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A Flexible Oligopoly-Oligopsony Model for Classroom Simulations and Policy Analyses

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Abstract

We present a flexible model of a vertical market where firms with possible oligopsony power procure a key input, combine it with other inputs purchased competitively, and sell a final product to consumers in a market that may have oligopoly power. The model is capable of depicting all forms of market power ranging from perfect competition to pure monopoly/monopsony. A linear version of the model depicts market equilibrium in terms of only five parameters. The model is useful in teaching undergraduate students about the impacts of market power in classes such as microeconomics, industrial organization, and regulation. An accompanying Excel spreadsheet enables instructors to conduct in-class illustrations and students to utilize the model to perform various problem solving and policy analyses.

KEYWORDS: market power, oligopsony, oligopoly

The performance of markets with oligopoly and/or oligopsony power is an integral component of courses such as industrial organization and business regulation. Yet the standard solution concepts are limiting in terms of their ability to depict the wide range of market outcomes that are possible in these settings. Cournot's equilibrium has obvious appeal, but to make its application accessible to most undergraduates requires strong assumptions on homogeneity among firms, which leads to a rather mechanical relationship between number of firms and the market's equilibrium. Second, the fact that Cournot is a noncooperative solution concept limits instructors' ability to illustrate quasi-collusive outcomes. Such a limitation is especially apparent when discussing mergers and the need for antitrust authorities to consider both unilateral market power and enhanced potential for collusion when evaluating merger applications.

We present a flexible oligopoly-oligopsony model in this paper that readily allows instructors and students to depict any market structure along a continuum from perfect competition to pure monopoly/monopsony. The model depicts equilibrium in a vertical market where firms with possible buyer market power procure a "key" input from upstream sellers, combine it with other inputs that are purchased competitively, and sell a final product to consumers, possibly also exercising market power as sellers. A linear version of the model is presented as an Excel spreadsheet that can be utilized by instructors for in-class presentations and by students in a variety of problem-solving settings.

The basic premise of the model is that competition on both the output selling and input procurement sides of the market can be depicted in terms of a parameter that ranges in the unit interval, where a value of zero denotes perfect competition and a value of 1.0 denotes pure monopoly or monopsony. Intermediate values represent different degrees of oligopoly and/or oligopsony power. In the basic model with linear consumer demand and key-input supply functions equilibrium is expressed in terms of only five parameters: the parameters depicting the degrees of oligopoly and oligopsony power, the price elasticity of consumer demand, the price elasticity of key-input supply, and the revenue share of the key input. Extensions are readily added at the cost of introducing additional parameters. The Excel file included with the paper includes one such extension—a cost-shift parameter, which is particularly useful for merger analysis.

For classes with calculus prerequisites, conceptual underpinnings for the approach can be presented in terms of the conjectural variations model of static oligopoly. Alternatively, modeling the degree of competition as a $[0,1]$ index can be motivated through appeal to the folk theorem and the fact that, although we might not know what dynamic game firms are playing, we can observe the results in terms of market equilibrium outcomes they achieve (e.g., Karp and Perloff

1989; Farrell and Shapiro 1990).¹ The entire model can be illustrated graphically with this motivation, as we show in the next section. We then describe its adaptation for simulation purposes and provide examples of exercises that can be performed using the model.

The Model

Consumers of the final product have aggregate inverse demand function:

$$(1) \quad P = D(Q^R | X),^2$$

where P is the consumer price, Q^R is total volume of the final product, and X is a demand-shift variable. The variable X can be omitted entirely by instructors in presenting the model if they wish merely to illustrate the effects of market power and are not interested in comparative static analysis. We include explicit notation for a shift variable in the consumer demand, key input supply, and firm cost functions because one application of the model is to illustrate to students how basic comparative static analysis, such as the imposition of taxes or subsidies, is different in the presence of market power, as compared to perfect competition. Figure 3 provides a graphical illustration of this point.³

Although oligopsony power ordinarily receives far less attention than oligopoly power, interest in ability of large companies to drive down the prices of their suppliers is on the rise (Wilke 2004), and is an important consideration in various markets, such as agriculture (Rogers and Sexton 1994), some labor markets such as professional sports and health care (Boal and Ransom 1997; Noll 2005), and markets for various intermediate goods.⁴ This model allows the specification of one key input, I , that faces potential oligopsony power from the downstream buyers. The applications we study generally involve an agricultural commodity that will be combined with other inputs to produce a final good for consumers.⁵ However, the key input could be labor, an energy input such as

¹ Dockner (1992) and Cabral (1995) provide formal justifications for the use of conjectural variations as the reduced-form solution to an unmodeled dynamic game.

² The Excel simulation assumes linear functional forms for final product demand and key input supply. Although we present the model in general functional form, instructors may simply begin with the linear functions, in which case all exogenous shifter variables represented by X in the general formulation of demand are subsumed within the intercept term of the demand curve.

³ In more advanced classes, the simulation model can be adapted to study formally the impacts from such decisions on the market equilibrium. For example, see Saitone, Sexton, and Sexton (2008) for analysis of the U.S. ethanol subsidy using a model of this genre.

⁴ For example, in popular press and internet blogs, Wal Mart is widely accused of exerting monopsony power over its suppliers.

⁵ Examples include studies of the impacts of agricultural research (Alston, Sexton, and Zhang 1997), agricultural trade liberalization (Sexton et al. 2007), and the U.S. ethanol subsidy (Saitone, Sexton, and Sexton 2008).

electricity, a component to a manufactured product, or a manufactured product that is sold to powerful retailers.

The potential for oligopsony power is present when the aggregate supply of an input to an industry is less than perfectly elastic. Write this supply in inverse form as

$$(2) \quad W = S(Q^I | Y),$$

where W is the unit price of input I , Q^I is the aggregate purchases of the input by the industry, and Y is a supply shift variable.

The flexibility with which we model the extent of oligopoly and/or oligopsony power is counterbalanced with simplicity in specification of the production technology. Specifically, the model assumes that all firms producing the final product utilize identical production functions, where input I is combined in a fixed-proportion, constant-returns technology with other unspecified inputs to produce the final product. Once we assume fixed proportions in converting input I to final product, the conversion coefficient can be set to 1.0 through choice of measurement units without further loss of generality. (For example, yield of a typical steer in terms of usable meat is about 63 percent. Thus, if we measure beef at retail in lbs. and cattle on the hoof in units of $1/0.63 \approx 1.6$ lbs., one unit of live animal converts to one unit of final product.) Thus, quantities of the final product and the input are the same: $Q^R = Q^I = Q$, making it possible to dispense with the superscripts. The fixed-proportions assumption also means that production costs due to the key input are separable from the costs associated with all other inputs. Thus, the constant marginal and average variable cost to produce a unit of the final product is $C = W + c(V)$, where $c(V)$ is the unit cost for all other inputs, and V is a cost-shift variable. For instructors wishing to minimize the technical detail that they present to students, the necessary information regarding firms' production relationships can be distilled into two key facts: (i) one unit of the key input is needed to produce one unit of output, and (ii) marginal and average variable costs for the output consist of the price of the key input and an additional cost, c , representing the combined cost of all other inputs used to produce the final product.

The final piece to the model is the equilibrium condition, which depicts the competitive interactions among the firms. We present the equilibrium via a simple, graphical approach. The alternative approach is to use conjectural variations theory as described for example in Sexton and Zhang (2000), an approach which requires the use of basic calculus. In what follows, we dispense with notation for the exogenous shift variables

The first step in the graphical approach is to compute a derived supply relationship for the final product by adding unit costs, c , for all other inputs vertically to the inverse supply function, $S(Q)$, for the key input. If firms in the

downstream industry were perfect competitors, this function, $P^R(Q) = S(Q) + c$, would represent the supply function for the final product. Computing the derived supply in this manner means that the model is being solved for equilibrium in the consumer market, with price for the key input then found from its supply curve, given the equilibrium quantity.⁶

We then introduce oligopoly power into the market by defining the concept of an industry perceived marginal revenue (PMR) curve constructed as a linear combination of the final product demand curve, $P = D(Q)$, and the monopoly marginal revenue curve, $MR(Q) = P + (\Delta P / \Delta Q)Q$:

$$PMR(Q) = \xi MR(Q) + (1 - \xi)D(Q),$$

where $\xi \in [0,1]$ is the degree of oligopoly power in the market. Students are easily motivated to see perfect competition in terms of $\xi = 0$ and pure monopoly in terms of $\xi = 1.0$. Specific oligopoly solutions can be illustrated as well, such as N homogeneous-firm Cournot, where $\xi = 1 / N$.

We introduce oligopsony power in the same way by defining the industry's perceived marginal factor cost (PMC) curve as a linear combination of the $P^R(Q)$ function and the monopsony marginal factor cost curve, $MC(Q) = P^R(Q) + (\Delta P^R / \Delta Q)Q$:

$$PMC(Q) = \theta MC(Q) + (1 - \theta)P^R(Q),$$

where $\theta \in [0,1]$ is the degree of oligopsony power exerted in the market. Analogous to the interpretation of the oligopoly parameter, perfect competition in input procurement is denoted by $\theta = 0$, and pure monopsony is denoted by $\theta = 1.0$, with intermediate values of θ depicting alternative intensities of oligopsony.

Equilibrium quantity is found by equating the PMR and PMC functions:

$$(3) \quad PMR(Q) = PMC(Q).$$

The market is represented by equations (1), (2), and (3), which can be solved for Q , total output and quantity of the key input, P , consumer price, and W , price of the key input.

⁶ An alternative but equivalent approach is to subtract c from the consumer demand curve to obtain what would be the derived demand curve for the key input if the industry were competitive. This approach results in solving for equilibrium in the market for the key input, with price for the final product found from the consumer demand function, given the equilibrium quantity—see figure 2.

The entire approach is readily illustrated graphically, as we do in figures 1 and 2 using linear functional forms. Figure 1 depicts a market with $\xi = 0.5$, e.g., a symmetric-firm, Cournot duopoly, with equilibrium (P^O, Q^O) , which is presented in comparison to the pure monopoly ($\xi = 1.0 \rightarrow P^M, Q^M$) and perfect competition ($\xi = 0 \rightarrow P^C, Q^C$) solutions.⁷ To understand figure 1, students begin with linear versions of the consumer demand and key input supply functions. They then add unit costs, c , for all other inputs to get the competitive supply function for the final product. Students then draw marginal revenue according to the usual rule of MR having the same intercept and twice the slope of demand for the linear case. The relationship of the PMR curve shown in red to the demand and marginal revenue curves then indicates the degree of oligopoly power. We draw PMR at the midpoint between demand and MR to give us an oligopoly market with $\xi = 0.5$. Although we don't depict it on the graph to minimize clutter, price for the key input is found off the $S(Q)$ curve, given each of the equilibrium outputs.

Figure 2 presents a comparable depiction of oligopsony power of $\theta = 0.5$, e.g., as would emanate from symmetric-firm Cournot duopsony, relative to monopsony ($\theta = 1$) and perfect competition ($\theta = 0$). We depict the market for the key input by subtracting from final-product demand the costs, c , incurred in converting the key input into a final product sold to consumers. The curve $D(Q) - c$ represents the derived demand curve for the input under perfect competition. We then construct the marginal factor cost curve for the input according to the usual rule for a linear function, and, finally, draw the perceived marginal cost curve to depict the level of market power we wish to illustrate, $\theta = 0.5$, so that PMC lies midway between the $S(Q)$ and MFC curves. The oligopsony equilibrium (W^S, Q^S) is readily compared to the competitive (W^C, Q^C) and monopsony (W^{MS}, Q^{MS}) equilibria. Prices for the consumer product are not depicted in figure 2 but are found from the consumer demand function for each equilibrium quantity.

⁷ Figures 1-4 are also included as animated Powerpoint slides for use by instructors.

Figure 1. Symmetric Cournot Duopoly Equilibrium

Figure 2. Symmetric Cournot Duopsony Equilibrium

Figure 3 takes the additional step of presenting an equilibrium with both oligopoly and oligopsony power.⁸ Although presenting both on the same graph adds complexity, it is helpful in showing students how market power exerted in multiple stages of a market acts in concert to reduce sales, reduce consumer and producer surplus, increase profits of the firms with market power, and create deadweight loss. We also use figure 3 to illustrate how comparative static results are affected by the presence of market power.⁹

⁸ A further graphical extension would be to depict successive levels of market power in a vertical market chain that included, for example farm production, processing, and retailing as separate market stages. Sexton et al. (2007) study such cases and provide graphical illustrations.

⁹ We strongly recommend the animated approach to figure 3 provided in the Powerpoint slide to ease the complexity in presenting this graph.

Figure 3. Effect of a Consumption Subsidy under Perfect Competition versus Oligopoly and Oligopsony

Suppose, for example, the product illustrated in figure 3 is electricity generated from “green” sources. Utilities purchase this energy input from suppliers and resell it to electricity consumers. The utilities might exercise market power as buyers of the green-energy inputs and as sellers of electricity to consumers. If government provides a subsidy on green energy to encourage its production and use, demand shifts upward by the amount of the subsidy from

$D(Q)$ to $D^1(Q)$. We compare a competitive market response to the subsidy to the response generated in a duopoly/duopsony with $\xi = \theta = 0.5$. The demand shift from the green energy subsidy causes the competitive equilibrium to shift from point A to point B in figure 3, whereas under oligopoly/oligopsony the equilibrium shifts from point C to point D. Students can see that the impact of the subsidy in terms of increased usage of green energy and price paid to suppliers of green energy is approximately halved in the market-power scenario. Electric utilities capture a sizable portion of the subsidy benefit in this setting.

Linear Simulation Model

Given linear functional forms for (1) and (2), equilibrium solutions for the endogenous variables, P , W , and Q are readily derived, as are formulae for the key market performance indicators—firm profit, consumer surplus, producer surplus for suppliers of the key input, and total welfare (defined as the sum of consumer and key-input supplier surplus and oligopoly/oligopsony profits), as functions of the five model parameters. We rewrite the consumer demand and key input supply functions in linear form as:

$$(1') \quad Q^R = a - \alpha P^R, \text{ consumer demand,}$$

$$(2') \quad W = b + \beta Q^I, \text{ inverse input supply.}$$

The parameters a, α, b and β lack much economic significance in their own right, but we eliminate them by (a) invoking the normalizations that are freely available and (b), given the normalizations, replacing the demand and supply slope parameters with demand and supply price elasticity parameters, respectively.¹⁰

We normalize both price and quantity by setting the quantity ($Q^R = Q^I = Q$) and the retail price (P) each equal to 1.0 at the competitive equilibrium. Therefore the price of the key input in the competitive equilibrium is $W = P - c = 1 - c = s$, where s is the share of revenue received by the key input under perfect competition. Next, utilize the normalizations to eliminate the intercept parameters in the demand and supply curves as follows:

$$1 = a - \alpha(1) \rightarrow a = 1 - \alpha$$

$$W = s = b + \beta(1) \rightarrow b = s - \beta.$$

¹⁰ The steps we describe next are all done without loss of generality, given our use of the linear model. Instructors may choose to omit these steps entirely in their presentations to students and go directly from providing a graphical demonstration of the model to describing the Excel simulation model. Results from the simulation model are readily interpreted as percent or proportional deviations from the results under perfect competition without ever needing to introduce students to the normalizations utilized in the simulation model.

Finally, we eliminate dependency on units of measurement by replacing the demand and supply slope parameters with price elasticities evaluated at the competitive equilibrium:

$$\text{Price elasticity of demand: } \eta = \frac{\Delta Q}{\Delta P} \frac{P}{Q} = \alpha \frac{1}{1} = \alpha$$

$$\text{Price elasticity of input supply: } \varepsilon = \frac{\Delta Q}{\Delta W} \frac{W}{Q} = \frac{1}{\beta} \frac{s}{1} = \frac{s}{\beta}$$

Now we have a linear simulation model capable of depicting market equilibrium for any combinations of oligopoly power, ξ , oligopsony power, θ , price elasticity of retail demand, η , price elasticity of key input supply, ε , and revenue share, s , of the key input, with the latter three parameters all being evaluated at the competitive equilibrium.¹¹ Thus, we have three parameters, ξ, θ , and s that by definition vary in the unit interval, and two elasticities; the model is free of any issues of units of measurement. Furthermore, all results for market power are evaluated relative to the convenient competitive-market benchmark, where retail price and quantity are each 1.0, and the input share and price is s . Thus, all market power equilibria can be interpreted as proportional or percent deviations from what would occur if the market were competitive.

Equilibrium values for the endogenous variables in the linear model are as follows:

$$Q = \frac{1 + \eta s}{\Omega \varepsilon}, \quad P^R = \frac{\eta + 1 - Q}{\eta}, \quad \text{and} \quad W = (s / \varepsilon)[\varepsilon - 1 - Q]$$

where $\Omega = (1 + \xi) + (1 + \theta)\eta(s / \varepsilon)$.

These solutions, as well as the solutions for consumer surplus, producer surplus for suppliers of the key input, oligopoly/oligopsony profits, and total welfare, all expressed in terms of the five model parameters, are programmed into the Excel simulation model for students' use.

¹¹ Because demand and supply are linear functions, the price elasticities will vary depending upon where the functions are being evaluated. This fact may require some words of explanation on instructors' parts, but otherwise presents no complications for the model because the values set for η and ε at the competitive equilibrium determine the values that result at alternative equilibria. For example, suppose students are investigating how price elasticity of demand interacts with the degree of oligopoly power to determine the distortion from competitive equilibrium. They can experiment with alternatively setting η at, say, 1.0 and 2.0. The elasticity at the oligopoly equilibrium will be greater in either case, but they will see that the more elastic demand causes less distortion due to oligopoly power than the less elastic demand.

Excel Simulation Model

The Excel spreadsheet uses the linear version of the model developed in the previous section to provide students with simulation software that they can utilize to study the impact of market power on prices, output, and welfare. We have found the Excel simulation model useful both for in-class demonstrations and as a tool for students to use in doing homework assignments. Because the Excel model is all preprogrammed, in-class demonstrations are easily conducted and student participation can be elicited to choose the values for the parameters. Among many possible applications, we illustrate use of the model to study the efficiency and distributional impacts of market power and to evaluate the impacts of a merger.

The Distributional and Efficiency Impacts of Market Power

Students can use the Excel simulation model to compare a counterfactual level of market power to a base scenario such as perfect competition ($\xi = \theta = 0$). In both the base and counterfactual scenarios students choose the values of the five model parameters: (i) the absolute value of retail price elasticity of demand, $\eta > 0$, (ii) input supply elasticity, $\varepsilon > 0$, (iii) key input revenue share, $s \in [0,1]$, (iv) degree of oligopoly power, $\xi \in [0,1]$, and (v) degree of oligopsony power, $\theta \in [0,1]$.

Instructors can ask students to use the simulation model to consider how market power affects the welfare of consumers, input producers, and market intermediaries. Figure 4 illustrates such calculations for alternative values of ξ and θ , given base values of $\eta = 1$, $\varepsilon = 2$, and $s = 0.5$ for the other parameters. The figure shows the percentage loss in consumer surplus relative to perfect competition from (i) exertion of oligopsony power for the key input, (ii) oligopoly power for the final product or (iii) equal amounts of both oligopsony and oligopoly power. Modest amounts of oligopoly power alone ($\xi = 0.2$ --the equivalent of five-firm symmetric Cournot oligopoly) cause consumer welfare to decline by nearly 26% relative to perfect competition. When only modest oligopsony power ($\theta = 0.2$) is exercised, consumer welfare declines by nearly 8% relative to perfect competition. Finally, when both oligopoly and oligopsony power are exerted jointly ($\xi = 0.2$ and $\theta = 0.2$), consumer welfare declines by over 30% relative to perfect competition.

A number of lessons are evident in figure 4: (i) consumer loss is increasing in the extent of either type of market power, (ii) even though it is directed towards input suppliers, oligopsony power hurts consumers because it reduces production of the final product, (iii) the joint exercise of oligopoly and oligopsony power compounds the consumer loss, and (iv) the impact on consumers of a given level of oligopoly power is in general more severe than an

equivalent amount of oligopsony power. In figure 4 this latter point is due both to input supply being more elastic than consumer demand and the fact that oligopsony “matters” to consumers only to the extent that the key input matters—in this case $s = 0.5$, so the key input represents half of the value of the final product in competitive equilibrium. These points can be driven home by asking students to recreate figures like figure 4 for alternative choices of η, ε , and s . Students could also be instructed to complete this type of exercise for producer surplus, oligopoly/oligopsony profit, and total welfare to see how increases in market power cause consumer and producer surplus to fall, intermediaries’ profits to rise, and total welfare to decline.

Figure 4. The Effect of Market Power on Consumer Surplus

Impacts of a Merger

A merger can augment market power, as well as induce positive efficiency effects. To enhance the simulation model’s usefulness as a tool to study the impacts of mergers, we have programmed a sixth parameter, δ , to account for

possible efficiency effects of the merger. Students or the instructor set a base value for all costs incurred by the oligopoly/oligopsony firms apart from costs incurred for the key input when they choose an initial value for s , i.e., $s = s_0$, so that $c_0 = 1 - s_0$. To study the impact of a merger that increases firm efficiency, students or instructor select a value for $\delta > 0$, so we have $c_1 = 1 - s_0 - \delta < c_0$. Thus, $\delta < c_0$ provides for a vertical shift downward in the market intermediaries' costs. It is best thought of as what percent efficiency gain might be possible due to the merger. For example, if $c_0 = 0.5$, and it is believed that the merger could induce a 20 percent efficiency gain, students would set $\delta = 0.1$.

In the merger example depicted in the screen shot (figure 5), students are first provided with a base or pre-merger set of parameters ($\eta = 1$, $\varepsilon = 2$, $\xi = 0.2$, $s = 0.5$, and $\theta = 0$) and then can be presented with a variety of counterfactuals. Examples of counterfactuals or post-merger scenarios could include that the merger induces various combinations of the following outcomes: (i) increase in oligopoly power, (ii) gain in production efficiency, (iii) cause (or enhance) market power in procurement of the key input, and/or (iv) facilitate collusion, causing coordinated effects that result in greater market power than predicted by a noncooperative (e.g., Cournot) equilibrium.

The screen shot (figure 5) depicts the merger as causing a modest increase in oligopoly power to $\xi = 0.4$, but it also causes a large efficiency gain represented by $\delta = 0.25$, so that c is reduced from 0.5 pre-merger to 0.25 post merger.¹² Students are able to see that, if this is the outcome, the merger enhances welfare of consumers and suppliers of the key input, as well as total welfare, and should be approved despite the increase in market power that it causes. Overall social welfare rises because the cost savings from the merger outweighs the deadweight loss due to the increase in market power.

¹² These values were chosen arbitrarily to illustrate use of the simulation model for merger analysis. The impacts of any merger are to some extent speculative, with merger proponents touting prospective efficiency gains and arguing that competitive impacts are nil, with opponents arguing the opposite. Thus, having students explore outcomes over a variety of post-merger choices for ξ , θ , and δ is a way to reflect the uncertainty that is inherent in merger analysis.

Figure 5. Excel Simulation Model of Merger Example

		Base Scenario	Counterfactual	
1				
2				
3	Demand Elasticity η	1	1	
4				
5	Input Supply Elasticity ϵ	2	2	
6				
7	Input Share $s=1-c$	0.5	0.5	
8				
9	Oligopoly Power ξ	0.2	0.4	
10				
11	Oligopsony Power θ	0	0	
12				
13	Change in Cost δ		-0.25	
14				
15				
16				
17	Retail Price p^R	1.138	1.091	-4.13
18				
19	Input Price p^I	0.466	0.477	2.53
20				
21	Quantity Q	0.862	0.909	5.17
22				
23	Consumer Surplus CS	0.372	0.413	11.21
24				
25	Producer Surplus PS	0.093	0.103	11.21
26				
27	Profit π	0.149	0.103	-30.50
28				
29	Social Welfare SW	0.613	0.620	1.10
30				

Students could at this point be prompted to determine whether their conclusions regarding the merger would change if it caused oligopsony power, $\theta > 0$, that did not exist in the pre-merger market presented in figure 5. The screen shot in figure 6 depicts the equilibrium if oligopsony power increases from zero to 0.4 as a consequence of the merger, holding other factors the same as in figure 5. Students should ascertain that the merger should not be approved in this case because, although profit increases, the welfare of consumers and suppliers of the key input declines under the merger scenario, as does total welfare. In this scenario the efficiency gains are dominated by deadweight losses incurred due to the increased market power.

Figure 6. Excel Simulation of Merger Example with Oligopsony Power

		Base Scenario	Counterfactual	
1				
2				
3	Demand Elasticity η	1	1	
4				
5	Input Supply Elasticity ϵ	2	2	
6				
7	Input Share $s=1-c$	0.5	0.5	
8				
9	Oligopoly Power ξ	0.2	0.4	
10				
11	Oligopsony Power θ	0	0.4	
12				
13	Change in Cost δ		-0.25	
14				
15	Simulation Output			
16				% Change
17	Retail Price P^R	1.138	1.143	0.43
18				
19	Input Price P^I	0.466	0.464	-0.26
20				
21	Quantity Q	0.862	0.857	-0.57
22				
23	Consumer Surplus CS	0.372	0.367	-1.14
24				
25	Producer Surplus PS	0.093	0.092	-1.14
26				
27	Profit π	0.149	0.153	2.98
28				
29	Social Welfare SW	0.613	0.612	-0.14
30				
31				

Conclusion

The flexible model presented in this paper enables instructors to present the impacts of alternative magnitudes of oligopoly and/or oligopsony power free from the limitations imposed by particular solution concepts. Because the model can be presented entirely in graphical form, it can be used in undergraduate courses in industrial organization, regulation, and microeconomic theory regardless of mathematical prerequisites. The simulation software enables students to see how market power interacts with other key market parameters, such as demand and supply price elasticities, to determine impacts on prices and quantities, as well as the distribution of welfare. Comparative static and policy analyses can be performed with the model, either graphically or using the Excel software.

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