# Double Marginalization...

Manufacturer (M) produces garment at cost c = $40
The selling price is r = $100, the salvage value s = $30.
Demand is normally distributed with mean $\mu$=100 and Standard Deviation $\sigma$ = 30.

**System 1:** M sells directly to customer.
Standard Newsboy Problem:

$$P(d \le q) = \frac{r-s}{r-c} = 0.86 \quad \Rightarrow \quad z = 1.068$$

$\Rightarrow$ Lot Size q = 100 + 1.068 * 30 = 132
$\Rightarrow$ Expected Profit $ 5,560 (Simulation Result)

# ...Double Marginalization...

**System 2:** M sells to Retailer at Price w = $ 70.
Now **Retailer** solves Standard Newsboy Problem:

$$P(d \le q) = \frac{r - s}{r - w} = 0.43 \quad \Rightarrow \quad z = -0.18$$

$\Rightarrow$ Lot Size *q = 100 + -0.18 * 30 = 95*

$\Rightarrow$ Expected Profit

| | |
|---|---|
| Retailer | $ 2,165 |
| Manufacturer | $ 2,838 |
| System | $ 5,003 |

Before: System $ 5,560 !!!

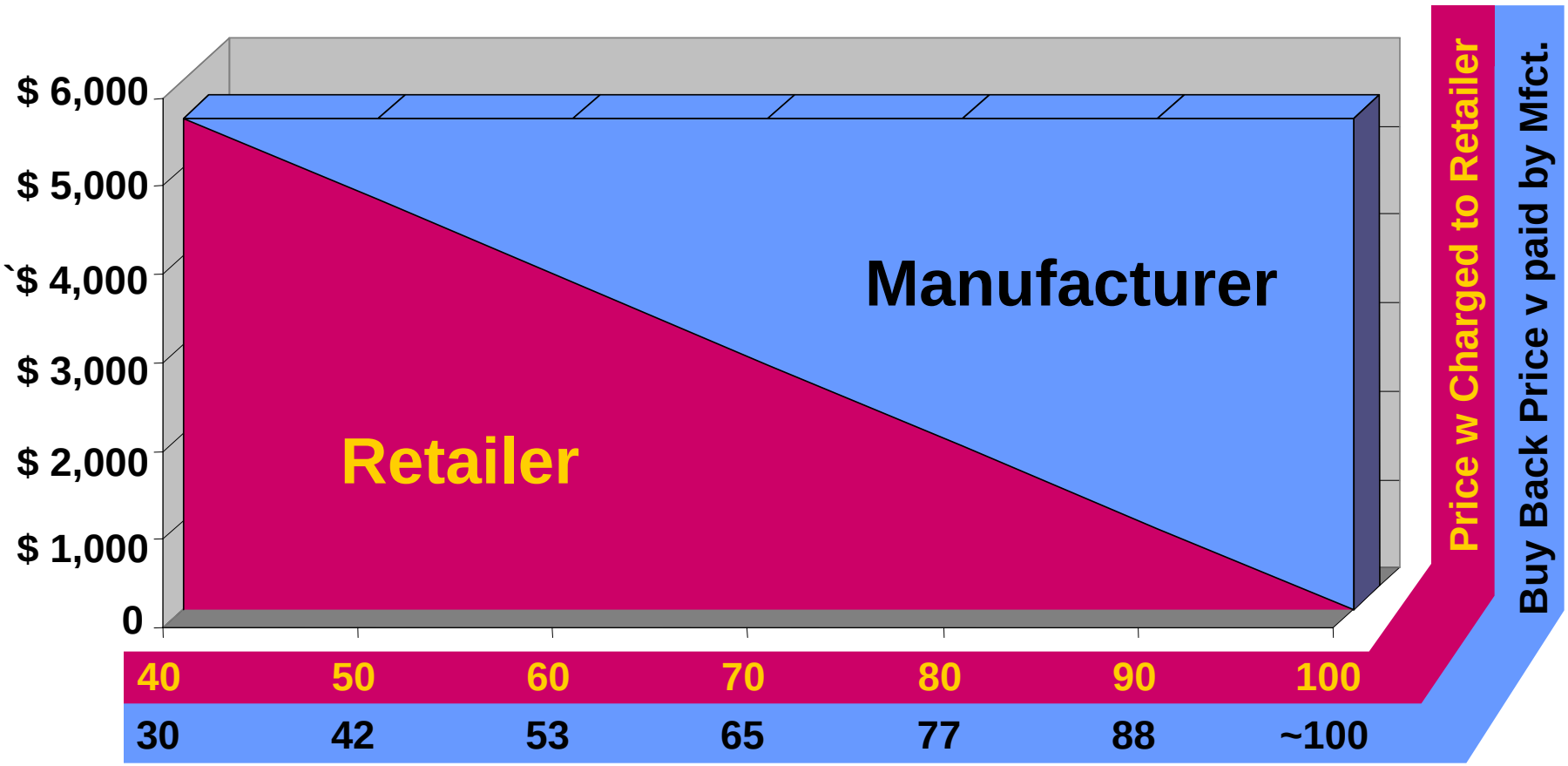
# ...Double Marginalization...

**System 3:** M sells to Retailer at Price w, and offers to buy back excess at Buy Back Price v.
Now Retailer solves Standard Newsboy Problem:

$$P(d \le q) = \frac{r - v}{r - w}$$

As long as $\frac{r-v}{r-w} = \frac{r-s}{r-c}$ total **system** will remain at maximum of $ 5,560. Choose w & v combination that is "mutually palatable"!

# Profit Split: Manufacturer - Retailer



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