PRICING TO MARKET

Econ 690: Issues in International Finance
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We look at the pricing behavior of a firm that sells the same good in two different markets. We will ignore transportation and distribution costs for the producer, and model pricing behavior.

Suppose firm *i* has a constant cost per unit of C_i. (Its marginal cost and average cost are both C_i.)

If markets are competitive, then we know in the home market it charges a price equal to C_i: $P_i = C_i$.

In the foreign market, the home currency price of the good should still equal C_i: $SP_i^* = C_i$.

Or, we could say that the foreign currency cost is $\frac{C_i}{S}$, so under perfect competition, $P_i^* = \frac{C_i}{S}$. That gives us the same equation as before: $SP_i^* = C_i$.

Under perfect competition if $P_i = C_i$ and $SP_i^* = C_i$, then the law of one price holds: $SP_i^* = P_i$

Why do identical goods sell for different prices in two countries? For many goods, $SP_i^* \neq P_i$.

We will consider models of imperfect competition, in which firms have some power to set the price of their goods.

Price discrimination

If markets for goods were perfectly competitive, the price difference between locations could only incorporate transportation costs. If one seller tried to set a foreign/domestic price differential that was greater than the cost of shipping the unit overseas, another producer would enter the market and charge a lower price abroad.

However, transportation costs alone cannot account for the international price variation that we see.

We consider a monopolistic producer of a good that sets a price for each market it sells in.

If markets are *segmented*, then clearly a firm can set a different price in different markets, but why would the producer want to do this?

Review the profit maximization problem of a monopolistic producer.

- Demand for firm *i*'s product is given by $D(P_i / P)$. Demand depends on the price the firm charges, P_i, relative to the overall consumer price bundle, *P*.
- Assume the (nominal) cost per unit of producing the good is C_i.

The firm chooses its price to maximize profits:

$$P_i D(P_i / P) - C_i D(P_i / P)$$

The firm’s total revenue is given by its price times the quantity it sells, $P_i D(P_i / P)$ and its total cost is the cost per unit times the number of units it sells, $C_i D(P_i / P)$. The first-order condition for maximizing the profit is given by:

(1) $D(P_i / P) + (P_i / P) D'(P_i / P) - (C_i / P) D'(P_i / P) = 0$,

where we assume $D'(P_i / P) < 0$.

We can rewrite this equation. Remember that the elasticity of demand can be expressed as:

$$\varepsilon(P_i / P) \equiv -\frac{(P_i / P)D'(P_i / P)}{D(P_i / P)}.$$

The negative sign appears here so that the elasticity, $\varepsilon(P_i / P)$, is a positive number. We are not assuming that the elasticity of demand is some constant. In general, the elasticity of demand depends on the price, so we write $\varepsilon(P_i / P)$.

With this definition in hand, we can rewrite the first-order condition for profit maximization as:

(2) $$P_i = \frac{\varepsilon(P_i / P)}{\varepsilon(P_i / P) - 1} C_i .$$

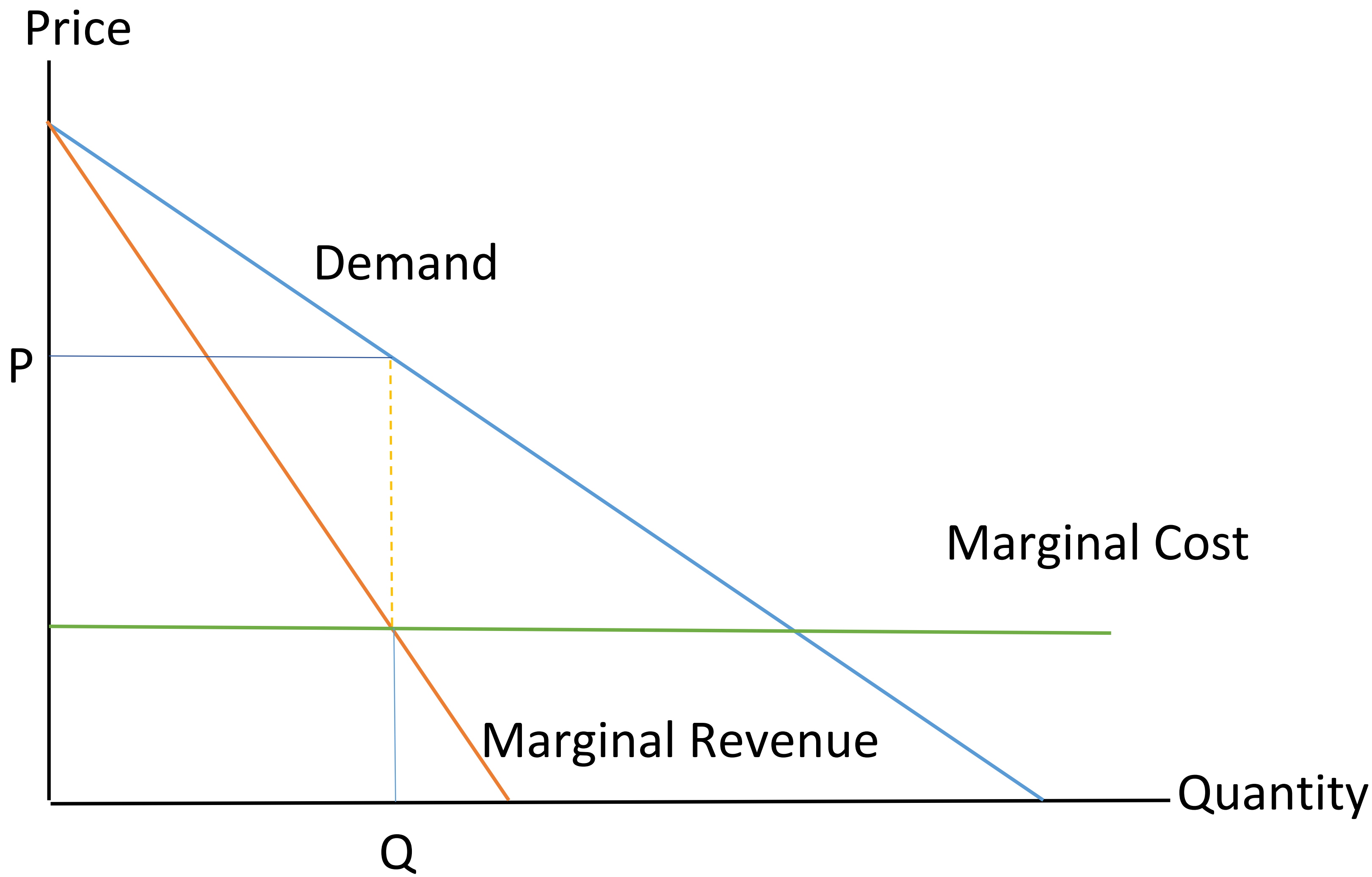
You should convince yourself that you can derive equation (2) from equation (1).

A monopolist always sets a price so that it is on the elastic portion of the demand curve it faces: $\varepsilon(P_i / P) > 1$. Therefore, equation (2) tells us that the firm sets a price above cost per unit.

Let’s define the “markup” as:

$$M(P_i / P) \equiv \frac{\varepsilon(P_i / P)}{\varepsilon(P_i / P) - 1}.$$

- The markup is the ratio of price to cost, and is greater than one.
- The more inelastic the demand for a product (the closer is $\varepsilon(P_i / P)$ to one), the greater the markup.


Price
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P
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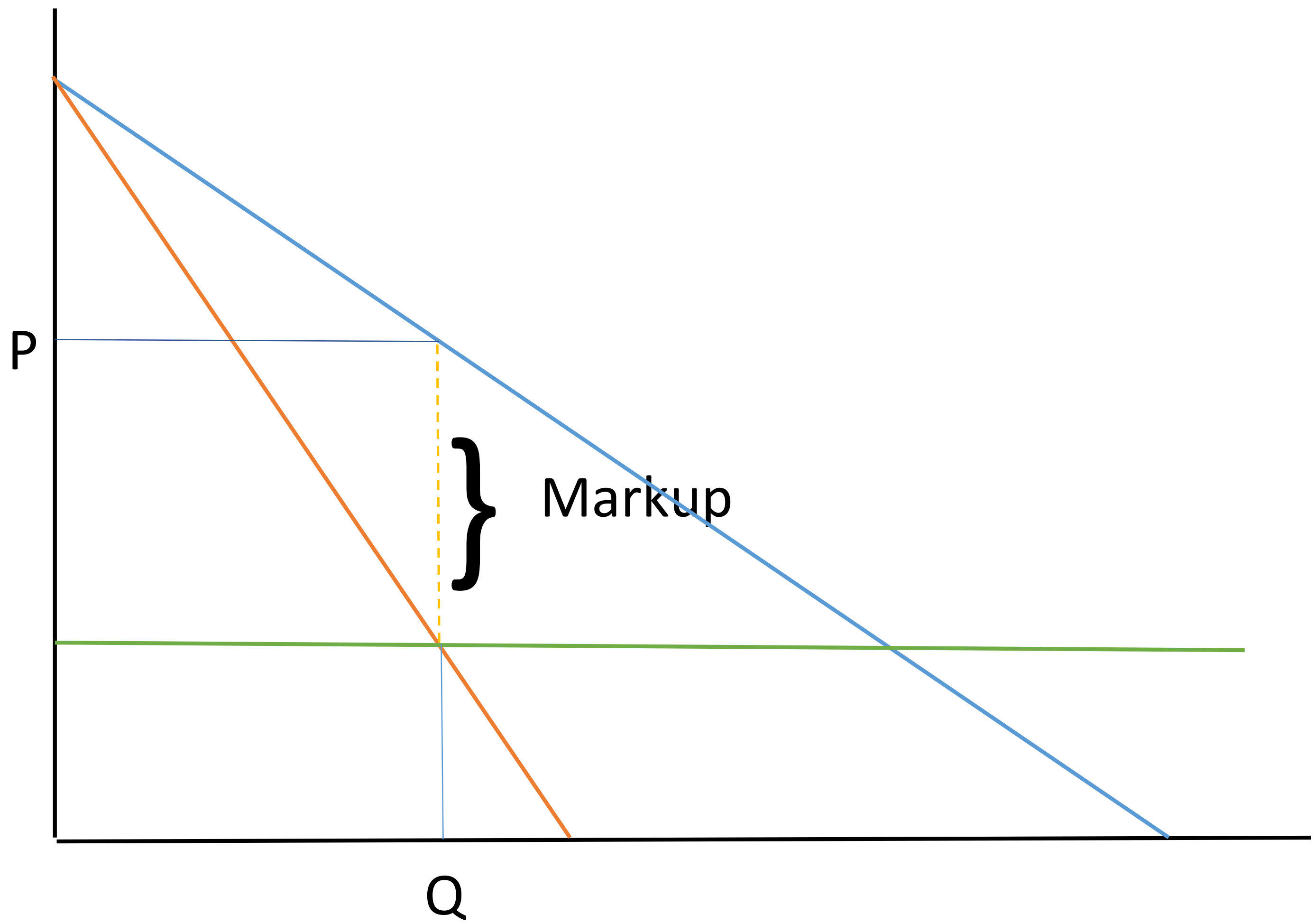

P
Markup
Q

Assume that the cost per unit for producing a good to be sold at home is the same as for sale abroad. That is, ignore the transportation cost. Foreign demand for the product is given by $D^*(P_i^* / P^*)$, and the foreign elasticity of demand is given by $\varepsilon^*(P_i^* / P^*)$. Then the foreign price is determined by:

(3) $SP_i^* = \dfrac{\varepsilon^*(P_i^* / P^*)}{\varepsilon^*(P_i^* / P^*) - 1} C_i$, or simply $SP_i^* = M^*(P_i^* / P^*) C_i$.

Or, we could say the cost per unit in foreign currency is $\dfrac{C_i}{S}$. Then the price in foreign currency is a markup over foreign currency price: $P_i^* = \dfrac{\varepsilon^*(P_i^* / P^*)}{\varepsilon^*(P_i^* / P^*) - 1} \dfrac{C_i}{S}$

We get that the ratio of the foreign price to the home price of the home good is given by the ratio of the markups:

$$\frac{SP_i^*}{P_i} = \frac{M^*(P_i^*/P^*)}{M(P_i/P)}.$$

There can be differences in the optimal markup if the elasticities of demand are very different in the two countries. Especially when elasticities of demand are near to one, markups can be large, and a small difference in the elasticity can lead to a large difference in the mark-up. For example, when the elasticity is 1.1, the markup is 11, but when the elasticity is 1.2, the markup falls to 6.

Take as examples demand curves of the following form, where we set the overall price level in each country equal to 1:

$$D(P_i / P) = a - bP_i$$

$$D^*(P_i^* / P^*) = a - bP_i^*$$

The elasticity of demand for home demand is given by:

$$\varepsilon(P_i / P) \equiv -\frac{(P_i / P)D'(P_i / P)}{D(P_i / P)} = \frac{bP_i}{a - bP_i}$$

$$\varepsilon(P_i^* / P^*) = \frac{bP_i^*}{a - bP_i^*}.$$

Notice that the elasticities increase as the price increases. The higher the price, the more elastic is demand, so the lower will be the mark-up.

Then,

$$M(P_i/P) \equiv \frac{\varepsilon(P_i/P)}{\varepsilon(P_i/P)-1} = \frac{\dfrac{bP_i}{a-bP_i}}{\dfrac{bP_i}{a-bP_i}-1} = \frac{bP_i}{2bP_i-a}.$$

Since $\varepsilon(P_i/P) > 1$, we must have $2bP_i - a > 0$.
Since demand is positive, $bP_i - a < 0$.
Together, these imply $M(P_i/P) > 1$.

Similarly, $M(P_i^* / P^*) = \dfrac{bP_i^*}{2bP_i^* - a}$.

Then we have the relative price the firm charges in two locations is given by:

$$\frac{SP_i^*}{P_i} = \frac{M^*(P_i^* / P^*)}{M(P_i / P)} = \frac{\dfrac{bP_i^*}{2bP_i^* - a}}{\dfrac{bP_i}{2bP_i - a}}.$$

If $S = 1$, a solution to this complicated expression is simply $P_i = P_i^*$, which would then mean $P_i = SP_i^*$. The law of one price holds.

But what if S rises above one, for example? Does the law of one price still hold?

Let's define $R_i = \frac{S_i P_i^*}{P_i}$, so that we have $P_i^* = \frac{P_i R_i}{S_i}$. Then we get, after some algebra:

$$R_i = \frac{2bP_i + (S-1)a}{2bP_i}$$

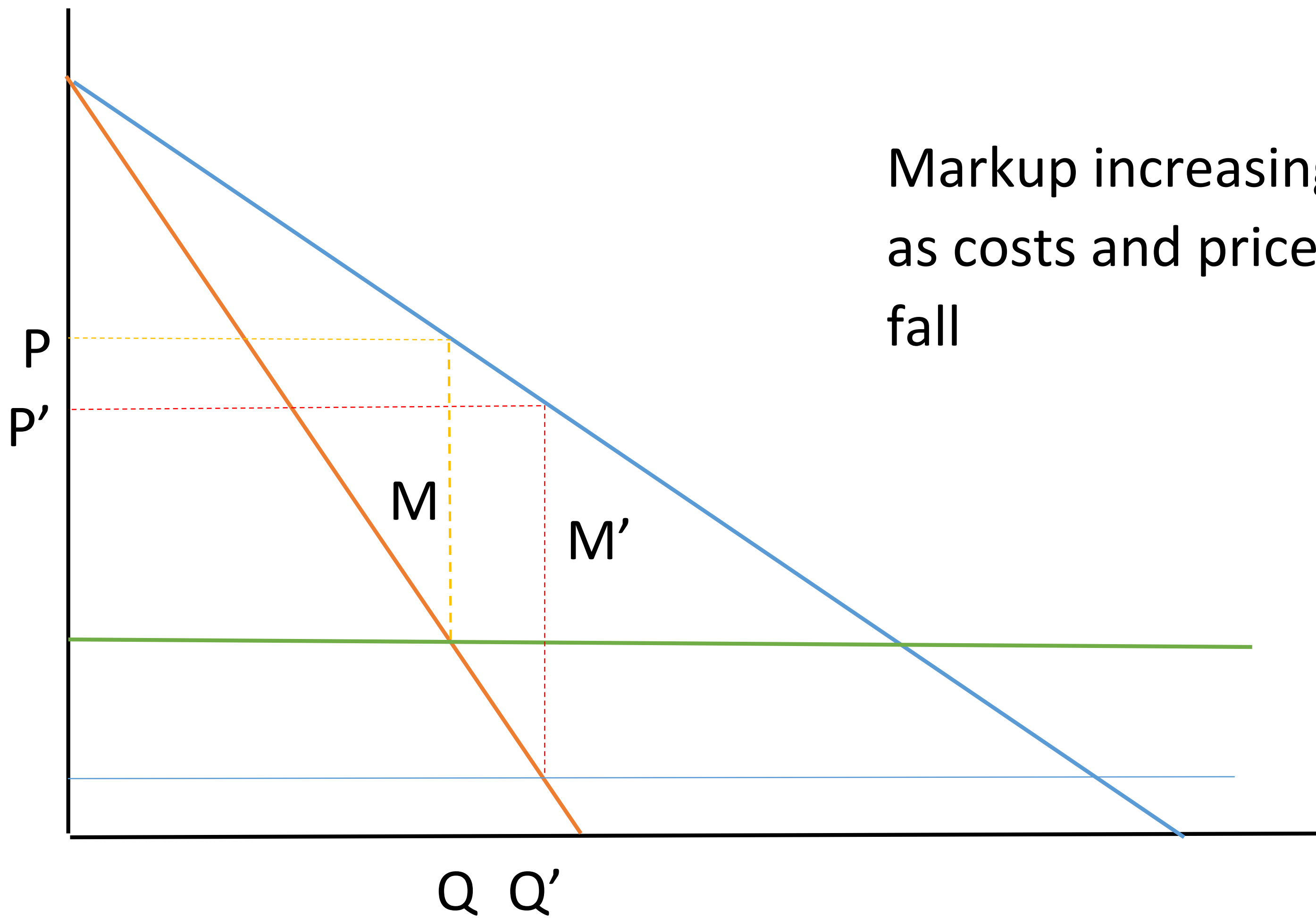
Looking at this expression, it is clear that if *S* rises, then R_i will have to rise. That means when *S* rises above one, we will have $S_i P_i^* > P_i$.

Why does this happen? Why does the firm not set the same price in the two locations?

Suppose *S* rises by 5 percent. Holding the domestic price constant, the firm would need to lower its foreign currency price by 5 percent.

But if it lowers its foreign currency price, it moves toward a less elastic part of the demand curve. As the elasticity of demand falls, the mark-up increases.

Hence, it lowers its price by less than 5 percent because of the increasing mark-up charged to foreigners. That then implies that SP_i^* must increase.



Markup increasing as costs and price fall

Limit pricing

Suppose we have firm that faces a constant elasticity of demand, so it would set price as a constant markup over unit cost:

$$P_i = (\eta / (\eta - 1))C_i.$$

The elasticity of demand is constant only up to a point for this firm.

When the price gets too high, we will assume that there is a potential competitor that will enter the market. This competitor can produce a product that is *identical* to the one our firm produces – it can produce a perfect substitute. Our firm can produce the product at a lower cost than this other potential or “latent” competitor. What price should our firm set?

Let C_{iL} be the cost per unit of the latent competitor. We assume that our firm has a lower cost per unit, $C_i < C_{iL}$. If our firm has a really big cost advantage, it will just set its price according to the formula $P_i = (\eta / (\eta - 1))C_i$.

However, if $(\eta / (\eta - 1))C_i > C_{iL}$, it would be a mistake to use this formula to set its price. If it did, the latent competitor could enter the market and set a price that undercuts the price charged by our firm. Our firm would lose all of its market since the competitor is offering an identical product at a lower price.

In this case (the case in which $(\eta / (\eta - 1))C_i > C_{iL}$), our firm instead will set its price equal to C_{iL} - or perhaps it will set a price just a penny below C_{iL}.

If it sets the price at C_{iL} or just a shade below, the latent competitor will have no reason to enter the market. Our firm will make a profit on every unit sold because it is earning a price equal to C_{iL}, and we have assumed its cost per unit is lower, $C_i < C_{iL}$.

To recap, then, we assume $C_i < C_{iL}$. If the cost advantage of our firm is really great, so that $(\eta/(\eta-1))C_i < C_{iL}$, the firm sets the price at $(\eta/(\eta-1))C_i$.

If our firm has a smaller cost advantage so that $C_i < C_{iL} < (\eta/(\eta-1))C_i$, then our firm sets its price equal to C_{iL}. This pricing strategy is called "limit pricing" – the firm sets a price in order to limit entry from potential competitors.

Now consider an exporting firm that follows a limit pricing strategy.

The key assumption that we make is that it faces different latent competitors in the home and the foreign market. Our firm has a cost advantage in both markets. It has a cost advantage over its potential competitors in the foreign country, even though our home firm has to incur transportation costs when it ships the good abroad.

We assume that the latent competitor in the home market is a home firm, but the latent competitor in the foreign market is a foreign firm. Why?

The latent competitor is the potential entrant in each market that can produce the product at the lowest cost. We assume that the transportation cost wedge is large enough that the low-cost potential entrant in the home market won't be the lowest-cost potential entrant in the foreign market (and vice-versa.)

Our monopolistic firm has to set a price in the home market that is low enough to keep out the potential entrant in the home market, and a price in the foreign market that is low enough to keep out the foreign latent competitor in that market.

Assume that the latent competitor in the home market has a cost of C_{iL}. As before, let's assume that the only cost is labor cost, so that the cost per unit for the home latent competitor is some constant times the home wage: $C_{iL} = \omega W$. Similarly, the cost per unit for the foreign latent competitor (in the foreign currency) is $C_{iL}^{*} = \omega^{*} W^{*}$. Our monopolist firm sets its price in each market equal to the cost of the latent competitor, so $P_i = \omega W$ and $P_i^{*} = \omega^{*} W^{*}$. Then we have:

$$\frac{SP_i^{*}}{P_i} = \frac{\omega^{*}}{\omega} \frac{SW^{*}}{W}.$$

Since ω and ω^{*} are constants, the price of good *i* in the foreign location compared to at home moves proportionately to the relative wage.

In this model, there is no pass-through of the cost of the monopolistic firm to the consumer. As the monopolistic firm's costs fluctuate, it still sets its price according to the cost of the home latent competitor at home, $P_i = \omega W$, and the foreign latent competitor abroad, $P_i^* = \omega^* W^*$.