

Figure 1: timing-pattern

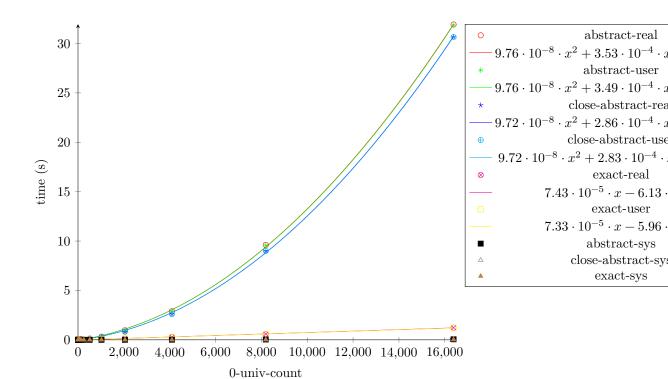


Figure 2: timing-n-polymorphic-universes param-1-n 0

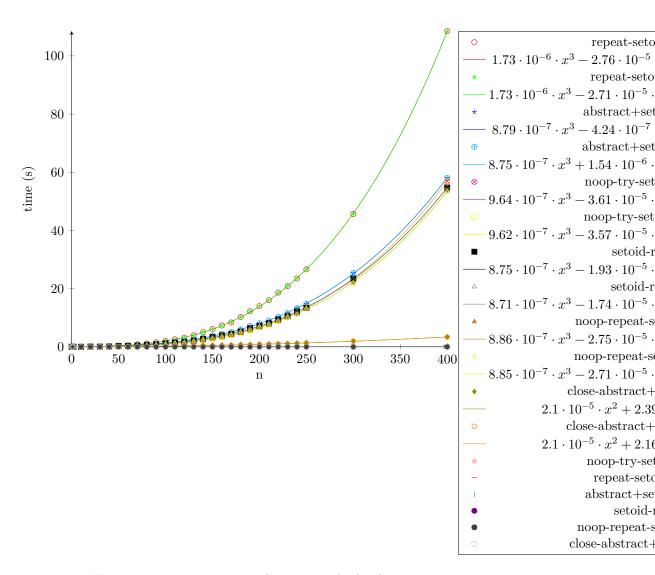


Figure 3: timing-repeat-setoid-rewrite-under-binders

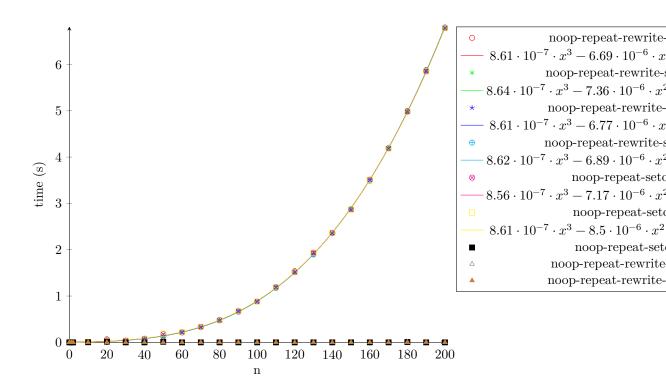


Figure 4: timing-repeat-setoid-rewrite-under-binders-noop

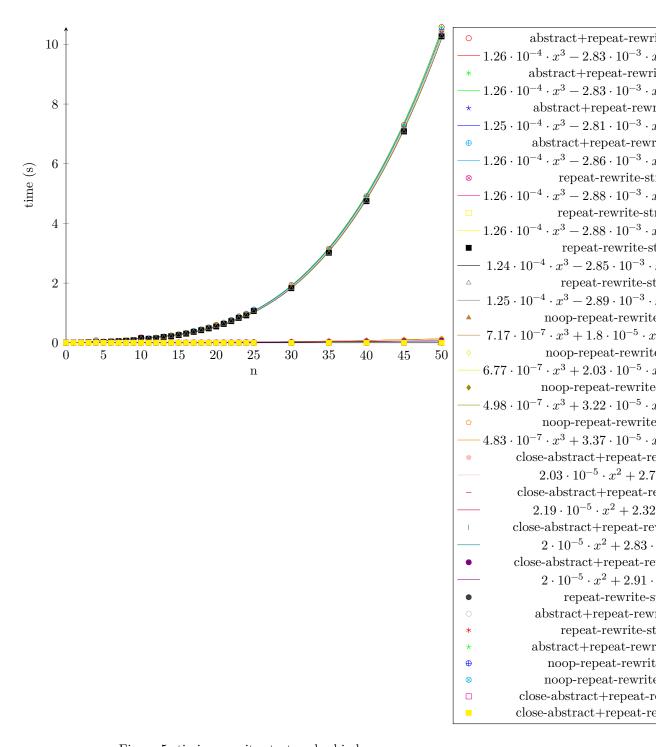


Figure 5: timing-rewrite-strat-under-binders

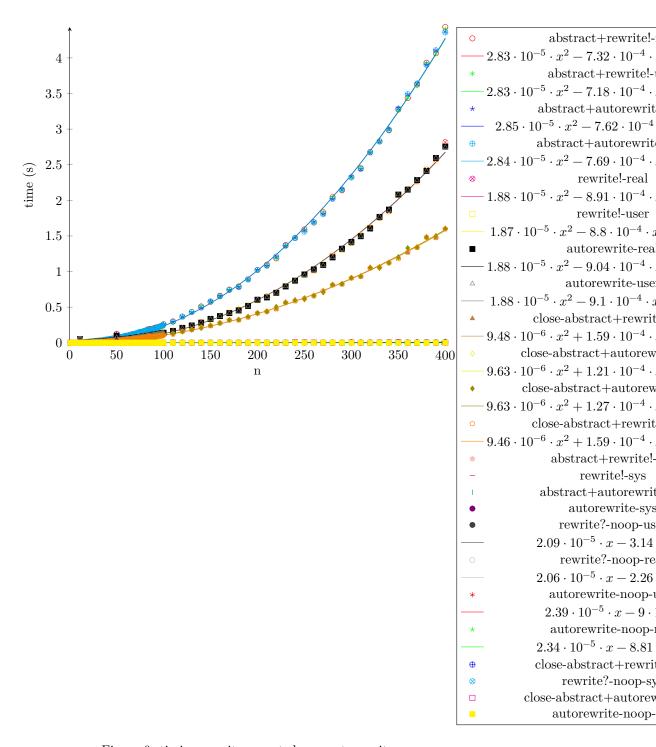


Figure 6: timing-rewrite-repeated-app-autorewrite

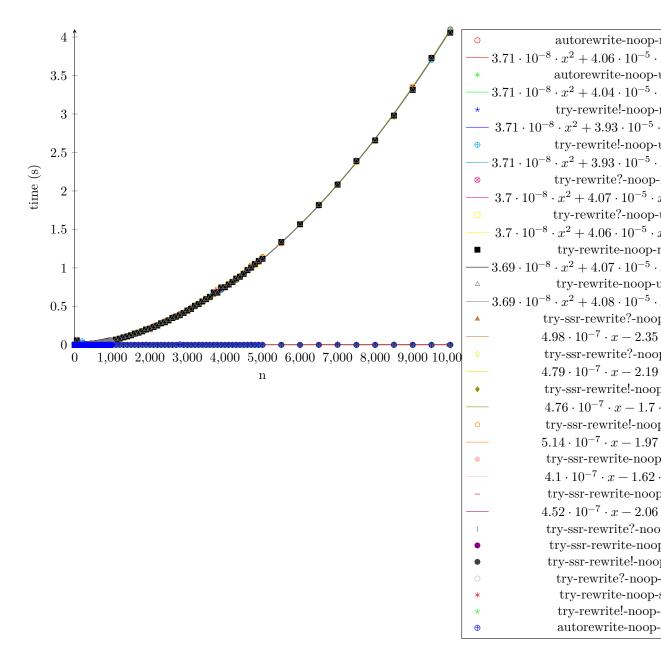
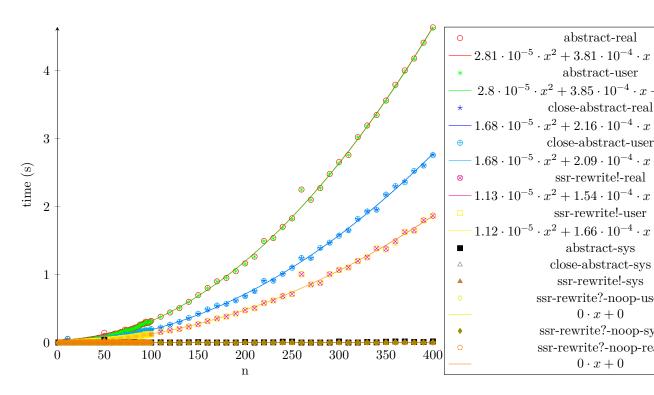


Figure 7: timing-rewrite-repeated-app-autorewrite-noop



 ${\bf Figure~8:~timing\text{-}rewrite\text{-}repeated\text{-}app\text{-}ssrrewrite}$ 

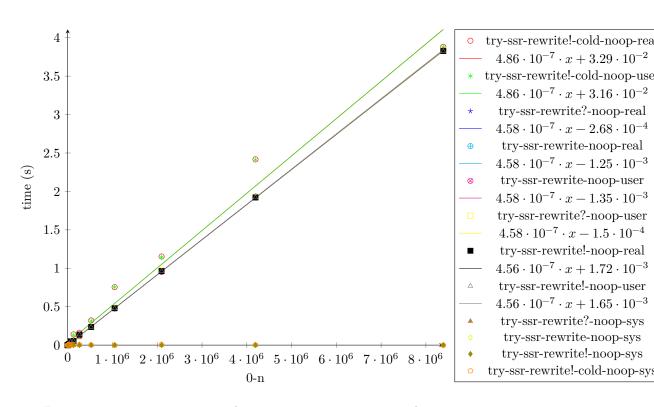


Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn  $\,1\,$ 

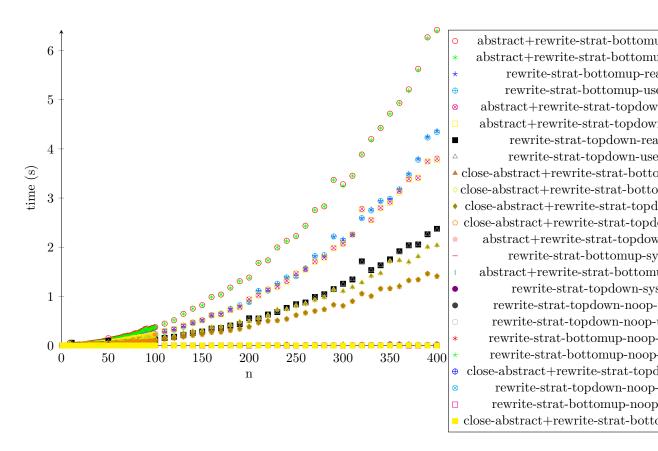
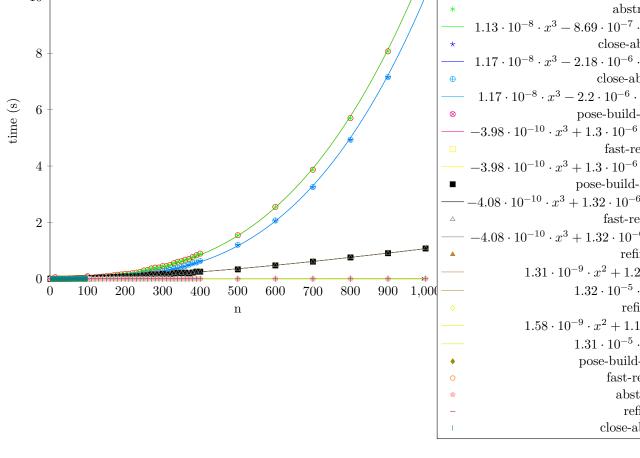


Figure 10: timing-rewrite-repeated-app-rewrite-strat

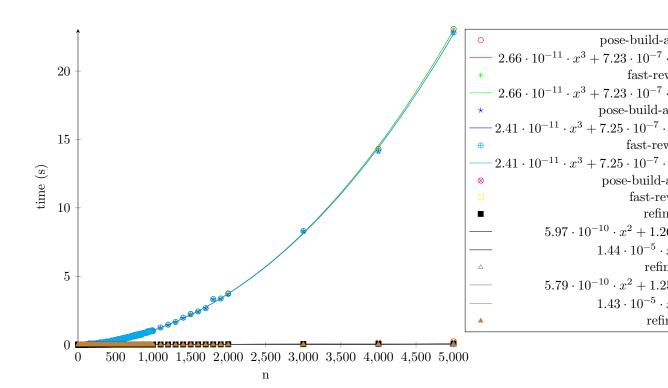


abst

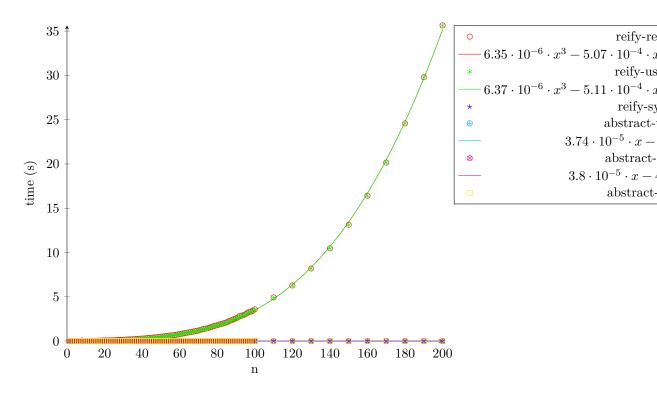
 $1.13\cdot 10^{-8}\cdot x^3 - 8.45\cdot 10^{-7}\cdot$ 

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

10



Figure~12:~timing-rewrite-repeated-app-fast-rewrite-no-abstract



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

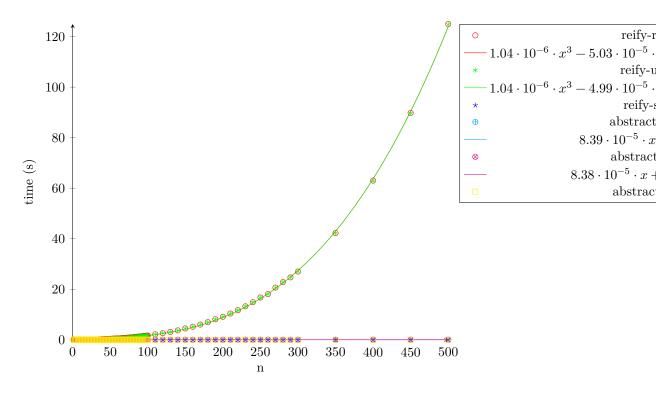
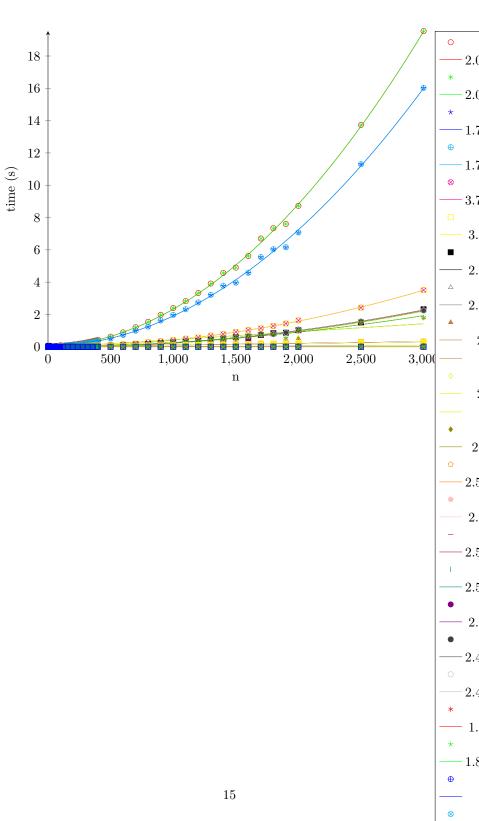


Figure 14: timing-typeclass-reification-let-in-PHOAS



 $2.09 \cdot 10^{-6} \cdot x^2 + 2.35 \cdot 10^{-4} \cdot x^2$  $2.09 \cdot 10^{-6} \cdot x^2 + 2.33 \cdot 10^{-4} \cdot x^2$  $1.72 \cdot 10^{-6} \cdot x^2 + 1.88 \cdot 10^{-4} \cdot x^2$  $1.72 \cdot 10^{-6} \cdot x^2 + 1.87 \cdot 10^{-4} \cdot x^2$  $3.74 \cdot 10^{-7} \cdot x^2 + 4.53 \cdot 10^{-5} \cdot x^2$  $3.74\cdot 10^{-7}\cdot x^2 + 4.46\cdot 10^{-5}\cdot \\$  $2.55 \cdot 10^{-7} \cdot x^2 - 4.44 \cdot 10^{-6}$  $2.54 \cdot 10^{-7} \cdot x^2 - 4.41 \cdot 10^{-6}$  $2.6\cdot 10^{-7}\cdot x^2 - 4.69\cdot 10^{-5}\cdot$  $4.94 \cdot 10^{-4} \cdot x - 5.33 \cdot$  $2.6\cdot 10^{-7}\cdot x^2 - 4.66\cdot 10^{-5}\cdot$  $4.94 \cdot 10^{-4} \cdot x - 5.33 \cdot$  $2.5 \cdot 10^{-7} \cdot x^2 + 2.18 \cdot 10^{-6} \cdot x^2$  $2.57 \cdot 10^{-7} \cdot x^2 - 1.23 \cdot 10^{-5} \cdot x^2$  $2.5 \cdot 10^{-7} \cdot x^2 + 2.22 \cdot 10^{-6} \cdot x$  $2.56 \cdot 10^{-7} \cdot x^2 - 1.16 \cdot 10^{-5} \cdot x^2$  $2.55 \cdot 10^{-7} \cdot x^2 - 1.44 \cdot 10^{-5} \cdot x^2$  $2.55 \cdot 10^{-7} \cdot x^2 - 1.44 \cdot 10^{-5}$  $2.49 \cdot 10^{-7} \cdot x^2 + 4.92 \cdot 10^{-6} \cdot x^2$  $2.49 \cdot 10^{-7} \cdot x^2 + 5.43 \cdot 10^{-6} \cdot x^2$  $1.88 \cdot 10^{-7} \cdot x^2 + 8.03 \cdot 10^{-5}$  $1.88 \cdot 10^{-7} \cdot x^2 + 8.05 \cdot 10^{-5} \cdot x^2$  $1.06 \cdot 10^{-4} \cdot x - 7.63$  $1.06 \cdot 10^{-4} \cdot x - 6.37$ 

abstract-real

abstract-user

fast-rewrite-real

fast-rewrite-user

close-abstract-rea

close-abstract-use

check-pf-cast-rea

check-pf-cast-use

refine-user

refine-real

type-admit-cast-re

type-pf-cast-real

type-admit-cast-us

type-pf-cast-user

check-admit-cast-u

check-admit-cast-r

type-admit-user

type-admit-real

check-admit-user

check-admit-real

build-eval-thunk-u

build-eval-thunk-re

build-thunk-user  $1.05 \cdot 10^{-4} \cdot x - 8.05 \cdot$ build-thunk-real  $1.05 \cdot 10^{-4} \cdot x - 6.88$ -1- - -1- T ---