GAINS FROM VERTICAL INTEGRATION

1. LOWER TRANSACTION COSTS
2. ASSURE THE SUPPLY OF IMPORTANT INPUTS (BACKWARD VI)
3. ELIMINATE NEGATIVE EXTERNALITIES

   Ex: MCDONALD / BURGER KING OWNS UPSTREAM FIRMS TO ENSURE THAT ITS REPUTATION WILL NOT BE AFFECTED BY ANY MISTAKES THAT MIGHT OCCUR IN THE SUPPLY CHAIN IF IT IS NOT VERTICALLY INTEGRATED.
4. AVOID GOVERNMENT REGULATION / RULE

   Ex: PRICE CONTROLS

   STEEL FIRM ← CAR MANUFACTURERS

   SUPPOSE GOVT IMPOSE PRICE FLOOR ON STELL ; A LEGALLY MINIMUM PRICE STEEL FIRM MUST GET WHEN IT SELLS

   TO AVOID THIS REGULATION, CAR MANUFACTURERS MAY TAKE OVER STEEL FIRM. (SELLING STEEL TO ITSELF)
5. INCREASE MONOPOLY PROFITS FOR A VERTICALLY INTEGRATED FIRM,
6. REDUCE OR ELIMINATE MARKET POWER (OF BIG FIRMS).

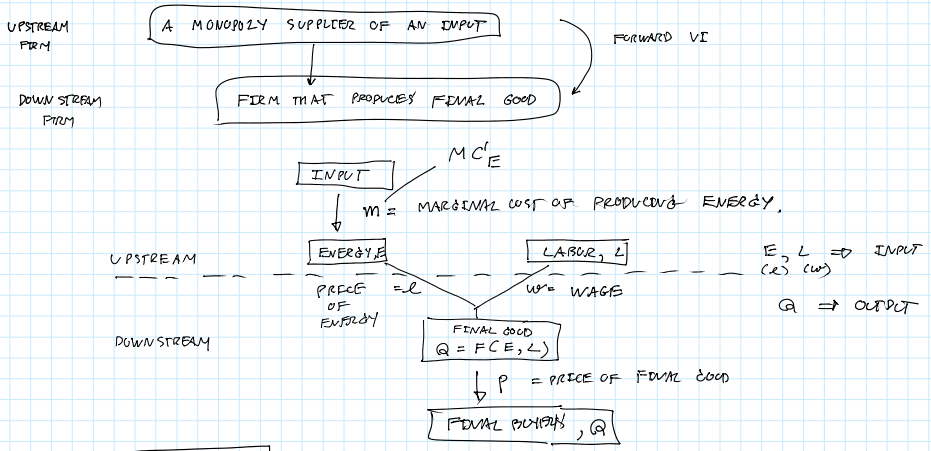
   A GROUP OF SMALL FIRMS MAY DO VI TO REDUCE THE BIG FIRMS' MARKET POWER.

COSTS OF VERTICAL INTEGRATION

- LEGAL COSTS OF MERGING MAY BE HIGH.
- LARGE FIRMS ARE HARDER TO MANAGE.
- COSTS MAY BE HIGHER THAN THE CASE YOU JUST BUY INPUTS FROM COMPETITIVE SUPPLIERS.

BOTTOM LINE: IF BENEFIT FROM VI > COSTS OF VI, FIRMS ARE VERTICALLY INTEGRATED. OTHERWISE, THEY WILL NOT DO SO.

VERTICAL INTEGRATION TO MONOPOLIZE ANOTHER INDUSTRY



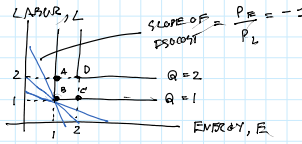
ASSUMPTIONS

1. CONSTANT RETURNS TO SCALE : DOUBLING ALL INPUTS DOUBLES OUTPUT.
2. CONSTANT MARGINAL COST OF INPUTS : $\overline{m}$, $\overline{w}$
3. UPSTREAM FIRM ⇒ MONOPOLY
   DOWNSTREAM FIRM ⇒ COMPETITIVE FIRM (WE RELAX THIS ASSUMPTION LATER)
4. VERTICAL INTEGRATION IS COSTLY.

KEY POINT: MONOPOLY UPSTREAM WILL ENJOY HIGHER PROFITS

FROM VERTICALLY INTEGRATING W/ COMPETITIVE DOWNSTREAM OR NOT DEPENDING ON PRODUCTION TECNOLOGY OF COMPETITIVE DOWNSTREAM

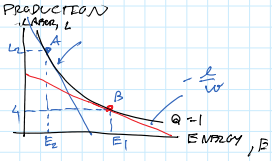
FIXED – PROPORTION PRODUCTION



A(1, 2) → Q = 1
B(1, 1) → Q = 1
C(2, 1) → Q = 1
D(2, 2) → Q = 2

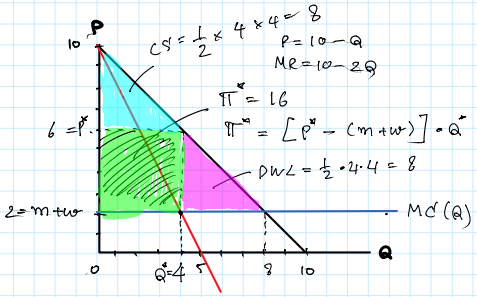
TWO INPUTS MUST BE USED IN THE SAME FIXED PROPORTION : 1 : 1

VARIABLE PROPORTION PRODUCTION



CASE1 FIXED PROPORTION PRODUCTION FUNCTION

(a) PROFITS OF AN INTEGRATED FIRM



DEMAND FUNCTION FACING BY COMPETITIVE FIRM :

$P = 10 - Q$

SUPPOSE $m = 1$, $w = 1$

$Q = F(E, L)$

SO MARGINAL COST OF PRODUCING A UNIT OF FINAL GOOD = $m \cdot E + w \cdot L$

$= 1 \cdot 1 + 1 \cdot 1$

$= 2$

SINCE 1E + 1L → 1Q.

SOLVE : $P = 10 - Q$ ($\equiv P = a - bQ$)

$TR = P \cdot Q = (10 - Q)Q = 10Q - Q^2$

$MR = \frac{dTR}{dQ} = 10 - 2Q$. ($\equiv P = a - 2bQ$)

Q^* ⇒ $MR = MC$ ⇒ $10 - 2Q = 2$

$Q^* = 4$

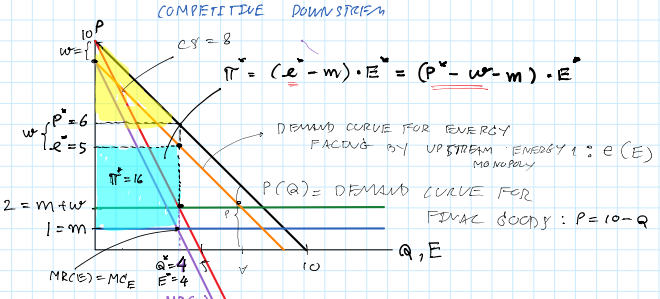
$P^* = 10 - Q^* = 10 - 4 = 6$

$\pi^* = (P^* - AC) \cdot Q^*$

$= (6 - 2) \cdot 4$

$= 16$

(b) PROFITS OF UPSTREAM MONOPOLY SUPPLYING ENERGY TO A COMPETITIVE DOWNSTREAM



TO PRODUCE A UNIT OF GOOD, A COMPETITIVE DOWNSTREAM FIRM MUST SPEND w PART + e PART. THE DOWNSTREAM GET $ p PART WHEN IT SELLS

WITH $P = MC$

$P = e + w$

$e = P - w$ → THE HIGHEST PRICE OF E AN OUTPUT FIRM IS WILLING TO PAY

NOTICE THAT IF PRICE OF ENERGY (e) RISES BY 1 PART, THEN PRICE OF FINAL GOOD WILL ALSO RISE BY 1 PART.

IMPLICATION ? NON VERTICALLY INTEGRATED ENERGY MONOPOLY TAKES FULL CONTROL OVER THE MKT PRICE OF FINAL GOOD.

SUMMARY $P = 10 - Q$, $m = 1$, $w = 1$

	ALL MARKETS ARE COMPETITIVE	FIXED PROPORTION NO VI	FIXED PROPORTION VI	VARIABLE PROPORTIONS NO VF		VARIABLE PROPORTIONS VF
• PRICE, P	2	6	6	5.63	<	6
• QUANTITY, Q	8	4	4	4.37	>	4
• CONSUMER SURPLUS	32	8	8	9.55	>	8
• PROFITS TO OWNER OF E	0	16	16	10.75	<	16
• DWL	0	8	8	6.59		8
• LOSS FROM INEFFICIENT PRODUCTION	0	0	0	5.11		0
• E	8	4	4	1.55		4
• L	8	4	4	12.30		4
• m	1	5 = e ($e \neq m$) OR $e > m$	1 ($e = m$)	7.93		1

CASE2 VARIABLE – PROPORTIONS PRODUCTION FUNCTION

NOW, IF PRICE OF L IS RELATIVELY CHEAPER COMPARED TO PRICE OF E, DOWNSTREAM COMPETITIVE FIRM CAN SUBSTITUTE AWAY FROM A RELATIVELY EXPENSIVE INPUT TO A RELATIVELY CHEAPER INPUT.

IN THIS CASE, ENERGY MONOPOLY CANNOT TAKE CONTROL

OF DOWNSTREAM FIRM FOR THE CHOICE OF USING INPUT MIX! (E, L)

THEREFORE, ENERGY MONOPOLY MAY WANT TO DO FORWARD VI IN ORDER TO HAVE ABILITY TO CONTROL THE USE OF INPUTS CHOSEN BY DOWN STREAM FIRM.

LET'S START OUR ANALYSIS ...

COST FUNCTION FOR DOWNSTREAM FIRM:

$$c(e, w, Q) = \min_{E,L} e \cdot E + w \cdot L$$

(e: PRICE OF ENERGY; w: PRICE OF LABOR)

PRODUCTION FUNCTION:

$$Q = E^{\frac{1}{2}} L^{\frac{1}{2}}$$

[COB-DOUGLAS PRODUCTION FUNCTION]

LET'S FIND DEMAND FUNCTION FOR E, CONDITIONAL ON FACTOR COSTS AND OUTPUT ...

$$C(e, w, Q) = \min_{E,L} e \cdot E + w \cdot L$$

$$= \min e \cdot E + w \cdot \frac{Q^2}{E}$$

NOTE:

$Q = E^{\frac{1}{2}} L^{\frac{1}{2}}$

$L^{\frac{1}{2}} = \frac{Q}{E^{\frac{1}{2}}}$ OR $\frac{Q}{\sqrt{E}}$

$\sqrt{L} = \frac{Q}{\sqrt{E}}$

$L = \frac{Q^2}{E}$ #

- SOLVING FOR FOC TO OBTAIN THE DEMAND FUNCTION FOR E:

$$\frac{\partial c(e, w, Q)}{\partial E} = 0 \longrightarrow E(e, w, Q) = Q\left(\frac{w}{e}\right)^{\frac{1}{2}}$$

- DEMAND FUNCTION FOR L:

$$\frac{\partial c(e, w, Q)}{\partial L} = 0 \longrightarrow L(e, w, Q) = Q\left(\frac{e}{w}\right)^{\frac{1}{2}}$$

- SO, TOTAL COST

$$c(e, w, Q) = e \cdot E(e, w, Q) + w \cdot L(e, w, Q)$$

$$= e \cdot Q\left(\frac{w}{e}\right)^{\frac{1}{2}} + w \cdot Q\left(\frac{e}{w}\right)^{\frac{1}{2}}$$

$$= 2Q(w \cdot e)^{\frac{1}{2}}$$

- IF VERTICALLY INTEGRATED:

THE DOWNSTREAM FIRM WILL MAXIMIZE PROFITS BY PRODUCING Q WHERE $MR(Q^*) = MC(Q^*)$

$$MR = MC$$

$$a - 2bQ = 2w^{\frac{1}{2}} \cdot m^{\frac{1}{2}}$$

[NOTE: INVERSE DEMAND FUNCTION $P = a - bQ$]

$$Q = \frac{(a - 2w^{\frac{1}{2}} m^{\frac{1}{2}})}{2b}$$

"OUTPUT PRODUCED BY THE INTEGRATED FIRM"

USING THE SAME PARAMETERS ($a = 10$, $b = 1$, $m = 1$, $w = 1$)

WE WILL GET $Q^* = 4$ UNITS.

NOTE THAT THE INTEGRATED FIRM W/ VARIABLE PRODUCTION FUNCTION PRODUCES THE SAME OUTPUT AS WE FOUND IN THE CASE OF FIXED PROPORTION PRODUCTION FUNCTION.

- IF NO VERTICAL INTEGRATION:

THE DEMAND FOR E FACING UPSTREAM ENERGY MONOPOLY CAN BE DERIVED BY SETTING $P = MC$:

$$P = 2w^{\frac{1}{2}} e^{\frac{1}{2}}$$

AND THEN SOLVING FOR E:

SO $E = a\left(\frac{w}{e}\right)^{\frac{1}{2}} - 2w$

UPSTREAM MONOPOLY MAXIMIZES PROFIT π: $(e-m)\cdot E$

BY DOING F.O.C., WE GET

$$aw^{\frac{1}{2}} - 2w\cdot e^{\frac{1}{2}} - \frac{1}{2}(e-m)\cdot a\cdot\left(\frac{w}{e}\right)^{\frac{1}{2}} = 0$$

USING THE SAME SET OF PARAMETERS',

- $e = 7.9265$.
- MARGINAL COST $= 2w^{\frac{1}{2}}\cdot e^{\frac{1}{2}} = 2(1)^{\frac{1}{2}}(7.9265)^{\frac{1}{2}}$
  $= 5.6308 = P$
- $Q = 10 - P = 10 - 5.6308 = 4.3692$
  ↳ OUTPUT THAT DOWNSTREAM COMPETITIVE FIRM PRODUCES.
- NOTICE THAT Q (W/O VI, W/ VARIABLE PROPORTION PRODUCTION FUNCTION) $>$ $Q = 4$ IN ALL CASES.

OBSERVATIONS

① W/ INTEGRATION, $e = m = 1 \Rightarrow E^* = L^* = Q^* = 4$

W/O INTEGRATION, IF $e \uparrow$, DOWNSTREAM WILL TRY TO DO SUBSTITUTION BY USING MORE L AND E. IF IT DOES SO, MARGINAL COST (MC) OF OUTPUT WILL NOT RISE AS MUCH AS THE INCREASE IN PRICE OF ENERGY(e)!

EX: $MC = 2(w\cdot e)^{\frac{1}{2}} = 2\cdot e^{\frac{1}{2}}$ (NOTE $w=1$)

e	$2\cdot e^{\frac{1}{2}}$	
1	2	41% INCREASE
2	$2\cdot 2^{\frac{1}{2}} = 2.82$	41% INCREASE
4	$2\cdot(4)^{\frac{1}{2}} = 4.00$	41% INCREASE
8	$2\cdot(8)^{\frac{1}{2}} = 5.64$	

MC RISES BY ONLY 41% IN RESPONSE TO 100% INCREASE TO PRICE OF ENERGY(e)

RECALL THAT E AND L ARE NO LONGER USED IN EQUAL PROPORTIONS!

② PRICE OF FINAL GOOD $= 5.63$ (W/O INTEGRATION) WHICH IS CHEAPER THAN WHEN 2 FIRMS MERGE! ($P=6$)

③ $CS_{\text{NO VI}}$ ($=9.55$) $>$ CS_{VI} ($=8$)

CS IS HIGHER BY 19.375%.

W/ VARIABLE PROPORTION PRODUCTION FUNCTION, CONSUMERS' WELFARE IS HIGHER UNDER THE CASE OF NO VI.

④ INEFFICIENT PRODUCTION OCCURS WHEN NO INTEGRATION, HOWEVER. (WHY?)

ACTUALLY THE LEAST EXPENSIVE WAY TO PRODUCE QUANTITY THAT WE FOUND ($Q = 4.37$) IS TO USE

E = 4.37 + L = 4.37

WHICH COST = 4.37 × 1 + 4.37 × 1 = 8.74

BUT, LOOK..., NOW, W/O VI, E = 1.55 + L = 12.30

WHICH COSTS

= 1.55 + 12.30 = 13.85

SO, SOCIAL LOSS FROM INEFFICIENT PRODUCTION

= 13.85 − 8.74 = 5.11

⑤ SOCIAL WELFARE IS LOWER UNDER W/O VI THAN UNDER W/ VI.

	W/O VI		W/ VI
CS	9.55		8
Π	10.75	<	16
	20.3		24

ΔSW = 20.3 − 24 = −3.7

W/O VI W/VI

REFLECTS LOSS FROM INEFFICIENT PRODUCTION WHEN WE DO NOT INTEGRATED (= −5.11)

LOSS < GAIN

THAT "OUTWEIGHS"

THE REDUCTION IN DWL DUE TO MONOPOLY PRICING (+1.44)

COME FROM = 8 − 6.59

DWL_{VI} $DWL_{NO\ VI}$

TO SUMMARISE, UNDER VARIABLE PROPORTION PRODUCTION FUNCTION, FIRMS HAVE INCENTIVE TO "MERGE" AS Π_{VI} (16) > $\Pi_{NO\ VI}$ (10.75).

FIRMS THEN WILL MERGE IF $BENEFIT_{VI}$ > COST OF INTEGRATION.

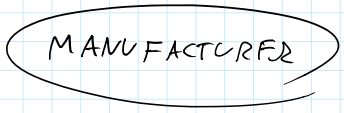
SOCIAL WELFARE W/ VI IS HIGHER.

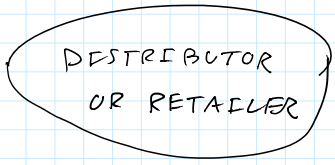
Friday, April 28, 2017 4:05 PM

VERTICAL RESTRICTIONS

"I DON'T TRUST HIM. WE'RE FRIENDS."

— BERTOLT BRECHT





VR : CONTRACTUAL RESTRICTIONS IMPOSED ON DISTRIBUTOR(S) BY A MANUFACTURER.

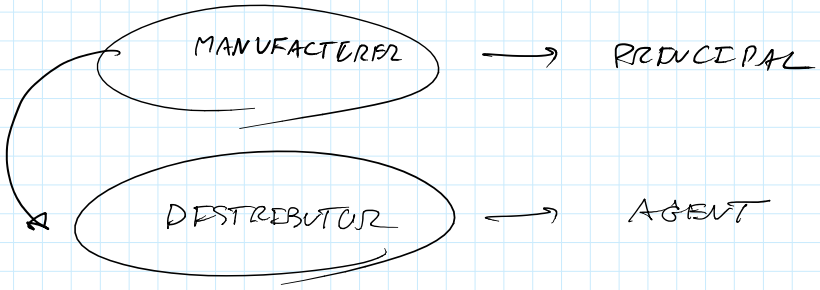
EX:
- RESTRICTION OF MINIMUM SALES
- RESTRICTION ON PRICE CHARGED TO BUYERS
- RESTRICTION ABOUT LOCATIONS (EX: THEY MUST NOT LOCATE CLOSE TO EACH OTHER)
- DO NOT SELL ANY COMPETING PRODUCTS

RATIONALE

(1) TWO FIRMS LOCATE AT DIFFERENT COUNTRIES

(2) MANUFACTURER MAY GAIN/BENEFIT FROM EXPERTISES OF DISTRIBUTOR(S)
- LOCATION
- TASTES OF CONSUMERS
- ETC.

PRINCIPAL – AGENT PROBLEM



PRINCIPAL WANTS AGENT TO ACT IN ACCORDANCE W/ PRINCIPAL'S BEST INTEREST.

FREE-RIDER PROBLEM ARISES.

EX: DISTRIBUTORS MAY ADVERTISE LESS THAT IT REQUIRED IN THE CONTRACT.

VR USED TO SOLVE PROBLEM IN DISTRIBUTION

FOUR PROBLEMS ARISE WHEN DISTRIBUTION IS COSTLY.

① DOUBLE MONOPOLY MARKUP

DOUBLE MONOPOLY OR SUCCESSIVE MONOPOLIES:
- MANUFACTURER → MONOPOLY (CHARGE PRICE TO DISTRIBUTOR HIGHER THAN MC)
- DISTRIBUTOR → MONOPOLY (CHARGE PRICE TO CONSUMERS HIGHER THAN THE WHOLESALE PRICE)

Ton Wrasai at 28-Apr-17 4:31 PM

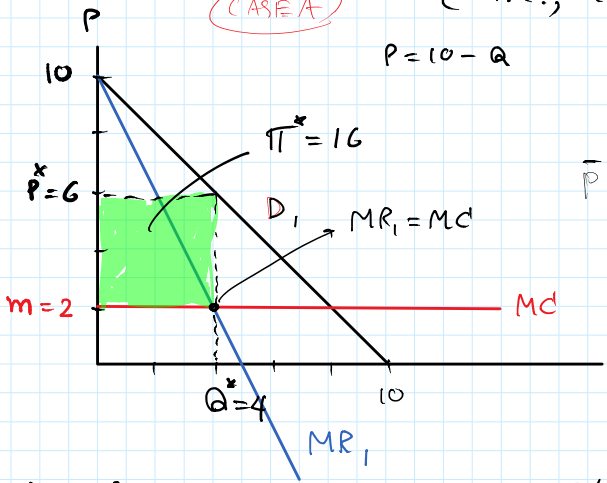
RESULTS: (1) VERY EXPENSIVE TO FINAL USERS

(2) DOUBLE MONOPOLY MARKUP LOWERS THE JOINT PROFITS OF MANUFACTURER & DISTRIBUTOR

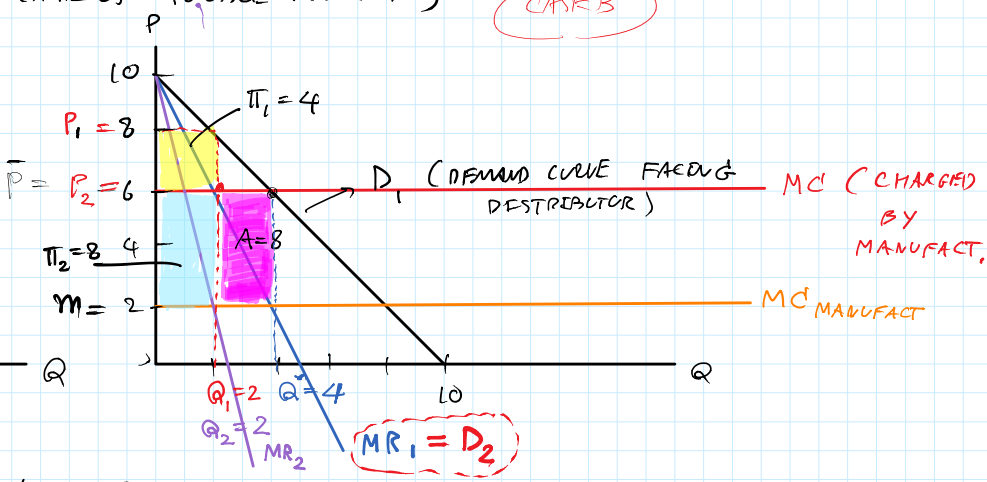
↳ LEADS TO "INCENTIVE" FOR BOTH TO DO EITHER VI OR VR.

LET'S COMPARE PROFITS OF INTEGRATED MANU-DISTRIBUTOR (CASE B) W/ PROFITS OF SUCCESSIVE MONOPOLIES' (CASE A) ...
(i.e., CASE OF DOUBLE MARKUP)

CASE A



CASE B



NOTE: ASSUME THAT THE COSTS OF DISTRIBUTION ARE ZERO, FOR SIMPLICITY.

P_2 = WHOLESALE PRICE MANUFACTURER CHARGES TO DISTRIBUTOR.
(IT BECOMES DISTRIBUTOR'S MARGINAL COST)

Q_1 = PROFIT MAXIMIZING OUTPUT LEVEL OF DISTRIBUTOR (WHERE $MR_1(Q_1) = MC = P_2$)

$MR_1 = D_2$ (DEMAND CURVE FACING MANUFACTURER)

Q_2 = PROFIT-MAXIMIZING OUTPUT LEVEL THAT MANUFACTURER PRODUCES AND SELLS TO DISTRIBUTOR (YOGURT)

- MANUFACTURER PRODUCES $Q_2 = 2$ AND CHARGES $P_2 = 6$ TO DISTRIBUTOR (i.e. SUPERMARKET) → FIRST MARKUP.

$\pi_2 = (P_2 - m) \cdot Q_2 = (6 - 2) \cdot 2 = 8$ BAHT / TIME PERIOD

- DISTRIBUTOR SELLS $Q_2 = 2$ AND CHARGES $P_1 = 8$ TO THE BUYERS → SECOND MARKUP

$\pi_1 = (P_1 - P_2) \cdot Q_1 = (8 - 6) \cdot 2 = 4$ BAHT / TIME PERIOD

- JOINT PROFITS = π_1 (SUPERMARKET) + π_2 (YOGURT FIRM) = 4 + 8 = 12 BAHT / TIME PERIOD

WHICH IS LOWER THAN π OF THE INTEGRATED YOGURT-SUPERMARKET.

THE LOSS OF π = − 4 BAHT / TIME PERIOD

NOTE $\pi_{\text{UNDER DOUBLE MARKUP}}$ IS 25% LOWER THAN $\pi_{\text{UNDER VI}}$

- CONSUMERS PAY 20% HIGHER UNDER TWO SUCCESSIVE MONOPOLIES

$P^{VI} = 6$ (VI CASE) < $P_1 = 8$ (DOUBLE MARKUP CASE)

- SUMMARY, UNDER TWO SUCCESSIVE MONOPOLIES, BOTH CONSUMERS AND PRODUCERS ARE WORSE OFF

↓

INCENTIVE TO DO VI OR VR

* YOGURT FIRM DOES NOT WANT SUPERMARKET TO DO MARKUP AS IT GAINS NOTHING FROM THIS ACTION.

IF SUPERMARKET CHARGES 6 BAHT (THE WHOLESALE PRICE) TO BUYERS, OUTPUT WOULD INCREASE TO $Q = 4$ AND $\pi_{\text{YOGURT FIRM}}$ WOULD BE HIGHER!

IN OTHER WORDS, YOGURT FIRM WOULD LOVE TO SEE COMPETITION AT DISTRIBUTION LEVEL

(CHARGE BUYERS AT WHOLESALE PRICE)

- IF THE CONTRACT SETS PRICE THAT SUPERMARKET MUST SELL TO BUYER ($\bar{P}$) = 6, SUPERMARKET WILL BEHAVE LIKE A COMPETITIVE SUPERMARKET, SELL $Q^* = 4$.
  THEN OUTCOME WILL BE THE SAME AS VI CASE!

- OTHER METHODS → QUANTITY FORCING: DISTRIBUTOR MUST SELL A MINIMUM AMOUNT OF OUTPUTS
  GIVEN THIS, TO MEET A TARGET, DISTRIBUTOR MAY HAVE TO LOWER THE PRICES

→ TWO-PART TARIFF CAN BE APPLIED

- FRANCHISE FEE → MANUFACTURER EARNS IT FROM THIS PART
- P = MC (IN THIS EXAMPLE, CHARGE $P_2 = m$!) = 2 PART → MANUFACTURER EARNS ZERO PROFITS

(THEN WE GOT THE SAME RESULT AS VI CASE!)