

Figure 1: timing-pattern

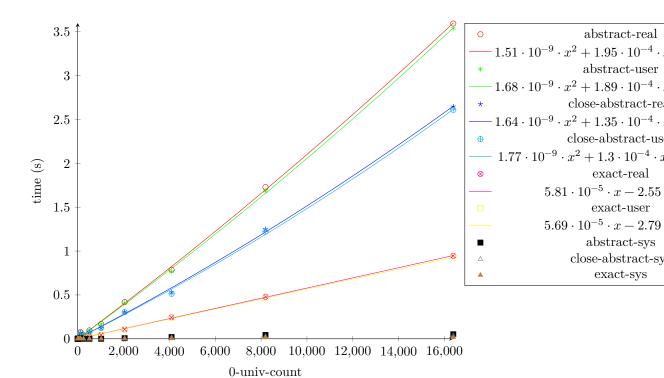


Figure 2: timing-n-polymorphic-universes param-1-n 0

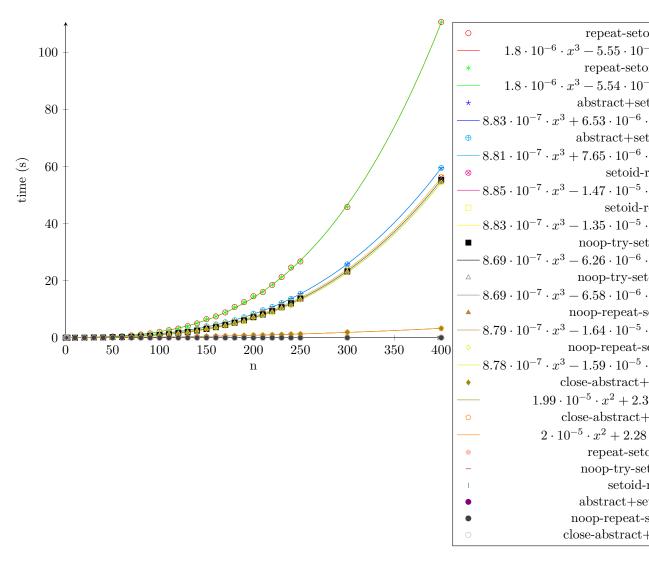


Figure 3: timing-repeat-setoid-rewrite-under-binders

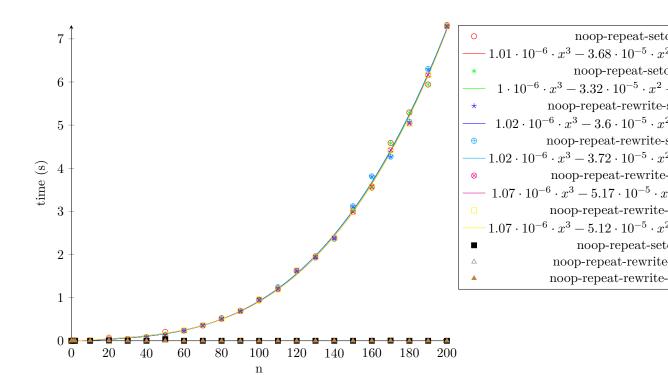


Figure 4: timing-repeat-setoid-rewrite-under-binders-noop

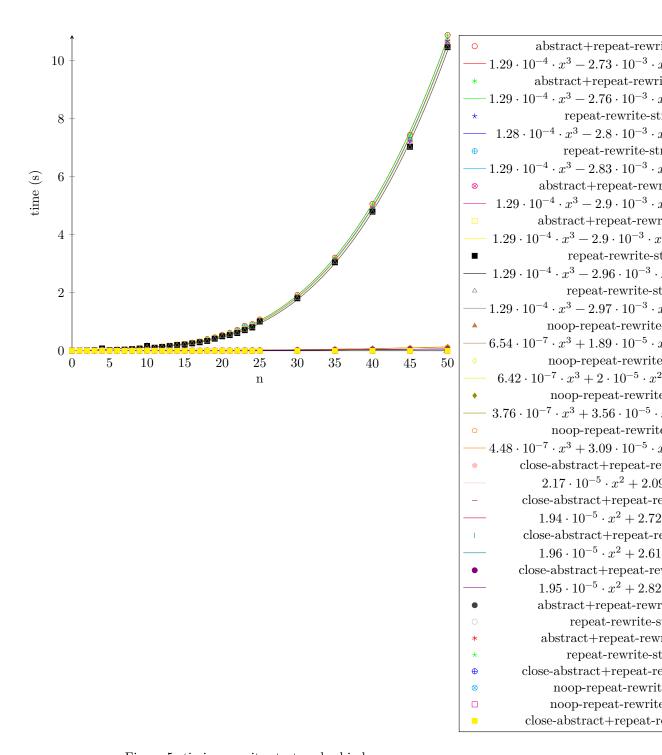
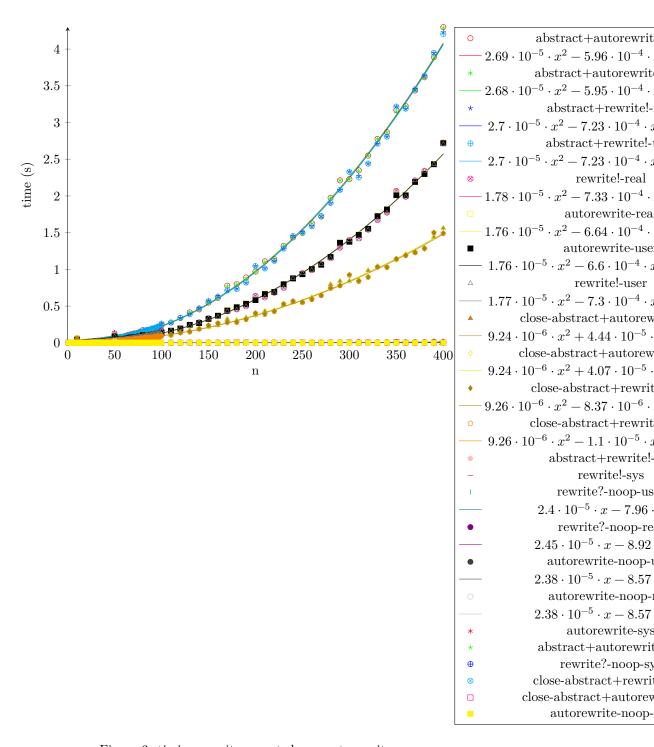


Figure 5: timing-rewrite-strat-under-binders



 $Figure \ 6: \ timing-rewrite-repeated-app-autorewrite \\$ 

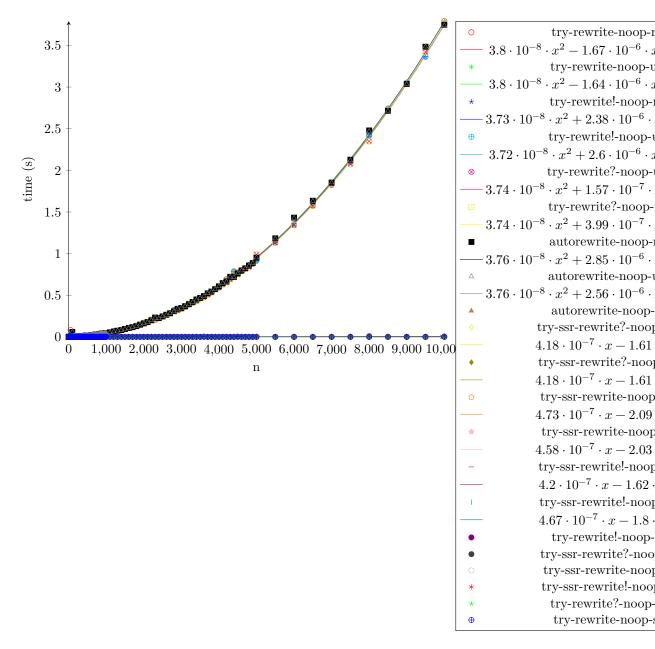


Figure 7: timing-rewrite-repeated-app-autorewrite-noop

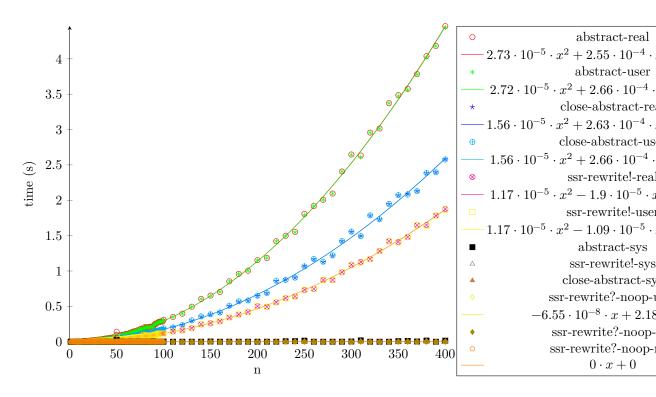


Figure 8: timing-rewrite-repeated-app-ssrrewrite

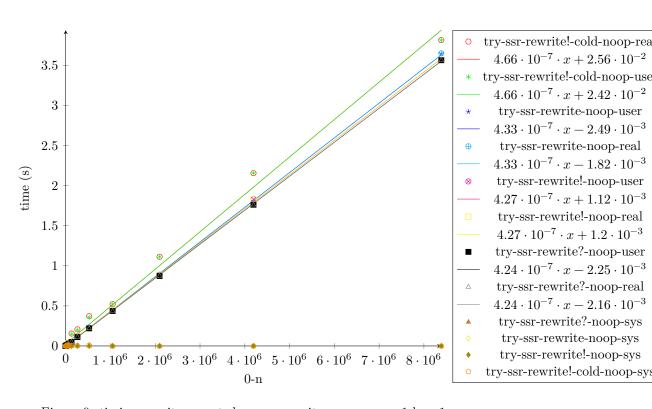


Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn  $\ 1$ 

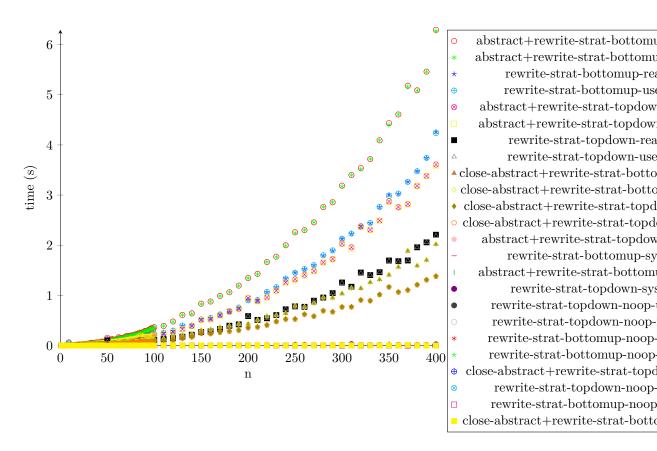


Figure 10: timing-rewrite-repeated-app-rewrite-strat

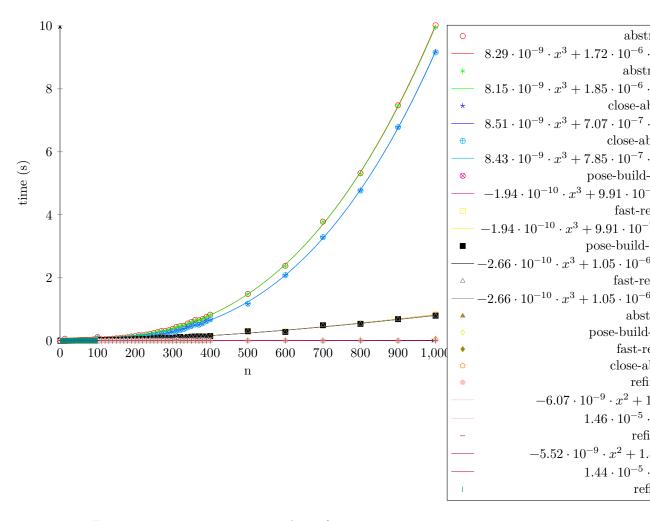
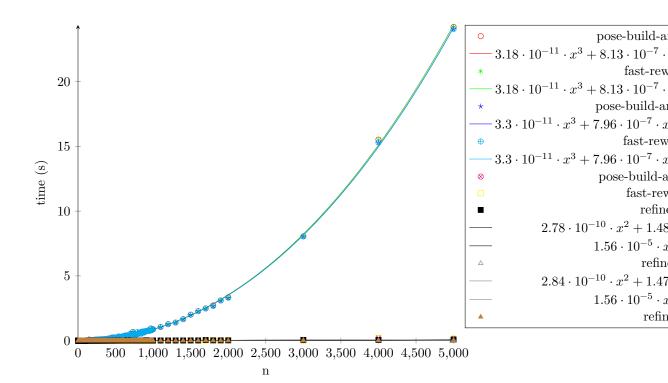
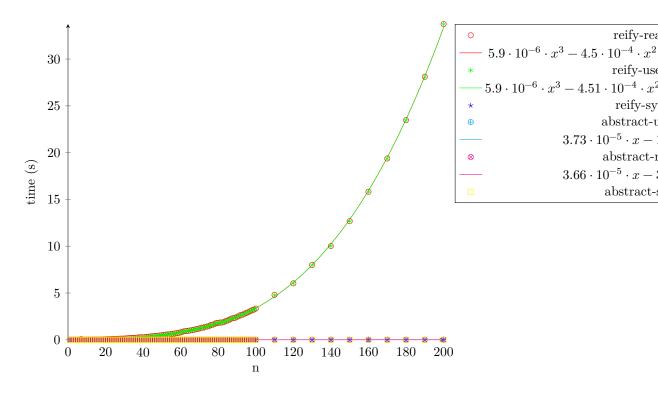


Figure 11: timing-rewrite-repeated-app-fast-rewrite



 $Figure~12:~timing\mbox{-rewrite-repeated-app-fast-rewrite-no-abstract}$ 



 ${\bf Figure~13:~timing-type class-reification-let-in-HOAS}$ 

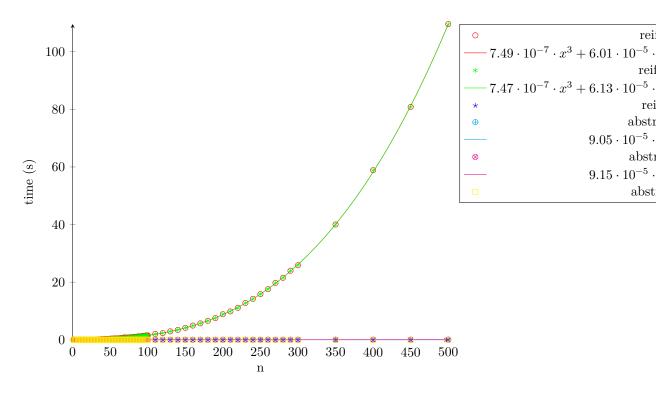
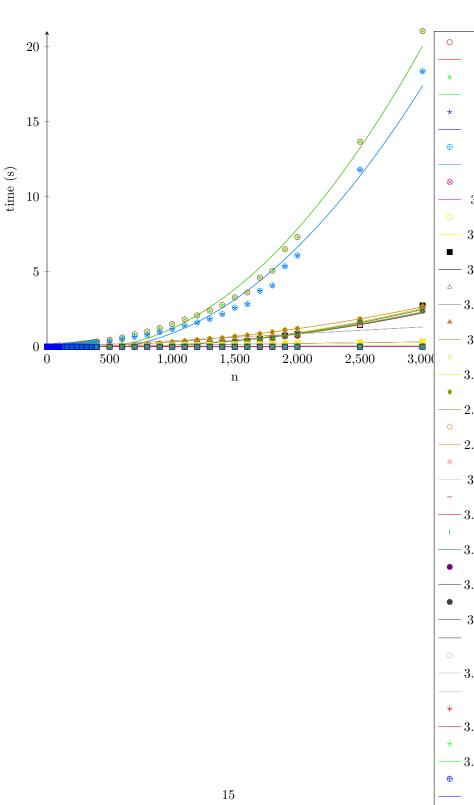


Figure 14: timing-typeclass-reification-let-in-PHOAS



 $2.79 \cdot 10^{-6} \cdot x^2 - 1.73 \cdot 10^{-6}$  $2.79 \cdot 10^{-6} \cdot x^2 - 1.74 \cdot 10^{-6}$  $2.5 \cdot 10^{-6} \cdot x^2 - 1.77 \cdot 10^{-3}$  $2.5 \cdot 10^{-6} \cdot x^2 - 1.77 \cdot 10^{-3}$  $3.9\cdot 10^{-7}\cdot x^2 - 3.2\cdot 10^{-4}\cdot x$  $3.91 \cdot 10^{-7} \cdot x^2 - 3.2 \cdot 10^{-4} \cdot x$  $3.74 \cdot 10^{-7} \cdot x^2 - 3.04 \cdot 10^{-4}$  $3.74 \cdot 10^{-7} \cdot x^2 - 3.04 \cdot 10^{-4} \cdot x^2$  $3.9 \cdot 10^{-7} \cdot x^2 - 3.28 \cdot 10^{-4} \cdot x$  $3.91 \cdot 10^{-7} \cdot x^2 - 3.29 \cdot 10^{-4} \cdot x^2$  $2.84 \cdot 10^{-7} \cdot x^2 + 3.51 \cdot 10^{-5} \cdot x^2$  $2.84 \cdot 10^{-7} \cdot x^2 + 3.61 \cdot 10^{-5} \cdot x^2$  $3.3 \cdot 10^{-7} \cdot x^2 - 2.47 \cdot 10^{-4} \cdot x$  $3.29 \cdot 10^{-7} \cdot x^2 - 2.45 \cdot 10^{-4} \cdot x^2$  $3.39 \cdot 10^{-7} \cdot x^2 - 2.54 \cdot 10^{-4} \cdot x^2$  $3.39 \cdot 10^{-7} \cdot x^2 - 2.54 \cdot 10^{-4} \cdot x^2$  $3.37 \cdot 10^{-7} \cdot x^2 - 2.4 \cdot 10^{-4} \cdot x$ 

 $3.36 \cdot 10^{-7} \cdot x^2 - 2.39 \cdot 10^{-4} \cdot x^2$  $4.6 \cdot 10^{-4} \cdot x - 5.51 \cdot$ check-admit-real  $3.37 \cdot 10^{-7} \cdot x^2 - 2.46 \cdot 10^{-4} \cdot x^2$ check-admit-user  $3.37 \cdot 10^{-7} \cdot x^2 - 2.46 \cdot 10^{-4} \cdot x^2$ build-eval-thunk-u  $1.08 \cdot 10^{-4} \cdot x - 6.74$ build-eval-thunk-re  $1.08 \cdot 10^{-4} \cdot x - 5.52 \cdot$ build-thunk-user  $1.07 \cdot 10^{-4} \cdot x - 7.25$ build-thunk-real  $1.07 \cdot 10^{-4} \cdot x - 6.04$ shool. I ....

abstract-real

abstract-user

fast-rewrite-real

fast-rewrite-user

type-pf-cast-real

type-pf-cast-user

check-admit-cast-u

check-admit-cast-r

type-admit-real

type-admit-user

close-abstract-use

close-abstract-rea

check-pf-cast-use

check-pf-cast-rea

type-admit-cast-us

type-admit-cast-re

 $4.6 \cdot 10^{-4} \cdot x - 5.51 \cdot$ refine-real

refine-user