

An Open Policy Analysis for Deworming Interventions

BITSS Annual Meeting

Fernando Hoces de la Guardia, BITSS
07 January 2021 | [slides](#)

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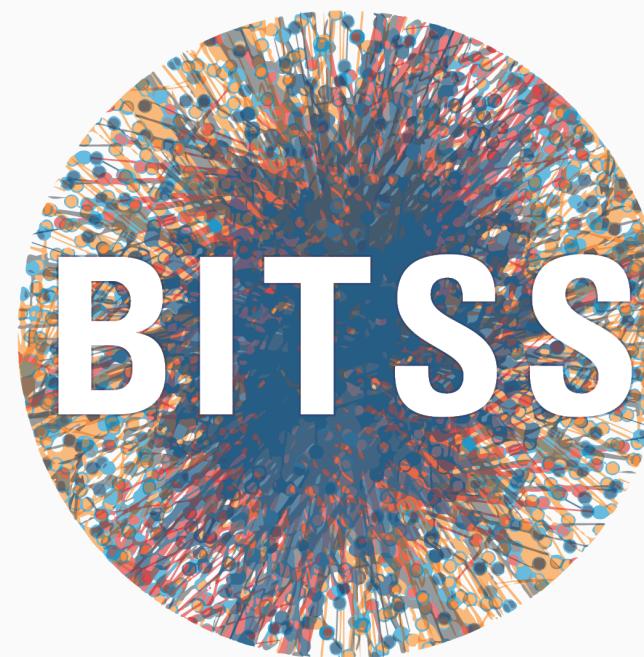
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IN THE SOCIAL SCIENCES

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BITSS is part of the Center
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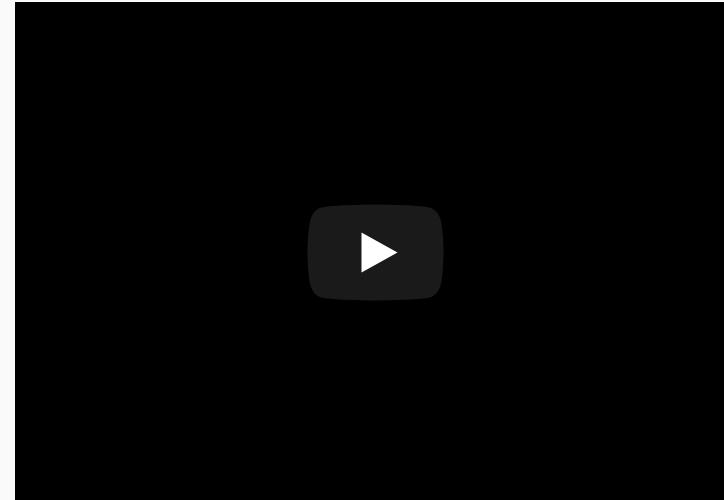
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1. **Introduction**

2. Demo

3. Lessons

Motivation: Rise of Alternative Facts



Interviewer: “We I have looked at what economist are saying, and [...] there is no measurable evidence that people are staying at home because of [\$600 unemp. insurance]”

Congressman: “[scoffs] I don’t know which economist you are talking about, but ...”

Possible Mechanism: Opaqueness of Policy Analysis

- Incredible Certitudes (Manski, 2011)
- Report wars (Wesselink et al, 2013)
- Low overall credibility of PA → credibility based on reputation ("serious") → assignment of reputation varies across political positions
- Parallels to "Reproducibility Crisis" and Open Science reponse (Hoces de la Guardia, Grant, Miguel 2020). Propose:
 - Core principles for Open Policy Analysis (OPA) in outputs, analysis and materials (reproducibility)
 - Agenda to implement and document how OPA can be applied into several policy issues
- Growing adoption of open science methods into policy analysis

Deworming Interventions

- Parasitic worm infections are endemic in many countries, disproportionately affecting the poor
- They interfere with regular bodily processes by decreasing nutrient uptake and can thus lead to serious consequences on human health, education outcomes, and long-term economic well being
- Mass deworming interventions, at school level, have been proposed as a cost-effective approach to tackle this problem

Different settings for deworming

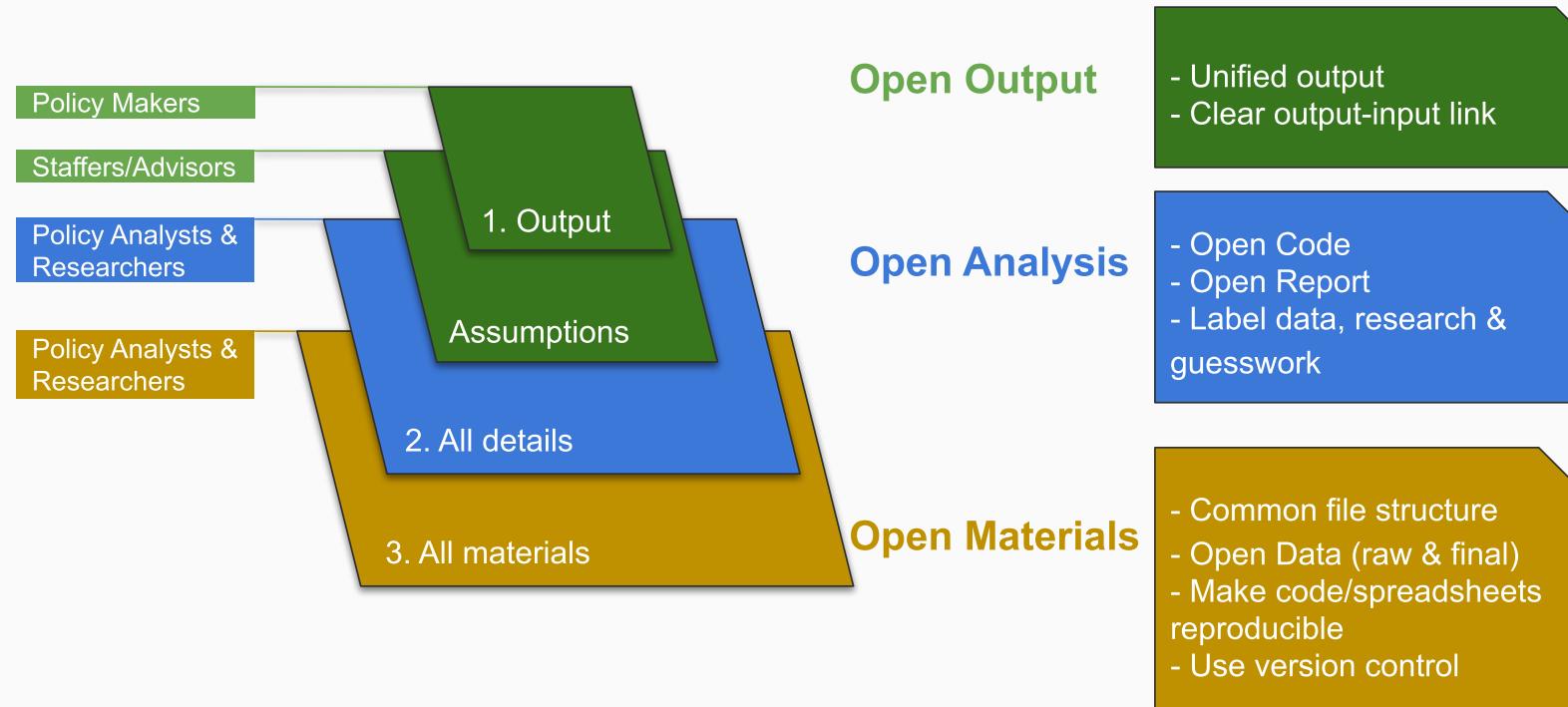
- Context of original study (Kenya, 1998-99) had very high prevalence rates of worm infections
- Implementation costs were very low (\$0.42 per round of treatment)
- Length of treatment was relatively short (2.4 years)
- Current deworming settings have lower prevalence rates, varying implementation costs and length of treatments

Strong debate around initial results

- Ozier (2020) summarizes differences between original findings (Miguel and Kremer 2004) and a re-analysis (Aiken et al, 2015). Emphasizes the role of communication of results in a reanalysis.
- This type of debate (result/re-analysis) can be seen in several other topics. For example: minimum wage, immigration, taxation.
- OPA need not guarantee agreement on key research finding, but should help avoid multiple policy reports

A Framework for Open Policy Analysis

Hoces de la Guardia,
Grant, Miguel (2020)



Contributions of OPA to deworming:

1. Selected one policy estimate among several alternatives and establish a clear link between it and underlying assumptions
2. Added documentation to increase reproducibility
3. Created a public repository with all materials for one-click reproducibility

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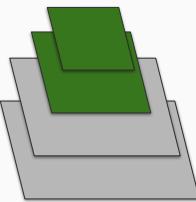
1. Introduction

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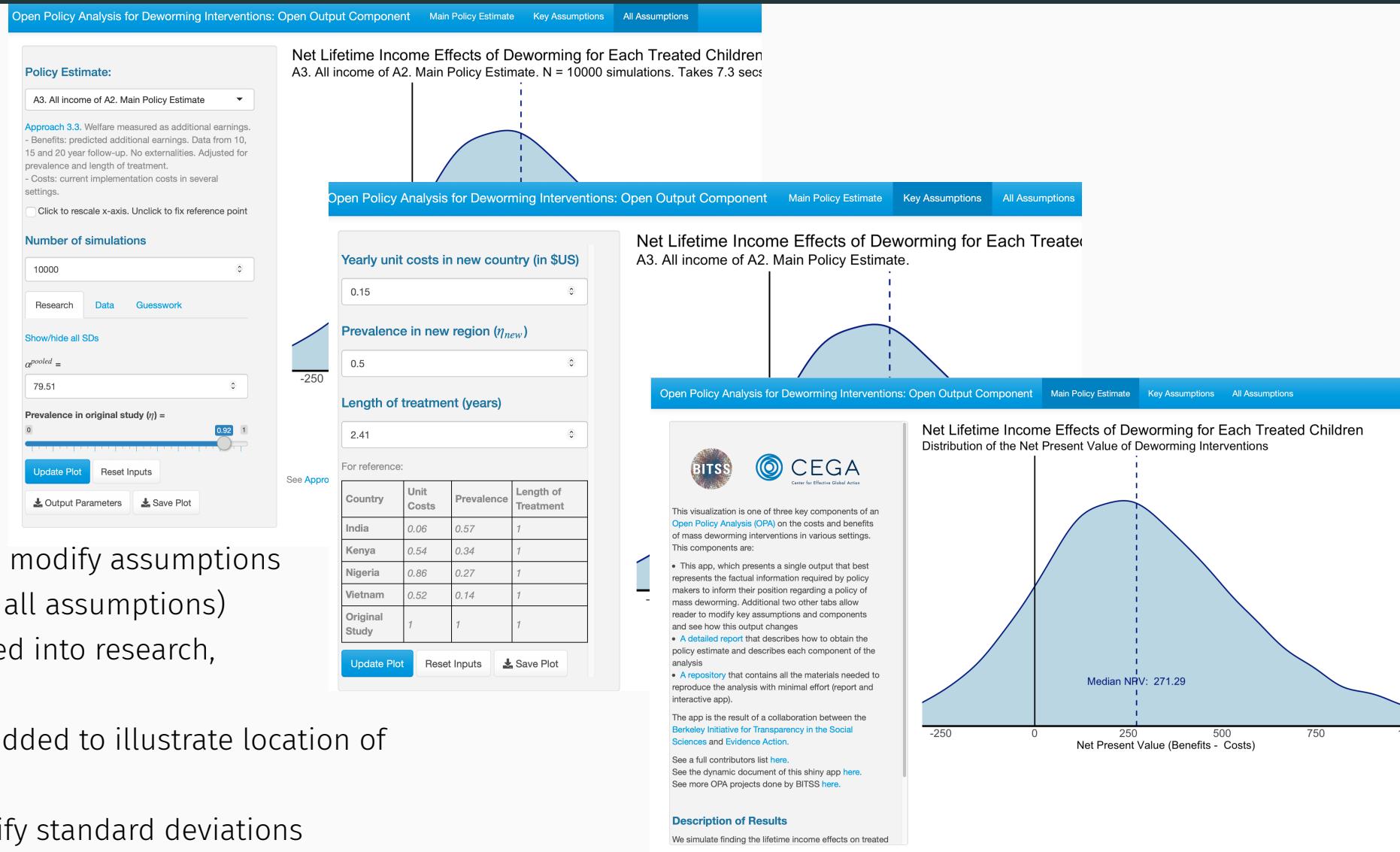
Open Output

Demo



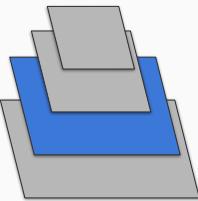
Main features

- One clear output previously agreed in consultation with policy partner
- Two additional tabs to modify assumptions (key assumptions and all assumptions)
- Each source is classified into research, data, or guesswork
- High level equations added to illustrate location of components
- Added feature to modify standard deviations
- Track values of each component



Open Analysis

Demo



Main features

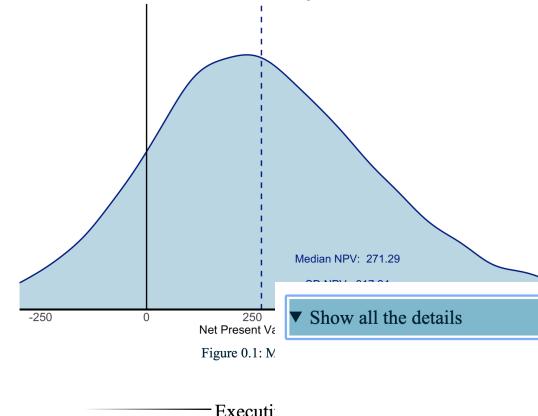
- Complete narrative description of the methodology
- Translation of each narrative step into an equation
- Implementation of each equation into code
- Combine all of the above into using a dynamic document (RMarkdown)
- Presentation of narrative, equations, and code in layered fashion to avoid overwhelming the reader
- Icon figure

BITSS CEGA
Open Policy Analysis
1 Introduction
2 Methodology
3 Main Results
References

OPEN POLICY ANALYSIS FOR DEWORMING

18 December, 2020

Net Lifetime Income Effects of Deworming for Each Treated Children
Distribution of the Net Present Value of Deworming Interventions



$$B = \sum_{t=0}^{50} \left(\frac{1}{1+r} \right)^t E_t \quad (1)$$

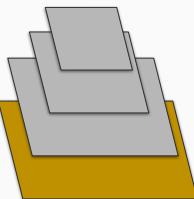
Where:

- E_t : earnings individuals are expected to generate at period t
- r : real interest rate as the discounting rate
- t : period t. Period 0 represents time of intervention. Individuals are assumed to enter the labor market 9 years after treatment.

```
# - inputs: stream earnings, discounting rate, number of periods
# - outputs: function that computes the present value of benefits
chunk_benefits <- function(){
#####
pv_benefit_f <- function(
  earnings_var = earnings_in,
  interest_r_var = interest_in,
  periods_var = periods_so
) {
  index_t <- 0:periods_var
  res1 <- sum( ( 1 / (1 + interest_r_var) )^index_t * earnings_var )
  return(res1)
}
```

Open Materials

Demo



Main features

- One-click reproducible documentation and app
- Extensive readme files
- Clear folder structure
- Version controlled
- Open data
- Acknowledgment to all contributors

BITSS-OPA / [opa-deworming](#)

Code Issues Pull requests Actions Projects Wiki Security Insights Settings

master 21 branches 1 tag Go to file Add file Code

fhoces Change title of readmen file 53bb6f1 1 minute ago 728 commits

.binder update install.R 2 months ago

code Merge branch 'master' of <https://github.com/fhoces/opa-deworming> 1 hour ago

data

docs

rawdata

.gitignore

contributors.R

contributors.csv

opa-deworming.Rproj

readme.Rmd

readme.md

RStudio File Edit Code View Plots Session Build Debug Profile Tools Window Help

OS_final_opa.Rmd

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1 ---  
2 title: "<center><div class= 'mytitle'>Open Policy Analysis for Deworming</div></center>"  
3 date: "<center><div class='mysubtitle'>r format(Sys.time(), '%d %B, %Y')<br><img height='80px' src='./shiny_app/www/bits_logo_horizontal.png'><br><img height='80px' src='./shiny_app/www/CEGA_logo.png'></div></center>"  
4 editor_options:  
5 chunk_output_type: console  
6 output:  
7 bookdown::html_document2:  
8 code_download: yes  
9 code_folding: hide  
10 css: style.css  
11 highlight: tango  
12 includes:  
13   after_body: footer.html  
14 keep_md: yes  
15 number_sections: yes  
16 smooth_scroll: no  
17 theme: cerulean  
18 toc: yes  
19 toc_collapsed: no  
20 toc_depth: 3  
21 toc_float: yes  
22 html_document:  
23 df_print: paged  
24 toc: yes  
25 toc_depth: 3  
26 word_document: null  
27 link_citations: yes  
28 pdf_document:  
29   extra_dependencies: xcolor  
30   fig_caption: no  
31 biblio: libbiblio.bib
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readme.md

Open Policy Analysis of Deworming

BITSS BERKELEY INITIATIVE FOR TRANSPARENCY IN THE SOCIAL SCIENCES

R version 4.0.0 (2020-04-24) -- "Arbor Day"
(Copyright (C) 2020 The R Foundation for Statistical Computing
Platform: x86_64-apple-darwin17.0 (64-bit)

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Natural language support but running in an English locale

R is a collaborative project with many contributors.
(type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.)

OPEN PO

BITSS CEGA Center for Effective Global Health

Open Policy Analysis

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Net Lifetime Income Effect
Distribution of the Net Present Value

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What happens if one principle fails: Opaque Output

- Policy estimates of approach 2 of deworming (Baird et al, 2016)
- Assume Open Analysis and Open Materials
- Good for researchers
- Unclear for policy analysts
- Allows policy makers to cherry pick results
- Does not disclose uncertainty
- Unclear separation of roles between policy analyst and policy maker (Truman's request for a "one-handed" economist)

TABLE V
FISCAL IMPACTS OF DEWORMING SUBSIDIES

	No subsidy	Partial subsidy	Full subsidy	Notes
Panel A: Calibration parameters				
Size of subsidy: S	\$0.00	\$1.15	\$1.42	From Deworm the World; Kremer and Miguel (2007)
Take-up rate: $Q(S)$	5%	19%	75%	From Kremer and Miguel (2007)
Average per-person cost: $SQ(S)$	\$0.00	\$0.22	\$1.07	Subsidy \times take-up rate
Mean per person increase in work hours/week: λ_1	0.00	0.44	1.75	Men: increase of 3.49 hours/week; women: no change (Table III). Partial subsidy multiplied by $\frac{Q(S)}{Q(\text{full})}$
Mean increase in work hours/week from externality: $p\lambda_2$	0.00	1.76	5.21	10.20 (Table III) \times Coverage of treatment school students within 6 km (R , 68.1%) $\times [Q(S)$ for full subsidy, $\frac{Q(S)}{Q(\text{full})}$ for partial subsidy]
Mean increase in schooling costs	0.00	2.71	10.71	NPV of (additional secondary schooling costs per pupil-year (\$116.85) \times direct increase in secondary schooling). Partial subsidy multiplied by $\frac{Q(S)}{Q(\text{full})}$.
Mean increase in schooling costs from externality	0.00	3.40	13.42	NPV of (additional secondary schooling costs per pupil-year (\$116.85) \times externality increase in secondary schooling). Partial subsidy multiplied by $\frac{Q(S)}{Q(\text{full})}$.
Panel B: no health spillovers				
Annual increase in per person earnings	\$0.00	\$3.91	\$15.44	$\lambda_1 \times$ starting wage \times 52
NPV increase in per person earnings (relative to no subsidy)	—	\$36.08	\$142.43	9.85% annual (real) interest rate in Kenya
NPV increase in per person government revenue	—	\$3.27	\$12.90	NPV earnings \times 16.575% tax rate – Direct schooling costs
Panel C: With health spillovers				
Annual increase in per person earnings	\$0.00	\$26.77	\$83.11	$(\lambda_1 + \frac{p}{R} \lambda_2) \times$ starting wage \times 52
NPV increase in per person earnings (relative to no subsidy)	—	\$246.99	\$766.81	9.85% annual (real) interest rate in Kenya
NPV increase in per person government revenue	—	\$34.83	\$102.97	NPV earnings \times 16.575% tax rate – (Direct externality schooling costs)

Opaque Analysis/Materials

- Assume open output and open materials
- In this scenario we can have two policy analyses: one from advocates and one from opponents
- Each analysis can claim to be open source. Code is available, reproducible, and each as an interactive app.
- But each analysis can bury in their code analytical choices that move the final policy estimate in their favor
- Same though exercise can be done with opaque materials

Lessons for future OPA projects: Timeline

1. Reviewed existing documentation
2. Review code/spreadsheets and write down missing documentation.
3. Add equations to reflect any additional clarifying steps.
4. Translate analysis to code scripts (ideally open source software)
5. Check for computational reproducibility and consult with original analysts for discrepancies/further questions
6. Discuss with policy partner on target policy estimate
7. Draft doodle of app
8. Incorporate any potential new analysis (repeat steps 1 - 3)
9. Present draft of OPA (DD and doodle of app) to policy partner
10. Incorporate comments into documentation of the OPA
11. Build app based on analysis of dynamic document
12. Incorporate any additional features requested by policy partner
13. Verify that all three components produce the same output
14. Publish v1.0

Useful practices developed during the project

Documentation of analysis and app are connected

- Each analytic step is declared in the documentation and wrapped in a function
- All these steps are used to produce the results in the documentation
- These steps are also stored in a file that is later sourced in the app.
- If something changes in the report, it will update the app.

Style guide

- Group objects according to use: only within the documentation, for simulations, and for the app
- Use diagram trees to depict nested relationships

Lessons for future OPA projects: Costs

- Costs (approx bandwidth over a year at full time):
 - Principal Investigator 30-50%
 - Research assistant/programmer 100-150%
 - Program Manager 20%-30%
 - Original researcher: 1-5%
- Not all policy analysis justify this level of effort
- Characteristics that might justify an OPA:
 - Topics with strong disagreement on the facts among analysts
 - Recurrent reports (eg. ex-ante economic analysis from development banks/agencies)
 - Topics that have large expected welfare effects (eg. tax reform, social cost of carbon)
- With each new OPA project, templates will emerge and costs will likely fall

Additional Benefits of OPA

Easy to update and reuse

After deworming OPA is released, anybody can modify and improve into a newer version

Clearer connection of how evidence from research is used in policy analysis

Researchers can see clearly where their estimates are being used in a policy analysis. For example, the OPA can be used to justify power calculations of potential new studies.

Connection with forecasting

When there is little information for a parameter used in an OPA, a forecasting exercise can be carried out to elicit expert knowledge (DellaVigna, Pope, Vivaldi 2019).