

Commercial Knowledge

A Chronological Guide to the Discovery

When the ballpoint spills blood from the fountain pen, the economy grows.



When the compact disc denied money to the gramophone, the economy grew.

of the Laws by which
an Economy **Actually** Grows

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The original insights featured in this monograph were developed under the radar of academe. A campus is, by definition, remote from corporate centers of excellence where practitioner knowledge operates tacitly. It is therefore remarkable that the enclosed suite of knowledge can even be studied, let alone marshaled into a compelling synthesis that now eclipses economic knowledge currently emanating from Universities around the world.

Governments would be well advised to learn the basics we now provide – especially the equation for productivity on page g , for innovation on page h , and how iDe creates (p/c) on page i - and act on them in their country's interest.

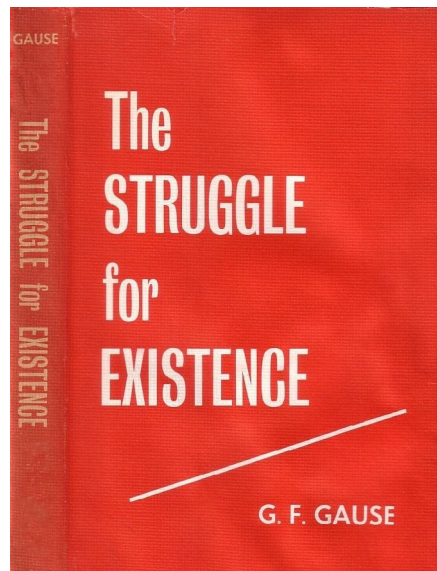
The economic measurement of innovation in the firm, for the market, in industries and for the economy provides an arrow to prosperity like no other.

'If you don't grasp its importance, for heaven's sake pass it on to someone who might'. The Mendel-Mawer Parable

1964 'The Struggle for Existence'

G.F.Gause

The 2021 Nobel Prize for Economics was awarded for using evidence that arises naturally between similar economic conditions. But another source of natural evidence remains neglected, one that G.F. Gause provided from his laboratory.



He grew species of single cell organisms in test tubes, separately at first and then together. By periodically counting their numbers he discovered how one species vanquished the other. In Economics this is paralleled by 'creative destruction'. He also matched microorganism behavior to Lotka-Volterra equations, which likewise transfer to Economics.

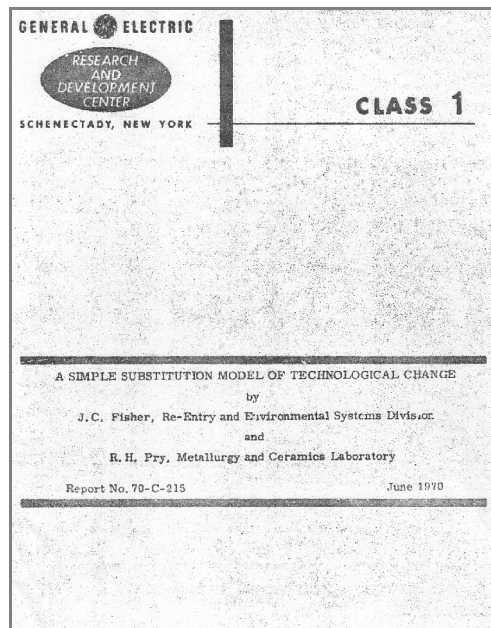
There is one Lotka-Volterra equation per species. Each equation contains a term from the other. Their interaction multipliers determine the competitive outcome. For Gause these were constants. But what are they in Economics?

Without guidance from commercial knowledge economists have presumed the firm is the most fundamental competitive element. As depicted on the front cover, and from Gause, it's a firm's products that are competing (for money (= food)). This changes everything in the analysis of growth.

1970 'A Simple Substitution Model of Technological Change'

J.C. Fisher and R.H. Pry

This commercial knowledge was developed to forecast technological opportunities within the General Electric Company. A year later it was made public in several versions and had a profound impact on the viability of corporate strategic planning through the 1980s.



Fisher & Pry used two equations equivalent to Lotka-Volterra's. By setting Lotka-Volterra's interacting multipliers to zero and applying the condition of substitution, a single equation emerges. As one species rises the other declines. This maintains a constant total market size. It is simple and slide-rule ready.

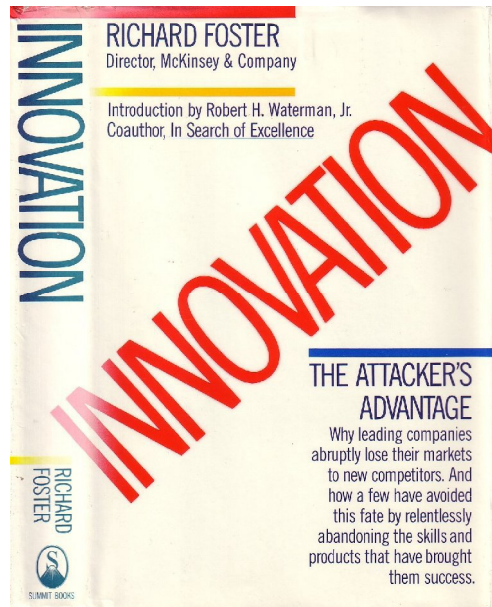
Although no economic force lies behind this substitution it is a giant step in the right direction.

The most important release of commercial knowledge into the public domain of its time.

1986 ‘Innovation The Attacker’s Advantage’

R.N. Foster

Consulting firms - like McKinsey - have access to commercial knowledge from multiple clients and can process it as Foster did.



His major breakthrough was to identify superior product offerings as the principal advantage a firm can leverage to increase its market share at the expense of incumbents. In particular, and with Celanese and Goodyear’s data, he actually enumerated the rising functional performance of four successive generations of tire cord and plotted it against cumulative technology development.

The economics of creative destruction is advancing.

There are two firsts here. One is the first use of a functional performance metric to characterize advancement. The second is to connect it with R&D (in 2018 becoming the iDe component). Noting that Foster’s ‘performance’ is closest to what economists refer to as ‘quality’.

1993 ‘Survival of the Fittest Technologies’

C.J. Farrell

In pursuit of the elusive nature of the interaction constants in the Lotka-Volterra equations, and how they might connect with Foster’s insights, this article looked at explaining known product successes using them.



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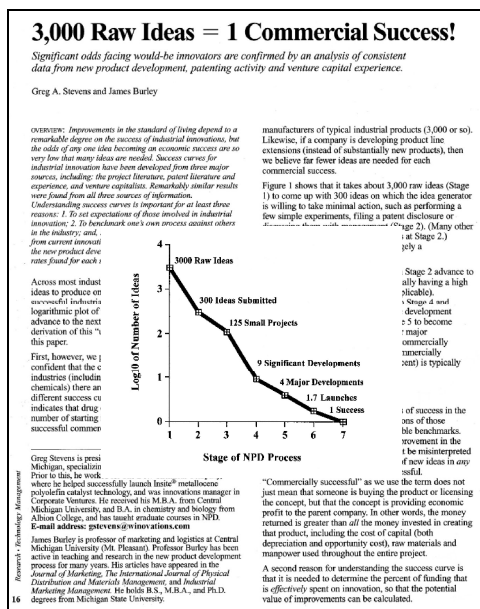
The article appeared before the original paper in ‘Technology Forecasting & Social Change’. A peer reviewer had asked for more data. Though overruled by the editor, the point was taken. For the next ten calendar years 1993 to 2003 – as opportunity allowed - I sought data from any source on known instances of creative destruction. The resulting database dubbed DINTEC™ (Data on INnovation TEchnology and EConomics) rescues such numbers from their substantially disused origins. It spans five decades (1951 to 2001) for more than 100 commodities at the 7-digit SIC level.

The article is the first application of the Lotka-Volterra equations to explain creative destruction to a general scientific readership. More importantly it spawned a database eventually capable of connecting the efforts of Fisher, Pry and Foster to Economics.

1997 ‘The Innovation Funnel’

G.A.Stevens and J.Burley

Dow Chemical’s Corporate Ventures innovation manager Greg Stevens publishes otherwise tacit knowledge on the extent of the innovation funnel challenge by quantifying its mouth (inset).



Ideas – the ultimate intangibles – are treated in Economics as a capital resource. This store is located somewhere to the left of the Stevens-Burley depiction. Treating new ideas generated by humans - or by AI - as intellectual capital is therefore a purely academic exercise.

Intangibles can only become tangible – and commercial – by passing through the funnel and that requires iDe (idea development expense). That task is entrepreneurial when venture capital funds the funneling process. The above ratios represent their financial risk while, if successful, (P-c) from p ÷ c (turn to page g) will deliver their return.

NPD is New Product Development

2009 ‘The pPQ Law’

In the 17th century scientists of the day published their discoveries as ciphers while they worked out possible usefulness. In one famous case Robert Hooke realized his theory of springiness could lead to better time-keeping devices. So he published its formula as an anagram of ‘*ut tensio, sic vis*’ that is ‘*as the extension, so the force*’.

What connects Foster’s performances to Fisher & Pry’s total market and provides the Attacker’s Advantage otherwise missing from the Lotka-Volterra treatment is so simple and universal it has the character of a law.

To buy time to establish this I went back to the 17th century and published an interim anagram of its formula ‘*tribuo effectus per vis*’ that is ‘*divide performance by (the competitive) force*’,

$$P = p / Q \quad \text{or} \quad p = P Q$$

This law allows the performance p of any commodity holding a market share to be calculated from its market price P multiplied by the market size delivering the competitive force (pressure), which is Q (equation on the right). It also allows the price of a commodity to be calculated at constant performance (‘quality’). This left equation capability has profound consequences against the hedonic method for determining the same.

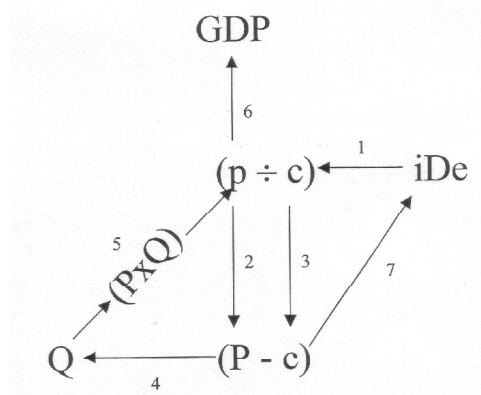
Economists will quickly realize that a plot of P against Q generates a demand curve. This means that performance (or ‘quality’) is equal to the area of a rectangle whose top right hand corner touches the ‘supplied demand’ curve at the point of interest.

These simple answers have been hiding in plain sight for decades.

The pPQ was verified (from DINTEC™) by comparing calculated ‘performances’ with actual ones for intermediate goods - where performance is closely aligned with engineering specifications. Its universality extends to the service sector and therefore to e-commerce.

2018 ‘The Algebra of Economic Growth’

GDP arises from a system of innovation whose elemental unit has four fundamental variables. These are p , c , Q and iDe . They lie in a geometric array, an innovation parallelogram,



If iDe (the idea or innovation development expense dominated by E within STEM activities) raises product performance p and/or reduces its cost of delivery c , then (after a gestation period that is longer for durable goods than it is for non-durable ones) the innovation metric (p/c) will rise – segment 1.

Because GDP is algebraically connected to the numerator of the innovation metric, GDP will rise – segment 6.

A rise in p allows a higher price to be asked – segment 2.

A reduction in c increases the profit margin – segment 2 – 3.

Profit can be spent to (a) produce greater quantity Q – segment 4 – and/or to (b) produce better offerings by increasing iDe – segment 7 and/or to (c) reward venture capital.

Ultimately it's greater quantity Q produced at higher price that delivers the increase in p through the pPQ law - segment 5.

$$\text{True Productivity} = \text{Output to GDP}(\text{year } t) / iDe(\text{year } t-\delta)$$

where δ is the appropriate gestation period.

In this new paradigm Capital and Labor are no longer primal. Labor operates within iDe and in c (from different skill sets) while Capital supports Q . For five decades $(p/c)(t)$ trended closely with $iDe(t-\delta)$ while fluctuations occurred in p due to influenceable, yet mainly elusive, purchaser spending perceptions.

2022 ‘Innovation in Economics: Missing Pieces’

Growth Economics, from economists, suffers from the following inadequacies.

Firstly, capital and labor raised to powers and multiplied together do not equal GDP and never have. This non-equality or ‘residual’ is attributed to innovation or technology or to a combination of both, but nobody knows which, or by how much. And the inclusion of extra inputs just produces a different ‘residual’.

Famously called ‘a measure of our ignorance’ in 1956 this ‘residual’ is now known as Total or Multi Factor Productivity, a re-styling that removes the stigma but not the ignorance.

Secondly, intangible capital is summed to create a virtual source of applicable knowledge. But no mechanism is given for its conversion to real effect except a tentative few % addition to current GDP.

Innovation is **not** a residual. Innovation does **not** just add to current GDP. Innovation **drives** GDP. Innovation is **responsible** for GDP.

‘Innovation in Economics: Missing Pieces’ provides what Growth Economics from economists has not, but Applied Physics has. This is exemplified in the discovery of four new laws,

1 st Law	$p=PQ$	13
2 nd Law	$GDP = \sum_{i=1}^N p_U^i$	39
3 rd Law	$\frac{p_1}{P_1} = \frac{p_2}{P_2}$	42
4 th Law	$Innovation = p/c$	44

Where the 1st 2nd and 4th laws, in the geometry of a parallelogram, constitute one of N markets that depict the whole economy.

The right column contains page references to ‘Innovation in Economics: Missing Pieces’ reviewed in <http://www.techmatt.com/techmatt/Google-Books-Review.pdf> the methodology behind which is available to download in full from <http://www.techmatt.com/techmatt/Innovation-in-Economics-Missing-Pieces.pdf>

Commercially Vital but Missing from Economic Discourse
iDe funnels ideas into commercially successful
products characterized by a rising (p/c)
whose p is what causes GDP to grow.

