Il tema in pillole

*Evidence on **entry, exit, firm survival, innovation and firm structure** in new industries is reviewed to assess whether industries proceed through regular cycles as they age. A leading depiction of **the evolution of new industries**, the product life cycle, is used to organize the evidence. It is shown that the product life cycle captures the way many industries evolve through their formative eras, but regular patterns occur when industries are mature that are not predicted by the product life cycle.*

– Klepper S., 1997, Industry Life Cycles, *Industrial and Corporate Change* 6(1):145

*A **model** emphasizing differences in firm innovative capabilities and the importance of firm size in appropriating the returns from innovation is developed to explain the **regularities**.* [...] *It predicts that over time firms devote more effort to process innovation but the number of firms and the rate and diversity of product innovation eventually wither.*

– Klepper S., 1996, Entry, Exit, Growth, and Innovation over the Product Life Cycle, *American Economic Review* 86(3):562

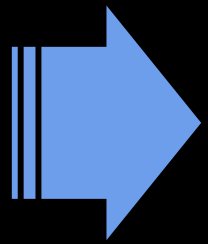
This study attempts to measure and analyse the ***diffusion of product innovations****.* [...] *We trace the history of diffusion for 46 new products and examine the interrelations among diffusion, other aspects of technological change, price, output, and certain attributes of the relevant markets.* [...] *the historical sequence, or* ***time path****, of events is viewed as a critical determinant of the ultimate structure of new product markets.*

– Gort M., Klepper S., 1982, Time Paths in the Diffusion of Product Innovations, *Economic Journal* 92(367):630

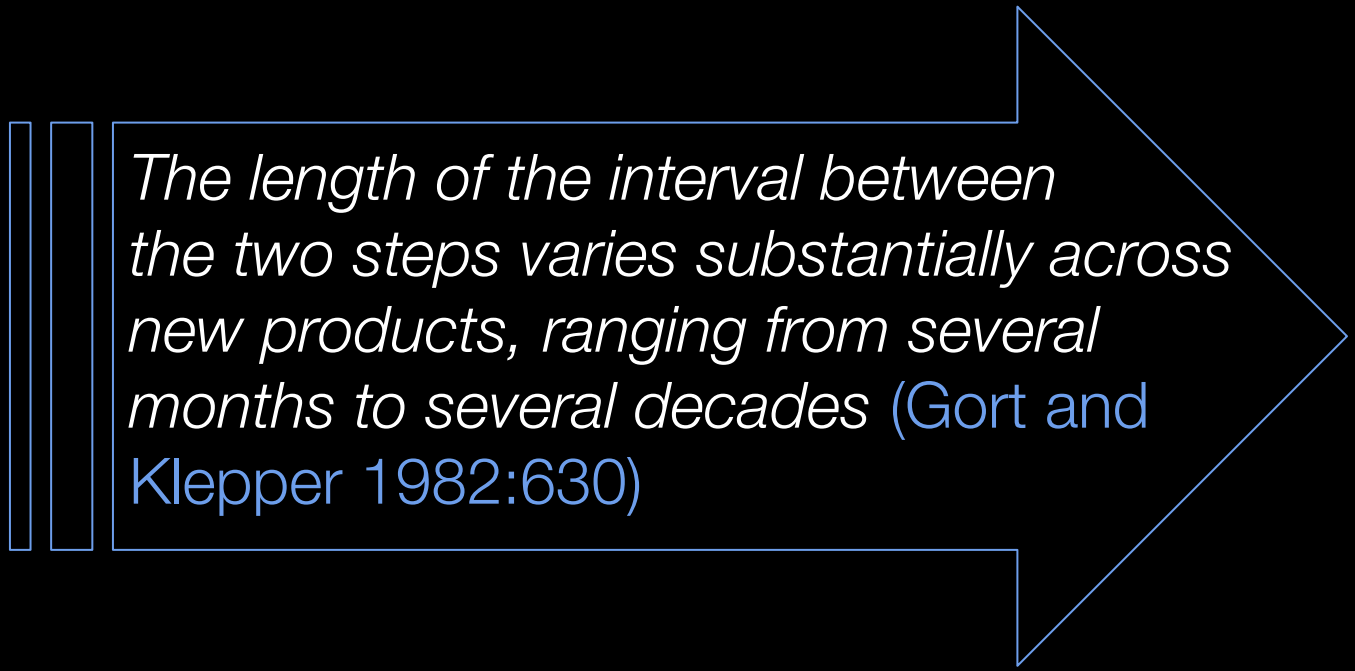
Il motore

Innovazione di prodotto

1. sviluppo tecnico del nuovo prodotto (**invenzione**)



2. introduzione del nuovo prodotto nel mercato (**sfruttamento commerciale**)


The length of the interval between the two steps varies substantially across new products, ranging from several months to several decades (Gort and Klepper 1982:630)

Il prototipo

five stages in the evolution of the market with respect to the number of producers in it. These five stages represent ***a prototype of the life-cycle of the market*** *from its beginning up to, but not including, the period of eventual decay or contraction in absolute market size* (Gort and Klepper 1982:630)

*the identification of stages in the history of a continuously changing phenomenon is, essentially, an **analytical convenience**.* [...] *The five periods, however, capture the major transitions in the forces that we believe determine the number of producers in a market during most of its life-cycle* (Gort and Klepper 1982:631)

5 stadi

Stadio I

[inizio] introduzione
di un nuovo prodotto
dal suo primo produttore
(raramente più di uno
allo stesso tempo)

[fine] rapido aumento
del tasso di entrata
di nuovi produttori

*the **length** of this stage is related to the ease of copying the initial innovator(s), the size of the market* [...]*, and the number of potential entrants into the market. In addition, the speed with which technological information is communicated in the economy* (Gort and Klepper 1982:631)

Stadio II

[a] *period of sharp increase in the number of producers* (Gort and Klepper 1982:631)

[domande]

1. perché il mercato non è interamente catturato dai suoi primi produttori?
2. cosa porta alla fine della rapida crescita del numero di produttori?

Stadio III

[a] *period in which the number of entrants is roughly balanced by the number of exiting firms, leaving net entry approximately zero* (Gort and Klepper 1982:631)

zero net entry *does not, however, reflect an equilibrium but rather is associated with structural changes in the market* (Gort and Klepper 1982:631)

Stadio IV

[a] *period of negative net entry*
(Gort and Klepper 1982:631)

Stadio V

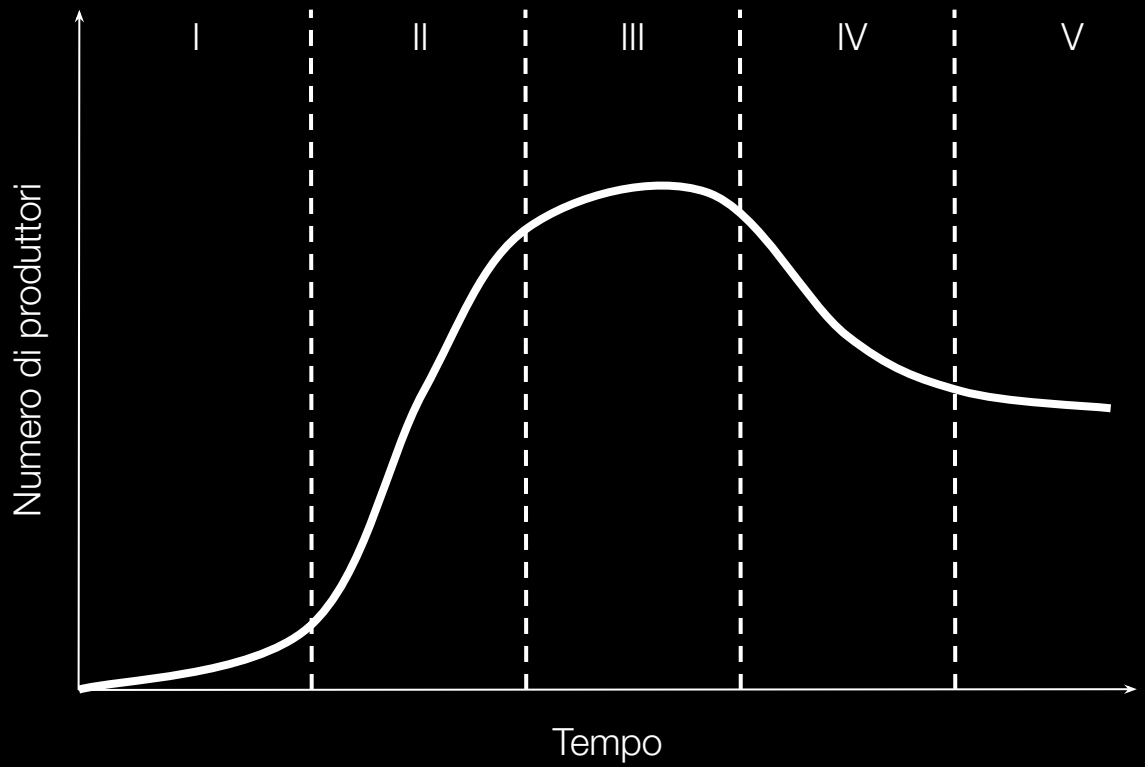
[a] *second period of approximately zero net entry* [continuing] *until the eventual shrinkage of the market, induced by obsolescence of the product, or until fundamental changes in technology launch a new product cycle* (Gort and Klepper 1982:631)

the approximate absence of net entry or exit does not result, however, from equality of the ***number of producers*** *with a unique equilibrium level defined by market size and economies of scale* (Gort and Klepper 1982:631)

In sintesi

Stadio	Inizio	Fine	Determinanti
I	Introduzione di un nuovo prodotto	Rapido aumento del numero dei produttori	- facilità di imitare l'innovazione iniziale - dimensione del mercato per il nuovo prodotto - numero di potenziali entranti - velocità di circolazione dell'informazione
II	Rapido aumento del numero di produttori	Entrata netta zero	- le imprese esistenti non sono in grado di catturare la totalità del mercato - le dinamiche di mercato portano a un equilibrio tra le imprese operanti ed entranti nel settore
III	Entrata netta zero	Entrata netta negativa	- trasformazioni nella struttura del mercato
IV	Entrata netta negativa	Entrata netta zero (ancora)	- [la struttura del mercato è "data"] - [comportamenti strategici] - [entry prevention]
V	Entrata netta zero (ancora)	Eventuale contrazione o introduzione di cambiamenti tecnologici rilevanti	- il ciclo si avvia alla sua conclusione o in alternativa - un nuovo prodotto fa ripartire il ciclo

I cinque stadi del ciclo di vita dell'industria



L’andamento del ciclo di vita dell’industria

Note 1/6

- le teorie “tradizionali” sulla struttura del mercato generalmente catturano solo una parte delle dinamiche sottese dal ciclo di vita
- nessuna assunzione di simmetria sulle imprese e le loro caratteristiche tecnologiche
- in ciascuno stadio le strategie delle imprese devono adattarsi a specifiche caratteristiche del mercato

Note 2/6

- le caratteristiche del mercato sono condizionate da fattori diversi:
  - natura dell'innovazione (prodotto),
  - complessità dell'innovazione (tecnologia),
  - dimensione del mercato potenziale (domanda),
  - numero dei potenziali entranti (offerta),
  - comportamento dei produttori esistenti (strategia)
- la struttura del mercato non è data
- l'esito finale del ciclo non è dato

La dinamica

F_t = numero atteso di entranti al tempo t
P_t = probabilità di entrata al tempo t
N = popolazione di potenziali entranti
n_{t-1} = numero di imprese già entrate nel mercato

$$F_t = P_t(N - n_{t-1})$$

– processo generale –

The central issue, of course, is what determines P_t, the ***probability of entry****.* [...] *it basically depends upon the ways in which returns can be maximised on a component of organisation capital, namely, information on new product technology* (Gort and Klepper 1982:632)

We distinguish organisation capital from ***human capital*** *in that the returns to the latter can be appropriated by the individual employees who possess such capital. In contrast,* ***organisation capital*** *belongs to the firm either because it has legal title to it, as in the case of a patent, or because it depends upon the interdependent actions or* ***information*** *of more than one employee* (Gort and Klepper 1982:632)

Information on new product technology *may take a wide variety of forms, including knowledge and skills relating to production processes and market characteristics for the new product* (Gort and Klepper 1982:632)

Fonti di informazione

I_1

1. imprese che già operano nel mercato (**dentro il mercato**)

I_2

2. imprese che non appartengono all'insieme dei produttori attuali (**fuori dal mercato**)

new information emanating from ***experience*** *in production by existing firms. This type of information has both transferable and non-transferable components* (Gort and Klepper 1982:632)

dentro il mercato (I_1)

componente trasferibile

information that cannot be appropriated and is ***available for adoption*** *by other firms* (Gort and Klepper 1982:632)

componente non trasferibile (L_t)

[it] remains the property of its producer and tends to cumulate over time. [...] *what is commonly referred to* [...] *as "learning by doing" and, in the context of a model of entry, operates as a* ***barrier*** *to entry* (Gort and Klepper 1982:632)

fuori dal mercato (I_2)

technological information emanating from sources outside the set of current producers, [that] *has* ***a positive effect on entry****. Such innovation reduces the value of experience accumulated through past production and, thereby, facilitates entry*
(Gort and Klepper 1982:632)

A central feature of [...] *entry is that* ***systematic changes occur in the sources of innovations over the product cycle****. Innovation* [...] *is not a single event but a continuing process encompassing all product improvements and modifications in production techniques* (Gort and Klepper 1982:632)

Innovazione lungo il ciclo

*In the **early phase** of a product cycle (Stage II), [...] most innovations are of the I_2 **variety**. That is, they originate outside the set of current producers (from firms in technologically related markets, from independent inventors, from equipment manufacturers, etc.). In contrast, **later** in the product cycle (Stages III, IV, and V), we expect that the balance of innovations shifts to the I_1 **variety**, and the cumulative stock of such innovations begins to operate as an entry barrier* (Gort and Klepper 1982:633)

P_t = probabilità di entrata al tempo t
I_{2t} = numero di innovazioni da fuori il mercato al tempo t
L_t = esperienza cumulata dai produttori esistenti al tempo t
π_t = profitti dei produttori esistenti al tempo t

$$P_t = f(I_{2t}, L_t, \pi_t)$$

– probabilità di entrata –

The variables I_{2t} *and* L_t *represent* ***the influence of technological change*** *on the probability of entry* (Gort and Klepper 1982:633)

$$\partial P_t / \partial I_{2t} > 0$$

$$\partial P_t / \partial L_t < 0$$

The variable π_t represents ***the potential rewards of entry****.* [...] *larger the potential rewards of entry, the greater the probability that a potential entrant who possesses valuable information will enter the market* (Gort and Klepper 1982:633)

Stadio	Dinamica
I	**Nuovo prodotto**
II	**Diffusione:** *the entry rate accelerates at the beginning* [...]*, propelled by the two forces* I_2 *and* π_t*. As technology matures and opportunities for the most dramatic product improvements are realised, the rate of important innovations declines, leading to a reduction in the entry rate. This is reinforced by: (a) the accumulation of experience by existing firms (itself a function of* I_1*) operating as an entry barrier; (b) the eventual decrease in* π_t *resulting from the increase in the number of producers; (c) a* [...] *reduction in* $N–n_{t-1}$*, the population of potential entrants that have not as yet entered the market* (Gort and Klepper 1982:633)
III	**Entrata netta zero:** [it] *is not an equilibrium but rather reflects structural changes in the industry that, when they mature, precipitate Stage IV* (Gort and Klepper 1982:634)
IV	**Maturità:** *as prices and profit margins approach normal competitive levels under pressure from imitators, there is renewed pressure to raise the rate of innovation. Now, however, the induced rise in innovation takes mainly the form of* I_1 *(innovations internal to the set of current producers). This not only reinforces the barriers to new entry but, in addition, compresses the profit margins of the less efficient producers who are unable to imitate the leaders from among the existing firms. Consequently, the exit rate rises sharply until the less efficient firms are forced out of the market* (Gort and Klepper 1982:634)
V	**Declino o nuovo ciclo**

Innovazione ed entrata nel mercato

Strategie a confronto

II diffusione: *a much larger fraction of the innovations have major consequences for costs of production or for product quality* (Gort and Klepper 1982:633)

IV maturità: *there is a retardation in technical change* [that is] *reflected primarily in the importance of the innovations rather than in their number.* [...] *innovations of the* I_1 *type are much more frequently associated with minor modifications in production and marketing techniques, in methods of quality control* (Gort and Klepper 1982:633)

From the standpoint of entry, however, what is critical is not simply the reduction in the rate of technical advance but the concurrent shift in its origin

– Gort and Klepper (1982:633)

Note 3/6

- l'entrata di nuove imprese è alimentata dai profitti attesi e dalle fonti di innovazione che si trovano fuori dal mercato di riferimento
- l'entrata è legata al possesso di informazioni rilevanti
- la rilevanza delle innovazioni e il tasso di entrata si riducono nel tempo (Stadi II – IV)
- l'esperienza e le fonti di innovazione dentro il mercato rafforzano le barriere all'entrata
- la struttura del mercato è più rigida nella maturità (Stadio IV)

Note 4/6

Di conseguenza:

- non esiste un unico equilibrio in termini di numero di imprese operanti nel settore
- la tecnologia condiziona il tasso di entrata e il numero di imprese operanti nel settore
- la prossimità tecnologica delle industrie può influenzare il tasso di entrata

Evidenze empiriche

Il tasso di entrata più elevato nello stadio II

Prodotto	I	II	III	IV	V
Computers	2,8	14,3	6,6	–13,0	–
Rasoi elettrici	0,2	15,0	–	–2,9	–0,1
Penne a sfera	0,1	1,4	–	–	–
Shampoo	0,8	4,9	–1,0	–	–

Media annuale del numero di imprese entranti per periodo e prodotto [selezione] (Gort and Klepper 1982:642)

Le innovazioni maggiori diventano dominanti nello stadio II

Le innovazioni minori diventano dominanti nello stadio III

Prodotto	Penne a sfera			Tutti (46)		
Innovazione	***M***	***m***	***M/m***	***M***	***m***	***M/m***
I	0,50	0,40	1,25	0,24	0,24	1,00
II	0,28	0,17	1,64	0,29	0,25	1,16
III	–	–		0,28	0,47	0,59
IV	–	–		0,24	0,22	1,09
V	–	–		0,26	0,18	1,44

Media annuale del numero di innovazioni per stadio, classificate per prodotto e importanza: *M* = major; *m* = minor [selezione] (Gort and Klepper 1982:647)

Note 5/6

1. *the markets for most new products appear to pass through at least five distinguishable stages*

2. *new industries generally pass through a stage in which the number of producers declines significantly*

3. *there appears to be an association between rises and declines in the rate of innovation and the rate of entry into new markets*

– Gort and Klepper (1982:651)

Note 6/6

4. *the character, importance, and sources of innovations appear to change over the product cycle*

5. *the results support the conclusion that the structure of markets (in terms of number and composition of producers) is shaped, to an important degree, by discrete events such as technical change and the flow of information among existing and potential producers*

– Gort and Klepper (1982:651)

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