1. In principle, we can use the same formula for the dispersion relation for a multi-species plasma. The only change is that now $F_0(v_z)$ is a sum from all species:

$$F_0(v_z) = \frac{1}{\omega_{pe}^2} \sum_s \omega_{ps}^2 F_s(v_z).$$

2. However, the shape of $F_0(v_z)$ can be very different from the case with just the electron distribution. The addition of the ion distribution can produce a bump at small $v_z$, and thus increase $|\partial F_0/\partial v_z|$ (and thus damping rate) locally.

3. One case that this can happen is the ion acoustic mode. As we have discussed using the fluid treatment, the phase velocity of this mode is $\omega/k = \pm \sqrt{kT_e/m_i}$. This means that the restoring force is provided by electron pressure, while the inertia is provided by ions. However, the fluid treatment cannot give information about the damping of the wave.

4. From this phase velocity, a simple physical picture can show that the damping rate $\gamma$ is much higher in the case of $T_e \sim T_i$ than the case $T_e >> T_i$.

5. To demonstrate this mathematically, we can consider cases using either the Cauchy distributions or the Maxwellian distributions.