2-point and 3-point lattice correlation functions and extract the decay constants and mixing matrix elements in Sec. IV, and extrapolate these results to the physical light-quark masses using a phenomenologically-motivated function based on next-to-leading order (NLO) $SU(2)$ heavy-meson chiral perturbation theory in Sec. V. In Section VI we estimate the contributions of the various systematic uncertainties to f_{B_s}/f_{B_d} and ξ, discussing each item in the error budget separately. We present our final results and conclude in Section VII.

This paper also contains four appendices. Appendix A specifies the $SU(3)$ projection methods that are used in our APE and HYP-smeared gauge links. In App. B some details of the perturbative formulae used to match from continuum QCD to HQET as well as for the HQET running are presented. Appendix C discusses the large ground state degeneracy present in HQET and how it can be exploited to compute B-meson mixing matrix elements using localized sources and sinks. The $SU(3)$ and $SU(2)$ NLO HMχPT expressions for the B-meson decay constants and mixing matrix elements relevant for $N_f = 2 + 1$ domain-wall lattice simulations are provided in App. D; some of these results have not been presented previously in the literature.

II. LATTICE ACTIONS AND PARAMETERS

In this section we briefly describe our numerical lattice simulations. We use the unquenched lattices generated by the RBC and UKQCD Collaborations which include the effects of 2+1 dynamical flavors of domain-wall quarks [19]. We calculate the decay constants and matrix elements on configurations with a lattice spacing of $a^{-1} = 1.729(28)$ GeV [34] and an approximate spatial volume of $L^3 \approx (1.8 \text{ fm})^3$. For each ensemble, the masses of the up and down sea quarks are degenerate and the mass of the strange sea quark is slightly larger than its physical value. In order to distinguish the dynamical quark masses used in our simulations from the physical u, d, and s-quark masses, we denote the lighter sea quark mass by m_l and the heavier sea quark mass by m_h. Our lightest pion mass is approximately 430 MeV. Table I summarizes the parameters of the dynamical domain-wall ensembles used in our analyses.

In Section II A we present the domain-wall fermion action used for both the valence and sea light u, d, and s quarks. Next, in Sec. II B, we show the Iwasaki gauge action used for the gluon fields. Finally, we discuss the static action used for the heavy b quarks in Sec. II C.