Basic Theory of Congestion Pricing

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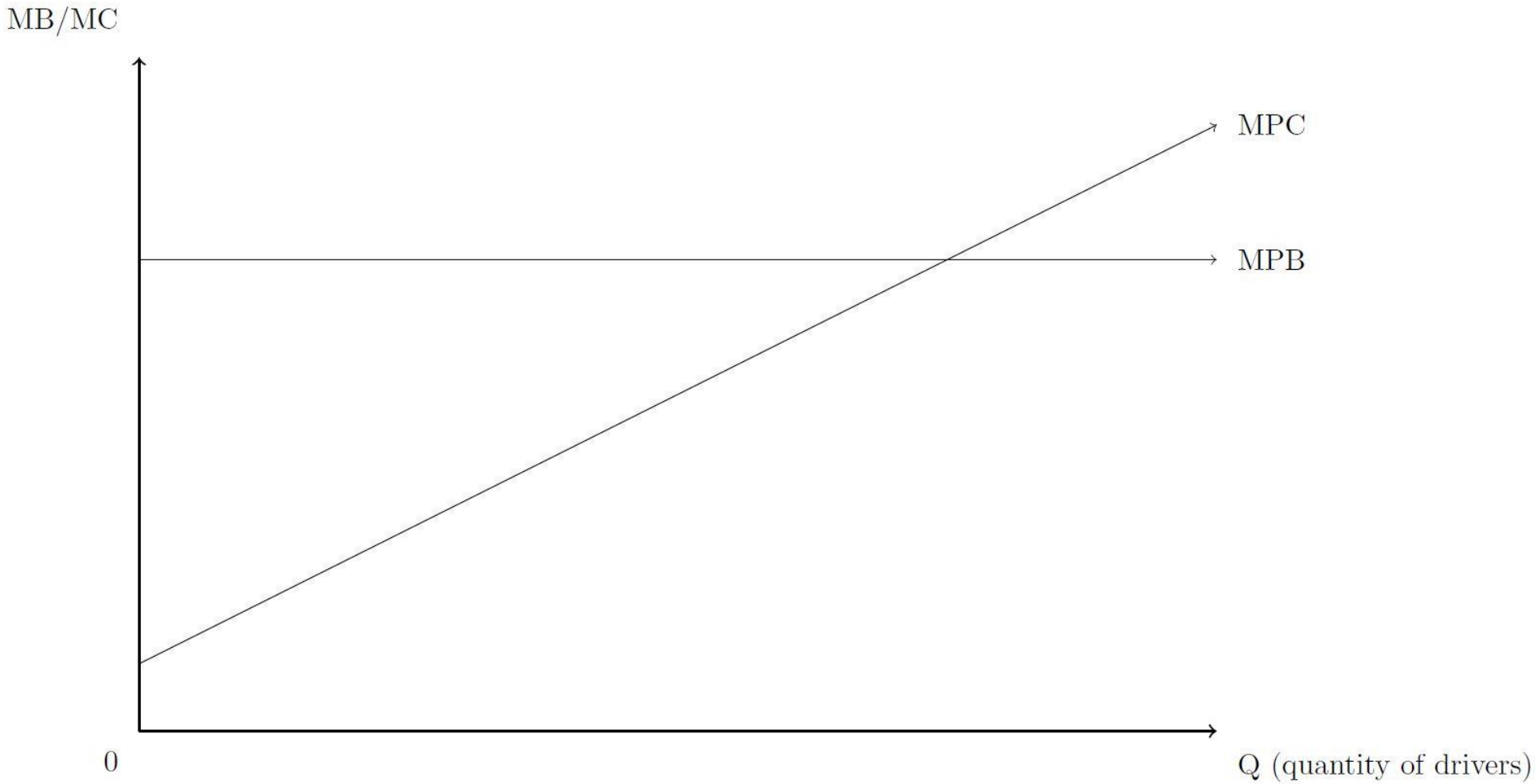
Pigouvian Taxation

- The absence of a negative externality is a good.
  - Ex: Less congestion is a good.
- There is essentially no market for this good, therefore it is not priced.
- People “consume” this good with their behavior.
  - Ex: Commuting consumes the lower congestion.
- There is overconsumption since the good is not priced.
  - Ex: Commuters do not feel the cost imposed on others from more congestion.
- Pigouvian Taxes price the good so that it will no longer be overconsumed.
  - Ex: Congestion pricing prices congestion so there will be less commuting.

Simple Theory of Congestion Pricing

- Commuters each have a marginal benefit and marginal cost of commuting.
  - Marginal benefit: depends on tastes, value of time, reasons for commuting, etc.
  - Marginal cost: depends on number of other drivers.
- Each commuter decides to commute or not based on their marginal private benefit (MPB) and marginal private cost (MPC).

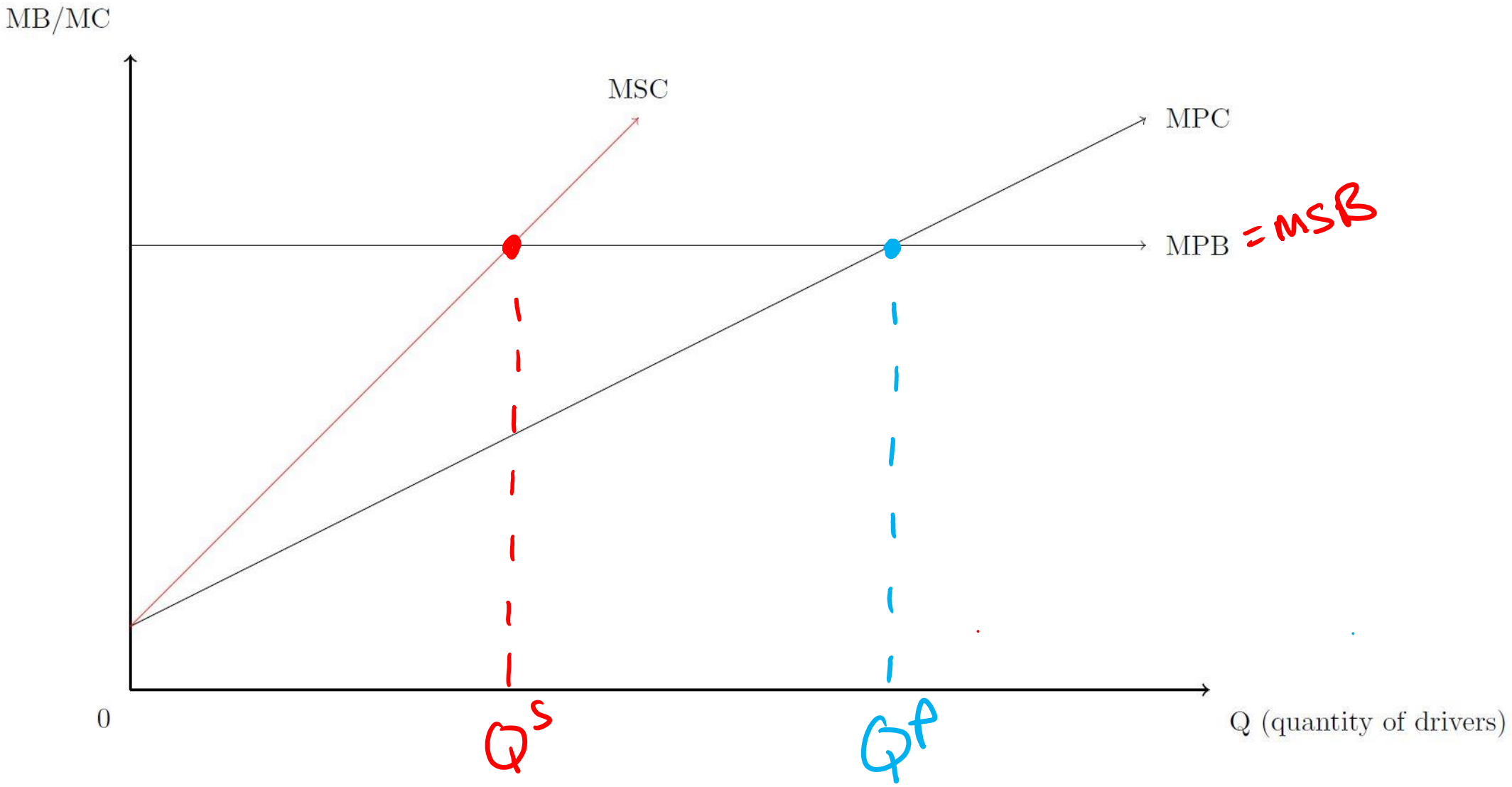
Private Decisions



Congestion Externality

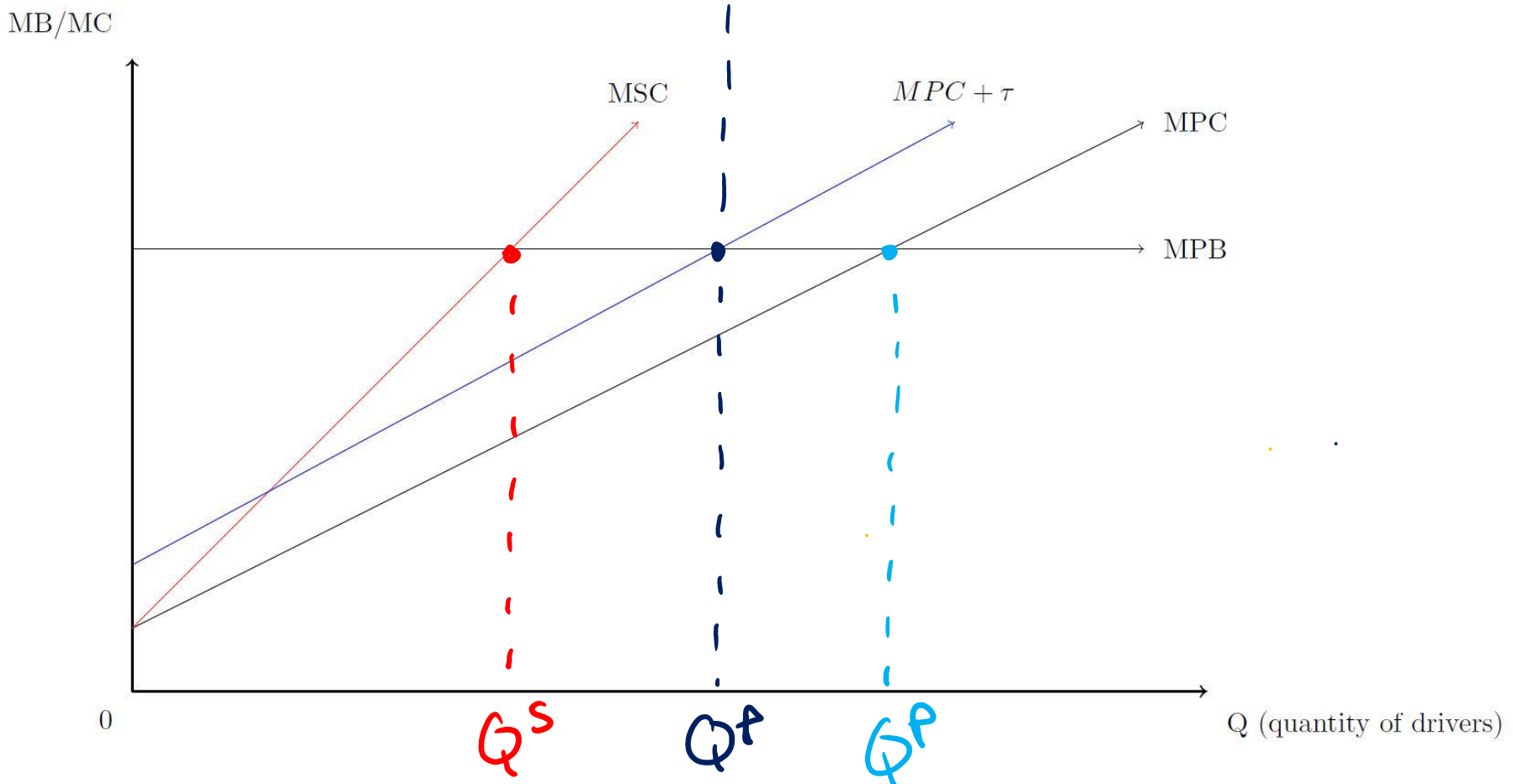
- Congestion means the marginal social cost (MSC) is higher than the marginal private cost (MPC).
  - MSC > MPC
  - When I commute, I incur a cost myself and impose a cost on you as well.
- The MSC increases more quickly than MPC since more commuters means more congestion.***

Social Optimum vs. Private Outcome



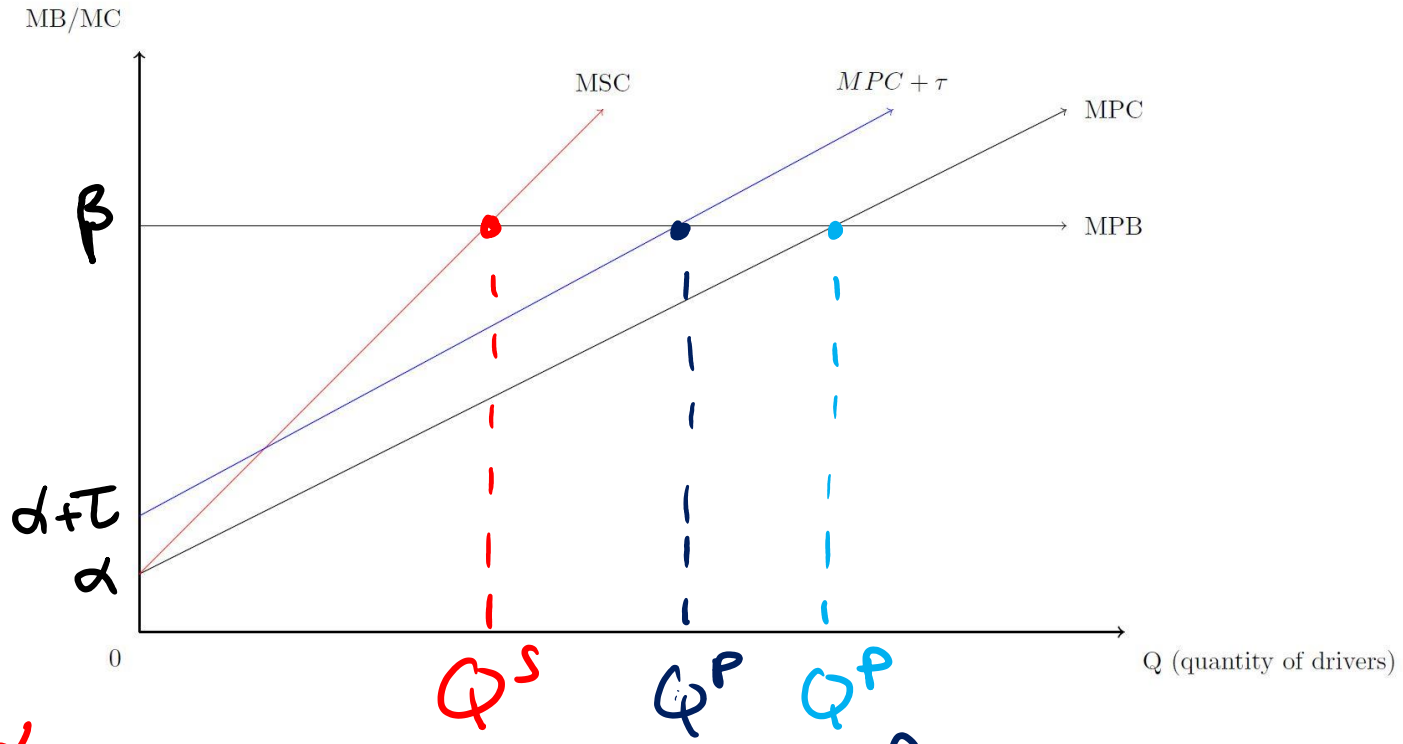
Congestion Price

- Introduce a congestion price $\tau > 0$ as an increase to the MPC:



Optimal Congestion Price

- Let:
  - $MPB = \beta$
  - $MPC = \alpha + Q$ where $\alpha < \beta$
  - $MSC = \alpha + 2Q$
  - $MPC + \tau = \alpha + Q + \tau$

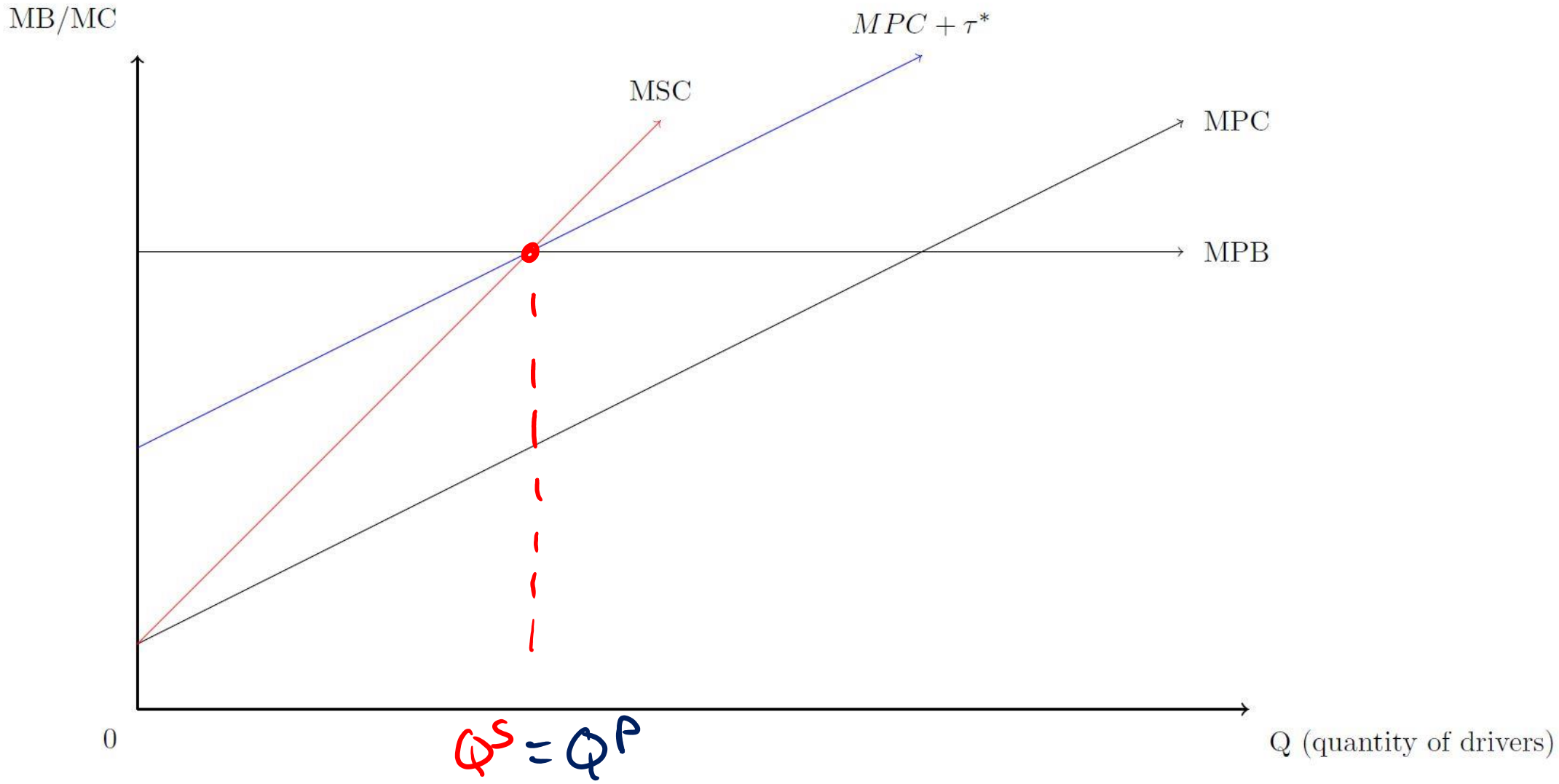


- Q^P: $\beta = \alpha + Q : Q^P = \beta - \alpha$
- Q^S: $\beta = \alpha + 2Q : Q^S = \frac{\beta - \alpha}{2}$

$\beta = \alpha + Q + \tau : Q^P = \beta - \alpha - \tau$

$Q^P = \beta - \alpha - \tau = \frac{\beta - \alpha}{2} = Q^S : \tau^* = \frac{\beta - \alpha}{2}$

Optimal Congestion Price



Implicit Assumptions

- No one faces a binding budget constraint.
  - Assumes all commuters can afford the congestion price.
  - NYC proposal is $15, which is $3750 a year.
  - This may be an even bigger issue with heterogenous benefits of commuting.

- The only externality is congestion.
  - Effect on (air) pollution is ignored.
  - Effect on (noise) pollution is ignored.

- Government Revenue is productive.
  - Not true if it is likely to be wasted/stolen (PPP during Covid).
  - May also underestimate the benefit if government revenue generates high returns (free school lunch programs).

- Implementation is costless.
  - A more complex congestion price may be more efficient (ignoring implementation costs).

Indirect Effects of the Congestion Price

- Reduce labor supply to congestion zone.
- Reduced demand for goods within the congestion zone.
- Increased demand for housing within the congestion zone.
- Increased congestion on public transportation.
- Government revenue.
- Distributional effects.

Distributional Effects

- Some commuters may experience large benefits from commuting but are not able to pay the congestion price.
  - More (less) likely with a large (small) congestion price.
- Housing already tends to be expensive in congestion zones.
  - Congestion pricing may increase housing prices even more.
- Gentrification, school inequality, effects on crime, effects on policing, etc.