Oligopsony and Minimum Wages*

Hernán Vallejo**
Universidad de los Andes, Bogotá

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Abstract
This article presents a model of oligopsony. It considers different conjectural variations that cover the whole range between the extreme cases of monopsony and perfect competition, such as Collusion, Threat, Cournot, Stackelberg, and Bertrand, and compares them in terms of prices, quantities, profits, markdown, price elasticity of supply and welfare. It also considers the impact of minimum wages, under the different conjectures analyzed.

Keywords: Oligopsony; collusion; threat; Cournot; Stackelberg; Bertrand; markdown; minimum wage.

JEL: C72; J21; J38; J48.

El oligopsonio y los salarios mínimos

Resumen
Este artículo presenta un modelo de oligopsonio. Considera diferentes variaciones conjeturales que cubren todo el rango entre los casos extremos de monopsonio y competencia perfecta, como colusión, amenaza, Cournot, Stackelberg y Bertrand, y las compara en términos de precios, cantidades, ganancias, markdown, elasticidad salario de la oferta y el bienestar. También considera el impacto de los salarios mínimos, bajo las diferentes conjeturas analizadas.

Palabras clave: oligopsonio; colusión; amenaza; Cournot; Stackelberg; Bertrand; markdown; salario mínimo.

Oligopsônio e salário mínimo

Resumo
Este artigo apresenta um modelo de oligopsônio. Ele considera diferentes variações conjecturais que abrangem toda a faixa entre os casos extremos de monopsônio e concorrência perfeita, como conluio, ameaça, Cournot, Stackelberg e Bertrand, e as compara em termos de preços, quantidades, lucros, remarcação, elasticidade salarial da oferta e bem-estar. Também considera o impacto do salário **mínimo, de** acordo com as diferentes conjecturas analisadas.

Palavras-chave: oligopsônio; conluio; ameaça; Cournot; Stackelberg; Bertrand; remarcação para baixo; salário mínimo.

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** Associate Professor at the Universidad de los Andes (Bogotá Colombia). E-mail: hvallejo@uniandes.edu.co
https://orcid.org/0000-0002-5507-8791

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Introduction

This article presents a model of oligopsony. Oligopsony can describe the input markets of a range of industries, such as large-scale retail, aerospace, automobile production, legal drug development, oil rigs and mining in far areas, and agricultural production processing, among others.

With oligopsony, firms may have market power and apply a markdown, paying for their inputs less than their marginal product.

The objective of this article is to develop a simple model of oligopsony, in order to illustrate some of the key insights of that market structure and show how its equilibrium may shift depending on the way firms interact, that is, depending on their conjectural variations. Such conjectural variations are the beliefs that firms have on how their competitors will react to their actions, for example in terms of output, employment, prices and wages.

Although in real life there may be infinite equilibria in an oligopsony, this article considers six standard conjectural variations that yield equilibria that cover the whole range between the extremes of monopsony and perfect competition, and some intermediate cases.

In order to make it easier to compare the different equilibria obtained, all the models are estimated with the same and simple production function, and the same and simple labor supply curve.

Previous literature

Oligopsony has been studied by different authors[1]. According to Bhaskar *et al.* (2002), oligopsony and monopsonistic competition are the market structures that best describe the labor markets in the real world. Rogers and Sexton (1994) argue that the dismissive treatment that the economics profession has given to buyer market power, is not reasonable when considering raw agricultural markets, which are likely to be structural oligopsonies, characterized by lots of farmers, and few buyers, and large farm-retail spreads. They also point out that the lack of public intervention leads to farmers trying to organize themselves, and buyers trying to divide and conquer farmers, by using discrimination.

OECD (1999) argues that large multi-product retailers could enjoy substantial buyer power, despite not having a dominant position in their retail market shares, as buyers or sellers. They suggest countries can use merger reviews; apply laws against discrimination, horizontal

1 Monopsony and monopsonistic power have been studied widely in economics. However, this section is devoted specifically to the literature on oligopsony, since it is the central focus of this article.

agreements, and resale price maintenance; and encourage complaints, in order to keep sufficient competition, both upstream and downstream. They also warn against applying policies that result in a reduction of effective competition in these markets.

Alderman, & Blair (2024) focus on monopsony, but mention oligopsony intuitively and graphically, including the Bertrand, Cournot, and Collusion conjectures. They conclude that the range of outcomes is "dismaying" because it "makes prediction difficult" and "muddles anti-trust policies".

Bhaskar *et al.* (2002) argue that oligopsony models can explain better certain empirical features of the labor market, such as wage dispersion and employers paying general training. They also argue that minimum wages generate a welfare tradeoff between an "oligopsony" employment increasing effect, and a firm exit effect.

Manning (2003) presents a model of a dynamic oligopsony as a simplified version of the Burdett and Mortensen (1998) model of search and wage dispersion, to argue that in such a context, raising wages to equal the marginal product, is not necessarily efficient. He also argues that when enough marginal decisions are introduced, theory becomes an unreliable guide for policymaking. To make that point, he includes in the model the elasticity of output supply (to highlight the cases of free entry and exit of firms); the elasticity of labor supply (to highlight free entry of workers and heterogeneity in their reservation wage); and an endogenous recruitment activity.

Manning (2003) also considers the role of minimum wages in an oligopsonistic market and concludes that the negative effects of a high minimum wage more than compensate the positive effects of an appropriately chosen minimum wage, and that policy making should be informed with empirical evidence.

Bergman *et al.* (1995) designed a test for oligopsony power and applied it to the Swedish pulpwood market, finding that the degree of market power changes over time.

Berger *et al.* (2022) use a model of oligopsony in labor markets with heterogeneous workers and find that higher minimum wages can improve welfare up to a certain level and that most of the gains are generated by redistribution rather than by efficiency.

Varian (2010) presents a model of oligopoly, while considering and comparing the impacts on the equilibrium of different conjectural variations. However, most textbooks and most academic programs in undergraduate and graduate economics, cover perfect competition, monopoly, monopolistic competition, and oligopoly —with different conjectures—, for goods and services; and perfect competition and monopsony for labor markets; but do not cover oligopsony and monopsonistic competition, as part of their core.

A Model of Oligopsony

To present the model of oligopsony proposed in this article, some general assumptions are used throughout the different conjectures considered here. Those assumptions are presented first, followed by the equilibria under Collusion, Threat, Cournot, Stackelbeg, and Bertrand.

Emphasis will be placed on obtaining simple algebraic results, that can be summarized and compared later on, to obtain an analytical idea of the way oligopsony works, and what are its consequences.

It is important to study different conjectural variations under oligopsony, since as Bergman *et al.* (1995) pointed out, the interactions between firms, may vary across time. They may also vary across markets.

General Assumptions

For all of the conjectural variations considered in this article, focus will be placed on labor markets, since labor is a key input. It will be assumed that there are many homogeneous suppliers of work, who are price takers. There are two identical firms *A* and *B*, that hire workers and have no fixed costs, since this article concentrates on the impacts of the conjectural variations, and not on the role of economies of scale.

In terms of production, both firms use only labor and have the following linear production function:

$$q_i = f(l_i) = bl_i \qquad (1)$$

The marginal product of labor is thus constant:

$$MgP_{l_i} = b \qquad (2)$$

Note that oligoposony has no market demand for labor. Producers have market power and maximize profits. As such, they pay the minimum price that they can for the labor that they hire, and that price is given by the supply curve. Thus, in oligopsony, it is impossible to find a relationship between labor hired and wages paid, that is independent of the supply of labor and thus, there is no labor demand in oligopsony (and neither in monopsony and monopsonistic competition, for that matter).

The market labor supply curve is also linear:

$$w = d + aL \qquad (3)$$

The market wage rate depends on the labor hired by firms A and B:

$$w = d + a(l_A + l_B) \qquad (4)$$

Output of firms A and B is sold in a competitive market, and the output unit price is p=1.

The three parameters of the model, a, b, and d, are assumed to be positive. Further- more, the market existence condition implies that $b > d$. Otherwise, the market would collapse.

Collusion

Collusion (or cartel), refers to firms that cooperate with each other as buyers of labor, to extract maximum surplus from their workers. Collusion is the only cooperative equilibrium considered in this article.

If the firms want to maximize profits and cooperate, they act as a profit-maximizing monopo- sonist. If there was something different that the colluding firms could do to have higher profits than a monopsonist, the monopsonist would not be maximizing its profits.

The profit maximization under Collusion can be written as:

$$\Pi = bL - (d + aL)L \qquad (5)$$

$$\frac{\partial \Pi}{\partial L} = b - d - 2aL = 0 \qquad (6)$$

$$\mathrm{L} = \frac{b-d}{2a} > 0 \qquad (7)$$

Replacing L in the supply curve:

$$\mathrm{w} = \frac{b+d}{2} > 0 \qquad (8)$$

There is a markdown (MD) in Collusion, since the wage is below the marginal product of labor:

$$\mathrm{MD} = \left[\frac{b-\frac{b+d}{2}}{b}\right] \qquad (9)$$

$$\mathrm{MD} = \frac{b-d}{2b} > 0 \qquad (10)$$

The price elasticity of supply at equilibrium is:

$$\eta = \frac{1}{a}\frac{\frac{b+d}{2}}{\frac{b-d}{2a}} \tag{11}$$

$$\eta = \frac{b+d}{b-d} > 0 \tag{12}$$

Since the marginal product of labor is assumed constant, for simplicity, there is no *a priori* mechanism to allocate labor between firms. However, in a symmetric equilibrium:

$$l_A = l_B = \frac{b-d}{4a} > 0 \tag{13}$$

$$\Pi_A = \Pi_B = \left[b - \left[\frac{b+d}{2}\right]\right]\frac{b-d}{4a} \tag{14}$$

$$\Pi_A = \Pi_B = \frac{(b-d)^2}{8a} \tag{15}$$

$$\Pi = \Pi_A + \Pi_B = \frac{(b-d)^2}{4a} \tag{16}$$

The welfare loss (*WL*) with the Collusion outcome, with respect to the welfare under the perfectly competitive equilibrium, is:

$$\mathrm{WL} = \frac{1}{2}\left[b - \frac{(b+d)}{2}\right]\left[\frac{(b-d)}{a} - \frac{(b-d)}{2a}\right] \tag{17}$$

$$\mathrm{WL} = \left[\frac{(b-d)}{4}\right]\left[\frac{(b-d)}{2a}\right] \tag{18}$$

$$\mathrm{WL} = \frac{(b-d)^2}{8a} \tag{19}$$

Threat

Threat is a conjecture where there is an established firm A that acts as a monopsonist, and another firm B considers entering the market. A increases the wage or expands employment to discourage the entry of B, and once B desists from entering the market, A moves back to being a monopsonist. Thus, the Threat equilbrium is the Monopsony equilibrium, which is the Collusion equilibrium, but all the employment is done by firm A, and all the profits are for firm A.

Cournot

In order to solve the Cournot conjecture, firms are assumed not to cooperate. Firms compete in the quantity of labor that they hire, meaning that they hire the amount of labor that maximizes their profits, given the amount of labor hired by their competitor. Each firm takes the labor hired by the other firm, as given. Hiring decisions can affect the labor market wages.

The profit maximization for firm A under Cournot, can be written as:

$$\Pi_A = bl_A - [d + a(l_A + l_B)]l_A \qquad (20)$$

$$\frac{\partial \Pi_A}{\partial l_A} = b - d - 2al_A - al_B \qquad (21)$$

The reaction function (optimal strategy) for firm A is:

$$l_A = \frac{b-d-al_B}{2a} \qquad (22)$$

By symmetry, the reaction function for firm B is:

$$l_B = \frac{b-d-al_A}{2a} \qquad (23)$$

Replacing the reaction function of firm A, in the reaction function of firm B:

$$l_B = \frac{b-d-a\left[\frac{b-d-al_B}{2a}\right]}{2a} \qquad (24)$$

$$l_B = \frac{b-d}{3a} \qquad (25)$$

Replacing the optimal demand of labor of firm B, in the reaction function of firm A:

$$l_A = \frac{b-d-a\left[\frac{b-d}{3a}\right]}{2a} \tag{26}$$

$$l_A = \frac{2(b-d)}{6a} = \frac{b-d}{3a} \tag{27}$$

Total employment is the sum of the optimal labor demands of A and B:

$$L = l_A + l_B = \frac{2(b-d)}{3a} \tag{28}$$

The wage is:

$$w = d + a\left[\frac{2(b-d)}{3a}\right] = \frac{2b+d}{3} > 0 \tag{29}$$

The markdown is estimated as the marginal product of labor minus the wage rate over the marginal product of labor, as before:

$$\mathrm{MD} = \left[\frac{b-\left[\frac{2b+d}{3}\right]}{b}\right] \tag{30}$$

$$MD = \frac{b-d}{3b} > 0 \tag{31}$$

The wage elasticity of supply at equilibrium is calculated as:

$$\eta = \frac{1}{a}\frac{\frac{2b+d}{3}}{\frac{2(b-d)}{3a}} \tag{32}$$

$$= \frac{2b+d}{2(b-d)} > 0 \tag{33}$$

The profits of each firm and the total profits are:

$$\Pi_A = \Pi_B = \left[b - \left[\frac{2b+d}{3}\right]\right]\frac{(b-d)}{3a} \tag{34}$$

$$\Pi_A = \Pi_B = \left[\frac{b-d}{3}\right]\frac{(b-d)}{3a} \tag{35}$$

$$\Pi_A = \Pi_B = \frac{(b-d)^2}{9a} \qquad (36)$$

$$\Pi = \Pi_A + \Pi_B = \frac{2(b-d)^2}{9a} \qquad (37)$$

The welfare loss with the Cournot outcome, with respect to the welfare under the perfectly competitive equilibrium is:

$$\mathrm{WL} = \frac{1}{2}\left[b - \frac{(2b+d)}{3}\right]\left[\frac{(b-d)}{a} - \frac{2(b-d)}{3a}\right] \quad (38)$$

$$\mathrm{WL} = \left[\frac{(b-d)}{6}\right]\left[\frac{(b-d)}{3a}\right] \qquad (39)$$

$$\mathrm{WL} = \frac{(b-d)^2}{18a} \qquad (40)$$

Stackelberg

Under the Stackelberg conjecture, firms do not cooperate but rather, compete, with one firm acting as a leader in the demand for labor, and the other firm acting as a follower in the demand for labor. Assume firm B is the leader and firm A is the follower, and takes the quantity of labor hired by firm B as given. Hiring decisions of A and B affect wages.

The reaction function for firm A is the same as in Cournot:

$$l_A = \frac{b-d-al_B}{2a} \qquad (41)$$

Firm B knows it is the market leader, and it is aware that the labor hiring decisions of A, depend on its own decision. In fact, B knows the reaction function of A. Thus, profit maximization for firm B can be expressed as:

$$\Pi_B = bl_B - [d + a(l_A + l_B)]l_B \qquad (42)$$

$$\Pi_B = (b-d)l_B - a\left[\frac{b-d-al_B}{2a}\right]l_B - al_B^2 \quad (43)$$

$$\Pi_B = (b-d)l_B - \left[\frac{(b-d)l_B - al_B^2}{2}\right] - al_B^2 \qquad (44)$$

$$\frac{\partial \Pi_B}{\partial l_B} = b - d - \left[\frac{(b-d)}{2}\right] + \left[\frac{2al_B}{2}\right] - 2al_B \quad (45)$$

$$l_B = \frac{b-d}{2a} \quad (46)$$

Replacing the optimal employment of the leading firm B, in the reaction function of firm A:

$$l_A = \frac{b-d-a\left[\frac{b-d}{2a}\right]}{2a} \quad (47)$$

$$l_A = \frac{b-d}{4a} \quad (48)$$

$$L = \frac{3(b-d)}{4a} \quad (49)$$

Thus, the wage rate is:

$$w = d + a\left[\frac{3(b-d)}{4a}\right] = \frac{3b+d}{4} > 0 \quad (50)$$

And the markdown is:

$$\mathrm{MD} = \left[\frac{b-\left[\frac{3b+d}{4}\right]}{b}\right] \quad (51)$$

$$MD = \frac{b-d}{4b} > 0 \quad (52)$$

The price elasticity of supply is:

$$\eta = \frac{1}{a}\frac{\frac{3b+d}{4}}{\frac{3(b-d)}{4a}} \quad (53)$$

$$\eta = \frac{3b+d}{3(b-d)} > 0 \quad (54)$$

The profits for A, B and the total profits, are:

$$\Pi_A = \left[b - \left[\frac{3b+d}{4}\right]\right]\frac{(b-d)}{4a} \qquad (55)$$

$$\Pi_A = \left[\frac{b-d}{4}\right]\frac{b-d}{4a} \qquad (56)$$

$$\Pi_A = \frac{(b-d)^2}{16a} \qquad (57)$$

$$\Pi_B = \left[\frac{b-d}{4}\right]\frac{b-d}{2a} \qquad (58)$$

$$\Pi_B = \frac{(b-d)^2}{8a} \qquad (59)$$

$$\Pi = \Pi_A + \Pi_B = \frac{(b-d)^2}{16a} + \frac{(b-d)^2}{8a} \qquad (60)$$

$$\Pi = \frac{3(b-d)^2}{16a} > 0 \qquad (61)$$

The welfare loss with the Stackelberg outcome, with respect to the welfare under the perfectly competitive equilibrium is:

$$\mathrm{WL} = \frac{1}{2}\left[b - \frac{(3b+d)}{4}\right]\left[\frac{(b-d)}{a} - \frac{3(b-d)}{4a}\right] \qquad (62)$$

$$\mathrm{WL} = \left[\frac{(b-d)}{8}\right]\left[\frac{(b-d)}{4a}\right] \qquad (63)$$

$$\mathrm{WL} = \frac{(b-d)^2}{32a} \qquad (64)$$

Bertrand

In Bertrand, firms compete in wages, meaning that they set their wages to maximize their profits, taking the wage paid by their competitor as given. Starting with any wage, for example the Cournot wage, one firm will have the incentive to increase the wage and hire all the labor supplied at that wage. But the other firm will do the same, and hire all the labor. At equilibrium, one or both firms will pay a wage equal to the marginal product of labor, and hire all the labor supplied at that wage.

Thus, under the setting of this article, the Bertrand equilibrium replicates the perfect competition equilibrium, since the wage equals the marginal cost of labor and the marginal product of labor.

Profit maximization in Bertrand can be expressed as:

$$w = b \tag{65}$$

$$b = d + aL \tag{66}$$

$$L = \frac{b-d}{a} \tag{67}$$

Since the marginal product of labor is assumed constant in this model, there is no *a priori* mechanism to allocate labor between firms. However, in a symmetric equilibrium:

$$l_A = l_B = \frac{b-d}{2a} \tag{68}$$

$$\Pi_A = \Pi_B = 0 \tag{69}$$

$$MD = 0 \tag{70}$$

$$\eta \to \infty \tag{71}$$

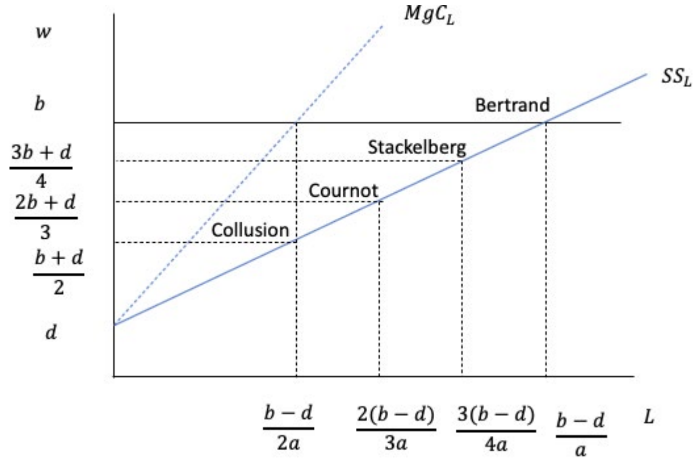
$$WL = 0 \tag{72}$$

In this case, η tends to infinity because the only price possible for a Bertrand producer is to pay the marginal product of labor that equals the marginal cost of labor. Else, the other firm will pay it and the firm will hire no labor. Its residual labor supply is horizontal. And as in perfect competition, firms will have no market power and no profits, and there will be no welfare loss with respect to the competitive equilibrium.

Summary

Graphically a summary of the results obtained in the model can be summarized as shown in Figure 1:

Figure 1. Results of the Model of Oligopsony



Source: Own elaboration.

A more detailed summary of the results is presented in tables 1 and 2:

Table 1. Results of the Oligopsony Model (Employment, Wages and Markdown)

Market	l_A	l_B	L	w	MD
Collusion	$\frac{b-d}{4a}$	$\frac{b-d}{4a}$	$\frac{b-d}{2a}$	$\frac{b+d}{2}$	$\frac{b-d}{2b}$
Threat	$\frac{b-d}{2a}$	0	$\frac{b-d}{2a}$	$\frac{b+d}{2}$	$\frac{b-d}{2b}$
Cournot	$\frac{b-d}{3a}$	$\frac{b-d}{3a}$	$\frac{2(b-d)}{3a}$	$\frac{2b+d}{3}$	$\frac{b-d}{3b}$
Stackleberg	$\frac{b-d}{4a}$	$\frac{b-d}{2a}$	$\frac{3(b-d)}{4a}$	$\frac{3b+d}{4}$	$\frac{b-d}{4b}$
Bertrand	$\frac{b-d}{2a}$	$\frac{b-d}{2a}$	$\frac{b-d}{a}$	b	0

Source: Own elaboration.

Table 2. Results of the Oligopsony Model (Elasticity, Profits and Welfare Loss)

Market	η	Π_A	Π_B	Π	WL
Collusion	$\frac{b+d}{b-d}$	$\frac{(b-d)^2}{8a}$	$\frac{(b-d)^2}{8a}$	$\frac{(b-d)^2}{4a}$	$\frac{(b-d)^2}{8a}$
Threat	$\frac{b+d}{b-d}$	$\frac{(b-d)^2}{4a}$	0	$\frac{(b-d)^2}{4a}$	$\frac{(b-d)^2}{8a}$
Cournot	$\frac{2b+d}{2(b-d)}$	$\frac{(b-d)^2}{9a}$	$\frac{(b-d)^2}{9a}$	$\frac{2(b-d)^2}{9a}$	$\frac{(b-d)^2}{18a}$
Stackleberg	$\frac{3b+d}{3(b-d)}$	$\frac{(b-d)^2}{16a}$	$\frac{(b-d)^2}{8a}$	$\frac{3(b-d)^2}{16a}$	$\frac{(b-d)^2}{32a}$
Bertrand	$\rightarrow \infty$	*0*	*0*	*0*	*0*

Source: Own elaboration.

Within the simple model structure presented in this article, the algebraic results allow us to conclude unambiguously, that:

- Collusion and Threat replicate Monopsony, have the lowest wage; the lowest employment; the highest markdown; the highest profits and the lowest welfare.

- When compared to Collusion, Cournot has a higher wage; a higher employment; a lower wage elasticity of supply; a lower markdown; lower profits and a higher welfare.

- Bertrand has the highest wage; the highest employment; highest wage elasticity of supply; the lowest markdown; the lowest profits; and the highest welfare, when compared to any of the other conjectural variations considered in this model, and replicates in this case the equilibrium that would prevail under perfect competition.

- Thus, in general, the conjectures with the highest wages have the highest employment; the highest welfare; and the lowest markdowns, and vice-versa.

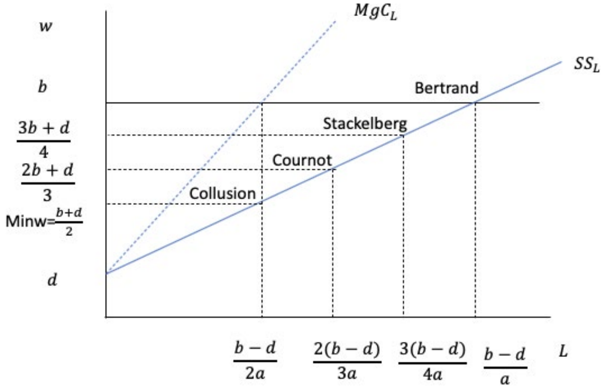
Policy

Given that except for the Bertrand equilibria, the oligopsony equilibria have mark- down and thus are inefficient, it is legitimate to ask what can the Government do to improve the resource allocation in this market structure. To highlight a way in which the model presented can be used to study the impacts of economic policy, consider the application of a minimum wage policy. Assume that there is monopsony or collusion, and that such is the wage the prevails in the market, before the Government sets the minimum wage.

Minimum Wage Equal to the Wage under Collusion

If the Government sets the minimum wage equal to the wage that would prevail in the case of collusion, nothing will happen, as shown in Figure 2.

Figure 2. Oligopsony with Minimum Wage Equal to Wage under Collusion

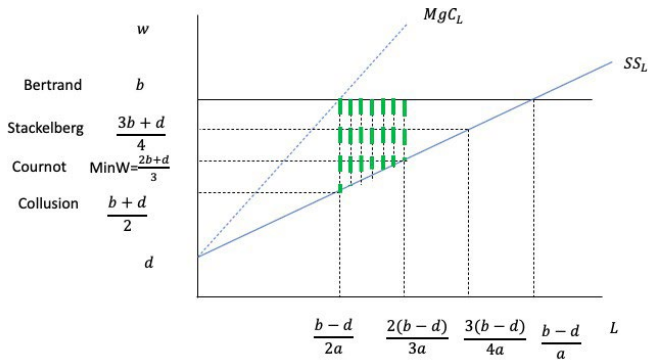


Source: Own elaboration.

Minimum Wage Equal to the Wage under Cournot

If the Government sets the minimum wage equal to the wage that would prevail in the case of Cournot, the level of employment would increase and welfare would increase in the area signaled in green in Figure 3.

Figure 3. Oligopsony with Minimum Wage Equal to Wage under Cournot

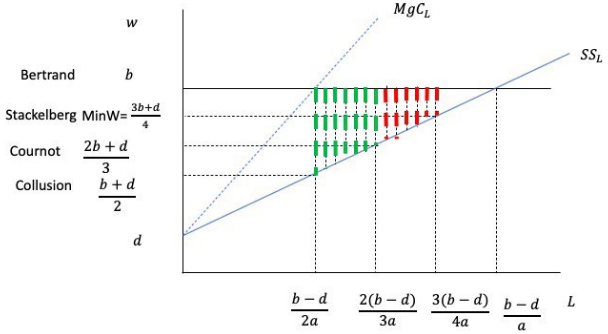


Source: Own elaboration.

Minimum Wage Equal to the Wage under Stackelberg

If the Government sets the minimum wage equal to the wage that would prevail in the case of Stackelberg, employment would increase and the welfare would increase in the areas signaled in green and red, in Figure 4.

Figure 4. Oligopsony with Minimum Wage Equal to Wage under Stackelberg

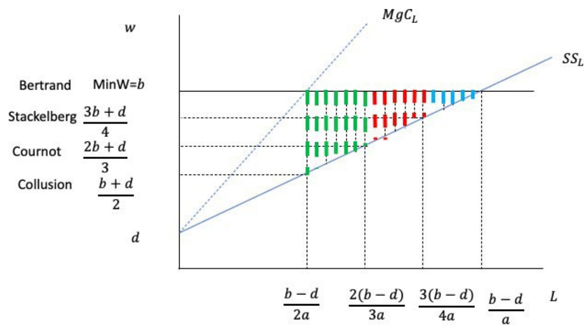


Source: Own elaboration.

Minimum Wage Equal to the Wage under Bertrand

If the Government sets the minimum wage equal to the wage that would prevail in the case of Bertrand, employment and welfare would be maximum and there would be no unemployment. Welfare would increase in the area signaled in green, red and blue, in Figure 5.

Figure 5. Oligopsony with Minimum Wage Equal to Wage under Bertrand



Source: Own elaboration.

If the Government sets a minimum wage above the Bertrand wage, there would be no employment and no welfare in this labor market.

Conclusions

This article has shown that given the model's assumptions, when firms interact as in Bertrand, they employ more workers and pay higher wages than when they interact as in Stackelberg. When firms interact as in Stackelberg, they employ more workers and pays higher wages than when they interact as in Cournot. In addition, when firms interact as in Cournot, they employ more workers and pay higher wages than when they collude.

In general, the conjectures with the highest wages have the highest employment; the highest welfare; the lowest markdowns, and the lowest profits, and vice-versa.

Starting from monopsony or Collusion in the employment of labor, a minimum wage equal to the Collusion wage, has no impact at all. If it is equal to the Cournot wage, it increases welfare and employment and reduces profits. If it is equal to the Stackelberg wage, it increases welfare and employment and reduces profits, even more. Finally, if it is equal to the Bertrand wage, it maximizes welfare and employment and reduces profits to zero.

However, a minimum wage that is higher than the Bertrand wage generates unemployment and reduces employment, profits and welfare.

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