Foundations of Modern Macroeconomics

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Chapter 5: The Macroeconomics of Quantity Rationing

Aims of this lecture

- To introduce the first attempt by (neo-) Keynesian economists to build macro on micro foundations
- To study fiscal and monetary policy under the different “regimes”
- To discover what has been the “value added” of the rationing approach [i.e. what have we learnt from it?]

Building blocks

- Quantity signal replaces price signal
- Rationing and spill-overs across markets
- The Dual Decision Hypothesis and the distinction between "notional" and "effective" plans
- Minimum transaction rule

$$Q = \min\left[Q^S(P_0), Q^D(P_0)\right],$$

i.e. no market party is forced to trade more that it wishes to trade [see **Figure 5.1**]. In the figure:

  - P_0 is too low: not all demanders can get the good as aggregate supply falls short of aggregate demand

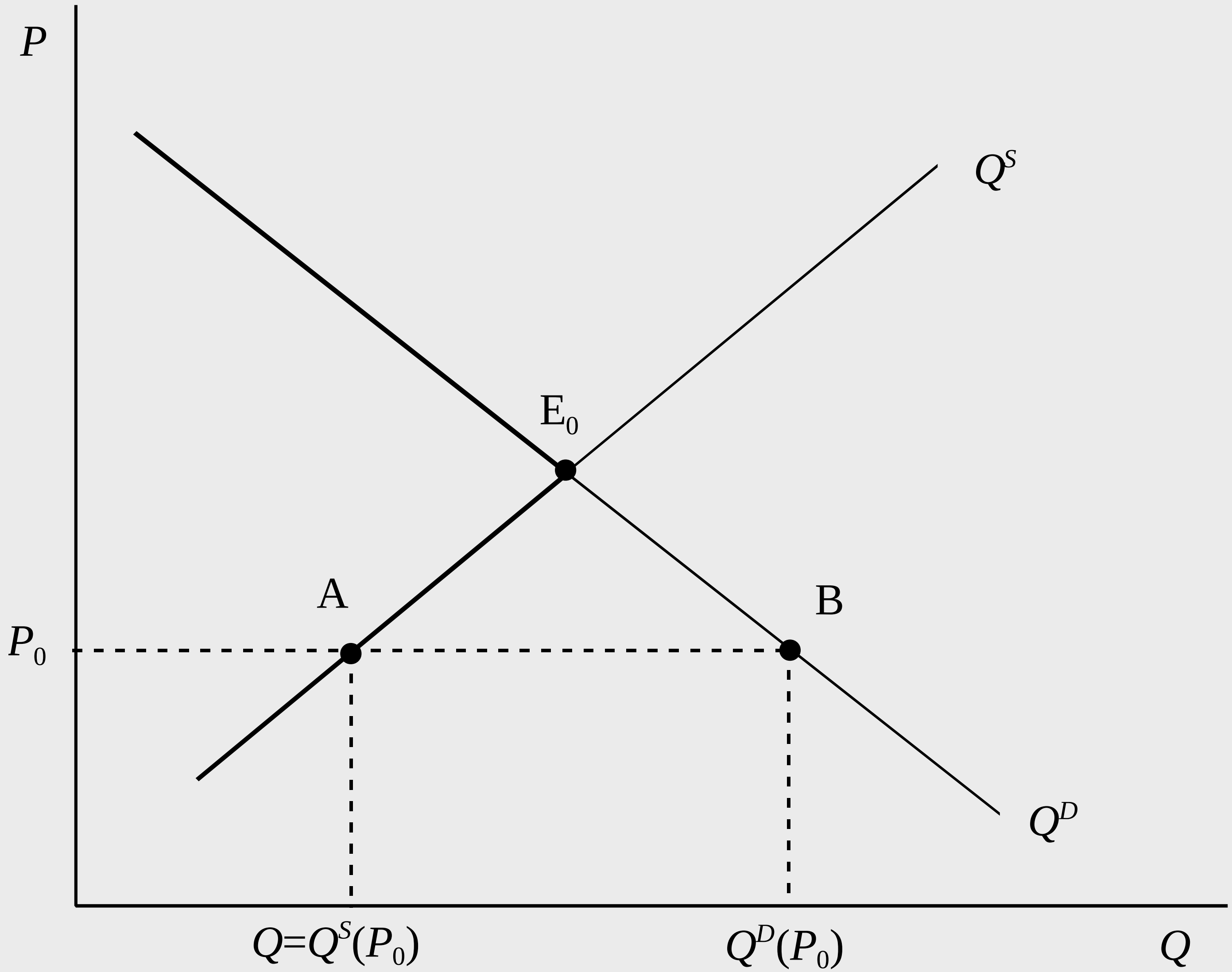

Figure 5.1: The Minimum Transaction Rule

A simple model with rationing

- Households:
  - buy and consume goods (C)
  - sell labour (N) [and thus consume leisure, $1 - N$]
  - demand real money balances ($m \equiv M/P$) [only asset available]
- Firms:
  - produce goods (Y)
  - demand labour (N)
- Government:
  - consumes goods (G) [never rationed by assumption; government served first!]
  - balances its budget by money creation

- Notational conventions
  - *notional* plans: superscript "S" for notional supply and "D" for notional demand
  - *effective* plans: superscript "SE" for effective supply and "DE" for effective demand
  - *actually traded quantities* (realized trades): overstrike "$-$"
  - e.g. N^D is the notional demand for labour, C^{DE} is the effective household demand for goods, and $\bar{N}$ is the actually traded quantity of labour
- We will solve the model in two steps
  - Step (A): notional behaviour and Walrasian equilibrium
  - Step (B): effective behaviour and rationing equilibrium

(A) Notional behaviour

- Households
  - Utility is U_H:

$$U_H = U(C, 1-N, m) \qquad (*)$$
$$= C^{\alpha}(1-N)^{\beta} m^{\gamma},$$

where $0 < \alpha, \beta, \gamma < 1$ and $\alpha + \beta + \gamma = 1$. We occasionally use the Cobb-Douglas form to get simple examples and build up intuition.

– Budget identity:

$$m - m_0 = \pi_0 + wN - C,$$

where π_0 [$\equiv \Pi_0/P$] is real profit income received at the beginning of the period, m_0 [$\equiv M_0/P$] is initial real money balances, and w [$\equiv W/P$] is the real wage rate. The budget identity can also be written as:

$$\underbrace{C + w(1-N) + m}_{(a)} = \underbrace{m_0 + \pi_0 + w}_{(b)} \qquad (**)$$

∗ Item (a): full spending [on consumption, leisure, and money balances]

∗ Item (b): full income [maximum that can be spent]

– Notional plans regarding C^D, N^S, and m^D are obtained by maximizing (*) subject to (**). For the simple Cobb-Douglas utility function we get:

$$C^D = C^D(\underset{+}{w}, \underset{-}{P}, M_0 \underset{+}{+} \Pi_0) = \alpha \left[\left(\frac{M_0 + \Pi_0}{P} \right) + w \right]$$

$$N^S = N^S(\underset{+}{w}, \underset{+}{P}, M_0 \underset{-}{+} \Pi_0) = 1 - \left(\frac{\beta}{w} \right) \left[\left(\frac{M_0 + \Pi_0}{P} \right) + w \right]$$

$$m^D = m^D(\underset{+}{w}, \underset{-}{P}, M_0 \underset{+}{+} \Pi_0) = \gamma \left[\left(\frac{M_0 + \Pi_0}{P} \right) + w \right]$$

**** Self test ****

You should be able to derive these expressions and understand the intuition behind the partial derivative results!

****

- Firms:
  - Real profits, π, are defined as:

$$\pi \equiv \Pi/P = Y - wN \qquad (*)$$

  - The production function is:

$$\begin{aligned} Y &= F(N) \qquad (**) \\ &= N^{\epsilon}, \qquad 0 < \epsilon < 1, \end{aligned}$$

    where we use the simple form occasionally to get simple expressions and build up intuition.

– Notional plans regarding Y^S and N^D are obtained by maximizing (*) subject to (**). The first-order condition is $\pi_N = 0$ or $F_N(N^D) = w$ [recall from Lectures 1, 2, and 4!]. It follows that:

$$N^D = N^D(\underset{-}{w}) \equiv F_N^{-1}(w) = \left(\frac{w}{\epsilon}\right)^{-1/(1-\epsilon)},$$

$$Y^S = Y^S(\underset{-}{w}) \equiv F\left(N^D(w)\right) = \left(\frac{w}{\epsilon}\right)^{-\epsilon/(1-\epsilon)},$$

i.e. a high real wage stifles production and the demand for labour.

- Government budget restriction:

$$\underbrace{(m - m_0)}_{(a)} + \underbrace{(\pi - \pi_0)}_{(b)} = G \qquad (\#)$$

  - Item (a): household saving
  - Item (b): firm saving
  - equation (#) is in the nature of $S = G$ [i.e. in general we have for the closed economy $Y = C + S + T$ and $Y = C + I + G$. In this model there is no investment ($I = 0$) and there are no lump-sum taxes ($T = 0$). This means that $S = G$]

- *Walrasian equilibrium*: summarize the model with two schedules
  - **G**oods **M**arket **E**quilibrium locus (GME):

$$Y^S(\underset{-}{w}) = C^D(\underset{+}{w}, \underset{-}{P}, M_0 \underset{+}{+} \Pi_0) + G$$

In the left-hand panel of **Figure 5.2** GME represents an upward sloping relationship between the real wage (vertical axis) and the price level (horizontal axis). *Intuition*:

* *slope*: for a given price level a fall in the real wage ($w \downarrow$) causes an increase in supply ($Y^S \uparrow$) and a decrease in household demand ($C^D \downarrow$) thus opening up an excess supply of goods (ESG). To restore goods market equilibrium, demand must rise, i.e. the price must fall ($P \downarrow$)
* *shifts*: for a given real wage, an increase in G or M_0 raises demand and opens up an excess demand for goods (EDG). To restore goods market equilibrium at the given real wage private demand must fall, i.e. the price must rise ($P \uparrow$). Hence, GME shifts to the right

– **L**abour **M**arket **E**quilibrium locus (LME):

$$N^D(\underset{-}{w}) = N^S(\underset{+}{w}, \underset{+}{P}, M_0 \underset{-}{+} \Pi_0)$$

In the left-hand panel of **Figure 5.2** LME represents a downward sloping relationship between the real wage (vertical axis) and the price level (horizontal axis). *Intuition*:

∗ *slope*: for a given price level a fall in the real wage ($w \downarrow$) causes an increase in labour demand ($N^D \uparrow$) and a decrease in labour supply ($N^S \downarrow$) thus opening up an excess demand for labour (EDL). To restore labour market equilibrium, supply must rise, i.e. the price must rise ($P \uparrow$)

∗ *shifts*: for a given real wage, an increase in M_0 lowers supply and opens up an excess demand for labour (EDL). To restore labour market equilibrium at the given real wage labour supply must increase, i.e. the price must rise ($P \uparrow$). Hence, LME shifts to the right.

- In the right-hand panel of Figure 5.2 we plot the demand for labour function in order to find out equilibrium employment (and thus production).
- With a flexible real wage and price level, the initial Walrasian equilibrium is at E_0^W where the real wage is w_0^* and the price level is P_0^*

- Policy effects:
  - Fiscal policy ($G \uparrow$): shifts GME to the right (from GME_0 to GME_1). In E_0^W there is now EDG and LME. The new equilibrium is at E_1^W where the real wage is w_1^* ($< w_0^*$) and the price is P_1^* ($> P_0^*$). Employment and thus output increase.
  - Monetary policy ($M_0 \uparrow$): shifts both GME and LME to the right. The price level unambiguously rises but the effect on the real wage (and thus on employment and output) is ambiguous. [**NB**: the Classical dichotomy fails here because nominal profits are distributed to the agent at the end of the period. The system is not homogeneous of degree zero in M_0, P, and W (the nominal wage)]

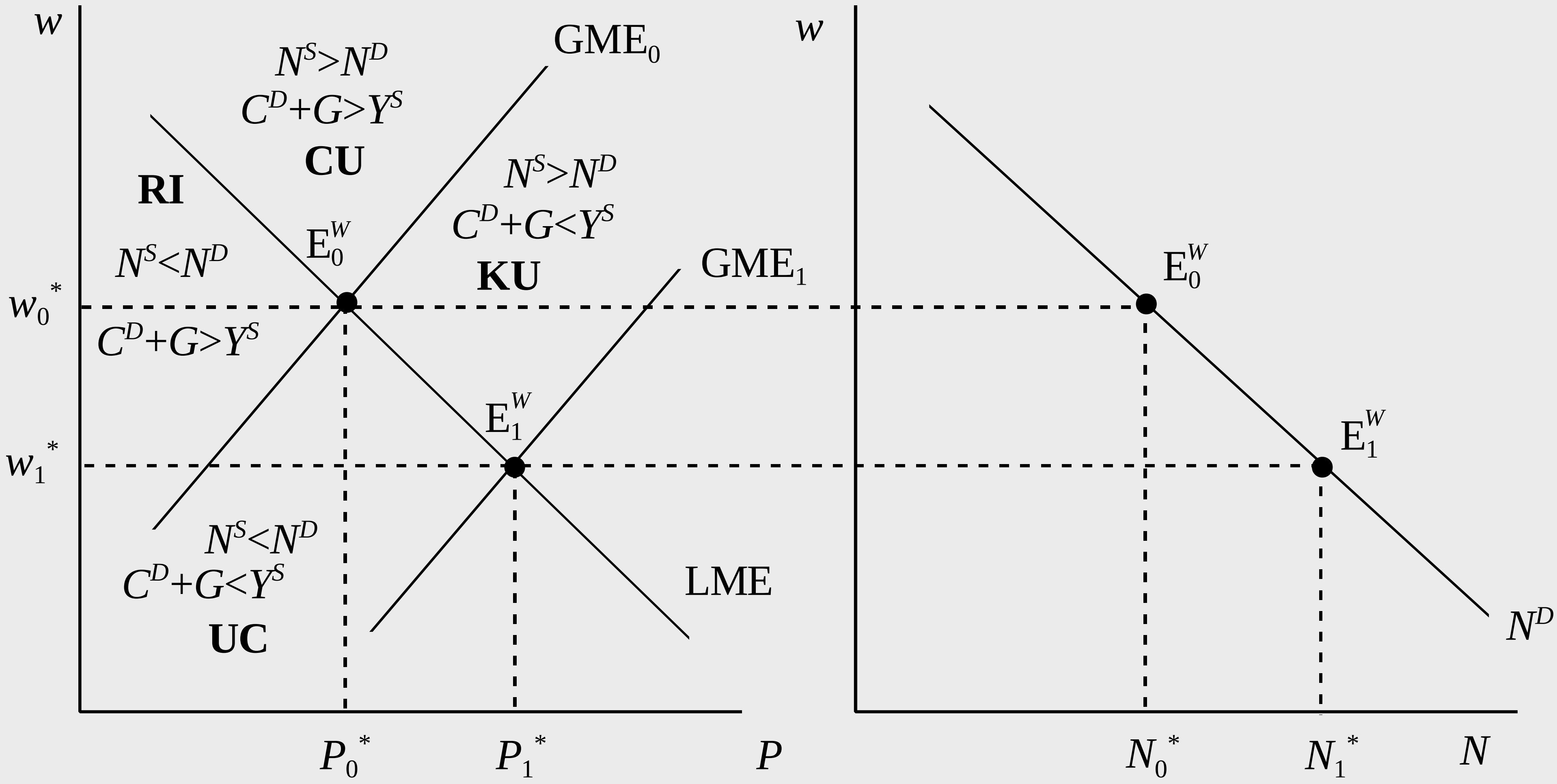

Figure 5.2: Walrasian Equilibrium and Fiscal Policy

(B) Effective behaviour

- What happens if the price and/or the real wage rate is fixed (rather than fully flexible)?

- Figure 5.2 suggests that there are problems because the economy will not generally be in the Walrasian equilibrium. Instead, there will be various combinations of EDL, ESL, EDG, and ESG: see **Table A** (not in book).

- The *Dual Decision Hypothesis* [formulated by Clower] suggests that agents will take constraints on their plans into account. For example, in the Keynesian Unemployment (KU) regime, households cannot sell all the labour they would like to sell (because there is ESL, i.e. $N^S > N^D$). They take the constraint they face in the labour market into account when deciding on other plans.

Table A. Notional Regime Classification

		Labour market Excess Supply (ESL)	*Labour market* Excess Demand (EDL)
Goods market	Excess Supply (ESG)	**Keynesian Unemployment** $\bar{C} = C^D < Y^S - G$ $\bar{N} = N^D < N^S$	**Underconsumption Regime** $\bar{C} = C^D < Y^S - G$ $N^D > N^S = \bar{N}$
	(Effective) Excess Demand (EDG)	**Classical Unemployment** $C^D + G > Y^S = \bar{Y}$ $\bar{N} = N^D < N^S$	**Repressed Inflation** $C^D + G > Y^S = \bar{Y}$ $N^D > N^S = \bar{N}$

- Households:
  - formulate C^{DE} and m^{DE} if they face a binding constraint on the labour market [and cannot sell all the labour they want to sell] $\longrightarrow$ case (a)
  - formulate N^{SE} and m^{DE} if they face a binding constraint on the goods market [and cannot buy all the goods they want to buy] $\longrightarrow$ case (b)

(a) Binding labour market constraint ($\bar{N} < N^S$). Households choose C and m in order to maximize utility:

$$U_H = U(C, 1 - \bar{N}, m)$$

subject to the budget constraint:

$$C + m = m_0 + \pi_0 + w\bar{N},$$

where we have already substituted the labour market constraint ($\bar{N}$). We obtain:

$$C^{DE} = C^{DE}(\underset{+}{w\bar{N}}, \underset{-}{P}, \underset{+}{M_0 + \Pi_0}) = \left(\frac{\alpha}{\alpha + \gamma}\right)\left[\left(\frac{M_0 + \Pi_0}{P}\right) + w\bar{N}\right]$$

$$m^{DE} = m^{DE}(\underset{+}{w\bar{N}}, \underset{-}{P}, \underset{+}{M_0 + \Pi_0}) = \left(\frac{\gamma}{\alpha + \gamma}\right)\left[\left(\frac{M_0 + \Pi_0}{P}\right) + w\bar{N}\right]$$

– Obviously $C^{DE} < C^{D}$: due to the labour market constraint the household cuts back consumption. Indeed, for the CD case we have:

$$C^{DE} = C^{D} - \left(\frac{\alpha}{\alpha + \gamma} \right) w \left[N^{S} - \bar{N} \right]$$

– The effective demand for goods looks a lot like a Keynesian consumption function!! (Income argument in consumption function)

(b) Binding goods market constraint ($\bar{C} < C^D$). Households choose N and m in order to maximize utility:

$$U_H = U(\bar{C}, 1 - N, m)$$

subject to the budget constraint:

$$\bar{C} + m = m_0 + \pi_0 + wN,$$

where we have already substituted the goods market constraint ($\bar{C}$). We obtain:

$$\begin{aligned} N^{SE} &= N^{SE}(\underset{+}{w}, \underset{+}{P}, \underset{+}{\bar{C}}, M_0 \underset{-}{+} \Pi_0) \\ &= 1 - \left(\frac{\beta}{(\beta+\gamma)w}\right)\left[\left(\frac{M_0 + \Pi_0}{P}\right) + w - \bar{C}\right] \\ m^{DE} &= m^{DE}(\underset{+}{w}, \underset{-}{P}, \underset{-}{\bar{C}}, M_0 \underset{+}{+} \Pi_0) \\ &= \left(\frac{\gamma}{\beta+\gamma}\right)\left[\left(\frac{M_0 + \Pi_0}{P}\right) + w - \bar{C}\right] \end{aligned}$$

– Obviously $N^{SE} < N^S$: due to the goods market constraint the household cuts back on labour supply [it cannot buy all the goods it wants anyway and thus consumes more leisure!]. For the CD case we have:

$$N^{SE} = N^S - \left(\frac{\beta}{\beta+\gamma}\right)\left(\frac{1}{w}\right)\left[C^D - \bar{C}\right]$$

- Firms:
  - formulate Y^{SE} if they face a binding constraint on the labour market [and cannot buy all the labour they want to buy] $\longrightarrow$ case (a)
  - formulate N^{DE} if they face a binding constraint on the goods market [and cannot sell all the goods they want to sell] $\longrightarrow$ case (b)

(a) Binding labour market constraint ($\bar{N} < N^D$). Firm chooses Y in order to maximize profit:

$$\pi = F(N) - wN$$

subject to the labour market constraint:

$$N \leq \bar{N}$$

The constraint is binding and thus $\pi_N > 0$: if only the firm could hire more labour they would do so since profits would increase. Hence, the best the firm can do is to buy as much labour as it can, i.e. $N = \bar{N}$, and the effective supply of goods is:

$$Y^{SE} = Y^{SE}(\underset{+}{\bar{N}}) \equiv F(\bar{N}) = \bar{N}^{\epsilon}$$

– Obviously $Y^{SE} < Y^S$: due to the labour market constraint the firm is forced to produce less than it would like to produce. For the CD case we have:

$$\ln Y^{SE} = \ln Y^S - \epsilon \left[\ln N^D - \ln \bar{N}\right]$$

(b) Binding goods market constraint ($\bar{Y} < Y^S$). Firm chooses N in order to maximize profit:

$$\pi = Y - wF^{-1}(Y)$$

subject to the goods market constraint:

$$Y \leq \bar{Y},$$

where $N = F^{-1}(Y)$ is the amount of labour needed to produce output Y (inverse production function). Since the constraint is binding, we have that $\pi_Y > 0$, i.e. the firm produces $\bar{Y}$ and the effective demand for labour is:

$$N^{DE} = N^{DE}(\underset{+}{\bar{Y}}) \equiv F^{-1}(\bar{Y}) = \bar{Y}^{1/\epsilon}$$

– Obviously $N^{DE} < N^D$: due to the labour market constraint the firm cuts back on labour demand. For the CD case we have:

$$\ln N^{DE} = \ln N^D - \left(\frac{1}{\epsilon}\right)\left[\ln Y^S - \ln \bar{Y}\right]$$

- We can now redo the configuration of regimes [that was done for the notional regimes in Table A] for the effective schedules–see **Table 5.1**. It is clear that the underconsumption regime is not possible because firms cannot be rationed in both markets at the same time: once N (or Y) is chosen, Y (or N) is also determined. No inventories are possible in the model.

- In **Figure 5.3** we indicate the three different regions of Classical Unemployment (CU), Keynesian Unemployment (KU), and Repressed Inflation (RI).

Table 5.1. Effective Regime Classification

		Labour market (Effective) Excess Supply (ESL)	(Effective) Excess Demand (EDL)
Goods market	(Effective) Excess Supply (ESG)	**Keynesian Unemployment** $\bar{C} = C^{DE} < Y^S - G$ $\bar{N} = N^{DE} < N^S$	**Impossible**
	(Effective) Excess Demand (EDG)	**Classical Unemployment** $C^{DE} + G > Y^S = \bar{Y}$ $\bar{N} = N^D < N^{SE}$	**Repressed Inflation** $C^D + G > Y^{SE} = \bar{Y}$ $N^D > N^{SE} = \bar{N}$

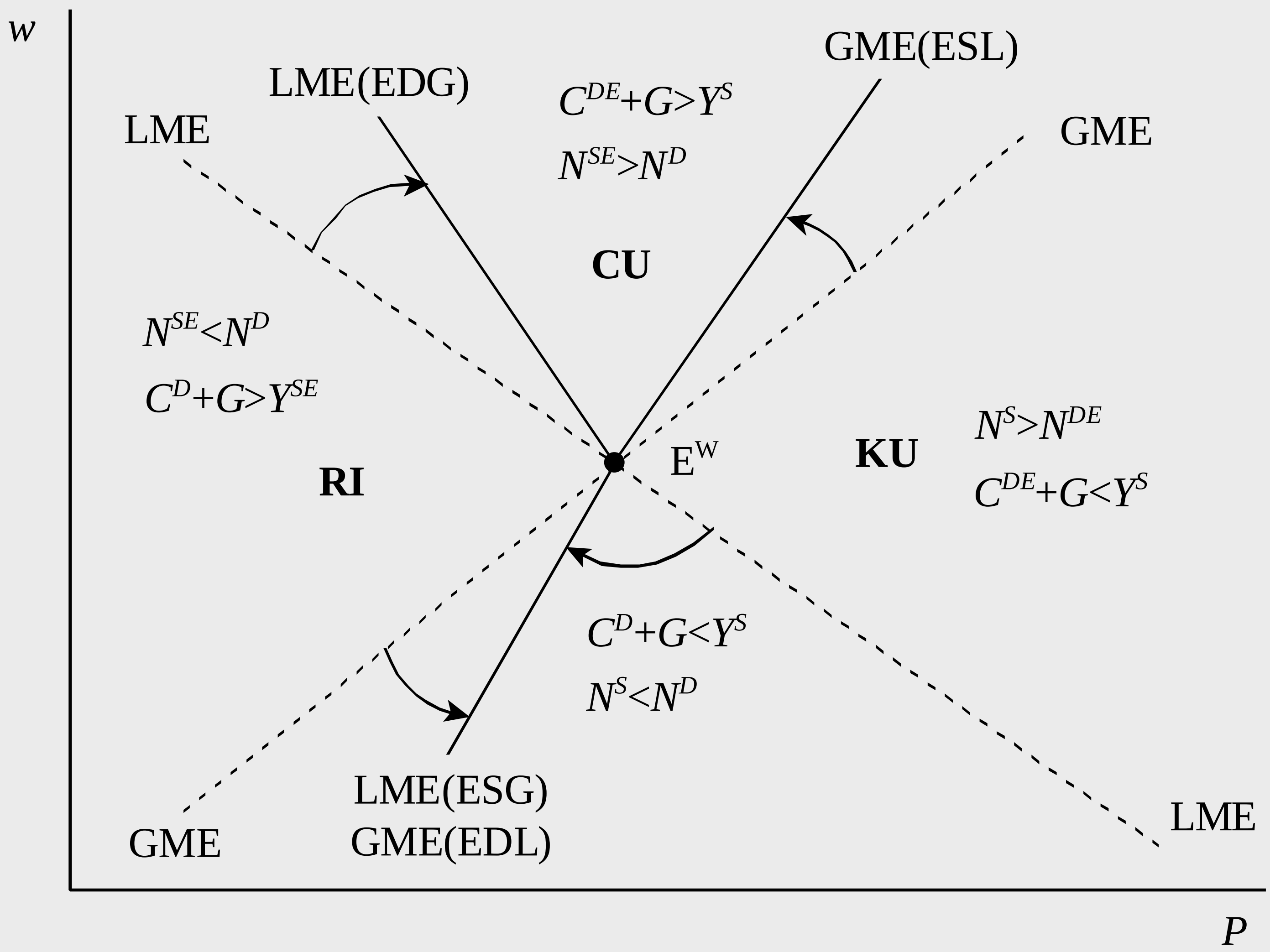

Figure 5.3: Effective Equilibrium Loci and the Three Regions

Intuition behind the slopes of the different schedules

- LME(EDG) rotates clockwise w.r.t. LME. By definition we have:

$$\text{LME(EDG)} \quad : \quad N^{SE}(w, \underset{+}{P}, \bar{C}, M_0 + \Pi_0) = N^D(w) \qquad \text{(a)}$$

$$\text{LME} \quad : \quad N^{S}(w, \underset{+}{P}, M_0 + \Pi_0) = N^D(w), \qquad \text{(b)}$$

$$\text{constraint} \quad : \quad \bar{C} = Y^S(\underset{-}{w}) - G$$

For a given real wage, the right-hand sides of (a) and (b) are the same. But for the same (w, P) combination N^{SE} is less than N^S. Hence, it must be the case that the price level in (a) is higher than that in (b). Hence, LME(EDG) lies to the right of LME.

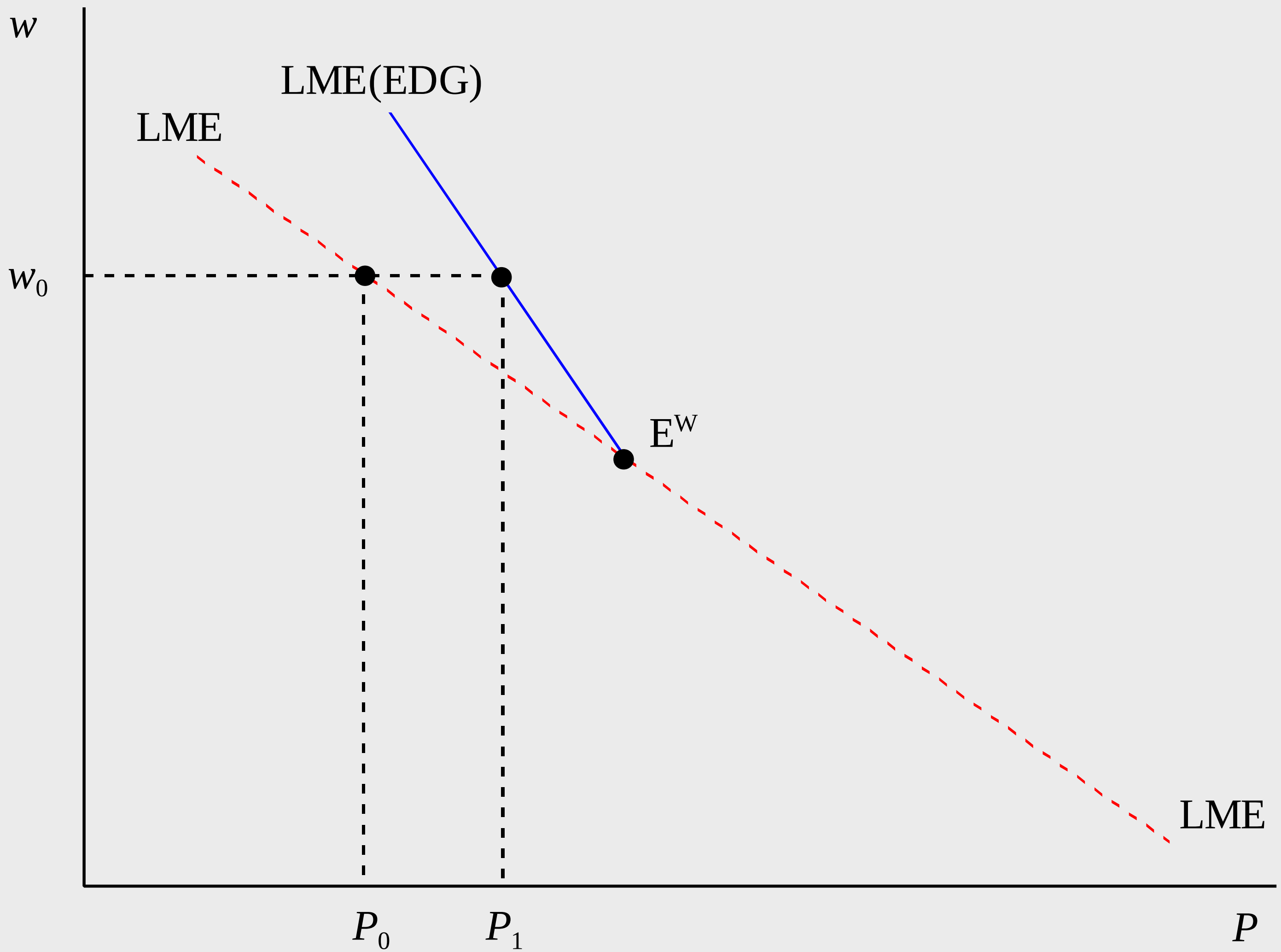

Figure A: LME and LME(EDG)

- GME(ESL) rotates counterclockwise w.r.t. GME. By definition we have:

$$\text{GME(ESL)} : \quad C^{DE}(w\bar{N}, \underset{-}{P}, M_0 + \Pi_0) + G = Y^S(w) \quad \text{(a)}$$

$$\text{GME} : \quad C^D(w, \underset{-}{P}, M_0 + \Pi_0) + G = Y^S(w) \quad \text{(b)}$$

$$\text{constraint} : \quad \bar{N} = N^D(\underset{-}{w})$$

For a given real wage, the right-hand sides of (a) and (b) are the same. For the same (w, P) combination, $C^{DE} < C^D$ due to the labour market constraint. Hence, it must be the case that the price level on (a) is lower than that on (b). It follows that GME(ESL) lies to the left of GME.

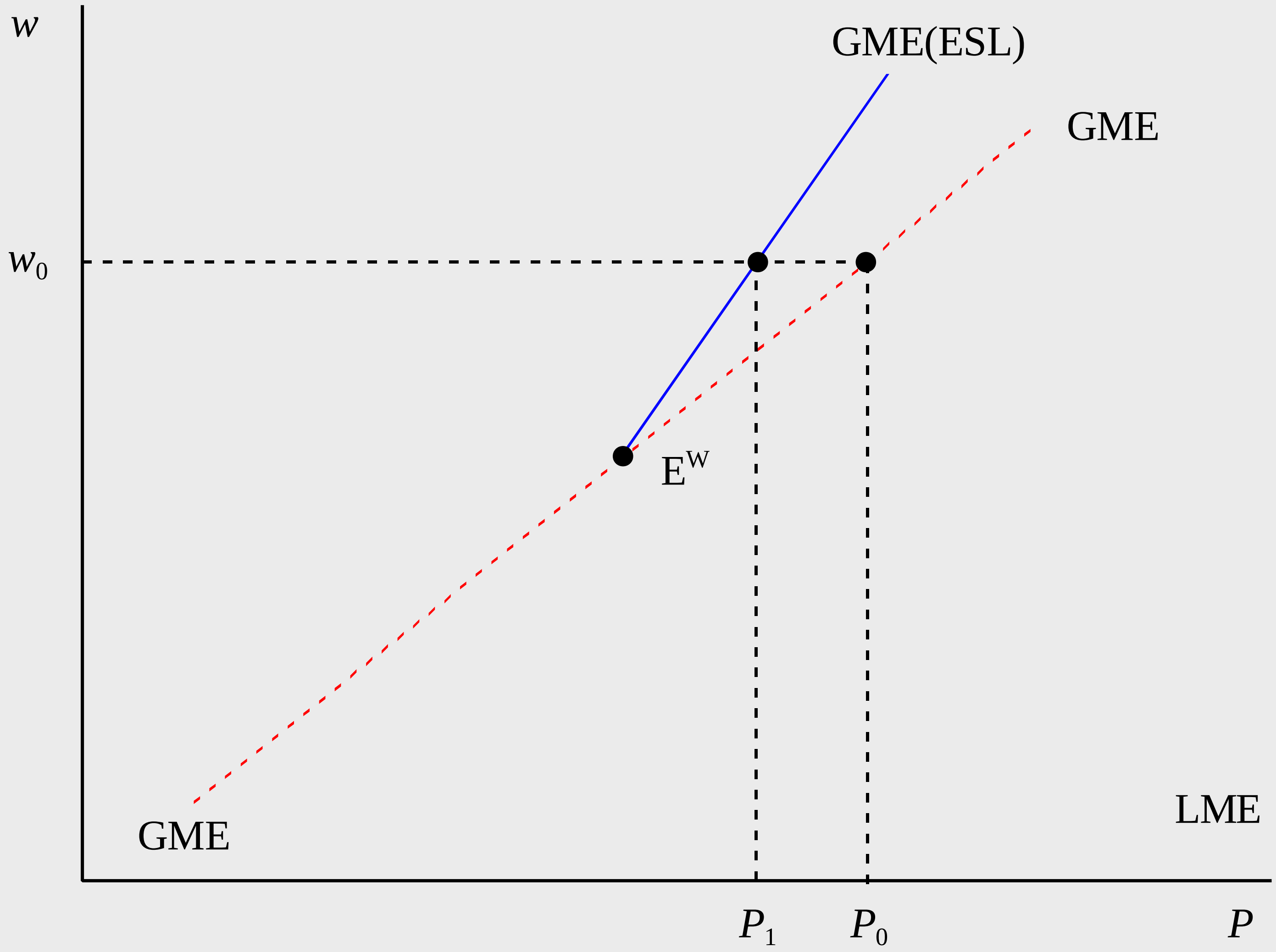

Figure B: GME and GME(ESL)

- GME(EDL) rotates counterclockwise w.r.t. GME. By definition we have:

$$\text{GME(EDL)} \quad : \quad C^D(w, \underset{-}{P}, M_0 + \Pi_0) + G = Y^{SE}(\bar{N}) \qquad \text{(a)}$$

$$\text{GME} \quad : \quad C^D(w, \underset{-}{P}, M_0 + \Pi_0) + G = Y^S(w) \qquad \text{(b)}$$

$$\text{constraint} \quad : \quad \bar{N} = N^S(w, \underset{+}{P}, M_0 + \Pi_0)$$

We know that firms are rationed due to the labour market constraint, i.e. $Y^{SE} < Y^S$. Hence the notional demand for goods in (a) is lower than that in (b). For a given real wage, this can only be the case if the price in (a) is higher than that in (b). Hence, GME(EDL) lies to the right of GME.

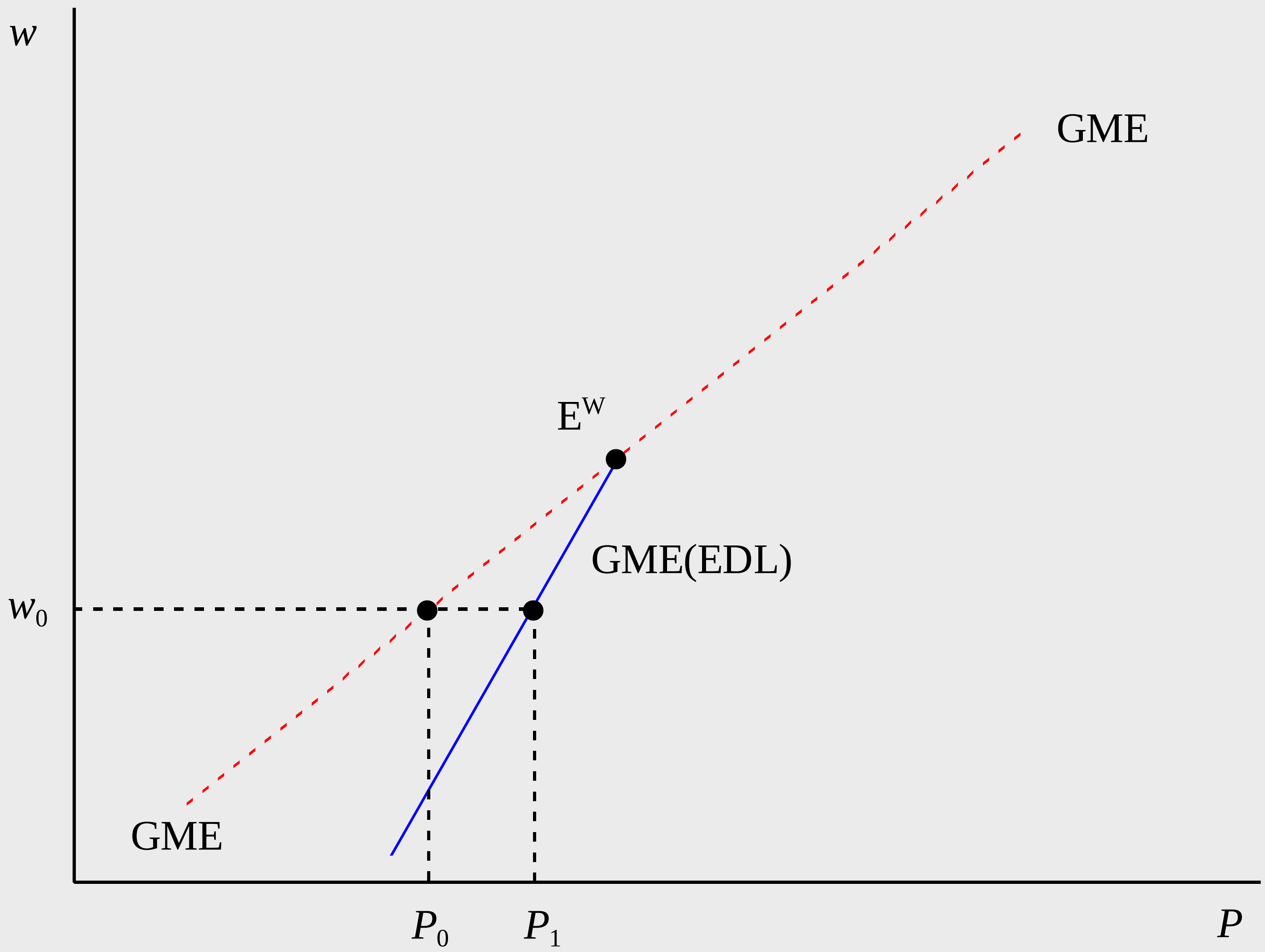

Figure C: GME and GME(EDL)

- LME(ESG) rotates clockwise w.r.t. LME. By definition we have:

$$\text{LME(ESG)} \quad : \quad N^S(w, \underset{+}{P}, M_0 + \Pi_0) = N^{DE}(\bar{Y}) \qquad \text{(a)}$$

$$\text{LME} \quad : \quad N^S(w, \underset{+}{P}, M_0 + \Pi_0) = N^D(w), \qquad \text{(b)}$$

$$\text{constraint} \quad : \quad \bar{Y} = C^D(\underset{-}{w}, P, M_0 + \Pi_0) + G$$

We know that firms are rationed due to the goods market constraint, i.e. $N^{DE} < N^D$. Hence, the notional labour supply in (a) is lower than that in (b). For a given real wage, this can only be the case if the price in (a) is lower than that in (b). Hence, LME(ESG) lies to the left of LME.

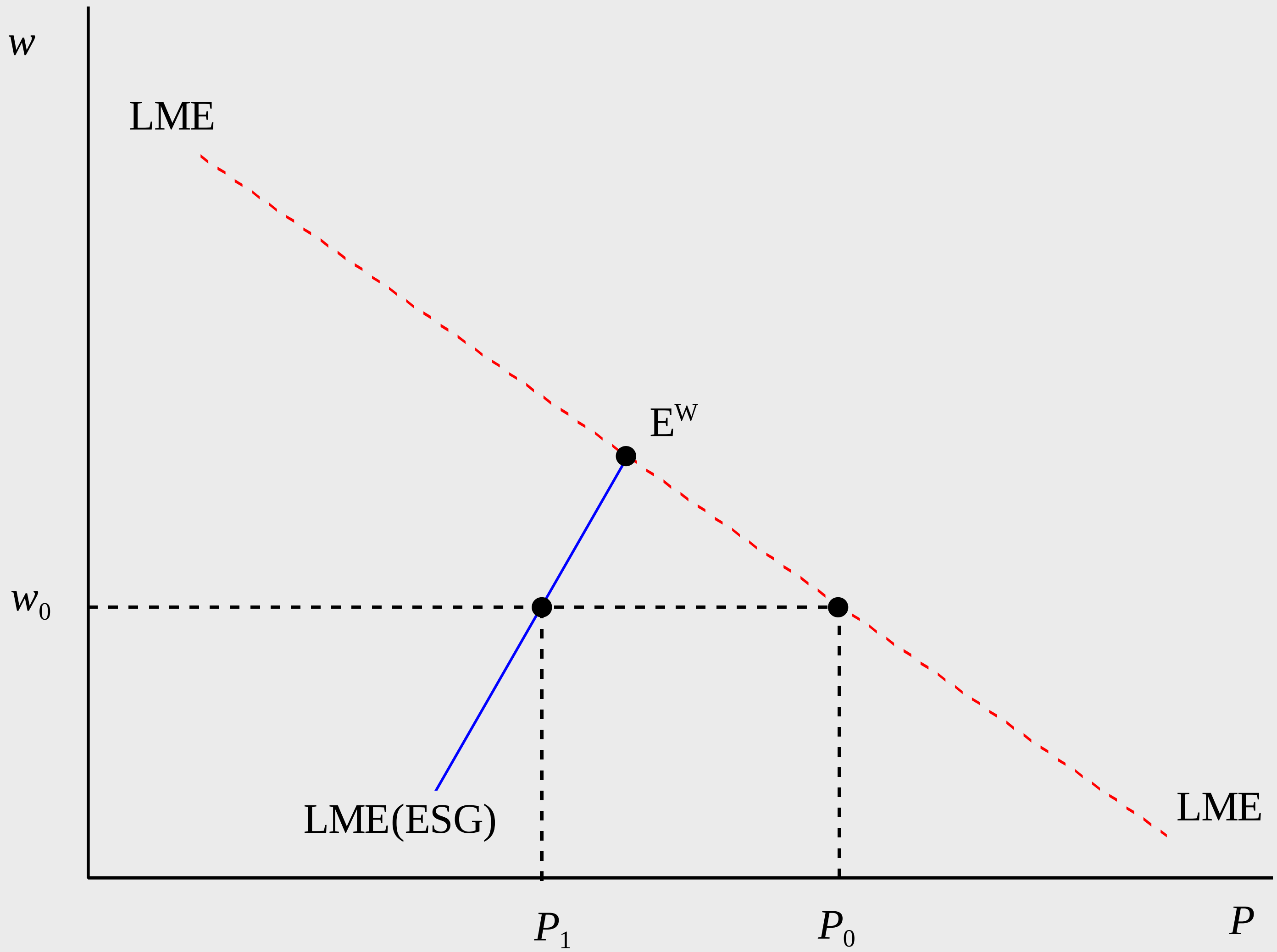

Figure D: LME and LME(ESG)

- GME(EDL) coincides with LME(ESG). By definition we have that:

$$\text{GME(EDL)} \quad : \quad C^D(w, \underset{+}{P}, M_0 + \Pi_0) + G = Y^{SE}(\bar{N})$$
$$\text{LME(ESG)} \quad : \quad N^S(w, \underset{+}{P}, M_0 + \Pi_0) = N^{DE}(\bar{Y})$$

We know that $N^{DE}(\bar{Y}) = \bar{N}$ and that $Y^{SE}(\bar{N}) = \bar{Y}$ as for firms one constraint implies the other. Hence, GME(EDL) and LME(ESG) coincide.

Fiscal and monetary policy in the rationing model

- Fiscal policy: a money financed increase in government consumption ($G \uparrow$)
- Monetary policy: a helicopter dropping of money at the beginning of the period ($M_0 \uparrow$)
- *Key result*: the effects depend on which regime the economy is in!!

Classical Unemployment regime (CU)

$$\bar{N} = N^D(\underset{-}{w}) < N^{SE}(\underset{+}{w}, \underset{+}{P}, \underset{+}{\bar{Y} - G}, \underset{-}{M_0 + \Pi_0}) \qquad \text{LME(CU)}$$

$$\bar{Y} = Y^S(\underset{-}{w}) < C^{DE}(\underset{+}{w\bar{N}}, \underset{-}{P}, \underset{+}{M_0 + \Pi_0}) + G \qquad \text{GME(CU)}$$

- $G \uparrow$: employment ($\bar{N}$) and output ($\bar{Y}$) not affected but $\bar{C} = \bar{Y} - G$ goes down [crowding out]. Household supply less labour so unemployment, $N^{SE} - \bar{N}$, goes down also.
- $M_0 \uparrow$: employment ($\bar{N}$) and output ($\bar{Y}$) not affected. Household supply less labour so unemployment, $N^{SE} - \bar{N}$, goes down. Excess demand in the goods market becomes worse.
- What does work? A reduction in the real wage ($w \downarrow$) boosts both employment and output. A very Classical recipe.

Keynesian Unemployment regime (KU)

$$\bar{N} = N^{DE}(\underset{+}{\bar{Y}}) < N^S(\underset{+}{w}, \underset{+}{P}, M_0 \underset{-}{+} \Pi_0) \qquad \text{LME(KU)}$$

$$\bar{Y} = C^{DE}(\underset{+}{w\bar{N}}, \underset{-}{P}, M_0 \underset{+}{+} \Pi_0) + G < Y^S(\underset{-}{w}) \qquad \text{GME(KU)}$$

- The KU equilibrium is illustrated in **Figure 5.4**.
- $G \uparrow$: boosts output ($\bar{Y} \uparrow$), effective demand for labour rises ($N^{DE} \uparrow$), employment rises ($\bar{N} \uparrow$), labour income rises ($w\bar{N} \uparrow$), effective demand for goods rises ($C^{DE} \uparrow$), further increase in output ($\bar{Y} \uparrow$). Hence, there is a multiplier effect!
- $M_0 \uparrow$: boosts the effective demand for goods ($C^{DE} \uparrow$), output ($\bar{Y} \uparrow$), effective demand for labour rises ($N^{DE} \uparrow$), employment rises ($\bar{N} \uparrow$), labour income rises ($w\bar{N} \uparrow$), effective demand for goods rises ($C^{DE} \uparrow$), further increase in output ($\bar{Y} \uparrow$). Hence, here also a multiplier effect!

- Hence, in the KU regime both monetary and fiscal policy are highly effective!
- The Classical recipe of cutting the real wage makes things worse because it chokes off the effective demand for goods!

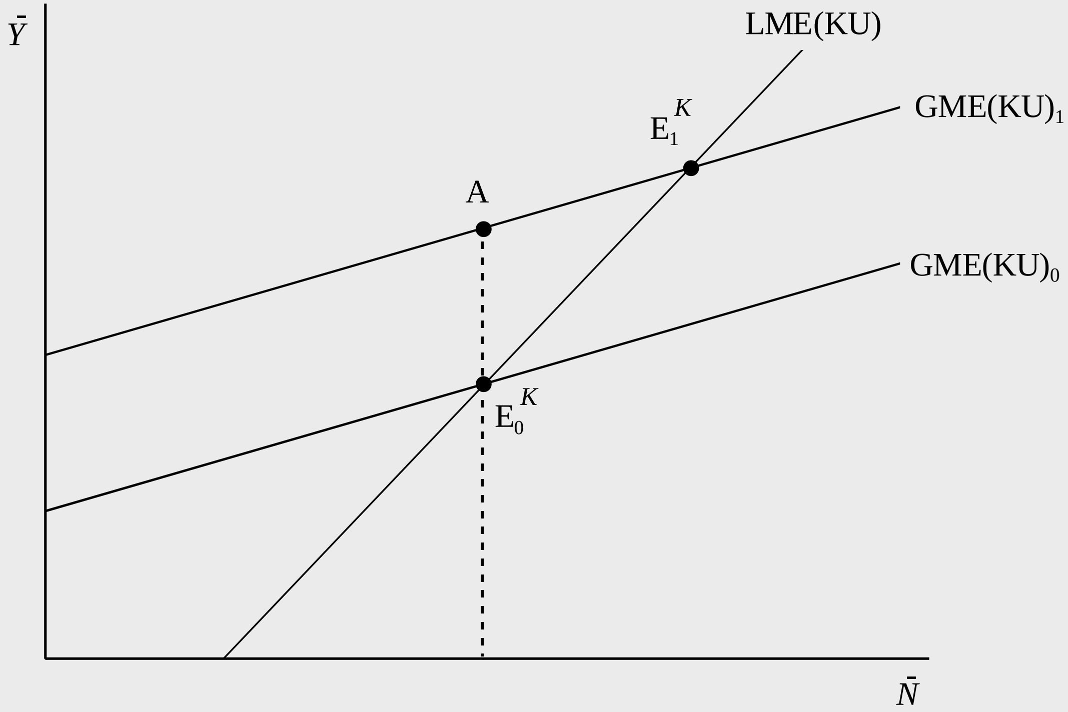

Figure 5.4: The Keynesian Unemployment Equilibrium and Fiscal Policy

Repressed Inflation regime (RI)

$$\bar{N} = N^{SE}(\underset{+}{w}, \underset{+}{P}, \bar{Y} \underset{+}{-} G, M_0 \underset{-}{+} \Pi_0) < N^D(\underset{-}{w}) \qquad \text{LME(RI)}$$

$$\bar{Y} = Y^{SE}(\underset{+}{\bar{N}}) < C^D(\underset{+}{w}, \underset{-}{P}, M_0 \underset{+}{+} \Pi_0) + G \qquad \text{GME(RI)}$$

- The RI equilibrium is illustrated in **Figure 5.5**.
- $G \uparrow$: reduces $\bar{C} = \bar{Y} - G$, effective supply of labour falls ($N^{SE} \downarrow$), employment falls ($\bar{N} \downarrow$), effective supply of goods falls ($Y^{SE} \downarrow$), further decrease in household consumption ($\bar{C} \downarrow$). Hence, there is a negative multiplier effect [called the supply multiplier]!
- $M_0 \uparrow$: effective supply of labour falls ($N^{SE} \downarrow$), employment falls ($\bar{N} \downarrow$), effective supply of goods falls ($Y^{SE} \downarrow$), decrease in household consumption ($\bar{C} \downarrow$). Hence, here also a negative multiplier effect!
- Hence, in the RI regime both monetary and fiscal policy are highly effective but in the

opposite direction! The economy is “overheated” and the government should cool things down by pursuing a contractionary policy

- The Classical recipe of cutting the real wage makes things worse because it chokes off the effective supply of labour!

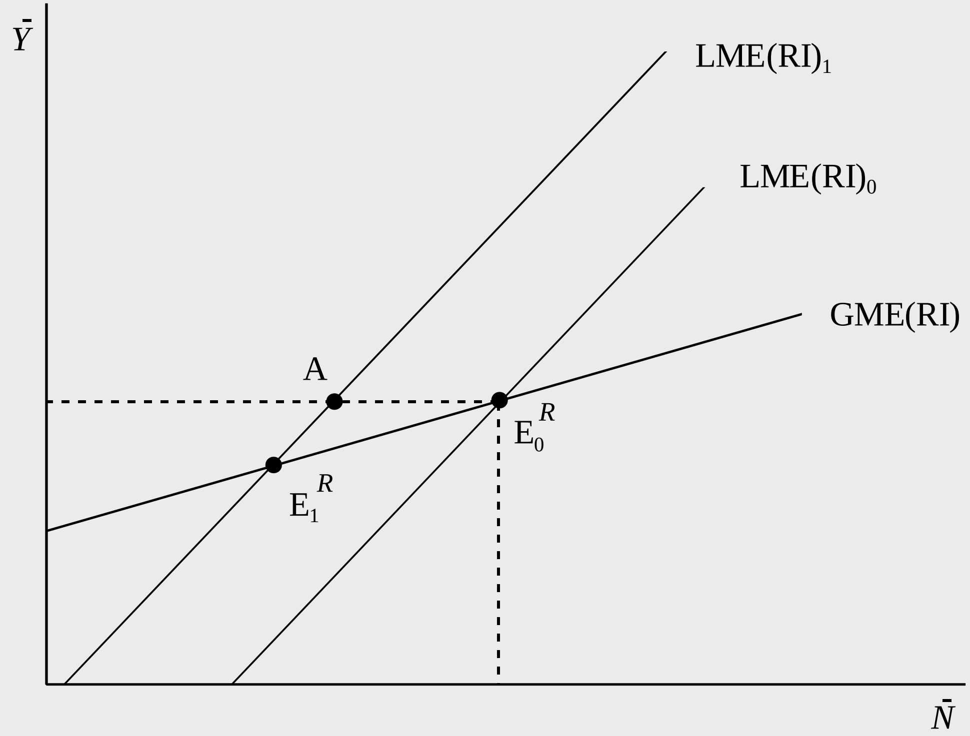

Figure 5.5: The Repressed Inflation Equilibrium and Fiscal Policy

Punchlines

- Lasting contributions of the quantity rationing approach
  - clarify the general equilibrium effects of incorrect [i.e. non-Walrasian] price and or real wage rate
  - policy choice is a subtle one: the level of the real wage may have nothing to do with unemployment [e.g. in the KU regime w is too low for full employment]
  - price- and wage stickiness is a fact of life [even though we do not exactly know why this is the case]. (Truman Bewley interviews)
- Weaknesses of the quantity rationing approach
  - rationing equilibria are not Pareto efficient: why don't agents facing a constraint bargain with unconstrained agents and change the wage or the price?
  - who sets the wage? [Chapter: trade unions] Who sets prices [see Chapter 13: monopolistic competition in the goods market]?

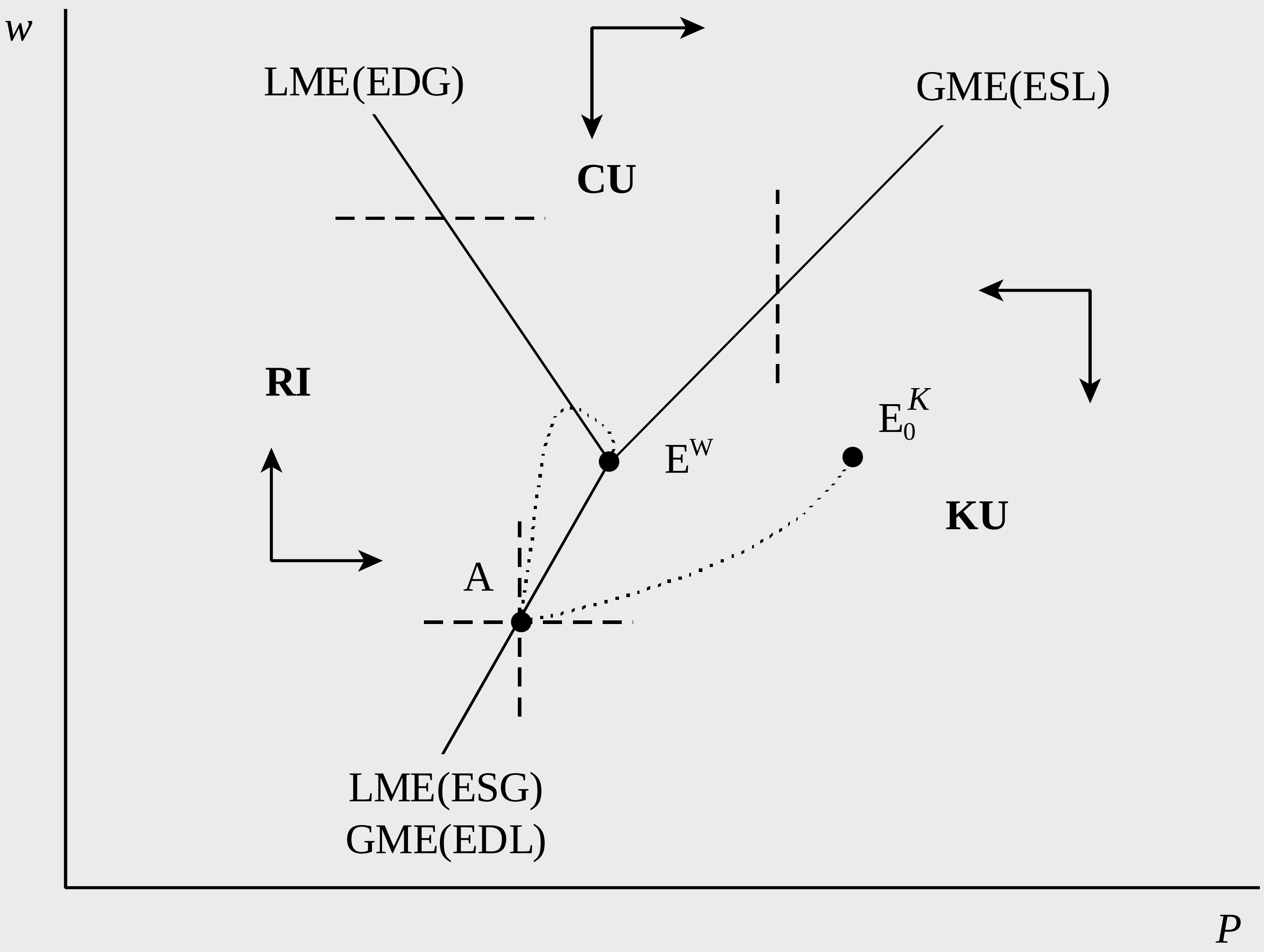

Figure 5.6: Wage and Price Dynamics and Stability

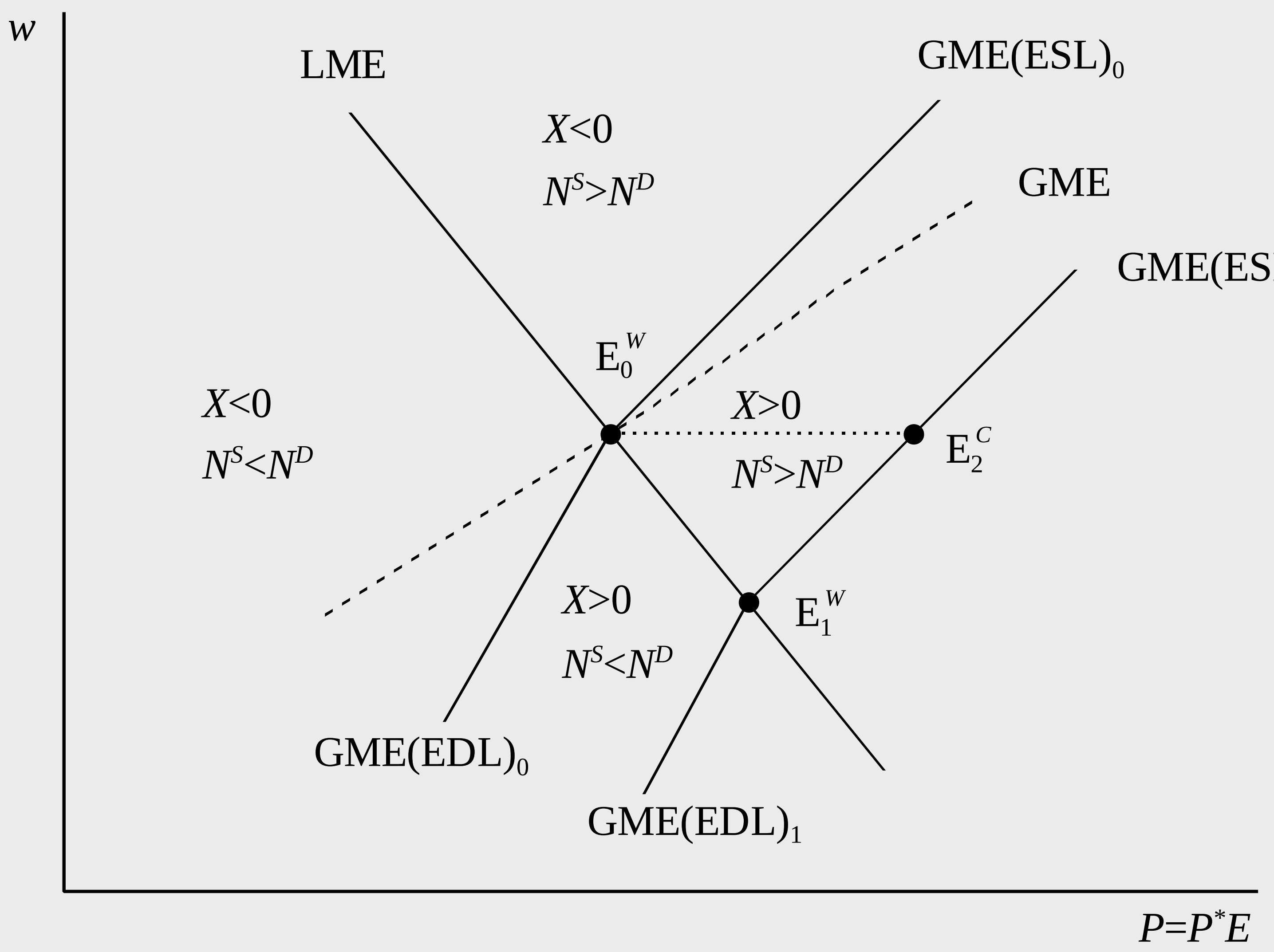

Figure 5.7: Rationing in the Small Open Economy

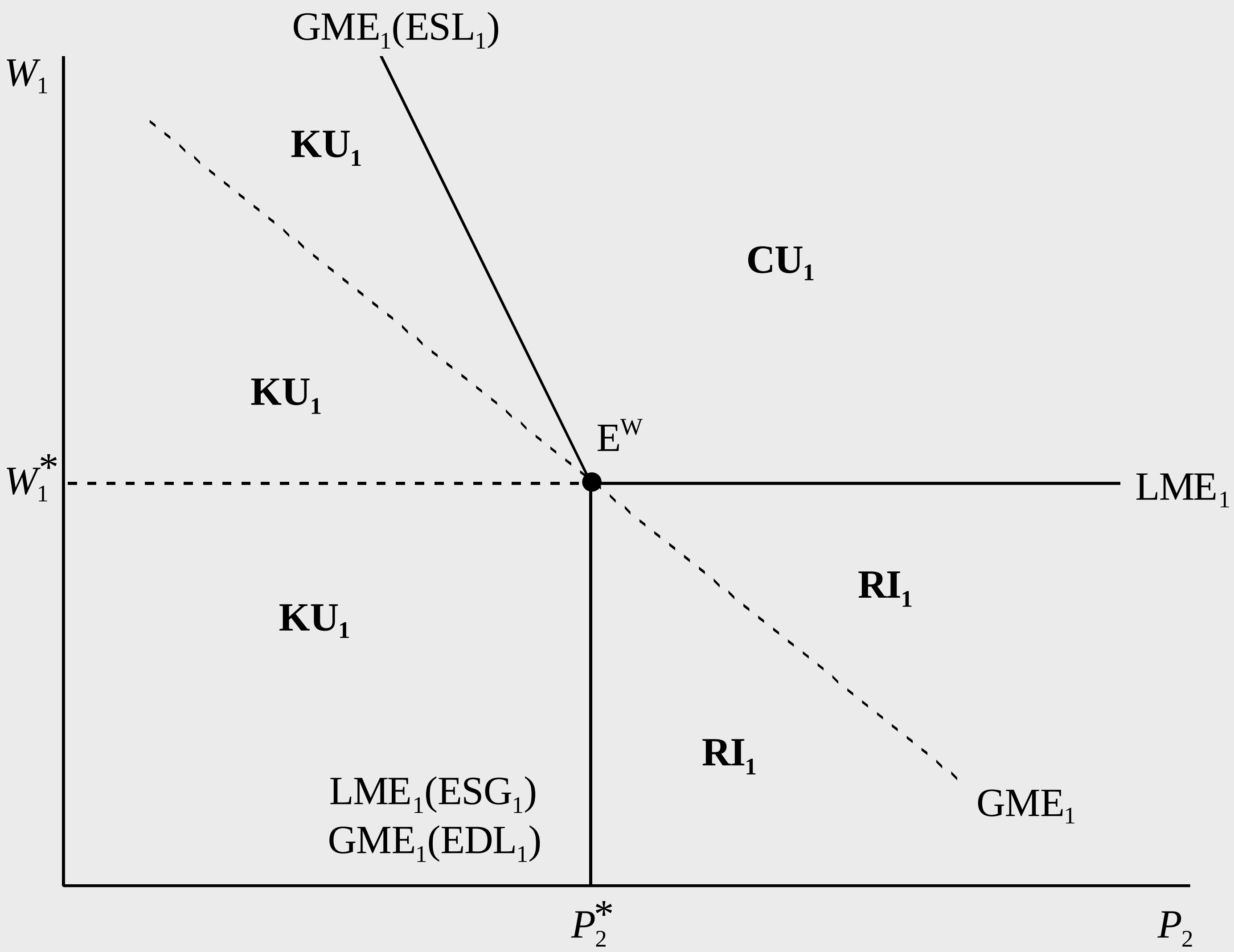

Figure 5.8: Notional and Effective Equilibria with Walrasian Expectations

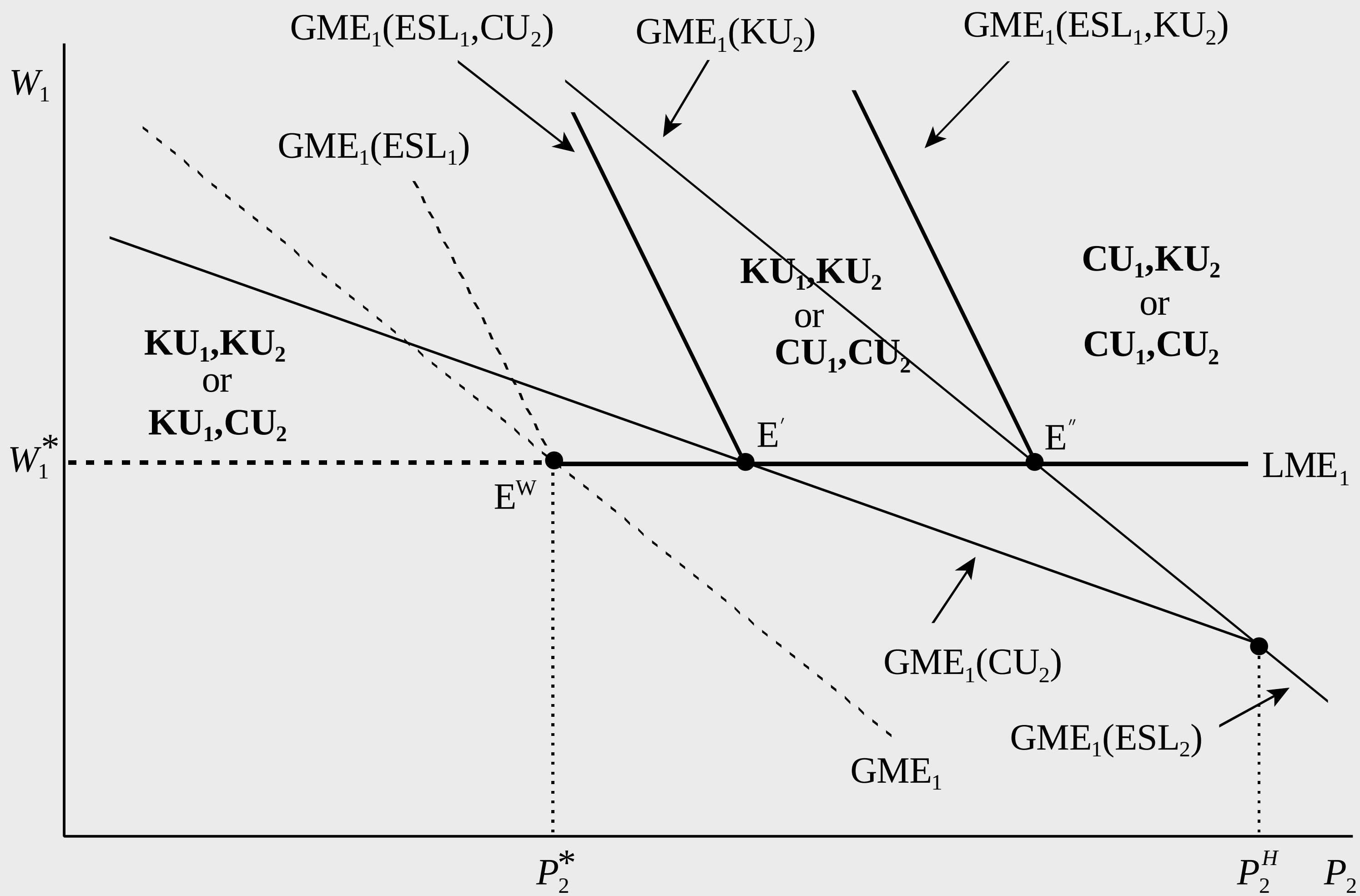

Figure 5.9: Effective Equilibrium With Expectations of Future KU or CU

Table 5.2. Effects on Output and Employment of Changes in Government Spending and the Money Supply

	Government spending	*Money supply*
Keynesian unemployment	$\frac{\partial \bar{N}}{\partial G} = \frac{N_Y^{DE}}{1-C_N^{DE} N_Y^{DE}} > 0$ $\frac{\partial \bar{Y}}{\partial G} = \frac{1}{1-C_N^{DE} N_Y^{DE}} > 0$	$\frac{\partial \bar{N}}{\partial M_0} = \frac{C_M^{DE} N_Y^{DE}}{1-C_N^{DE} N_Y^{DE}} > 0$ $\frac{\partial \bar{Y}}{\partial M_0} = \frac{C_M^{DE}}{1-C_N^{DE} N_Y^{DE}} > 0$
Classical unemployment	$\frac{\partial \bar{N}}{\partial G} = 0$ $\frac{\partial \bar{Y}}{\partial G} = 0$	$\frac{\partial \bar{N}}{\partial M_0} = 0$ $\frac{\partial \bar{Y}}{\partial M_0} = 0$
Repressed inflation	$\frac{\partial \bar{N}}{\partial G} = \frac{-N_C^{SE}}{1-N_C^{SE} Y_N^{SE}} < 0$ $\frac{\partial \bar{Y}}{\partial G} = \frac{-Y_N^{SE} N_C^{SE}}{1-N_C^{SE} Y_N^{SE}} < 0$	$\frac{\partial \bar{N}}{\partial M_0} = \frac{N_M^{SE}}{1-N_C^{SE} Y_N^{SE}} < 0$ $\frac{\partial \bar{Y}}{\partial M_0} = \frac{Y_N^{SE} N_M^{SE}}{1-N_C^{SE} Y_N^{SE}} < 0$

Table 5.3. Effects on output and employment of changes in the real wage rate and the price level

	Real wage	*Price level*
Keynesian unemployment	$\frac{\partial \bar{N}}{\partial w} = \frac{C_w^{DE} N_Y^{DE}}{1 - C_N^{DE} N_Y^{DE}} > 0$ $\frac{\partial \bar{Y}}{\partial w} = \frac{C_w^{DE}}{1 - C_N^{DE} N_Y^{DE}} > 0$	$\frac{\partial \bar{N}}{\partial P} = \frac{C_P^{DE} N_Y^{DE}}{1 - C_N^{DE} N_Y^{DE}} < 0$ $\frac{\partial \bar{Y}}{\partial P} = \frac{C_P^{DE}}{1 - C_N^{DE} N_Y^{DE}} < 0$
Classical unemployment	$\frac{\partial \bar{N}}{\partial w} = N_w^D < 0$ $\frac{\partial \bar{Y}}{\partial w} = Y_w^S < 0$	$\frac{\partial \bar{N}}{\partial P} = 0$ $\frac{\partial \bar{Y}}{\partial P} = 0$
Repressed inflation	$\frac{\partial \bar{N}}{\partial w} = \frac{N_w^{SE}}{1 - N_C^{SE} Y_N^{SE}} > 0$ $\frac{\partial \bar{Y}}{\partial w} = \frac{Y_N^{SE} N_w^{SE}}{1 - N_C^{SE} Y_N^{SE}} > 0$	$\frac{\partial \bar{N}}{\partial P} = \frac{N_P^{SE}}{1 - N_C^{SE} Y_N^{SE}} > 0$ $\frac{\partial \bar{Y}}{\partial P} = \frac{Y_N^{SE} N_P^{SE}}{1 - N_C^{SE} Y_N^{SE}} > 0$