

Figure 1: timing-pattern

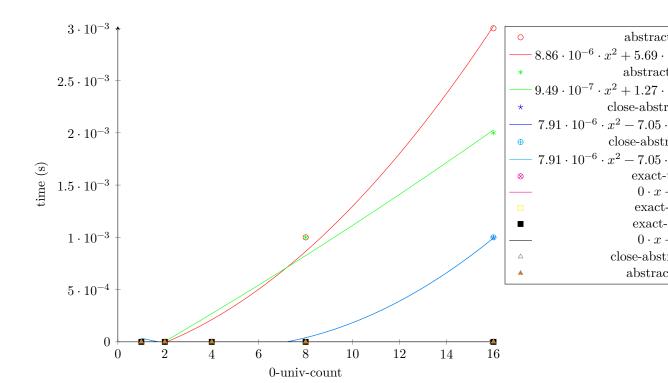


Figure 2: timing-n-polymorphic-universes param-1-n  $\,0\,$ 

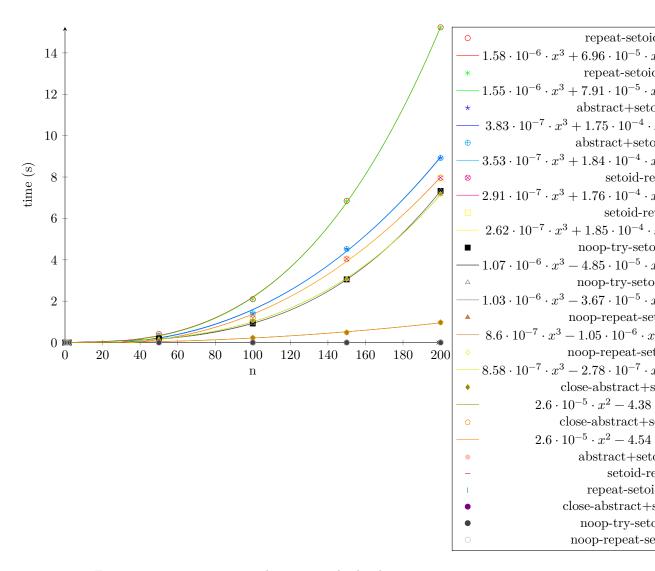
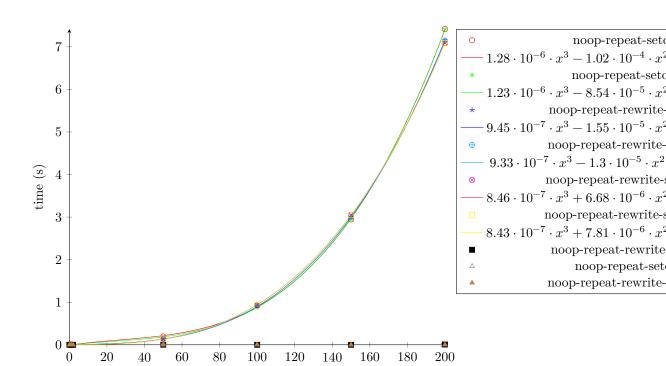


Figure 3: timing-repeat-setoid-rewrite-under-binders



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

n

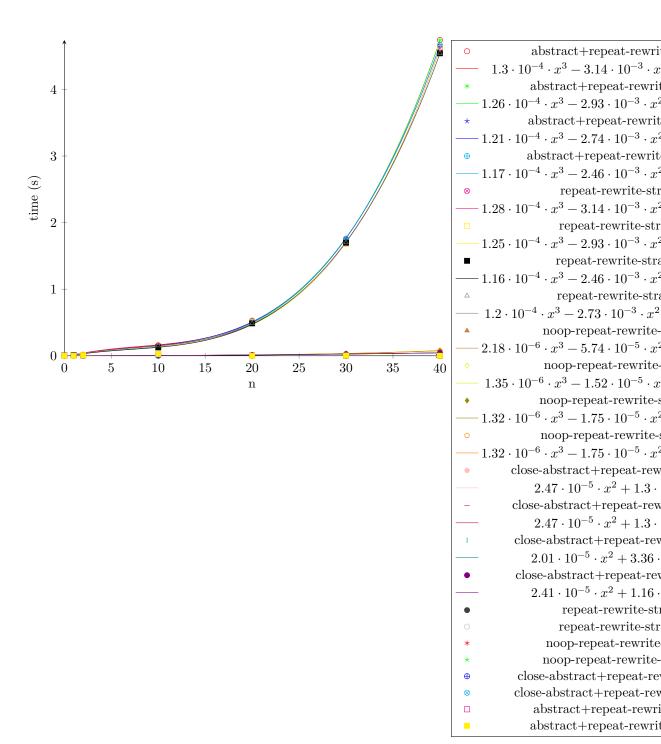


Figure 5: timing-rewrite-strat-under-binders

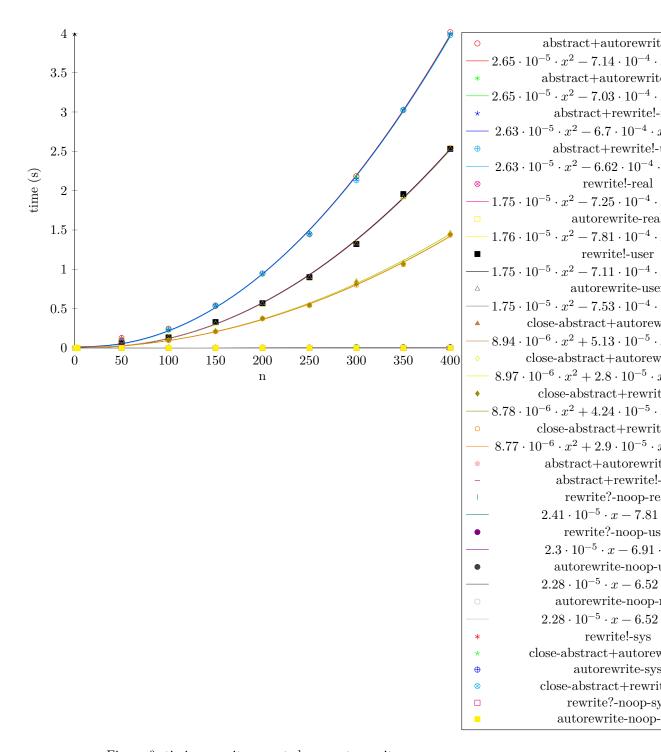


Figure 6: timing-rewrite-repeated-app-autorewrite

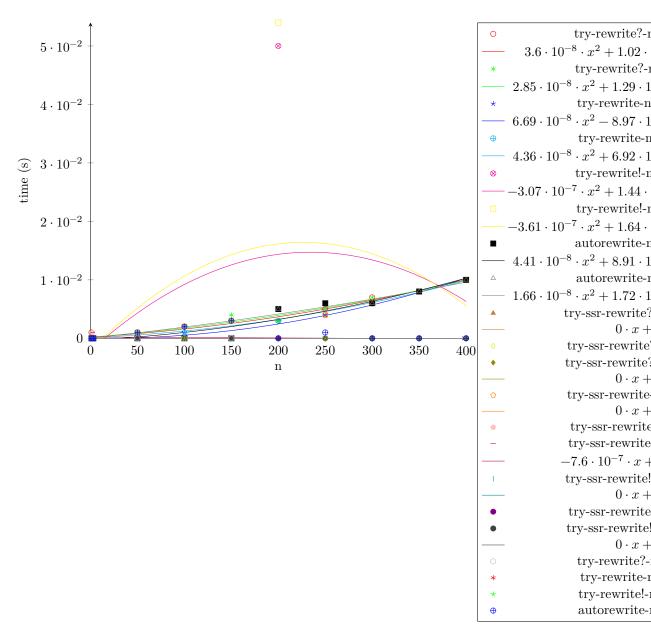


Figure 7: timing-rewrite-repeated-app-autorewrite-noop

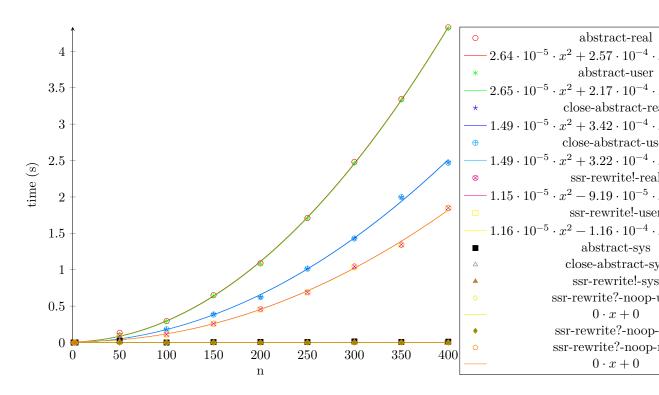


Figure 8: timing-rewrite-repeated-app-ssrrewrite

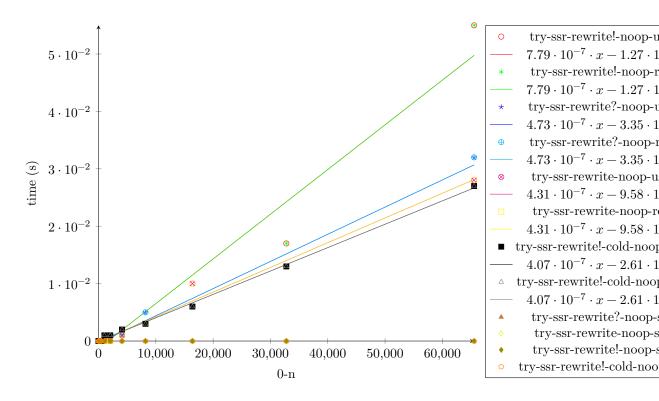


Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn  $\ 1$ 

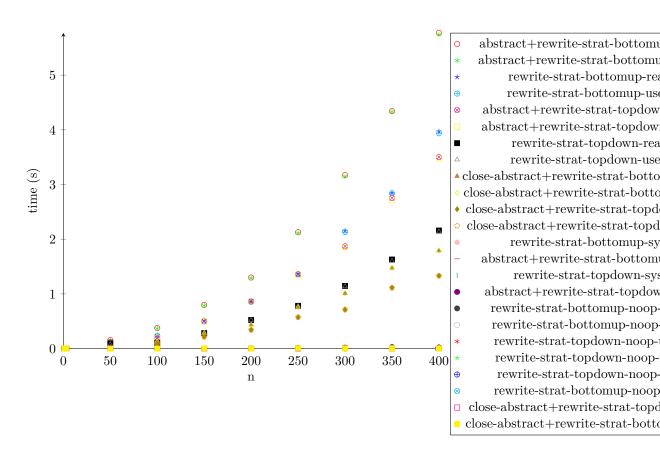


Figure 10: timing-rewrite-repeated-app-rewrite-strat

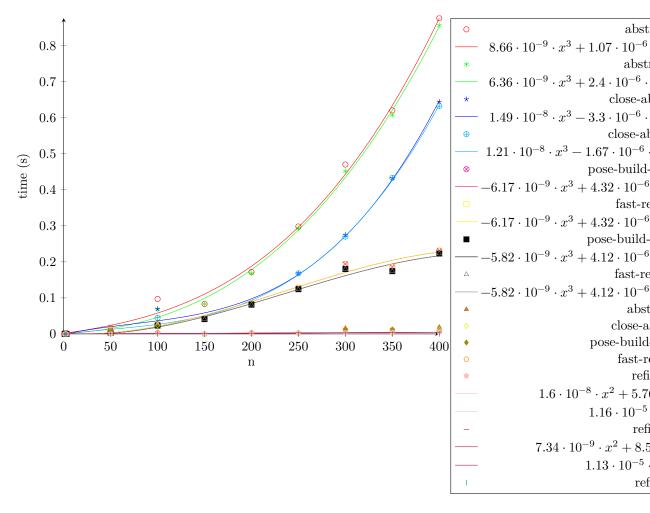
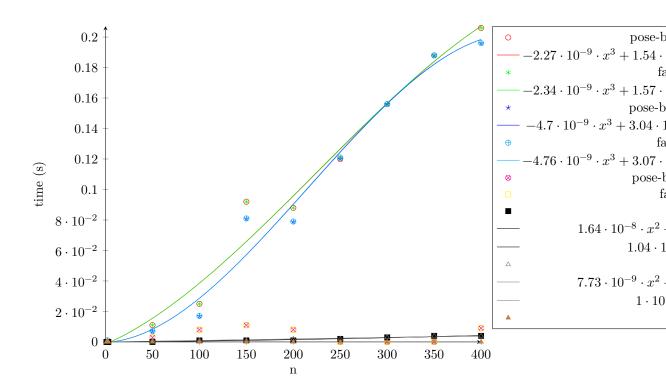
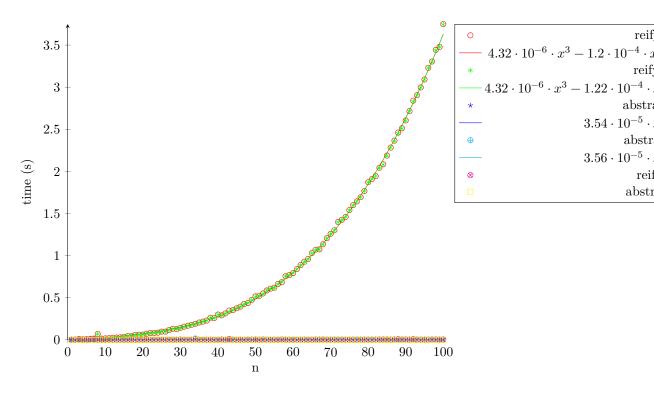


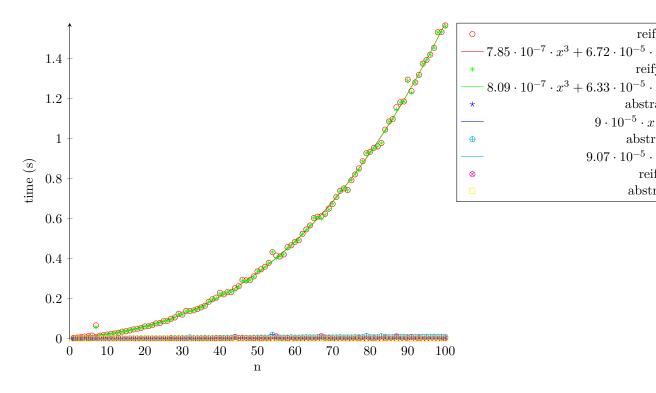
Figure 11: timing-rewrite-repeated-app-fast-rewrite



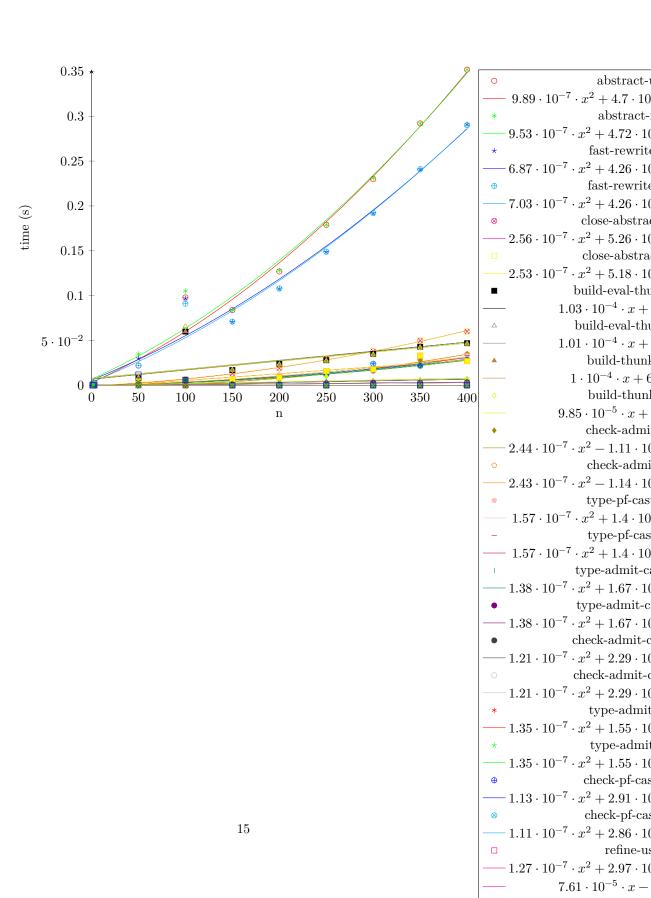
Figure~12:~timing-rewrite-repeated-app-fast-rewrite-no-abstract



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



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



abstract-

abstract-

fast-rewrite

fast-rewrite

close-abstrac

close-abstra

build-eval-thu

 $1.03 \cdot 10^{-4} \cdot x +$ build-eval-thu

 $1.01\cdot 10^{-4}\cdot x +$ build-thunk  $1 \cdot 10^{-4} \cdot x + 6$ 

 $9.85 \cdot 10^{-5} \cdot x +$ 

build-thunl

check-admi

check-admi

type-pf-cas

type-pf-cas

type-admit-ca

type-admit-c

check-admit-c

check-admit-o

type-admit

type-admit

check-pf-cas

check-pf-cas

 $7.61\cdot 10^{-5}\cdot x -$ 

 $7.56\cdot 10^{-5}\cdot x -$ 

 $1.26 \cdot 10^{-7} \cdot x^2 + 2.95 \cdot 10^{-7}$ 

refine-us

refine-re