

# A new database of Indian patents

Presented at the NBER Innovation Initiative Meeting

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Indian School of Business, Catholic University of Milan, India Development Foundation

December 7, 2024

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## 1 Introduction

- Motivation
- Our dataset

## 2 Construction of the dataset

- Example

## 3 An application - Evolving geography of innovation in India

- Descriptive statistics
- Concentration of researchers
- Emergence of new research locations

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## 1 Introduction

- Motivation
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## 2 Construction of the dataset

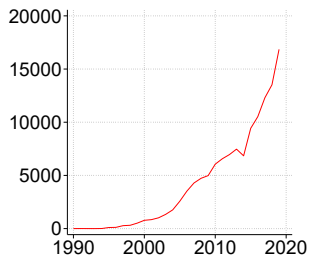
- Example

## 3 An application - Evolving geography of innovation in India

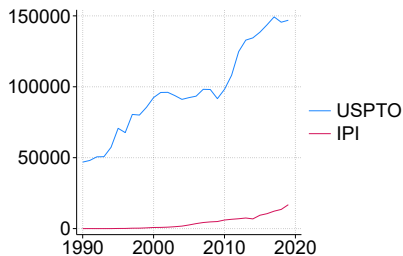
- Descriptive statistics
- Concentration of researchers
- Emergence of new research locations

# Increase in patenting in India

Still a young research ecosystem and can offer insight into the spread of R&D



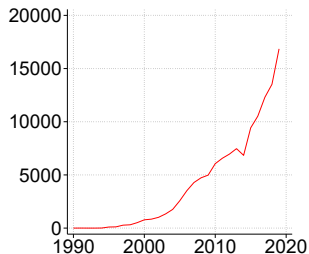
Domestic patent filings - IPI



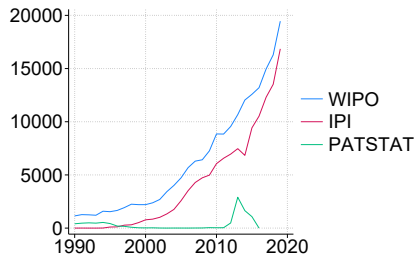
IPI vs. USPTO

# Increase in patenting in India

But incomplete information and very little innovation research

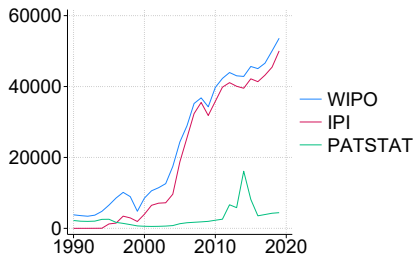


Domestic patent filings - IPI

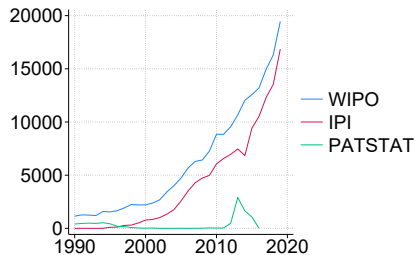


PATSTAT vs. WIPO vs. IPI

# For all patents (domestic + foreign)



PATSTAT vs. WIPO vs. IPI - All



PATSTAT vs. WIPO vs. IPI - domestic

# About the dataset

We develop a patent-location dataset that has:

- All published resident patents and their inventors from 2005 to 2024 (post-TRIPS)
- For most inventors of a patent, we have a postal code (called pin code in India)  $\sim$  85 percent

The big picture addition that we bring to existing datasets is completeness and granularity

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# How do we scrape it? Example - 1/8



## Patent Search

Patent Search

Patent E-register

Application Status

Help

Publication Type:

Published

Granted

Select Search Field

Application Date (National) ▾

From Date (MM/dd/yyyy)

09/29/2016

To:

To Date (MM/dd/yyyy)

09/29/2016

Select Search Field

Title ▾

Please Enter Title

e.g. ONBOARD VEHICLE DIGITAL IDENTIFICATION TRANSMISSION

Select Search Field

Abstract ▾

Please Enter Abstract

e.g. COMPUTER IMPLEMENTED

Select Search Field

Complete Specification ▾

Please Enter Complete Specification

e.g. VEHICLE DIGITAL IDENTIFICATION

Select Search Field

Please Enter Application Number

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## Patent Search

Patent Search Patent E-register Application Status Help

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Application Number	Title	Application Date	Status	
201611033387	INTEGRATED BRAKING SYSTEM OF VEHICLE	29/09/2016	Published	<a href="#">Application Status</a>
201641033386	UNIFIED VERSA FRACKING DEVICE FOR ENHANCED RECOVERY FROM CONVENTIONAL RESERVOIRS, HYDRATES, AND SHALES	29/09/2016	Published	<a href="#">Application Status</a>
201641033371	TIERING DATA BLOCKS TO CLOUD STORAGE SYSTEMS	29/09/2016	Published	<a href="#">Application Status</a>
201641033406	A METHOD OF CREATING STORY ALBUM IN REAL-TIME USING A SET OF MEDIA FILES	29/09/2016	Published	<a href="#">Application Status</a>
201611033369	METHOD OF INHIBITING SCALE/CRYSTAL FORMATION IN SODIUM BOROHYDRIDE SOLUTION FOR ONBOARD HYDROGEN GENERATION OF FUEL CELL POWER PLANT	29/09/2016	Published	<a href="#">Application Status</a>
201641033365	ELECTRONIC DEVICE AND METHOD THEREOF FOR MANAGING NOTIFICATIONS	29/09/2016	Published	<a href="#">Application Status</a>
201621033360	AN APPARATUS AND A PROCESS FOR HALOGENATION OF A HYDROCARBON	29/09/2016	Published	<a href="#">Application Status</a>
201611033349	STRAIGHT REDUCTION CLAMP AND ITS METHOD OF USE THEREOF	29/09/2016	Published	<a href="#">Application Status</a>
201644033347	SMART WEARABLE DEVICE FOR HEALTH WATCH	29/09/2016	Published	<a href="#">Application Status</a>
201641033345	QUICK HARDWARE INVENTORY OF A SOFTWARE-DEFINED DATA CENTER (SDDC) MULTI-RACK	29/09/2016	Published	<a href="#">Application Status</a>
201631033343	COMMUNICATION DEVICE AND METHOD FOR USING A COMMUNICATION SERVICE	29/09/2016	Published	<a href="#">Application Status</a>



Patent Search

Patent Search

Patent E-register

Application Status

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201641033365	ELECTRONIC DEVICE AND METHOD THEREOF FOR MANAGING NOTIFICATIONS

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	Application Date	Status	
	29/09/2016	Published	<a href="#">Application Status</a>
M CONVENTIONAL RESERVOIRS,	29/09/2016	Published	<a href="#">Application Status</a>
	29/09/2016	Published	<a href="#">Application Status</a>
T OF MEDIA FILES	29/09/2016	Published	<a href="#">Application Status</a>
BOROHYDRIDE SOLUTION FOR	29/09/2016	Published	<a href="#">Application Status</a>
TIFICATIONS	29/09/2016	Published	<a href="#">Application Status</a>
OCARBON	29/09/2016	Published	<a href="#">Application Status</a>
:	29/09/2016	Published	<a href="#">Application Status</a>

## Patent Search

[Patent Search](#) [Patent E-register](#) [Application Status](#) [Help](#)

Invention Title	METHOD OF INHIBITING SCALE/CRYSTAL FORMATION IN SODIUM BOROHYDRIDE SOLUTION FOR ONBOARD HYDROGEN GENERATION OF FUEL CELL POWER PLANT
Publication Number	14/2018
Publication Date	06/04/2018
Publication Type	INA
Application Number	201611033369
Application Filing Date	29/09/2016
Priority Number	
Priority Country	
Priority Date	
Field Of Invention	MECHANICAL ENGINEERING
Classification (IPC)	F02M

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# Example - 5/8

inventor

Name	Address	Country	Nationality
[REDACTED]	Naval Materials Research Laboratory, [REDACTED] Thane, Maharashtra, India 421 506	India	India
[REDACTED]	Naval Materials Research Laboratory, [REDACTED] Thane, Maharashtra, India 421 506	India	India

Applicant

Name	Address	Country	Nationality
CHAIRMAN, DEFENCE RESEARCH & DEVELOPMENT ORGANISATION	Ministry of Defence, Govt. of India [REDACTED] DRDO Bhawan, Rajaji Marg, New Delhi 110 1055, India	India	India

Abstract:

The present invention relates to fuel solution for hydrogen generation comprising an aqueous solution concentrate of sodium borohydride, a stabilizer and crystallization inhibitor.

## Complete Specification

### FIELD OF INVENTION

The present invention relates to method and materials for the generation of hydrogen gas from hydrogen storage materials. In particular, the present invention relates to method of generation of hydrogen gas by contacting sodium borohydride aqueous solution in presence of catalyst - such as cobalt or nickel with crystal suppressor / stratification inhibitor to allow pumping of concentrated aqueous borohydride solution to the hydrogen generator. The present invention more particularly relates to fuel solution comprising an aqueous solution concentrate of sodium borohydride, a stabilizer and phase formation inhibitor.

### BACKGROUND OF THE INVENTION

Hydrogen gas is used as a fuel for fuel cells and it requires a compact, high-density, controllable source of hydrogen gas. Hydrogen Gas cylinders are too heavy and bulky, while liquid hydrogen requires cryogenic cooling. Metal hydride systems are limited to 1-3% hydrogen by weight; are endothermic (that is, as hydrogen is evolved, the container gets colder, which reduces the hydrogen vapor pressure); the hydrogen evolution rate is not controllable or adjustable (so that an oversized amount of hydride is necessary).

Hydrogen generation is on-demand basis and comprises the raw material feed tanks, the hydrogen generation system and the spent material storage tanks. In operation, hydrogen flows into the fuel cell stacks where it is consumed along with oxygen to form water and unregulated raw DC power. Water produced in the fuel cell is used in hydrogen generator and the unregulated DC power is fed into the power electronics system. The output of the power electronics system resulting on regulated user specified quality DC power is interfaced with the platform switch board which in turn provides power to the platform. Hydrogen generation is the first subsystem in the

[View Application Status](#)

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Address	Country
Naval Materials Research Laboratory, [REDACTED] Thane, Maharashtra, India 421	India
Naval Materials Research Laboratory, [REDACTED] Thane, Maharashtra, India 421	India

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Office of the Controller General of Patents, Designs & Trade Marks  
Department for Promotion of Industry and Internal Trade  
Ministry of Commerce & Industry,  
Government of India

सत्यमेव जयते



Application Details	
APPLICATION NUMBER	201611033369
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	29/09/2016
APPLICANT NAME	<b>CHAIRMAN, DEFENCE RESEARCH &amp; DEVELOPMENT ORGANISATION</b>
TITLE OF INVENTION	METHOD OF INHIBITING SCALE/CRYSTAL FORMATION IN SODIUM BOROHYDRIDE SOLUTION FOR ONBOARD HYDROGEN GENERATION OF FUEL CELL POWER PLANT
FIELD OF INVENTION	MECHANICAL ENGINEERING
E-MAIL (As Per Record)	cal@patentindia.com
ADDITIONAL-EMAIL (As Per Record)	
E-MAIL (UPDATED Online)	
PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	08/11/2017
PUBLICATION DATE (U/S 11A)	06/04/2018
FIRST EXAMINATION REPORT DATE	11/02/2020
Date Of Certificate Issue	27/04/2021
POST GRANT JOURNAL DATE	30/04/2021
REPLY TO FER DATE	11/08/2020





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REQUEST FOR EXAMINATION DATE	08/11/2017
PUBLICATION DATE (U/S 11A)	06/04/2018
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POST GRANT JOURNAL DATE	30/04/2021
REPLY TO FER DATE	11/08/2020

## Application Status

APPLICATION STATUS

Granted Application, Patent Number **365505**

E-Register

Order(s)/Decision(s)

View Documents



In case of any discrepancy in status, kindly contact [ipo-helpdesk@nic.in](mailto:ipo-helpdesk@nic.in)

Table: Some important measures

Data	IPI
Applications	818,038
Application type	99.56
<b>Pin codes</b>	<b>86.54</b>
<b>Email</b>	<b>93.54</b>
<b>Status</b>	<b>99.99</b>
Req. for exam for granted	98.43
First exam report for granted	88.56
Reply to FER	86.19

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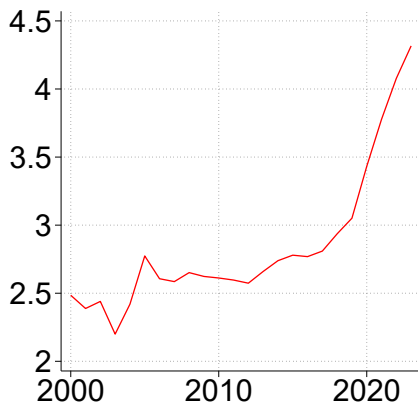
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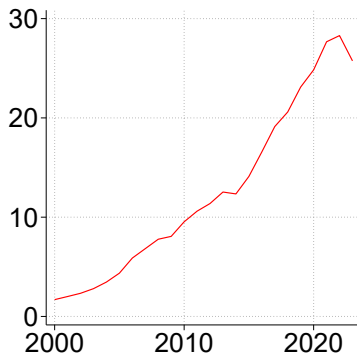
# Increase in researcher population



Annual averages of inventors per patent

The average number of inventors on a patent has increased from 2.49 in 2000 to 4.33 in 2023. But, varies between sectors.

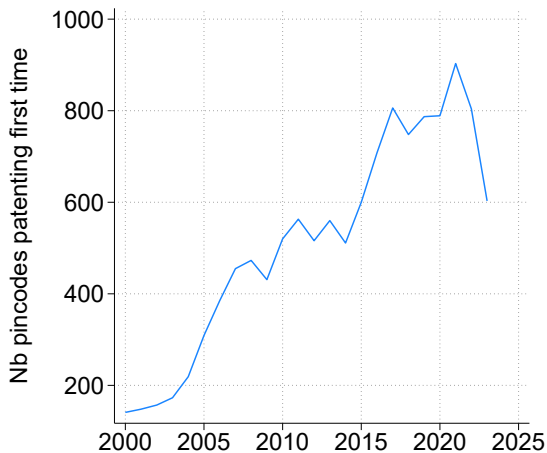
These researchers come from increasingly diverse geographies



Proportion of participating pin codes

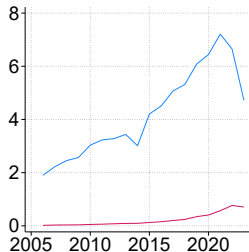
- In 2000 all researchers came from 1.68% of pin codes. This increased to 25.48% in 2023.

# Process of diffusion has been continuous

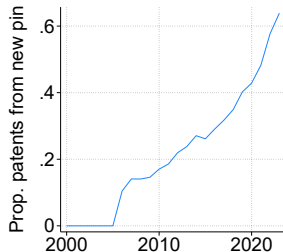


First time patenting pin codes by year

# New pin codes also contribute significantly to research



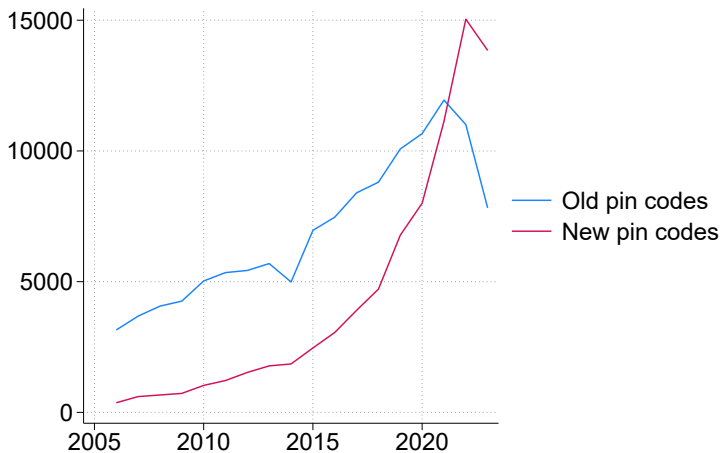
Average patents from old and new pin codes each year



Proportion of inventors coming from new pin codes

- 'New' pin codes are those that started patenting in or after 2005.

# Some new pin codes have taken over

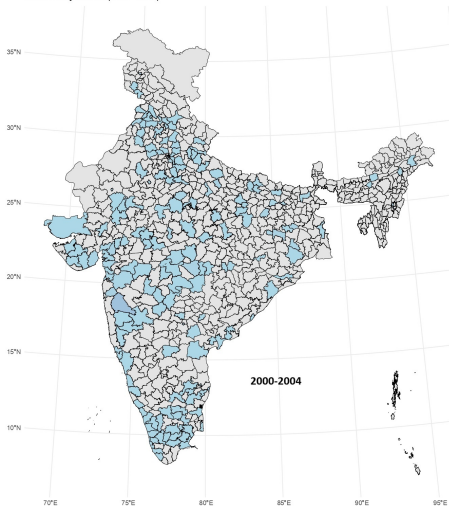


Patents from old and new pin codes each year

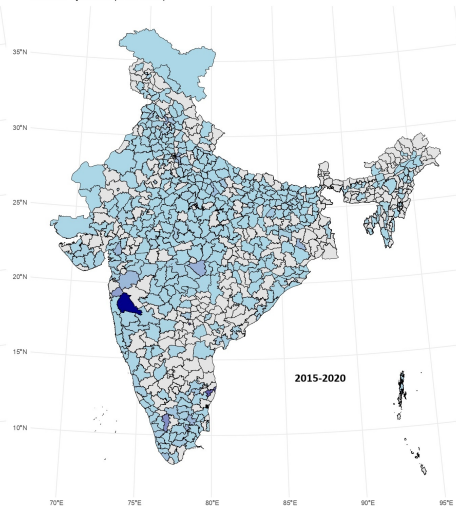


# District-Wise Trends in Decreasing Concentration

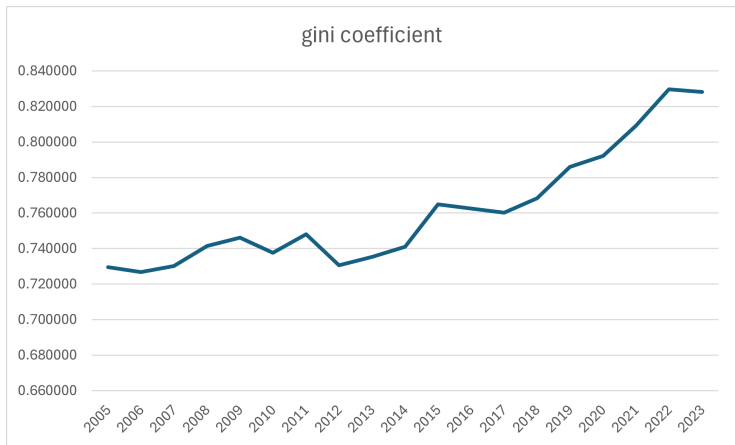
Inventors by District (2000–2004)



Inventors by District (2015–2020)

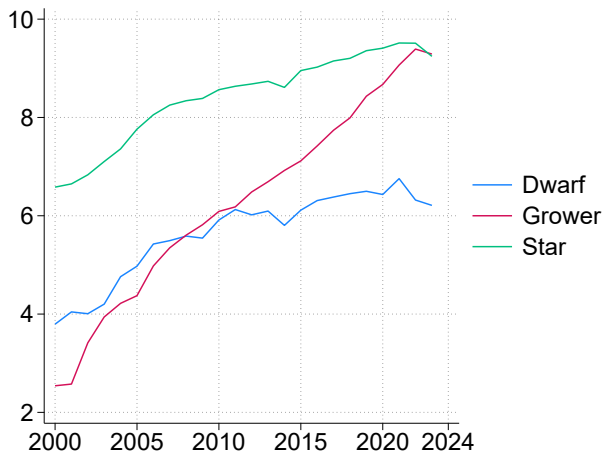


# Concentration has decreased but inequality increased



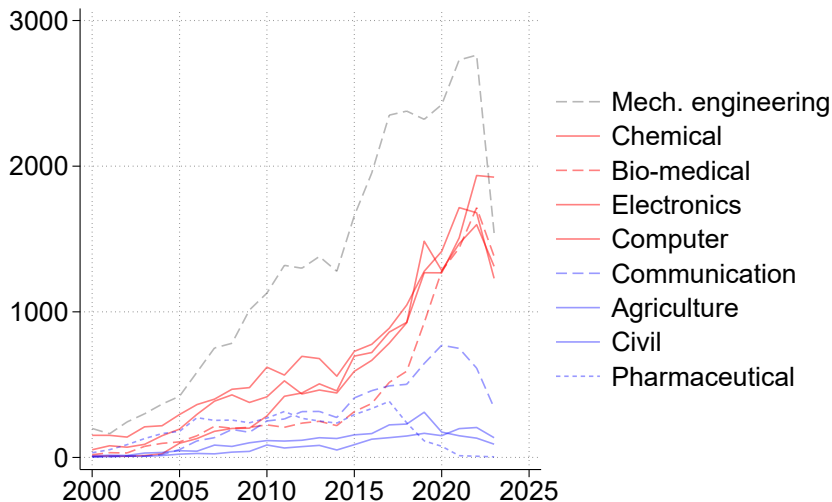
Gini coefficient of annual patenting at the pin code level

# Stars, Growers and Dwarfs



logs of total annual inventors in Star, Grower and Dwarf pin codes

# Bio-medical, Computer and Electronics are growing sectors



# Growers have a comparative advantage in emerging sectors

<b>Research field</b>	<b>All</b>	<b>Star</b>	<b>Grower</b>	<b>Dwarf</b>
Chemical	18.30	19.30	15.80	17.70
Communication	6.90	7.40	6.00	5.50
Mech. Engineering	26.60	26.30	26.70	29.60
Bio-medical	11.20	10.20	14.00	10.70
Electronics	13.80	13.50	14.60	12.90
Computer	14.80	14.30	16.70	11.10
Agriculture	2.30	2.10	2.20	4.50
Civil	1.60	1.40	1.80	1.80
Pharmaceutical	4.60	5.40	2.10	6.20

Table: Research field data distribution across different types of pincodes