

The AI Before the Law

LLM vs. Expert Coding of Women's Rights in French Customary Law

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ERC conference - Historical Human Capital in the Age of Big Data

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Motivation

- In the *Age of Big Data*, copious **text-as-data** is open to research.
e.g., social media, newspapers, political debates, letters, scientific articles, laws, ...
- Rich but **costly to extract and code** by hand.
- **Large language models (LLMs)** offer a solution.
- **Validation** of LLMs for *tables, handwritten docs, (some) text annotation*
... but **not for** an important source of historical data: **Laws**
 - **Institutions.** Levine (1999); AJR (2001); Iwasaki (2026)
 - **Legal origin.** Laporta et al. (1998, 2008)
 - **Measure upper-tail human capital.** Cantoni & Yuchtman (2014); de la Croix & Curtis (2025)
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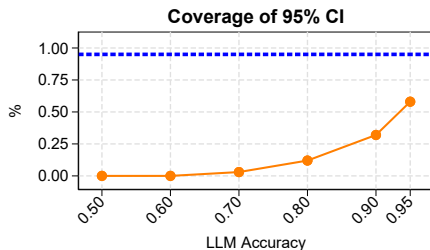
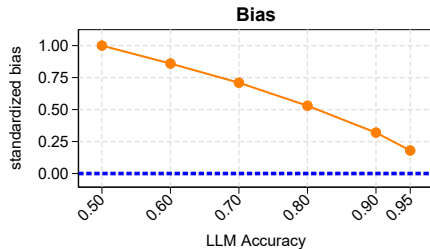
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Why do we need ~~this paper~~ to validate LLMs?

- Rapid LLM adoption in economics... but also:
 - Replicability concerns.
 - Contamination.
 - **Accuracy bias.**
- LLM is a *predictive model*!
 - **Expert coder:** (random) mistakes $\rightarrow$ ME
 - **LLM:** (systematic) prediction errors $\rightarrow$ Bias
- Bigger problem for **interpretative text-as-data**!
- Solution? **Validate LLM vs. expert-coded data.**



This paper

1. New **dataset of women's economic rights** in 15-18C France (*the groundtruth*).

- **Hand-coded** legal provisions for 141 Customary laws.

Marital property regime, asset ownership and management rights, legal provisions for widows, testamentary capacity, dower, widow's housing rights ...

2. New **LLM toolkit** to extract and code these data (Gemini 2.5 Flash).

3. **Validation study**: LLM vs. groundtruth dataset.

- **Detection (stage 1)**: >80% *precision, recall, F1*.
- **Classification (stage 2)**: 75% *accuracy*.
- **Performance varies a lot**: by variable (30–100%) and Custom (20–100%).
- **Naive vs. expert prompt**: ↗5% *accuracy* [preliminary!]
- **(Systematic) errors**: *Negations, false cues, wrong evidence*.

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Literature review (1/2)

Contribution to AI in social sciences

1. LLM evaluation vs. human-coded data.

- **Objective:** Tables (Horn & Keuper 2026) Record linking (Dasanaike 2026) Handwritten (Humphries et al. 2024, Crosilla, Klic & Colavizza 2025) Chinese documents (Keller, Shiue & Yan 2026)
- **Interpretative:** News, tweets, forums (Gilardi, Alizadeh & Kubli 2023, Asirvatham, Moksiki & Shleifer 2026) policy documents (Choi, Peskoff & Stewart 2026) speeches (Koniaris, Tsipi & Tsanakas 2025)

→ **First LLM evaluation for legal data.**

→ **text-as-data + interpretative + but has objective “truth” (vs. sentiment analysis).**

2. AI tools for social sciences (Dell 2025; Törnberg 2024)

- **Inference** (Angelopoulos et al. 2023, Egami et al. 2024, Ludwig et al. 2025, Carlson & Dell 2025)
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→ **Toolkit for coding pre-modern legal data.**

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(Data) contribution to economics

3. Law and economics.

- **Historical legal data.** Measuring institutions (Levine 1999, Iwasaki 2026, Rodríguez 2026) legal origins (Laporta et al. 1998, 2008) measuring upper-tail human capital (Murphy, Shleifer, Vishny 1990, Cantoni and Yuchtman 2014, de la Croix & Curtis 2025)

→ Bringing **customary law** into the debate (vs. civil/common law).

4. Women's economic rights.

- **19C-20C.** (Goldin 1990; Geddes & Lueck 2002; Geddes, Lueck & Tennyson 2012; Doepke & Tertilt 2009; Doepke, Tertilt & Voena 2012; Fernández 2014; Hazan, Weiss & Zoabi 2019, 2023; Doepke et al. 2025)
- **Pre-modern.** History (Boissonade 1874, Pellegrin & Winn 1998, Beauvalet-Boutouyrie 2001, Fauve-Chamoux 2009, Diefendorf 2014) Econ. (Ogilvie & Schaff 2025, Blasutto et al. 2026, Sutter 2026)

→ (Most) comprehensive dataset on **pre-modern women's rights**.

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Road map

1. Introduction
- 2. The raw data (Customs)**
3. The ground truth (women's rights dataset)
4. The LLM
5. Results
6. Conclusion

Historical background (1/2)

Women's economic rights

Legal rules determining women's ability to own, control, use, and transfer economic resources independently of husband, father, or male relatives.

- Different history from political rights!
- Economics literature focused on **gains after 19C legal reforms**
... but **pre-modern women had (some) economic rights**.
- **Examples:** *marital property regime, testamentary capacity, dower, remarriage inheritance.*
- These rights **varied by marital status**.
→ Regulated by **customary law** ($\approx$ family law)

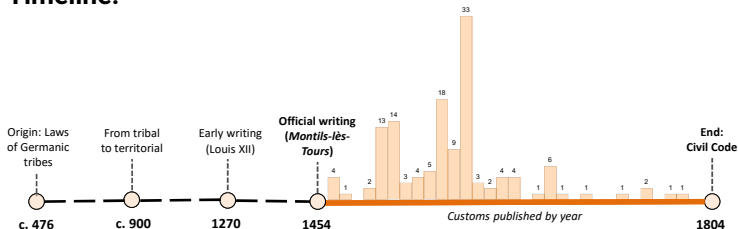
Historical background (2/2)

Customary law

Customs are **usages that acquired obligatory force** [...] though repetition of peaceable and public acts over a relatively long lapse of time

— Gilissen (1979): p. 27

Timeline:



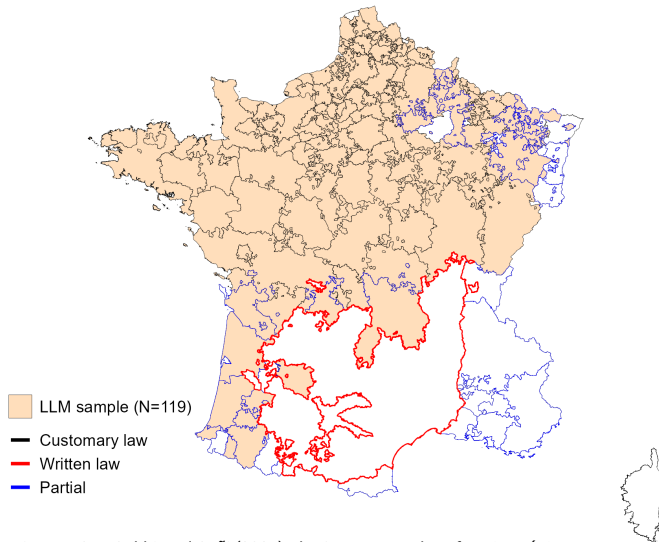
Main characteristics:

- Regulated inheritance and family law.
- Customs were written laws.
- Local variation.

Custom regions

There are, it is said, 144 customs in France which have the force of law; these laws are almost all different. A man who travels in this country changes laws almost as often as he changes horse post.

— Voltaire (1878)

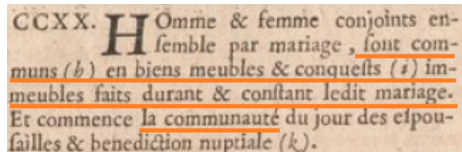


Source: Gay, Gobbi, and Goñi (2024) *The Customary Atlas of Ancien Régime France*.

Coding women's rights in Customs

Example: Matrimonial property regime

- **Custom of Paris** (CG vol. 3 part I, p. 45):

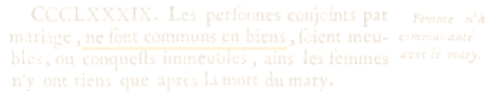


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→ Community property regime.

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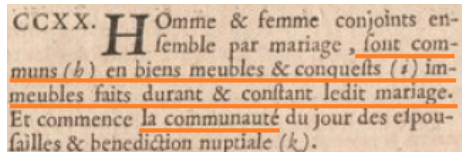
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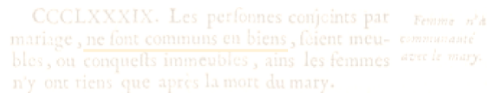


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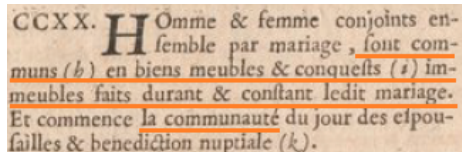
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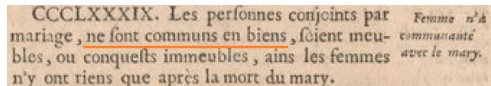


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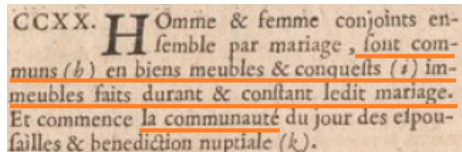
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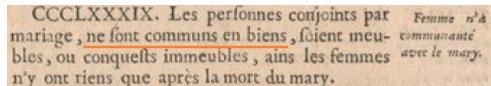


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Sources

1. Original customary laws.

- 118 customs from ***Nouveau Coutumier Général*** (Bourdote de Richebourg, 1724)
- 23 customs from 20 other sources (e.g., *Straßburg, Perpinyà*) [▶ list](#)
→ LLM sample: 116 customs from CG; 3 from other sources.

2. Commentaries and treatises.

- d'Argis (1738), Pothier (1824), Boissonade (1874), Olivier-Martin (1922), Chénou (1929), Yver (1952), Zink (1993).

3. Custom regions.

- *The Customary Atlas of Ancien Régime France* (Gay, Gobbi and Goñi 2024)

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1. Rights of married women.

- Marital property regime.
- Capacity to administer goods or write a will without husband consent.
- Intervivo gifts.

2. Rights of widows.

- Widowhood provisions (usufruct).
- Wills and/or mutual gifts.
- Housing rights.

3. Rights of re-married and unmarried women.

- How re-marring affects inheritance and widowhood provisions.
- Age of legal independence vs. (parental) guardianship.

Economic rights of married women

Marital property regime

- *Community*: property acquired during marriage is jointly owned.
- *Separate (dotal)*: no property jointly owned.

Wife's share protection

Under community property, is the wife's share protected from disposal without her consent?

Independent administration

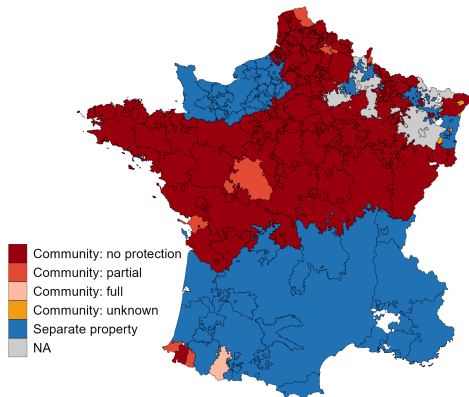
Types of assets a married woman could administer without her husband's consent.

Testamentary capacity

Can a married woman write a will without her husband's consent?

Inter vivos gifts

Can spouses transfer property to each other during marriage?



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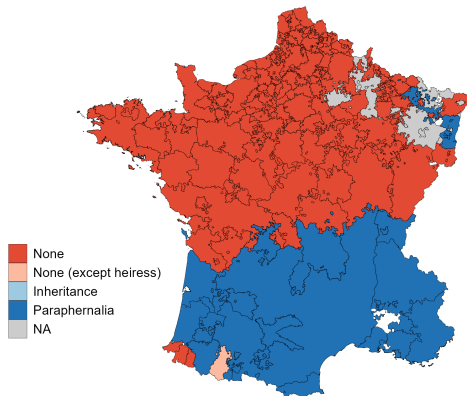
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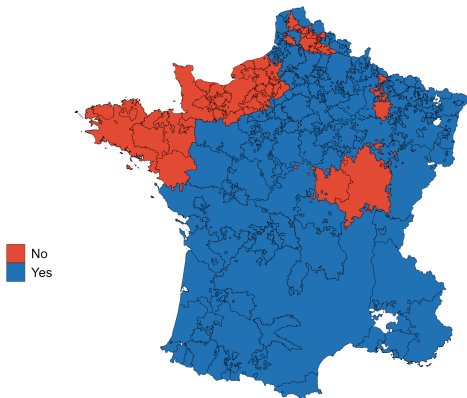
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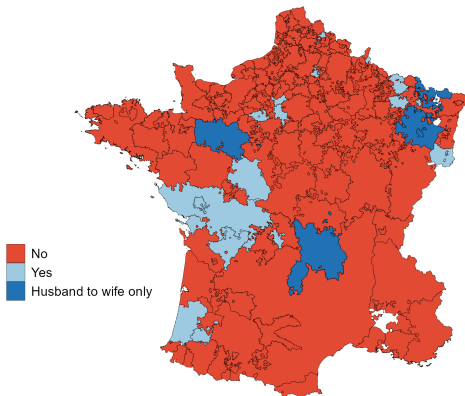
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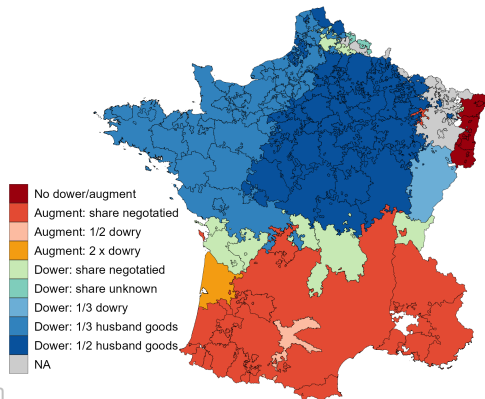
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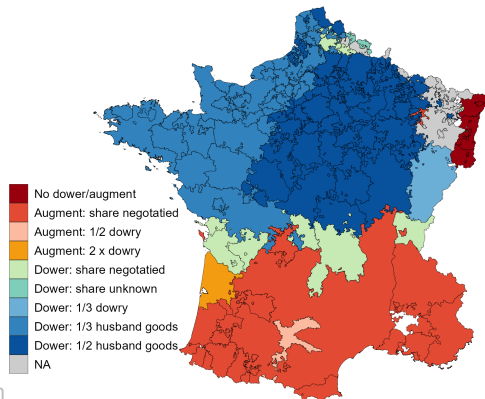
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Legal vs. conventional dower	If <i>conventional</i> dower is specified in marriage contract, does it forfeit <i>legal</i> dower?
– “ – amount	Must conventional dower exceed legal dower?
Dower and gift	Can a widow receive both a dower and a gift?
Spousal will	Can spouses bequeath each other property through a will?
Mutual gift	Can spouses transfer each other property at death through a reciprocal gift agreed during marriage?
Housing right	Widow's right to reside in late husband's house.



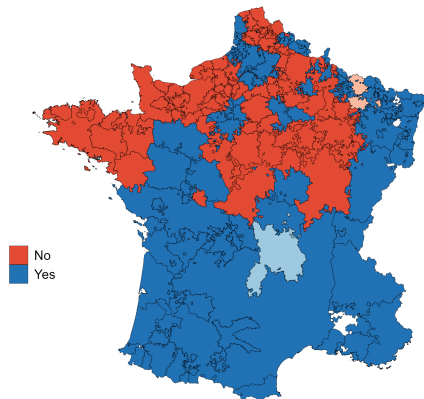
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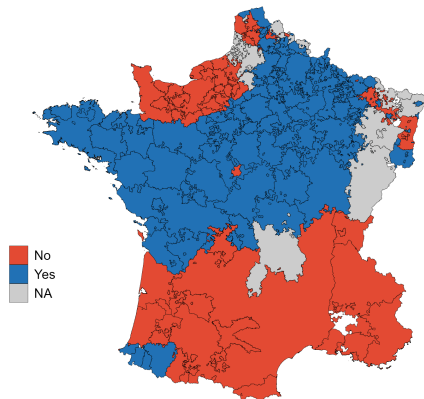
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Spousal will	Can spouses bequeath each other property through a will?
Mutual gift	Can spouses transfer each other property at death through a reciprocal gift agreed during marriage?
Housing right	Widow's right to reside in late husband's house.



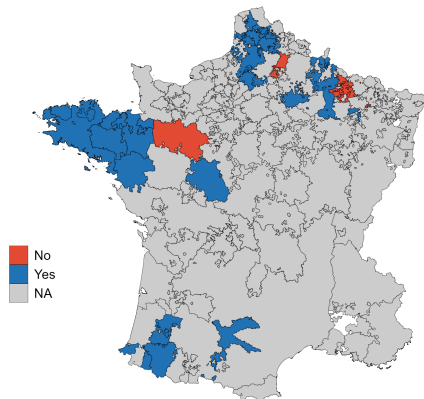
Economic rights of widows

Dower	Is a <i>dower</i> or <i>augment de dot</i> granted?
Dower amount	Share of husband's property granted to widow in usufruct.
Legal vs. conventional dower	If <i>conventional</i> dower is specified in marriage contract, does it forfeit <i>legal</i> dower?
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Economic rights of re-married and unmarried women

Remarriage inheritance

How is inheritance divided among children from multiple marriages:

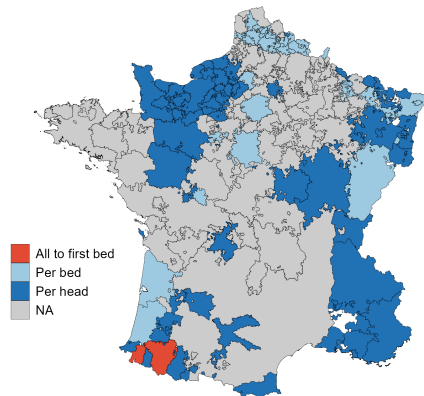
- *Per head*: divided by total number of children.
- *Per bed*: divided by number of fertile marriages.
- All to first bed.

Remarriage dower

Dower amount received by a wife in a second or subsequent marriage.

Legal age

Age at which an unmarried woman acquires legal independence.



Economic rights of re-married and unmarried women

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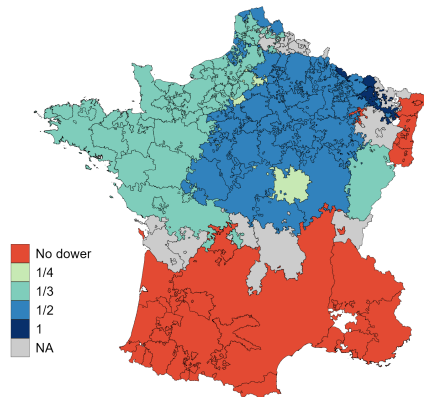
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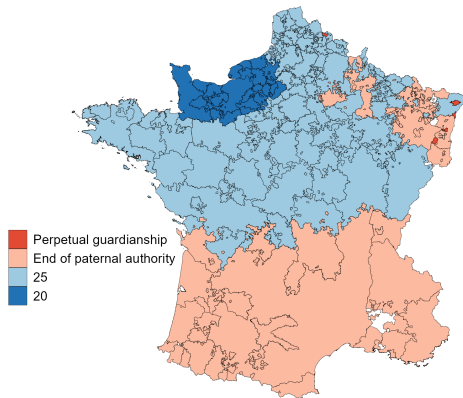
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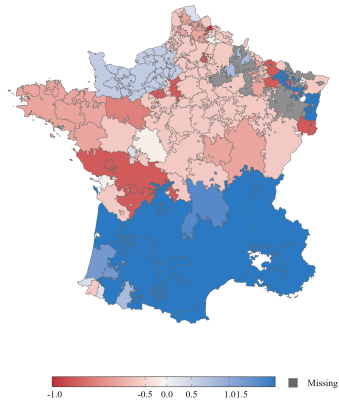
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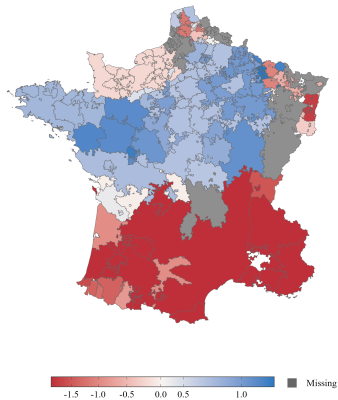
General patterns

Rank-based PCA indices

Married women's rights



Widow's rights



Road map

1. Introduction
2. The raw data (Customs)
3. The ground truth (women's rights dataset)
- 4. The LLM**
5. Results
6. Conclusion

Data-extraction pipeline

Customary law

Split into page images (Python)



Raw data (PDF)



LLM

Gemini 2.5 Flash

```
prompt:
# -----
variable_rules:
- 1. **file_name**
  - Fill with the string "x". Will be replaced in
- 2. **page_number**
  - Fill with the integer 0. Will be replaced in p
- 3. **custom_section_title**
  - String or null.
  - If the page has a section header identifying w
  - Otherwise return null.
- 4. **administration_good_types**
  - Array of objects with fields ["asset_phrase":
  - Clauses about whether a married woman may adm
  - Return [] if no mention on the page.
- 5. **dower_customary**
  - Array of objects with fields ["customary": boc
```

LLM output

Aggregate page-level JSON to custom-level CSV (Python)

```
{
  "file_name": "Nouveau coutumier_général_t_1",
  "page_number": 00,
  "custom_section_title": "AUTRES COUTUMES LOCALES DU LIÉU
ET BOURGALGE D'IS-VRONNE",
  "administration_good_types": [],
  "dower_customary": [
    {
      "customary": faizae,
      "evidence": "VII. Item, & par Coutume locale, dont
l'on n'a point de douaire coutumier, s'il n'est convenue
en traitant le mariage."
    },
    {
      "dower_prefix": [
        {
          "dower_prefix": true,
          "evidence": "VII. Item, & par Coutume locale, dont
l'on n'a point de douaire coutumier, s'il n'est convenue
en traitant le mariage."
        }
      ]
    }
  ]
}
```

Final dataset

	A	B	C	D
1	custom_id	custom	dower_customary	dower_customary_evidence
2	100	Agen	True	[p.318] Si aucun homme ou femm
3	200	Amiens	True	[p.153] Par ladite Coutume la fen
4	201	Beauvaisis	True	[p.180] En Coutumes generales c
5	202	Montreuil	True	[p.171] La Coutume de ladite Pre
6	300	Angoumois	True	[p.262] Par la coutume d'Angouli
7	400	Anjou	True	[p.578] Si femme noble fait dépu
8	501	Aire	True	[p.344] Quand de deux conjoints
9	502	Arras	True	[p.305] Les veuves par le trépas c
10	503	Bapaumes	True	[p.358] Item, par le trespas du pn
11	504	Béthune	Faise	[p.342] Par la Coutume de l'advoi
12	505	Hesdin	Faise	[p.371] Femmes veuves ne peuv
13	506	Lens	True	[p.340] La premiere femme après
14	507	Saint-Omer	True	[p.309] Et avec ce peut apprehen
15	600	Auvergne	True	[p.578] Toutefois si elle n'a point
16	700	Auxerre	True	[p.622] Pour douaire constitué o
17	800	Bailleul	True	[p.345] XII. Le mary ou la femme c
18	900	Bar	True	[p.448] La femme renonçant à la
19	1000	Bassigny	True	[p.568] La femme après le deces

LLM overview

- Gemini 2.5 Flash, ran thorough Gemini API [▶ more](#)
- Prompt structure:
 1. **General instructions.**
 2. **Data-extraction instructions:** one prompt per variable.
 - **Detection rules (stage 1):** *What information to look for in the legal text.*
 - **Classification rules (stage 2):** *How to code the information found.*
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 3. **Technical prompts:**
 - Page aggregation and page conflict resolution [▶ here](#)
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- **Do not hallucinate!**

Prompt: Data-extraction instructions (1/3)

Example: Independent asset administration

- **Detection rules (stage 1):** *What information to look for in the legal text.*

Identify clauses which say explicitly whether a married woman may or may not administer, manage, dispose of, sell, or alienate property [e.g. “paraphernaux”, “propres”, “héritages”, “communauté”] without her husband’s consent or authorisation.

- **Classification rules (stage 2):** *How to code the information found.*
- **Exclusion rules:** *What seemingly relevant information should NOT be coded.*

Prompt: Data-extraction instructions (2/3)

Example: Independent asset administration

- **Detection rules (stage 1):** *What information to look for in the legal text.*
- **Classification rules (stage 2):** *How to code the information found.*

For each clause, return:

- **allowed** True if she is allowed without husband's consent, = False if she is not allowed or needs husband's consent.
- **evidence** the exact words that support the allowed value, quoted verbatim.
- **asset_phrase** the exact noun phrase naming the asset(s), quoted verbatim
- Return [] if no mention on the page.



allowed	False
evidence	"La femme liée de mary ne peut fans l'autorité de son mary, faire aucune disposition, vente, ou alienation de ses héritages, ne de ses meubles."
asset_phrase	"aucune disposition, vente, ou alienation de ses héritages, ne de ses meubles"
page	303

Example from custom of Arras

- **Exclusion rules:** *What seemingly relevant information should NOT be coded.*

Prompt: Data-extraction instructions (3/3)

Example: Independent asset administration

- **Detection rules (stage 1):** *What information to look for in the legal text.*
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Do NOT extract the following as `independent_admin_assets`:

- Clauses about the HUSBAND's power to dispose of property (e.g. "le mari peut vendre").
- Clauses about WIDOWS or SURVIVING SPOUSES disposing of property after the husband's death (e.g. "après le trépas", "le survivant", "femme veuve"). This variable is only about a MARRIED woman's rights DURING marriage.
- General rules about "any person" ("toute personne", "on peut") not specific to married women.
- Clauses about guardianship of minors ("tutelle", "gardien", "administration des biens des mineurs").

Additional exercise: Expert vs. naive prompt

- **Objective:** Measure importance of **expert domain knowledge** for LLM data extraction
- Examples:
 - *Legal terminology, how customary law is phrased.*
 - *Old French typography, negations.*
 - *Exclusions and worked examples for each variable.*
- **Experiment design:** Same data inputs and extraction pipeline; different prompts:
 - **Expert prompt** (baseline): includes domain knowledge.
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Naive prompt (1/3)

General instructions

- You are ~~an expert extraction agent~~ working with scanned images of **Coutumiers**, collections of customary laws in Ancien Regime France.
- You receive ONE image: a single page. Extract all information on coutumiers that appear on this CURRENT page.
- ~~Never infer values or information.~~ If you do not find information on a certain custom ON THIS PAGE, set to null.

[...]

- ~~The text you will encounter is in old French typeset. This means that an "s" sometimes looks like an "f" (e.g. "sans le consentement" can look like "fans le confentement").~~
- ~~Do not hallucinate!~~

Naive prompt (2/3)

Data-extraction instructions

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- **Classification rules (stage 2):** *How to code the information found.*

- allowed = True / False ~~if allowed without husband consent / not allowed or needs husband consent.~~
- evidence = Fill with string ~~the exact words that support the allowed value, quoted verbatim.~~
- asset_phrase = Fill with string ~~the exact noun phrase naming the asset(s), quoted verbatim.~~
- Return [] if no mention on the page.

Naive prompt (3/3)

Data-extraction instructions

- **Exclusion rules:** *What seemingly relevant information should NOT be coded.*

~~-Do NOT extract the following as administration_good_types:-~~

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How well does the LLM detect if a women's right is present in the custom?

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		Detected	Not detected
Ground truth	Present	True Positive (TP)	False Negative (FN)
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Detection (stage 1)

Measures

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Accuracy: How often does the LLM get it right?

$$\text{Accuracy} = \frac{TP + TN}{TP + TN + FP + FN}$$

Precision: When LLM finds something, can you trust it?

Recall: How much of the available info does the LLM find?

F1: Balance finding what is there vs. avoiding false finds

FPR (hallucination): When there is no information, how often does the LLM "find" it?

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$$F1 \text{ score} = 2 \times \frac{\text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}}$$

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Detection (stage 1)

Measures

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$$\text{False-positive rate} = \frac{FP}{FP + TN}$$

Detection (stage 1)

Aggregate results

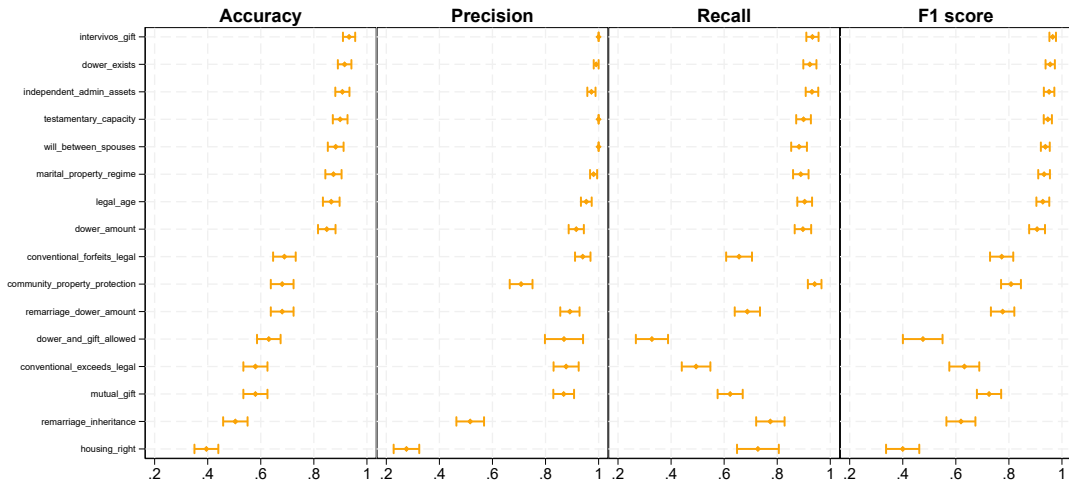
		LLM	
		Detected	Not detected
Ground truth	Present	1,243	301
	Missing	191	169

Accuracy	0.742
Precision	0.867
Recall	0.805
F1 score	0.835
False-positive rate	0.531

Notes: N = 1,904 (119 customs × 16 variables)

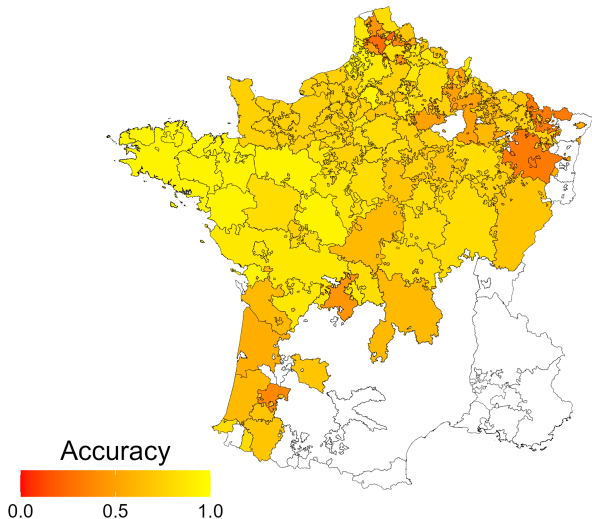
Detection (stage 1)

Results by variable



Detection (stage 1)

Results by Custom



▸ precision

▸ recall

▸ F1 score

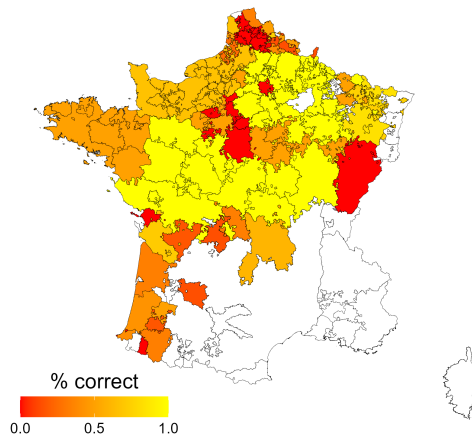
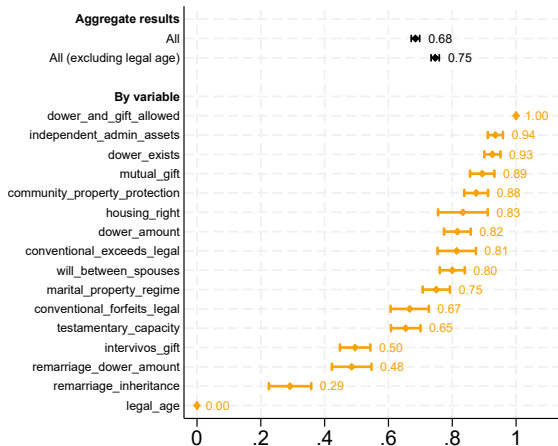
▸ false-positive

Classification (Stage 2)

How well does the LLM code the legal information it detects?

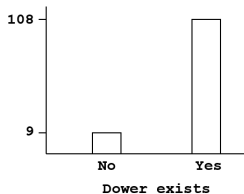
Classification accuracy

% correctly classified by LLM



Cohen's kappa (κ)

- Accuracy can overstate performance when **some categories are more common**.



- Stupid LLM who always says “Yes”
→ high accuracy.
- LLM who learned from context that “Yes” is common
→ high accuracy.

- Cohen's κ is a chance-adjusted measure:

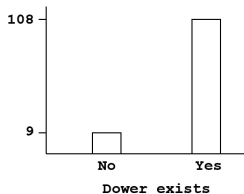
$$\kappa = \frac{p_o - p_e}{1 - p_e} \in [-1, 1],$$

where p_o : observed agreement; p_e : expected agreement by chance.

- $\kappa = 0$: chance agreement; $\kappa = 1$: perfect agreement.

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Cohen's kappa (κ)

Example: widow's dower (share of husband's property)

Ground truth	LLM			Total
	1/2	1/3	Other	
1/2	35	12	0	47
1/3	2	36	0	38
Other	1	1	0	2
Total	38	49	0	N=87

Observed agreement:

$$p_o = \frac{35 + 36 + 0}{87} = 0.82$$

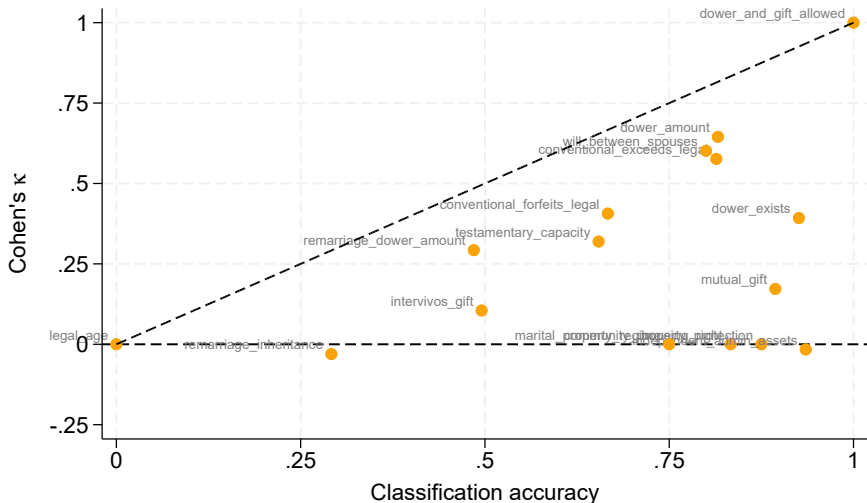
Expected agreement (marginal distributions):

$$p_e = \underbrace{\frac{47}{87} \cdot \frac{38}{87}}_{\text{both say 1/2}} + \underbrace{\frac{38}{87} \cdot \frac{49}{87}}_{\text{both say 1/3}} + \underbrace{\frac{2}{87} \cdot \frac{0}{87}}_{\text{both say other}} = 0.49$$

Cohen's κ :

$$\kappa = \frac{0.82 - 0.49}{1 - 0.49} = \mathbf{0.65}$$

Cohen's kappa vs. Classification accuracy

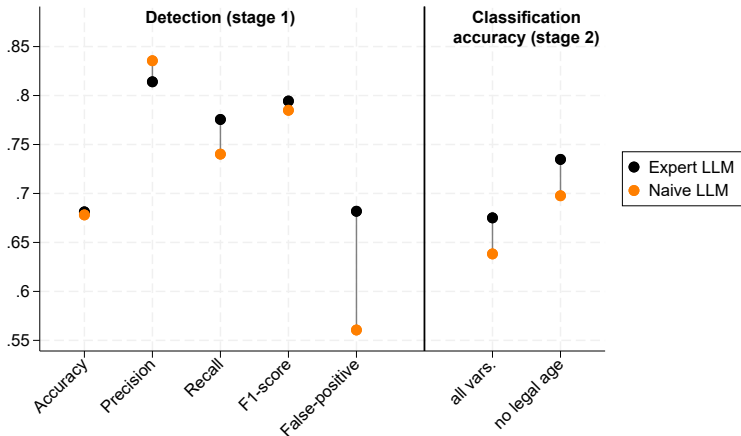


Naive vs. expert LLM

Naive vs. Expert LLM

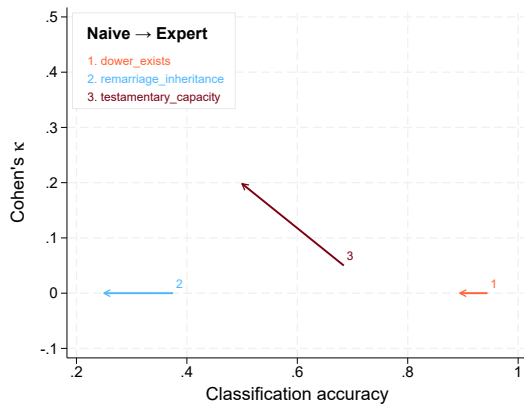
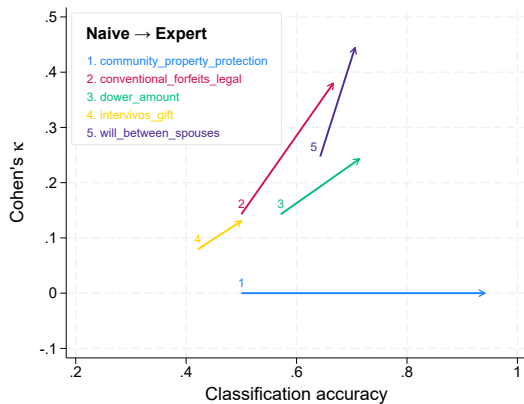
Aggregate results

- Preliminary!** Sample of two coutumiers: 20 customs $\times$ 16 variables ($N = 320$) [▶ more](#)



Naive vs. Expert LLM

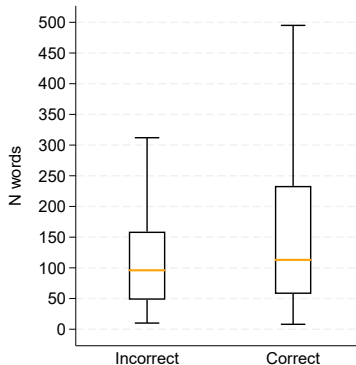
Cohen's κ vs. Classification accuracy



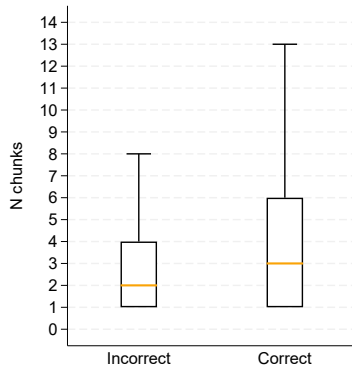
Error patterns

Evidence length vs. classification accuracy

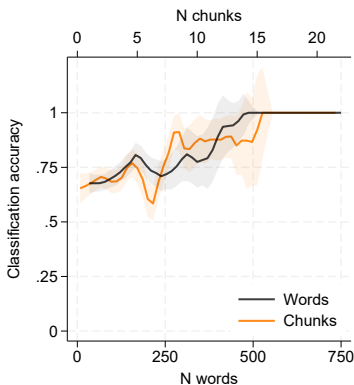
(a) Words in detected evidence



(b) N of evidence chunks



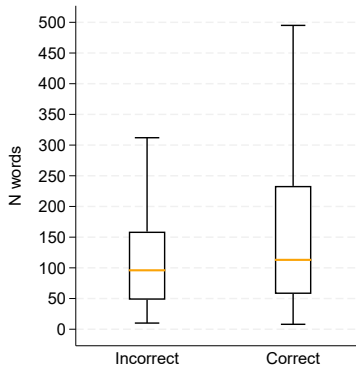
(c) Local polynomial smooth



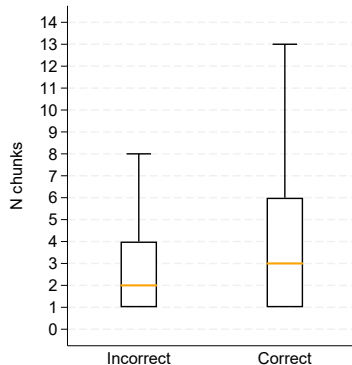
→ Systematic prediction errors (bias) vs. random mistakes (ME)

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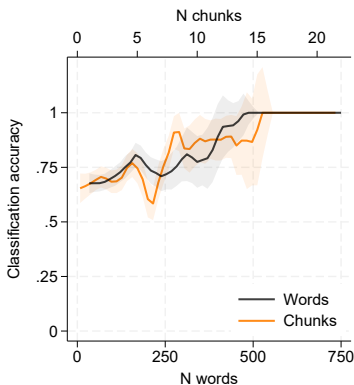
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(c) Local polynomial smooth

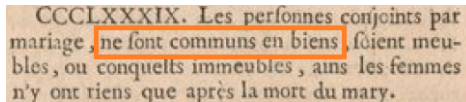


→ **Systematic prediction errors (bias) vs. random mistakes (ME)**

Error patterns

Problem 1: Negations

- **Example:** Marital property regime in Normandy (groundtruth = separate property).



CCCLXXXIX. Les personnes conjoints par mariage, ne font communs en biens, soient meubles, ou conquelets immeubles, ains les femmes n'y ont riens que après la mort du mary.

Source: CG vol. 4 part I, p. 79

CCCLXXXIX. Persons joined in marriage **do not hold property in common**, whether movable property or immovable ...

- **LLM detected evidence:**

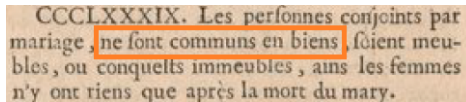
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- **LLM classification mistake (negations):**
 - LLM reads “property in common” (*communs en biens*).
 - LLM does not read negation: *ne font* (early-modern) vs. *ne sont pas* (modern).
→ marital property regime = community

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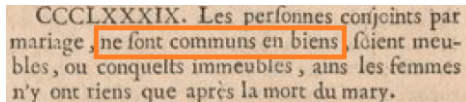
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Error patterns

Problem 2: False cues and hallucinated cues (1/2)

- **Example:** Remarriage inheritance in Normandy (groundtruth = per head).
- LLM detected evidence (1/2):

CCCC. *S'il y a enfants de divers lits*, tous enfemble n'auront qu'un tiers ...

Source: CG vol. 4 part I, p. 80

CCCC. *If there are children from various beds*, they shall collectively receive 1/3 ...

- LLM classification mistake (**false cue**):
 - LLM reads "bed" (*lit*) cue word and infers inheritance rule (per bed vs. per head).
→ remarriage inheritance = per bed

Error patterns

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Source: CG vol. 4 part I, p. 80

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- **LLM classification mistake (false cue):**
 - LLM reads "bed" (*lit*) cue word and infers inheritance rule (per bed vs. per head).
→ remarriage inheritance = per bed

Error patterns

Problem 2: False cues and hallucinated cues (2/2)

- **Example:** Remarriage inheritance in Normandy (groundtruth = per head).
- **LLM detected evidence (2/2):**

Les [article] CCCCII, commençant, **Les
enfants partagent par lits...**

The [article] CCCCII, starting, **children
divide by bed...**

- **LLM detection mistake (hallucination):**
 - The text in the custom never says "by bed" (*par lit*)!

Les quatre cens, commençant, S'il y a enfans de divers liés: quatre cens un, commençant, Et ne pourront les enfans, quatre cens deux, commençant, Les enfans partageront, quatre cens trois, commençant, Et où le pere, quatre cens quatre, commençant, Pareillement la propriété, & quatre cens cinq, commençant, La femme convolant en secondes nocces, ont esté accordez pour nouvelles.

Source: CG vol. 4 part I, p. 149

Error patterns

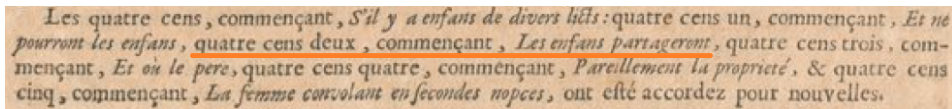
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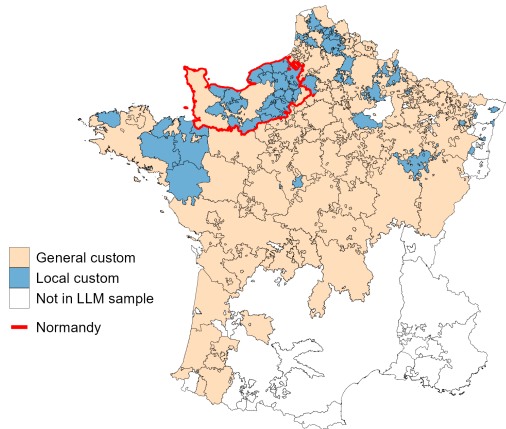
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Source: CG vol. 4 part I, p. 149

Error patterns

Problem 3: Trickle-down mistakes

- **General customs** apply to several judicial districts (*Bailliage*).
- **Local customs** follow general customs and specify deviations.
 - Mistakes in general customs can trickle down to local customs.
- **Example:**
 - *General custom:* Normandy.
 - *Mistake:* Marital property regime.
 - *Affected local customs:* 18*



* Alençon, Andely, Arques, Bayeux, Beaumont-le-Roger, Caen, Caudebec, Caux, Conches et Breteuil, Falaise, Gisors, Montivilliers, Neufchâtel, Pont-de-l'Arche, Rouen, Verneuil, Vernon, Vire.

Error patterns

Problem 4: Evidence conflated from wrong article/social group/clause

- Evidence from **wrong article**.

Normandy (CG vol. 4 part II, p. 148):

Au 397 article, commençant, Les enfans des femmes decedees, a esté adjousté [...] Mais succederont avec leurs tantes, s'il n'y a frere vivant...

To Article 397, beginning 'The children of deceased women,' the following was added [...] 'But they shall inherit together with their aunts if there is no surviving brother...

- Article refers to **collateral succession**.
- LLM uses it to code **remarriage inheritance rules**.

- Evidence from **nobility** (vs. general population).
- Evidence from **general clauses** (vs. spouse-specific clauses).

Error patterns

Problem 4: Evidence conflated from wrong article/social group/clause

- Evidence from **wrong article**.
- Evidence from **nobility** (vs. general population).

Angoumois (CG vol. 4 part II, p. 262):

[E]ntre personnes nobles, à la femme qui survit son mary, appartient à avoir & lever le cours de sa vie, par douaire, la tierce partie des choses nobles...

[A]mong persons of noble status, a wife who survives her husband is entitled to have and enjoy, for the duration of her life, as dower, one third of the noble property...

→ Article refers to dower of **noble women**.

→ LLM uses it to code dower of **general population** (even though we hard-coded this!)

- Evidence from **general clauses** (vs. spouse-specific clauses).

Error patterns

Problem 4: Evidence conflated from wrong article/social group/clause

- Evidence from **wrong article**.
- Evidence from **nobility** (vs. general population).
- Evidence from **general clauses** (vs. spouse-specific clauses).

Agen (CG vol. 4 part II, p. 319):

Tous habitants d'Agen peuvent faire donation
des biens qu'ils auront.

*All inhabitants of Agen may make gifts of the
property they possess.*

→ Article refers to donations by **anyone**.

→ LLM uses it to code inter vivos **between spouses**.

Road map

1. Introduction
2. The raw data (Customs)
3. The ground truth (women's rights dataset)
4. The LLM
5. Results
6. Conclusion

Conclusion

- **New dataset** of **women's economic rights** in France (15-18C).
- Present **LLM toolkit** to **extract and code legal data** in customary law.
- **Validation**: fair LLM performance, but **far from perfect**:
 - **Systemmatic errors**
 - Classification **accuracy** $\approx 75\%$ $\rightarrow$ can lead to bias.
- Worse than for (objective) OCR-type tasks (Humphries et al. 2024, Crosilla, et al. 2025).
- LLMs useful for legal data... but **expert coding remains essential** for:
 1. **Training** LLMs with expert-coded sample.
 2. **Validating** LLMs vs. expert-coded sample.
 3. **Bias correction** using LLM vs. expert differences (Ekami et al. 2024, Carlson & Dell 2026).

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■ Video killed the radio star — The Buggles (1979)

■ **AI** didn't kill the **archive** star — Gobbi, Goñi, Rigaux, Sutter (2026)

Back up slides

Simulation details

Egami, Hinck, Stewart and Wei (forthcoming *AJPS*)

1. Simulation:

- $n = 5,000$ i.i.d. observations.
- **Covariates:** 10 correlated covariates $\{X_{i1}, X_{i2}, \dots, X_{i10}\}$; X_{i2} is binarized.
- **Outcome:** Binary from nonlinear logistic model using subset of covariates.
- **Prediction error:**

$$\tilde{Y}_i = P_i Y_i + (1 - P_i)(1 - Y_i), \quad P_i \sim \text{Bernoulli}(P_q)$$

2. Measures

- **Bias:** $|\beta - \hat{\beta}|/\beta$.
- **Coverage:** Probability that the 95% CI covers the true coefficient.
- **Root mean square error:**

$$RMSE = \sqrt{\frac{1}{n} \sum_{i=1}^n (y_i - \hat{y}_i)^2}.$$

Rank-based PCA (1/3)

- **Standard PCA:** based on **Pearson's correlation** matrix.
→ unsuited for **ordinal variables** (e.g., women's rights).
- **Rank-based PCA:** based on **Kendall's τ_B** correlation matrix.

$$\tau_b(x, y) = \frac{C - D}{\sqrt{(C + D + T_x)(C + D + T_y)}} ,$$

- C : concordant pairs of customs (e.g., $x_i > x_j$ and $y_i > y_j$).
- D : discordant pairs of customs (e.g., $x_i > x_j$ and $y_i < y_j$).
- T_x, T_y : pairs tied only in variable x and y , respectively.

Rank-based PCA (2/3)

Kendall's τ_B correlation matrices

Married women's rights	(1)	(2)	(3)	(4)
(1) Matrimonial property regime	1.00			
(2) Independent administration	0.57	1.00		
(3) Testamentary capacity	-0.22	0.30	1.00	
(4) Inter vivos gifts	-0.08	-0.02	0.21	1.00

Widow's rights	(1)	(2)	(3)	(4)	(5)	(6)
(1) Dower type	1.00					
(2) Dower amount	0.39	1.00				
(3) Spousal will	-0.37	-0.29	1.00			
(4) Mutual gifts	0.06	0.40	0.03	1.00		
(5) Inheritance (with children)	0.17	0.51	-0.04	0.53	1.00	
(6) Inheritance (without children)	0.18	0.45	-0.10	0.59	0.85	1.00

Rank-based PCA (3/3)

- **Step 1.** Kendall's τ_B correlation matrices, T_B .
- **Step 2.** Find the first eigenvalue (λ) and eigenvector ($\mathbf{v}_1$) of T_B :

$$T_b \mathbf{v}_1 = \lambda \mathbf{v}_1 \text{ and } \|\mathbf{v}_1\| = 1 \text{ for the largest } \lambda .$$

- **Step 3.** Rank-based PCA index for custom i is:

$$\text{Index}_i = Z_i' \mathbf{v}_1,$$

- where Z : standardized rank data matrix and Z_i : data vector corresponding to custom i .

LLM Setup

Model	Gemini 2.5 Flash
Input	Single page image (200 dpi)
Temperature	0; increased on retries
Response format	Structured JSON (36 fields)

▶ back

Page-conflict resolution

- LLM produces **one output per page** (JSON).
- We **aggregate** data by custom.
 - When known, we input custom page ranges in original source (e.g., *Coutumier Général*).
- Sometimes conflicting evidence across pages.
- **Conflict-resolution rule:**
 - Unanimous → keep value.
 - Clear majority (> 60%) → majority vote.
 - Close (40–60%) → Gemini adjudication.

**missing values ignored.*

► back

Gemini adjudication

Multiple pages give conflicting values.
Your job is to decide which value is best supported by the quoted evidence from the original coutumier text.

- Choose the value that is best supported by evidence **DIRECTLY RELEVANT** to this specific variable.
- Ignore evidence that is about a different legal concept even if it superficially mentions related terms.
- Pay close attention to negations ("ne peuvent pas", "n'ont point de").
- If one side's evidence explicitly addresses spouses/ the couple/ wives/ widows/ women while the other side's evidence is about general gift-giving or general rules etc., prefer the spousal/ wife-specific evidence.

Adaptive splitting

Python:

- Gemini sometimes reaches maximum token limit (token $\approx$ word or word part).
- If extraction is truncated, rerun on subsets of variables and merge.

36 variables

→ 2 subsets

→ 3 subsets

→ 5 subsets

- Subsets tailored to expected token length.

Prompt:

IMPORTANT: You are extracting only a SUBSET of the variables for this page.

For all fields not listed above, set them to null in the JSON output.

Still include ALL standard fields in each JSON object, but only extract values for the fields described above.

► back

Output format instructions

- Return structured data, not *chatty* explanations, e.g.:

"Here are the results of your brilliant request, my human friend..."

- Include all predefined fields.
- Formats; JSON (data), binary values (true/false), missing values (null).

OUTPUT RULES

- Return ONLY a JSON array, no surrounding text.
- Keep evidence verbatim but as concise as possible.
- Each object must have all fields listed above.
- Missing data -> 'null'.
- Boolean values must be 'true' or 'false' (not strings).

▶ back

You are an expert extraction agent working with scanned images of Coutumiers, collections of customary laws in Ancien Regime France checklist.

You receive ONE image: a single page.

Extract all information on coutumiers that appear on this CURRENT page.

Never infer values or information.

Never borrow numbers from the next or previous entry.

Extract all information fully visible on this page.

If a sentence is visibly incomplete (e.g., continues on next page), extract only the visible part and leave unknown fields as null.

If you do not find information on a certain custom ON THIS PAGE, set to null.

Use the 36-field JSON schema described below.

Return only the JSON array with no markdown and no explanation.

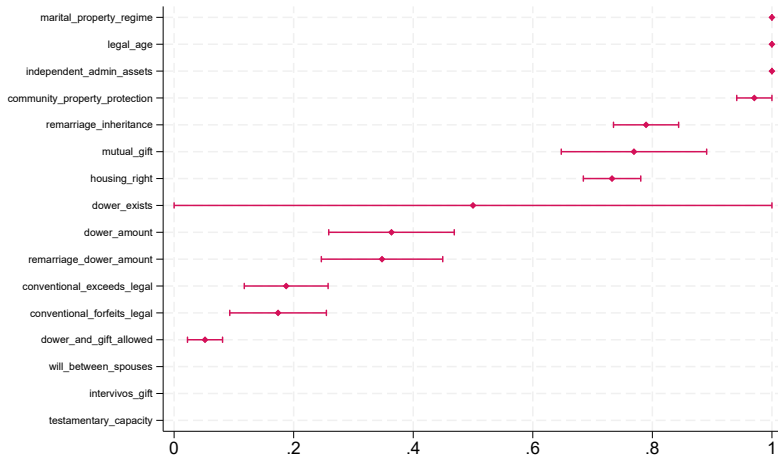
Be as CONCISE as possible in your extractions and use as little characters as possible, while following the instructions for each field and not omitting any information that you are asked to extract.

For the "evidence" or "text" fields, provide only the first 2 sentences of the relevant article rather than the full text.

The text you will encounter is in old French typeset. This means that an "s" sometimes looks like an "f" (e.g. "sans le consentement" can look like "fans le confentement" etc.). Please take this into account when extracting information. When asked to give verbatim evidence, always try to give the text as it is intended in modern typesetting: i.e. transcribe it as "sans le consentement" and not as "fans le confentement" etc.

Detection (stage 1)

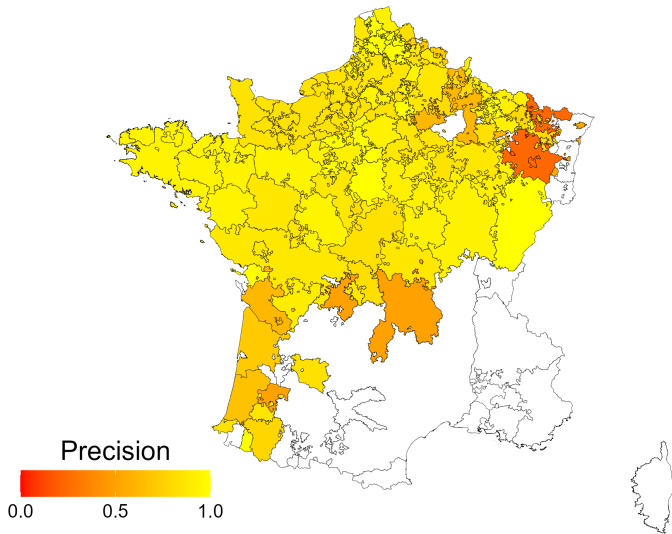
False-positive rate, by variable



► back

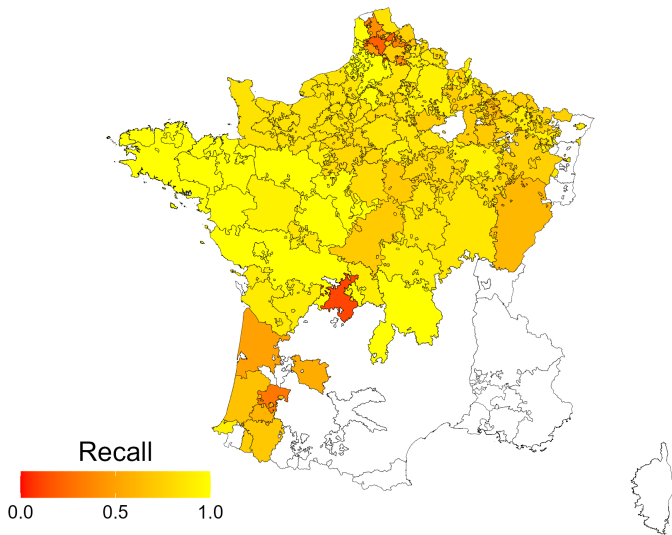
Detection (Stage 1)

Precision by Custom



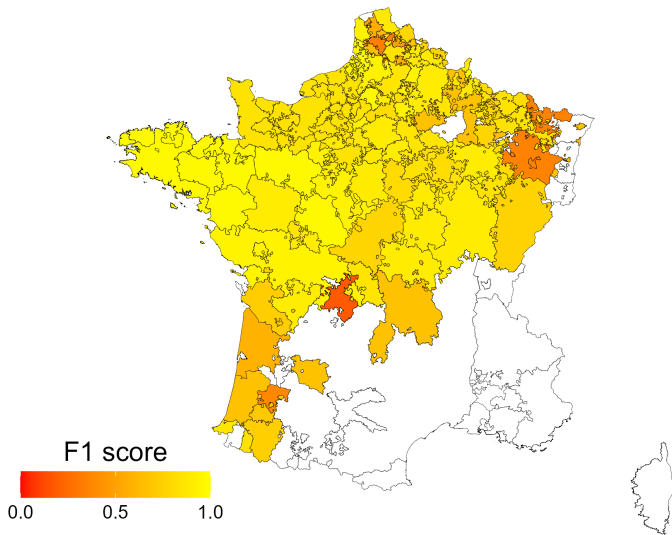
Detection (Stage 1)

Recall by Custom



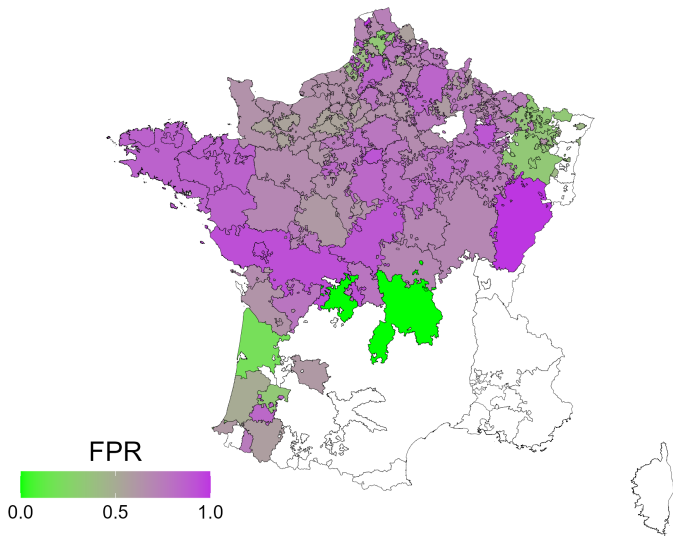
Detection (Stage 1)

F1 score by Custom



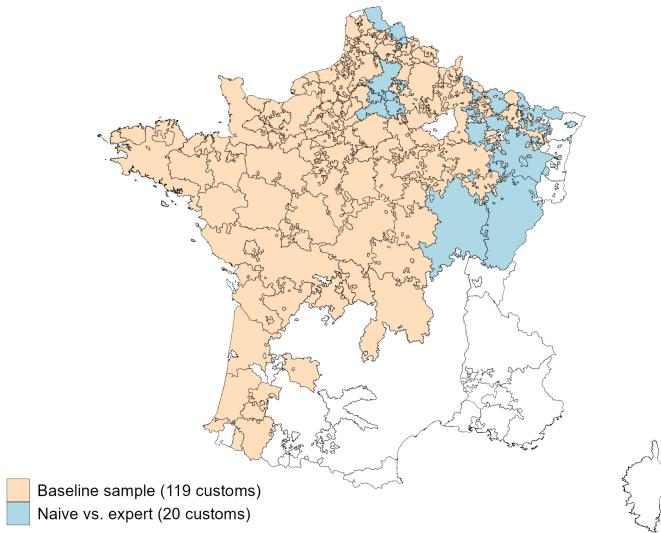
Detection (Stage 1)

False-positive rate (hallucination) by Custom



Naive vs. Expert LLM

Provisional sample



Additional sources (1/5)

Custom	Source
Bazas	Coutumes de Bazas in Recueil de coutumes, en langue provençale et en latin (Paris: Bibliothèque nationale de France, 1481).
Bresse	L'usage des pays de Bresse, Bugey, Valromey et Gex, leurs statuts, stils et édits (Bourg-en-Bresse: Ravoux, 1729).
Colmar	Ancien statutaire d'Alsace (Colmar: Decker, 1825).
Corse	Statuti civili e criminaly dell'isola di Corsica (Genova: Bellone, 1751).
Dauphiné	Statuta Delphinalia novissime facta (Grenoble: Balsarin, 1531).
Ferrette	Coutumes de la Haute-Alsace dites de Ferrette (Colmar: Barth et Held-Baltzinger, 1870).

Additional sources (2/5)

Custom	Source
Forcalquier	Délibérations de la ville, comté et viguerie de Forcalquier (Aix: Mouret, 1788).
Lavedan	Explication des coutumes de la vallée de Barège, des six vallées du Lavedan, de la ville de Lourdes, Pays de Rivière-Ousse, baronnie des Angles et du marquisat de Benac, dépendants du pays et comté de Bigorre (Toulouse: Noguès, 1789).
Blamont*	"Coutumes du comté de Blémont" in Coutumes générales du marquisat de Hatonchatel (Nancy: Haener, 1788).
Petite-Pierre*	Ancien statutaire d'Alsace (Colmar: Decker, 1825).

Notes: * in LLM sample

Additional sources (3/5)

Custom	Source
Strasbourg*	Urkundenbuch der Stadt Straßburg (Strasbourg: Trübner, 1888).
Marseille	Les status municipaux et coutumes anciennes de la ville de Marseille (Marseille: Garcin, 1656).
Navarre	Les fors et costumaz deu Royaume de Navarre (Pau: Desbaratz, 1681).
Oléron	Estienne Cleirac, Des coutumes de la mer contenant les jugements d'Oléron (Bordeaux, 1647).
Orange	Ordonnances, lois et statuts faits pour le règlement de la justice dans la principauté d'Orange (Lyon, 1522).

Notes: * in LLM sample

Additional sources (4/5)

Custom	Source
Perpignan	Llibre de privilegis, usos, stils, y ordinacions de consulat de mar de la fidelissima vila de Perpinyà (Perpignan: Decker, 1825).
Provence	Les statuts et coustumes de Provence (Aix: David, 1825).
Aix	Les statuts et coustumes de Provence (Aix: David, 1825).
Quatre-Vallées	Abbé Marsan. 1898. "Les coutumes de la vallée d'Aure." Bulletin de la Société archéologique du Midi de la France, 17, 48–56.
Saint-Amand	E. M. Meijers and J. J. Salverda de Grave, Des lois et coutumes de Saint-Amand (Haarlem: H. D. Tjeenk Willink en zoon, 1934).

Additional sources (5/5)

Custom	Source
Toul	Usages locaux de la ville de Toul et du pays Toullois (Metz: François Antoine, 1747).
Toulouse	Coutume de la ville, gardiage et viguerie de Toulouse (Toulouse: Dupleix, 1770).
Wissembourg	Ancien statutaire d'Alsace (Colmar: Decker, 1825).

