LINKS Tutorial #8:
Postponed Production

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In LINKS, you have the option to:

- Produce finished goods at your plant and ship directly to customers.
- Produce finished goods at your plant and distribute them via regional DCs.
- Produce product P-0 at your plant and finish them into either hyperware or metaware at regional DCs that you own.

This last option is called **postponed production** because final production from the generic P-0 to metaware or hyperware is "postponed" then finished at your DC once regional demand is known. Under what circumstances is postponed production the best alternative?

This tutorial presents a "hands-on" exercise to help you understand and compare the costs and benefits of postponed production. While the exercise uses data from a fictitious LINKS firm, you can also apply the same approaches for your own decision making using your own LINKS firm's data.

This brief tutorial consists of three parts:

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PART 1: "Hands-On" Exercise

NOTE!
To get the most from this exercise, you should be familiar with P&L statements, inventory tracking, forecasting, and distribution. If any of these are unfamiliar, you may wish to work through the appropriate LINKS Tutorials (#1, #2, #4 and #7) before you start this exercise.

A. Exploring Production Costs for a "Minimum" Configuration (H11111) Assuming That You Own a DC in Each Region

Question 1 - Calculating Product Costs: Assume you currently have a product H11111 that you produce at your manufacturing plant for all regions. Use your LINKS participant's manual to fill-in the missing data, below, to determine the unit cost of this product. Assume that you source sub-assembly components from supplier D.

	H11111 Costs per Unit
Alpha	
Beta	
Bandwidth	
Warranty	
Packaging	
Gamma	
Epsilon	
Labor	
Production	
Total Unit Cost:	

Question 2 - Calculating and Comparing Production Costs:

a. Calculating Postponed Production Costs: Assume that you own a DC in every region and that you are exploring postponed production in each region. Refer to your LINKS participant's manual and your answer to question 1 (above) to complete the worksheet on the following page to calculate the cost of postponed production for H11111 in each region. (Shaded boxes should be left blank.)

Postponed Production Product Cost Worksheet

P = Product
PP-1 = Product 1 via postponed production

	P-0 Configuration	P-0 Unit Costs	P-1 Configuration	PP-1 Costs in Region 1	PP-1 Costs in Region 2	PP-1 Costs in Region 3
Alpha	9		1			
Beta	9		1			
Bandwidth			1			
Warranty			1			
Packaging			1			
Gamma			1			
Epsilon			1			
Labor						
Production						
P-0 Total Unit Cost:						
Total Unit Cost:						

b. Comparing Postponed Production Costs: Your calculations indicated that the unit costs for H11111 (above) will vary from region to region. What is (are) the cause(s) of this variation?

Question 3 - Comparing Variable Costs Between Production Options: For the example of product H11111, which product costs were the **same** for products produced in the region (using postponed production) **and** for products finished at your manufacturing plant only (without postponed production)?

a. Total raw materials used.
b. Bandwidth, warranty, and packaging.
c. Duties and tariffs.
d. Transportation costs.
e. b, c, and d
f. None of the above.

Question 4 - Calculating and Comparing Gross Margin:

a. Calculating Gross Margin by Production Option by Region: Assume that you will sell H11111 in channel 1 in every region for $420 per unit. Use the unit costs you calculated in question 2a (previous page) and "duties and tariffs" from your LINKS manual to calculate per unit gross margin by production option, by region. The following worksheet helps you organize this information by region.

	Region 1:		Region 2:		Region 3:	
Product from:	**Plant**	**Postponed Production**	**Plant**	**Postponed Production**	**Plant**	**Postponed Production**
Price:	$420	$420	$420	$420	$420	$420
Product Cost:						
Duties &Tariffs:						
Gross Margin:						
Gross Margin as a % of Revenue:						

b. Comparing Gross Margin: Which option had the higher gross margin in each region? Why?

B. Exploring Production Costs for a "Maximum" Configuration (H99632)

Assume you currently produce **H99632** at your manufacturing plant for all regions. Your current product cost per unit is as follows:

	H99632 Costs per Unit
Alpha (9)	$27
Beta (9)	$36
Bandwidth (6)	$118
Warranty (3)	$35
Packaging (2)	$14
Gamma	$22
Epsilon	$29
Labor	$30
Production	$20
Total Unit Cost:	**$331**

Question 1 - Calculating and Comparing Production Costs:

a. Calculating Postponed Production Costs: Assume that you own a DC in every region and that you are exploring postponed production in each region. Calculate the cost of postponed production for H99632 in each region using the worksheet below. (Shaded boxes should be left blank.)

	P-0 Configuration	P-0 Unit Costs	P-1 Configuration	PP-1 Costs in Region 1	PP-1 Costs in Region 2	PP-1 Costs in Region 3
Alpha	9		9			
Beta	9		9			
Bandwidth			6			
Warranty			3			
Packaging			2			
Gamma			1			
Epsilon			1			
Labor						
Production						
P-0 Cost:						
Total Unit Cost:						

b. Comparing Postponed Production Costs: How do the costs for the P-0 used in H99632 compare to those for the P-0 used in H11111?

Question 2 - Calculating and Comparing Gross Margin:

a. Calculating Gross Margin by Production Option by Region: Assume that you will sell H99632 in channel 1 in every region for $420 per unit. Use the unit costs you calculated above to calculate per unit gross margin by production option by region. The following worksheet helps you organize this information by region.

	Region 1:		Region 2:		Region 3:	
Product from:	**Plant**	**Postponed Production**	**Plant**	**Postponed Production**	**Plant**	**Postponed Production**
Price:	$420	$420	$420	$420	$420	$420
Product Cost:						
Duties &Tariffs:	0	0	$33.60	0	$50.40	0
Gross Margin:						
Gross Margin as a % of Revenue:						

b. Comparing Gross Margin: Which option appears to be better in each region? Why?

C. Applying This Analysis to Other Situations

Question 1 - Data to Include in Analysis: (True/False) When exploring the costs and benefits of postponed production in any region, you should do the unit cost calculations for all products and the gross margin calculations for all channels.

Question 2 - Additional Info If You DO NOT Have a DC: If you do not already have a DC in a region, and you want postponed production there, you *must* open your own DC in that region. Given this, which of the following costs should be included in your own profitability analysis of postponed production (check all that apply)?

_____ The costs to open a DC.
_____ On-going (per simulation round) operating costs for the DC.
_____ Inventory holding costs for estimated inventories.
_____ Transportation costs per unit.

Question 3 - Data to Include in Analysis: Under what circumstances does postponed production appear to be most profitable (check all that apply)?

_____ When you have low levels of alpha and beta in your products.
_____ When you have high levels of alpha and beta in your products.
_____ When duties and tariffs are low.
_____ When duties and tariffs are high.
_____ When you already own a DC in the region.
_____ When you do not have any DC in the region.

PART 2: Exercise Answers

A. Exploring Production Costs for a "Minimum" Configuration (H11111) Assuming That You Own a DC in Each Region

Question 1:

	H11111 Costs per Unit
Alpha	$3
Beta	$4
Bandwidth	$10.50
Warranty	$11
Packaging	$10
Gamma	$22
Epsilon	$29
Labor	$30
Production	$20
Total Unit Cost:	**$139.50**

Question 2:

a.

	P-0 Configuration	P-0 Unit Costs	P-1 Configuration	PP-1 Costs in Region 1	PP-1 Costs in Region 2	PP-1 Costs in Region 3
Alpha	9	($3 x 9) = $27	1			
Beta	9	($4 x 9) = $36	1			
Bandwidth			1	$10.50	$10.50	$10.50
Warranty			1	$11	$11	$11
Packaging			1	$10	$10	$10
Gamma			1	$22	$22	$22
Epsilon			1	$29	$29	$29
Labor		$22		$14	$15	$12
Production		$11		$12	$14	$11
P-0 Cost:				$96	$96	$96
Total Unit Cost:		**$96**		**$204.50**	**$207.50**	**$201.50**

b. The causes are labor and production costs that vary from region to region.

Question 3: b only (note that c and d are not considered "product" costs as the question specifies).

Question 4:

a.

	Region 1:		Region 2:		Region 3:	
Product from:	**Plant**	**Postponed Production**	**Plant**	**Postponed Production**	**Plant**	**Postponed Production**
Price:	$420	$420	$420	$420	$420	$420
Product Cost:	$139.50	$204.50	$139.50	$207.50	$139.50	$201.50
Duties &Tariffs:	0	0	$33.60	0	$50.40	0
Gross Margin:	**$280.50**	**$215.50**	**$246.90**	**$212.50**	**$230.10**	**$218.50**
Gross Margin as a % of Revenue:	67%	51%	59%	51%	55%	52%

b. Producing a finished H11111 at the plant appeared to have the higher gross margin in every region despite the extra cost of duties and tariffs. The main drivers of this higher cost for postponed production are the:

(1) Cost of alpha and beta that is taken out of P-0 to go from 9 to 1.
(2) Higher total labor and production costs.

EXERCISE ANSWERS continue…

B. Exploring Production Costs for a "Maximum" Configuration (H99632) Assuming That You Own a DC in Each Region

Question 1:

a.

	P-0 Configuration	P-0 Unit Costs	P-1 Configuration	PP-1 Costs in Region 1	PP-1 Costs in Region 2	PP-1 Costs in Region 3
Alpha	9	$27	9			
Beta	9	$36	9			
Bandwidth			6	$118	$118	$118
Warranty			3	$35	$35	$35
Packaging			2	$14	$14	$14
Gamma			1	$22	$22	$22
Epsilon			1	$29	$29	$29
Labor		$22		$14	$15	$12
Production		$11		$12	$14	$11
P-0 Cost:				$96	$96	$96
Total Unit Cost:		**$96**		**$340**	**$343**	**$337**

b. The costs for P-0 were the same. You will, however, waste less alpha and beta with this configuration since you will use all 9 units of each in the final PP-1. In general, as the alpha and beta raw materials increase in a configuration, the cost disadvantage of postponed production will be reduced. The choice of alpha and beta values in set-top box configurations depends on customer preferences for alpha and beta … and customer preferences for alpha and beta may vary across channels and/or regions.

Question 2:

a.

	Region 1:		Region 2:		Region 3:	
Product from:	**Plant**	**Postponed Production**	**Plant**	**Postponed Production**	**Plant**	**Postponed Production**
Price:	$420	$420	$420	$420	$420	$420
Product Cost:	$331	$340	$331	$343	$331	$337
Duties &Tariffs:	0	0	$33.60	0	$50.40	0
Gross Margin:	**$89**	**$80**	**$55.40**	**$77**	**$38.60**	**$83**
Gross Margin as % Revenue:	22%	19%	13%	18%	9%	20%

b. Region 1: Plant production has a slightly higher gross margin per product. If you experience very variable demand for your two products in this region, however, postponed production may be the more attractive alternative since it could lessen the need for accurate finished goods demand forecasting (you build finished goods on demand from the same P-0).

Region 2: Postponed production has a higher gross margin.

Region 3: Postponed production is much more profitable due to the very high duties and tariffs you'd pay if you shipped finished products into this region from your manufacturing plant in Region 1.

C. Applying This Analysis to Other Situations

Question 1: TRUE (We simplified the analysis in this tutorial by limiting it to just one product, one channel, and one price. Your own analysis will involve more data, but the same approach applies. Spreadsheets can be very helpful with this analysis!)

Question 2:

___✓__ The costs to open a DC.
___✓__ On-going (per simulation round) operating costs for the DC.
___✓__ Inventory holding costs for estimated inventories.
___✓__ Transportation costs per unit.

FYI, we've included an example of how to incorporate all of these extra costs in part of the TIPS section that follows on page 14.

Question 3 :

_____ When you have low levels of alpha and beta in your products.
_✓__ When you have high levels of alpha and beta in your products.
_____ When duties and tariffs are low.
_✓__ When duties and tariffs are high.
_✓__ When you already own a DC in the region.
_____ When you do not have any DC in the region.

PART 3: TIPS for Your Own Analysis

* Excel spreadsheets can be invaluable for this analysis!

* If you already have a DC in the region, use the approach (and even the same worksheets!) you used in the "Hands-On" Exercise in this tutorial. You'll have to add your own data, and you'll have to calculate the costs and gross margin for your second product — but at least this approach can get you started.

* If you do **not** have a DC in the region, you'll need to expand your analysis a bit by:

  (1) Adding the costs to open and operate your new DC.
  (2) Adding transportation costs to your variable cost calculations since transportation costs will vary greatly between options.
  (3) Estimating expected inventories since inventory charges are different for each option you're evaluating.
  (4) Estimating expected sales at the prices you set since you'll need to calculate total revenue, from which you'll subtract the new fixed costs for DC operation and inventory.

  Here is an example of how your spreadsheet might look for one product in one region:

Product From:	Plant to Customer	Plant to DC (Owned)	Postponed Production (in Owned DC)
Revenue			
- Product Costs			
- Transportation			
- Duties & Tariffs			
= Gross Margin			
- On-Going DC Operating Cost			
- Inventory Charges			
= Operating Income			