

### 3.1 Trade Growth Accounting

Although the growth in offshoring is not easily observed directly, we describe an accounting framework which can be used to approximate it. We use the following notation.  $Y$  is GDP,  $Y_D$  is domestic value-added,  $S_D$  is the domestic manufacturing sales and  $M$  is total imports. Then, define  $\beta$  and  $\gamma$  so that

$$S_D = \beta \times \left( \begin{array}{c} \text{imported} \\ \text{intermediate goods} \end{array} + \begin{array}{c} \text{domestically produced} \\ \text{intermediate goods} \end{array} \right) \quad (31)$$

$$M = \gamma \times \left( \begin{array}{c} \text{imported} \\ \text{intermediate goods} \end{array} \right) \quad (32)$$

Meanwhile, we define our measure of offshoring  $q$  is the ratio of imported intermediate goods to the total intermediate goods - both imported and domestically produced. Thus, we have:

$$q \equiv \frac{\text{imported intermediate goods}}{\begin{array}{c} \text{imported} \\ \text{intermediate goods} \end{array} + \begin{array}{c} \text{domestically produced} \\ \text{intermediate goods} \end{array}} \quad (33)$$

Then by using our definitions of  $\beta$  and  $\gamma$ , we can write

$$\begin{aligned} M &= q \times S_D \times \frac{\gamma}{\beta} \\ &= q \times \frac{S_D}{Y_D} \times \frac{Y_D}{Y} \times Y \times \frac{\gamma}{\beta} \end{aligned} \quad (34)$$

So, import/GDP ratio is

$$\frac{M}{Y} = q \times \frac{S_D}{Y_D} \times \frac{Y_D}{Y} \times \frac{\gamma}{\beta} \quad (35)$$

Finally, if we make the assumption that  $\beta$  and  $\gamma$  are constants, then the growth of offshoring can be obtained as

$$g(q) = g\left(\frac{M}{Y}\right) - g\left(\frac{S_D}{Y_D}\right) - g\left(\frac{Y_D}{Y}\right)$$