metajelo: A metadata package for journals to support external linked objects

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Reproducibility and replicability of scientific findings has been given great scrutiny in recent years

(Camerer et al. 2016; Collaboration 2015; Fanelli 2018; Klein et al. 2014) .

Historically, it has been difficult to find the materials required to conduct reproducibility or replication exercises

(Dewald, Thursby, and Anderson 1986; McCullough, McGeary, and Harrison 2006; McCullough and Vinod 2003) .

Reproducibility of research

Journals are supporting the endeavor with "Data [and Code] Availability Policies" [DAP]

with variable success rates (Höffler 2017a; Stodden, Guo, and Ma 2013; Stodden, Seiler, and Ma 2018; Stodden et al. 2016) .
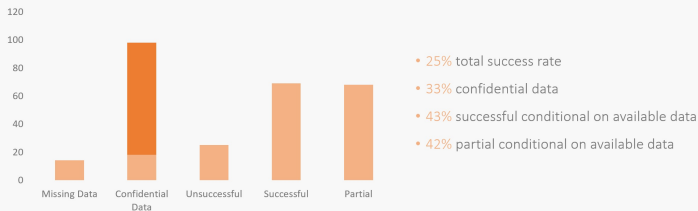
Not a panacea

Despite DAPs, researchers often find that studies do not reproduce (Chang and Li 2017, 2015; Höffler 2017b; Stodden, Seiler, and Ma 2018)

Our own study

Moderate replication success

- 25% total success rate
- 33% confidential data
- 43% successful conditional on available data
- 42% partial conditional on available data

Restricted-access Data

Confidential Government Data

- U.S. Census Bureau
- Statistisk sentralbyrå (Statistics Norway)
- many others

Confidential sub-national data

Just in the US:

- North Carolina Education Data
- Ohio Earnings and Education Statistics
- Oregon Health Data
- etc.

What do we need?

- ► Description of the analysis (possibly as code)
- ► Access to the data

Is restricted-access data compatible with reproducibility?

Answer: yes

- ► Theoretical access to confidential data:
    - ► More than **1000** users (not just Germans from Germany) have been granted access to German confidential labor market data (Müller and Möller 2019)
    - ► More than **1500** users currently have access to confidential French data (https://casd.edu)
    - ► More than **700** researchers were active at the end of 2017 in the US Federal Statistical Research Data Centers (U.S. Census Bureau, 2018)

Is restricted-access data compatible with reproducibility?

Answer: yes

▶ Replications actually do occur with restricted-access data

For instance, see exchange between Olivier (2016) and Chemin and Wasmer (2017) regarding Chemin and Wasmer (2009), using French (Réseau Quetelet) data

Access Conditions

Is access **easy**?

- No

Is access **fast**?

- No

Can **others** access the data?

- **Yes**!

Is there a **process** for granting access?

- **Yes**!

No data, OK - surely we have metadata on all those things?

No.

Lack of reliable metadata

There is a

pervasive lack of consistent, reliable metadata

on the materials provided to journals, and in particular those provided through third-party locations.

Get Journal Alerts

Policies, Copyright, and Permissions

Advertise in AEA Journals

JSTOR access for AEA members

Athens Subscriber Login

Choose Format:

Additional Materials

Data Set (565.50 MB)

Author Disclosure Statement(s) (88.84 KB)

JEL Classification

Source code

```html
<ul id='additionalMaterials'>
  <li>
    <a href="/doi/10.1257/app.20170300.data">
        Data Set  (565.50 MB)
    </a>
  </li>
</ul>
```

Example 1: AEA journal

AEJ: Applied Economics

- **Supplementary data** as ZIP file
- **Accessibility method**: download (obvious)
- **Accessibility conditions** or **license**: none stated (but in fact, Copyright with "all rights reserved"!)
- **Persistence**: assumed to be "permanent" because on journal website

MENU ▾ War increases religiosity

Log in | OpenAthens | Shibboleth

Code availability

All code files for a complete reproduction of the analyses herein are available at: https://github.com/bgpurzycki/Religion-and-Violence.

Data availability

All data and analytical scripts are available at:
https://github.com/bgpurzycki/Religion-and-Violence.

Sections | Figures | References

Abstract

Additional information

Code availability

Data availability

References

nature
machine intelligence

A human take on
AI and robotics

Source code

```
<section aria-labelledby="data-availability">
 <div class="..." id="data-availability-section">
  <h2 class="..." id="data-availability">Data avail
   <div class="..." id="data-availability-content">
    <p>All data and analytical scripts are available
    <a href="https://github.com/bgpurzycki/Religion-
    https://github.com/bgpurzycki/Religion-and-Viole
    </p>
   </div>
 </div>
</section>
```

Nature Human Behavior

- **Supplementary data** as (manually!) linked Github archive
- **Accessibility method**: unknown, but download presumed
- **Accessibility conditions** or **license**: none stated on journal website, and in fact, none stated on Github site. Therefore: Copyright with "all rights reserved"!
- **Persistence**: none stated, but use of Github is troublesome, as deletion is nearly instantaneous (at whim of author) and permanent

Current Metadata is Problematic

For **easily** accessible data

- Unstructured
- Opaque
- Leads to imperfect, unreliable, failing replications

Current Metadata is Problematic

For **difficult to access** data

- ► Highly unstructured (*prose*) or inexistant
- ► Opaque
- ► Leads to imperfect, unreliable, failing replications

Mission of journals:
Better transparency

metajelo

metadata (package) for
journals to support
external
linked
objects

Basic motivation

Publication-oriented
Provide journals with the metadata needed to assess the robustness and reliability of supporting materials.

Minimal information
Requests no more information than (in theory) is currently being requested from authors.

- Name
- Location
- Accessibility (conditions, license)
- Persistence

Basic motivation

Extensive re-use

Leverage existing metadata *schemas* and *infrastructure* as much as possible

- ▶ Re-use of DataCite and re3data metadata elements
- ▶ Overlapping elements map into Dublin Core, CrossRef, DDI

Structure of `metajelo`

Each package is a linkage record

- conceptually models a linkage between a publication and its supplementary materials
- A record has an **identity** (Digital Object Identifier (DOI)), a **date created**, a **last modified date**, and the **identity** (DOI) **of the research objects** (papers) that are associated with the supplementary products
- Then an unlimited number of `supplementaryProducts`

Structure of `metajelo`

Each `supplementaryProducts` has

- an identifier,
- a description of its **type**,
- linkages to full metadata available elsewhere that fully describes the product.
- an associated location block (institutional archive)
- the set of possible policies (**access, license, preservation**), with a boolean designation flagging the relevant policy for the particular object
- Each policy instance structured to allow for verbatim answers if necessary

Full annotated schema
github.com/labordynamicsinstitute/metajelo

About that *infrastructure* . . .

Why not directly collect the information from *infrastructure*

Paper goes into detail about the **failures of the current infrastructure** to provide information even when the objects are registered by knowledgeable institutions, and despite the ability to do so **within existing metadata schemas**.

Enable authors

Develop an application to allow users to generate a `metajelo` package

- ▶ Leveraging infrastructure where possible
- ▶ Querying the user where necessary

Portability

Once created, a `metajelo` package should be of use at multiple journals: saved locally

Encourage data providers

All information can be provided by data providers in a static format

- ▶ Generate once, deposit on website
- ▶ (optional) leverage to display suggested data citations

This is where YOU come in

`metajelo` 0.7	DDI 2.5
	/codeBook/docDscr[1]/citation[1]/
resourceMetadataSource[1]	titlStmt[1]/IDNo[1]
@relationType="HasMetadata"	

All `metajelo` under `/record/supplementaryProducts[1]/supplementaryProduct[1]/`

Mapping DDI to `metajelo`: `basicMetadata`

`metajelo` 0.7	DDI 2.5
	/codeBook/stdyDscr[1]/citation[1]/
basicMetadata[1]/Title[1]	titlStmt[1]/titl[1]
basicMetadata[1]/Creator[1]	prodStmt[1]/producer[1]
basicMetadata[1]/PublicationYear[1]	distStmt[1]/distDate[1]
location[1]/institutionName[1]	rspStmt[1]/AuthEnty[1..n]

All `metajelo` under `/record/supplementaryProducts[1]/supplementaryProduct[1]/`

Mapping DDI to `metajelo`: Institution and product

`metajelo` 0.7	DDI 2.5
	/codeBook/stdyDscr[1]/dataAccs[1]/
institutionPolicies/institutionPolicy[1..n]	
@policyType="Access"	useStmt/confDec
	useStmt/restrctn
	useStmt/specPerm
	useStmt/conditions

All `metajelo` under `/record/supplementaryProducts[1]/supplementaryProduct[1]/location[1]/`

Mapping DDI to `metajelo`: `Institution` and `product`

`metajelo` 0.7	DDI 2.5
	/codeBook/stdyDscr[1]/dataAccs[1]/
institutionPolicies/institutionPolicy[1..n]	
@policyType="Usage"	useStmt/restrctn
	useStmt/specPerm
	useStmt/conditions
	useStmt/deposReq
institutionContact@institutionContactType=	
"dataCustodian"	useStmt/contact

All `metajelo` under /record/supplementaryProducts[1]/supplementaryProduct[1]/ location[1]/

Mapping DDI to `metajelo`: Missing?

`metajelo` 0.7	DDI 2.5
institutionPolicies/institutionPolicy[1..n]	
@policyType="Preservation"	??
institutionSustainability/missionStatementURL	??

All `metajelo` under `/record/supplementaryProducts[1]/supplementaryProduct[1]/ location[1]/`

How to **use** a `metajelo` package?

Enable journals

The information should be leverable with minimal modifications to current journal infrastructure

- ▶ Simplest: attach `metajelo` package, leverage CSS and JS to display contents
- ▶ More robust: ingest in journal management system

Short-term implementation can be made, without preventing future robust implementation

Sketch of a user-facing app
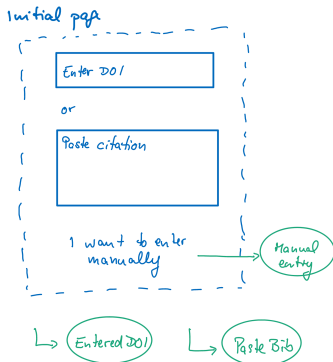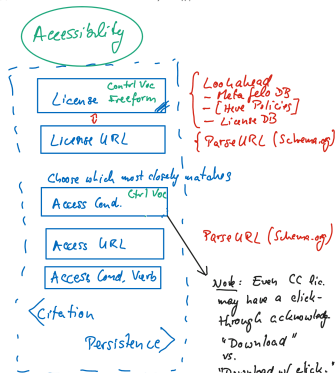
Sketch of a website

Supplementary materials

- Code and Data

  Besley, Timothy, and Hannes Mueller. 2018. "Replication data for: Predation, Protection, and Productivity: A Firm-Level Perspective." American Economic Journal: Macroeconomics, 10 (2): 184-221. DOI: 10.1257/mac.20160120.data

  cite! ▾

  - ☑ Data is freely accessible at 10.1257/mac.20160120.data under CC BY-NC 4.0.
  - ☑ Code verified under AEA guidelines 2.0

- Data

  Statistics Norway. 2015. "Firm-level statistics 1975-2013 [dataset]" Norwegian Data Archive [curator], v2. DOI: 10.7654/nda::7643A::34

  cite! ▾

  - 🔒 Data restricted-access (has residency requirement, has citizenship requirement), accessible at Norwegian Data Archive in Oslo, Norway, under Norwegian Data Access license.
  - ❓ Code could not be verified due to access restrictions.

Sketch of a website

- Code and Data

  Besley, Timothy, and Hannes Mueller. 2018. "Replication data for: Predation, Protection, an
  Perspective." American Economic Journal: Macroeconomics, 10 (2): 184-221. DOI: 10.1257/ma

  | cite! ▾ |

  - ☑ Data is freely accessible at 10.1257/mac.20160120.data under CC BY-NC 4.0.

Next steps

We want to hear from a broad community

Carl Lagoze and Lars Vilhuber. 2019. *metajelo: A metadata package for journals to support external linked objects*. Document 52. Labor Dynamics Institute.

http://digitalcommons.ilr.cornell.edu/ldi/52/

Development of apps

We have started development of both **user-facing apps** and **journal-oriented toolkit**, see

github.com/labordynamicsinstitute/metajelo

Implementation

This is part of a broader strategy to improve transparency and reproducibility at the American Economic Association and in economics in general

Merci

Merci

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