Principles of Economics

# Distorting and Undistorting Competitive Markets

# The Planner's Perspective

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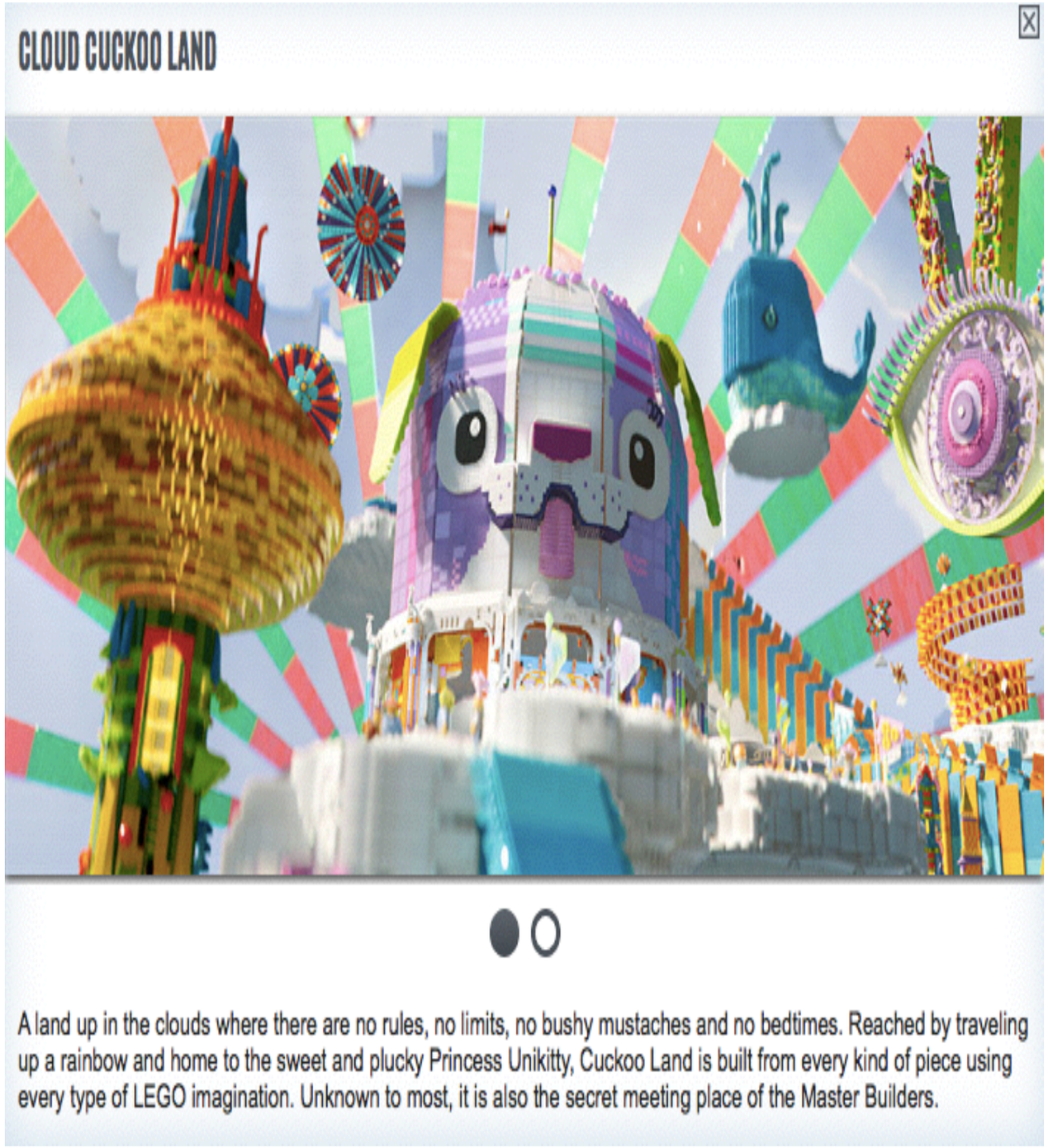
# Cloud-Cuckoo Land Is Saved!

- **Yes!:**
  - **E. Impose a tax to force bric producers (and master builders!) to take account of the damage they inflict on Cloud-Cuckoo Land, and then use the revenue for pollution remediation (or some other benefit to CCL**
- A.C. Pigou, *The Economics of Welfare*



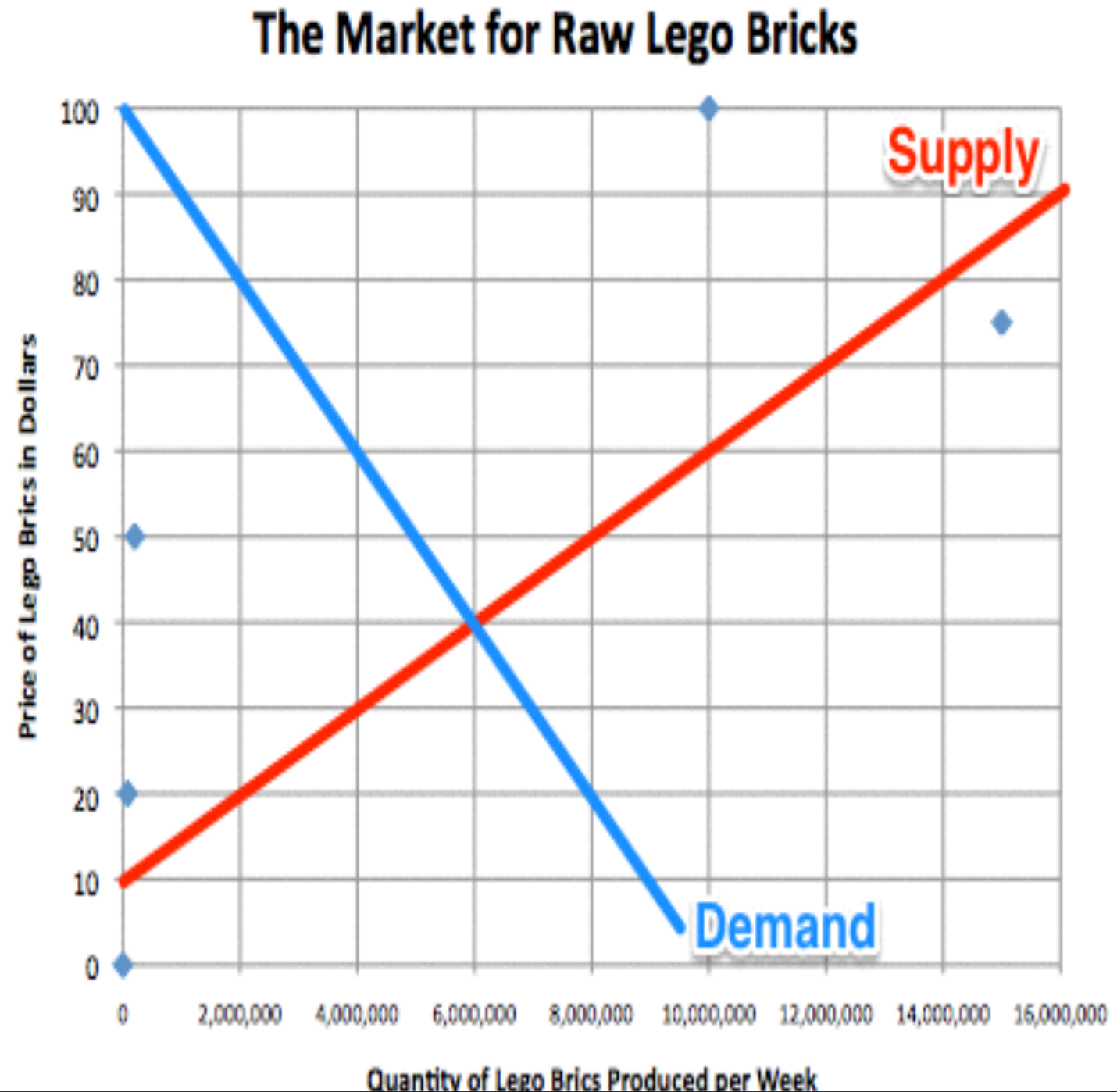
# What Should the Tax Be?

- How would you go about calculating what the proper value of the Pigouvian tax for the right to pollute would be?

- A thought experiment:
    - Suppose we had a competitive market for the right to pollute (or for the right to be free from pollution)…
    - What would the market equilibrium price be for the right to pollute?

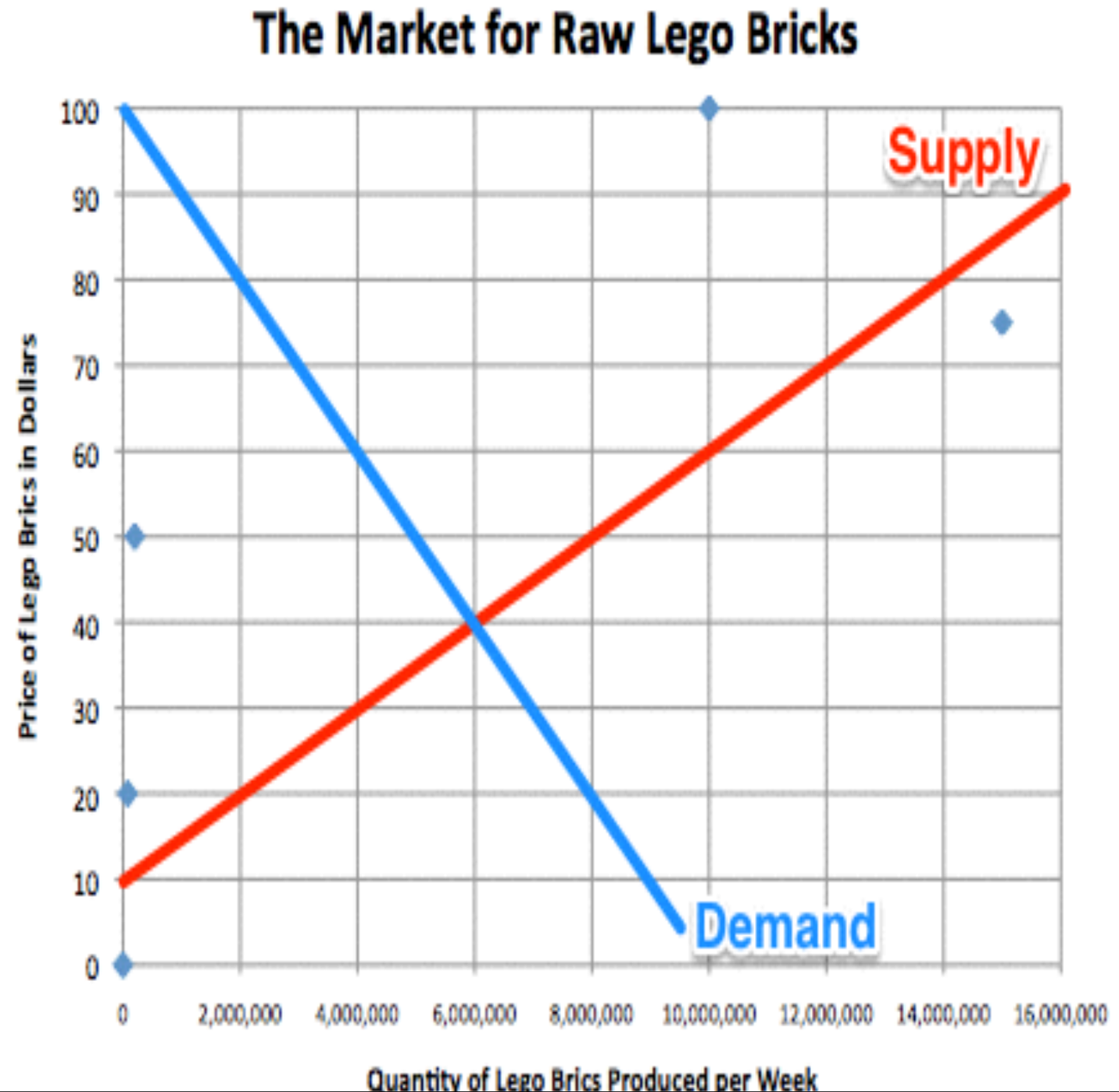
# Our Market for Brics

- Supply: $P_s=10+0.000005Q$
- Demand: $P_d=100-0.00001Q$
- Externality: ????



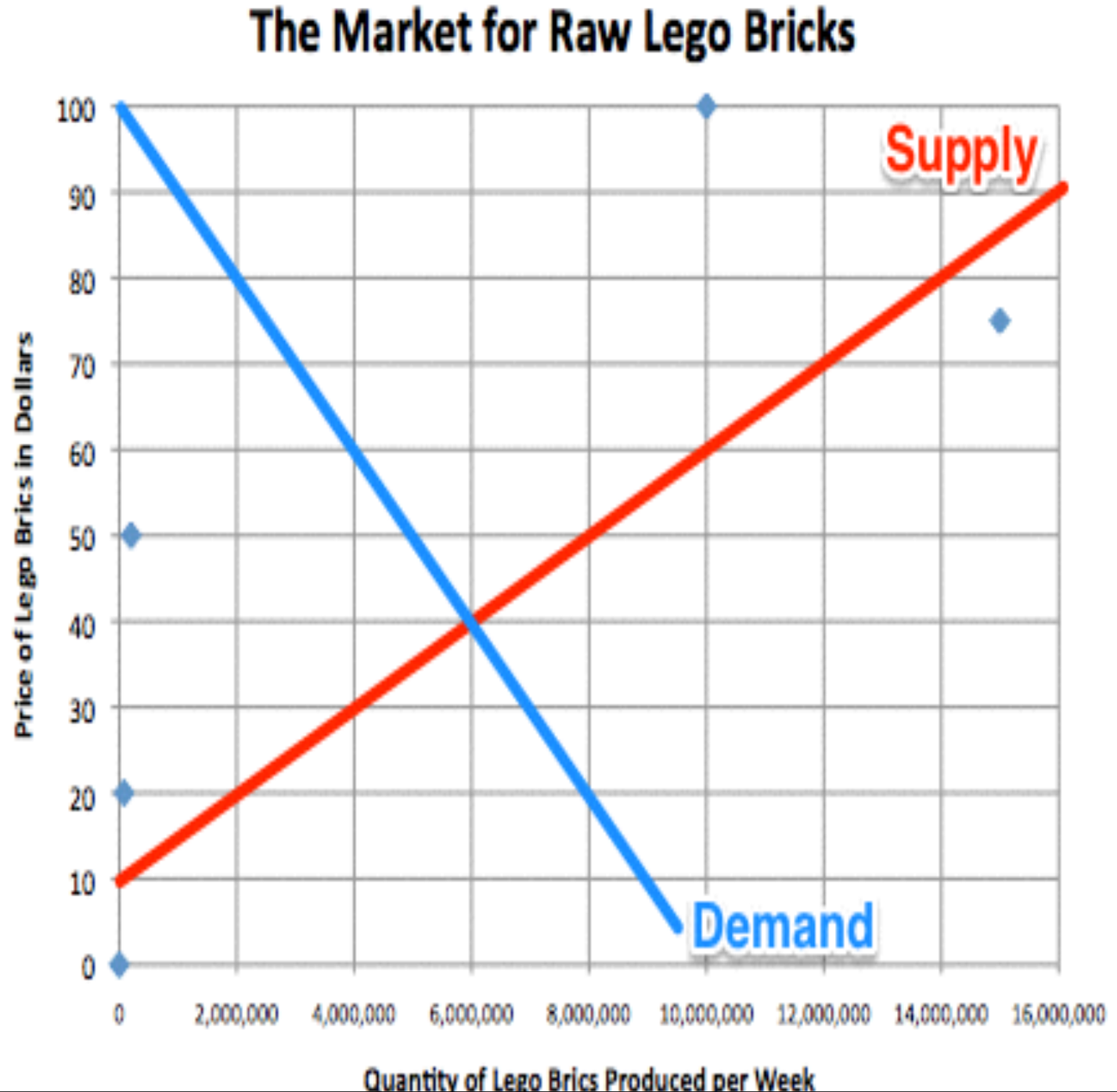
# Our Market for Brics II

- Supply:
  - $P_s$=10+0.000005Q
- Demand:
  - $P_d$=100-0.00001Q
- Externality:
  - Q=0 XC=0
  - XC = -30Q



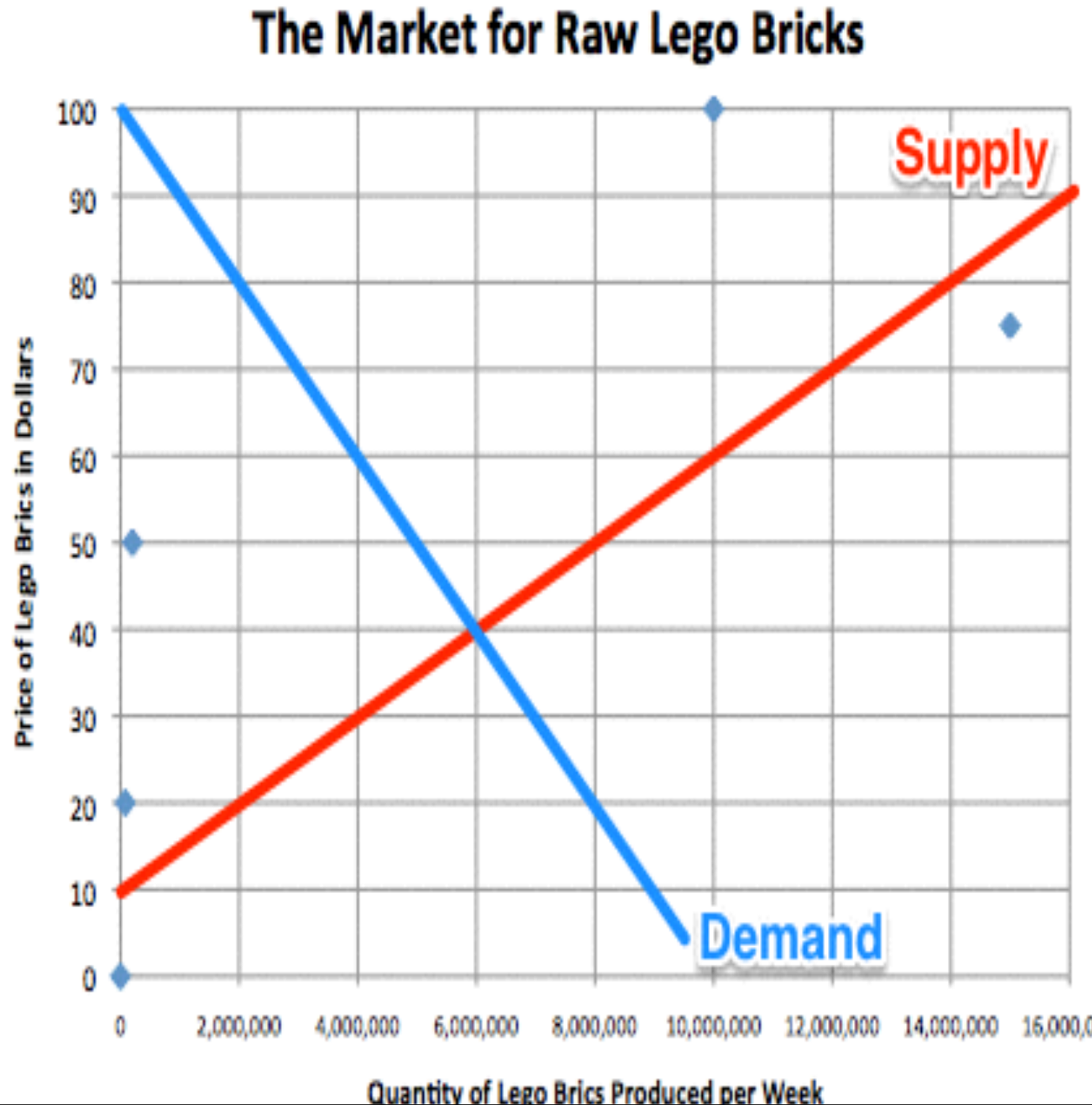
# Our ~~Market~~ Omniscient, Benevolent Central Planner for Brics

- Demand:
  - $P_d$=100-0.00001Q
- Total Value:
  - TV = Q x (100- $P_d$)



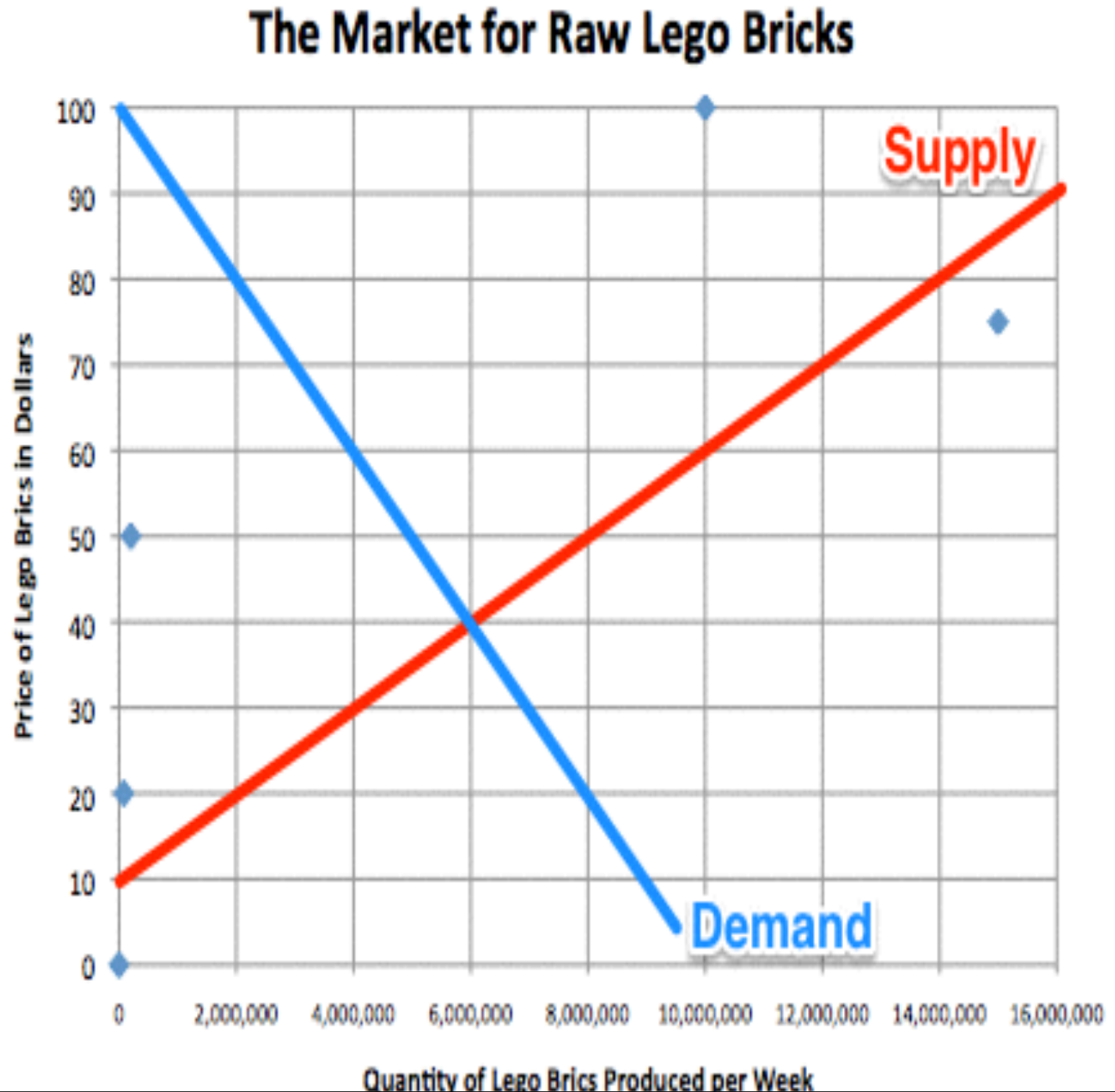
# Our ~~Market~~ Omniscient, Benevolent Central Planner for Brics II

- Demand:
  - $P_d$=100-0.00001Q
- Total Value:
  - TV = Q x (100 - $P_d$)
- Supply:
  - $P_s$=10+0.000005Q
- Total Cost:
  - TC= Q x (10 + $P_s$)



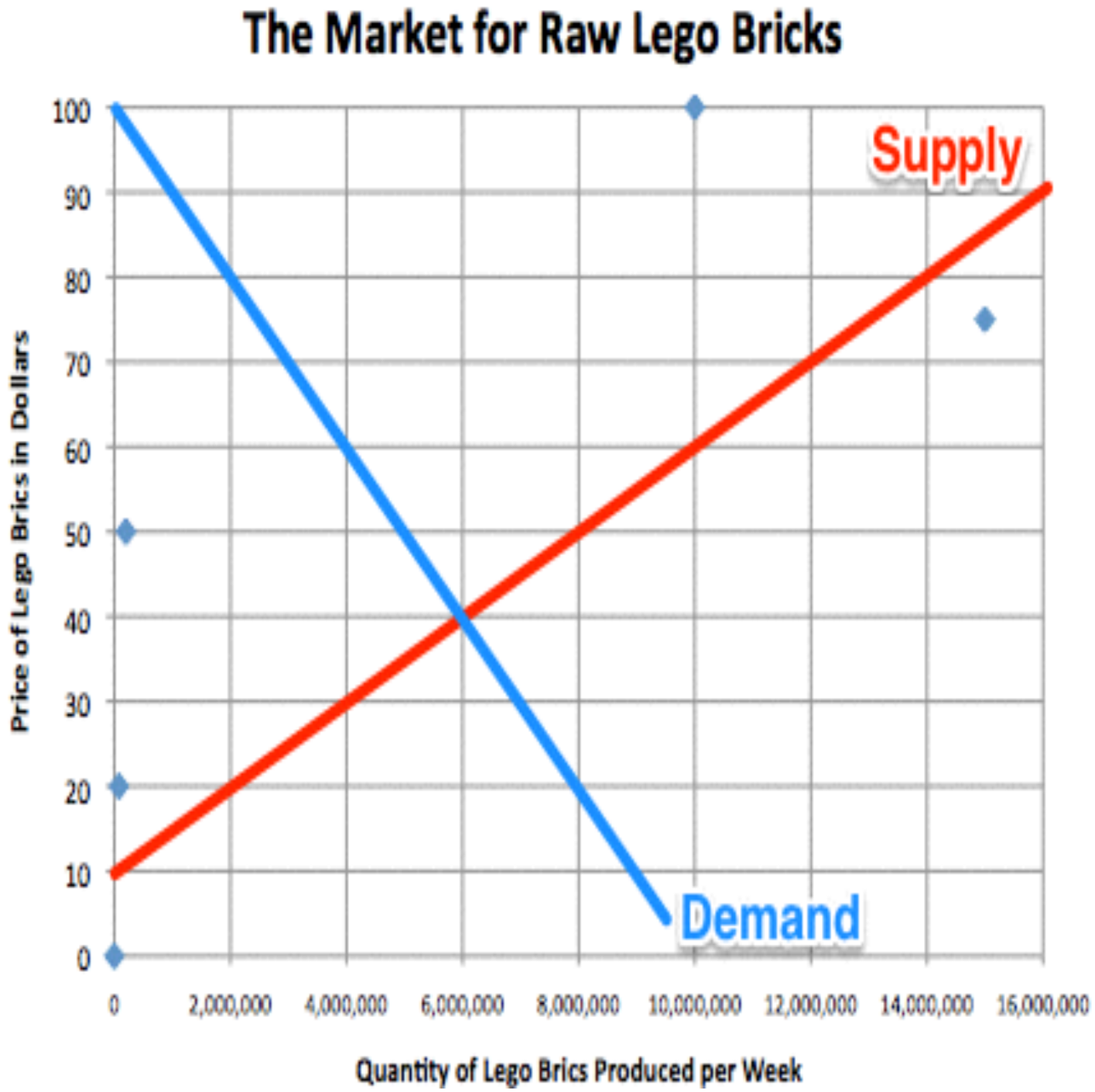
# Our ~~Market~~ Omniscient, Benevolent Central Planner for Brics III

- Demand:
  - $P_d$=100-0.00001Q
- Total Value:
  - TV = Q x (100+$P_d$)/2
- Supply:
  - $P_s$=10+0.000005Q
- Total Cost:
  - TC= Q x (10+$P_s$)/2
- Total Surplus:
  - TS = TV - TC



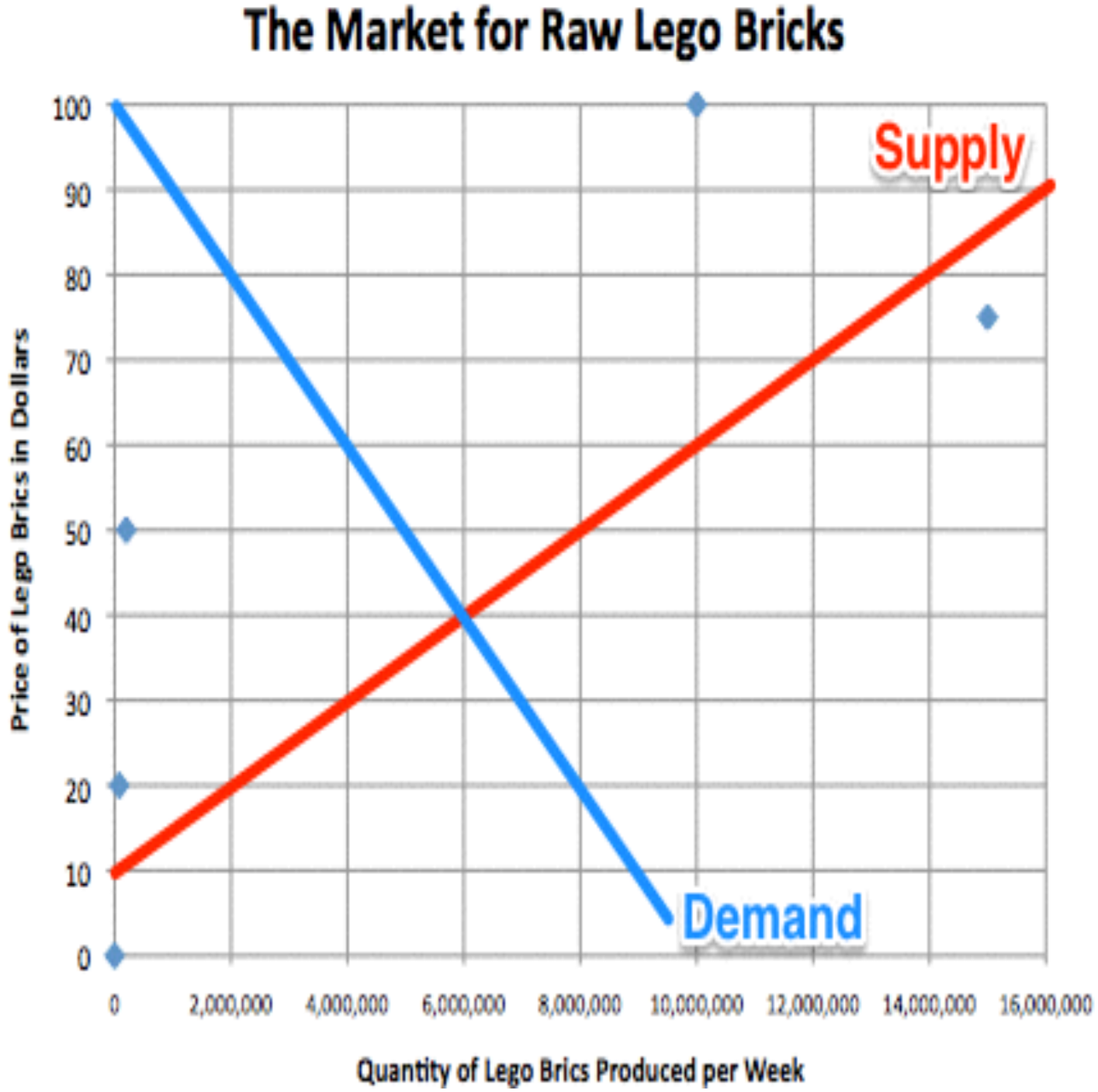
# Our ~~Market~~ Omniscient, Benevolent Central Planner for Brics IV

- Demand:
  - $P_d$=100-0.00001Q
- Total Value:
  - TV = Q x (100+$P_d$)/2
- Supply:
  - $P_s$=10+0.000005Q
- Total Cost:
  - TC= Q x (10+$P_s$)/2
- Total Surplus:
  - TS = TV - TC
  - TS= Q(45+($P_d$-$P_s$)/2)



# Our ~~Market~~ Omniscient, Benevolent Central Planner for Brics V

- Total Surplus:
  - TS = $Q(45+(P_d-P_s)/2$
  - TS = Q x (45 + (100-0.00001Q - (10+0.000005Q))/2)
    - TS = Q x (90 - 0.0000075Q)
    - TS = $90Q - 0.0000075Q^2$
- We want to maximize th



# Ladies, Gentlemen, and Benevolent, Omniscient Central Planners, to Your i>Clickers!

- How do you pick a Q to maximize: $TS = 90Q - 0.0000075Q^2$ ?
  - A. Take an integral!
  - B. Take a derivative!
  - C. Pick two values close together, see which one is higher, and then head off in that direction with another value of Q and repeat the process
  - D. Set up an Excel/Numbers spreadsheet with all possible quantity values
  - E. Do something else

# Ladies, Gentlemen, and Benevolent, Omniscient Central Planners, to Your i>Clickers!: Answer

- How do you pick a Q to maximize: $TS = 90Q - 0.0000075Q^2$ ?
  - ~~A. Take an integral!~~
  - B. Take a derivative!
  - C. Pick two values close together, see which one is higher, and then head off in that direction with another value of Q and repeat the process
  - D. Set up an Excel/Numbers spreadsheet with all possible quantity values
  - E. Do something else
- **I'm not sure what (E) entails, but (B), (C), and (D) will all work…**
- **But the most insight can be gained via (B)…**

# Our ~~Market~~ Omniscient, Benevolent Central Planner for Brics VI

- Total Surplus:
  - $TS = 90Q - 0.0000075Q^2$
- Derivative:
  - $d/dQ(TS) = d/dQ(90Q) + d/dQ(- 0.0000075Q^2)$
  - $d/dQ(TS) = 90 - 0.000015Q$
  - $d/dQ(TS) = 0 \rightarrow Q = 90/0.000015$

# Our ~~Market~~ Omniscient, Benevolent Central Planner for Brics VII

- Total Surplus is maximized when:
  - d/dQ(TS) = 0 —> Q = 90/0.000015
- If I had not substituted in the numbers for the demand and supply curves—if I had kept them as:
  - Demand: $P_d = 100 - 0.00001Q$; $P_d = P_{d0} - b \times Q$
  - Supply: $Ps = 10 + 0.000005Q$; $P_s = P_{s0} + a \times Q$
- What would my equation Q = 90/0.000015 look like?

# Our ~~Market~~ Omniscient, Benevolent Central Planner for Brics VIII

- Total Surplus is maximized when:
  - d/dQ(TS) = 0 —> Q = 90/0.000015
- If I had not substituted in the numbers for the demand and supply curves—if I had kept them as:
  - Demand: $P_d = 100 - 0.00001Q$; $P_d = P_{d0} - b \times Q$
  - Supply: $Ps = 10 + 0.000005Q$; $P_s = P_{s0} + a \times Q$
- What would my equation Q = 90/0.000015 look like?
- It would be: **$Q = (P_{d0} - P_{s0})/(a + b)$**
  - Where have we seen that equation before?

# Our Market Is a Omniscient, Benevolent Central Planner for Brics

- Total Surplus is maximized when:
  - d/dQ(TS) = 0
  - Q = 90/0.000015
  - Q = $(P_{d0} - P_{s0})/(a + b)$
  - Q = 6,000,000
- **The competitive market in equilibrium carries out exactly the calculation that a benevolent, omniscient central planner would carry out**
  - **And the CMiE does not then have to boss people around to get them to carry out its plan**

# Back to Our Pollution Problem

- Now we have three things happening in this marketplace:
  - Value to consumers:
    - $TV = Q \times (P_{d0} + P_d)/2$
- Cost to producers:
  - $TC = Q \times (P_{s0} + P_s)/2$
- Externality cost to Cloud-Cuckoo Landers:
  - $XC = -(P_x)Q$
  - $P_x = 30$