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HARVARD Kennedy School ASH CENTER for Democratic Governance and Innovation

FULBRIGHT Economics Teaching Program

LMPPI Lower Mekong Public Policy Initiative

Technical Training in Project Appraisal for the Lower Mekong Basin

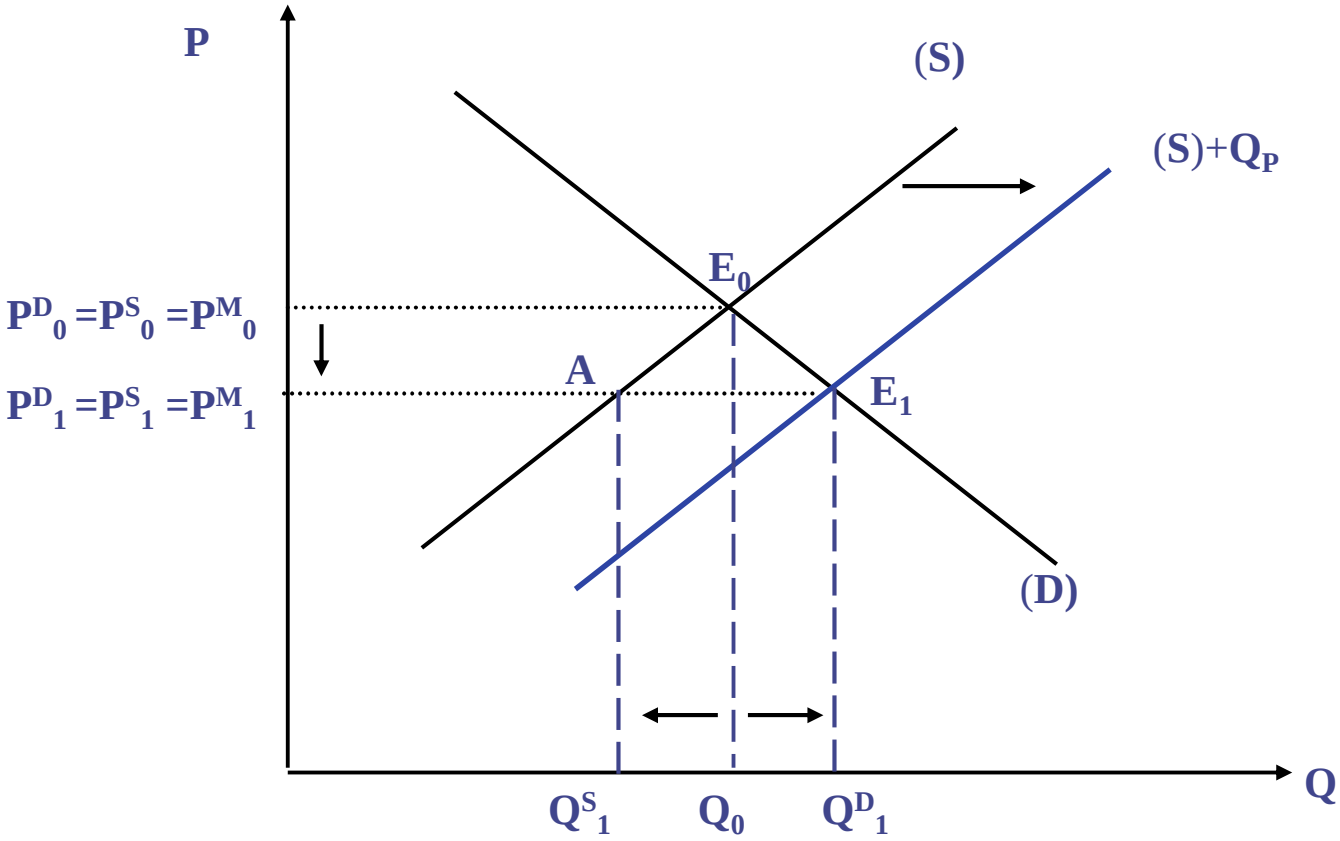
VALUATION OF PROJECT ECONOMIC BENEFITS
Technical Appendix

Ho Chi Minh City

Nov 28 - Dec 09, 2016

Project Impact on the Output Market

Nontradable

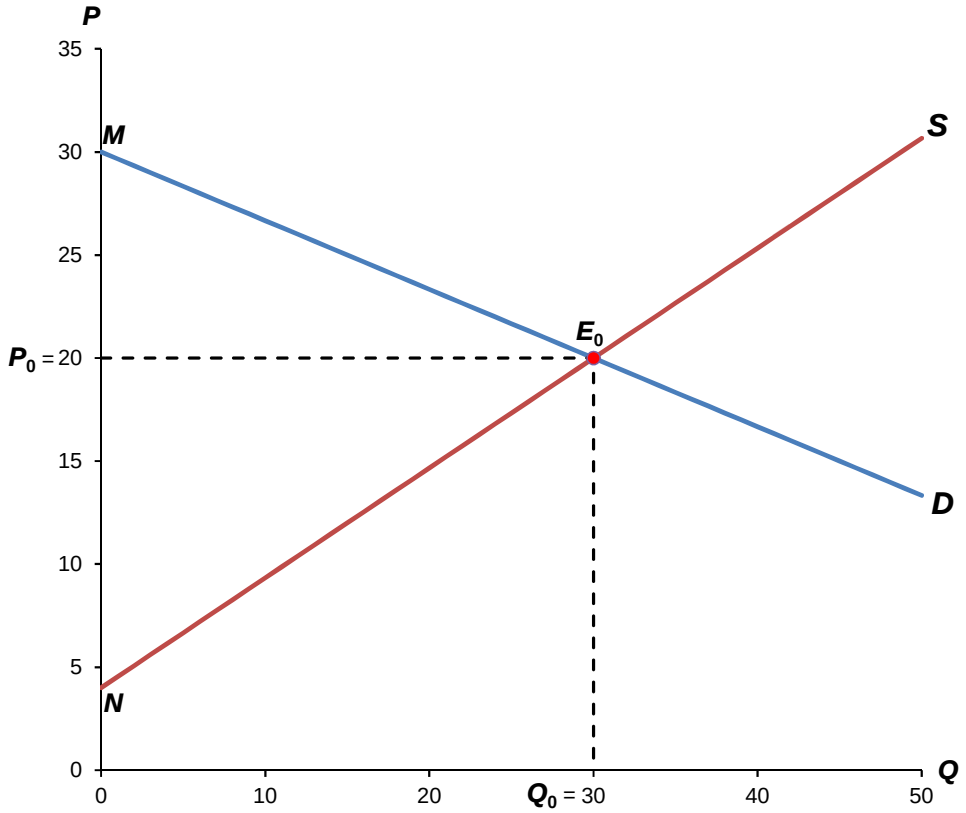


Example: Hotel Project (Manual, Ch. 8)

- The market of hotel rooms in a coastal resort
  - ✓ Non-traded services
  - ✓ Suppliers are private hotels
  - ✓ Consumers are tourists
  - ✓ Undistorted market (not taxes and subsidies)
- Supply and demand
  - ✓ The room rates that the tourists are willing to pay are measured by the demand curve, *D*.
  - ✓ The marginal cost to provide an additional room is represented by the supply curve, S.
  - ✓ The quantities demanded and supplied are measured by room-night/year.

Market without the Project

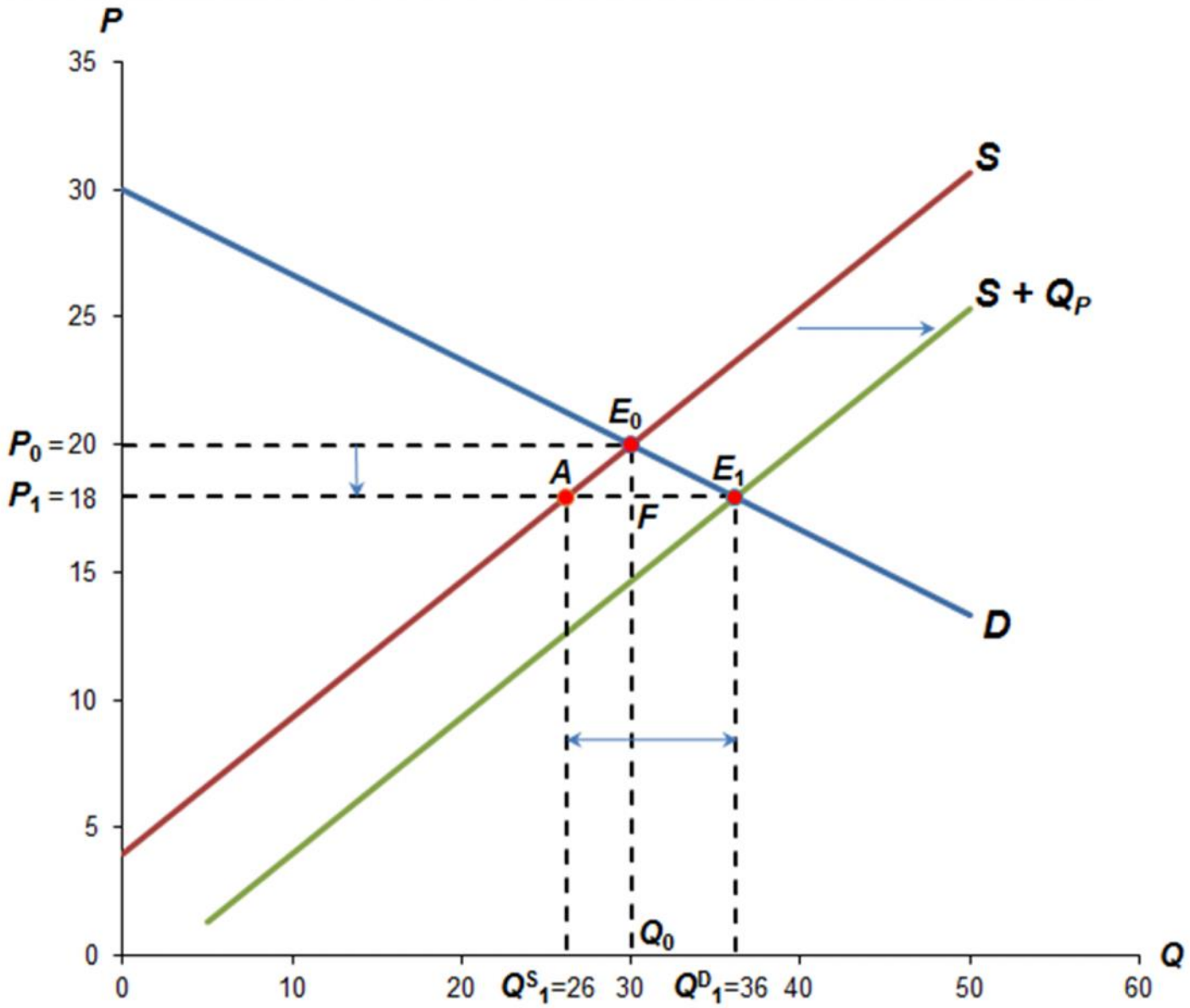
- In equilibrium (E_0), the quantity demanded and supplied is 30.000 room-nights/year at $20/room-night.
- At this quantity, customers are willing to pay an amount of money measured by an area below the demand curve, OME_0Q_0 ($750.000). However, to buy this quantity, they actually pay $20/ room-night for a total amount of only $OP_0E_0Q_0$ ($600,000). The consumer surplus is expressed by the area P_0ME_0 ($150.000).



- Total cost of resources to provide hotel rooms each year is given by area ONE_0Q_0 ($360,000). At the margin, the cost of providing a hotel room night is $20. This is the price to supply a marginal unit. In an undistorted market, that is also the demand price for the last unit.
- The hotel receives $600,000 in revenue, represented by area $OP_0E_0Q_0$. The difference between the total cost of supply and revenue is the economic rent or the producer surplus received by the hotel, expressed by area NP_0E_0 with an annual value of $240,000.

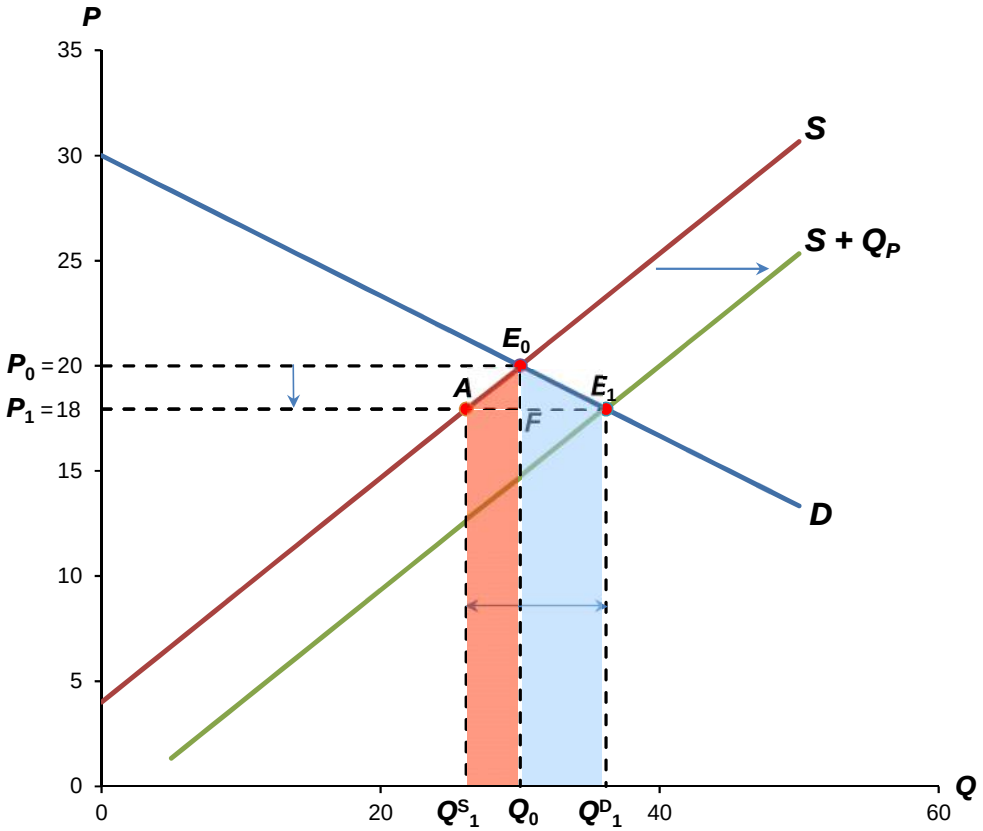
Market with the Project

- Quantity increase by Q_P = 10.000 room-night/year.
- The supply curve shifts to the right to $S+Q_P$.
- The new equilibrium is E_1.
- Price reduces from \$20 to \$18/ room-night.
- Quantity demanded increases as price falls.
- Reduced price makes the existing hotels less willing to provide as many rooms as before.



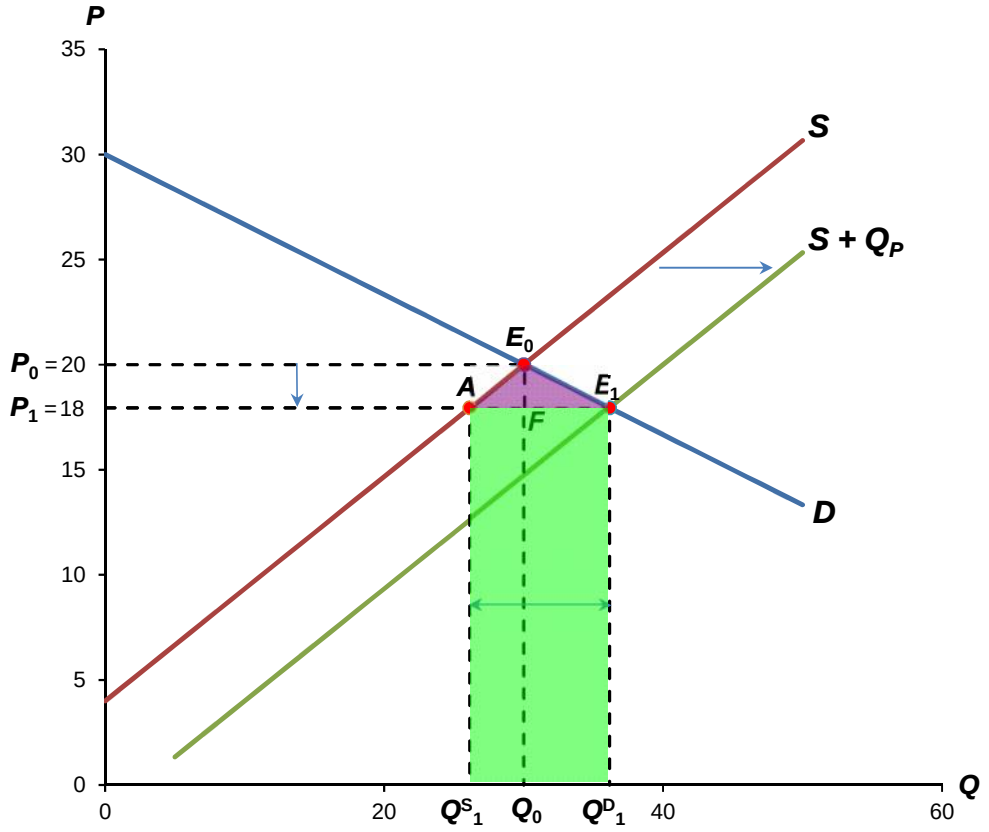
Valuation of Project Economic Benefits

Total economic benefits of the project	=	Incremental benefits to consumers	+	Nonincremental Resource cost savings
(area $Q^S_1AE_0E_1Q^D_1$)		(area $Q_0E_0E_1Q^D_1$)		(area $Q^S_1AE_0Q_0$)
190	=	(½)(36 – 30)(18 + 20)	+	(½)(30 – 26)(18 + 20)



Valuation of Project Economic Benefits

Total economic benefits of the project	=	Financial benefits of the project	+	Change in the net economic welfare
(area $Q^S_1AE_0E_1Q^D_1$)		(area $Q^S_1AE_1Q^D_1$)		(area AE_0E_1)
190	=	10*18	+	(½)*10*(18 + 20)

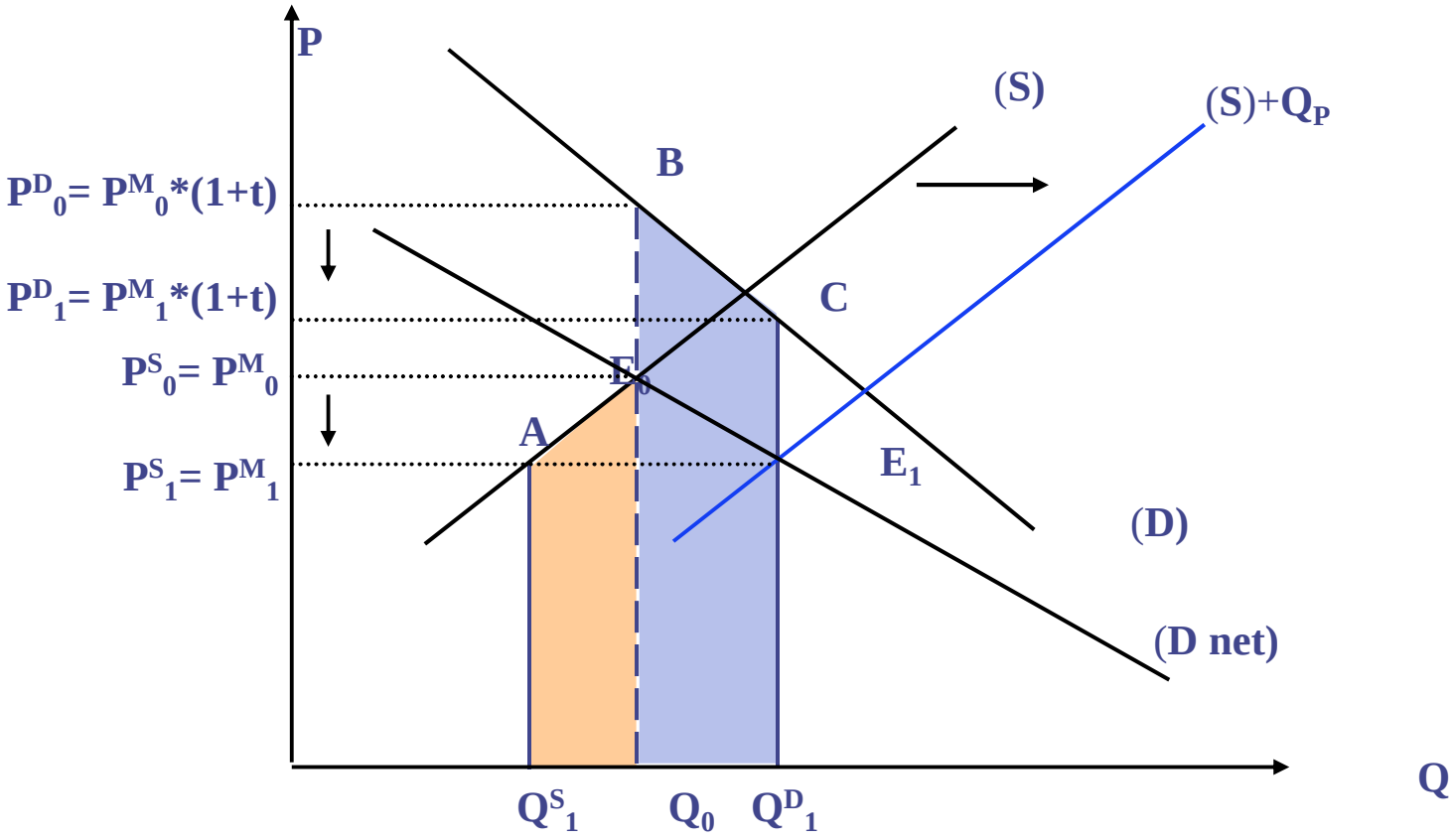


Types of Market Distortions

- Market distortions caused by tax
- Market distortions caused by subsidy
- Market distortions caused by tax and subsidy
- Market distortions caused by government price control
- Market distortions due to monopoly

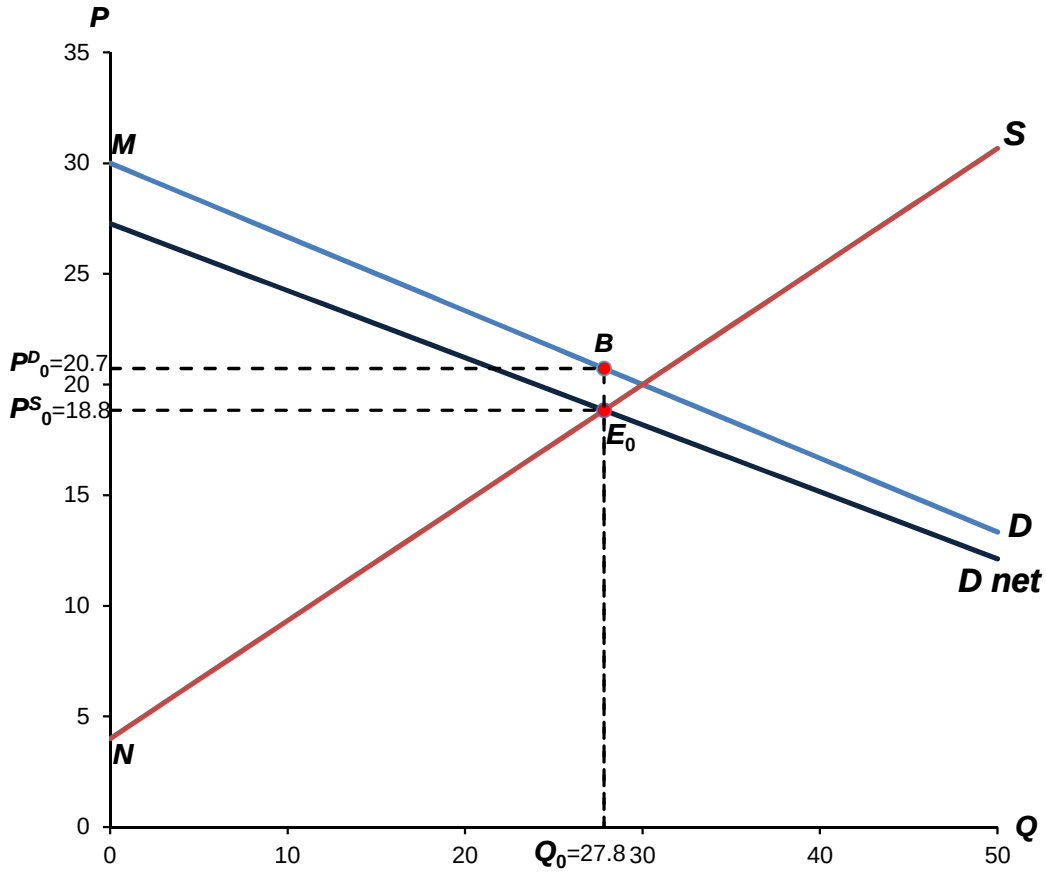
- These distortions occur in the markets of:
  - ✓ Goods and services (in prices)
  - ✓ Foreign exchange (in exchange rate)
  - ✓ Cost of capital (discount rate)
  - ✓ Labour (wage rates)

Project Economic Benefits with Tax



Example: Hotel Market with Tax

- VAT rate, t = 10%, the after-tax demand curve shifts downwards (by 1 / (1 + t)) from *D* to *D net*.
- In equilibrium (E_0), the quantity is 27.800 room-nights/year.
- VAT creates a wedge between the demand price ($20.7) paid by hotel guests) and supply price ($18.8) received by hotels). The wedge equal the tax rate.
- Consumers are willing to pay an amount equal to the area under the curve in $OMBQ_0$ ($705.734). However, to buy this quantity, they

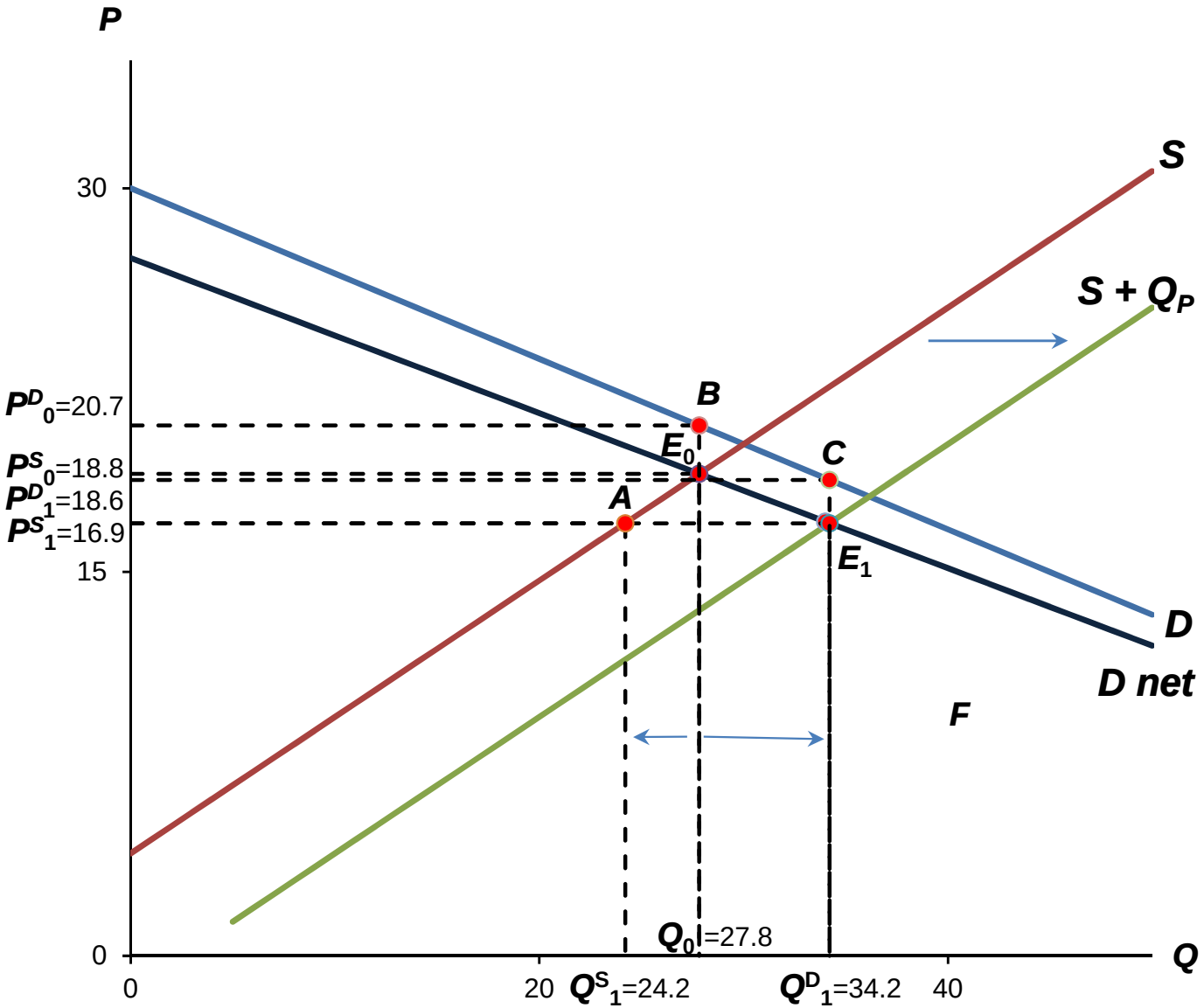


pay $20.7/room-night, for a total amount of money expressed by area $OP^D_0BQ_0$ ($576,690). Consumer surplus is expressed by area P^D_0MB ($129.049).

- Total cost of resources to provide hotel rooms each year is given by area ONE_0Q_0 ($317.782). Hotels will receive $524.266 revenue, shown by area $OP^S_0E_0Q_0$. The difference between the total cost and total revenue is the producer surplus, shown by area $NP^S_0E_0$ ($206.478).
  - The VAT collected by the government is the area $P^S_0P^D_0BE_0$ ($52.426).

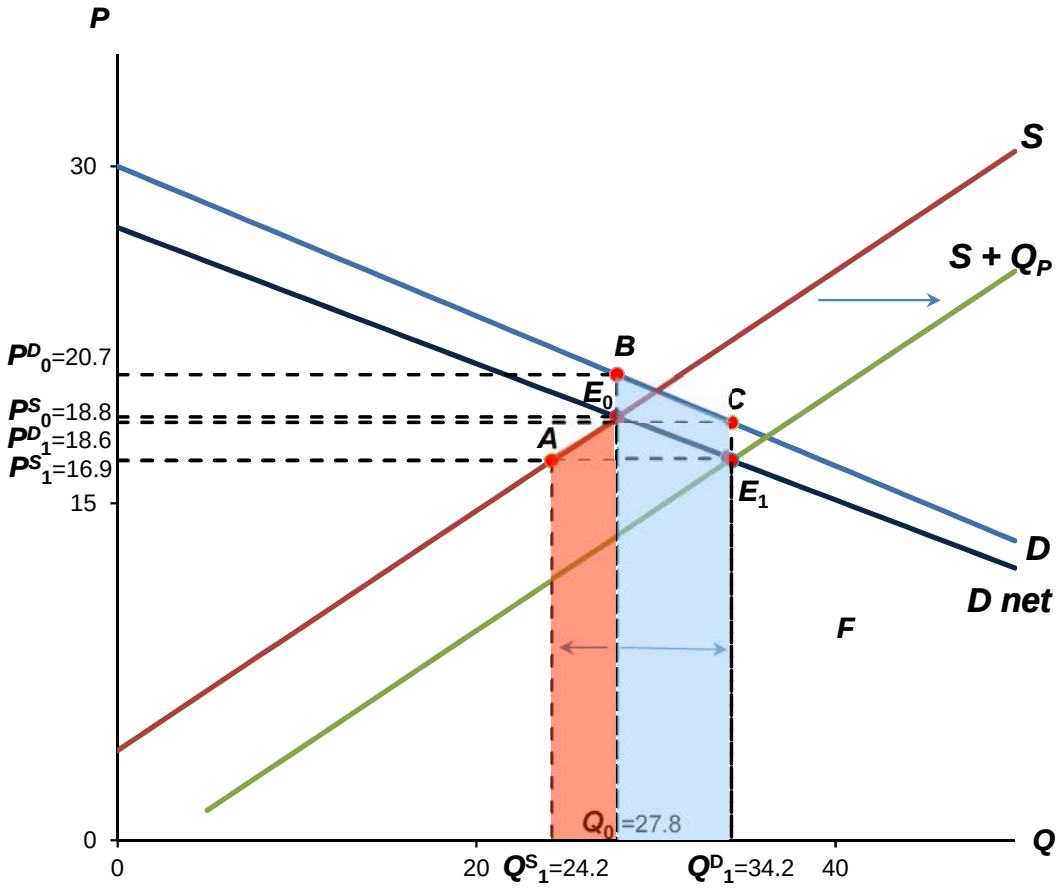
Impact of the Project

- Quantity increases by Q_P = 10,000 room-nights/year.
- The supply curve shifts to the right to $S+Q_P$.
- The new equilibrium is E_1.
- The demand price reduces from $20.7 to $18.6/room-night.
- The supply price reduces from $18.8 to $16.9/room-night.
- The quantity demanded increases as prices fall, while the existing hotels will not provide many rooms as

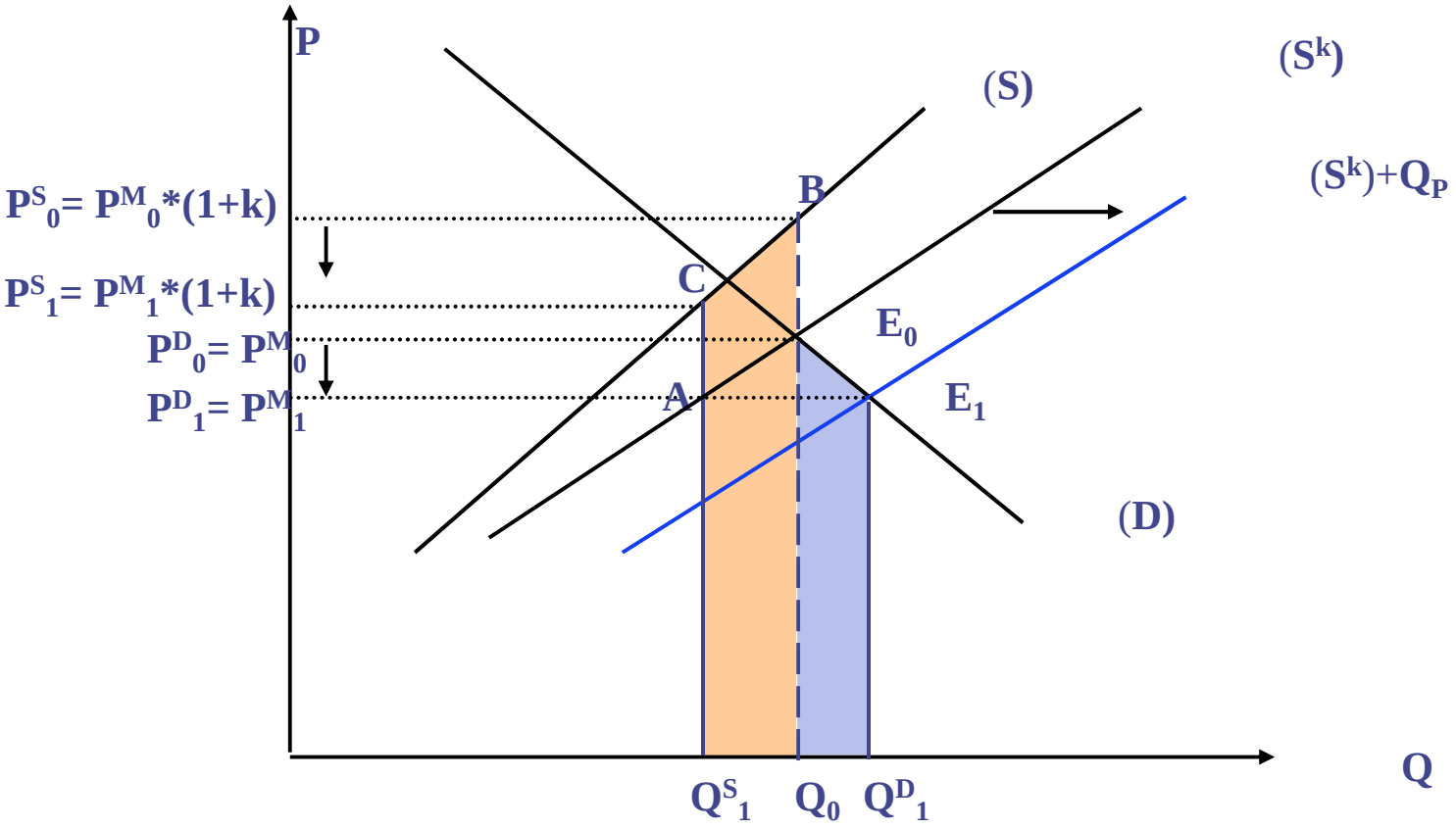


Valuation of Project Economic Benefits

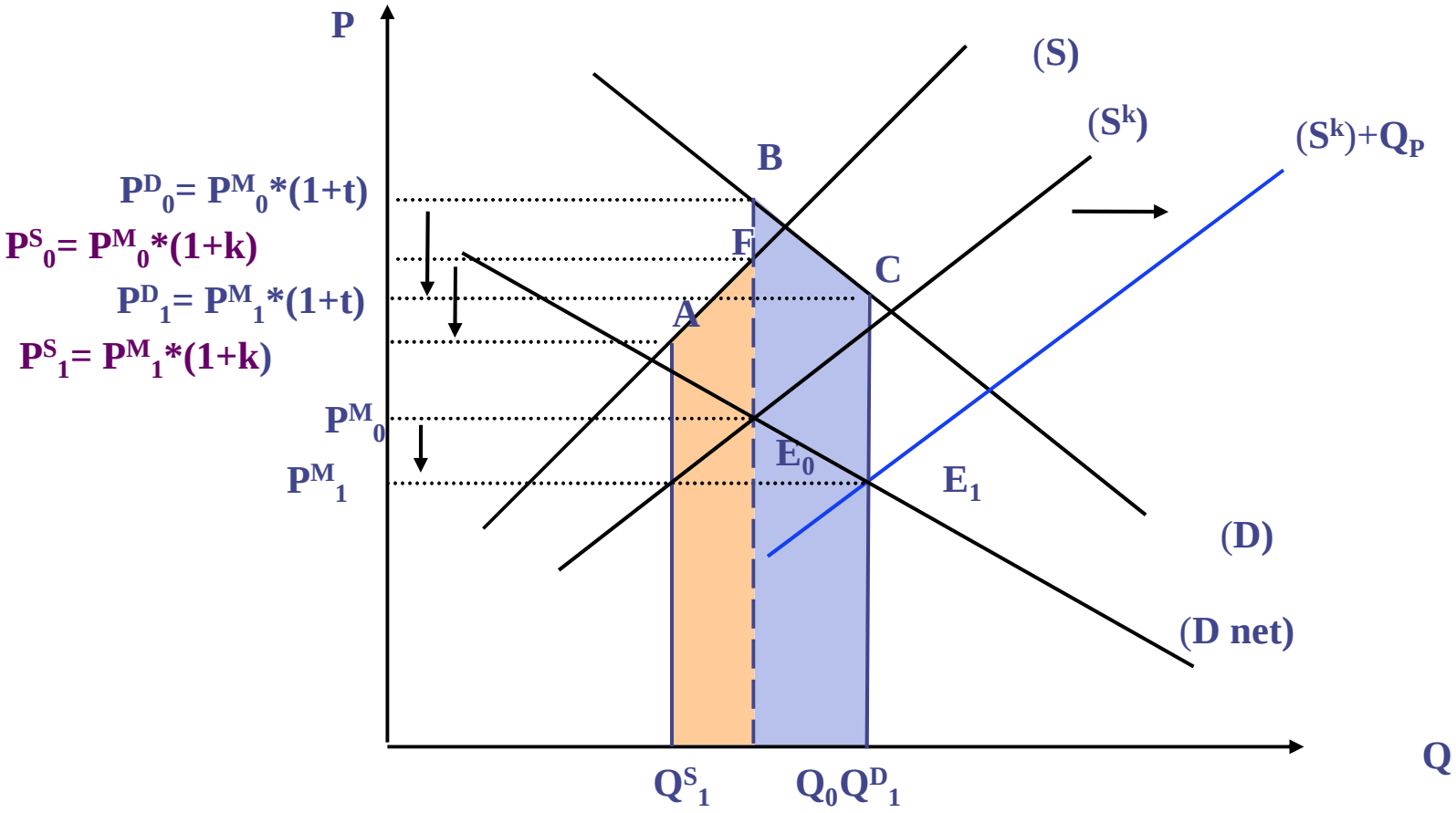
Total project economic benefit	=	Incremental benefit to consumers	+	Nonincremental resources cost savings
(area $Q^S_1AE_0BCQ^D_1$)		(area $Q_0BCQ^D_1$)		(area $Q^S_1AE_0Q_0$)



Project Economic Benefits with Subsidy



Project Economic Benefits with Tax and Subsidy

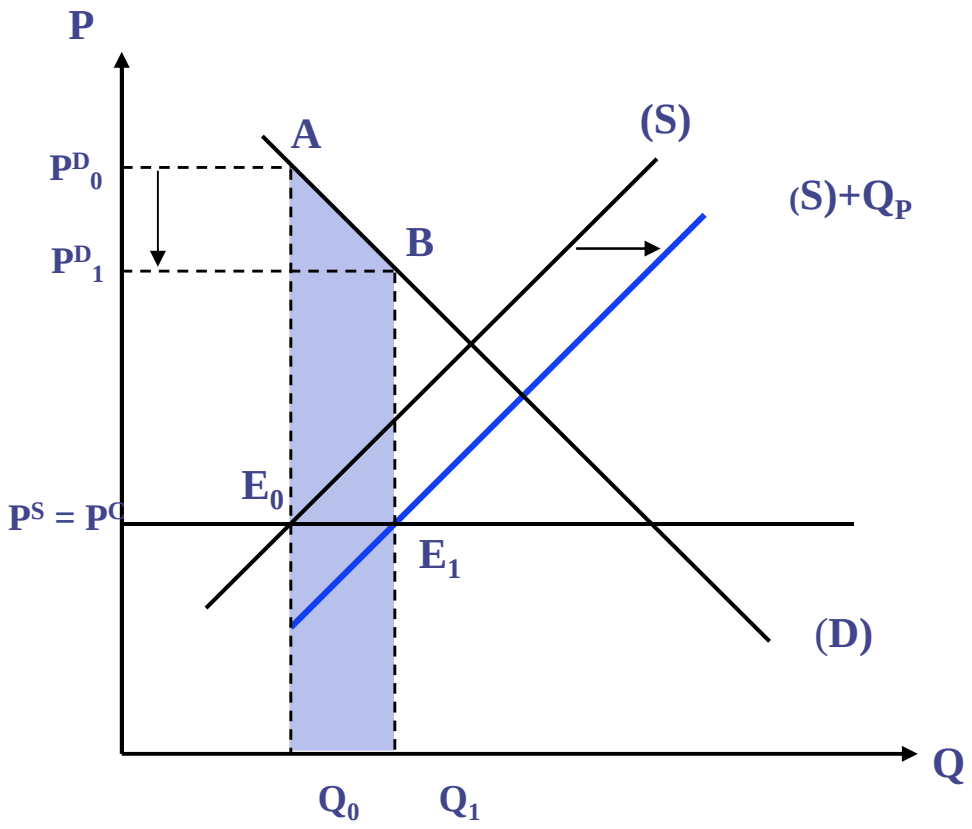


$$P^e = w^S * P^S + w^D * P^D$$

Project Economic Benefits with Price Control

- Presence of a black market

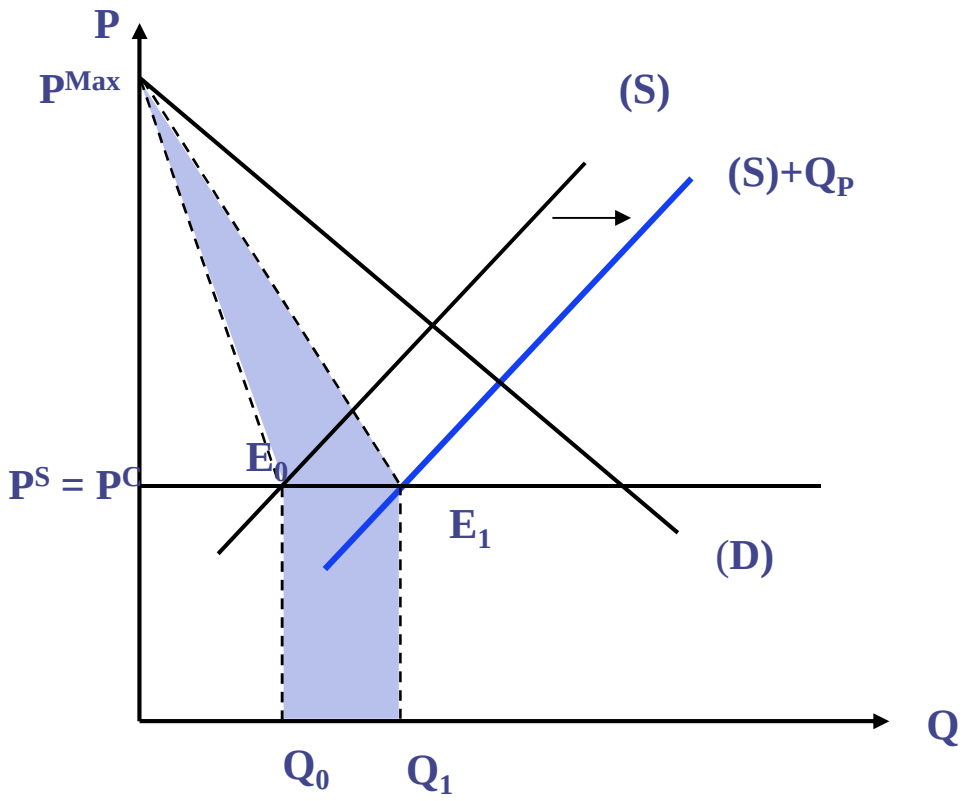
$$P^e = (P^D_0 + P^D_1)/2 > P^f = P^S = P^C$$



Project Economic Benefits with Price Control

- The absence of a black market

$$P^e = \frac{\frac{1}{2} * (P^{Max} - P^C) * Q_P + P^C * Q_P}{Q_P}$$

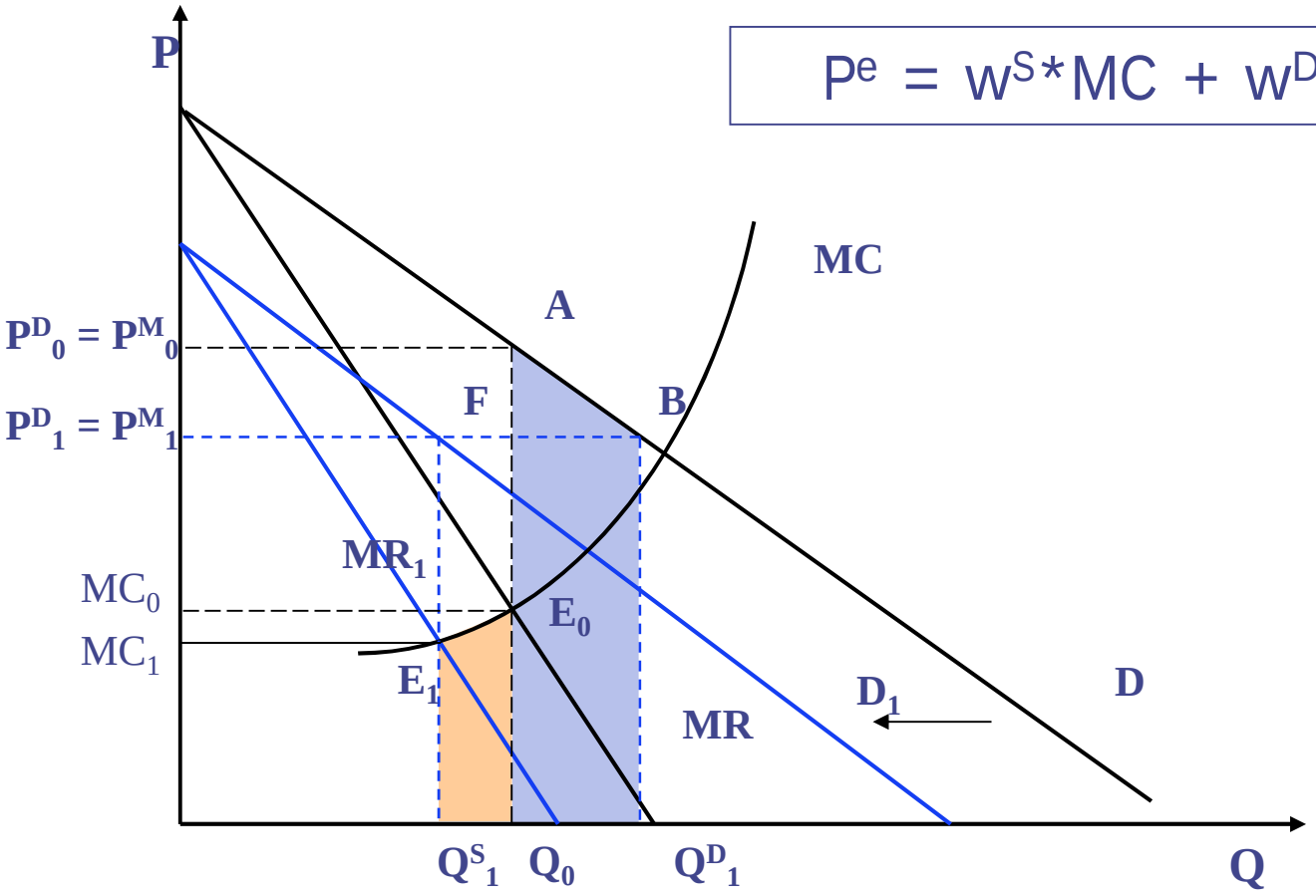


$$P^e = \frac{1}{2} * (P^{Max} - P^C) + P^C$$

$$\boxed{P^e = \frac{1}{2} * (P^{Max} + P^C)}$$

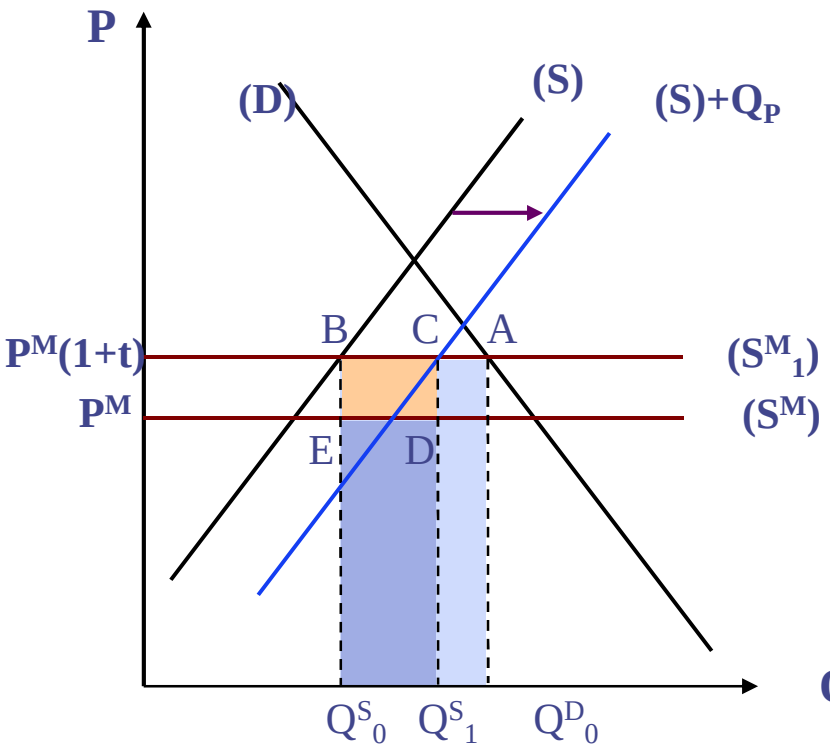
Project Economic Benefits in Case of Monopoly

$$P^e = w^S * MC + w^D * P^D$$



Imported goods subject to import duties

Projects of producing import substitutes



- An import tax, t, increases the domestic price from PM to PM(1+t).
- In the presence of the project, consumption is Q^D_0 and previously domestic production is Q^S_0. All output of the project is for import substitution.
- The economic benefit of the project is the benefit of saving resources for imports:

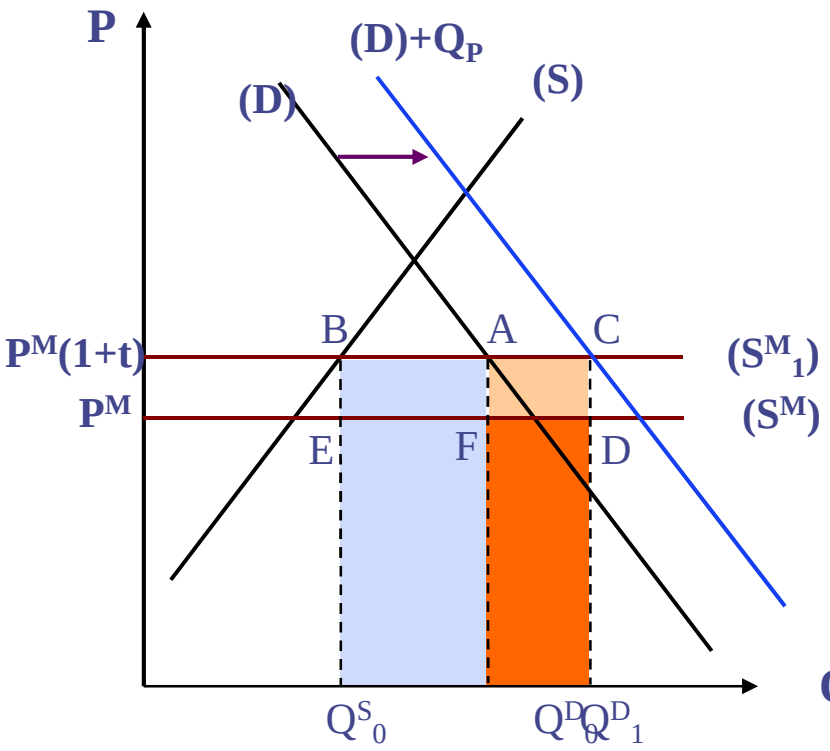
  Area $Q^S_0EDQ^S_1$.
- The economic price of project output:

  $P^e = P^M$
- The financial price of project output:

  $P^f = P^M(1 + t)$

An import tax is a transfer. In financial terms, the unit price of imports is $P^f = P^M(1 + t)$, including tax, $T = P^Mt$, transferred to the government. In economic terms, the cost of social resources is only P^M.

Imported goods subject to import duties



Projects that make use of imports

- In the presence of the project, domestic consumption increases to Q^D_1, while domestic production is still Q^S_0. All demand for project input is additional imports.
- The economic cost of the project is the cost of additional imports:

  Area $Q^D_0FDQ^D_1$.
- The economic price of project input:

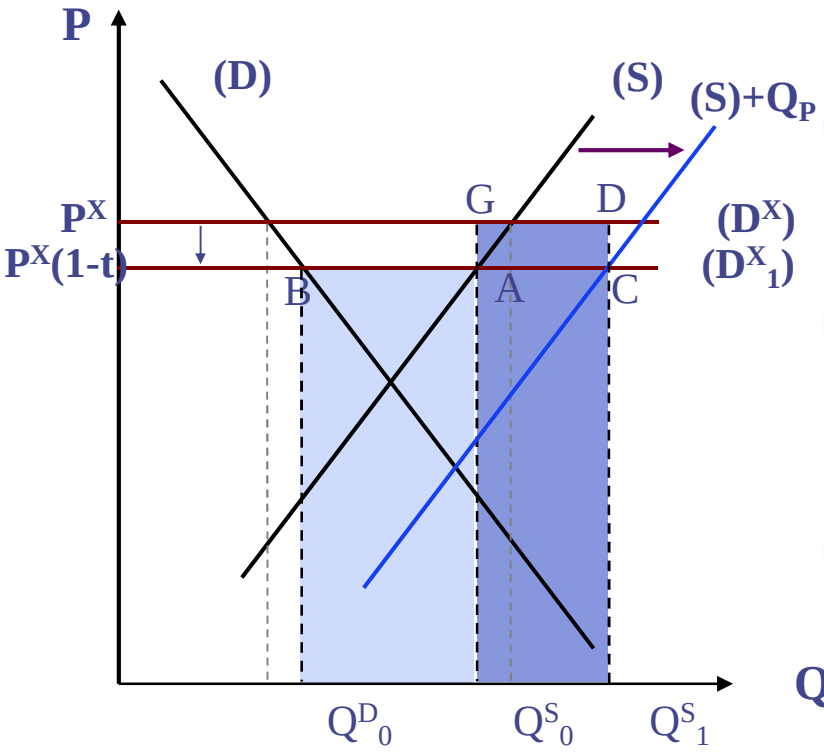
  $P^e = P^M$
- The financial price of project input:

  $P^f = P^M(1 + t)$

An import tax is a transfer. In financial terms, the unit price of imports is $P^f = P^M(1 + t)$, including tax, $T = P^Mt$, transferred to the government. In economic terms, the cost of social resources is only P^M.

Exported goods subject to export tax

Projects of producing exportable goods



- An export tax, t, reduces the domestic price from P^X to $P^X(1 - t)$.
- Domestic consumption is Q^D_0 and production by all existing producers is Q^S_0. All project output is exported.
- The economic benefit of the project is the benefit of additional exports:

  Area $Q^S_0GDQ^S_1$.
- The economic price of project output:

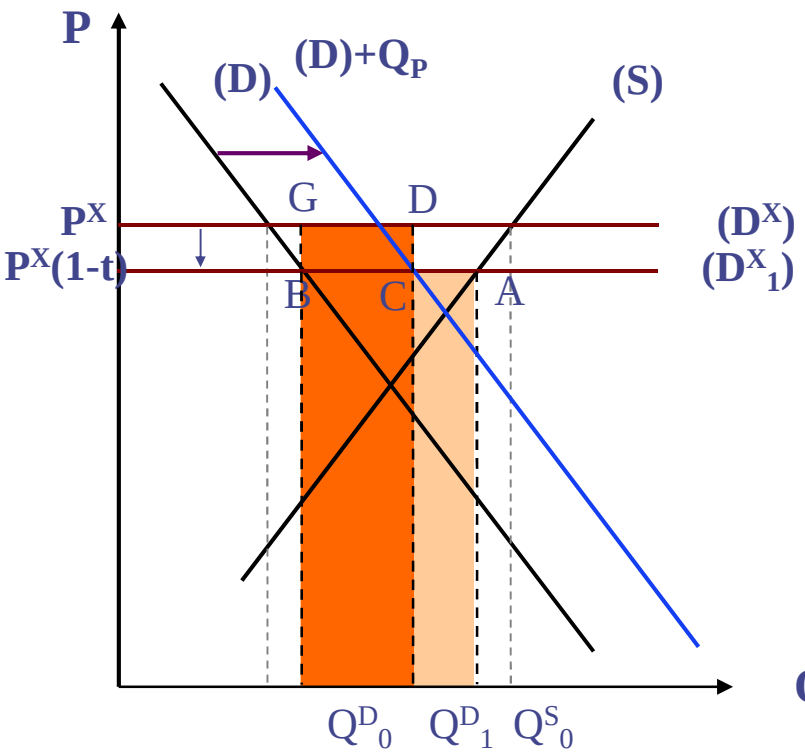
  $P^e = P^X$
- The financial price of project output:

  $P^f = P^X(1 - t)$

Export taxes are transfers from exporters to the state. The economy receives $P^e = P^X$ from foreign buyers, while exporters receive the financial price of $P^f = P^X(1 - t)$ and the state receives taxes, $T = P^Xt$.

Exports subject to export tax

Projects that make use of exportable goods



- In the presence of the project, domestic price is still unchanged, so domestic production remains Q^S_0 and consumption is Q^D. All demand for input is obtained from the reduction of exports.
- The economic cost of the project is the cost of reduced exports:

  Area $Q^D_0GDQ^D_1$.
- The economic price of project input:

  $P^e = P^X$
- The financial price of project input:

  $P^f = P^X(1 – t)$

Export taxes are transfers from exporters to the state. The opportunity cost of reduced exports is $P^e = P^X$, equal the exporters' financial loss, $P^f = P^X(1 – t)$, and the government tax loss, $T = P^Xt$.