4.1 b. $E(Y|C=0, X=0) = \frac{0 \times 80 + 1 \times 20}{80 + 20} = 0.2$

$E(Y|C=1, X=0) = \frac{0 \times 20 + 1 \times 10}{20 + 10} = 0.33$

$E(Y|C=0, X=1) = \frac{0 \times 80 + 1 \times 20}{80 + 20} = 0.2$

$E(Y|C=1, X=1) = \frac{0 \times 80 + 1 \times 40}{80 + 40} = 0.33$

$P(C=1) = \frac{20 + 10 + 80 + 40}{350} = 0.43$

$P(C=0) = \frac{20 + 10 + 80 + 40}{350} = 0.57$

$E(Y(1)) = E[Y|do(X=1)] = E(Y|C=0, X=1) \cdot P(C=0) + E(Y|C=1, X=1) P(C=1)$

$\qquad = 0.2 \times 0.57 + 0.33 \times 0.43 = 0.26$

$E(Y(0)) = E[Y|do(X=0)] = E(Y|C=0, X=0) P(C=0) + E(Y|C=1, X=0) P(C=0)$

$\qquad = 0.2 \times 0.57 + 0.33 \times 0.43 = 0.26$

$ATE = E(Y(1)) - E(Y(0)) = 0$

$E(Y(1)|X=1) = E[Y|X=1, do(X=1)]$

$\qquad = E(Y|C=0, X=1) P(C=0|X=1) + E(Y|C=1, X=1) P(C=1|X=1)$

$\qquad = 0.2 \times 0.45 + 0.33 \times 0.55 = 0.27$

$E(Y(0)|X=1) = E[Y|X=1, do(X=0)]$

$\qquad = E(Y|C=0, X=0) P(C=0|X=1) + E(Y|C=1, X=0) P(C=1|X=1)$

$\qquad = 0.2 \times 0.45 + 0.33 \times 0.55 = 0.27$

$ATT = E(Y(1)|X=1) - E(Y(0)|X=1) = 0$