Collusion in the Labor Market
A tale of conspiracy between employers

Pedro Gonzaga
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Collusion in the labor market

- Collusion in the supply side of the market (workers)
- Collusion in the demand side of the market (employers)
Collusion in the supply side of the labor market:

Objectives:

✓ Achieve greater wages;
✓ Improve working conditions (benefits, workplace safety, promotions, hiring and firing rules…)
✓ Increase the level of employment ?

LABOR UNIONS
Collusion in the supply side of the labor market...

IF the labor market is competitive...

⇒ Increase in wage levels;

⇒ FALL IN EMPLOYMENT

⇒ FALL IN SOCIAL WELFARE in .
Milton Friedman’s critique

If unions raise wage rates in a particular occupation or industry, they necessarily make the amount of employment available in that occupation or industry less than it otherwise would be—just as any higher price cuts down the amount purchased. The effect is an increased number of persons seeking other jobs, which force down wages in other occupations. Since unions have generally strongest among groups that would have been high-paid anyway, their effect has been to make high paid workers higher paid at the expense of lower-paid workers. Unions have therefore not only harmed the public at large and workers as a whole by distorting the use of labor; they have also made the incomes of the working class more unequal by reducing the opportunities available to the most disadvantaged workers.
Milton Friedman’s critique

Unionized Industry

Collective Labor Supply

Non-Unionized Industry

Augmented Labor Supply

Demand

Supply

W_0

W_1

L_1

L_0

W_0

W_1

L_0

L_1
Collusion in the supply side of the labor market…

However, if firms have market power…
Collusion in the supply side of the labor market...

However, if firms have market power...
Collusion in the supply side of the labor market...

However, if firms have market power...

⇒ Increase in wage levels;

⇒ INCREASE IN EMPLOYMENT

⇒ RAISE IN SOCIAL WELFARE in .
Is collusion in the supply side of the labor market legal?

**Treaty on the Functioning of the European Union – Article 101**

1. The following shall be prohibited as incompatible with the internal market: all agreements between **undertakings**, decisions by **associations of undertakings** and concerted practices which may affect trade between Member States and which have as their object or effect the prevention, restriction or distortion of competition within the internal market.

   (a) directly or indirectly fix purchase or selling prices or any other trading conditions;
   (b) limit or control production, markets, technical development, or investment;
   (c) share markets or sources of supply;
   (d) apply dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage;
   (e) make the conclusion of contracts subject to acceptance by the other parties of supplementary obligations which, by their nature or according to commercial usage, have no connection with the subject of such contracts.

2. Any agreements or decisions prohibited pursuant to this Article shall be automatically void.
Is collusion in the supply side of the labor market legal?

Charter of Fundamental Rights of the European Union – Article 12

1. Everyone has the right to freedom of peaceful assembly and to freedom of association at all levels, in particular in political, trade union and civic matters, which implies the right of everyone to form and to join trade unions for the protection of his or her interests.

2. Political parties at Union level contribute to expressing the political will of the citizens of the Union.

Article 13
Freedom of the arts and sciences
The arts and scientific research shall be free of constraint. Academic freedom shall be respected.

Article 14
Right to education
1. Everyone has the right to education and to have access to vocational and continuing training.
2. This right includes the possibility to receive free compulsory education.
3. The freedom to found educational establishments with due respect for democratic principles and the rights of parents to ensure the education and teaching of their children in conformity with their religious, philosophical and pedagogical convictions shall be respected, in accordance with the national laws governing the exercise of such freedom and right.

Article 15
Freedom to choose an occupation and right to engage in work
1. Everyone has the right to engage in work and to pursue a freely chosen or accepted occupation.
We cannot prevent workers from joining labor unions... but neither should we force them to do so.
Bibliometry
Collusion in the demand side of the labor market…

✓ Cooperative agreements to reduce wages;
✓ Centralized determination of employment levels;
✓ No poaching agreements;
✓ Working conditions settlements…
Oil Cartel to set the wages of managerial, professional and technical employees.

- Surveys about past and current salary information;
- Exchange of detailed information between firms;
- Frequent meeting to discuss wage budgets.
Conspiracy between the hospitals in Detroit to depress the wage levels of registered nurses in the context of a national nurse shortage.

Exchange of detailed and non-public information about remuneration through:

- Meetings;
- Telephone conversations;
- Surveys.
Eric, I am told that Google's new cell phone software group is relentlessly recruiting in our iPod group. If this is indeed the truth, can you put a stop to it? Thanks, Steve.

I'm sorry to hear this; we have a policy of no recruiting of Apple employees. I will investigate immediately! Eric.
We rarely hear, it has been said, of the combinations of masters, though frequently of those of workmen. But whoever imagines, upon this account, that masters rarely combine, is as ignorant of the world as of the subject. Masters are always and everywhere in a sort of tacit, but constant and uniform combination, not to raise the wages of labor above their actual price.
Sherman Act

AN ACT
To protect trade and commerce against unlawful restraints and monopolies.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Sec. 1. Every contract, combination, or conspiracy in restraint of trade or commerce among the several States, or with foreign nations, is hereby declared to be illegal. Every person who shall make or enter into any such contract or engage in any such combination or conspiracy, shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be punished by fine not exceeding five thousand dollars, or by imprisonment not exceeding one year, or both, with such further punishment as the directions of the court.

Sec. 2. Every person who shall conspire with any other person or persons, to monopolize any part of the trade or commerce among the several States, or with foreign nations, shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be punished by fine not exceeding five thousand dollars, or by imprisonment not exceeding one year, or both, with such further punishment as the directions of the court.

Sec. 3. Every contract, combination, or conspiracy in restraint of trade or commerce in any Territory of the United States or in any Territory or District of Columbia, or in restraint of trade or commerce between the inhabitants of the District of Columbia and any State or Territory or District of Columbia, or with foreign nations or between the inhabitants of the District of Columbia and any State or State or foreign nation, is hereby declared illegal. Every person who shall make or enter into any such contract or engage in any such combination or conspiracy, shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be punished by fine not exceeding five thousand dollars, or by imprisonment not exceeding one year, or by such further punishment as the directions of the court.

Sec. 4. This act shall take effect on the day of December, one thousand eight hundred and eighty-nine.
Economic literature

Oligopsonistic and monopsonistically competitive labor markets

Economic literature

Collusion in the labor market


“We just don't know much about tacit collusion by employers because no-one has thought it worth-while to investigate in detail “

Manning
Economic literature

Collusion in the input market


Theory of Collusion in the Labor Market

by

Pedro Gonzaga
António Brandão
Hélder Vasconcelos
Assumptions

- Industry composed by $n$ firms;
- Oligopoly in the final good market and oligopsony in the labor market;
- Downward sloping demand functions;
- Upward sloping supply functions;
- Production functions with one input;
- Convex cost technology;
- Competition by prices and wages;
- Differentiated products;
- Differentiated jobs posts.
Relation between the labor market and the final good market...

Wages

\[ W_1 \]

\[ \ldots \]

\[ W_n \]

Labor Supplies

\[ L_1 = g_1(W_1, \ldots, W_n) \]

\[ L_n = g_n(W_1, \ldots, W_n) \]

Production Functions

\[ Q_1 = h_1(L_1) \]

\[ Q_n = h_n(L_n) \]

Good Demands

\[ Q_1 = f_1(P_1, \ldots, P_n) \]

\[ Q_n = f_n(P_1, \ldots, P_n) \]

Prices

\[ P_1 \]

\[ \ldots \]

\[ P_n \]
Non-cooperative equilibrium

\[ \pi_i = P_i Q_i - L_i W_i \]

Profits in terms of price:

\[ \pi_i = P_i f_i(P_i, P_{-i}) - h_i^{-1}(f_i(P_i, P_{-i})) g_i^{-1}(h_i^{-1}(f_i(P_i, P_{-i})), W_{-i}) \]

Profits in terms of labor:

\[ \pi_i = f_i^{-1}(h_i(g_i(W_i, W_{-i})), P_{-i}) h_i(g_i(W_i, W_{-i})) - g_i(W_i, W_{-i}) W_i \]
Non-cooperative equilibrium

Optimal Prices:

\[ Q_i + P_i \frac{\partial Q_i}{\partial P_i} - \frac{\partial L_i}{\partial Q_i} \frac{\partial Q_i}{\partial P_i} W_i - L_i \frac{\partial W_i}{\partial L_i} \frac{\partial L_i}{\partial Q_i} \frac{\partial Q_i}{\partial P_i} = 0 \]

Optimal Wages:

\[ P_i \frac{dQ_i}{dL_i} \frac{\partial L_i}{\partial W_i} + \frac{\partial P_i}{\partial Q_i} \frac{dQ_i}{dL_i} \frac{\partial L_i}{\partial W_i} Q_i - L_i - \frac{\partial L_i}{\partial W_i} W_i = 0 \]
Non-cooperative equilibrium

Equations:
- $N$ final good demand functions;
- $N$ production functions;
- $N$ labor supply functions;
- $N$ best reply functions.

Equilibrium variables:
- $N$ prices;
- $N$ quantities;
- $N$ employment levels;
- $N$ wages.
Collusive equilibrium

Maximization problem:

\[
\text{Max } \pi = \sum_{j=1}^{n} P_j f_j(P_i, P_{-i}) - g_j(W_i, W_{-i}) W_j
\]

s.t. \( h_j^{-1} \left( f_j(P_i, P_{-i}) \right) = g_j(W_i, W_{-i}), \quad j = 1, \ldots, n. \)

\[
L = \sum_{j=1}^{n} P_j f_j(P_i, P_{-i}) - g_j(W_i, W_{-i}) W_j + \lambda_j \left[ g_j(W_i, W_{-i}) - h_j^{-1} \left( f_j(P_i, P_{-i}) \right) \right]
\]
Collusive equilibrium

Optimal Prices:

\[ Q_i + \left[ P_i - \left( W_i + L_i \frac{\partial W_i}{\partial L} \frac{\partial L_i}{\partial Q_i} \right) \frac{\partial Q}{\partial P_i} \right] = 0 \]

Labor Stealing Effect

Business Stealing Effect
Non-cooperative vs collusive equilibrium in the final good market
Non-cooperative vs collusive equilibrium in the final good market

Diagram showing price, output, demand, and marginal cost with rivalry and collusion curves.
Non-cooperative vs collusive equilibrium in the labor market

Wage

Marginal Cost

Labor Supply

Marginal Revenue

\( W_0 \)

\( L_0 \)

\( \text{Rivalry} \)
Non-cooperative vs collusive equilibrium in the labor market

- Wage
- Labor
- Non-cooperative vs collusive equilibrium
- Marginal Cost
- Income
- Rivalry
- Collusion
Effects of collusion in the labor market...

⇒ Fall in wages;
⇒ Fall in employment levels;
⇒ Fall in quantities transacted;
⇒ Raise in prices.

↓ Worker’s Welfare
↓ Consumer’s Welfare

Labor Supplies \( L_i = g_i(W_1, \ldots, W_n) \)

Production Functions \( Q_i = h_i(L_i) \)

Good Demands \( Q_i = f_i(P_1, \ldots, P_n) \)
Partial collusion (in labor market A)

↓ Wages
↓ Employment

Labor Market A

Final Good Market

↓ Total Quantity Transacted
↑ Prices

Labor Market B

↑ Wages
↑ Employment
Partial collusion (in labor market A)

- Labor Market A:
  - ↓ Wages
  - ↓ Employment

- Labor Market B:
  - ↑ Wages
  - ↑ Employment

- Labor Market C:
  - ↑ Wages
  - ↑ Employment

- Final Good Market 1:
  - ↓ Total Quantity Transacted
  - ↑ Prices

- Final Good Market 2:
  - ↓ Total Quantity Transacted
  - ↑ Prices

- ...
Theory of Semi-Collusion in the Labor Market

by

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Economic literature

Semi-collusion

New assumption:

- Industry composed by $n$ firms;
- Oligopoly in the final good market and oligopsony in the labor market;
- Downward sloping demand functions;
- Upward sloping supply functions;
- Production functions with two inputs but employers can only fix the price of one;
- Convex cost technology;
- Competition by prices and wages;
- Differentiated products;
- Differentiated jobs posts.
Production function with two inputs

Final Good

Specialized Workers \((L_1)\)

Oligopsonistic labor market
(firms can coordinate wages)

\[ L_{1i} = g_i(W_1, ..., W_n) \]

Non-specialized Workers \((L_2)\)

Perfectly competitive labor market
(firms are not able to collude)

Wage exogenously fixed at \(\bar{W} \).
Production function with two inputs

⇒ The two inputs are **imperfect substitutes**.

There is no more a deterministic relation between the price of the final good and the price of the input.
Price

Output

Non-Specialized Labor

Wage

Supply

Specialized Labor

Isoquants of the Production Function

Specialized Labor

Output

Output

Demand

Output
A two stage game

**First Stage**
- Wages of Specialized Workers
- Employment of Specialized Workers

**Second Stage**
- Employment of Non-Specialized Workers
- Prices
- Final Output

**SEMI-COLLUSION**
⇒ Firms can only collude at the first stage…
Equilibrium in the second stage

⇒ Firms choose prices and levels of non-specialized workers that maximize individual profits;

⇒ Wages of specialized workers are taken as given.

$$\text{Max}_{P_i, L_{2i}} P_i f_i(P_1, ..., P_n) - W_i g_i(W_1, ..., W_n) - \bar{W} L_{2i}$$

s.t. $$f_i(P_1, ..., P_n) = h_i(g_i(W_1, ..., W_n), L_{2i}).$$
Equilibrium in the second stage

Optimal Conditions

\[ f_i(P_1, \ldots, P_n) + \left( P_i - \bar{W} \frac{\partial L_{2i}}{\partial h_i} \right) \frac{\partial f_i(P_1, \ldots, P_n)}{\partial P_i} = 0 \]

\[ f_i(P_1, \ldots, P_n) = h_i(g_i(W_1, \ldots, W_n), L_{2i}) \]
Equilibrium in the second stage

Optimal Conditions

Price

Output

Demand

Marginal Cost

Y₀

P₀

Mg

Income

Non-specialized Labor

Specialized Labor

Isoquants

L₂₀

L₁₀

Y₀
Non-cooperative equilibrium in the first stage

⇒ Firms choose wages of specialized workers that maximize \textit{individual} profits;

⇒ Firms predict how wages will affect their own behavior in the second stage.

\[
\begin{align*}
\max_{W_i} & \quad P_i(W_1, \ldots, W_n)f_i(P_1(W_1, \ldots, W_n), \ldots, P_n(W_1, \ldots, W_n)) - \\
& - W_i g_i(W_1, \ldots, W_n) - \bar{W}L_{2i}(W_1, \ldots, W_n) \\
\text{s.t.} & \quad f_i(P_1(W_1, \ldots, W_n), \ldots, P_n(W_1, \ldots, W_n)) = h_i(g_i(W_1, \ldots, W_n), L_{2i}(W_1, \ldots, W_n))
\end{align*}
\]
Non-cooperative equilibrium in the first stage

Optimal Condition

\[-g_i(.) + \left( \bar{W} \frac{\partial L_{2i}(.)}{\partial h_i} \frac{\partial h_i(.)}{\partial g_i} - W_i \right) \frac{\partial g_i(.)}{\partial W_i} + \]

\[+ \left( P_i(.) - \bar{W} \frac{\partial L_{2i}(.)}{\partial h_i} \right) \sum_{k \neq i}^{n-1} \left\{ \frac{\partial f_i(.)}{\partial P_k} \frac{\partial P_k(.)}{\partial W_i} \right\} = 0 \]

DYNAMIC EFFECT
DYNAMIC EFFECT

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<td>Job Posts</td>
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<td>Dynamic Effect</td>
<td>price war effect</td>
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**Price War Effect**

$\Rightarrow$ Firms set lower wages to avoid triggering price wars in the second stage;

**Shooting-the-Moon Strategy**

$\Rightarrow$ Firms set higher wages to reduce the productive capacity of the rivals, forcing them to raise prices and obtaining additional costumers.
Collusive equilibrium in the first stage

⇒ Firms choose wages of specialized workers that maximize joint profits;

⇒ Firms predict how wages will affect their behavior in the second stage.

\[ \text{Max}_{W_i} \sum_{j=1}^{n} P_j(W_1, \ldots, W_n)f_j(P_1(W_1, \ldots, W_n), \ldots, P_n(W_1, \ldots, W_n)) - \]

\[ - \sum_{j=1}^{n} W_jg_j(W_1, \ldots, W_n) - \sum_{j=1}^{n} \bar{W}L_{2j}(W_1, \ldots, W_n) \]
Collusive equilibrium in the first stage

Optimal Condition

\[-g_i(.) + \sum_{j=1}^{n} \left\{ \left( \bar{W} \frac{\partial L_{2j}(.)}{\partial h_j} \frac{\partial h_j(.)}{\partial g_j} - W_j \right) \frac{\partial g_j(.)}{\partial W_i} \right\} + \]

\[+ \sum_{j=1}^{n} \left\{ \left( P_j(.) - \bar{W} \frac{\partial L_{2j}(.)}{\partial h_j} \right) \sum_{k \neq j}^{n-1} \frac{\partial f_j(.)}{\partial P_k} \frac{\partial P_k(.)}{\partial W_i} \right\} = 0 \]
Non-cooperative vs collusive equilibrium in the first stage

\[
\sum_{j \neq i}^{n-1} \left\{ \left( P_j(\cdot) - \bar{W} \frac{\partial L_{2j}(\cdot)}{\partial h_j} \right) \frac{\partial f_j(\cdot)}{\partial P_i} \frac{\partial P_i(\cdot)}{\partial W_i} \right\} \Rightarrow \text{Business stealing effect}
\]

\[
+ \sum_{j \neq i}^{n-1} \left\{ \left( \bar{W} \frac{\partial L_{2j}(\cdot)}{\partial h_j} \frac{\partial h_j(\cdot)}{\partial g_j} \right) \frac{\partial g_j(\cdot)}{\partial W_i} \right\} \Rightarrow \text{Specialized labor force stealing effect}
\]

\[
+ \sum_{j \neq i}^{n-1} \left\{ \left( P_j(\cdot) - \bar{W} \frac{\partial L_{2j}(\cdot)}{\partial h_j} \right) \sum_{\substack{k \neq j \\ k \neq i}}^{n-2} \frac{\partial f_j(\cdot)}{\partial P_k} \frac{\partial P_k(\cdot)}{\partial W_i} \right\} \Rightarrow \text{Dynamic effect}
\]
Non-cooperative vs collusive equilibrium in the first stage

Again lower employment and wages of specialized workers under collusion.
Impact of collusion in the labor market on prices and output

Again lower output and higher prices under collusion.
Impact of collusion in the labor market on the employment of non-specialized labor

Substitution Effect > Scale Effect

Higher level of non-specialized labor

Substitution Effect < Scale Effect

Lower level of non-specialized labor
Effects of semi-collusion in the labor market...

- Fall in wages of specialized workers;
- Fall in employment of specialized workers;
- Unknown effect on employment of non-specialized workers;
- Fall in quantities transacted;
- Raise in prices.

↓ Worker’s Welfare

↓ Consumer’s Welfare
Upcoming research...

Development of empirical methods to detect collusion based on the relation between collusion in the final good market and collusion in the labor market...
The End

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