Teaching Competition Topics in Undergraduate Courses in Agribusiness Programs: Applications of Seller Market Power

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Abstract

The paper presents a simple theoretical framework that can be used to explain to students taking undergraduate courses in agribusiness programs (a) the structure, conduct and performance of agricultural industries, and (b) the seller market power and its applications in agricultural industries. The theoretical framework components include a linear inverse demand function and a constant marginal cost function, and a set of measures of costs, revenue and profit. The key decision (strategic) variables are product quantity and product price. The theoretical framework is used to develop a generic problem set containing a logical sequence of questions, answering which allows learning the economic concept of the seller market power. In addition, the theoretical framework is used to develop two problem sets focusing on applying this framework to understand the conduct and performance of the U.S. peanut industry and the U.S. potato industry.

Key words: agricultural industry profitability, competition, peanut industry, potato industry, seller market power, structure-conduct-performance framework, teaching.
1. Introduction

A remarkable growth of industries comprising the national and global food supply chains has considerably increased demand for graduates with agribusiness degrees. Many Universities aim to meet this demand by designing agribusiness programs as well as offering agribusiness courses within traditional agricultural economics programs. The structural complexity and dynamics of modern agricultural and food industries (i.e. increasing consolidation and concentration, a presence of firms with seller and/or buyer market power) as well as changes in the regulatory environment affecting marketing and pricing of agricultural and food products (i.e. a decrease in the government intervention in agricultural marketing and pricing) highlight an increasing importance of teaching competition topics in a variety of undergraduate courses in agribusiness programs. In general, this includes conveying to students the importance of a thorough understanding of the nature and dynamics of a competition process in modern agricultural and food industries.

A review of the relevant text-books indicates that competition topics are typically considered to be elements of “marketing” and “prices” or “markets and prices”. Kohls and Uhl (2002) in their “Marketing of Agricultural Products” offer a thorough descriptive introduction into competition in agricultural and food industries. Norwood and Lusk (2008) in “Agricultural Marketing and Price Analysis”, Hudson (2007) in “Agricultural Markets and Prices” and Tomek and Kaiser (2014) in “Agricultural Product Prices” introduce traditional economic models of seller market power and buyer market power\(^1\). These economic models are similar to the ones included in classic text-books in the areas of microeconomics (Varian 1996) and industrial organization (Carlton and Perloff 2005) recommended for undergraduate courses in economics departments and business schools. A discussion of the applications of these traditional models in agribusiness system (especially in agricultural industries), which can be used as examples in undergraduate teaching, is very limited. At the same time, there are more than enough examples of the presence of competition problems in the national and global industries comprising the modern food supply chain (U.S. Department of Justice, Antitrust Division and U.S. Department of Agriculture Public Workshops “Agriculture and Antitrust Enforcement Issues in our 21\textsuperscript{st} Century Economy” 2010).

The teaching objective is to develop a simple theoretical framework that can be used to explain to students taking undergraduate courses in agribusiness programs (a) the structure, conduct and performance of agricultural industries, and (b) the seller market power and its applications in agricultural industries. The theoretical framework components include a linear inverse demand function and a constant marginal cost function, and a set of measures of costs, revenue and profit. The key decision (strategic) variables are product quantity and product price. The theoretical framework is used to develop a generic problem set containing a logical sequence of questions, answering which allows learning the economic concept of the seller market power. In addition, the theoretical framework is used to develop two problem sets focusing on applying this framework to understand the conduct and performance of the U.S. peanut industry and the U.S. potato industry.

\(^{1}\) The economic models explaining seller market power are the ones of monopoly and oligopoly. The economic models explaining buyer market power are the ones of monopsony and oligopsony. The majority of the reviewed text-books discuss the economic models explaining seller market power.
The paper is organized as follows. Section 2 presents a brief introduction into competition topics. Section 3 discusses the theoretical framework explaining seller market power, presents a generic problem set developed using this framework and two problem sets illustrating the application of this framework in the case of the U.S. peanut industry and U.S. potato industry. The following sections provide additional information that may be useful for (a) developing applications for other industries (Section 4), (b) a more thorough understanding of the factors affecting the product quantity produced and marketed by the industry (Section 5), and (c) understanding relevant antitrust issues (Section 6).

2. Introduction to Competition Topics

This section presents a summary of key economic concepts and definitions providing introduction into competition topics: competition as a process and as a market structure; a distinction between an individual firm and the industry using a market share concept; key factors distinguishing a perfectly competitive market structure and imperfectly competitive market structures (the focus is on market structures with seller market power); the firm’s profit-maximization objective and decisions involving product quantity and price.

Defining Competition

A definition of competition as a process provided by Merriam-Webster Dictionary:

“The act or process of competing: RIVALRY: such as a. the effort of two or more parties acting independently to secure the business of a third party by offering the most favorable terms”

A definition of competition as a market structure provided by Carlton and Perfloff (2005: page 7 and Glossary page 780):

“A market has many potential buyers and sellers and has no entry or exit barriers”.

Market structure is determined by

- The number of firms operating in the industry -> these firms produce and sell the same product -> they compete for the same customers;
- The size of each firm relative to the overall industry size. A relative size of each firm is defined by its market share: the share of the firm’s revenue (sales) in the total industry revenue (sales).

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2 The class time allocation (three class sessions): the first class session focuses on introduction into competition (Section 2 of this paper), the second class session focuses on explaining the theoretical framework (Section 3.1), and the third class session focuses on explaining agricultural industry applications (Section 3.2: select one industry for in-class explanation and one industry as a homework assignment). Depending on the course, additional one or two class sessions can be devoted to introducing agricultural cooperatives and discussing antitrust issues (alternatively, a discussion of these issues can be incorporated in the first introductory class session).

3 The example following this definition “contractors in competition for the contract to build the new school”. [https://www.merriam-webster.com/dictionary/competition](https://www.merriam-webster.com/dictionary/competition)
Distinguishing a perfectly competitive market structure and imperfectly competitive market structures (the focus is on market structures with seller market power)

**Perfect competition**
- Many sellers (firms) and many buyers
- The size of each seller (firm) is small relative to the overall industry size (i.e. firms have very small market shares)
- The firms are price-takers -> individually they cannot affect (influence) market prices -> individually they do not have control over market prices (these market prices affect selling (output) prices of these firms) -> individually the firms do not have market power
- The firms earn zero profit -> the industry earns zero profit

**Imperfect competition -> Market structures with seller market power (monopoly and oligopoly)**
- One seller (firm) or a few sellers (firms) and many buyers
- The size of each seller (firm) is large relative to the overall industry size (i.e. firms have large market shares)
- The firms are price-makers -> individually they can affect (influence) market prices -> individually they can control market prices (these market prices affect selling (output) prices of these firms) -> the firms have seller market power
- The firms earn a positive profit -> the industry earns a positive profit

**A Firm: Understanding Objective and Decisions**

The firm’s objective is to maximize its profit (i.e. to achieve as high as possible profit in a given market environment). A “pricing rule”, which verifies the firm’s profit-maximizing behavior, is MR=MC. A firm (industry) maximizes its profit when it produces the product (output) quantity at which Marginal Revenue (MR) from producing and selling one additional unit is equal to Marginal Cost (MC) incurred to produce and sell this unit. For a perfectly competitive firm (industry), Marginal Revenue is equal to output price (“selling price”): MR=MC becomes P=MC. Therefore, a perfectly competitive firm (industry) maximizes its profit when it produces the product (output) quantity at which output price is equal to marginal cost. Consequently, a perfectly competitive firm (industry) earns zero profit (P-MC=0).

Understanding a firm’s decision-making process and the relationship between the product quantity produced and sold and product price received (i.e. output quantity and output price using the firms’ perspective)
- A firm makes a decision on the product quantity to produce to maximize its profit. The firm produces this product quantity and sells it.
- The product price that the firm receives (or charges -> the selling price) is determined by the market price. The market price is determined by the product quantity produced and supplied to the market by all producers (sellers) of this product (there could be a few sellers or many sellers).
  - Market price is a function of the total product quantity available in the market OR
  - The total product quantity available in the market determines market price
  - Market price affects prices received by individual firms
3. Theoretical Framework Explaining Seller Market Power: Teaching Approach and Class Notes

A simple theoretical framework that can be used to explain the structure, conduct and performance of agricultural industries and the seller market power focuses on the product price-quantity relationship and profitability in a representative industry. A brief description of the framework is as follows.

- **Three typical (or possible) market scenarios** that the industry can experience are introduced.
- The industry can be thought of as the one including a few firms (producers/sellers of the analyzed product) or many firms (producers/sellers of the analyzed product).
- The market scenarios differ due to the product quantity the industry produces and sells and the product price.
- The product price-quantity combinations in three market scenarios have **different effects on the industry profitability and consequently on the profitability of firms** comprising this industry.
  - **The first market scenario** is characterized by the product over-supply
    -> economic outcome: **loss (i.e. negative profit)** for the industry and firms (producers/sellers).
  - **The second market scenario** is a **perfectly competitive market** scenario
    -> economic outcome: **zero profit** for the industry and firms (producers/sellers).
  - **The third market scenario** is a **seller market power** scenario
    -> economic outcome: **profit** for the industry and firms (producers/sellers)\(^4\).

This framework is a simple economic version of a classic Structure-Conduct-Performance (SCP) framework.

3.1. Introducing the Theoretical Framework

**Appendix 1 (Figure 1 and Figure 2) and Appendix 2**

The theoretical framework is explained to students in two stages by using a graphical approach (Appendix 1) and an analytical approach (Appendix 2). The theoretical framework uses a linear inverse demand function and a constant marginal cost function.

*At the first stage, the focus is on explaining the product (output) price-quantity relationship, using a linear inverse demand function* (i.e. a price-dependent demand function). Product quantity determines product price; alternatively, product price is a function of product quantity; there is a negative relationship between product price and quantity (See **Appendix 1 Figure 1**).

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\(^4\) A more detailed discussion of this framework and of its applications in the analysis of selected agricultural industries is presented in Bolotova (2014, 2016). A comprehensive discussion of a more complex version of this framework and of its individual elements, as applied to the U.S. cotton industry, is presented in Moore (1919).
The two typical market scenarios are introduced. They differ due to the product quantity and consequently product price. Scenario A: a larger quantity and a lower price, and Scenario B: a smaller quantity and a higher price. **Seller market power is the industry ability to decrease product quantity, which causes product price to increase: moving from Scenario A to Scenario B.** The results are interpreted using the perspective of sellers and buyers. Producers (sellers) sell a smaller product quantity and receive a higher price. Consumers (buyers) have access to a smaller product quantity and pay a higher price.

**At the second stage, information on marginal cost becomes available** (a constant marginal cost function). This allows to evaluate the industry **profitability** in a new set of typical (possible) market scenarios, which also differ due to the product quantity produced and marketed by the industry (See Appendix 1 Figure 2). **The following three market scenarios are introduced.**

1) **A perfectly competitive industry scenario:** Scenario C - Qpc and Ppc

2) **A product oversupply scenario:** Scenario Q - Qo and Po
   *Note: Qo > Qpc and Po < Ppc*

3) **A seller market power scenario:** Scenario M - Qm and Pm
   *Note: Qm < Qpc and Pm > Ppc*

The product price-quantity combinations for these three scenarios are shown on a graph. It is now possible to identify price-cost margins (measured in $ per unit) in the analyzed scenarios. A graphical analysis reveals a clear pattern connecting the product quantity, product price and industry profitability (i.e. price-cost margin: PCM, measured in $ per unit and as a percentage of the selling price (Lerner Index)).

1) **A perfectly competitive industry** scenario: Scenario C - Qpc and Ppc
   Qpc -> Ppc = MC -> PCM = Ppc - MC = 0
   -> **Zero profit** for the industry and firms (producers/sellers)

2) **A product oversupply** scenario: Scenario Q - Qo and Po
   Qo > Qpc -> Po < MC -> PCM = Po - MC < 0 -> a **negative** profit
   -> **LOSS** for the industry and firms (producers/sellers)

3) **A seller market power** scenario: Scenario M - Qm and Pm
   Qm < Qpc -> Pm > MC -> PCM = Pm - MC > 0 -> a **positive** profit
   -> **PROFIT** for the industry and firms (producers/sellers)

**Seller market power is the industry ability to decrease product quantity, which causes product price to increase:** The results are interpreted using the perspective of sellers and buyers. If producers (sellers) sell a smaller product quantity, they would receive a higher price and achieve a higher profit (measured in $ per unit). At the same time, consumers (buyers) would have access to a smaller product quantity and would pay a higher price.
This theoretical framework is used to develop a generic analytical analysis framework represented by a generic problem set, which uses generic inverse demand and marginal cost functions (Appendix 2). This generic analytical analysis framework serves as a foundation for developing agricultural industry applications.

3.2. Applying the Theoretical Framework to Study Agricultural Industries

Appendix 3 and Appendix 4

The theoretical framework is applied to study the U.S. peanut industry and the U.S. potato industry at the farm (grower) level of the peanut and potato supply chains. Appendix 3 presents a problem set developed to analyze the U.S. peanut industry, and Appendix 4 presents a problem set developed to analyze the U.S. potato industry. The type and sequence of questions are the same in both problem sets. The industry-specific information (an inverse demand function and a marginal cost function) differs.

4. Extending Agricultural Industry Applications: Industry Data

The industry data/information required to develop an industry-specific problem set includes a linear inverse demand function and an assumption on marginal (average) cost (i.e. a constant marginal cost function).

A simple linear inverse demand function can be estimated using yearly production and price data available on the USDA National Agricultural Statistics Service web-page. The quantity (production) variable is the total product quantity produced by the industry. The price variable is product price received by growers. An assumption on the marginal (average) cost can be formulated using information presented in relevant enterprise (production) budgets. The USDA Economic Research Service maintains a large collection of commodity costs and returns estimates. Land-Grant Universities maintain collections of the enterprise budgets for crops grown in specific geographic locations.

The U.S. peanut industry inverse demand function used in the peanut problem set is a simplified version of the peanut inverse demand function reported in Bolotova (2018). The U.S. potato industry inverse demand function used in the potato problem set is similar to the one reported in Bolotova (2017)\(^5\).

\(^5\) An example of additional agricultural industry application is an analysis of the Idaho-Eastern Oregon onion industry presented in Bolotova and Jemmett (2010).
5. Agricultural Industries, Agricultural Producers and Factors Affecting the Product Quantity Produced and Marketed

Given that agricultural industries include many agricultural producers, it is important to explain the types of factors that may affect the agricultural product quantity produced and marketed each year by all agricultural producers comprising the analyzed industry (a particular focus is on crops).

1) Production decisions of agricultural producers: the area to plant and the crop varieties to plant; the latter affect crop yield per acre.
2) Production management practices implemented by agricultural producers; they affect crop yield per acre.
3) Weather conditions; they affect crop yield per acre and may affect the area harvested (as compared to the area planted).
4) Crop disease outbreaks; they affect crop yield per acre and may affect the area harvested (as compared to the area planted).
5) The area harvested and yield per acre determine the total product quantity produced each year.
6) Marketing programs of agricultural cooperatives may affect the product quantity available at the marketplace during certain periods of time.
7) International trade policies (including trade barriers) and changes in international trade rules may increase or decrease the product quantity available for domestic market (consumption).

6. Agricultural Cooperatives, Collective Marketing and Relevant Antitrust Issues

Agricultural marketing cooperatives (their types, functions and membership) are discussed during one of the class sessions. Also, the Sherman Antitrust Act (1890) and the Capper-Volstead Act (1922), a limited antitrust exemption from the Sherman Act, are introduced.

In addition to understanding the structure, conduct and performance of agricultural industries, the presented theoretical framework can be conveniently used to discuss the effects of marketing programs (“collective marketing”) implemented by the organizations of agricultural producers in various industries. These programs may affect the product quantity marketed and/or product price. The most recent examples include the supply management programs implemented by the organizations of agricultural producers in the U.S. dairy, potato, mushroom and egg industries (Bolotova 2014, 2015, 2016).

References


APPENDIX 1: *Figure 1 The Product Price-Quantity Relationship: Two Representative Market Scenarios.*

**Focus is on Price-Quantity relationship**  
*Cost is not used* in this analysis (Figure 1)

**A linear inverse demand function:*** \( P = a - bQ \)

An *increase* in \( Q \) causes \( P \) to *decrease*  
A *decrease* in \( Q \) causes \( P \) to *increase*

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**Scenario A** "**Large** product *quantity* supplied to the market": \( Q_1 \) and \( P_1 \) are product quantity and price.  
**Scenario B** "**Small** product *quantity* supplied to the market": \( Q_2 \) and \( P_2 \) are product quantity and price.  
**SELLER MARKET POWER: the industry ability to move from A to B:** A *decrease in Quantity causes Price to increase*.  
Producers (sellers) receive a higher price by decreasing quantity. Consumers pay a higher price and have access to a smaller quantity.
APPENDIX 1: *Figure 2* The Product Price-Quantity Relationship and the Industry Profitability: Three Alternative Market Scenarios: Perfect Competition, Over-Supply and Seller Market Power.

Focus is on *Price*-Quantity relationship AND *COST* -> *PROFITABILITY* ANALYSIS

$P$, $$/unit$

**Qpc** and **Ppc** (Point C) is a perfectly competitive industry scenario: $Q_{pc} \rightarrow P_{pc} = MC$ ($P_{pc}$-$MC = 0$) -> *Profit is zero*.

**Qo** and **Po** (Point O) is an oversupply scenario: $Q_{o} > Q_{pc} \rightarrow P_{o} < MC$ ($P_{o}$-$MC < 0$, *profit is negative*) -> *LOSS*.

**Qm** and **Pm** (Point M) is a seller market power scenario: $Q_{m} < Q_{pc} \rightarrow P_{m} > MC$ ($P_{m}$-$MC > 0$, *profit is positive*) -> *PROFIT*.

*SELLER MARKET POWER: the industry ability to decrease product quantity, which causes price to increase* -> increases profit.

By decreasing product quantity, producers (sellers) receive a higher price and a higher profit.

Consumers pay a higher price and have access to a smaller quantity of the product they purchase.
Appendix 2: A Generic Problem Set
The Product Price-Quantity Relationship and the Industry Profitability

Market demand for the analyzed product:
Inverse demand function (i.e. price-dependent demand function): \( P = 300 - Q \).
P ($/unit) is product (market) price.
Q (units) is the total product quantity produced and supplied to the market by all producers in the analyzed industry.

Three alternative market scenarios differing due to the total product quantity

Scenario A: \( Q_a = 200 \) units
Scenario C: \( Q_c = 150 \) units
Scenario B: \( Q_b = 100 \) units

Question #1: Analyzing the Product Price-Quantity Relationship

1) Use the inverse demand function (equation) to calculate (predict) prices received by all producers in the analyzed industry (i.e. market prices) in three scenarios differing due to the product quantity produced and supplied to the market.

2) Show the inverse demand curve and price-quantity combinations corresponding to the analyzed scenarios on a graph. Label the axes, curve and clearly identify three price-quantity combinations.

3) Briefly discuss the results of your analysis: Compare and contrast three analyzed scenarios by evaluating the price-quantity combinations.

Question #2: Analyzing the Industry Profitability

You continue analyzing the same industry. Now the information on marginal cost becomes available. Marginal Cost (MC) is $150 per unit. Recall that Marginal Cost (MC) is additional cost incurred to produce and sell one additional unit of output (product).

4) Use prices calculated in Question #1 and information on marginal cost to calculate the price-cost margins (in $ per unit and as a percentage of the selling price) in three analyzed market scenarios.

5) Show the price-cost margins on the same graph (Question #1). Make sure you show MC curve.

6) Classify each analyzed market scenario as an over-supply scenario, perfect competition or a market scenario with seller market power. Briefly explain your reasoning in the case of each market scenario.
### Question #3: Summary

Summarize the results of your analysis in a table below. In addition, calculate the industry total revenue, total cost and total profit in three analyzed market scenarios.

**Note:** formulas and numerical answers are provided as answer key.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Scenario A: A relatively large product quantity</th>
<th>Scenario C: “Normal” product quantity</th>
<th>Scenario B: A relatively small product quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Marginal Cost ($/unit) = Average Cost ($/unit)</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Q</td>
<td>Product quantity (units)</td>
<td>200</td>
<td>150</td>
</tr>
<tr>
<td>P</td>
<td>Product price ($/unit)</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>Profit ($/unit) = P – C</td>
<td>-50</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>Lerner Index (%) = [(P-C)/P]*100</td>
<td>-50</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Total Revenue ($) = P * Q</td>
<td>20,000</td>
<td>22,500</td>
<td>20,000</td>
</tr>
<tr>
<td>Total Cost ($) = C * Q</td>
<td>30,000</td>
<td>22,500</td>
<td>15,000</td>
</tr>
<tr>
<td>Total Profit ($) = TR - TC OR</td>
<td>-10,000</td>
<td>0</td>
<td>5,000</td>
</tr>
</tbody>
</table>

Note: product price ($ per unit) is the *average* revenue ($ per unit), and profit ($ per unit) is the *average* profit ($ per unit). In this analysis we assume that AC = MC. AC is *average* cost ($ per unit) and MC is *marginal cost* ($ per unit).
Consider the following \textbf{three market scenarios} that the U.S. peanut industry represented by all peanut growers might experience. These market scenarios \textit{differ due to the total peanut quantity} produced and supplied to the market each year.

\textbf{Scenario A}: The industry produces \textbf{7 billion pounds} of peanuts per year.  
\textbf{Scenario B}: The industry produces \textbf{4 billion pounds} of peanuts per year.  
\textbf{Scenario C}: The industry produces \textbf{3 billion pounds} of peanuts per year.  

The peanut industry \textit{inverse demand function} (i.e. price-dependent demand function) is 

\begin{equation*}
    P = 0.30 - 0.01Q
\end{equation*}

\(P\) is peanut price received by growers (i.e. price paid by buyers of peanuts) [in \textit{$ per pound$}].  
\(Q\) is peanut quantity produced by all peanut growers [in \textit{billion pounds}].  

\textbf{Question #1: Analyzing the Peanut Price-Quantity Relationship} 

1. Use the peanut industry inverse demand function to \textbf{calculate} (predict) \textbf{peanut prices} in three market scenarios. \textit{Show your work}.  

2. \textbf{Show} the inverse demand curve and \textbf{peanut price-quantity combinations} corresponding to three analyzed market scenarios on a graph below. \textit{Label the axes and clearly identify three price-quantity combinations}.  

\begin{center}
\begin{tikzpicture}
\end{tikzpicture}
\end{center}

3. \textbf{Briefly discuss} the results of your analysis: Evaluate the peanut price-quantity combinations across three market scenarios.
Question #2: Analyzing the Peanut Industry Profitability

You continue analyzing the same peanut industry. Now the information on marginal cost becomes available. Marginal Cost (MC) is $0.26 per pound of peanuts (i.e. this is additional cost incurred to produce one additional pound of peanuts). M C i s t h e s a m e i n t h r e e a n a l y z e d m a r k e t s c e n a r i o s.

1. Use peanut prices calculated for three market scenarios (Question #1) and information on marginal cost to calculate price-cost margins (PCM) in $ per pound of peanuts and as a percentage of peanut price (i.e. Lerner Index of market power) in three analyzed market scenarios. Write down PCM formulas and record your answers in a table below.

2. Summarize the results of your analysis in a table below.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Scenario A Classified as</th>
<th>Scenario B Classified as</th>
<th>Scenario C Classified as</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marginal Cost in $ per pound</td>
<td>0.26</td>
<td>0.26</td>
<td>0.26</td>
</tr>
<tr>
<td>Peanut Quantity in billion pounds</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Peanut Price in $ per pound</td>
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<tr>
<td>Price-Cost Margin in $ per pound</td>
<td></td>
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<tr>
<td>Price-Cost Margin as % of Price</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(Lerner Index)</td>
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</tbody>
</table>

3. Use calculated PCMs to classify each analyzed market scenario as an over-supply market scenario, perfect competition or a market scenario with seller market power. You can write down the answers in the table heading.

4. On the graph (Question #1) show a marginal cost curve and clearly identify three calculated PCMs (in $ per pound).
Appendix 4: Applications of the Theoretical Framework of Seller Market Power: An Analysis of the U.S. Potato Industry

Consider the following three market scenarios that the U.S. potato industry represented by all potato growers might experience. These market scenarios differ due to the total potato quantity produced and supplied to the market each year.

Scenario A: The industry produces 420 million cwt of potatoes per year.
Scenario B: The industry produces 389 million cwt of potatoes per year.
Scenario C: The industry produces 370 million cwt of potatoes per year.
Note: cwt is one hundredweight (=100 pounds).

The potato industry inverse demand function (i.e. price-dependent demand function) is

\[ P = 22.26 - 0.034Q \]

\( P \) is potato price received by growers (i.e. price paid by buyers of potatoes) [in $ per cwt].
\( Q \) is potato quantity produced by all potato growers [in million cwt].

**Question #1: Analyzing the Potato Price-Quantity Relationship**

1. Use the potato industry inverse demand function to calculate (predict) potato prices in three market scenarios. Show your work.

2. Show the inverse demand curve and potato price-quantity combinations corresponding to three analyzed market scenarios on a graph below. Label the axes and clearly identify three price-quantity combinations.

3. Briefly discuss the results of your analysis: Evaluate the potato price-quantity combinations across three market scenarios.
Question #2: Analyzing the Potato Industry Profitability

You continue analyzing the same potato industry. Now the information on marginal cost becomes available. **Marginal Cost** (MC) is $9.00 per cwt of potatoes (i.e. this is additional cost incurred to produce one additional cwt of potatoes). **MC is the same in three analyzed market scenarios.**

1. Use potato prices calculated for three market scenarios (Question #1) and information on marginal cost to **calculate price-cost margins (PCM)** in $ per cwt of potatoes and as a **percentage of potato price** (i.e. Lerner Index of market power) in three analyzed market scenarios. **Write down PCM formulas and record your answers in a table below.**

2. **Summarize the results** of your analysis in a table below.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Scenario A Classified as</th>
<th>Scenario B Classified as</th>
<th>Scenario C Classified as</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marginal Cost in $ per cwt</td>
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<tr>
<td>Potato Quantity in million cwt</td>
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<tr>
<td>Potato Price in $ per cwt</td>
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<tr>
<td>Price-Cost Margin in $ per cwt</td>
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<tr>
<td>Price-Cost Margin as % of Price</td>
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<td>(Lerner Index)</td>
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</tbody>
</table>

3. Use calculated PCMs to classify each analyzed market scenario as an over-supply market scenario, perfect competition or a market scenario with seller market power. Write down the answers in the table heading.

4. On the graph (Question #1) show a marginal cost curve and clearly **identify three calculated PCMs (in $ per cwt).**