

# The new pedigree matrix numbers: do they matter?



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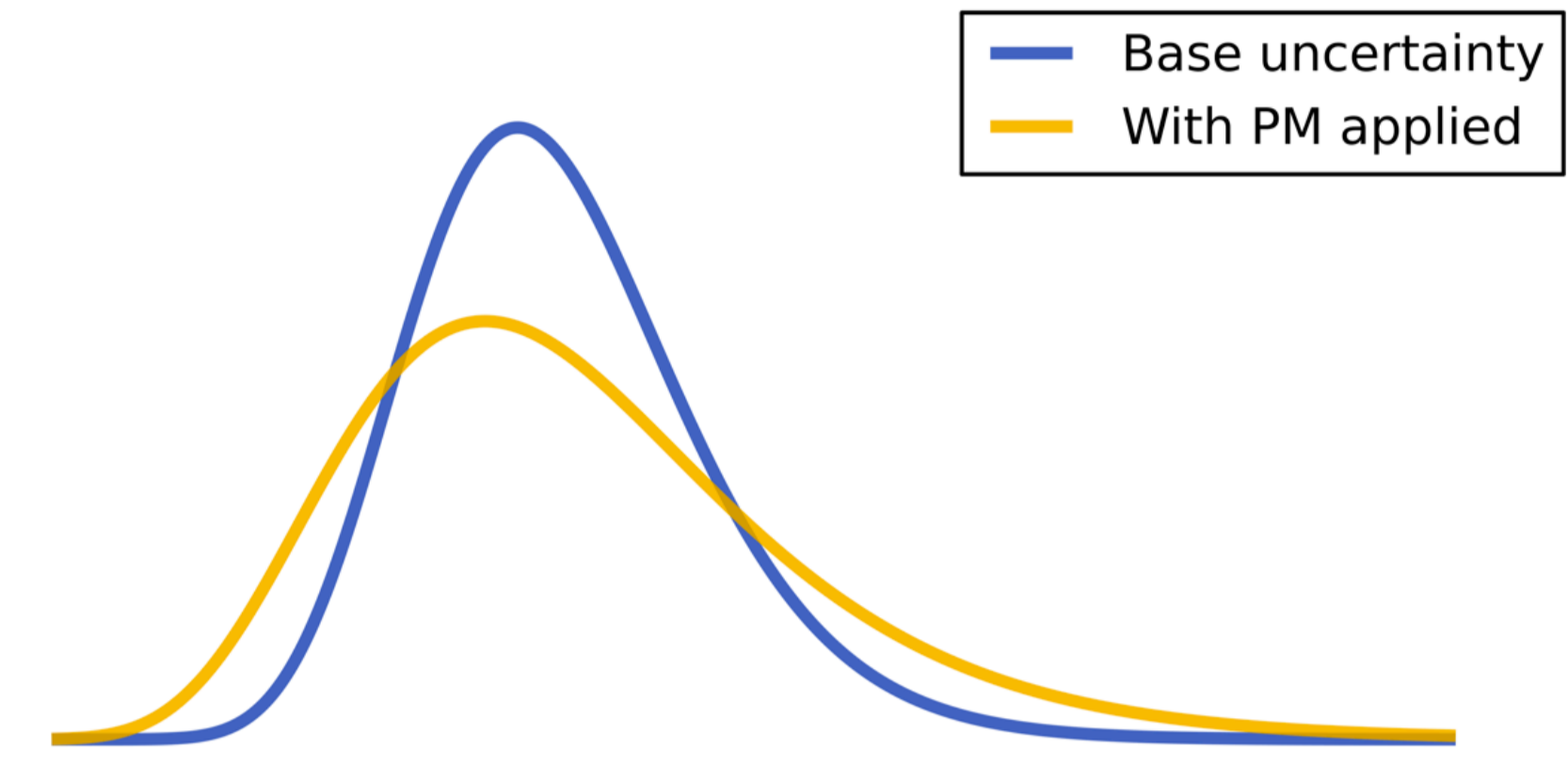


## Introduction

- The pedigree matrix (PM) is a *post-normal* approach to assigning uncertainty
- A new version (version 2) of the ecoinvent PM was recently developed

## How does the pedigree matrix work?

- Each dataset exchange has a *base uncertainty* which is log-normally distributed
- A new uncertainty distribution is produced by multiplying the *base uncertainty* by a set of additional log-normal PM distributions, each of which has a median of one.
- Applying the PM assumes that each factor is *independent*, i.e. the covariance is zero



The additional PM distributions don't shift the *median*, but *stretch* the distribution at both ends, increasing uncertainty

## Versions 1 & 2

	1	2	3	4	5
Reliability	1	1.05	1.1	1.2	1.5
Completeness	1	1.02	1.05	1.1	1.2
Temporal Correlation	1	1.03	1.1	1.2	1.5
Geographical Correlation	1	1.01	1.02	1.02	1.1
Further technological correlation	1	1	1.2	1.5	2
Sample size	1	1.02	1.05	1.1	1.2

Pedigree matrix, version 1

	1	2	3	4	5
Reliability	1	1.54	1.61	1.69	1.69
Completeness	1	1.03	1.04	1.08	1.08
Temporal Correlation	1	1.03	1.1	1.19	1.29
Geographical Correlation	1	1.04	1.08	1.11	1.11
Further technological correlation	1	1.18	1.65	2.08	2.8

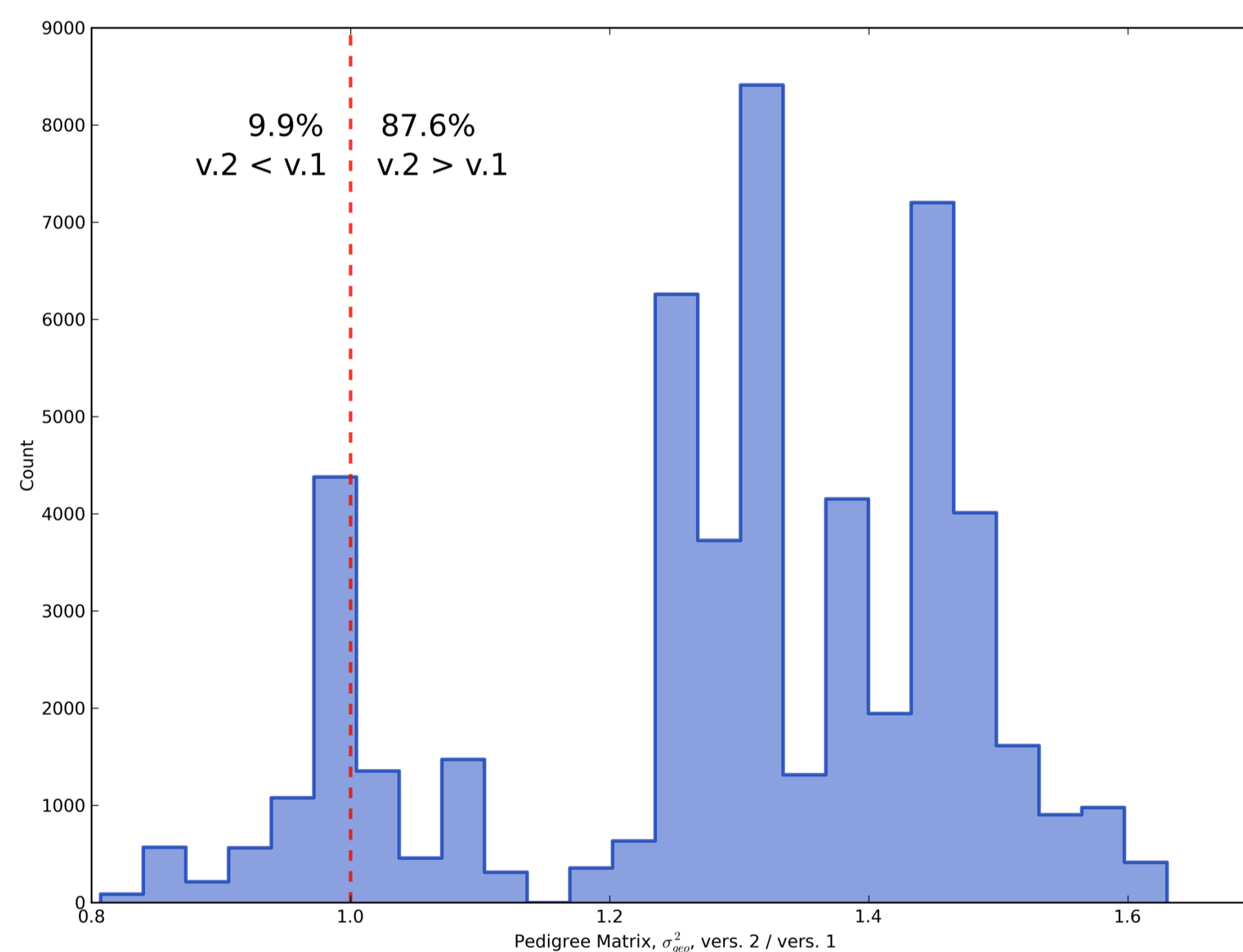
(sample size is removed from version 2)

Pedigree matrix, version 2

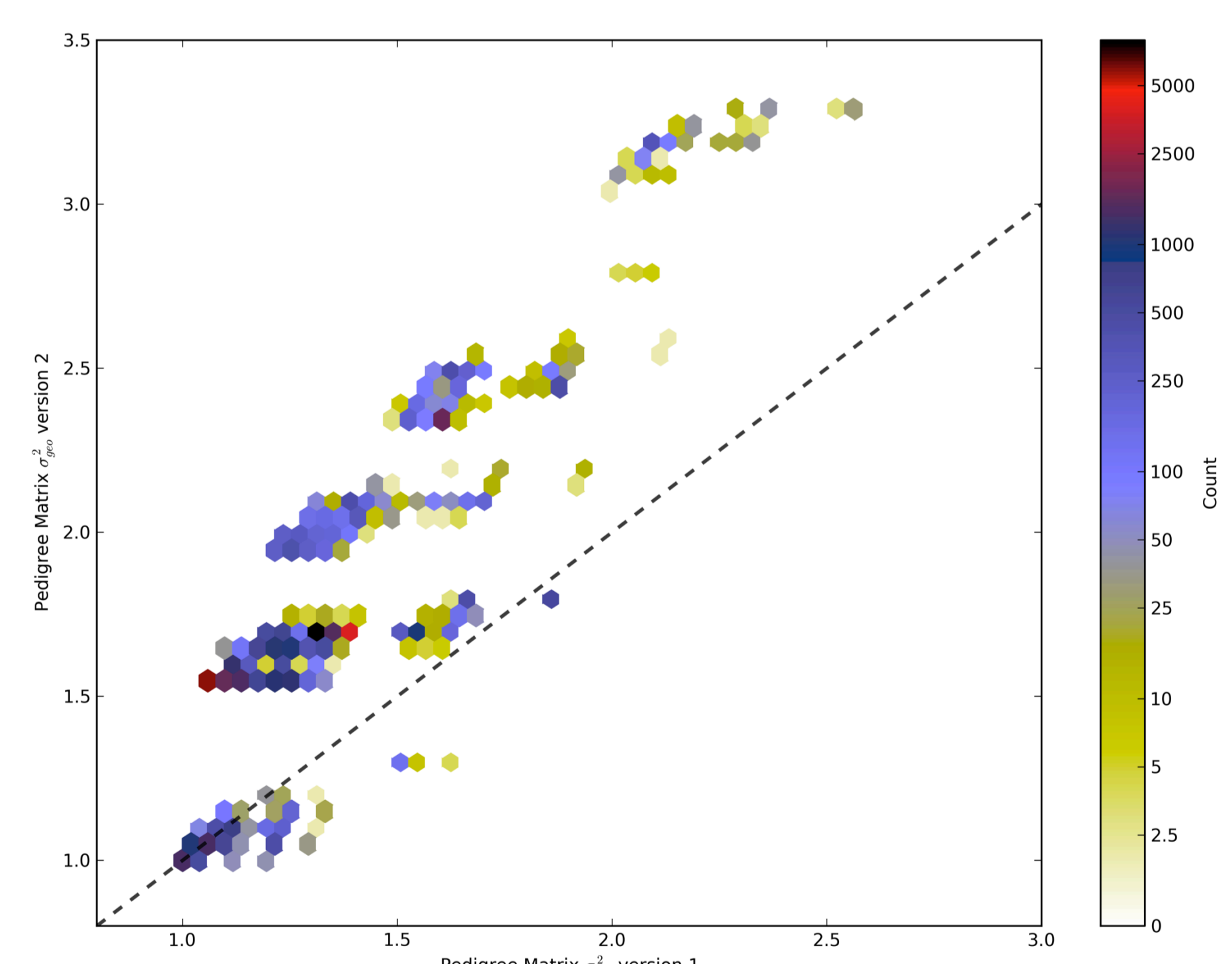
## Methodology

- We developed an open source library to make calculations with both versions of the PM easier (see link above)
- Results were calculated for all technosphere and biosphere exchanges in ecoinvent 2.2
- All calculations and graphics were calculated in an online scientific notebook for increased comprehension and reproducibility (see link above)
- See talk on online notebooks Thursday at 10:30 in room *Ligurian 1*

## Results



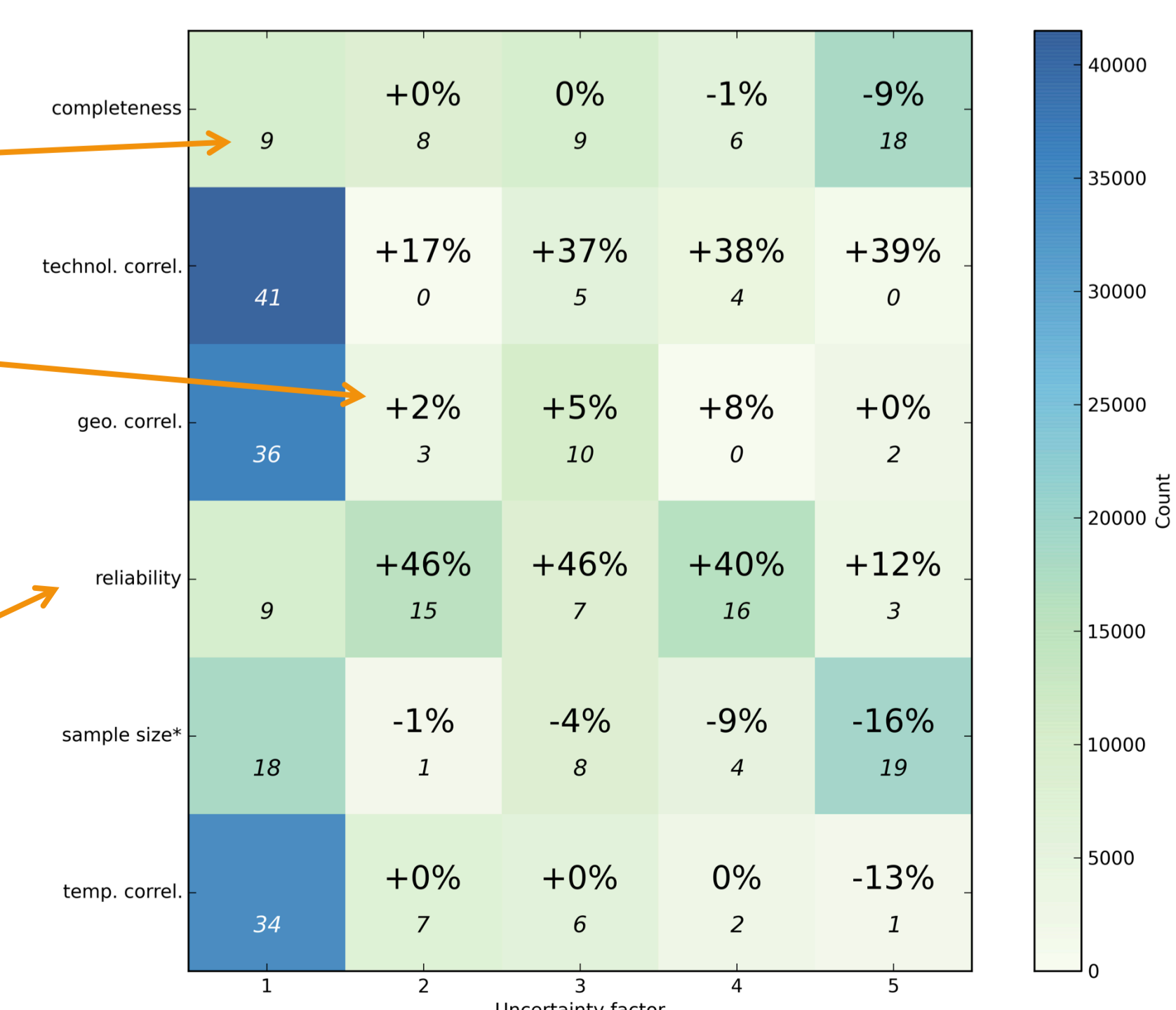
Histogram of the ratio of squared geometric standard deviations, version 2 divided by version 1. Version 2 is larger for 87% of the exchanges in ecoinvent 2.2



Density plot for squared geometric standard deviations, version 2 versus version 1. Differences between versions are small when uncertainty is small, but version 2 PM factors are substantially higher for higher uncertainties

Numbers of exchanges in ecoinvent 2.2 with this uncertainty factor (thousands)

Increase (decrease) in PM factor from version 1 to version 2



## Conclusions

- Pedigree matrix version 2 substantially increases uncertainty in ecoinvent 2.2
- The major source of increased uncertainty is the *reliability* category
- Technological, temporal, and geographical correlation PM factors are rarely used in ecoinvent