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The Knowledge Commons and Economic Growth : A Historical Perspective

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Why does the history of useful knowledge matter?

Quite simply, because useful knowledge (in its classical sense of “the useful arts”--- S&T) is the basis of our current prosperity.

It is worth emphasizing because it contains one of the most important answers to the “dilemma of modern economic growth.”



The dilemma is this:

In recent years, following the work of North and many others, a consensus has emerged that “institutions” are central to explain economic performance.

Law and order, low rent-seeking, good property rights, open-ness and inclusiveness, effective third-party or private-order contract enforcement, and efficient governance and provision of public goods are among the mechanisms cited.

The problem: the Industrial Revolution was above all about *technological* progress, not just more efficient markets.



The Consensus today:

The consensus among economic historians is that the roots of modern growth are above all in technological progress and innovation. Some are more fundamentalist than others about this, but none of any import disagrees.

It is also widely agreed that although non-European nations were perfectly capable of innovative activity and generated a great deal of technological change in earlier times, after 1700 or so, Europe took the lead.

To understand this, we must go back to the period 1500-1700, in which the preparatory stages of the Industrial Revolution were played out.

Argument: there was an institution that explains European technological leadership, but it has so far not been part of the “institutional” literature.



To see this, we go back to the issue of the commons of useful knowledge

As Elinor Ostrom and Charlotte Hess (2007, p. 41) pointed out, knowledge is a shared resource, but it is quite different from the main focus of Ostrom's work, which was resources that were common but depletable.



The famous Ostrom scheme:

		Subtractability (rivalrousness)	
		LOW	HIGH
Exclusion	Difficult	Public goods: Useful knowledge Sunsets	Common-pool resources: Libraries Irrigation systems
	Easy	Toll or Club goods: Electronic Journal Subscriptions Day-care centers	Private goods: Personal computers Doughnuts



How and why did the knowledge emerge?

As Hess and Ostrom point out, the knowledge-commons needs to be managed by a *community*.

But at first glance Europe in this “early modern” age (1500-1700) was hardly a “community”: it was fragmented, splintered, between hundreds of larger and smaller units with hazy sovereignty.

Moreover, many institutions within these countries had a great deal of autonomy.

So at first glance, Europe in this age seems an unlikely location for this problem to find a workable institutional solution.



Yet Europe was the first (and only) place to stumble upon a solution

What emerged to solve the problem was a community that
was both transnational and virtual.

[This is not too surprising, since the medieval Church had a
somewhat similar structure]



An early “virtual community”

Within Europe, the “commons resource” was managed by a community of scholars, which referred to itself as the *Respublica Literaria*.

This group included the educated elite, the intellectual *crème de la crème*: scientists, physicians, philosophers, mathematicians. As Hess and Ostrom note they should be, they were relatively homogeneous. They were also educated, literate, religious-but-open-minded, and they subscribed to a common ideology or culture.



What was the Republic of Letters?

Earliest mention of the term is in 1417, but came into its own in the first half of the sixteenth century, and reached a peak in the Age of Enlightenment.

It was an institution that was ex post efficient, even if it was not designed to be that way and its efficiency does not explain its longevity. What is clear is that it was uniquely European and that no other civilizations came up with this arrangement.



The Republic of Letters was above all a community that shared, distributed and evaluated knowledge. As such it was the institution in which the rules of open science emerged (David, 2008).

The main mode of communication of the age was letters, and it is hard to see how it could have emerged had it not been for the growth of the Continent-wide postal services associated with by Francisco de Tasso ((1459 - 1517), later known as Franz von Taxis) and his brothers who established regular postal services in Italy, Germany and the Habsburg lands in the early sixteenth century and later throughout Europe.



The other elements that made the Republic of letters possible were:

- the printing press,
- the heritage of a lingua franca,
- and the existence of semi-autonomous organizations in which the Republic of Letters could thrive, such as universities and later on academies and scientific societies.



It was most certainly **not** a construct of historians or
“an imagined past.”

Pierre Bayle, the French Huguenot philosopher who lived in exile in Rotterdam and who began publishing in 1684 his newsletter named *Nouvelles de la République des Lettres*, wrote that

“The Common-wealth of learning [= the Republic of Letters] is a State extremely free... the Empire of Truth and Reason is only acknowledged in it... everybody is both sovereign and under everybody’s jurisdiction... the laws of of the society have done no Prejudice to the Independency of the State of Nature as [much as to] Error and Ignorance”

(Bayle, 1734, Vol. II, p. 389, essay on *Catius*).



Some “nodal figures” were known as “intelligencers” and served as relay points for letters

Among the most famous of these clearing house figures were Samuel Hartlib and Henry Oldenburg in England and Marin Mersenne in France.

In the middle of the seventeenth century, periodicals started to supplement the epistolary network. The *Journal des Scavants* and the *Transactions of the Royal Society*, both of which began appearing in 1665 created what we call today the scientific paper.



These people invented “open science” as a transnational intellectual commons

Open science is what we (almost) all practice: place our “discoveries” in the public realm by publishing them and claiming property-rights but rarely exclusionary rights.

Unlike the Medieval Church, the Republic of Letters was formally non-hierarchical, though like every community it had some superstars who were “more equal” than others.



There was a strong association between one's reputation as a scientist and patronage

Some superstars got a great deal of patronage, none more than Galileo, Leibniz and Newton.

Assessment, as now, was carried out by “peer review” because most providers of credit were unable to discriminate between good and bad knowledge.



Many other stellar scientists and intellectual innovators benefitted from “global” reputations:

- **Christiaan Huygens**
- **René Descartes**
- **Andreas Vesalius**
- **Cornelis Drebbel**
- **Jan Comenius**
- **Hugo Grotius**



The economic roots of the Republic of Letters were analyzed by Paul David (2008)

David's basic argument is that patronage is strongly correlated with reputation for quality, but that it becomes increasingly difficult for patrons to establish quality as science becomes more technical.

Hence more and more patrons relied on the judgment of expert peers. To establish reputations, scientists had to persuade their peers of their ability and thus the system incentivized them to place new knowledge in the public realm and it created "open science."



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But some annoying counterexamples:

Antonie van Leeuwenhoek



Robert Boyle



Knowledge Commons
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This system has a tendency to create a unique form of IPR: credit without excludability. One becomes known as the founding father of an idea as in “the Solow model,” “the Lucas critique” or “Arrow’s theorem.” The payoff is purely in reputational terms.

Hence all useful knowledge split into “propositional knowledge” which by and large followed the “open science” model, and “prescriptive knowledge” which followed a more mixed model and in which secrecy was still sometimes practiced (although the introduction of patents was an attempt to place this knowledge too in the public domain).



Open science as it emerged in Europe 1500-1700 may have been one of the key institutions to subsequent growth

It incentivized men of learning to work hard and try to establish reputations amongst their peers (and if possible, within the wider public) by creating new knowledge, and follow a more “useful” agenda.

At the same time they placed their learning in the public realm and tried to maximize accessibility so that it became available to others who might a use for it. It was an institutional solution that realized the Baconian program: to produce useful knowledge to improve material conditions [Bacon suggested a greater role for the State].



This community governed the knowledge commons in the age of Enlightenment. What were the rules?

1. It was an *open* community: anyone (within reason) could enter.
2. Knowledge and data should be *shared*. (When someone refused, e.g. John Flamsteed, this could create a scandal.)
3. It was in principle egalitarian non-hierarchical (although Newton became a bit of an idol, and birth and wealth may have counted for more than they liked to admit).
4. Priority conveyed property rights in the sense of “credit” and *reputation* but not exclusionary rights. Many priority fights.
5. All knowledge was *contestable* (“in nullius verba”)
6. All new propositions were to be reproduced, checked, tested and evaluated (making the new knowledge more reliable).
7. It was a transnational community: “The sciences are never at war”.



It created a new “ethos of science”

It conformed well with the four tenets of the “ethos of science” established by Robert Merton: universalism, communism, disinterestedness, and skepticism.



This community created a “market for ideas”

- Not a real “market” that allocated resources in a traditional sense relying on price signals.
- Still, it has some market elements of it: people competed and cooperated at the same time, as they do in all markets.
- It connected between those who tried to sell (new ideas) and potential buyers (their audience).
- Persuasion is equivalent to “making a sale.”
- It rewarded success (if somewhat unpredictably) and thus provided medium-powered incentives.
- The most successful sellers can be thought of as “cultural entrepreneurs” such as John Calvin and Galileo Galilei (Mokyr, 2013).



The Republic of Letters was a critical element of the wider “market for ideas”

It reduced transactions costs.

How so?

Open science meant that new knowledge would be placed in the public realm and thus be accessible to potential skeptics and critics who tried to reproduce and verify the findings. Therefore useful knowledge became more reliable. The reason is that non-specialists contemplating using a specific piece of useful knowledge knew that a *self-policing community of specialist* experts had vetted it.



1. Needless to say, that system was not foolproof, many erroneous views survived peer review for decades and centuries.
2. If that surprises you, you have lived on Mars for the last few decades or you are a graduate student.
3. But the system had built-in corrective mechanisms because of its commitment to contestability and free entry.
4. Much like democracy, it was a flawed system that is better than all others.



Was the European “market for ideas” the only one to ever emerge?

1. By no means! Literate societies such as China, Islam, and Judaism all had comparable constructs.
2. But as economists know, not all markets are created equal.
3. The European market was more competitive, had freer entry, and was less restricted in what could be “traded.”



Greatest Difference between this market for ideas and others that existed elsewhere:

From 1500 on, a rapidly declining respect for the received wisdom of the classical canon (“the ancients”).

The notions and tenets of the classical authorities were tested against observations and experiments, and if found wanting, tossed overboard, sometimes politely and respectfully, sometimes insolently (Petrus Ramus, Paracelsus).

The entrenched authorities tried to defend themselves but failed in most places, in large part because of political fragmentation.



The members of the Republic of Letters also shared certain beliefs:

The three foundational ones were:

- **Belief in the possibility and desirability of *human progress*, a fundamental element of the Enlightenment.**
- **A belief in the superiority of the “moderns” over the “ancients.”**
- **A (Baconian) belief that “useful knowledge” is actually supposed to be *used* (that is, applied to production).**



How did political fragmentation support the new and free market for ideas?

It was responsible for a coordination failure between the reactionary forces, that were split between Catholics and Protestants, and each of those camps was deeply split internally.

This allowed many of the most original minds to physically move among competing political units if repression became too severe (examples: Comenius, Bayle, Hobbes, many others) and at times skillfully play one power against another.



So what?

1. It is not at all clear that the growth of science in the period 1550-1700 (“the scientific revolution”) led to economic change (big literature, 1950-2012).
2. But this takes a very narrow view of what the Industrial Revolution was about. The mechanisms by which the Republic of Letters affected technological progress are deeper and more complex than “how much science was needed to build a spinning jenny.” Science plays an ever-growing role in the subsequent history of industrialization in Europe (Mokyr, 2009).



Summary

1. The most important institutional change that explains the Industrial Revolution and the subsequent “take-off” is not property rights or a decline in transactions costs or the Glorious Revolution.
2. Instead: the institutions that governed the accumulation and diffusion of useful knowledge and the solution to the knowledge commons problem that the “Republic of Letters” in Europe provided.



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