

$$\begin{array}{ccccc}
 0 & \longrightarrow & M^u & \xrightarrow{\varphi^*} & P^v \\
 & & \downarrow f^* & \swarrow g & \\
 & & F^v & &
 \end{array}
 \qquad
 \phi^* = \left(\phi, E\left(\frac{R}{m}\right) \right)$$