

## Home assignment 5: The Melitz effect

The following questions are based on the Excel spreadsheet entitled “heterogeneous-firms.xls”. This provides data for a hypothetical monopolistically competitive market with heterogeneous firms.

Each firm is numbered from 1 to 100, and has its marginal product of labor marked. The common value of the fixed labor requirement,  $f$ , is marked at the top of the spreadsheet. For each firm, an assumed value for the firm’s initial quantity produced is marked as well; assume that this has been derived by setting each firm’s marginal cost equal to its marginal revenue. Fixed cost for production  $f = 50$ . And fixed cost for exporting  $g = 25$ .

Note that firms with higher marginal products of labor are assumed to produce more output.

(a) Compute each firm’s employment of labor under autarky.

```
# A tibble: 10 x 4
  `Firm number.` Marginal product of lab~1 Quantity produced un~2 Labor_autarky
      <dbl>          <dbl>          <dbl>          <dbl>
1           1           1           800           850
2           2          1.01          812.          854.
3           3          1.02          824.          858.
4           4          1.03          836.          862.
5           5          1.04          848.          866.
6           6          1.05          861.          870.
7           7          1.06          873.          874.
8           8          1.07          885.          878.
9           9          1.08          898.          881.
10          10          1.09          910.          885.
# i abbreviated names: 1: `Marginal product of labor,  $\Phi$ .`,
# 2: `Quantity produced under autarky.`
```

(b) Use this information to compute the industry’s labor productivity (total output per worker).

[1] 1.45

(c) Now, suppose that the industry is opened to trade, and in accordance with the Melitz effect, the least efficient 15% of the firms drop out. Further, suppose that firm #54 and all of the firms more efficient than firm #54 export, while the remainder of the surviving firms produce only for the domestic market. Suppose that exporting firms increase their output by 10% compared to autarky, while non-exporters reduce their output by 10% compared to autarky. Now, redo your calculations in parts (a) and (b). Interpret your results. In particular, what happens to industry productivity and why?

```
# A tibble: 10 x 7
  `Firm number.` Marginal product of lab~1 Quantity produced un~2 Labor_autarky
      <dbl>          <dbl>          <dbl>          <dbl>
1         91         1.9         2095.         1153.
2         92         1.91        2112.         1156.
3         93         1.92        2128.         1159.
4         94         1.93        2145.         1161.
5         95         1.94        2162.         1164.
6         96         1.95        2178.         1167.
7         97         1.96        2195.         1170.
8         98         1.97        2212.         1173.
9         99         1.98        2229.         1176.
10        100         1.99        2246.         1179.
# i abbreviated names: 1: `Marginal product of labor,  $\Phi$ .`,
# 2: `Quantity produced under autarky.`
# i 3 more variables: Export <chr>, `Quantity produced under trade` <dbl>,
# Labor_trade <dbl>
```

```
[1] 1.51
```

(d) Draw a graph to illustrate these results.

