0 Question: Is it possible that average wages went up from 1950 to 1960, but went down for both men and women? Assume that the proportion of men to women can change. (This is not a historical example.)

A1: A2:

Arguments for A1

No arguments

Arguments for A2

1 Question: No, this is not possible.

We can establish this by seeing that the overall change in wages is a weighted average of the changes for men and women. It's the change in wages for men multiplied by the number of men plus the change in wages for women multiplied by the number of women, all divided by the total number of people. This is exactly what a weighted average is.

We know that a weighted average of falling wages cannot give us rising wages overall, because a weighted average of two negative things cannot give a positive result. This is because a weighted average of two things is always somewhere between those two things, and a number that's between two negative numbers is always going to be negative too. You can see this by imagining a number line.

Don't get confused by the fact that the numbers of men and women can change - the total amount of wages paid might increase or decrease, but we're interested in the average wages. How the average changes is different from how the total changes, because we divide by the number of people when we take the average.

Similarly, the proportion of men and women changing will change exactly how we need to weight the average, but it can't ever make the average increase. If the population was entirely men, the average would just be the wage change for men, and vice versa for women, otherwise it's between the two.

A1: A2: