For discussion

Signalling Bursty Queue Delay

Expt 1.1 basic results

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Compare 2 marking approaches: Sojourn (s) & EST (e)

Experiment plans

- 2 unresponsive flows, a & b
- Ideal: marking probability, p,
  - monotonically increases with burst size, β
  - does not decrease with capacity share, λ
- Expt 1.1:
  - For a set of fixed capacity shares $\lambda_a + \lambda_b = \Sigma\lambda$ (constant)
  - burst size β: increase β_a, decrease β_b, with $\beta_a+\beta_b = \Sigma\beta$ (constant)
  - measure both marking probabilities, p_s & p_e
  - for each approach, report mean, max & min of each marking metric over a range of phase shifts
- Control expt 1.2:
  - Same as #1.1, with $\Sigma\lambda$ and $\Sigma\beta$ constant
  - but with $\beta_a = \beta_b$ increase λ_a
  - marking should not depend on capacity share, λ
- Expt 2.1:
  - Same as #1.1, except hold β_b, while increasing β_a
- Expt 3.1:
  - Same as #1.1 except increase β_a with λ_a
- Expt 4? Model packetization or use ns3
- Redesign marking?
- Design & Model aggregate policer

Normalized metrics

Goal: results applicable to any link rate and any step marking threshold delay

- Burst size β is in units of time (queue delay)
  - normalized to: marking threshold = 1 unit of time
- On time series plots, time is also normalized
  - queue delay at marking threshold = 1 unit of time
- Marking rate, λp, is marked bits per unit time
  - normalized as a dimensionless fraction of link bit rate = 1
- Marking probability, p, and capacity share, λ
  - both dimensionless and bounded within [0,1]
  - so normalized marking rate, λp, also bounded within [0,1]
- Comparison metrics use difference, $p_a - p_b = \Delta p$, not ratio p_a/p_b
  - not distorted as $p_b \rightarrow 0$
  - visualization of unresponsive traffic marking, irrespective of any congestion control assumptions

Expt 1.1

Utilization $\lambda_a + \lambda_b = \Sigma\lambda$	Max burst $\beta_a + \beta_b = \Sigma\beta$	sojourn vs. EST marking p_a	Δp	$\lambda_a p_a$	$\Delta(\lambda p)$
100%	106.25%	••	••	••	••
	125%	••	••	••	••
	225%	••	••	••	••
93.75%	106.25%	••	••	••	••
	125%	••	••	••	••
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- This slide introduces the next 6 slides
  - the rest are greyed out
- 4 marking metrics in 4 separate slide packs
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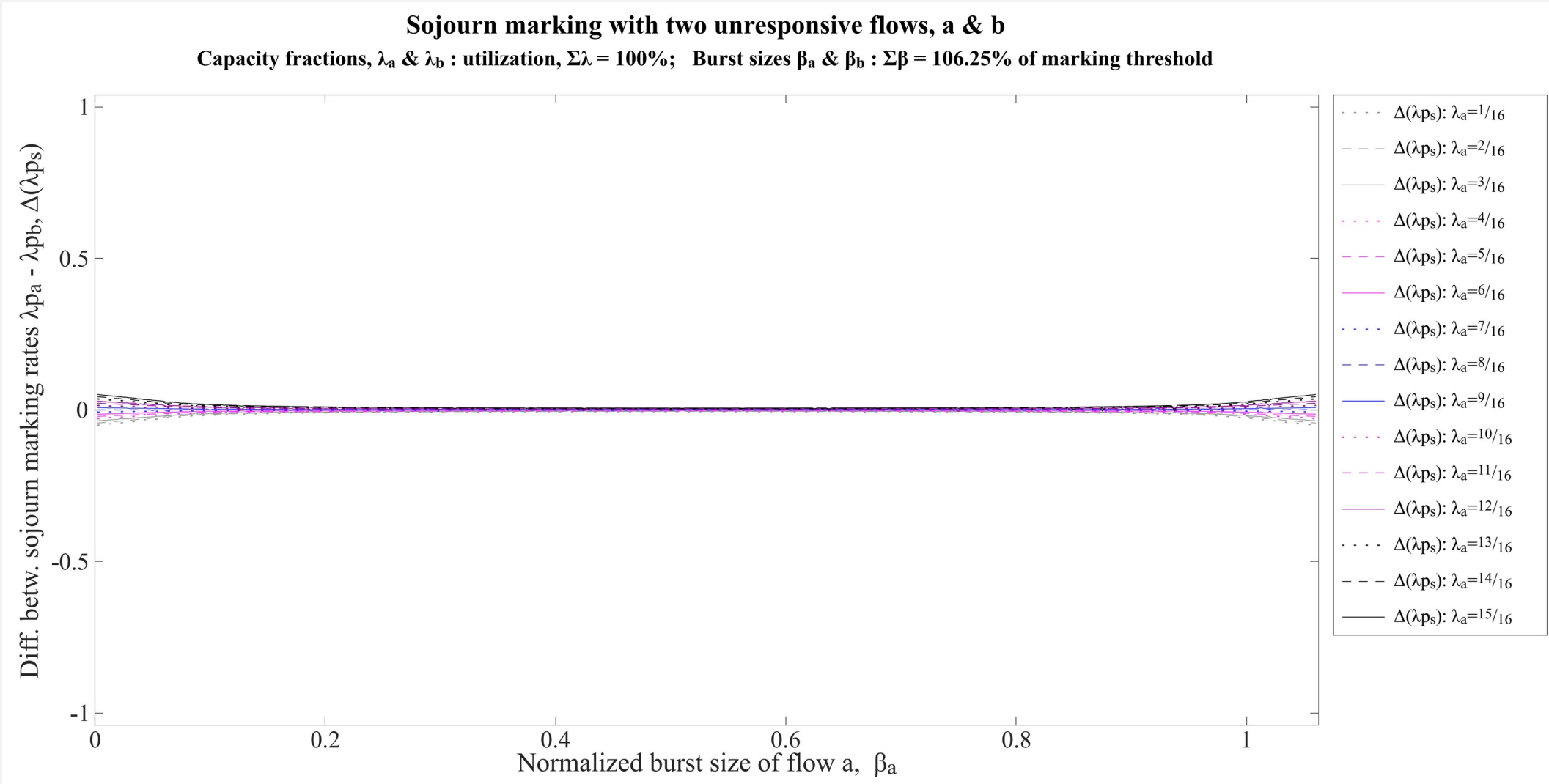
- p_a : marking probability of flow a
- $\Delta p = p_a - p_b$
- $\lambda_a p_a$: marking rate of flow a
- $\Delta(\lambda p) = \lambda_a p_a - \lambda_b p_b$


Sojourn marking with two unresponsive flows, a & b
Capacity fractions, λa & λb : utilization, Σλ = 100%; Burst sizes βa & βb : Σβ = 106.25% of marking threshold
Diff. betw. sojourn marking rates λpa - λpb, Δ(λps)
Normalized burst size of flow a, βa
1
0.5
0
-0.5
-1
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0.2
0.4
0.6
0.8
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Δ(λps): λa=1/16
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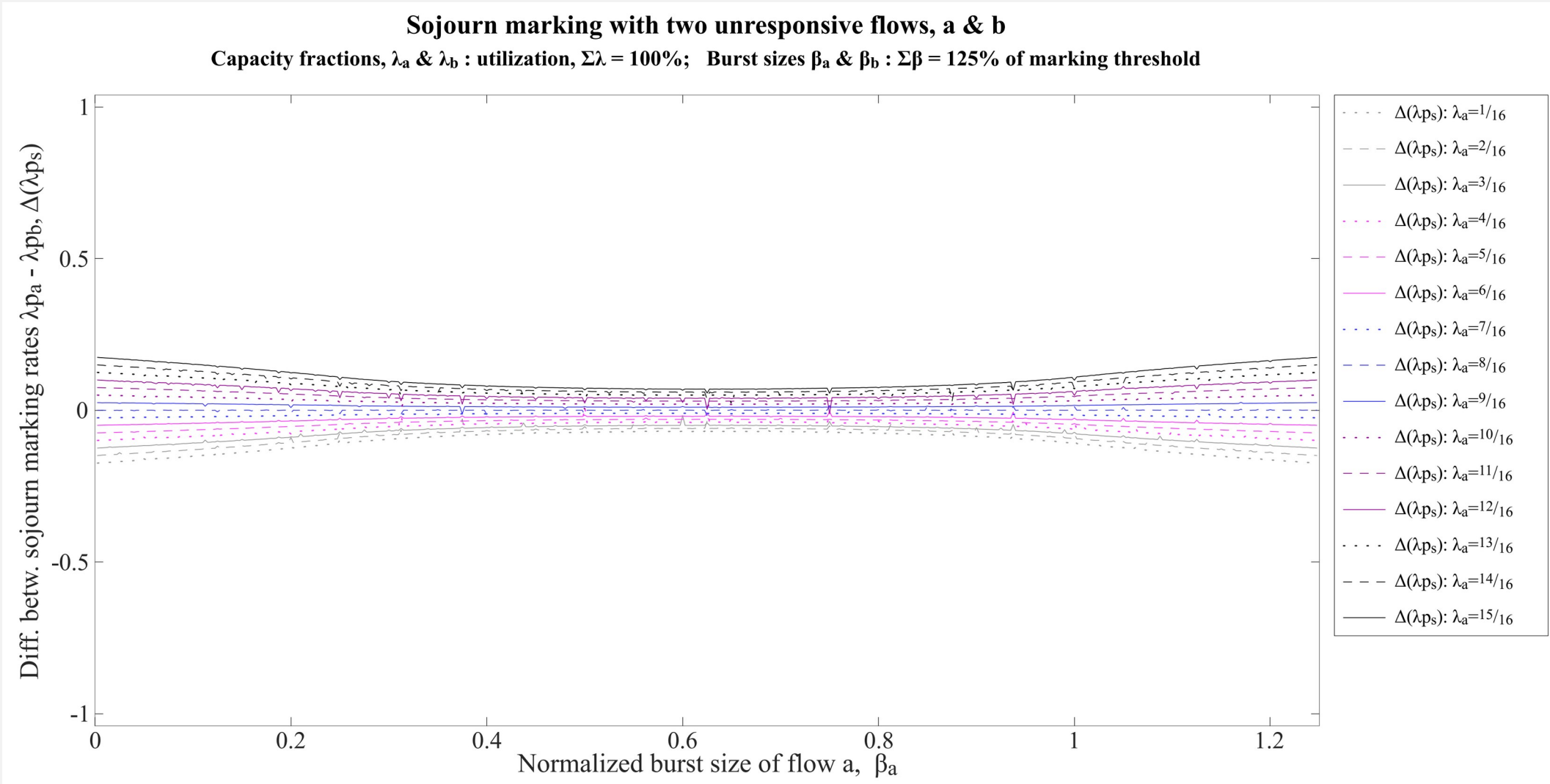
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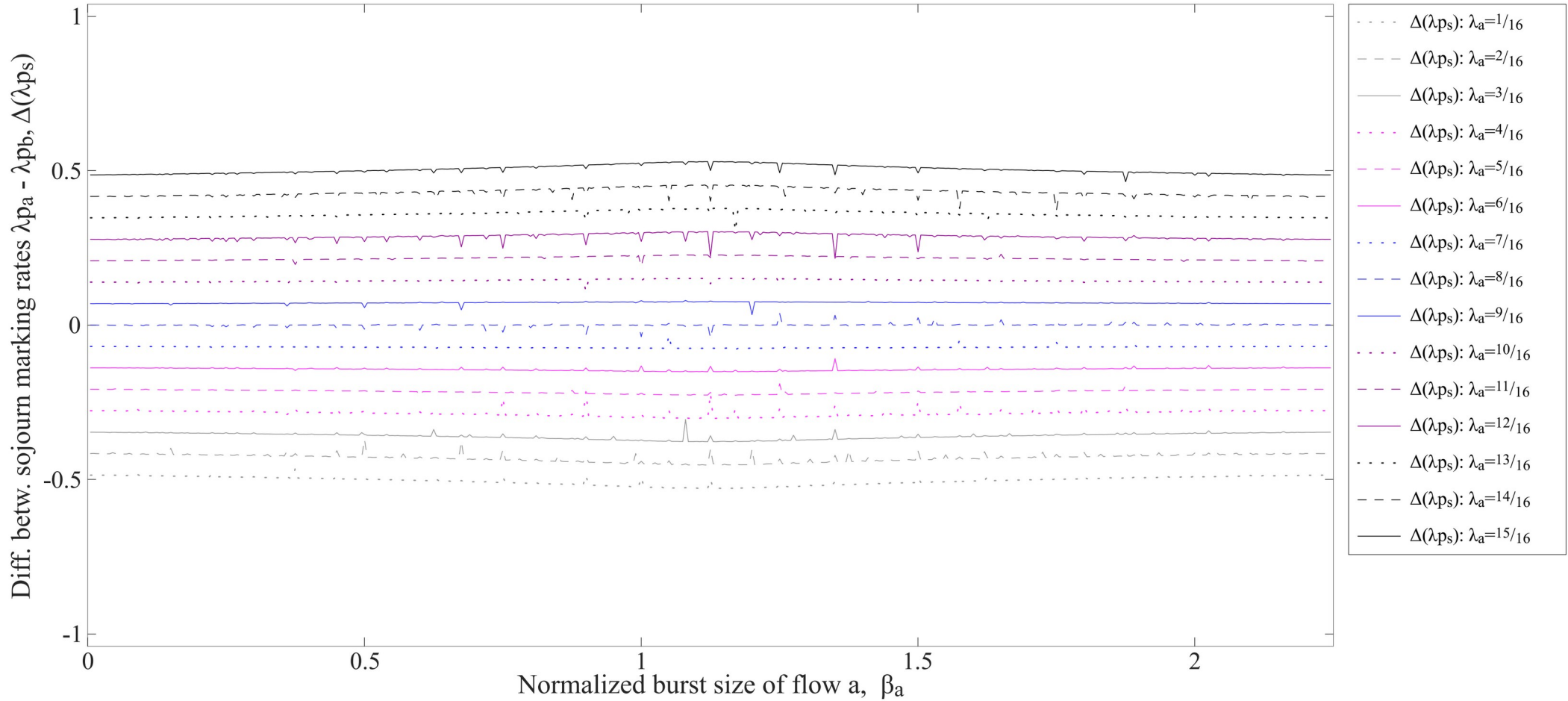
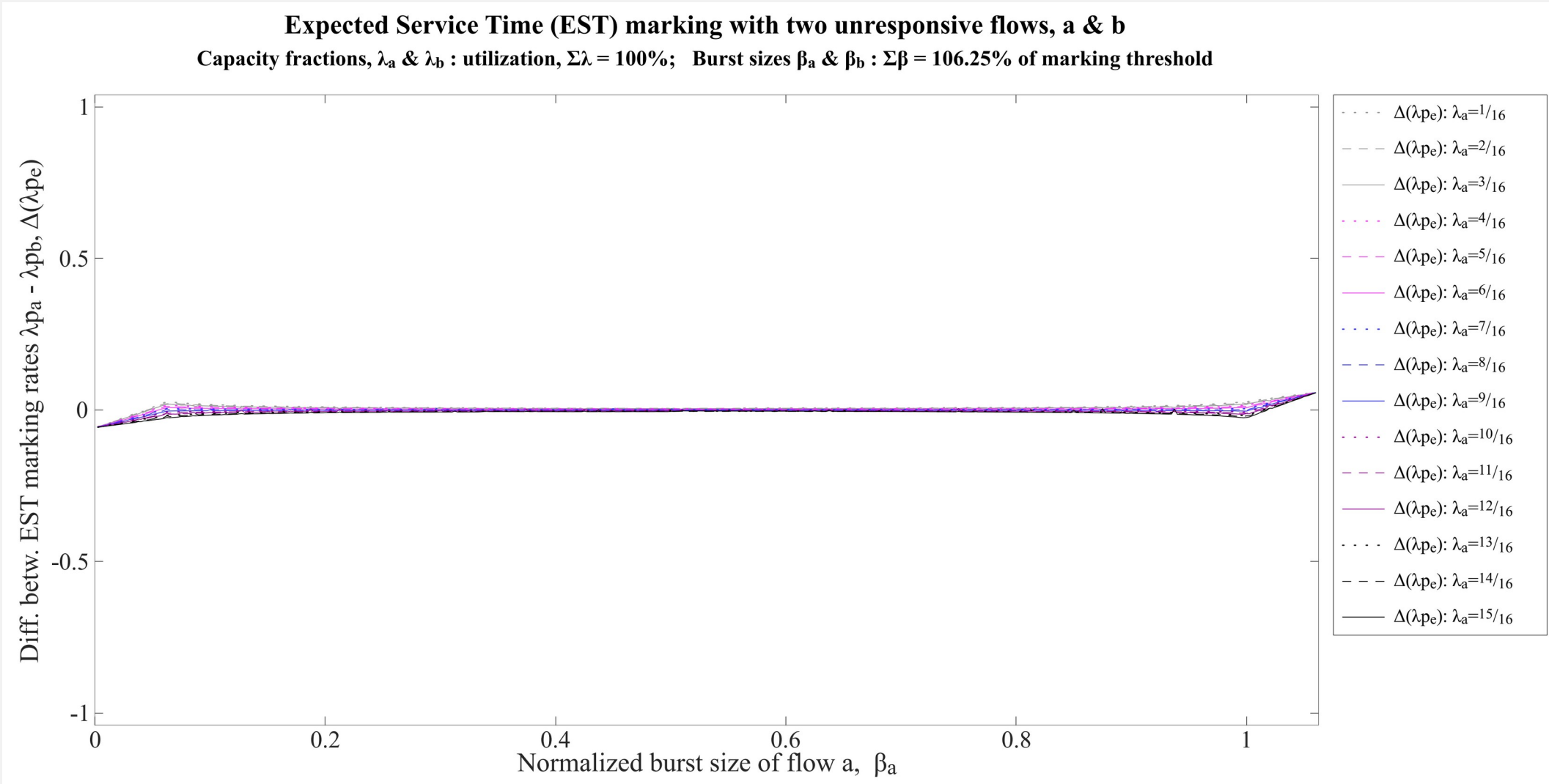
Sojourn marking with two unresponsive flows, a & b

Capacity fractions, λ_a & λ_b : utilization, $\Sigma\lambda = 100\%$; Burst sizes β_a & β_b : $\Sigma\beta = 225\%$ of marking threshold

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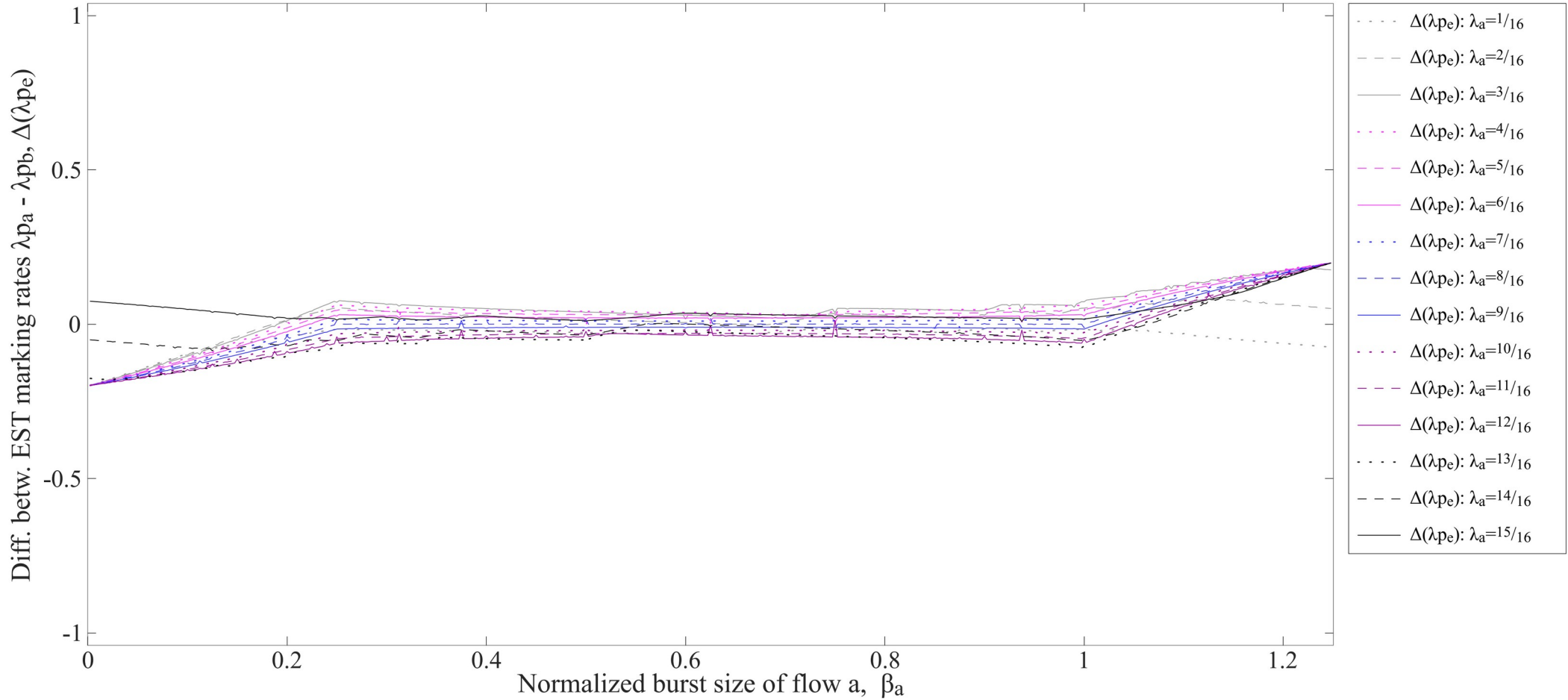

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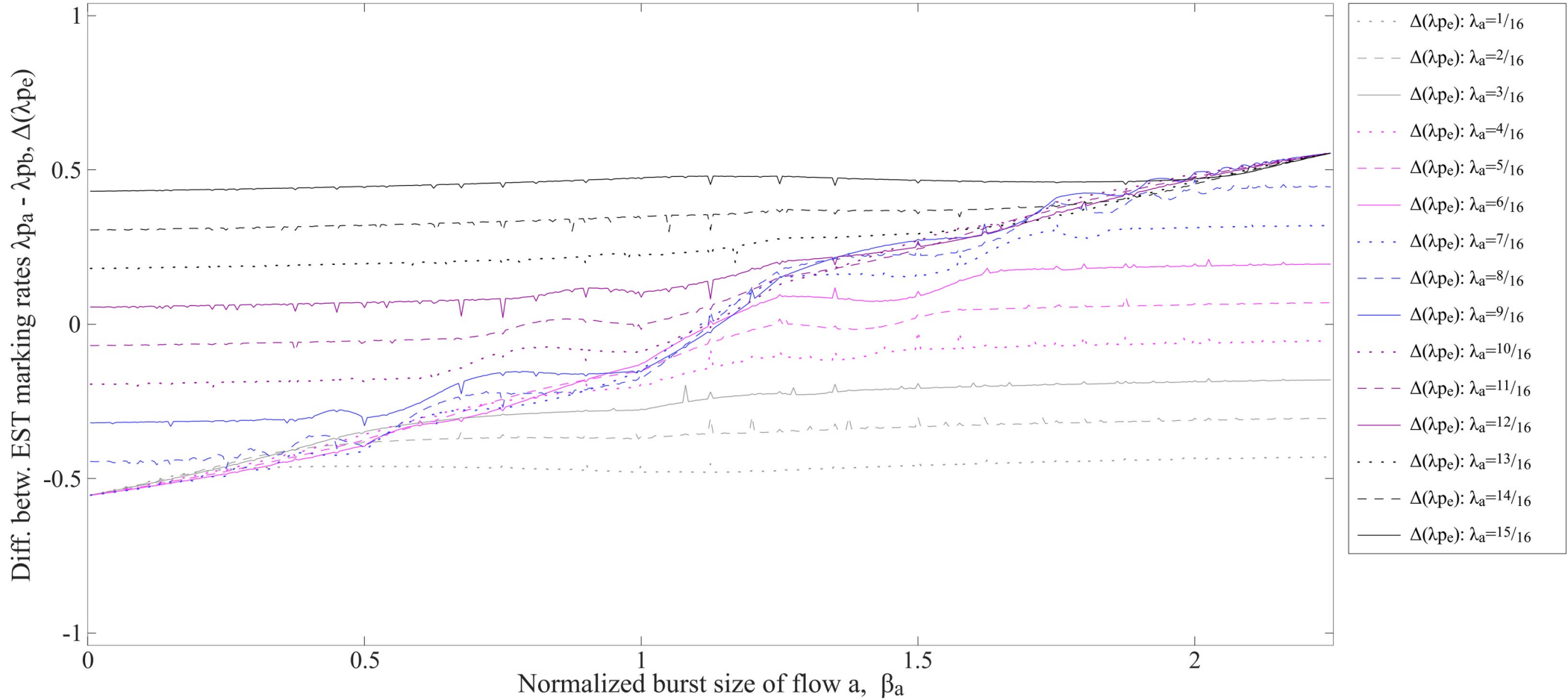

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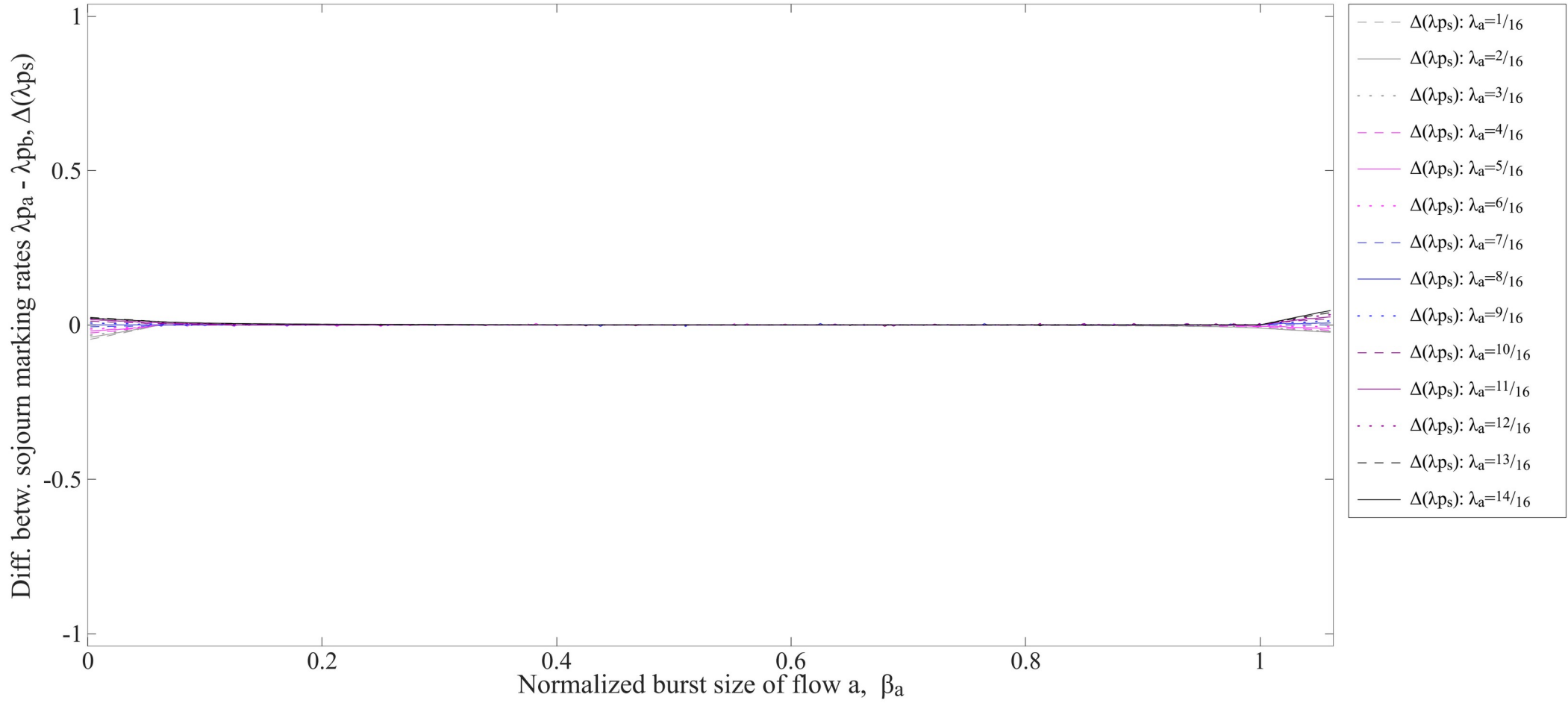

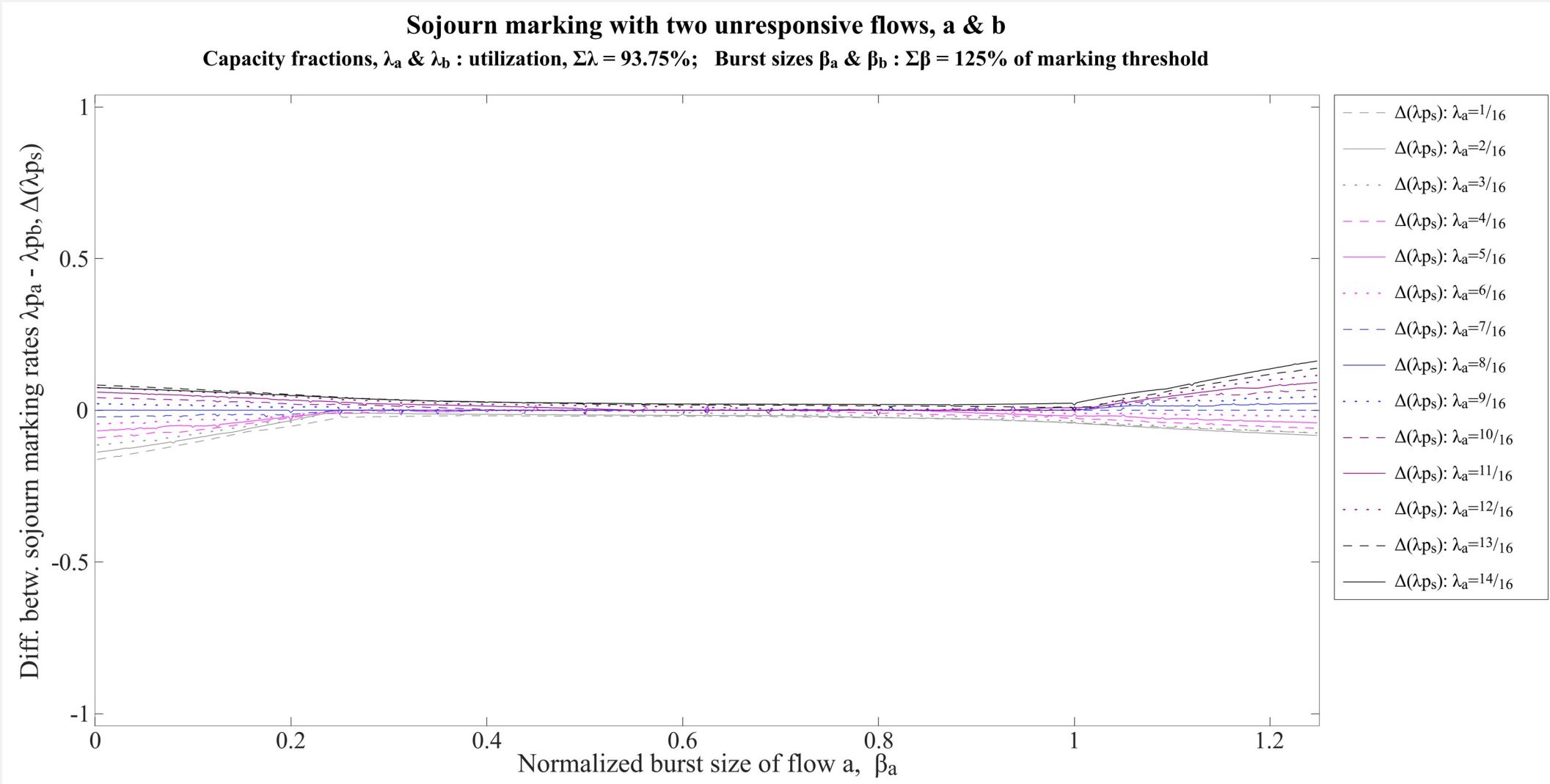
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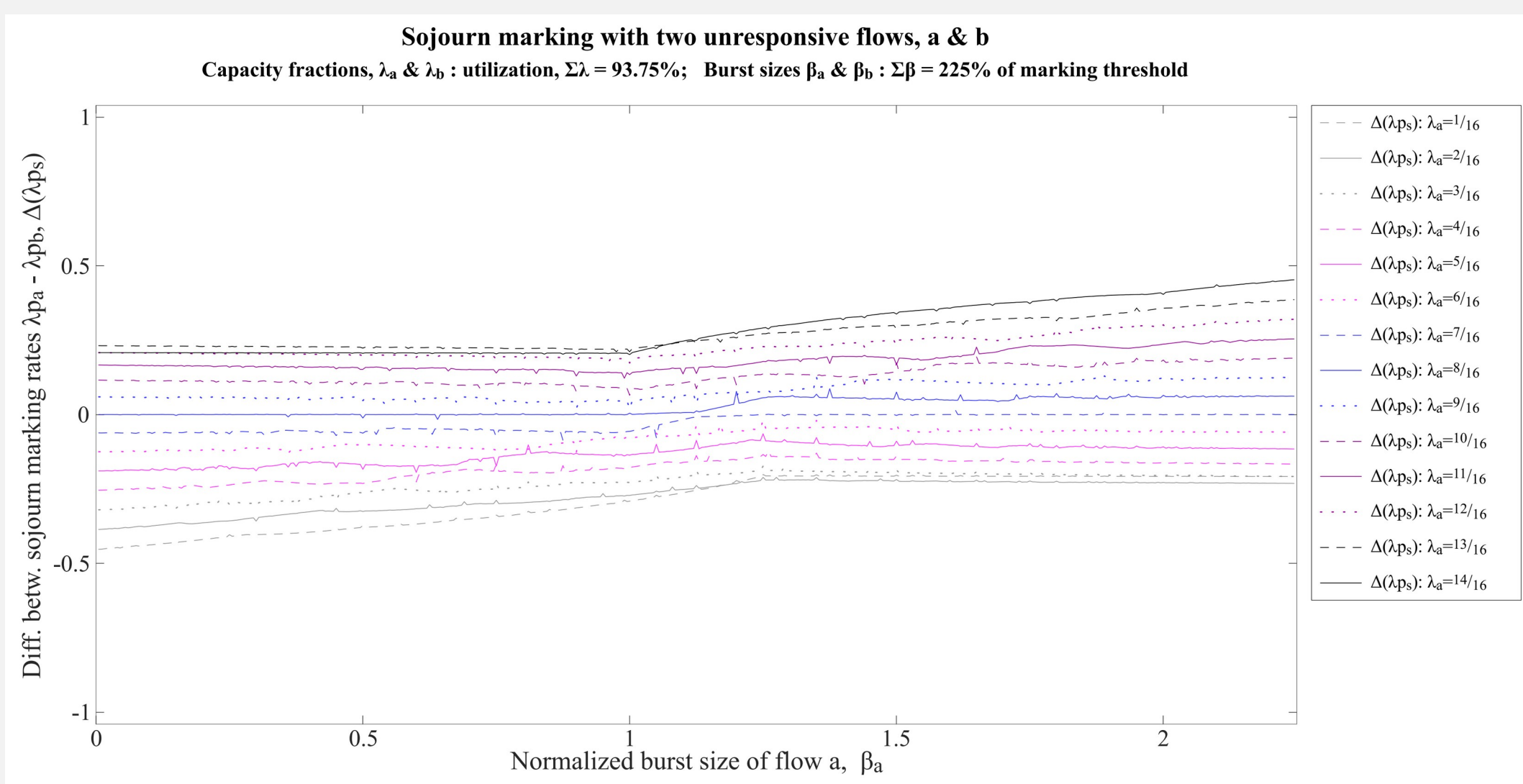
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0
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-1
0
0.5
1
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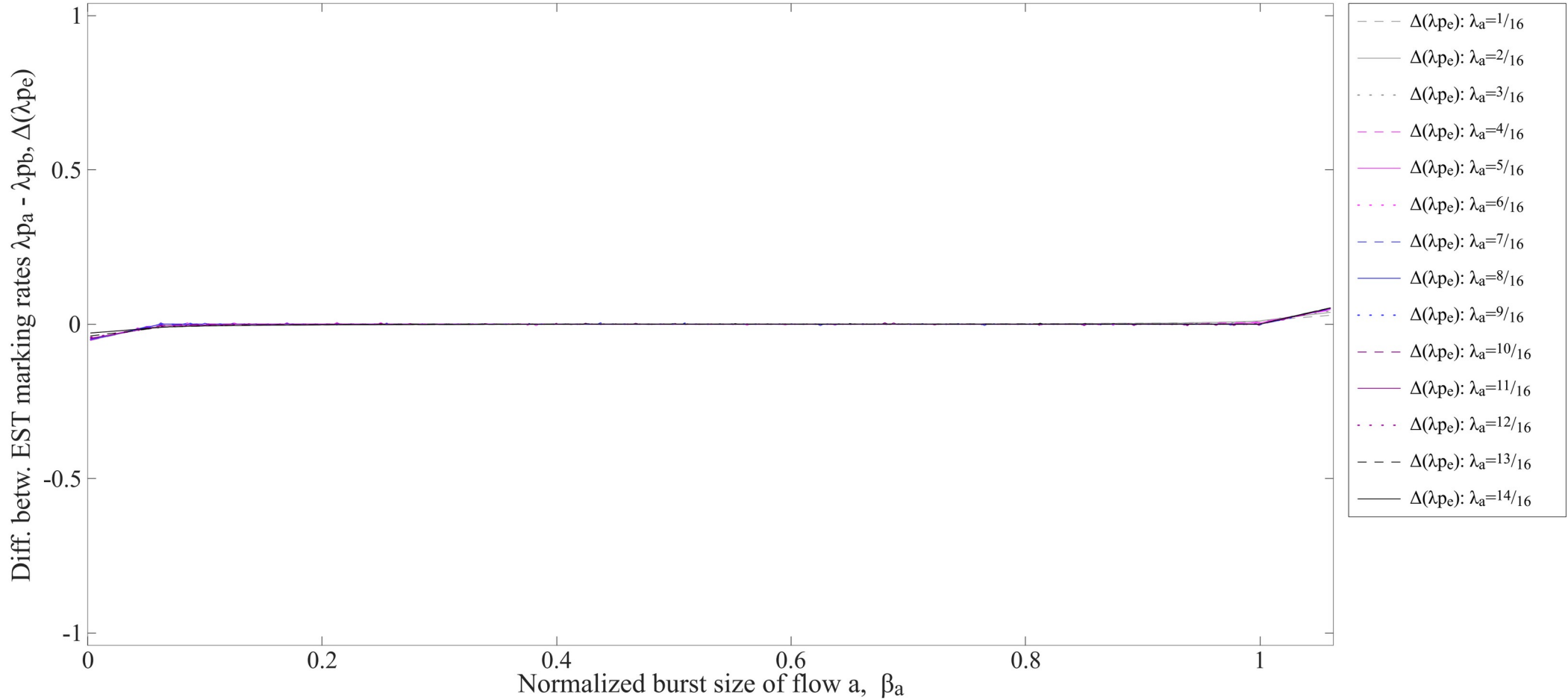

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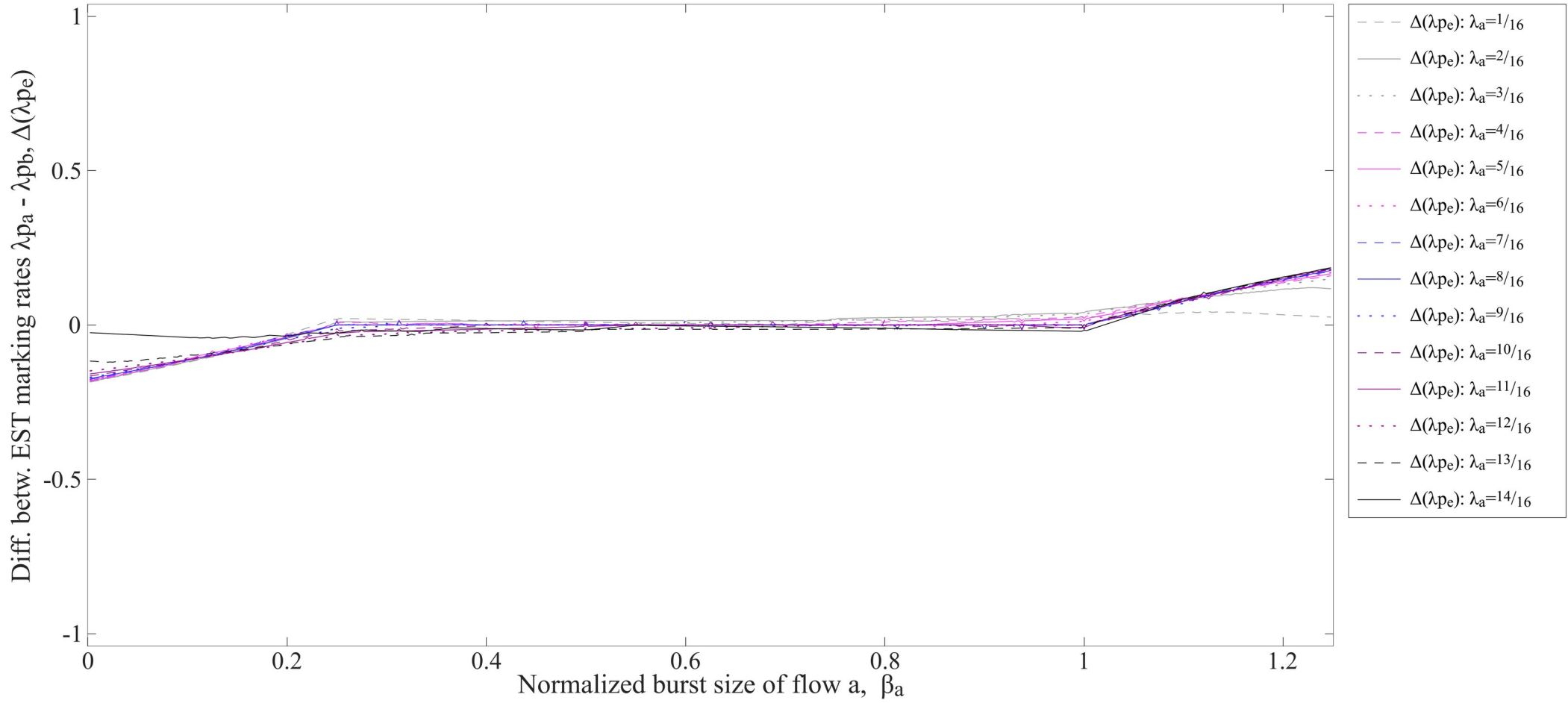

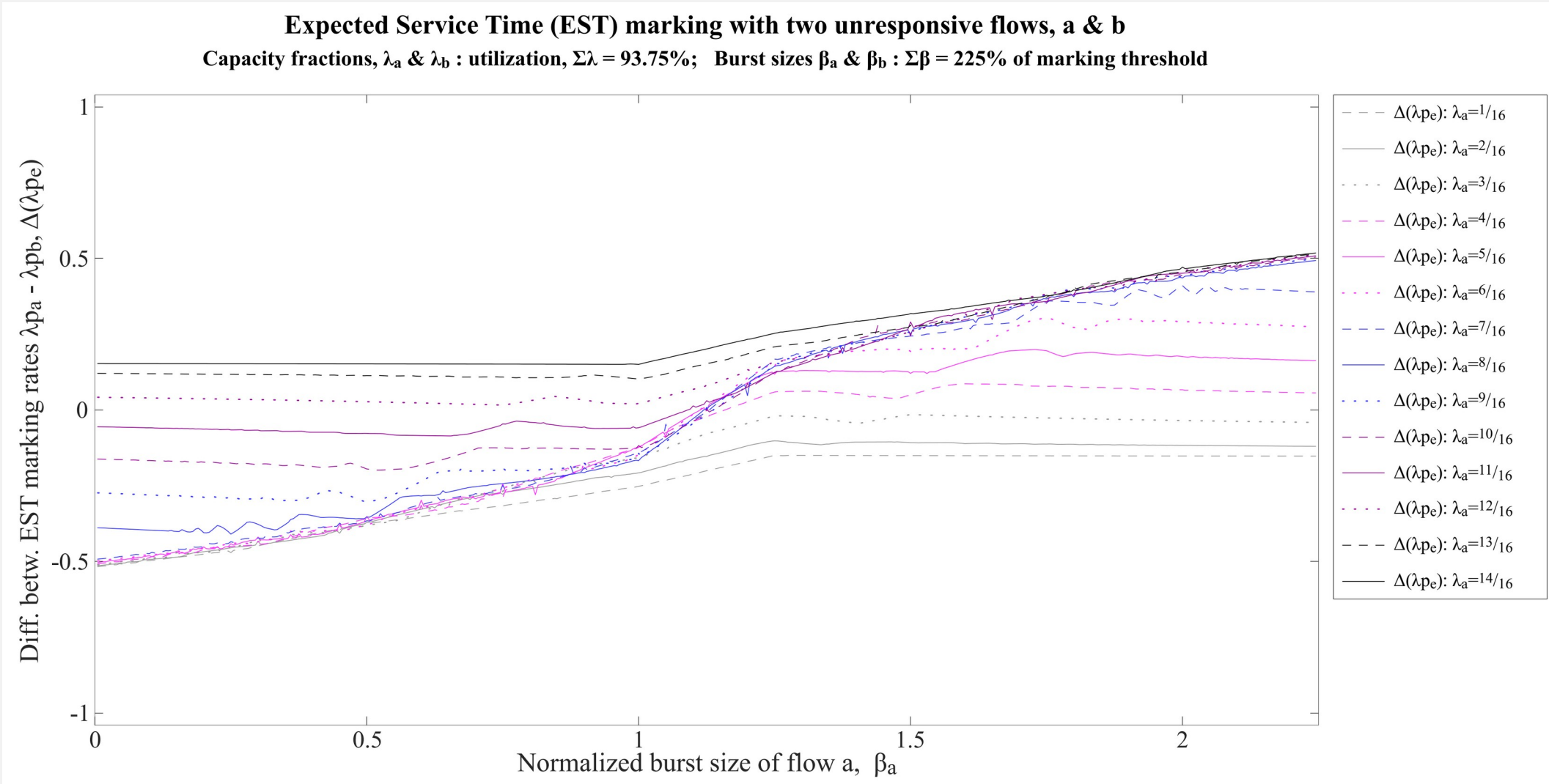
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