

Figure 1: timing-pattern

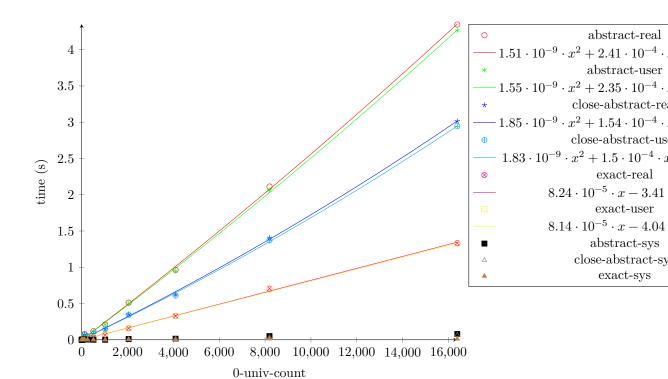


Figure 2: timing-n-polymorphic-universes param-1-n 0

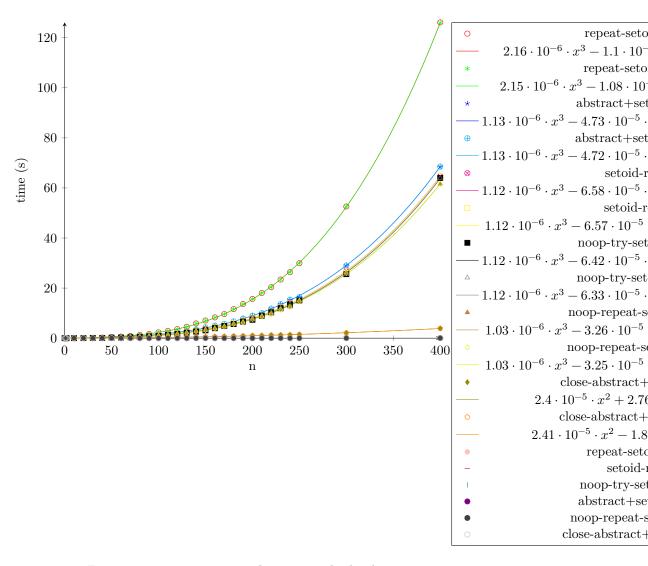
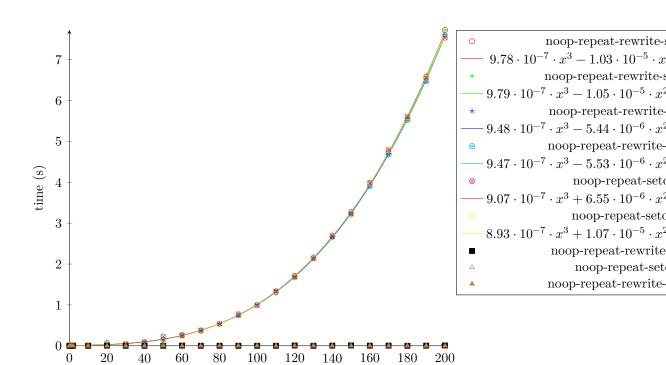


Figure 3: timing-repeat-setoid-rewrite-under-binders



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

n

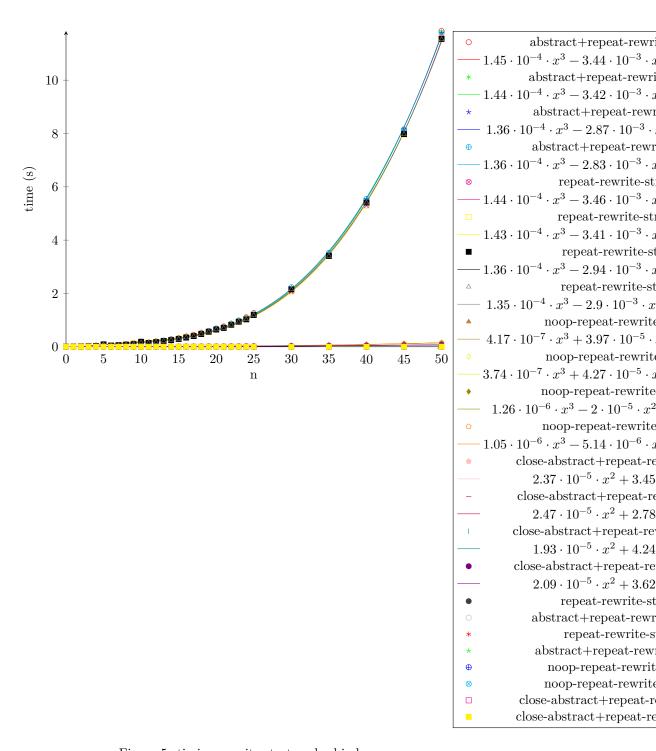


Figure 5: timing-rewrite-strat-under-binders

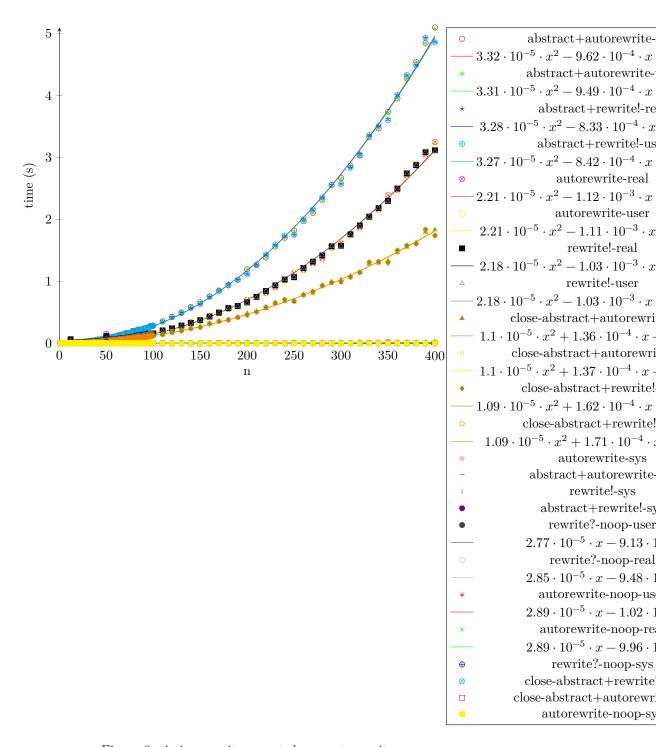


Figure 6: timing-rewrite-repeated-app-autorewrite

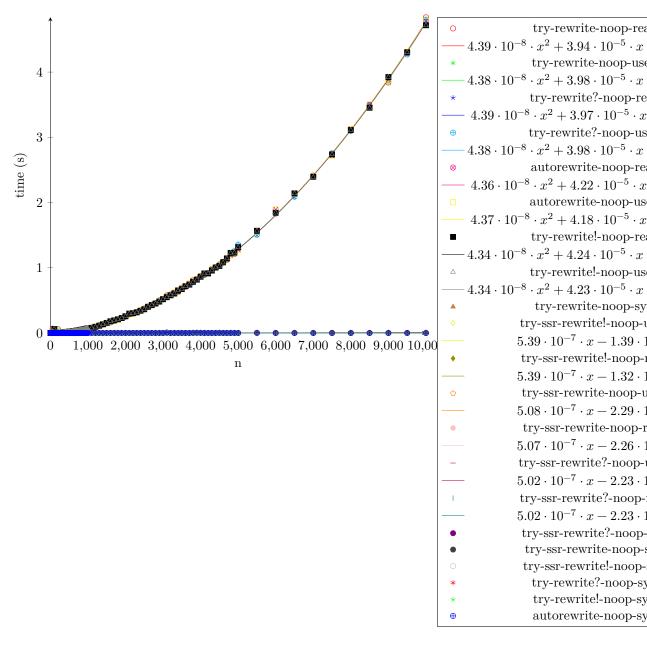


Figure 7: timing-rewrite-repeated-app-autorewrite-noop

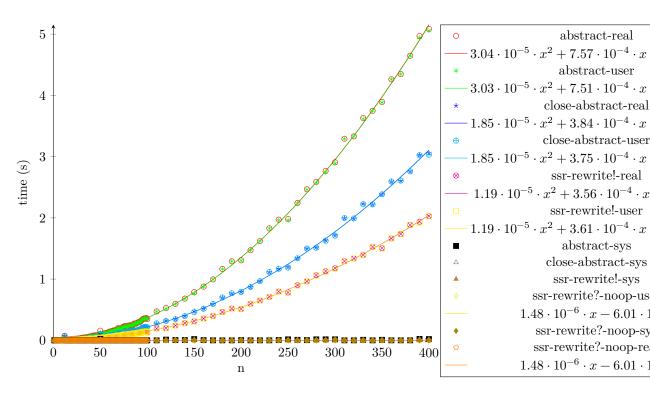


Figure 8: timing-rewrite-repeated-app-ssrrewrite

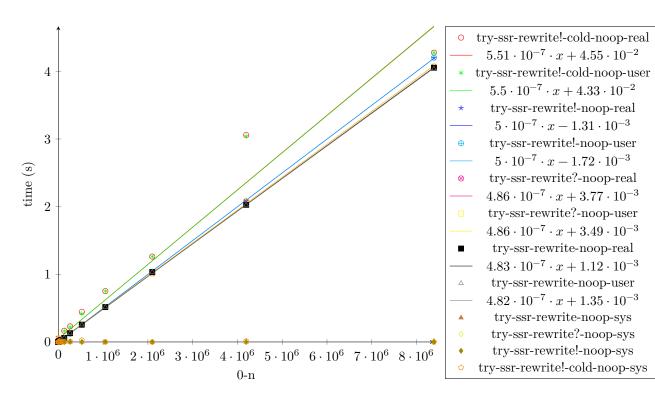


Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn $\ 1$

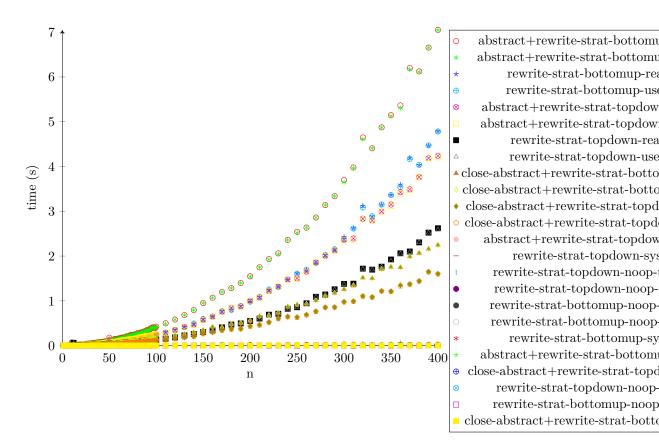


Figure 10: timing-rewrite-repeated-app-rewrite-strat

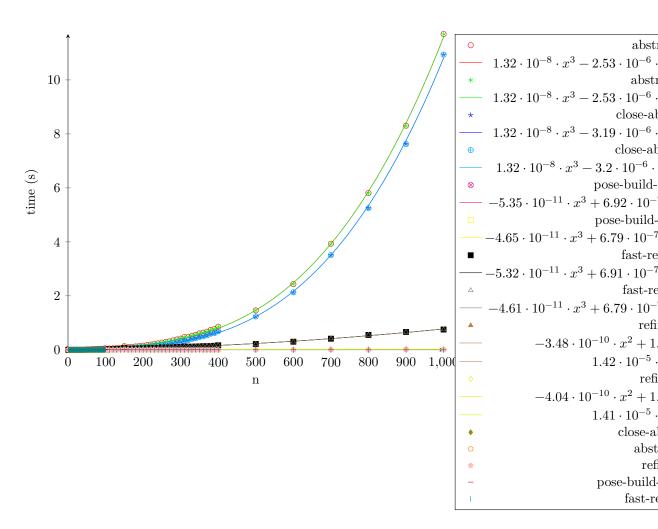
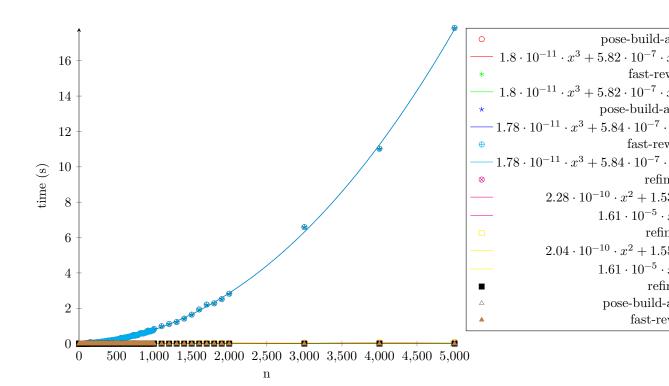
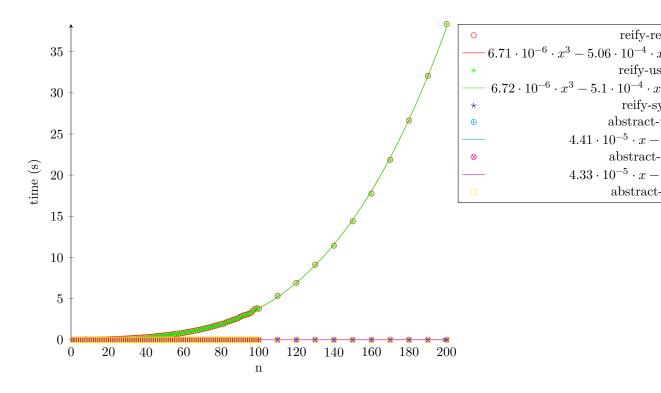


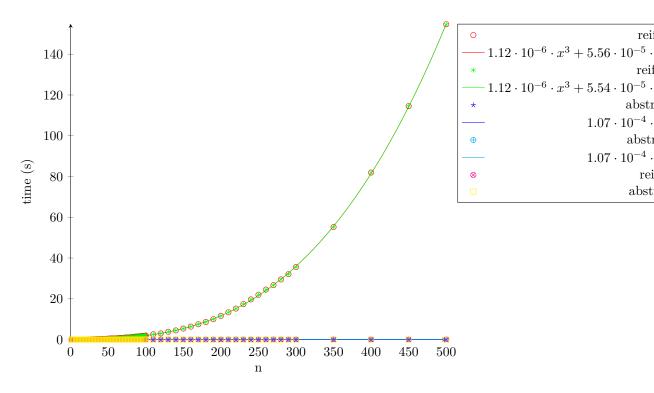
Figure 11: timing-rewrite-repeated-app-fast-rewrite



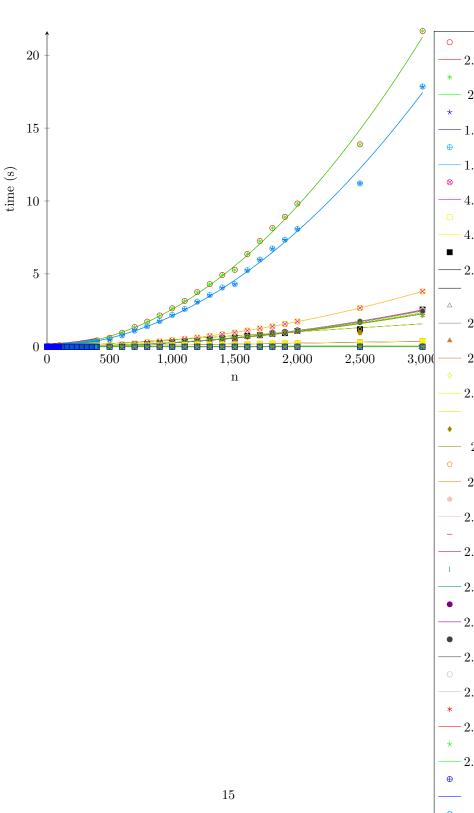
 ${\bf Figure~12:~timing\text{-}rewrite\text{-}repeated\text{-}app\text{-}fast\text{-}rewrite\text{-}no\text{-}abstract}}$



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



 ${\bf Figure~14:~timing-type class-reification-let-in-PHOAS}$



 $2.25 \cdot 10^{-6} \cdot x^2 + 3.25 \cdot 10^{-4} \cdot x^2$ $2.25 \cdot 10^{-6} \cdot x^2 + 3.21 \cdot 10^{-4} \cdot$ $1.85 \cdot 10^{-6} \cdot x^2 + 2.76 \cdot 10^{-4} \cdot x^2$ $1.85 \cdot 10^{-6} \cdot x^2 + 2.72 \cdot 10^{-4} \cdot x^2$ $4.08 \cdot 10^{-7} \cdot x^2 + 4.66 \cdot 10^{-5} \cdot x^2$ $4.07 \cdot 10^{-7} \cdot x^2 + 4.69 \cdot 10^{-5} \cdot x^2$ $2.54 \cdot 10^{-7} \cdot x^2 + 1.74 \cdot 10^{-5} \cdot x^2$ $2.88 \cdot 10^{-7} \cdot x^2 - 1.5 \cdot 10^{-5} \cdot x$ $2.87 \cdot 10^{-7} \cdot x^2 - 1.48 \cdot 10^{-5}$ $2.54 \cdot 10^{-7} \cdot x^2 + 1.68 \cdot 10^{-5} \cdot x^2$ $2.4 \cdot 10^{-7} \cdot x^2 + 3.38 \cdot 10^{-5} \cdot x^2$ $2.4 \cdot 10^{-7} \cdot x^2 + 3.34 \cdot 10^{-5} \cdot x$ $2.81 \cdot 10^{-7} \cdot x^2 - 1.03 \cdot 10^{-5} \cdot x^2$ $2.81 \cdot 10^{-7} \cdot x^2 - 1.03 \cdot 10^{-5} \cdot x^2 - 1.03 \cdot 10^{-5} \cdot x^2 + 1.03 \cdot 10^{-5} \cdot x^2$ $2.81 \cdot 10^{-7} \cdot x^2 - 1.93 \cdot 10^{-5} \cdot x^2$ $2.79 \cdot 10^{-7} \cdot x^2 - 1.67 \cdot 10^{-5} \cdot x^2$ $2.74 \cdot 10^{-7} \cdot x^2 - 1.58 \cdot 10^{-6} \cdot x^2$ $2.75 \cdot 10^{-7} \cdot x^2 - 1.55 \cdot 10^{-6} \cdot x^2$ $2.27 \cdot 10^{-7} \cdot x^2 + 7.64 \cdot 10^{-5} \cdot x^2$ $2.27 \cdot 10^{-7} \cdot x^2 + 7.65 \cdot 10^{-5} \cdot 10$

abstract-real

abstract-user

fast-rewrite-real

fast-rewrite-user

close-abstract-rea

close-abstract-use

 $5.45 \cdot 10^{-4} \cdot x - 5.78 \cdot$ type-admit-cast-us

type-admit-cast-re

 $5.45 \cdot 10^{-4} \cdot x - 5.78 \cdot$ type-pf-cast-real

refine-user

type-pf-cast-user

check-admit-user

check-admit-real

check-pf-cast-use

check-pf-cast-rea

type-admit-user

type-admit-real

check-admit-cast-u

check-admit-cast-r

build-eval-thunk-u

 $1.25 \cdot 10^{-4} \cdot x - 1.06 \cdot$ build-eval-thunk-re $1.25 \cdot 10^{-4} \cdot x - 7.63 \cdot$ build-thunk-user $1.24 \cdot 10^{-4} \cdot x - 1.13$ build-thunk-real $1.24 \cdot 10^{-4} \cdot x - 8.42 \cdot$

refine-real