



Introduction

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Day 2 Session 3: Expert Elicitation in the Social Sciences

Jose Pina-Sánchez

7th of December 2018

History of EKE

- EKE was born and has been predominantly used as a tool for risk management outside academia
 - US military, failures in nuclear power plants, risk management in private companies

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History of EKE

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- EKE was born and has been predominantly used as a tool for risk management outside academia
 - US military, failures in nuclear power plants, risk management in private companies
- Over the last few decades adopted and perfected by academics
- Has thrived in areas such as:
 - Toxicology, Environmental Sciences, Epidemiology, Health Economics
 - Disciplines that deal with risk management
 - With a strong tradition of quantitative research
 - Where it is not always possible to conduct the necessary research

EKE in the Social Sciences

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- Very rarely used in 'softer' Social Sciences
 - Some exceptions from Management, Migration, Sentencing
- Even then, not used to their full potential
 - More like questionnaires with samples of experts
 - Often simply interested in point estimates
 - Not always following well designed protocols
 - Rarely aggregating experts' views adequately

EKE in the Social Sciences

- Odd that EKE has not been used more in the Social Sciences
 - A more ‘subjective’ field by definition
 - Data is of lower quality
 - Research designs commonly limited by ethics and/or feasibility
 - Lots of questions unanswered / knowledge gaps

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 - Data is of lower quality
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 - Lots of questions unanswered / knowledge gaps
- I wonder whether the small presence of EKE in the Social Sciences is due to our own dogmatic believes
 - Clear separation between *quanti* and *quali* researchers
 - ‘Academic wars’ that disincentive mixed methods and cross-disciplinary research
 - Many qualitative researchers would argue that it is impossible to measure social reality
 - Many quantitative researchers dismissive of subjective information

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- We have discussed different examples where EKE could be particularly useful to disciplines in the Social Sciences
- Here are seven specific instances where that is the case (besides questions where no other research design is possible)
 - To inform models
 - To adjust for problems of data quality
 - To estimate hidden populations
 - To expose biases in decision-making
 - To undertake more encompassing meta-analyses
 - To develop scales of latent/subjective concepts

Inform Models

- Bayesian Statistics allow us to combine data (likelihood function) with subjective beliefs (prior distributions)
 - This can be used to improve the precision and robustness of the more typical ‘frequentist’ statistical models
 - Great compatibility between EKE and Bayesian stats
 - Elicited distributions represent exactly the type of information to be used as prior distributions

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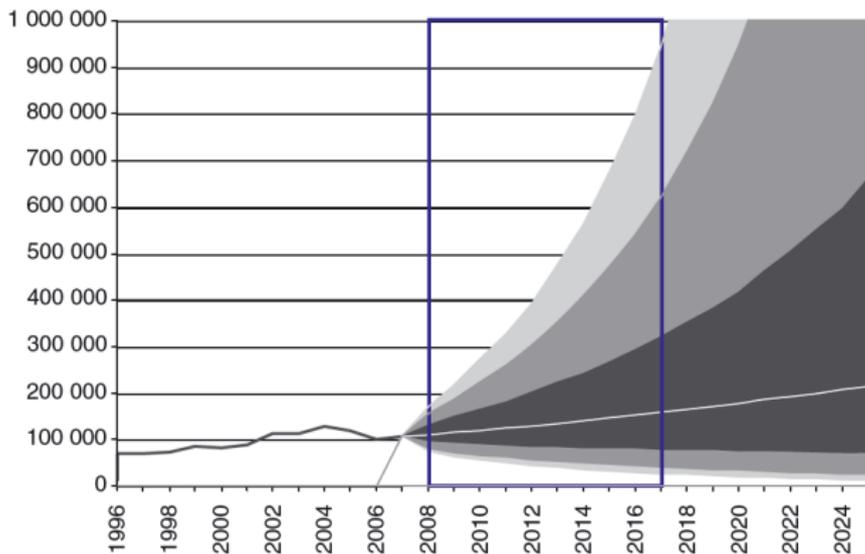
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Inform Models

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- Forecasting migration flows Bijak and Winiowski (2010)
 - Used time-series models in a Bayesian framework
 - And views from migration experts on the expected trends (whether positive, negative, or stationary)
 - Compared results from models assuming no expert knowledge (traditional models) with others including experts
 - Four different European countries
 - Concluded that including experts' knowledge increases precision
 - But predicting further than a few years ahead is hopeless

Austria Immigration Forecast



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Data Quality

- Problems of missing data and measurement error plague most datasets in the Social Sciences
 - Measurement error in retrospectively reported spells of unemployment in the Labour Force Survey
 - Police records underestimates true crime rates as most incidents are not reported

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Data Quality

- Problems of missing data and measurement error plague most datasets in the Social Sciences
 - Measurement error in retrospectively reported spells of unemployment in the Labour Force Survey
 - Police records underestimates true crime rates as most incidents are not reported
- These are two examples of fundamental concepts heavily affected
- But even seemingly harmless examples of measurement error or missing data can be devastating
 - Including a covariate affected by random measurement error (e.g. blood pressure) can bias all of the estimates in a regression model

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Data Quality

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 - Police records underestimates true crime rates as most incidents are not reported
- These are two examples of fundamental concepts heavily affected
- But even seemingly harmless examples of measurement error or missing data can be devastating
 - Including a covariate affected by random measurement error (e.g. blood pressure) can bias all of the estimates in a regression model
- Statistical adjustments can be applied if the extent of the measurement error/missing data mechanisms can be estimated
 - Pina-Sánchez et al. (2018) used a range of different probabilities for spells of unemployment being misclassified as spells of employment or out of the labour force
 - It would have been better to use a probability of misclassification elicited from interviewers or other survey experts

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- We are interested in subgroups of the population that are difficult to estimate
 - Number of LGTB in Malaysia
 - Number of people who are transgender in Brazil
 - Number of rough-sleepers in Leeds
- Often we have to rely on proxy measures
 - In the UK different localities used different methods to count the number of rough sleepers
 - Tend to rely on number of calls or interventions from public services like paramedics or the police
 - The Leeds City Council estimates there were 28 people sleeping rough in Leeds in 2017
- EKE of the right experts could do a better job

Exposing 'Experts'

- Built-in EKE exercises as part of recurrent policy processes to expose the decision making biases affecting those processes
- We intend to use EKE to investigate biases in 'Strategic Tasking and Coordinating' meetings in the police
 - Monthly meetings where police forces allocate resources based on expected police demand (crime trends)
 - Known to be rather inaccurate
 - Senior police managers accused of being affected by hindsight bias
 - Reproducing their predictions in statistical distributions and contrasting them to the observed crime rates could help them learn from the process
 - Improve transparency and accountability
 - Prevent them from getting away with hindsight explanations

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Subjective Meta-Analyses

- Meta-analyses are extremely useful
 - Allow to compile findings from different studies on a similar question
 - More structured than a typical literature review
 - Can weigh different studies based on their sample size or other features

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 - In the Social Sciences we use a wide array of methods

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Subjective Meta-Analyses

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 - Can weigh different studies based on their sample size or other features
- However, only possible for studies based on a similar research design
 - In the Social Sciences we use a wide array of methods
- An alternative could be EKE with academics
 - Subjective meta-analyses encompassing findings from the whole literature
 - E.g. the effect of political decentralisation on government corruption
 - The extent to which sentencing guidelines have increased consistency in sentencing
 - The effect of ‘stop and search’ on police legitimacy

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Measuring Sentence Severity

- Lastly, experts have been used for the development of a wide ranges of scales
 - Drugs harm
 - The Regional Authority Index
 - Sentence severity

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- Lastly, experts have been used for the development of a wide ranges of scales
 - Drugs harm
 - The Regional Authority Index
 - Sentence severity
- Almost never EKE protocols have been implemented for the above
 - The uncertainty around the values in those scales is neglected

Applications in your fields

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- Has this course helped you identify new applications of EKE?
- Any new areas where you might now be thinking of applying EKE?

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- We have used EKE (21 magistrates) to create a scale of sentence severity
- A research tool with multiple applications:
 - Monitor sentence severity
 - Measure proportionality in sentencing
 - Improve models using sentence data

The Research Problem

- Five main sentence outcomes (aka disposal types)
 - *discharge < fine < community order < suspended sentence < custodial sentence*
- Most of those disposal types use different units of measurement
 - e.g. pounds for fines, days for custodial sentences, conditions for community orders

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The Research Problem

- Five main sentence outcomes (aka disposal types)
 - *discharge* < *fine* < *community order* < *suspended sentence* < *custodial sentence*
- Most of those disposal types use different units of measurement
 - e.g. pounds for fines, days for custodial sentences, conditions for community orders
- It is hard to see any general trends in severity
- For reasons of convenience we tend to focus on custodial sentences
 - However these represent only 7% of the sentences imposed in England and Wales
 - Creating a problem of selection bias

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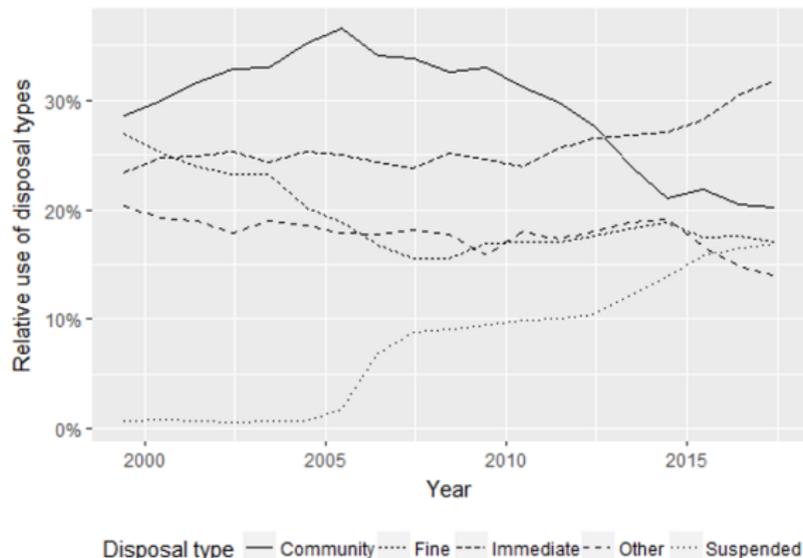
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B - Relative use of disposal types (indictable offences)



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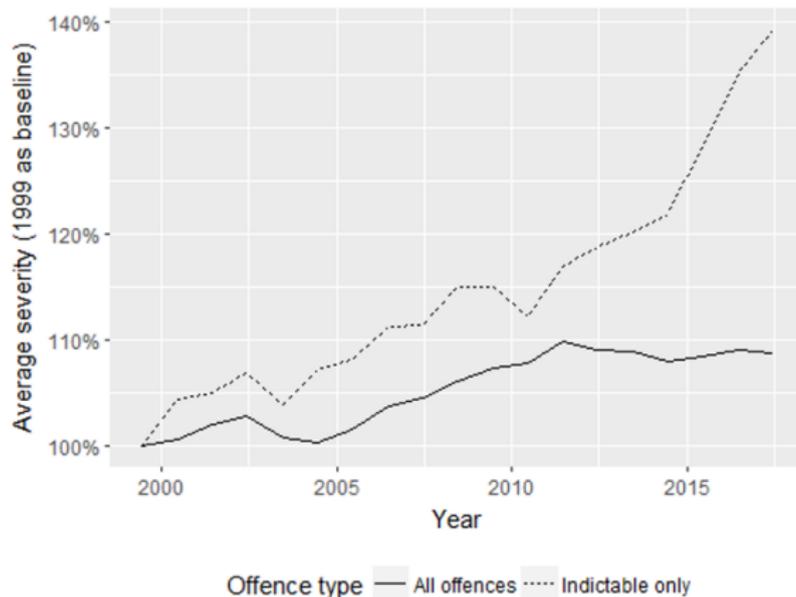
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B - Average severity (1999 as baseline)



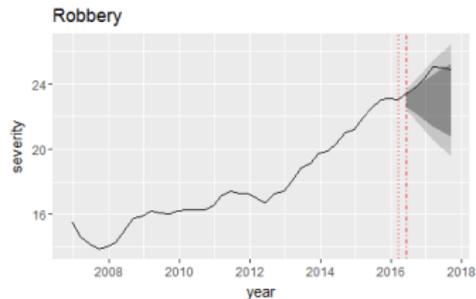
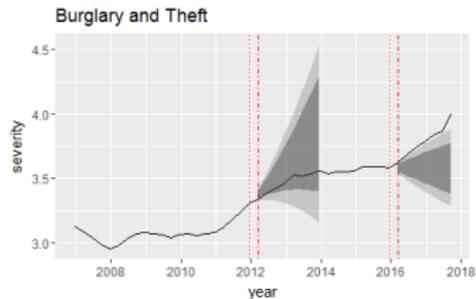
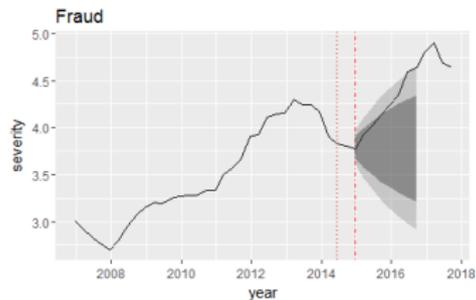
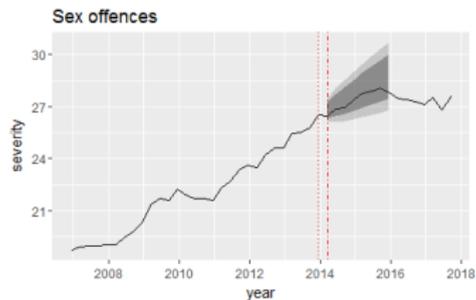
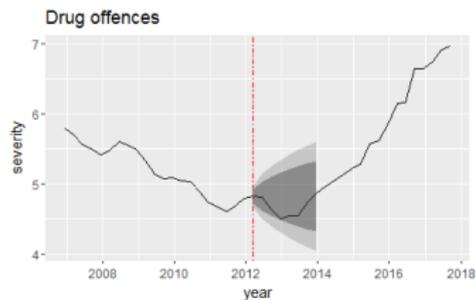
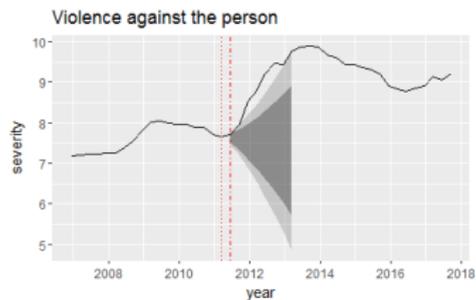
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4. How often can a **12-month custodial sentence suspended for 24 months** be more punitive than a **1-month immediate custodial sentence**? (Please consider all possible combinations of conditions that can be attached to a suspended sentence and circumstances of the offender)

- Never (0% of times)
- Almost never (10% of times)
- Very infrequently (20% of times)
- Infrequently (30% of times)
- Almost as often (40% of times)
- As often (50% of times)
- More often than not (60% of times)
- Often (70% of times)
- Very often (80% of times)
- Almost always (90% of times)
- Always (100% of times)
- Other

- a. If you selected Other, please specify:

Matrix of Severity

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	absolute discharge	conditional discharge	fine	community order	6month suspended 1month custody	12month suspended 1month custody	6month suspended 6month custody	24month suspended 12month custody	1month immediate custody	2month immediate custody	3month immediate custody
absolute discharge	0.5	1	1	1	1	1	1	1	1	1	1
conditional discharge	0	0.5	0.69	1	1	1	1	1	1	1	1
fine	0	0.31	0.5	0.78	1	1	1	1	1	1	1
community order	0	0	0.22	0.5	0.37	1	1	1	1	1	1
6month susp 1month cust	0	0	0	0.63	0.5	1	1	1	1	1	1
12month susp 1month cust	0	0	0	0	0	0.5	0.73	1	1	1	1
6month susp 6month cust	0	0	0	0	0	0.27	0.5	1	1	1	1
24month susp 12month cust	0	0	0	0	0	0	0	0.5	0.41	0.52	0.62
1month immediate custody	0	0	0	0	0	0	0	0.59	0.5	1	1
2month immediate custody	0	0	0	0	0	0	0	0.48	0	0.5	1
3month immediate custody	0	0	0	0	0	0	0	0.38	0	0	0.5

Scale of Severity

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Sentence outcome	Severity score
absolute discharge	0
conditional discharge	0.97
fine	1.33
community order	2.13
1-month custody 6-months suspended	2.34
1-month custody 12-months suspended	3.66
6-months custody 6-months suspended	3.78
12-months custody 24-months suspended	5.74
1-month custody	5.05
2-months custody	5.75
3-months custody	6.45
12-months custody	13.45
5-years custody	47.05
20-years custody	173.05

Thurstone Model: Visually

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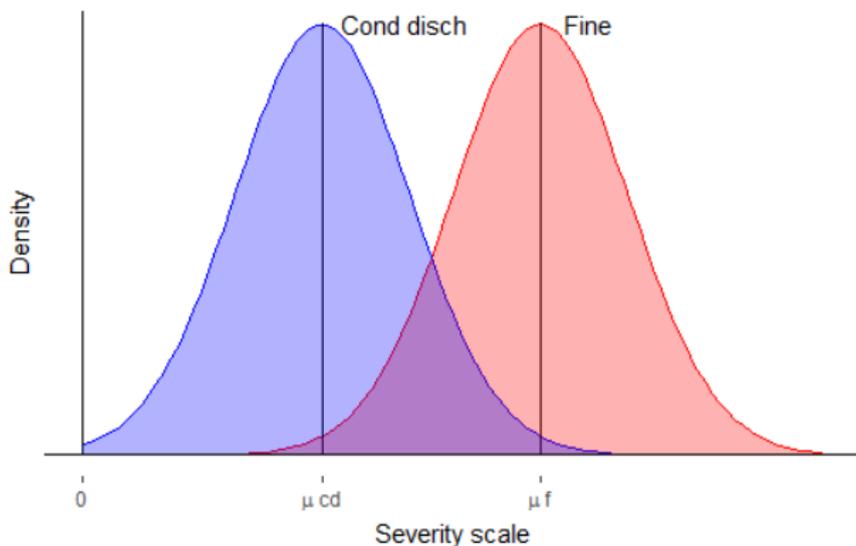
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PDF for Fine and Conditional Discharge



- We relied on self-completed questionnaires
 - Not the best format

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**Measuring
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Latest EKE Exercise

- We relied on self-completed questionnaires
 - Not the best format
- On Tuesday we conducted an EKE workshop on this topic
 - 1 defence lawyers, 1 magistrate, 2 criminal law experts from the Sentencing Council, 1 criminal lawyer, and 1 penal theorist
 - We conducted the same questionnaire in a much more discursive format
 - It took us less than a day, from 11:00 to 16:00
 - Aimed to discuss openly the questions and reach consensus
 - Requested information on the assumptions used
 - It turns out the assumptions of normality and equal variance are not valid
 - This finding illustrates perfectly an area where EKE is able to produce a remarkable contribution

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