North–South
Trade in Ideas as
New Development Policy

The Problem of
Leveraging Human Capital Formation through
Markets in Patents

by E. Ullberg, PhD

1. Exchange in human ideas

Einstein, the iconic scientist and insightful physicist who reshaped our natural worldview, said that his work was "1% imagination and 99% perspiration". Markets in Patents – new, publicly disclosed, technical solutions turned into tradable assets – ameliorate on this understanding of nature and are based on honoring the creative minds of inventors, in a society, – discovering – not only natural laws or resources like ores but solutions to technical problems furthering their use. The patent system can be seen as providing a key mechanism in integrating science and technology, the key concept that made the "second economic revolution" possible. This allows producing with fewer resources – or higher productivity – and is at the heart of *economic* development: More socio-economic gain for less use of the environment. These inventors and innovators who make use of the new technical and non-technical ideas are a rare flower and only make up a small portion of the world's population, but have huge impact on everyone. Just think of Watt's steam engine to solar power, computers to big data, chariots to planes and beyond and medicinal herbs to smart medicine.

How do we capitalize on these perhaps 1% ideas for the 100%, in a fair, equitable and honorable way? Through companies (creating products and services), universities (teaching new next generation) and markets in patents - and other IP - (exchanging your ideas for other's creating a more productive technical solution).

However, honoring the inventor has not always been the norm – we mostly imitate and steal from them as ideas may be easily copied although substantial toil has been put into arriving at these solutions (and maybe because they are often poor?) – but in 1474, it became the first known patent law of the then City State of Venice, attracting external inventors and their inventions, essentially creating an impersonal international market in technical ideas. (The first patent was in fact granted to a German for pump technology.)

Moving slowly through the centuries, in Europe, it rejected royal monopolies and privileges wherever it went, giving the rights to the true and first inventor. Why? It was the recognition of the fact that it was not simply the natural resources that counted but the technologies turning "sand into water", as the desert bloom when water is added; and this economy bloomed first in Europe then America, Japan and now most parts of the world most notably China, Israel, India, South

Korea, Singapore and Vietnam, and others, thanks to these imported, or traded, ideas. Some of them are patent protected, making *the patent system an instrument of economic development based on exchange in human ideas.*

2. Short summary of results

This talk will outline research findings from an *experimental economic study* and an *empirical company study* of such markets, and then draw implications for policy, in particular for a North-South context. Towards the end I will mention the immediate future research plans, which have just been given support by Sweden, and a practical initiative to advance such markets with a world leading technology partner. I will do my best to use non-technical language without letting down any economist.

The articles are based off two decades of work with companies on strategy, and 6 years with the EPO and their strategy, to contribute to growth in Europe (1999-2005) and relations with industry. Early experimental results have been presented here at WTO including WIPO in 2010 and at the UN Second committee in NY in 2012, and during the ECOSOC AMR in 2013. So this is in a sense a continued discussion, and finally we have arrived at "the right" forum: World Trade!

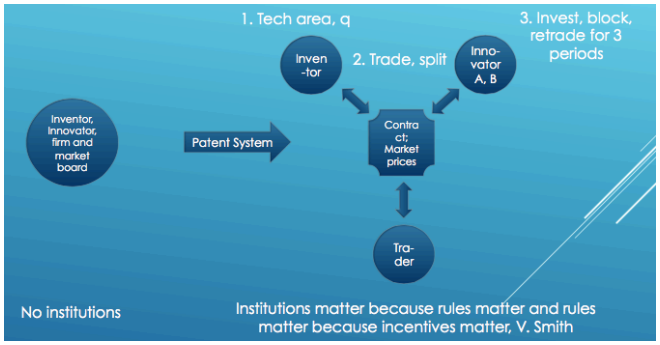
2.1 Coordination between inventor, traders and innovators in a patent market with prices

The problem was to investigate *willingness to search* for – or take risk in – new valuable patentable technology by inventors, given different *trading rules* (bidding rules) and *patent strengths* (high, low). This was done in a controlled laboratory experiment. (For full article see: http://rdcu.be/nWdL)

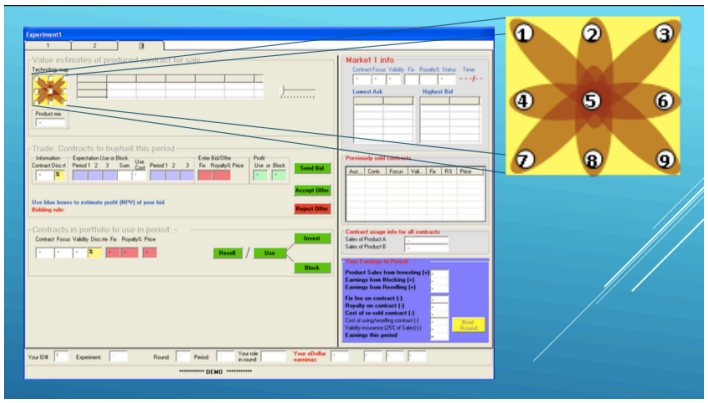
This selection process of which patented technology to *produce* was thus motivated by the demand from innovators and traders expressed through *price signals.*

In economics, technology is often treated as an externality (Arrow, 1962) or as an uncontrollable external force acting on "entrepreneurs" or "intrapreneurs" (Schumpeter, 1919/34, 1942). The existence of new technology, patented or not, is thus taken for granted or implicit in this analysis, like air, water and other *natural* resources. The focus is on *using* the technology not *producing* the technology, patented or not. However, in reality technology does not grow on trees, but often require a lot of experimenting, under great economic uncertainty. Development of new economically useful technology is instead a rather dynamic human coordination problem of highly specialized agents – inventors, traders, innovators, funders, patent expertise, universities, etc. - requiring an efficient selection process to be economically sustainable.

In this study a *dynamic microeconomic system* (technology can be altered over time from 9 areas) is studied in a controlled laboratory experiment, using human "subjects" motived by profit, which can only come from creating valuable technology (they get a percentage of what they earn from trading in the experiment in real $). To create high parallelism between the experiment and the real world, it is based on the actual *principles* and *practices* of the patent systems observed around us in the real economic system. The coordination thus took place not in a single implicit hierarchy (firm) of economic theory but in a market with prices. Se Fig 1.



An inventor "invented" from 9 technologies research areas with private and uncertain values, selling through a public bidding, like in a stock market, to traders and innovators. The traders could buy a contract, split it in two and sell to different non-competing industry innovators. The contract tariff was both a fixed fee and a royalty on the volume of products usages. See Fig 2.



The fundamental problem was thus to investigate if the *willingness to search* for – or take risk in – new valuable patentable technology. What was varied were the trading rules (increasing demand side bidding) and patent strength (high, low). The contract traded had a fixed fee and a royalty as a percentage of sales of final products/services, a model supported by an informal theory and also used in 50% of real world cases. Since productivity is driven by technology, understanding this selection process better with in these dimensions may shed light on what *institutional and taxation policies may foster a more productive economic system*.

Results: The right kind of technology

- Institutions trump patents; patents become “entry ticket” to this market as a tradable asset, but rules matter more when it comes to selecting the most productive technology for the whole economy

- Swinging search before settling on best technology triples (!) convergences time from rational assumptions.

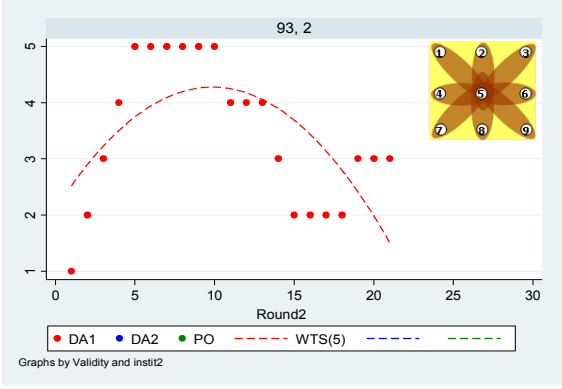
- Long Time to converge; this means that small nations must cooperate to stay competitive as technology producers, thus leverage human capital as nations. If they don’t to that people will leave (brain drain) and do their research in the largest nations who can afford multiple projects (this is of course what we have observed in the past: US, Russia, etc.).

- The time it takes to arrive at the highest value technology was estimated from the data – thus directly dependent on the willingness to search for new technology – in “rounds”, which can be interpreted as years. To our big surprise it took about 20-30 “years” to do so. Given that the economic life of a patent on average is about 6-7years today, one would need 4 parallel research initiatives just to meet end of patenting and, if lets say 3.5y is a max time to be able to give a suitable return, about 8 research projects are needed. This probably means that only the very largest nations can do this, all the others have to cooperate. This total serendipity finding means that a policy for international collaboration in technology research based on the patent system aught to be pursued.

- This means that a better level playing field when it comes to national cooperation based on patents would allow a much higher rate of technology development in the world that previously experienced.

- A taxation policy – a new kind of company!

- Prices: a second separate experiment (not reported here) showed that the importance to reduce the uncertainty in the patent asset through quality patents doubled the value of the same patent asset, pointing at accessible, low transaction cost procedures.



- Further investigations: What is the potential of this North-South trade for developing countries (and developed countries)?

Policy:
A policy conclusion would be not only to work on assets but *trade rules* – contracts, clearing, funding, anything that is involved in this dynamic process – which would give incentives, *compatible with North-South exchange in human ideas.*

Statistics: Since there are statistics lovers in the audience, this is an area worth developing further. What does the world patent technology trade map look like? How big are the flows, does it matter? Perhaps a project worthy WTO members?

2.2 The language of trust and reciprocity in patent markets

The second study takes this market dynamic discussion one step further: As new patented technology's economic value is genuinely uncertain, trading patented technology is then very challenging. Not only is the patent uncertain as a right and the technology may be unproven, but there may be another invention in pipeline not yet disclosed, or in the sellers lab, or will be invented by the seller, buyer or someone else tomorrow in spite of good faith agreements, all affecting that value needed to be understood in order to trade. But, this is precisely what firms do, internationally, increasing ever since 1474. What firms *do*, their *strategy*, to create the trust in each other's *actions*, needed to overcome such uncertainty, was the core problem investigated.

14 companies of which 10 were among the most patent *licensing* active firms in the world, one declining (which was also interesting), mostly leading technology producers in their field, participated in in-depth interviews. They were asked two questions: What do you *do* when you license and *why* do you license patents? After many interviews, at least 3 on-site visits and many phone calls, trying to capture these "globetrotters" with an intangible inclination, the answers to the questions revealed *four distinct strategies* that they all appeared to follow, to create trust in each other's actions, structuring the licensing market of the highly uncertain and potentially valuable patented technology.

As these firms license basically with everyone – between themselves, with small firms, with universities, with government, etc. – they provided essentially the full menu of strategies used. It did not show the particular problems of SMEs, which is a project I hope to run shortly, but the general toolbox available. This approach makes the study suitable for a first policy discussion. (For full study: http://hooverip2.org/working-paper/wp15016/)

This is an extremely complex material, as you are more aware of than most, as negotiators, but I will try to summarize the strategies and what we can learn from them, including examples where possible, and then some policy implications. The strategies are:

1. Staying clear or a "MAD" strategy
2. Capture period contracting
3. Marginal contracting
4. Systemic abuse

1. These are firms who typically do not license. They develop their own technology or buy it in M&A transactions or strategic networking collaborations. They want other firms to "stay clear" from their competitive core technology. Patents are here like weapons or "tigers". To create trust in that the other will not sued both parties intentionally patent to overlap each other's portfolios. If one sues then the other will also sue for infringement with the *strategic intent* that both would go "bankrupt". This is essentially cold-war Mutually Assured Destruction (MAD) strategy. They thus do not sue and stay clear of *each other* clearing any differences in technology value not through a patent license market but in the product/service market.
This strategy relies on *increasing* uncertainty in what is really owned, to create trust in each other's *actions* that the core technology will not be challenged. This is follows from the business model popular 100 years ago of vertical integration, but also enabled by weak patent trade and patent policy.
The strategy also requires huge number of patents to be effective "deterrent, is obviously costly and only the largest firms can afford to use such a strategy.

2. These are firms who cooperate freely in certain patented technology areas, products/service, and geographic markets. It is the opposite of 1. They share all patented technology not only in the current portfolio but future patents within the capture period. They thus create trust in each other's action not to harm through hold-up or assertion of future technology. A special case here is standards based FRAND (Fair, Reasonable and Non-Discriminatory) licenses. Another is "open access" where "zero royalty licenses" are offered for adopting technology. Basically they have taken the teeth out of the tiger, but only for well-behaved contracting partners. Any difference in perceived or real value is settled by a "net payment" between often most proven and valuable patents. They thus impose mutual assured restraint through a *capture period* contracting ("MAC").
These companies require smaller patent portfolio size as the collaboration can be selected on certain areas and for a limited time. Two versions are typical: "patent-life" (MAC/L) and "guillotine" (MAC/G) license, where re-negotiation is necessary at the end of the contract time (typically 3-5 years). These strategies allows for *strategic alignment* of resources with gains from specialization, a first market in ideas. This is an alternative to networking providing far broader possibilities of specialization and business strategic considerations. The strategic alignment allows for more *specialized* investments (as the complementary technology can be contracted with partners) leading to more technology investments to be made (less duplicates), more competition (than 1) and thus more technology driven economic growth.

3. These firms license "on the margin" and is closest to economic theory, except that theory is concerned with cost-reducing *process* inventions (reduce marginal cost). It is interesting to see that when most risks are gone, extant economic theory appears applicable. This calls for a rediscovery of economic principles to include risk and uncertainty in its core formulations.
This strategy only needs small portfolios (or slices) or even individual patents with technology that is already adopted in products or services, whose value is well known. These contracts basically gives "freedom to act" in the market.

"Tear-off" licenses are offered for standards (like "MP4"). Large-scale specialization can take place with equally large gains, as long as the rights are honored. This "works" thus when new technology is well established in the product and service markets.
This strategy takes issue with recent "efficient infringement" theory outline, which appears to neglect any gains from specialization. The incentives are pretty low – except for the largest firms playing strategy 1 - if small (and large) specialized players cannot assert patents through injunctions and penalties. Weakening of injunction rights and assertions would push firms into strategy 1, but only the largest can afford that, thus weakening the whole economic dynamics. Weakening right for traders (buy-hold-sell) typically weakens market efficiency. This is likely what happened in the USA after Ebay vs. MerchExchange (2006). A competitive technology market must be seen as in the public's interest. These markets, which thus closest resemble neo-classical markets, rely on low risk in value, well-defined assets and low transaction costs; something that rarely can be said about patent, except perhaps when technology is well-established.

4. These firms buy up low quality patents and assert them on potential infringers, hoping for an out-of-court settlement less than court costs. This behavior was likened to "mafia protection money" by one (large) firm. The strategy to deal with this abusive behavior was to "run these entities out of business" by going to court, spend 1-2$m and get your day in court to discuss the low value. These firms then loose out and cannot sustain their business model unless they resort to showing up valuable patents, which means playing strategy 3. Only the largest firms can afford this defense (but even they cannot assert the value if the abusing firm is very large and perhaps a large business partner as well as in recent cases with Apple-Samsung, Apple-Qualcomm, etc.). This imposed cost by both sides impose a mutual self-restraint, which results in valuable patents licensed. Recent discussions on patent "trolls" is so confused that even legitimate assertion by firms doing million dollar investments to produce the technology are considered abusive. The market transaction is a license for a valuable technology that would not exist would it not be for the anticipated protection of the investment. The huge uncertainty of patent validity, patents ownership (there is no up-to-date public "land registry" for patents), and not having a looser-pays policy were given as possible reasons for abuse. These transaction cost problems create a strategic problem for firms, where smaller inventors cannot play any strategy and have to rely on strategy 1.

Common theme

The common theme of all strategies is thus that the firms enforce ("contract") *mutual self-restraint on themselves,* which created the desired trust in each other's actions. This trust then translates into licensing given the economic realities (of risk, transaction costs, market demand, competition, etc.) created by extant institutional and taxation policy, allowing them to reap promises of gains from exchange in human ideas.

Policy

From an economic point of view a move from strategy 1 and 4 towards strategy 2 and 3 is then desirable. In order to inform policy the *mechanisms* of these strategies have to be understood. A key enabler for such policy must be to reduce uncertainty in the patent asset. This is then the "entry ticket" that can give incentives to specialization. Again it is the contract issues – and rules of trade – that are critical to such a move which may hold promises of gains from trade in 2 and 3, outpacing 1 and 4.

3. Conclusions

The first study thus implies that a policy must include both institutional policy as well as patent policy.

Then the time it takes to arrive at the highest value technology was estimated from the data to about 20-30 "years". Given the economic life of a patent about 8 research areas need to be pursued in parallel something only the very largest nations can do this, all the others have to cooperate. This surprising serendipity finding means that a policy for international collaboration in technology research *based on the patent system* aught to be pursued. A linear approach or a network approach cannot solve such a complex problem: It has to be done simultaneously in a multi-lateral market of nations.

The trade rules have thus to be incentive compatible with a North-South exchange in human ideas.

The second study pointed at need to understand the mechanisms of strategy 1-4 in detail in order to inform policy.

The conclusion is thus that a *dual policy* of trading rules, taxes and quality patents together with educational policy in STEM (understanding of nature, science) is needed to leverage human capital formation for North-South Trade in Ideas.

4. Pilot-study of economic potential of North-South exchange in ideas

In order to further the policy discussion, a pilot-study has been proposed to gather facts about the economic potential of North-South exchange in ideas based on the patent system. This study including 5 developing countries and up to 10 firms in each country. A selection will be done based on investments in higher education that has shown academic results and an initial university-company collaboration as selected cities.
The pilot study has was just recently granted funding from Sweden and will be carried out during the fall of 2017, with reporting during Q1 2018.

Countries wishing to participate in the study, or expanding the study, are more than welcome to contact me right after this event or by email. Information about the pilot project will be posted on report.ullberg.biz.

5. A Proof of Concept

Economists and academia are more than seldom accused for being abstract and proposing solutions which are not practical to implement. To make more than a dent in that perception, a proof of concept is on the drawing board.

To that end we are discussing with a world leading technology partner, in developing a first practical market, specifically targeted to releasing the values of North-South trade in ideas, helping in creating a level playing field for SMEs, individual inventors and MNCs.

This project will include corporate customers, and I hope, countries, interested in creating a more efficient market in ideas.

If your ministry of industry or trade are interested in promoting this practical test by connecting with local industry you are also welcome to connect after this event or by email. This study will benefit from the pilot-study but will go much further, focusing on key technology areas of food security, sustainable energy, and information and communications technology.

6. Concluding remarks

You are thus all welcome to join these projects: pilot-study and follow-on project.

Hopefully this talk has been informative for a North-South trade in ideas development policy.

Thank you for your time – I will now try to answer any questions you might have.

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