Erratum

- There is a fixable error in the proof of Lemma 8 where we falsely claimed $(1-\frac{1}{n})^{\tau} \leq \frac{1}{2}$ (a counterexample would be the case when $n=4$ and $\tau=2$). We hereby provide another proof to show that $\frac{dg(\tau)}{\tau} \leq 0$.

  To show that
  $$\big(1+\frac{\tau}{n-1}\big)\big(1-\frac{1}{n}\big)^{\tau}-1 \leq 0,$$
  we let $p(\tau)=(1+\tau/(n-1))(1-1/n)^{\tau}$. Then, we need to prove $p(\tau) \leq 1$ for all $1 \leq \tau \leq n-1$. Consider $q(\tau)=\log p(\tau)$, then we need to prove $q(\tau) \leq 0$ for all $1 \leq \tau \leq n-1$. Note that $q(1)=0$ ($p(1)=1$). It is easy to derive
  $$\frac{dq}{d\tau}=\frac{1}{n+\tau-1}+\log(1-\frac{1}{n}) \leq \frac{1}{n+\tau-1}-\frac{1}{n} \leq 0,$$
  where we used that $\log(x) \leq x-1$. This implies that $q(\tau)$ is decreasing. Along with the fact that $q(1)=0$, we have $q(\tau) \leq 0$ for all $\tau \geq 1$.

- Typos

  1. In the last equation on the left column of page 7, $\mathbb{P}(T_{1j} \leq t-1)$ should be $\mathbb{P}(T_{kj} \leq t-1)$;
  2. In the equation on the right column of page 9 regarding $\mathbb{P}(T_{1n}^{n} \leq \tau)$, P should be P_1;
  3. In the paragraph right before Remark 14, one of $\mathbb{P}(T_{1n}^{*} \leq \tau)$ should be $\mathbb{P}(T_{n1}^{*} \leq \tau)$.