The paper trail of knowledge flows: Evidence from patent interferences

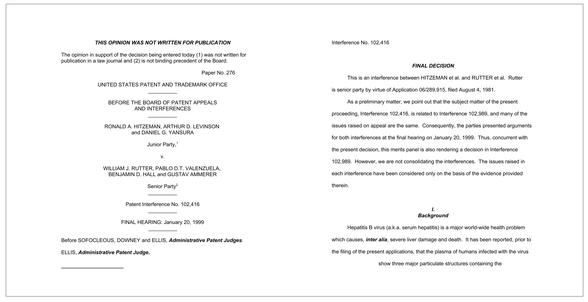
Ina Ganguli[a], Jeffrey Lin[b], Nicholas Reynolds[b]

[a]—SITE, Stockholm School of Economics and [b]—Federal Reserve Bank of Philadelphia†

Introduction

- From decisions in U.S. *patent interference* cases, we construct a novel database of identical inventions claimed simultaneously and independently by multiple parties.
- Importantly, common knowledge outputs in these cases strongly suggest common knowledge inputs.
- These data permit new tests of *tacit knowledge flows* via geographic distance and social networks.

Data



THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 276

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

RONALD A. HITZEMAN, ARTHUR D. LEVINSON and DANIEL G. YANSURA

Junior Party,[1]

v.

WILLIAM J. RUTTER, PABLO D.T. VALENZUELA, BENJAMIN D. HALL and GUSTAV AMMERER

Senior Party[2]

Patent Interference No. 102,416

FINAL HEARING: January 20, 1999

Before SOFOCLEOUS, DOWNEY and ELLIS, ***Administrative Patent Judges***.

ELLIS, ***Administrative Patent Judge***.

Interference No. 102,416

FINAL DECISION

This is an interference between HITZEMAN et al. and RUTTER et al. Rutter is senior party by virtue of Application 06/289,915, filed August 4, 1981.

As a preliminary matter, we point out that the subject matter of the present proceeding, Interference 102,416, is related to Interference 102,989, and many of the issues raised on appeal are the same. Consequently, the parties presented arguments for both interferences at the final hearing on January 20, 1999. Thus, concurrent with the present decision, this merits panel is also rendering a decision in Interference 102,989. However, we are not consolidating the interferences. The issues raised in each interference have been considered only on the basis of the evidence provided therein.

Background

Hepatitis B virus (a.k.a. serum hepatitis) is a major world-wide health problem which causes, ***inter alia***, severe liver damage and death. It has been reported, prior to the filing of the present applications, that the plasma of humans infected with the virus show three major particulate structures containing the

Figure 1: An interference decision, showing inventors, decision, etc.

- Simultaneous, identical claims of invention filed 1981–2013, involved in 1,314 interference decisions issued 1998–2014 [1]
- We hand-collect inventor names, patent/application numbers, assignees, seniority (first-to-file), judges, lawyers, and decisions from interference decisions (Figure 1) [1], [2]
- Citations, inventor locations, technology classes for issued patents and failed applications (Google, PAIR, [3], MCF)
- 19th-century patent interferences (NARA) in progress

	Freq	%
Concession or settlement ✓	784	59.7
Priority judgement ✓	270	20.5
Claims found unpatentable	97	7.4
Interfering inventors have common assignee	63	4.8
No interference-in-fact	47	3.6
Other	53	4.0
Total	1,314	100.0

Table 1: Decisions can distinguish knowledge flows (✓) from other factors

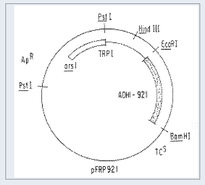
What is a patent interference?

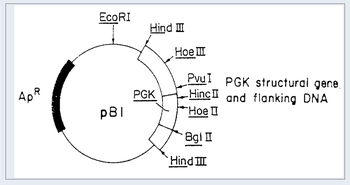
- Until 2013, the U.S. awarded patents to applicants who were "first to invent," not the "first to file."
- If multiple, independent inventors simultaneously submitted applications with identical claims, the patent examiner declared an "interference" to decide priority.
- Interfering inventors submitted lab notebooks, eyewitness testimony, etc., to prove they were the "first to invent."

Why are interferences useful?

- If new ideas result from combinations of existing ideas, then interfering inventors are likely to have **knowledge inputs in common**, including tacit knowledge.
- Decisions help rule out stealing, racing, other factors (Table 1).

Case Study: Producing Hepatits-B Vaccine from Yeast





Inventors	Rutter, Valenzuela, Hall & Ammerer (UC, Merck)	Hitzeman, Levinson, & Yansura (Genentech)
Application	07/209,504	07/248,863
Filed	August 4, 1981	August 31, 1981
Conceived	June 30, 1981	February 3, 1981
Reduced	June 30, 1981 ✓	July 20, 1981

Teams had knowledge inputs in common

- "Australian" antigen used costly infected blood ('76 Nobel)
- Many failed attempts to use bacteria to produce antigen
- Yeast could produce other proteins, e.g., interferon

Knowledge flows via co-inventor network

- Previous collaborations between Hitzeman and Hall

Inventions were nearly simultaneous

- Rutter successfully challenged Hitzeman's conception date

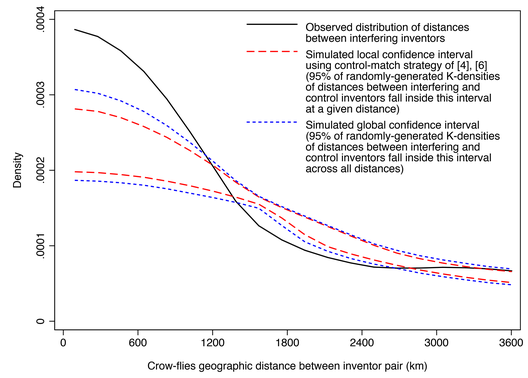


Figure 2a: Interfering inventors are more geographically localized

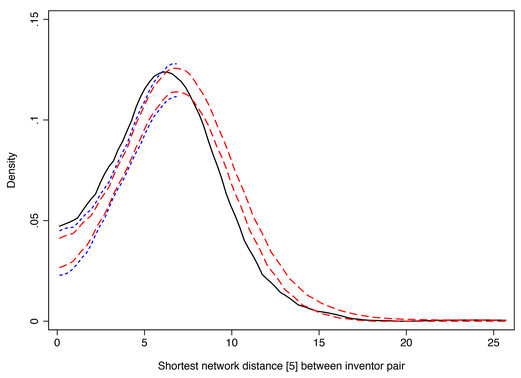


Figure 2b: Interfering inventors are separated by fewer co-inventors

Testing for tacit knowledge flows

- We test for tacit knowledge flows via geography and social networks using the control-matching strategy of [4], [5] to compare the distribution of interfering-pair distances to counterfactual distributions of similar control patents that control for all factors *except* common knowledge inputs.
- "Control pairs" include one interfering invention and one control patent. Control patents share with interfering pairs (i) a 6-digit technology class and (ii) a similar application date [6].
- Following [7], we estimate counterfactual distributions after simulating random draws of control pairs. Local and global confidence intervals are constructed so that no less than 95% of randomly-generated K-densities fall inside the intervals.
- We find that pairs of interfering inventors tend to be closer in geographic and social-network proximity compared to pairs of interfering and control patents (Figures 2a & 2b)

	Interfering pairs	Control pairs (95% CI)
Backward citations	18.2	14.0–16.5
Shared citations by pair	3.9	0.4–1.2
6-digit classes	5.4	4.3–5.7
Shared 6-dig. classes by pair	2.4	1.4–1.5

Table 2: Interfering pairs also share more codified knowledge inputs

Conclusions

- We construct a novel database of identical, simultaneous inventions from decisions in patent interference cases.
- Interferences measure common knowledge outputs, and are useful for the study of tacit knowledge flows.
- Using a control-matching strategy, we find that interfering inventors share codified and tacit knowledge inputs.
- Interfering inventors are more geographically localized and separated by fewer co-inventors vs. similar control inventors.
- Next steps: Study rivalry in subsequent invention by comparing interference winners vs. losers

References

[1] U.S. P.T.O. "Final Decisions of the Patent Trial and Appeal Board". `http://e-foia.uspto.gov/Foia/PTABReadingRoom.jsp`, February 18, 2014.

[2] U.S. P.T.O. "EFiling for Patent Trial and Appeal Board". `https://acts.uspto.gov/ifiling/PublicView.jsp`, February 18, 2014.

[3] R. Lai, A. D'Amou, A. Yu, Y. Sun, and L. Fleming. "Disambiguation and Co-authorship Networks of the U.S. Patent Inventor Database (1975–2010)". `http://hdl.handle.net/1902.1/15705`, March 31, 2013.

[4] A.B. Jaffe, M. Trajtenberg, and R. Henderson. "Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations". *The Quarterly Journal of Economics*, 108(3):577–598, 1993.

[5] S. Breschi and F. Lissoni. "'Cross-Firm' Inventors and Social Networks: Localized Knowledge Spillovers Revisited". *Annales d'Économie et de Statistique*, 79–80:189–209, 2005.

[6] P. Thompson and M. Fox-Kean. "Patent Citations and the Geography of Knowledge Spillovers: A Reassessment". *American Economic Review*, 95(1):450–460, 2005.

[7] Y. Murata, R. Nakajima, R. Okamoto, and R. Tamura. "Localized Knowledge Spillovers and Patent Citations: A Distance-Based Approach". *The Review of Economics and Statistics*, forthcoming, 2014.

†—We thank Jerry Carlino and Bob Hunt for comments and suggestions, and Aaron Rosenbaum for excellent research assistance. The views expressed here are those of the authors and do not necessarily represent the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.