A Connection to Osotimehin and Popov (2020)

In earlier work (Osotimehin and Popov, 2020) we consider the effect of distortions in production networks. The framework is a static multi-sector model with input-output linkages. In each sector, a representative firm produces goods using labor and intermediate goods with the production function

$$Q_i = A_i \left[(1-\alpha_i)^{1-\sigma} (B_i L_i)^{\sigma} + \alpha_i^{1-\sigma} X_i^{\sigma} \right]^{\frac{1}{\sigma}}, \tag{1}$$

where B_i is the labor-augmenting productivity component, A_i is the Hicks-neutral productivity component, and L_i is the labor input.[1] The intermediate-input bundle is given by

$$X_i = \left(\sum_j v_{ij}^{1-\rho} X_{ij}^{\rho} \right)^{\frac{1}{\rho}}, \tag{2}$$

where X_{ij} is the quantity of intermediate goods from sector j used by sector i. We impose $\alpha_i \in [0,1)$, $v_{ij} \in [0,1]$, and $\sum_{j=1}^{n} v_{ij} = 1$ for all $i = 1, ..., n$, $\rho \in (-\infty, 1)$ and $\sigma \in (-\infty, 1)$. Final output (consumption) is an aggregate of the goods from the different sectors,

$$Y = \prod_{i=1}^{n} \beta_i^{-\beta_i} \prod_{i=1}^{n} C_i^{\beta_i}, \tag{3}$$

with $\beta_i \in [0,1]$, $\sum_{i=1}^{n} \beta_i = 1$.

Finally, we assume that firms charge exogenous sector-specific markups μ_i over marginal costs.

Static models like ours (see for a survey Carvalho and Tahbaz-Salehi (2019)) are standard in the input-output literature and can be thought as at the steady state of richer dynamic model. In the short run there are likely to be significant adjustment costs, so in this study we assume sticky nominal wages and no worker reallocation.

Under these assumptions, it is immediate that the prices are fixed at their pre-shock level; similarly, from the constant returns to scale assumption, the ratios X_{ij}/Q_i and L_i/Q_i are constant. Then given our assumptions of constant labor productivity, $\frac{L_i - \bar{L}_i}{\bar{L}_i} = \frac{Q_i - \bar{Q}_i}{\bar{Q}_i} = \frac{q_i - \bar{q}_i}{\bar{q}_i}$, which we compute as specified.

Considering the long-run model reveals the margins of adjustment that we rule out in the short-run analysis. First, we assume that workers in shrinking sectors maintain their consumption of non-social consumption goods, either out of savings or through social insurance.

[1] For simplicity, we do not explicitly model capital. The primary input L_i can be thought of as a capital-labor bundle.

Second, we do not allow reallocation of final demand to goods that pose fewer health risk (in the scenario we consider their final consumption is fixed). Last, demand for investment by affected sectors will decline if the coronavirus crisis proves long. We argue that in the short run these effects are likely to be quantitatively small.