# Supplementary Material: Model Selection in Semiparametric Expectile Regression

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This is the supplementary material of the paper *Approaches for Model Selection in Semiparametric Expectile Regression*.

In the following first the results of the simulation study are given as pictures. Afterwards the selected models of the application are given as tables. The description of the simulation study is given in the paper in Section 4.1. For the design of the application have look at Section 5 of the paper.

The results of the simulation study (Part I) are structured as follows: (1) The results with 2000 observation are given, (2) the results with 500 observations are given. Inside these blocks the different selection approaches concerning P-splines come in the ordering: (i) Decomposition into linear and nonlinear effect ("complete"), (ii) Nonlinear vs. linear vs. no effect ("restricted"), (iii) Nonlinear vs. no effect ("no"), (iv) linear vs. no effect ("parametric") (see Section 3.1 of the paper for the details of this selection approaches). For all these selection approaches the three different data designs ((a) parallel, (b) linear, (c) exponential) are available.

The best model for the nutritional status (Part II) is selected via (i) cross-validation and scoring, (ii) stepwise AIC and area under the AIC curve, (iii) non-negative garrote and non-negative garrote on the grid and (iv) Boosting. Besides the results of weighted scoring are given in Table A.7. Furthermore the results of the selection of relevant effects per asymmetry parameter via stepwise backwards CV selection are given in Table A.8. Finally the estimated regional effects of the model selected via scoring are plotted in Figure A.25.

## Contents



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# Part I
# Simulation study

## 1 n=2000

### i.) Decomposition into linear and nonlinear effect

#### (a) Parallel design

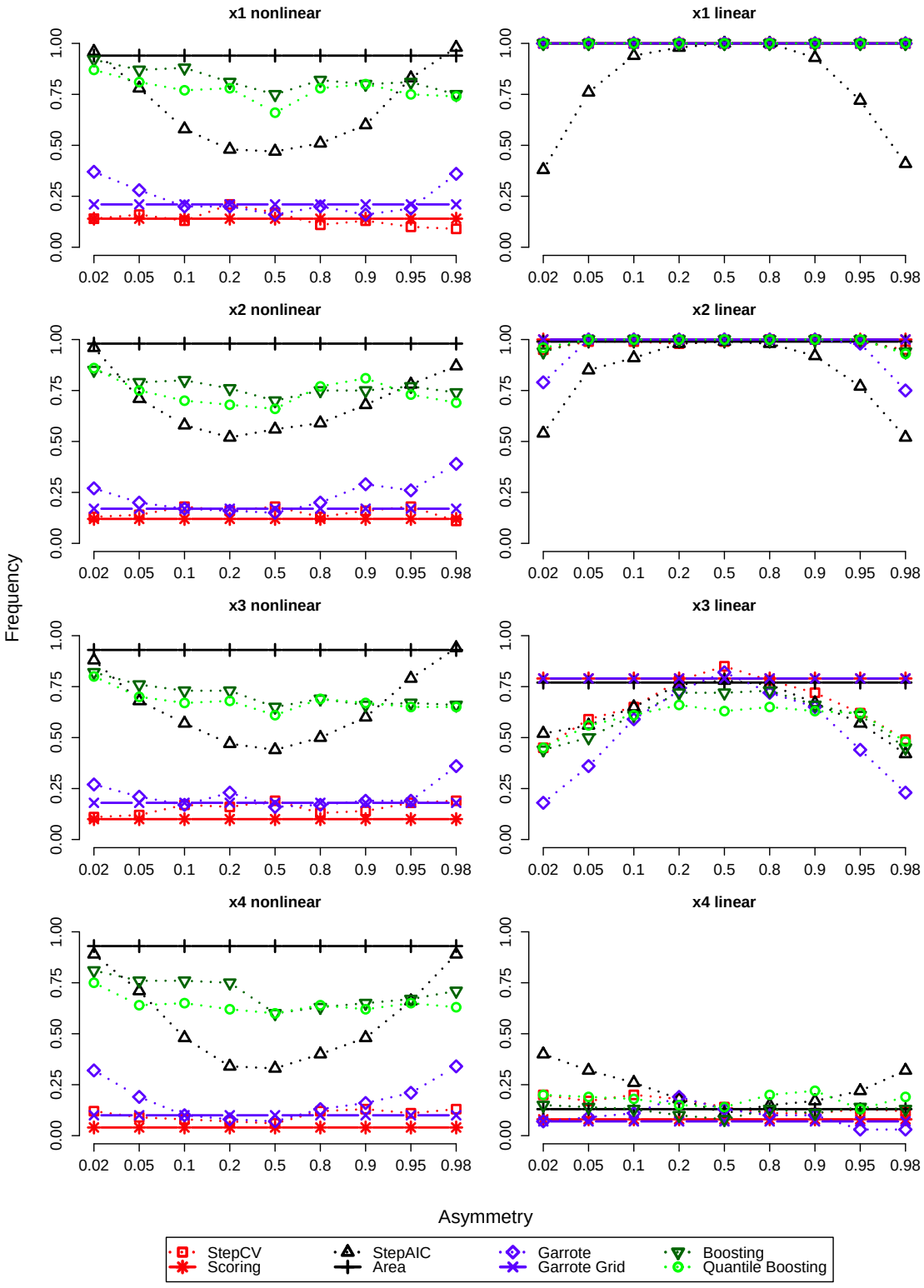


Figure A.1: Frequency of selected models for parallel design with n=2000 and decomposition into linear and nonlinear effect

**(b) Linear design**

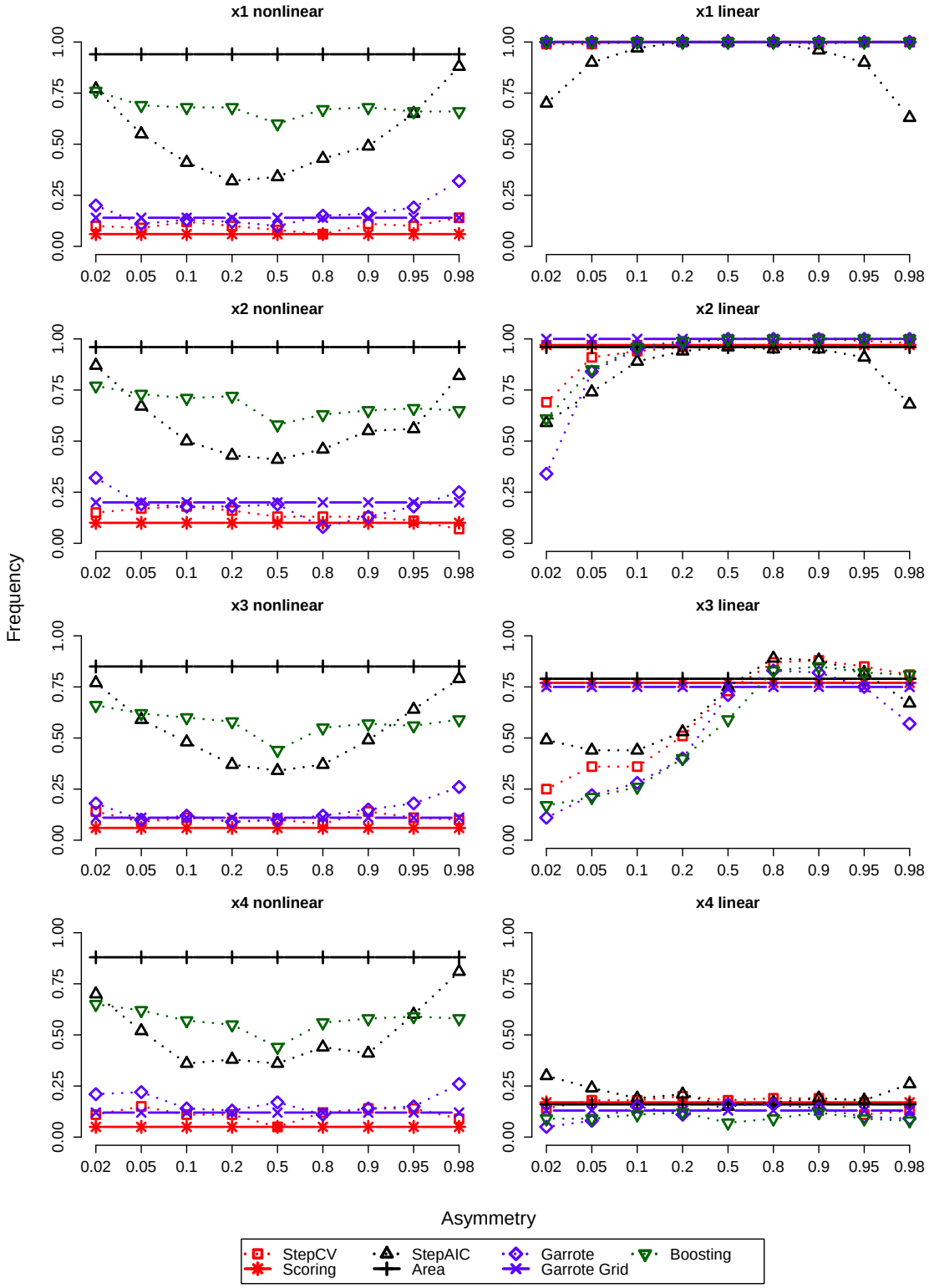


Figure A.2: Frequency of selected models for linear design with n=2000 and decomposition into linear and nonlinear effect

## (c) Exponential design

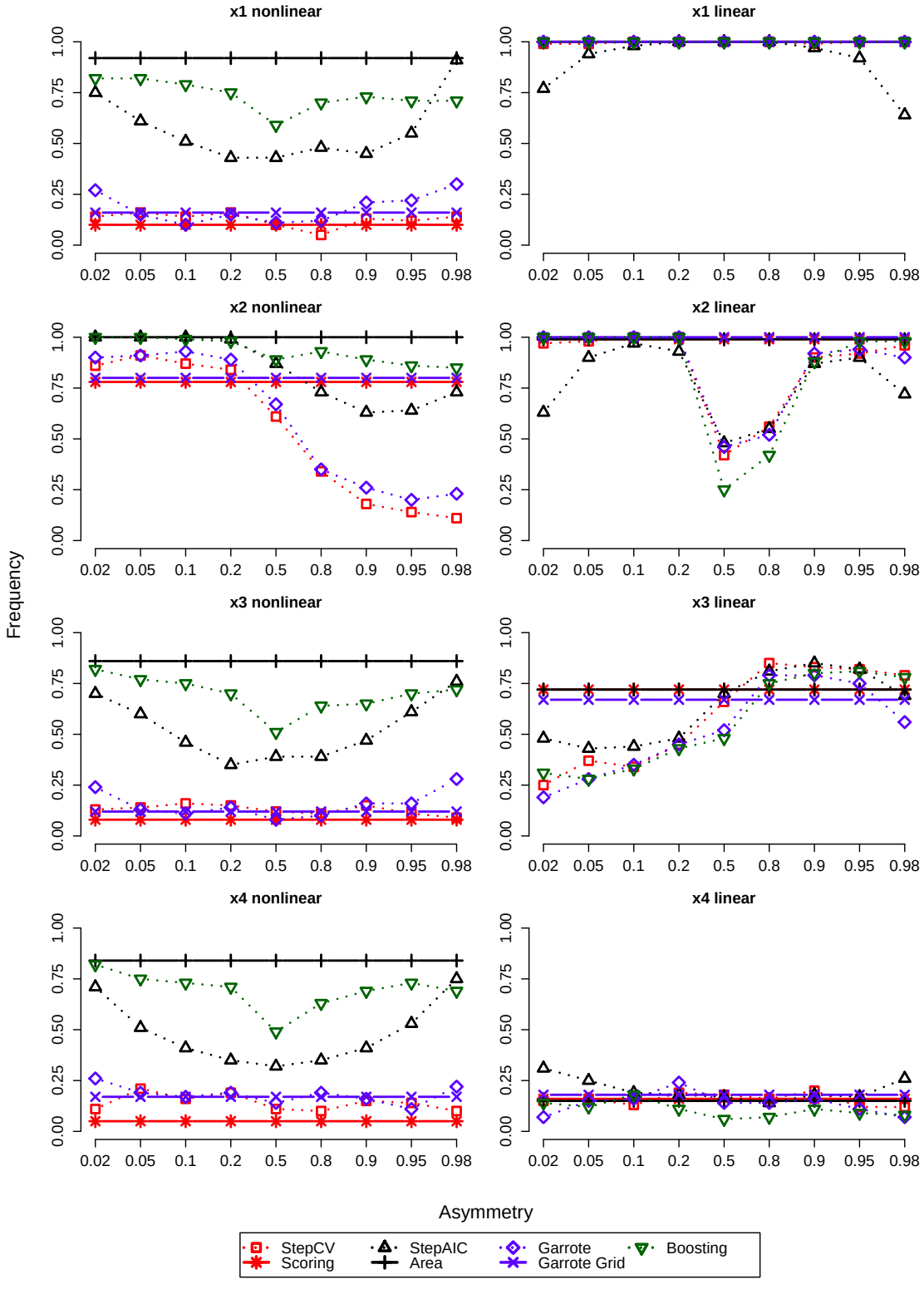


Figure A.3: Frequency of selected models for exponential design with n=2000 and decomposition into linear and nonlinear effect

## ii.) Nonlinear vs. linear vs. no effect

### (a) Parallel design

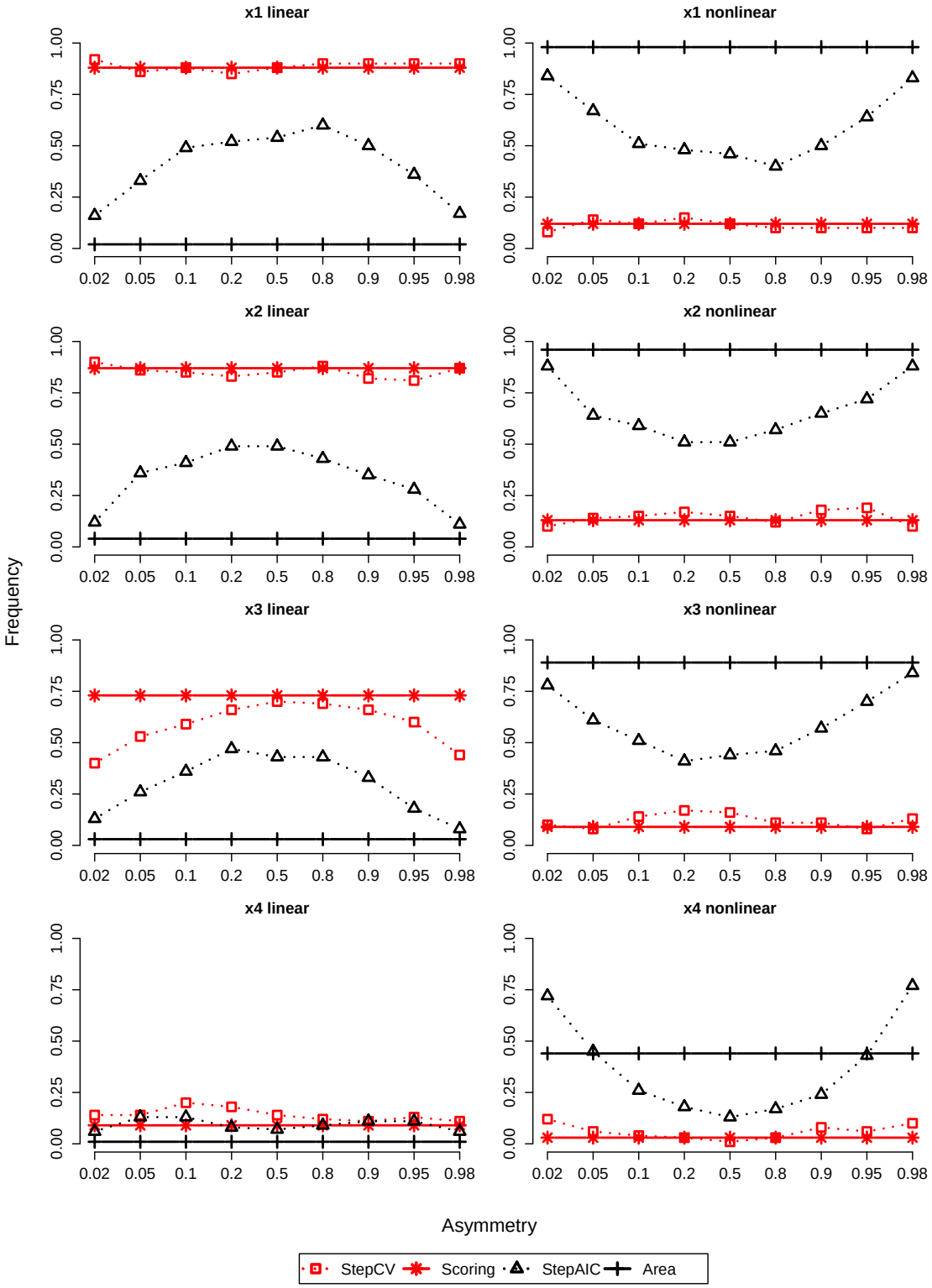


Figure A.4: Frequency of selected models for parallel design with n=2000 and restricted selection of P-splines

**(b) Linear design**

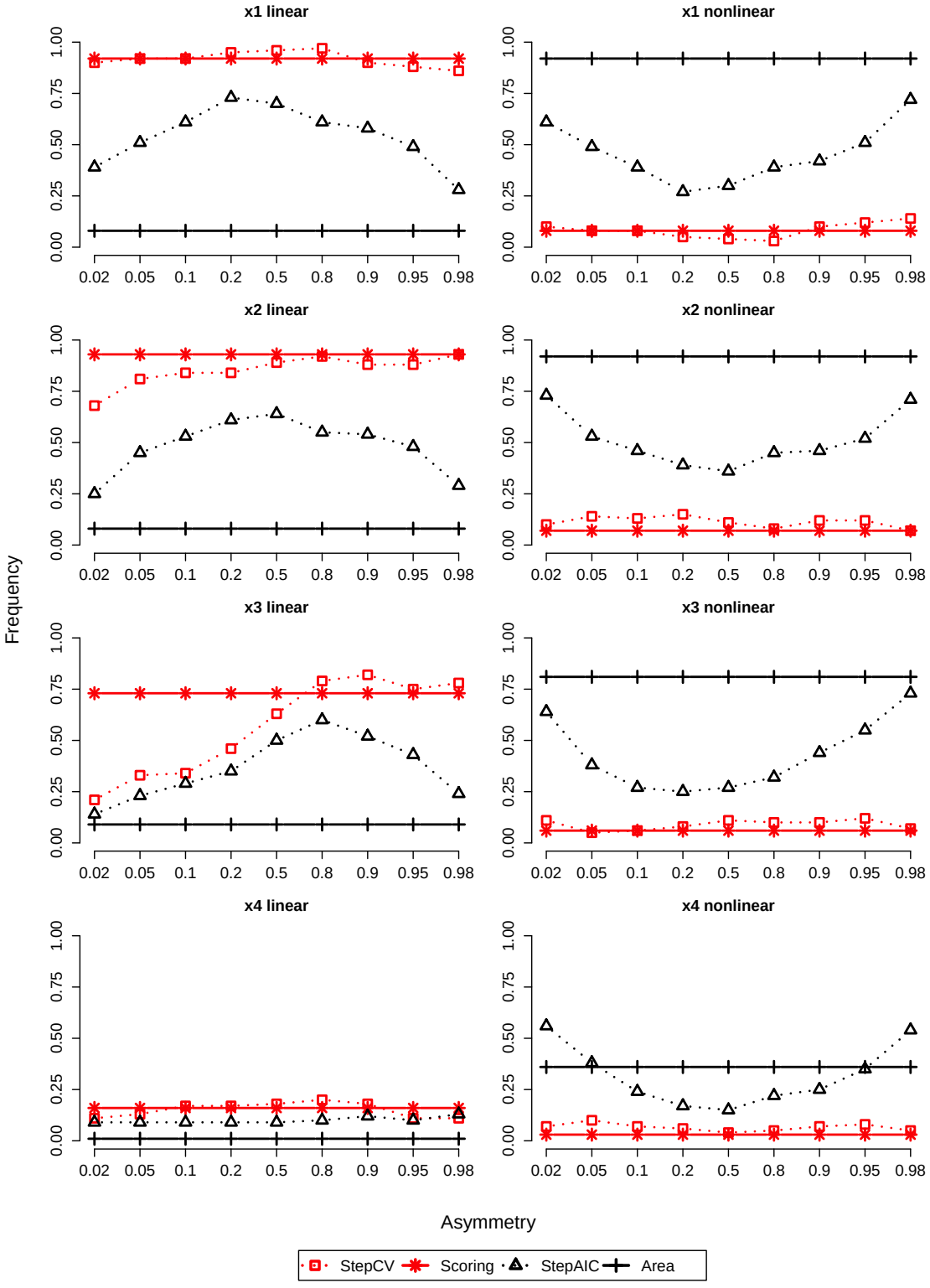


Figure A.5: Frequency of selected models for linear design with n=2000 and restricted selection of P-splines

## (c) Exponential design

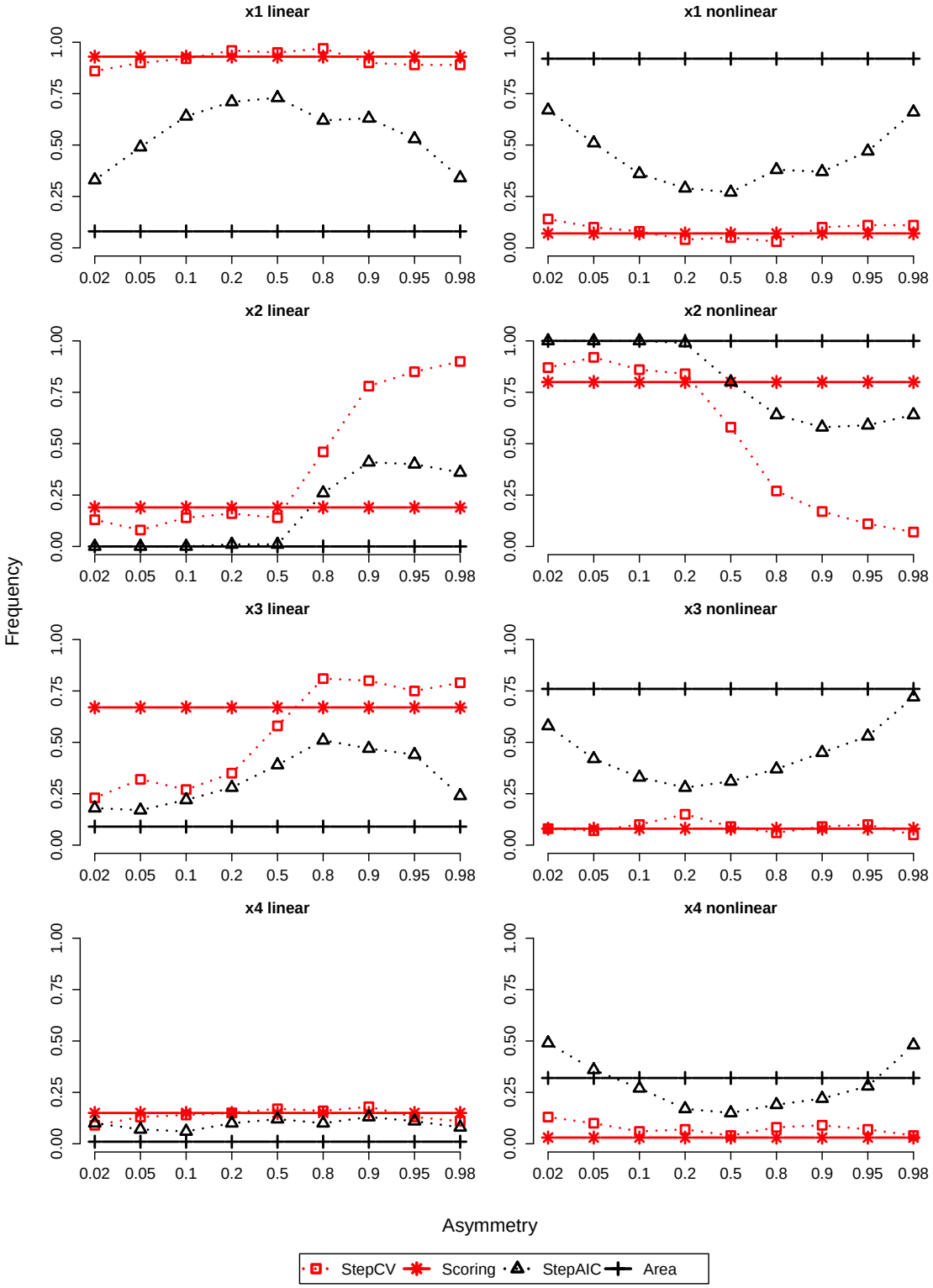


Figure A.6: Frequency of selected models for exponential design with n=2000 and restricted selection of P-splines

### iii.) Nonlinear vs. no effect

#### (a) Parallel design

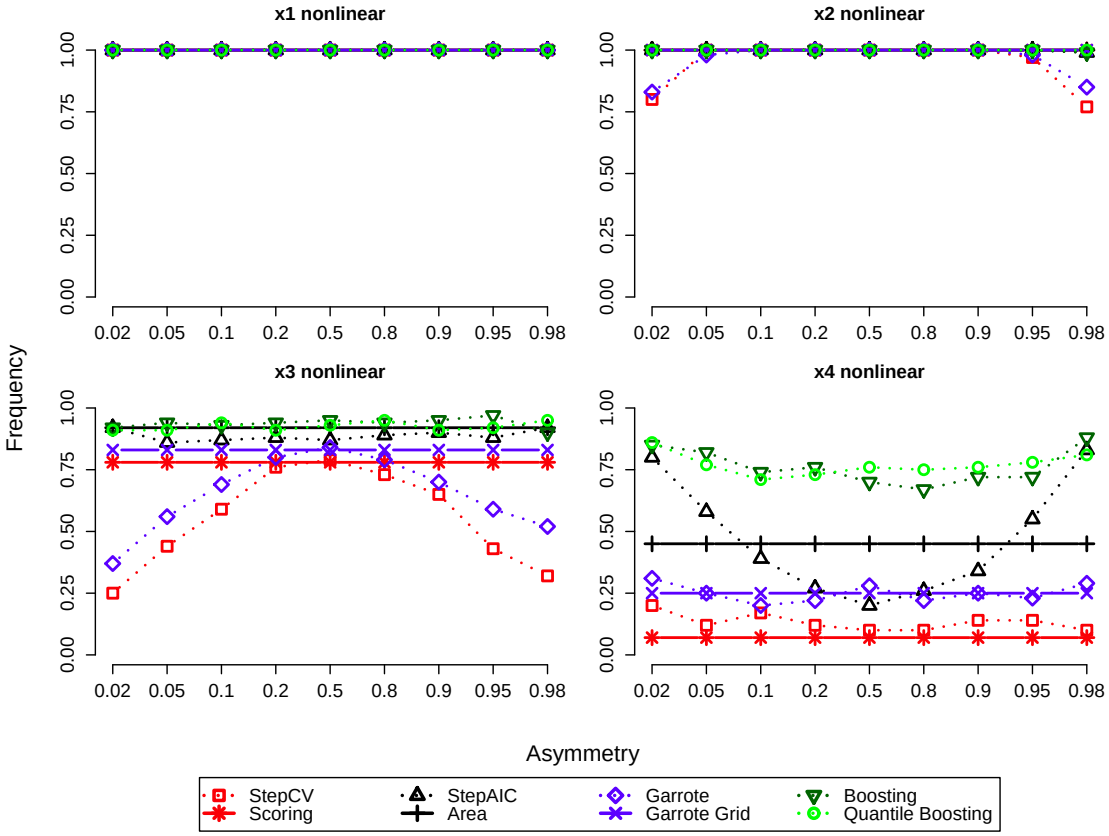


Figure A.7: Frequency of selected models for parallel design with n=2000 and selection as nonlinear or no effect

**(b) Linear design**

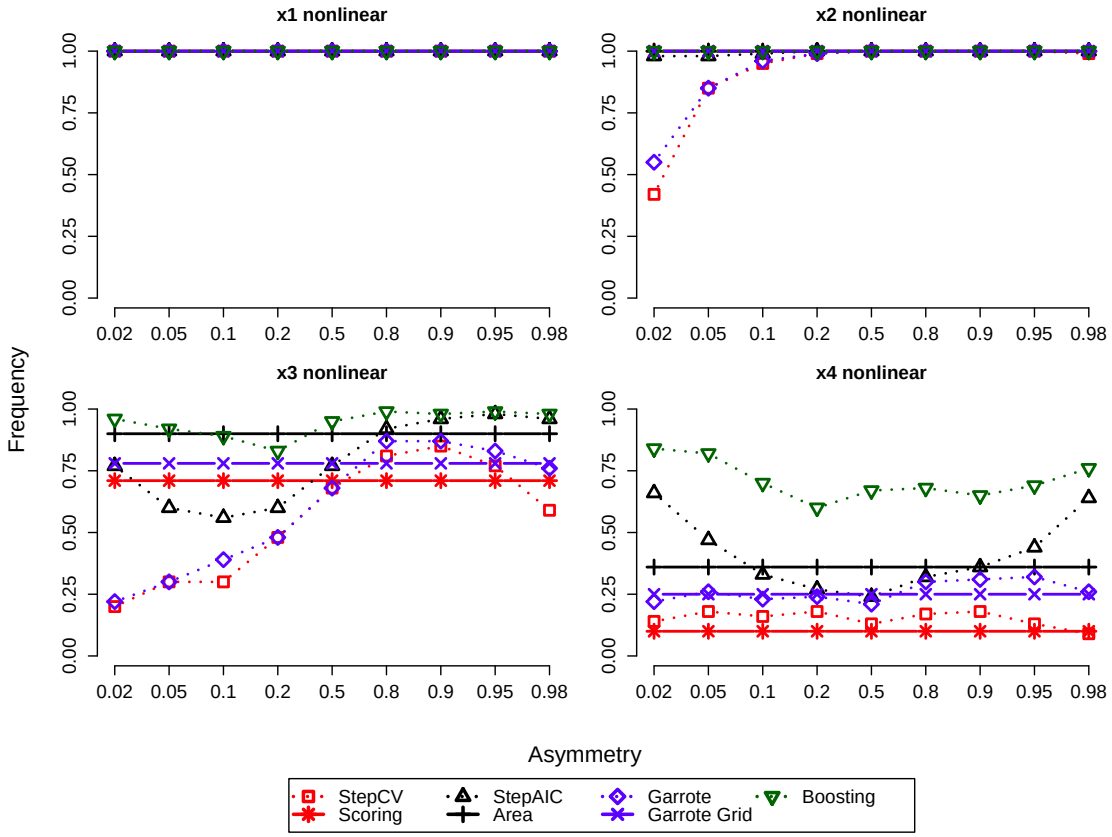


Figure A.8: Frequency of selected models for linear design with n=2000 and selection as nonlinear or no effect

## (c) Exponential design

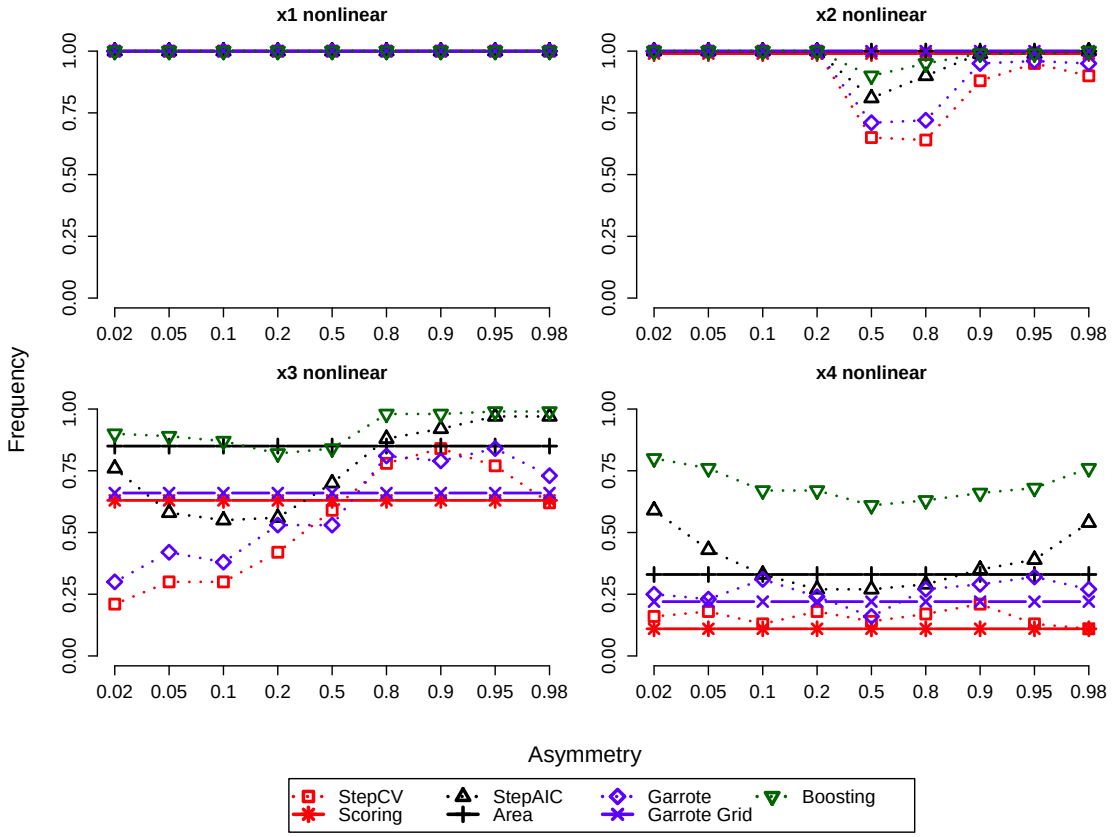


Figure A.9: Frequency of selected models for exponential design with n=2000 and selection as nonlinear or no effect

### iv.) Linear vs. no effect

#### (a) Parallel design

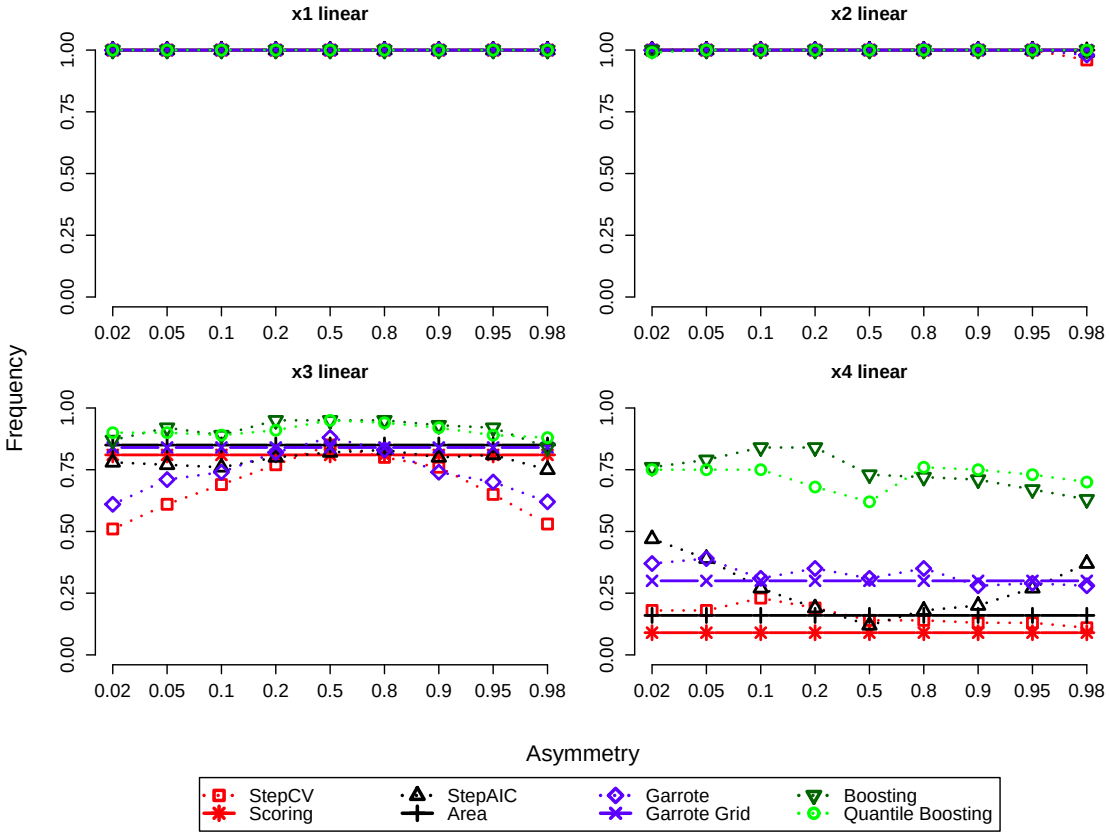


Figure A.10: Frequency of selected models for parallel design with n=2000 and selection as linear or no effect

**(b) Linear design**

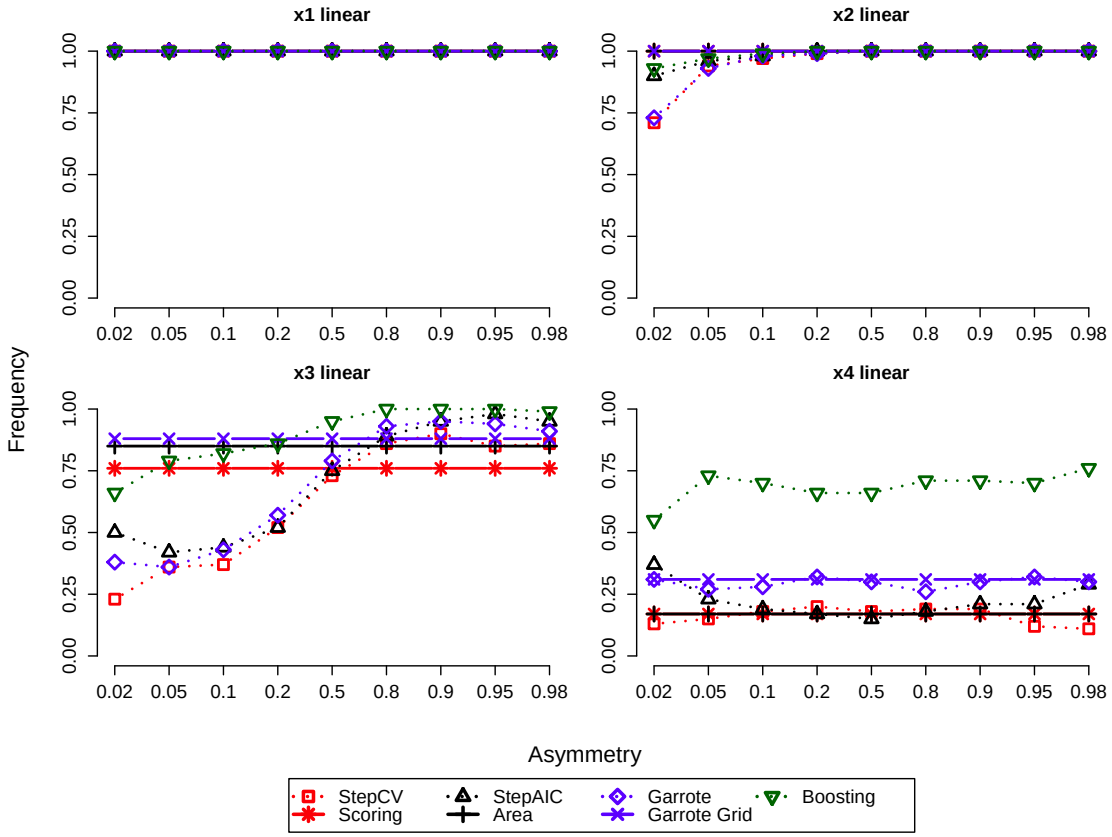


Figure A.11: Frequency of selected models for linear design with n=2000 and selection as linear or no effect

## (c) Exponential design

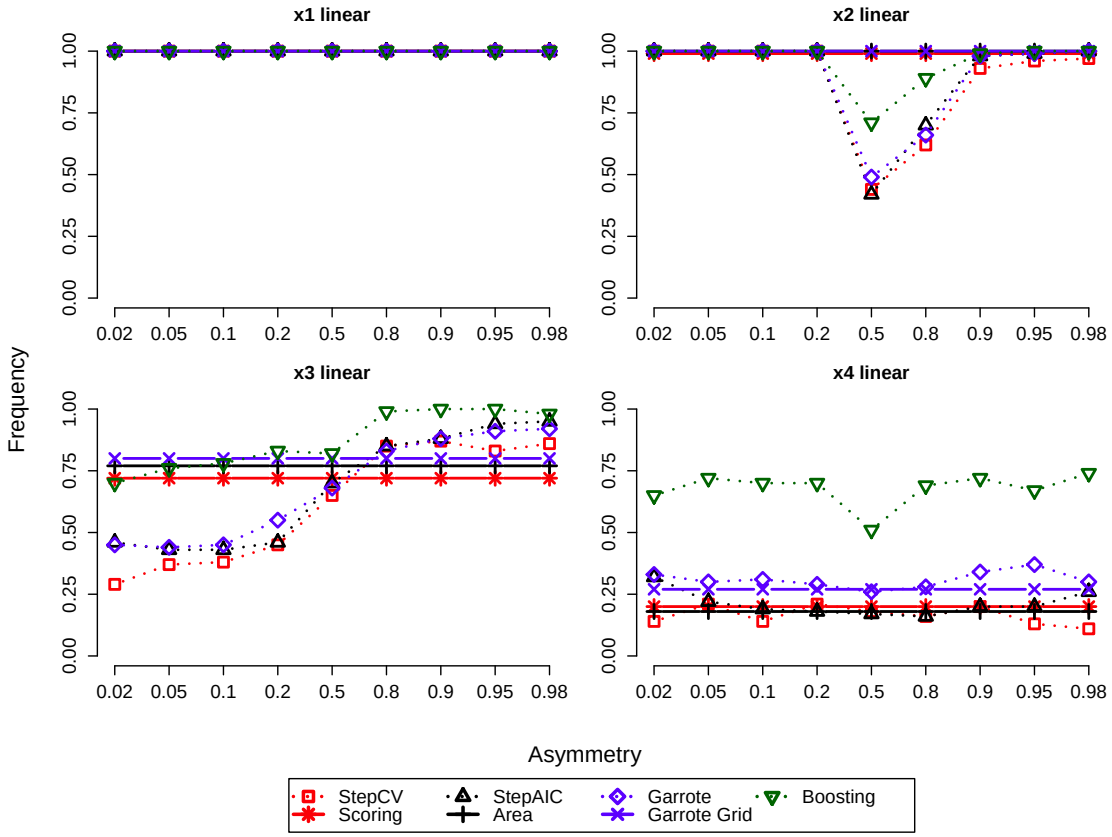


Figure A.12: Frequency of selected models for exponential design with n=2000 and selection as linear or no effect

## 2 n=500

### i.) Decomposition into linear and nonlinear effect

#### (a) Parallel design

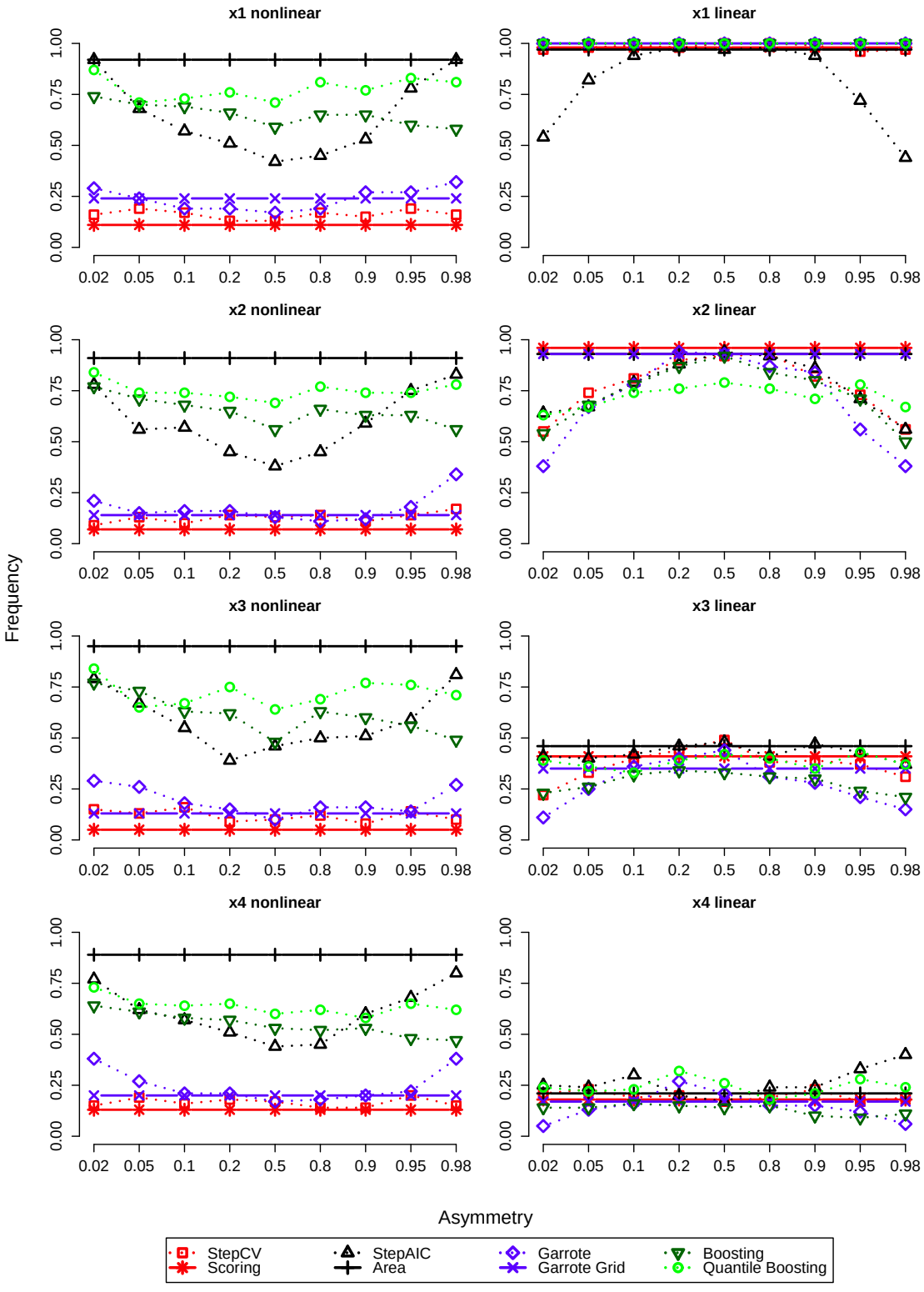


Figure A.13: Frequency of selected models for parallel design with n=500 and decomposition into linear and nonlinear effect

**(b) Linear design**

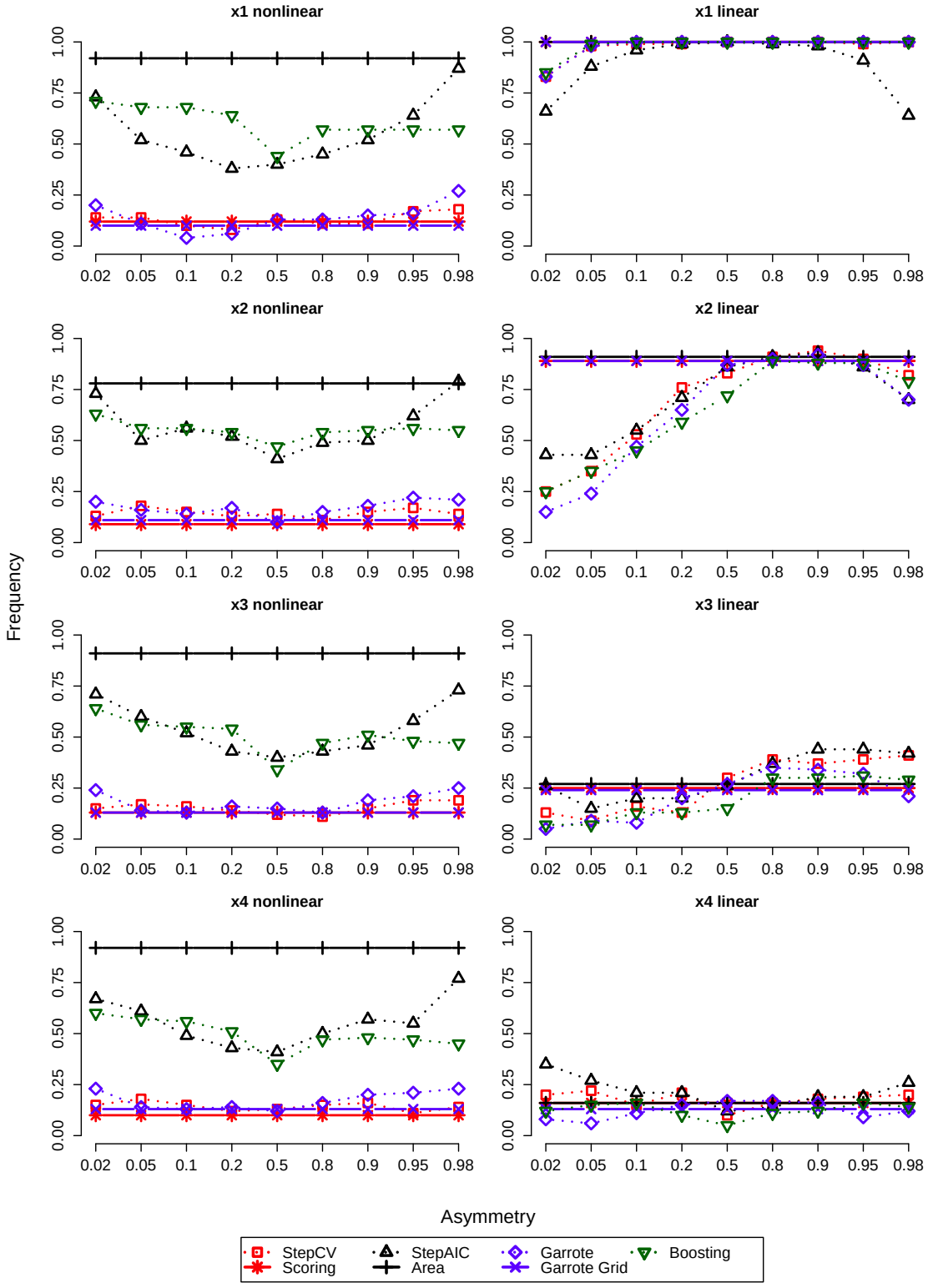


Figure A.14: Frequency of selected models for linear design with n=500 and decomposition into linear and nonlinear effect

### (c) Exponential design

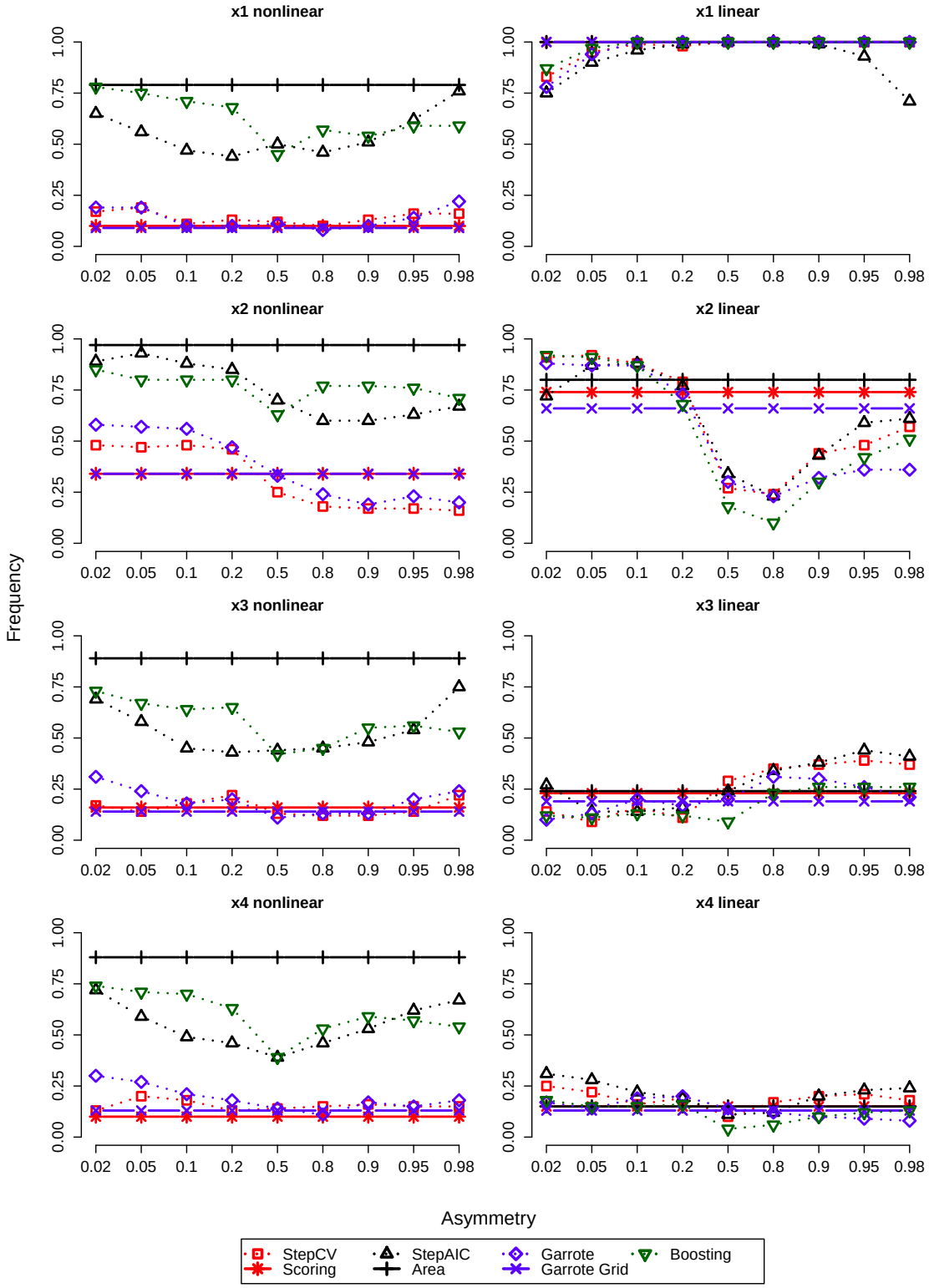


Figure A.15: Frequency of selected models for exponential design with n=500 and decomposition into linear and nonlinear effect

## ii.) Nonlinear vs. linear vs. no effect

### (a) Parallel design

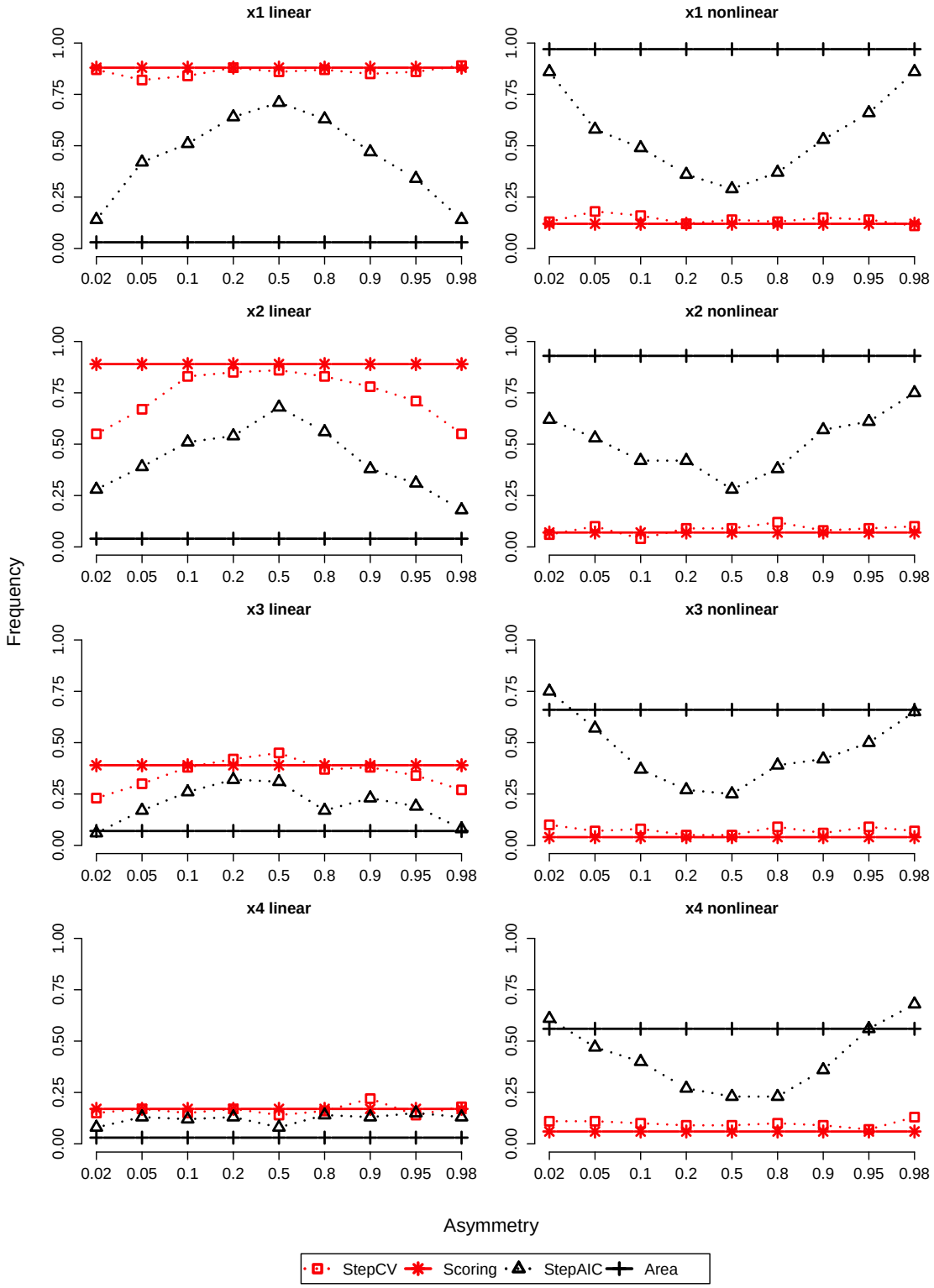


Figure A.16: Frequency of selected models for parallel design with n=500 and restricted selection of P-splines

**(b) Linear design**

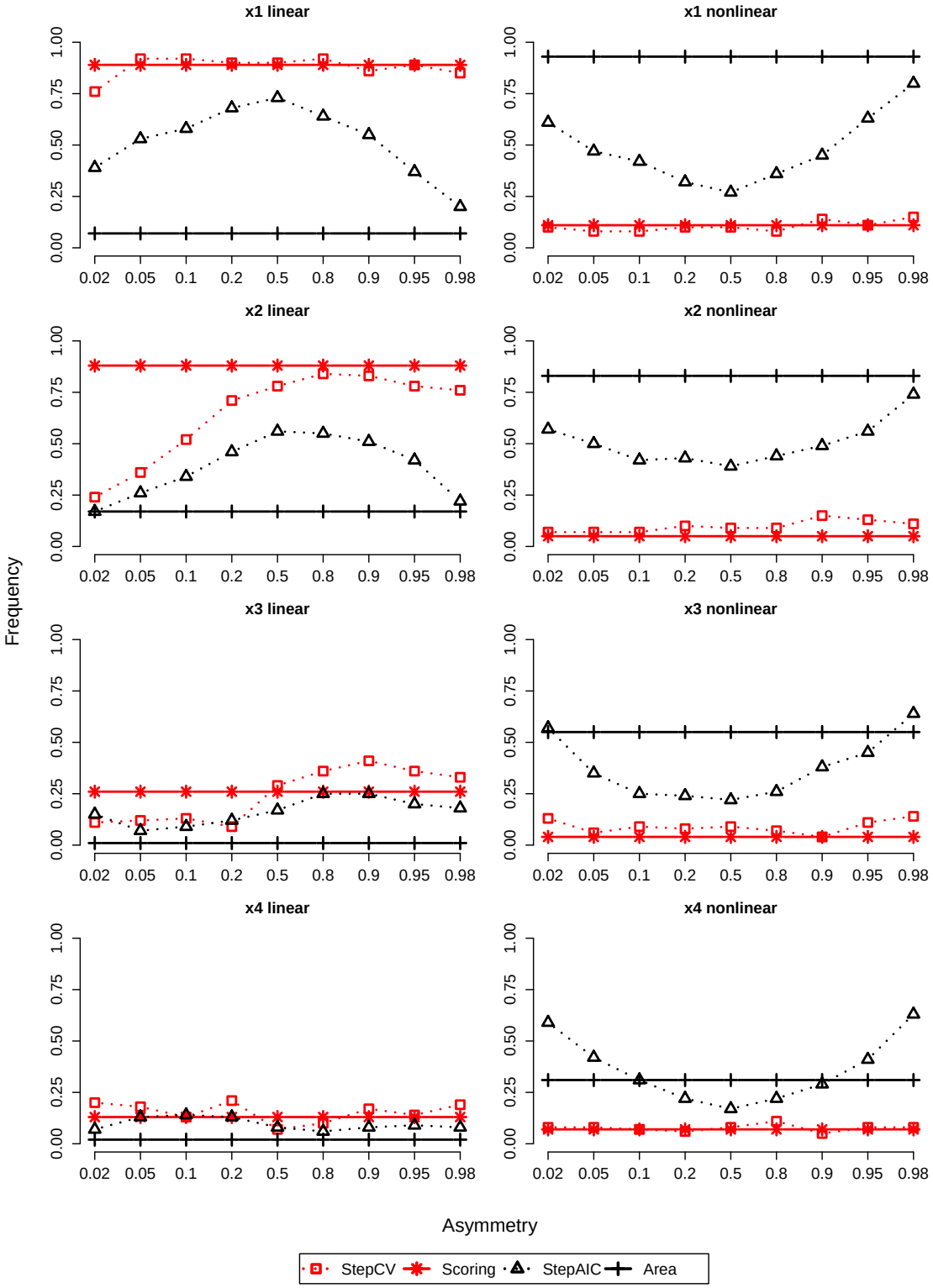


Figure A.17: Frequency of selected models for linear design with n=500 and restricted selection of P-splines

**(c) Exponential design**

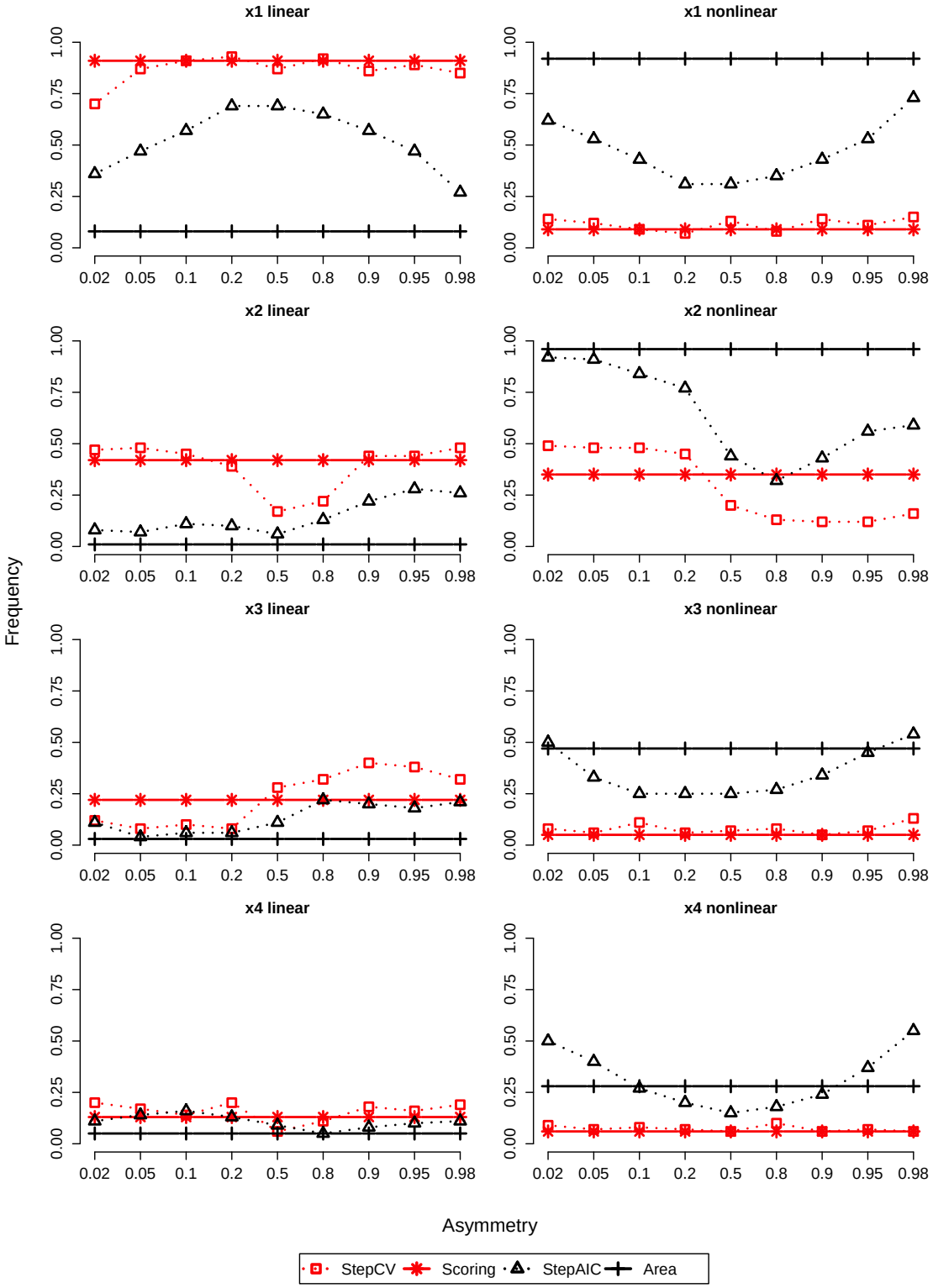


Figure A.18: Frequency of selected models for exponential design with n=500 and restricted selection of P-splines

### iii.) Nonlinear vs. no effect

#### (a) Parallel design

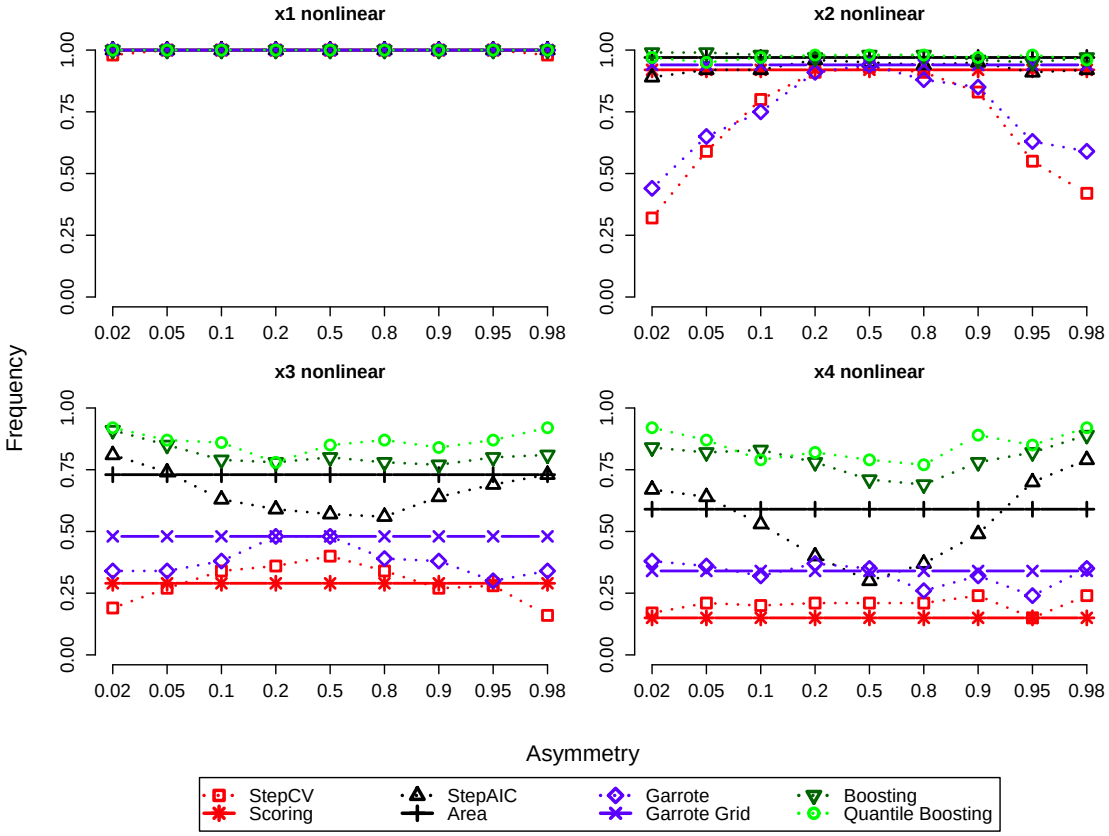


Figure A.19: Frequency of selected models for parallel design with n=500 and selection as nonlinear or no effect

**(b) Linear design**

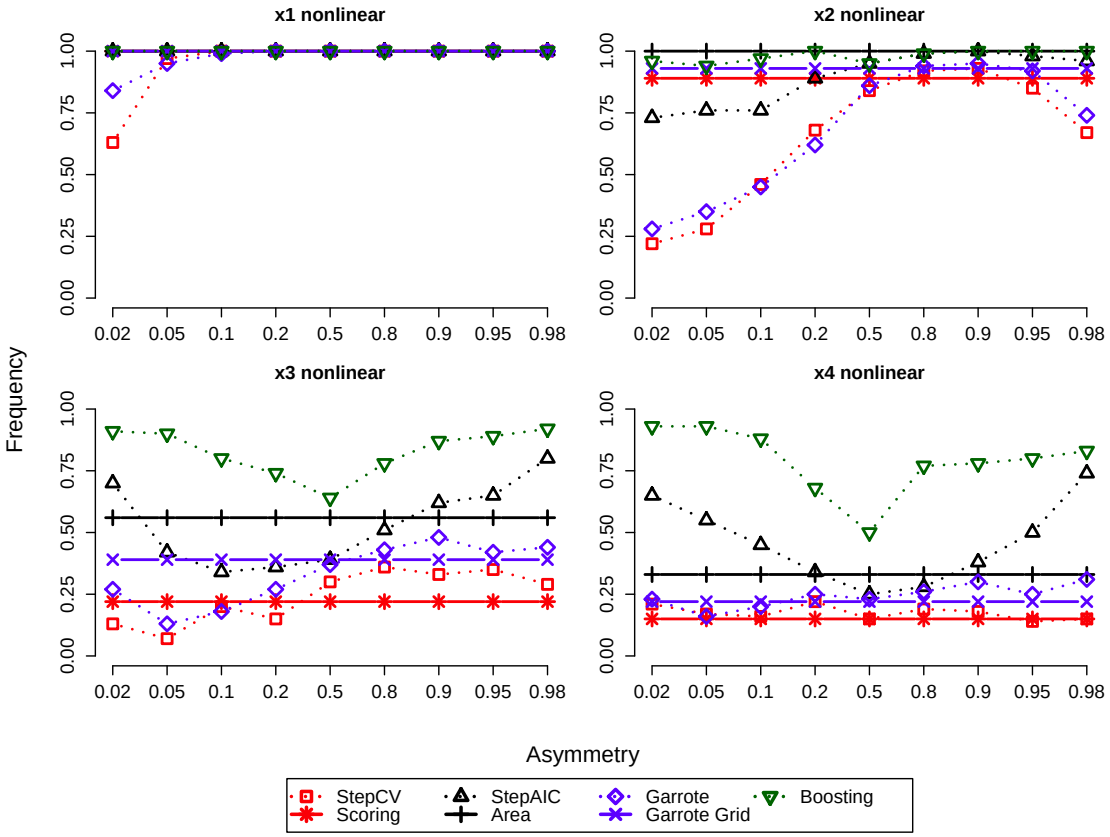


Figure A.20: Frequency of selected models for linear design with n=500 and selection as nonlinear or no effect

## (c) Exponential design

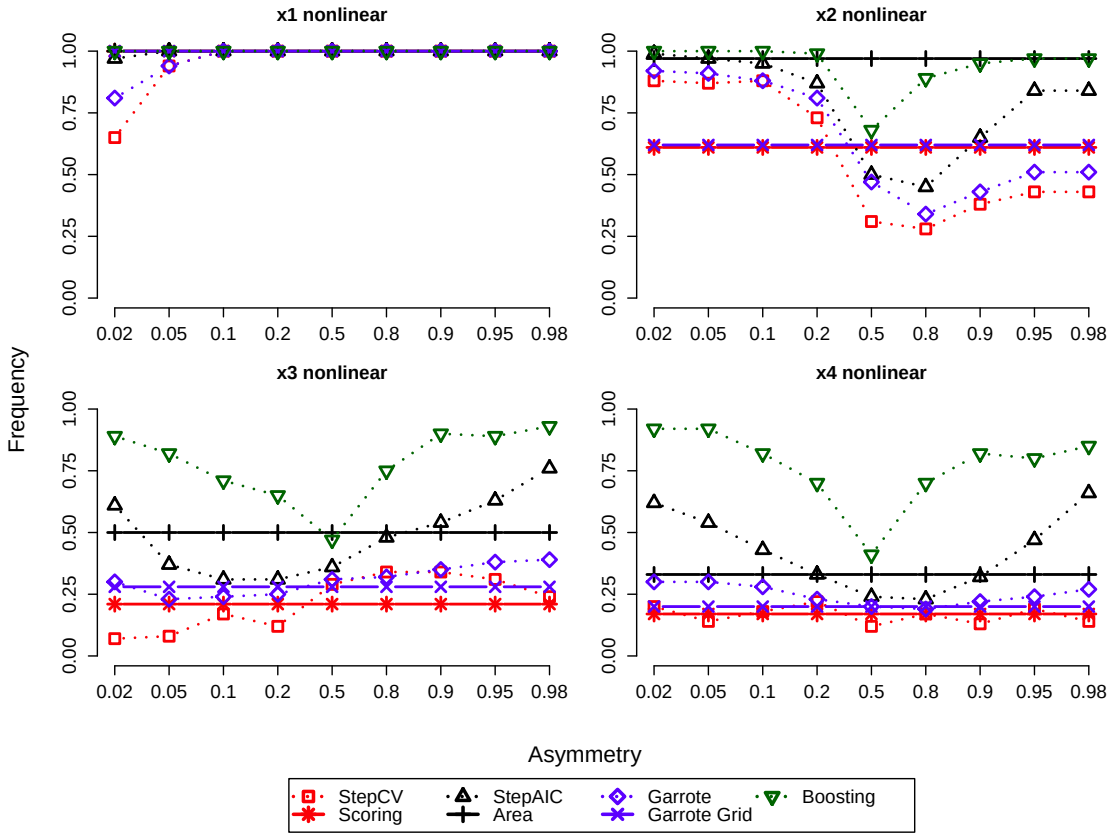


Figure A.21: Frequency of selected models for exponential design with n=500 and selection as nonlinear or no effect

### iv.) Linear vs. no effect

#### (a) Parallel design

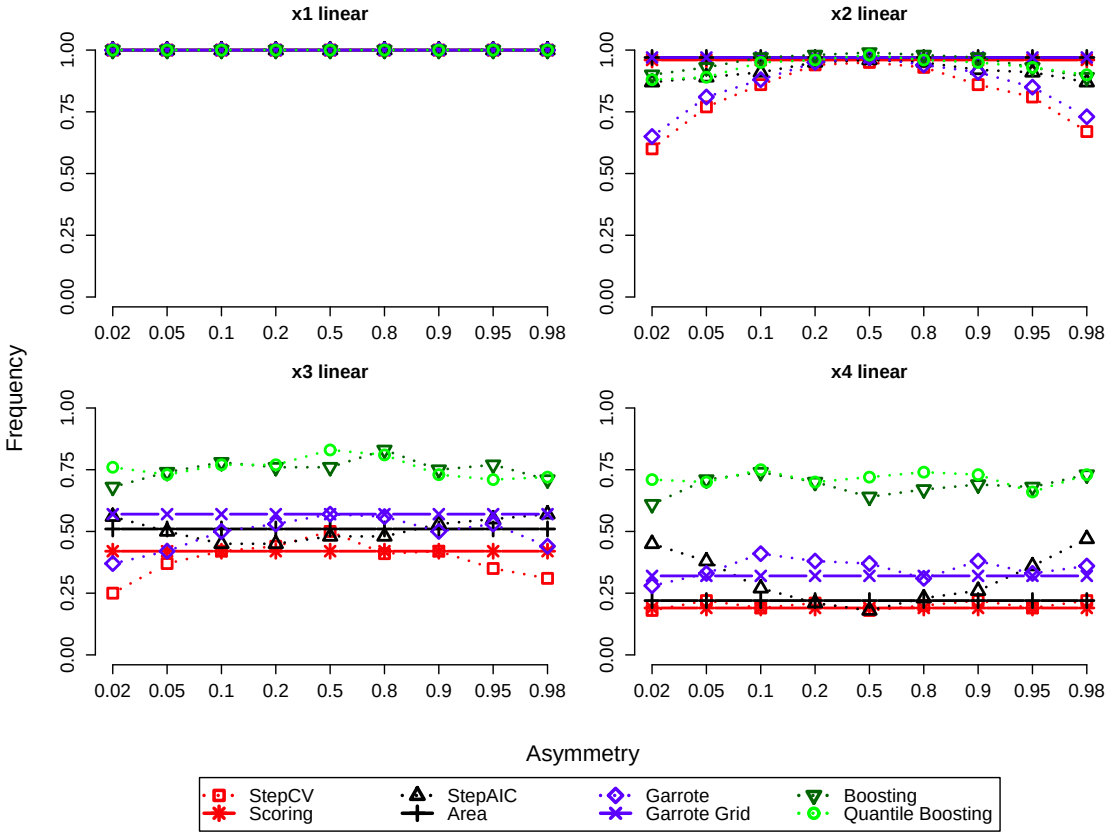


Figure A.22: Frequency of selected models for parallel design with n=500 and selection as linear or no effect

**(b) Linear design**

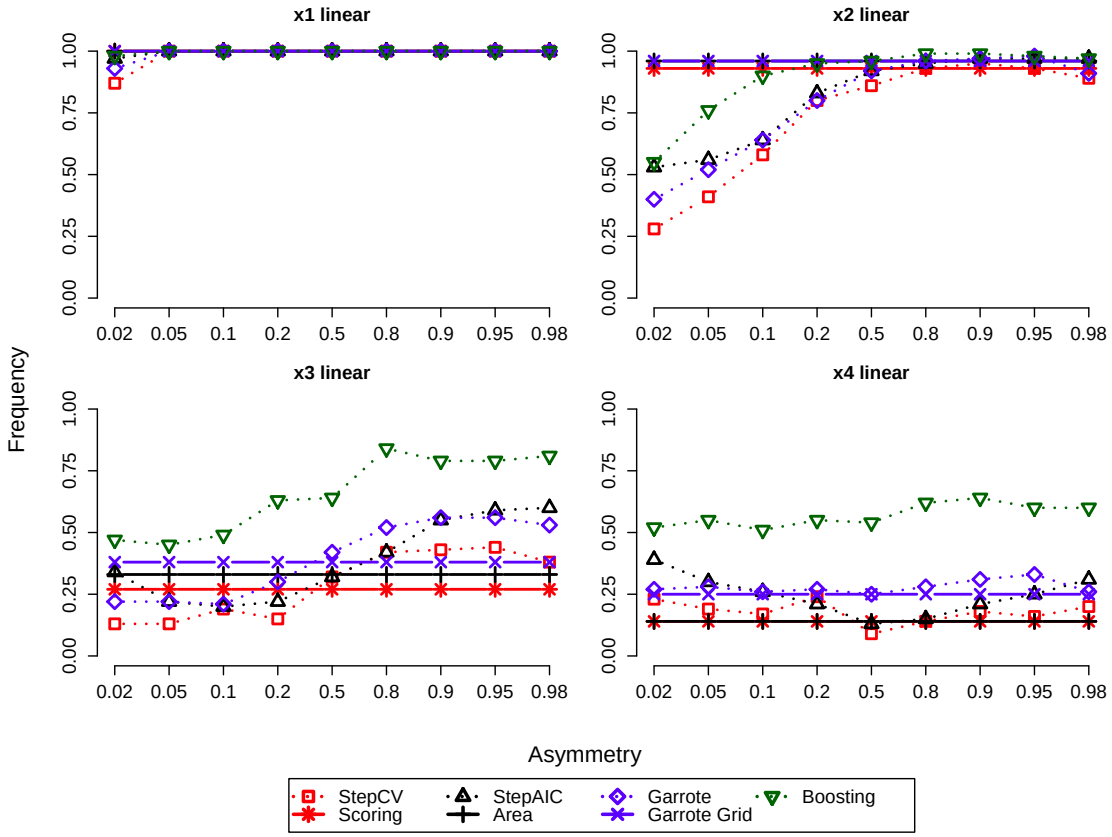


Figure A.23: Frequency of selected models for linear design with n=500 and selection as linear or no effect

## (c) Exponential design

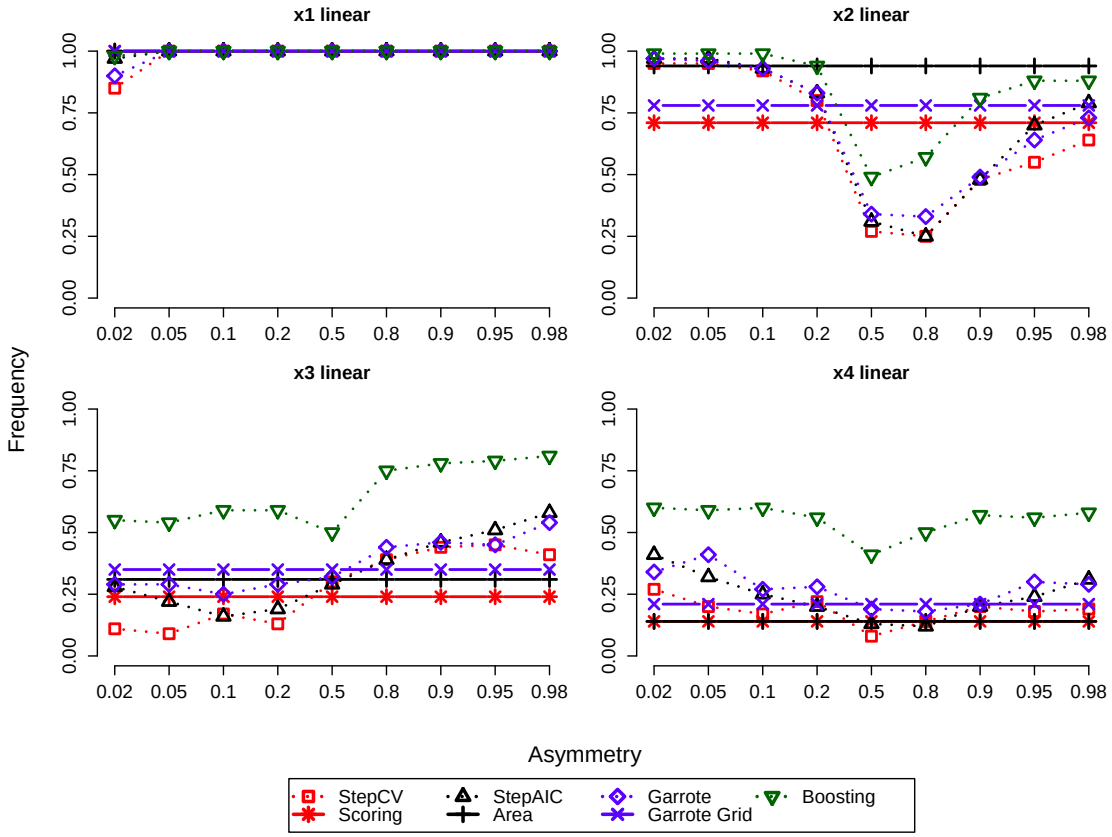


Figure A.24: Frequency of selected models for exponential design with n=500 and selection as linear or no effect

# Part II
# Application

## 3 Selection results for all approaches

### i.) Cross-validation and scoring

| Covariate | Type | 0.02 | 0.05 | 0.1 | 0.2 | 0.5 | 0.8 | 0.9 | 0.95 | 0.98 | grid |
|---|---|---|---|---|---|---|---|---|---|---|---|
| birth order | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| caesarian | | ■ | ■ | | | | | | | | |
| dead children | | ■ | | | | | | | | | |
| household head | | | | | | | | | | | |
| household members | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's education | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ |
| partner's education | | | | | | ■ | ■ | ■ | ■ | ■ | ■ |
| sex | | ■ | ■ | ■ | ■ | ■ | | | ■ | ■ | ■ |
| bicycle | | | | | | | | | | | |
| electricity | | | | | | | | ■ | | | |
| motorcycle | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| radio | | | | | | | | | | | |
| refrigerator | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| telephone | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| television | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| breastfeeding | linear | | | | | | | | | | |
| breastfeeding | nonlinear | | | | | ■ | ■ | ■ | ■ | ■ | ■ |
| child's age | linear | | | | ■ | | ■ | ■ | ■ | ■ | ■ |
| child's age | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's age | linear | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's age | nonlinear | | ■ | ■ | ■ | ■ | | | ■ | ■ | |
| mother's bmi | linear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's bmi | nonlinear | | | | | | | | | | |
| mother's height | linear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's height | nonlinear | ■ | ■ | | | | | | | | |
| region | GMRF | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

Table A.1: Selected covariates for stepwise forward selection with 10-fold cross-validation and scoring

## ii.) Stepwise AIC and area under the AIC curve

| Covariate | Type | 0.02 | 0.05 | 0.1 | 0.2 | 0.5 | 0.8 | 0.9 | 0.95 | 0.98 | grid |
|---|---|---|---|---|---|---|---|---|---|---|---|
| birth order | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| caesarian | | ■ | ■ | | | | | | ■ | ■ | |
| dead children | | | | | | | | | | | |
| household head | | | | | | | | | | | |
| household members | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's education | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| partner's education | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| sex | | ■ | ■ | ■ | ■ | ■ | | | ■ | ■ | ■ |
| bicycle | | | | | | | | | | | |
| electricity | | | | | | | | ■ | ■ | ■ | |
| motorcycle | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| radio | | ■ | | | | | | | | | |
| refrigerator | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| telephone | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| television | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| breastfeeding | linear | | | | | | | | | | |
| breastfeeding | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| child's age | linear | | | | | ■ | ■ | ■ | ■ | | ■ |
| child's age | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's age | linear | | | | | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's age | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's bmi | linear | ■ | ■ | ■ | ■ | ■ | ■ | | | | ■ |
| mother's bmi | nonlinear | | | | | | | ■ | ■ | ■ | ■ |
| mother's height | linear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ |
| mother's height | nonlinear | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ |
| region | GMRF | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

Table A.2: Selected covariates with stepwise forward selection with AIC and area under the AIC curve

### iii.) Non-negative garrote and non-negative garrote on the grid

| Covariate | Type | 0.02 | 0.05 | 0.1 | 0.2 | 0.5 | 0.8 | 0.9 | 0.95 | 0.98 | grid |
|---|---|---|---|---|---|---|---|---|---|---|---|
| birth order | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| caesarian | | ■ | ■ | | | | | ■ | ■ | ■ | |
| dead children | | | | | | | | | | | |
| household head | | | | | | | | | | | |
| household members | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's education | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| partner's education | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| sex | | ■ | ■ | ■ | ■ | ■ | | | ■ | ■ | ■ |
| bicycle | | | | | | | | | | | |
| electricity | | | | | | | | ■ | ■ | | |
| motorcycle | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| radio | | | ■ | | | | | | | | |
| refrigerator | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| telephone | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| television | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| breastfeeding | linear | | | | | | | | | | |
| breastfeeding | nonlinear | | | | | ■ | ■ | ■ | ■ | ■ | ■ |
| child's age | linear | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| child's age | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's age | linear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's age | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's bmi | linear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ |
| mother's bmi | nonlinear | | | | | | | | ■ | ■ | ■ |
| mother's height | linear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's height | nonlinear | ■ | ■ | ■ | | | | | ■ | ■ | |
| region | GMRF | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

Table A.3: Selected covariates with non-negative garrote and non-negative garrote on the grid

### iv.) Expectile Boosting

| Covariate | Type | 0.02 | 0.05 | 0.1 | 0.2 | 0.5 | 0.8 | 0.9 | 0.95 | 0.98 |
|---|---|---|---|---|---|---|---|---|---|---|
| birth order | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| caesarian | | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ |
| dead children | | | | | | ■ | ■ | | | |
| household head | | | | ■ | ■ | ■ | | | | |
| household members | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's education | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| partner's education | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| sex | | ■ | ■ | ■ | ■ | ■ | | | ■ | ■ |
| bicycle | | | | | | | | | | |
| electricity | | | | | | | | | | |
| motorcycle | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| radio | | | | | | | ■ | | | |
| refrigerator | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| telephone | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| television | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| breastfeeding | linear | | | | | | | | | |
| breastfeeding | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| child's age | linear | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| child's age | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's age | linear | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| mother's age | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's bmi | linear | | | | | ■ | ■ | ■ | | |
| mother's bmi | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's height | linear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's height | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| region | GMRF | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

Table A.4: Selected covariates with Boosting and maximal value $m_{stop}$ of 4000.

## v.) Quantile Boosting

| Covariate | Type | 0.07 | 0.13 | 0.19 | 0.29 | 0.5 | 0.71 | 0.81 | 0.87 | 0.93 |
|---|---|---|---|---|---|---|---|---|---|---|
| birth order | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| caesarian | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| dead children | | ■ | ■ | | ■ | | ■ | ■ | | |
| household head | | | ■ | ■ | | | | | | |
| household members | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's education | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| partner's education | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| sex | | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| bicycle | | | | | | ■ | | | | ■ |
| electricity | | | | | | | | | | |
| motorcycle | | | | | ■ | ■ | ■ | ■ | ■ | ■ |
| radio | | | | | | | ■ | | | |
| refrigerator | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| telephone | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| television | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| breastfeeding | linear | | | | | | | | | |
| breastfeeding | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| child's age | linear | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| child's age | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's age | linear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| mother's age | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's bmi | linear | | | ■ | ■ | ■ | ■ | ■ | | |
| mother's bmi | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's height | linear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's height | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| region | GMRF | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

Table A.5: Selected covariates via Quantile Boosting and maximal value $m_{stop}$ of 4000. The asymmetry levels are transformed under the assumption of an underlying Gaussian distribution. Then these results should coincide with the results of Expectile Boosting based on the original asymmetry levels.

### vi.) Selection based on confidence intervals

| Covariate | Type | 0.02 | 0.05 | 0.1 | 0.2 | 0.5 | 0.8 | 0.9 | 0.95 | 0.98 |
|---|---|---|---|---|---|---|---|---|---|---|
| birth order | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| caesarian | | ■ | | | | | | | | |
| dead children | | | | | | | | | | |
| household head | | | | | | | | | | |
| household members | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's education | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| partner's education | | | | | | ■ | ■ | ■ | ■ | ■ |
| sex | | ■ | ■ | ■ | ■ | | | | | |
| bicycle | | | | | | | | | | |
| electricity | | | | | | | | | | |
| motorcycle | | | | | | ■ | ■ | ■ | ■ | ■ |
| radio | | | | | | | | | | |
| refrigerator | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| telephone | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| television | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| breastfeeding | linear | | | | | | | | | |
| breastfeeding | nonlinear pointwise | | | | ■ | ■ | ■ | ■ | ■ | ■ |
| breastfeeding | nonlinear SCB | | | | | | | | | |
| child's age | linear | | | | ■ | ■ | ■ | ■ | ■ | ■ |
| child's age | nonlinear pointwise | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| child's age | nonlinear SCB | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's age | linear | | | | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's age | nonlinear pointwise | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's age | nonlinear SCB | | | | | | | | | |
| mother's bmi | linear | ■ | ■ | ■ | ■ | ■ | | | | |
| mother's bmi | nonlinear pointwise | | | | | | | ■ | ■ | ■ |
| mother's bmi | nonlinear SCB | | | | | | | | | |
| mother's height | linear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's height | nonlinear pointwise | | ■ | ■ | | | | | | |
| mother's height | nonlinear SCB | | | | | | | | | |
| region | GMRF | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

Table A.6: Selected covariates based on bootstrap confidence intervals, with 2000 bootstrap replications. The nonlinear functions are treated with simultaneous (SCB) and pointwise confidence intervals.

### vii.) Standard scoring vs. weighted scoring

| Covariate | Type | standard | weighted |
|---|---|---|---|
| birth order | | ■ | ■ |
| caesarian | | | |
| dead children | | | |
| household head | | | |
| household members | | ■ | ■ |
| mother's education | | ■ | ■ |
| partner's education | | ■ | ■ |
| sex | | ■ | ■ |
| bicycle | | | |
| electricity | | | |
| motorcycle | | ■ | ■ |
| radio | | | |
| refrigerator | | ■ | ■ |
| telephone | | ■ | ■ |
| television | | ■ | ■ |
| breastfeeding | linear | | |
| breastfeeding | nonlinear | ■ | ■ |
| child's age | linear | ■ | ■ |
| child's age | nonlinear | ■ | ■ |
| mother's age | linear | ■ | ■ |
| mother's age | nonlinear | | ■ |
| mother's bmi | linear | ■ | ■ |
| mother's bmi | nonlinear | | |
| mother's height | linear | ■ | ■ |
| mother's height | nonlinear | | |
| region | GMRF | ■ | ■ |

Table A.7: Comparison of selected covariates via 10-fold scoring, unweighted and with a weight of 10 for all asymmetries smaller than 0.11

### viii.) Stepwise backward CV after scoring

| Covariate | Type | 0.02 | 0.05 | 0.1 | 0.2 | 0.5 | 0.8 | 0.9 | 0.95 | 0.98 |
|---|---|---|---|---|---|---|---|---|---|---|
| birth order | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| household members | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's education | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| partner's education | | | | | | ■ | ■ | ■ | ■ | ■ |
| sex | | ■ | ■ | ■ | ■ | ■ | | | ■ | ■ |
| motorcycle | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| refrigerator | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| telephone | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| television | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| breastfeeding | nonlinear | | ■ | | | ■ | ■ | ■ | ■ | ■ |
| child's age | linear | | ■ | ■ | ■ | | ■ | ■ | ■ | ■ |
| child's age | nonlinear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's age | linear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's bmi | linear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| mother's height | linear | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| region | GMRF | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

Table A.8: Selected covariates with backward 10-fold CV after scoring

# 4 Estimated regional effects for all used asymmetries

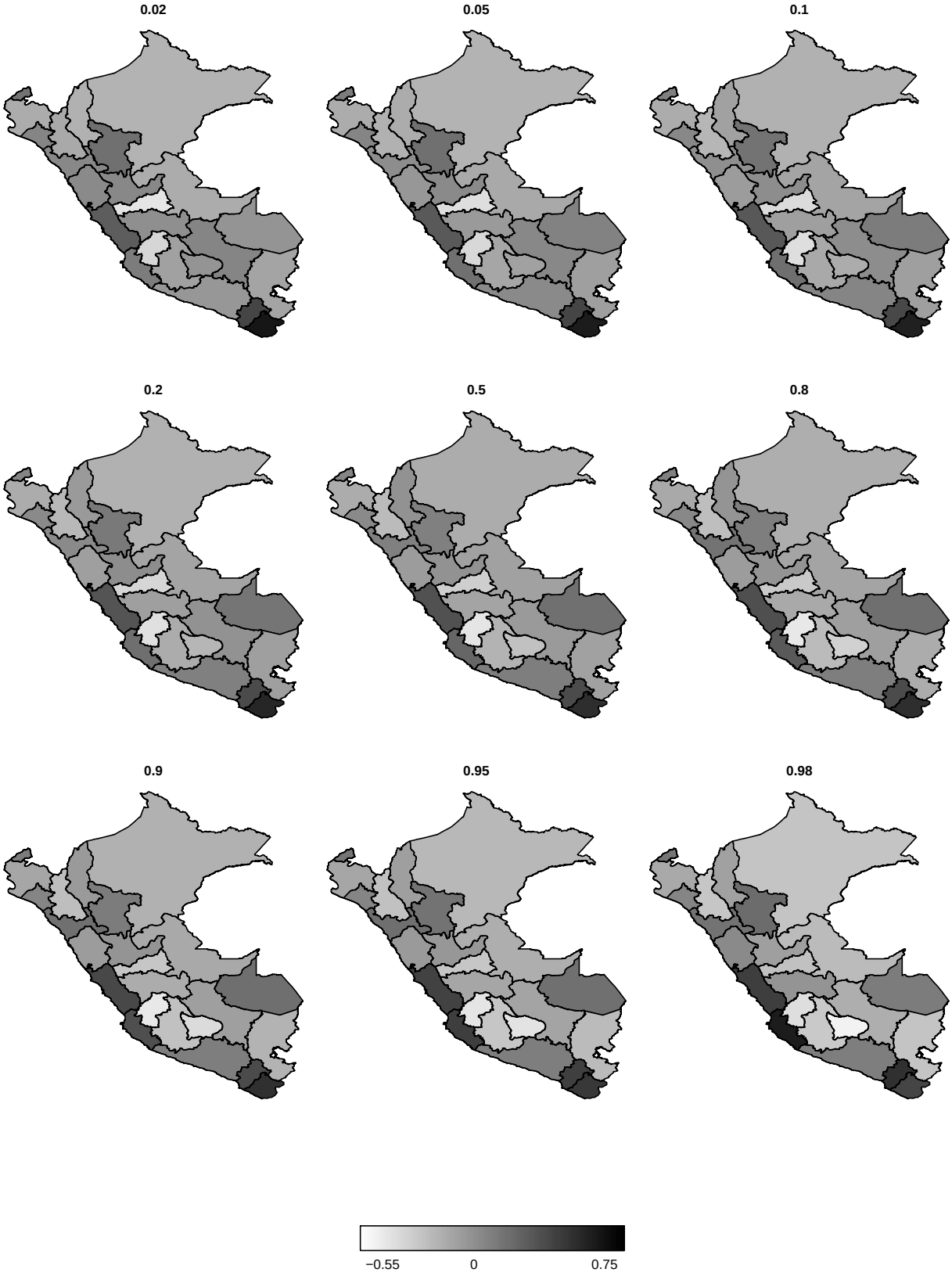


Figure A.25: Estimated coefficients of regional information for the best model selected via scoring