Structural change and income levels

For this topic, you will have to analyze the relationship of the contribution of structural change to growth in output per capita and the level of output per capita. This short paper does not require a formal model, but rather some accounting work and some very simple regressions.

Accounting background

Total output is the sum of output in separate J industries

$$Y_t = \sum_j^J Y_{jt}$$

where each individual Y_{jt} term is in real terms (meaning the values are comparable, and can be summed up). In addition, you know that L_{jt} workers are in each industry j, and there are a total of L_t workers. Let $s_{jt} = L_{jt}/L_t$ be the share of workers in industry j, and let $y_{jt} = Y_{jt}/L_{jt}$ be output per worker in industry j. Similarly, $y_t = Y_t/L_t$ is aggregate output per worker. Let $\Delta x_t = x_{t+1} - x_t$ for any given variable x.

You can derive the following accounting identities

$$\Delta y_t = \sum_j^J y_{j,t+1} \Delta s_{jt} + \sum_j^J s_{jt} \Delta y_{jt}.$$

The first term on the right-hand side here is the "between" growth in output per worker, meaning it comes from the shift of workers between industries. The second term on the right is the "within" growth, as it captures changes in output per worker coming from industries, holding the share of workers in an industry constant.

You can also derive the following, similar relationship.

$$\Delta y_t = \sum_j^J y_{jt} \Delta s_{jt} + \sum_j^J s_{jt} \Delta y_{jt} + \sum_j^J \Delta s_{jt} \Delta y_{jt}$$

Here the first term is again the "between", the second is again "within" (but notice the subscript differences), and the last term is the "covariance" term. This last term captures whether industries that were growing in output per worker were also growing in their share of labor.

Notice that this Δy_t is an absolute change in output per worker. For comparisons you'd probably want to scale this by something like initial y_t to get each term's percentage point contribution to growth.

Data

This is relatively data intense. By which I mean you will need to pull down raw data and manipulate it yourself in order to put it into a form that you can use to calculate the above breakdowns. You should got to the GGDC website, and the 10-sector database. Download it (it comes in either Excel or Stata).

For each country in that database, you should calculate the right-hand side terms of both accounting identities above for five year periods, 1960-1964, 1965-69, 1970-1974, etc.. Not every country will have data in all those periods, but you'll have roughly ten observations for each country.

Write-up

The point of this paper is to analyze whether the "between" term in accounting for structural change is related in any way to the level of output per capita. You will need to run some simple regressions of the between terms on the initial level of output per capita (e.g. the between term from 1970-74 regressed on the initial level from 1970). Essentially, you're looking to see whether the between effects get bigger or smaller as a country develops (or if they don't tend to change).

1. As you have multiple observations for each country, and multiple periods, you could incorporate country and/or period fixed effects.
2. You might also want to explore transforms of the initial level of output per capita (e.g. logs)
3. You could provide some plots of the residual relationship of the between terms of output per capita (e.g. after controlling for FE)
4. You could provide some robustness checks based on doing this for countries in different regions/continents to see if the relationships are consistent
5. You could provide some discussion of how to interpret what a "between" term represents, what a "within" term represents, and what a "covariance" term represents.

Your analysis should all be written in Latex, and include any figures or tables you produce to show your results.