Final demand multipliers derived from input-output tables at constant prices – explanatory note

Output multipliers

Output multipliers measure the amount of economy-wide output produced in all production stages in response to a change in final demand for a domestically produced good or service. Thereby they show which industries have most links with other industries and are an indicator of an industry's degree of integration in the economy.

The output multiplier mechanism is best shown for a specific product category, e.g. product category 15A1 "Meat and meat products". This product category includes different products of slaughtering (butcher meat in carcases or in chunks, poultry meat, offal...) as well as processed meat products (dried meats, cooked hams, sausages, pâtés...). In order to illustrate the impact on the economy-wide output in Belgium, take a € 1 million increase in final demand for domestically produced "meat and meat products" in 2005. In response to this additional demand, the meat industry will increase its production by € 1 million. This is the **initial effect** on production of the change in final demand. To produce this additional output, the meat industry needs inputs from its direct domestic suppliers which also raise their output: agriculture (live animals), slaughterhouses (meat used in meat preparations), plastic and metal packaging manufacturers, wholesalers... All the effects on the meat industry's direct domestic suppliers are called the **direct effects** on production of the change in the final demand for meat products. Moreover, the meat industry also needs intermediate inputs from its foreign suppliers. These direct intermediate imports are not taken into account in the calculation of the multiplier. They are leaks from the Belgian production cycle. Furthermore, the direct domestic suppliers of the meat industry will, in turn, source additional inputs from their domestic suppliers, which will themselves source inputs from their own suppliers... (purchase of forage, feed and veterinary services by livestock farmers, purchase of fertilizers and agrochemicals by farmers, purchase of basic plastic materials by plastic packaging manufacturers...). All the upstream effects on the suppliers of the meat industry's direct suppliers are called the **indirect effects** on production of the change in final demand.

The sum of the initial, direct and indirect effects is the **total effect** on production of the change in final demand for meat and meat products. It corresponds to the total extra domestic output in the entire economy that originates directly and indirectly from this additional final demand. In this example of a € 1 million increase in the final demand for domestically produced meat, the total effect on production amounts to € 2.15 million and can be split up into the initial effect (€ 1 million), the direct effect

(€ 0.64 million) and the indirect effect (€ 0.51 million). *Output multipliers* are calculated by **dividing the total effect by the initial effect**. Hence, in our example, the output multiplier of "meat and meat products" is € 2.15 million per € 1 million of final demand for domestically produced meat.

Employment multipliers

Employment multipliers measure the impact on total economy-wide employment of a change in final demand for a domestically produced good or service. They are calculated by converting the output change resulting from the change in final demand into a change in the number of jobs. This is done at each production stage by using the employment intensity for each industry, i.e. the number of employed persons per unit of output.

The calculation of employment multipliers is best illustrated by going back to the previous example of a € 1 million change in final demand for domestically produced "meat and meat products" in 2005. In response to this additional demand, the meat industry will raise its output by € 1 million giving rise to 2.9 extra jobs within the industry. This impact is the initial effect on employment, also referred to as **initial employment**. For the additional production, the meat industry needs inputs from its direct domestic suppliers, which will themselves need additional inputs from their suppliers, which will, in turn, need additional inputs from their suppliers… The production in each of these stages gives rise to additional jobs. In our example, 8.0 jobs are directly and indirectly generated in the economy through intermediate input purchases. This **direct and indirect employment** is mainly generated in agriculture, business services, wholesale trade, transport services and the meat industry itself. Hence, **total employment** generated in the entire economy in response to the € 1 million increase in final demand for domestically produced "meat and meat products" amounts to 10.9 jobs.

Employment multipliers are calculated by **dividing the total effect on employment** of a change in final demand **by the initial effect** of this change. In the literature, there are two employment multipliers, which differ in terms of the measure of the initial effect: the simple employment multiplier and the type I employment multiplier.

The simple employment multiplier is the **ratio between the *total employment effect*** and the ***initial exogenous shock***, i.e. the change in final demand. It is expressed as the total number of generated jobs per unit of final demand. In our example, the simple employment multiplier of the meat industry is 10.9. This is the number of jobs generated in all industries by a € 1 million increase in final demand for domestically produced "meat and meat products".

The type I employment multiplier is the **ratio between the *total employment effect*** and the ***initial employment effect*** of a change in final demand for domestic output. It is expressed as the total number of generated jobs per initial job. In our example, the type I employment multiplier of the meat industry is 3.78, i.e. total employment (10.9) divided by initial employment (2.9).

Income multipliers

Income multipliers measure the impact on total economy-wide primary inputs of a change in final demand for a domestically produced good or service. Primary inputs include the components of value added as well as taxes less subsidies on intermediates. By eliminating purchases of intermediate inputs in each production stage, the income multiplier measures the net contribution of final demand for each product to a country's GDP.

The calculation of income multipliers can also be illustrated with the example of a € 1 million increase in final demand for domestically produced "meat and meat products" in 2005. The aim is to measure the impact of this change on economy-wide income. In response to the additional demand, the meat industry raises its output by € 1 million. This is converted into a change in income by multiplying the rise in output by the industry's primary input intensity (i.e. primary inputs per unit of output). For the meat industry, this intensity is 0.15. In terms of income, the rise in output will thus generate € 150,000 of additional primary inputs within the industry. These **initial primary inputs** represent the initial effect on income of the increase in final demand. For the additional production, the meat industry needs inputs from its direct domestic suppliers, which themselves need additional inputs from their domestic suppliers, which, in turn, also need inputs from their suppliers... Additional income is generated in each of these stages. In our example, € 440,000 of income is directly and indirectly generated in the entire economy through intermediate input purchases. These **direct and indirect primary inputs** are mainly generated in wholesale trade, agriculture, business services, transport services, the meat industry itself and veterinary services. Altogether, € 1 million of extra final demand for domestically produced "meat and meat products" generates € 590,000 of primary inputs.

Income multipliers are calculated by **dividing the total effect on primary inputs** of a change in final demand by **the initial effect** of this change. In the literature, there are two income multipliers depending on the measure of initial effect that is used: the simple income multiplier and the type I income multiplier.

The simple income multiplier is the **ratio between the *total effect on primary inputs*** and the ***initial exogenous shock***, i.e. the change in final demand. It is expressed as the total value of primary inputs per unit of final demand. In the example, the simple income multiplier of the meat industry is € 0.59 million per € 1 million of final demand, i.e. a € 1 million rise in final demand for domestically produced "meat and meat products" generates a € 590,000 increase in GDP for Belgium.

The type I income multiplier is the **ratio between the *total primary inputs*** and the ***initial primary inputs***. This measure is expressed in € million of cumulated primary inputs per € million of initial primary inputs. Hence, the type I income multiplier of the meat industry is 3.95, i.e. total primary inputs (0.59) divided by initial primary inputs (0.15). In other words, the total income effect is approximately four times the initial effect.