so that we have $n \cdot c_0 - \sum_{q \in S} (v(q)-1)$ as the number of vertices.

$\Rightarrow$ By the definition (or relation) $g(S_0) = \dfrac{-\chi(S_0)+2}{2}$,

$$2 - 2g(S) = n(2 - 2g(S')) - \sum_{q \in S} (v(q)-1)$$

$$2g(S) - 2 = 2n(g(S')-1) + \sum_{q \in S} (v(q)-1)$$

$$\Rightarrow g(S) - 1 = n \cdot (g(S')-1) + \frac{1}{2} \sum_{q \in S} (v(q)-1)$$

$$\Rightarrow g(S) = n \cdot (g(S')-1) + 1 + \frac{1}{2} \sum_{q \in S} (v(q)-1).$$

We can also relate the canonical bundle of S to that of S'. Let ω be a global meromorphic 1-form on S', written locally as

$$\omega = \frac{g(w)}{h(w)}\, dw.$$

For any point $p \in S$ of ramification index v we can find a coordinate z on S centered around p with f given by

$$w = z^v.$$

Then
$$f^*\omega = \frac{g(z^v)}{h(z^v)}\, dz^v$$

$$= v \cdot z^{v-1} \frac{g(z^v)}{h(z^v)} \cdot dz.$$

so $\operatorname{ord}_p(f^*\omega) = v \cdot \operatorname{ord}_{f(p)}(\omega) + (v-1)$.