$$\int_{dv}^{S_\ell} f(v) = \int_{du}^{S_\ell} du\, \overbracket{\det h^{-1} T_u(\widetilde{g})}\, f(\widetilde{g}(u))$$

$$v = \widetilde{g}\,(u) \Longrightarrow dv = du\, \overbracket{\det h^{-1} T_u(\widetilde{g})}$$

$$hu = \widetilde{g}\,(u)$$

$$\int_{d^0_{\widetilde{g}\,(u)}\,(y)}^{\Omega_{\widetilde{g}\,(u)}} F(y) = \int_{d^0_u\,(x)}^{\Omega_u} F\left(\hat{g} \cdot x\right)$$

$$y = \hat{g}\,(x) \Longrightarrow d^0_{hu}\,(y) = d^0_u\,(x)$$

$$\Omega_{hu} = \Omega_{\widetilde{g}\,(u)} \xleftarrow[\text{struct}]{\hat{g}} \Omega_u$$

$$\Omega_u \xleftarrow[\text{struct}]{h^{-1}\hat{g}} \Omega_u$$

$$\Delta_{hu}\left(\hat{g} \cdot x\right) = \Delta_u\left(h^{-1}\hat{g} \cdot x\right) = \Delta_u\left(h^{-1}\hat{g} \cdot u\right) \Delta_u\,(x)$$

$$\overbrace{\hat{\varrho}_g(x)}^{2} = \overline{\det h^{-1} T_u(\tilde{g})} \frac{\mathcal{L}_u\left(h^{-1}\hat{g}\cdot x\right)}{\mathcal{L}_u(x)}$$

$$\int_{du}^{S_\ell} \int_{d_u^0(x)}^{\Omega_u} \mathcal{L}_u(x) \overbrace{\hat{\varrho}_g(x)}^{2} f\left(\hat{g}\cdot x\right) = \int \overbrace{\hat{\varrho}_g}^{2} f \circ \hat{g} = \int f = \int_{dv}^{S_\ell} \int_{d_v^0(y)}^{\Omega_v} \mathcal{L}_v(y) f(y)$$

$$= \int_{du}^{S_\ell} \overline{\det h^{-1} T_u(\tilde{g})} \int_{d^0_{\tilde{g}(u)}(y)}^{\Omega_{\tilde{g}(u)}} \mathcal{L}_{\tilde{g}(u)}(y) f(y) = \int_{du}^{S_\ell} \overline{\det h^{-1} T_u(\tilde{g})} \int_{d_u^0(x)}^{\Omega_u} \mathcal{L}_{\tilde{g}(u)}\left(\hat{g}\cdot x\right) f\left(\hat{g}\cdot x\right)$$

$$\Rightarrow \mathcal{L}_u(x) \overbrace{\hat{\varrho}_g(x)}^{2} = \overline{\det h^{-1} T_u(\tilde{g})} \mathcal{L}_{\tilde{g}(u)}\left(\hat{g}\cdot x\right) = \overline{\det h^{-1} T_u(\tilde{g})} \mathcal{L}_u\left(h^{-1}\hat{g}\cdot x\right)$$