$= \Omega^n_{\tilde M}((\tilde L^{k_1} + \tilde K^*_M) \otimes (\tilde L^{k'} - nE))$ $\quad k_1 + k' = k \geq k_0 = k_2 + k_1$
if $k' \geq k_2$, $\Rightarrow$ $k_1 + k' = k \geq k_1 + k_2 = k_0$.

Here we used the relation $K_{\tilde M} = \pi^* K_M + (n-1)E$ and $\mathcal{O}_{\tilde M}(E \otimes K_{\tilde M}) = \Omega^n_{\tilde M}(E)$ for any holomorphic vector bundle. refer to P153. Kodaira-Serre duality.

Now by hypothesis, $\tilde L^{k'} - nE$ has a positive definite curvature form on $\tilde M$; $L^{k_1} + K^*_M$ has a positive curvature form on M, and so $(\tilde L^{k_1} + \tilde K^*_M)$ has a positive semidefinite one on $\tilde M$.

Γ $\quad \tilde L^{k_1} + \tilde K^*_M = \pi^*(L^{k_1} + K^*_M) \geq 0$. $\Rightarrow$ positive semidefite.
One thing we omitted to discuss is the following:

$$K_{\tilde M} = \pi^* K_M + (n-1)E = \tilde K_M + (n-1)E.$$
$$\Rightarrow K^*_{\tilde M} = Hom(K_{\tilde M}, \mathbb{C}) = Hom(\tilde K_M + (n-1)E, \mathbb{C})$$
$$= \tilde K^*_M + (n-1)E^*. \Rightarrow K^*_{\tilde M} = \tilde K^*_M - (n-1)E.$$

In general, if L_1 & L_2 are line bundles.
$$\Rightarrow (L_1 \otimes L_2)^* = L_1^* \otimes L_2^*.$$

pf) $\{g_{\alpha\beta}\}$, $\{h_{\alpha\beta}\}$ are given as transition functions of L_1 & L_2 respectively.
$\Rightarrow \{g_{\alpha\beta} \otimes h_{\alpha\beta}\}$ is a set of transition functions of $L_1 \otimes L_2$. $\Rightarrow (L_1 \otimes L_2)^*$ has transition functions $\{g^{-1}_{\alpha\beta} \otimes h^{-1}_{\alpha\beta}\}$ by P67.
On the other hand, $L_1^* \otimes L_2^*$ has transition function $\{g^{-1}_{\alpha\beta} \otimes h^{-1}_{\alpha\beta}\}$ which are the same as above.

Thus the line bundle $(\tilde L^{k_1} + \tilde K^*_M) + \tilde L^{k'} - nE$ is positive