Money in a model of prior production and imperfectly directed search

Adrian Masters

September 2010
The aim is to assess the welfare effects of inflation in retail markets.
The aim is to assess the welfare effects of inflation in retail markets.

In retail markets:

- Goods are typically made before the seller meets the eventual buyer.
- Goods are dated (e.g., by deterioration, fashion, technology).
- How much a buyer likes a good is his private information.
- Inflation tax: The difference between what money costs the buyer and what a seller gets for it.
- Present regardless of trading probability.
- Hot potato effect: The propensity to off-load cash more quickly if inflation increases.
- Reduces wastage of goods.
The aim is to assess the welfare effects of inflation in retail markets.

In retail markets:

- Goods are typically made before the seller meets the eventual buyer.
The aim is to assess the welfare effects of inflation in retail markets.

In retail markets:
- Goods are typically made before the seller meets the eventual buyer.
- Goods are dated (e.g. by deterioration, fashion, technology).
The aim is to assess the welfare effects of inflation in retail markets.

In retail markets:
- Goods are typically made before the seller meets the eventual buyer.
- Goods are dated (e.g. by deterioration, fashion, technology).
- How much a buyer likes a good is his private information.
The aim is to assess the welfare effects of inflation in retail markets.

In retail markets:
- Goods are typically made before the seller meets the eventual buyer.
- Goods are dated (e.g., by deterioration, fashion, technology).
- How much a buyer likes a good is his private information.

Inflation tax.

MOTIVATION
The aim is to assess the welfare effects of inflation in retail markets.

In retail markets:
- Goods are typically made before the seller meets the eventual buyer.
- Goods are dated (e.g. by deterioration, fashion, technology).
- How much a buyer likes a good is his private information.

Inflation tax
- The difference between what money costs the buyer and what a seller gets for it.
The aim is to assess the welfare effects of inflation in retail markets.

In retail markets:
- Goods are typically made before the seller meets the eventual buyer.
- Goods are dated (e.g. by deterioration, fashion, technology).
- How much a buyer likes a good is his private information.

Inflation tax
- The difference between what money costs the buyer and what a seller gets for it.
- Present regardless of trading probability.
The aim is to assess the welfare effects of inflation in retail markets.

In retail markets:
- Goods are typically made before the seller meets the eventual buyer.
- Goods are dated (e.g. by deterioration, fashion, technology).
- How much a buyer likes a good is his private information.

Inflation tax:
- The difference between what money costs the buyer and what a seller gets for it.
- Present regardless of trading probability.

Hot potato effect.
The aim is to assess the welfare effects of inflation in retail markets

In retail markets:
- Goods are typically made before the seller meets the eventual buyer
- Goods are dated (e.g. by deterioration, fashion, technology)
- How much a buyer likes a good is his private information.

Inflation tax
- The difference between what money costs the buyer and what a seller gets for it
- Present regardless of trading probability

Hot potato effect
- The propensity to off-load cash more quickly if inflation increases
The aim is to assess the welfare effects of inflation in retail markets.

In retail markets:
- Goods are typically made before the seller meets the eventual buyer.
- Goods are dated (e.g., by deterioration, fashion, technology).
- How much a buyer likes a good is his private information.

Inflation tax
- The difference between what money costs the buyer and what a seller gets for it.
- Present regardless of trading probability.

Hot potato effect
- The propensity to off-load cash more quickly if inflation increases.
- Reduces wastage of goods.
Model is a variant of Rocheteau and Wright [2005] in which...
Model is a variant of Rocheteau and Wright [2005] in which sellers produce search market good at end of centralized market.
Model is a variant of Rocheteau and Wright [2005] in which

- sellers produce search market good at end of centralized market
- goods, once made, are indivisible and perishable
Model is a variant of Rocheteau and Wright [2005] in which

- sellers produce search market good at end of centralized market
- goods, once made, are indivisible and perishable
- buyers have general and idiosyncratic preferences over search goods
Model is a variant of Rocheteau and Wright [2005] in which

- sellers produce search market good at end of centralized market
- goods, once made, are indivisible and perishable
- buyers have general and idiosyncratic preferences over search goods

It introduces two new decision margins:
• Model is a variant of Rocheteau and Wright [2005] in which
  • sellers produce search market good at end of centralized market
  • goods, once made, are indivisible and perishable
  • buyers have general and idiosyncratic preferences over search goods

• It introduces two new decision margins:
  • Sellers decide on the general quality of the good
Model is a variant of Rocheteau and Wright [2005] in which

- sellers produce search market good at end of centralized market
- goods, once made, are indivisible and perishable
- buyers have general and idiosyncratic preferences over search goods

It introduces two new decision margins:

- Sellers decide on the general quality of the good
- Buyers set a reservation idiosyncratic preference shock
Model is a variant of Rocheteau and Wright [2005] in which

- sellers produce search market good at end of centralized market
- goods, once made, are indivisible and perishable
- buyers have general and idiosyncratic preferences over search goods

It introduces two new decision margins:

- Sellers decide on the general quality of the good
- Buyers set a reservation idiosyncratic preference shock

Entry cost for sellers endogenous
- Competitive search
Competitive search

- Rocheteau and Wright [2005]
**Competitive search**

- Rocheteau and Wright [2005]
- Faig and Huangfu [2007]
LITERATURE

- **Competitive search**
  - Rocheteau and Wright [2005]
  - Faig and Huangfu [2007]

- **Prior production:**
LITERATURE

- **Competitive search**
  - Rocheteau and Wright [2005]
  - Faig and Huangfu [2007]

- **Prior production:**
  - Dutu and Julien [2008]
LITERATURE

- **Competitive search**
  - Rocheteau and Wright [2005]
  - Faig and Huangfu [2007]

- **Prior production:**
  - Dutu and Julien [2008]
  - Jafarey and Masters [2003]
• Competitive search
  • Rocheteau and Wright [2005]
  • Faig and Huangfu [2007]

• Prior production:
  • Dutu and Julien [2008]
  • Jafarey and Masters [2003]

• Hot potato effect
**LITERATURE**

- **Competitive search**
  - Rocheteau and Wright [2005]
  - Faig and Huangfu [2007]

- **Prior production:**
  - Dutu and Julien [2008]
  - Jafarey and Masters [2003]

- **Hot potato effect**
  - Liu, Wang and Wright [2009]
LITERATURE

- **Competitive search**
  - Rocheteau and Wright [2005]
  - Faig and Huangfu [2007]

- **Prior production:**
  - Dutu and Julien [2008]
  - Jafarey and Masters [2003]

- **Hot potato effect**
  - Liu, Wang and Wright [2009]
  - Nosal [2009]
LITERATURE

- **Competitive search**
  - Rocheteau and Wright [2005]
  - Faig and Huangfu [2007]

- **Prior production:**
  - Dutu and Julien [2008]
  - Jafarey and Masters [2003]

- **Hot potato effect**
  - Liu, Wang and Wright [2009]
  - Nosal [2009]

- **Private information**
LITERATURE

- **Competitive search**
  - Rocheteau and Wright [2005]
  - Faig and Huangfu [2007]

- **Prior production:**
  - Dutu and Julien [2008]
  - Jafarey and Masters [2003]

- **Hot potato effect**
  - Liu, Wang and Wright [2009]
  - Nosal [2009]

- **Private information**
  - Ennis [2008]
LITERATURE

- **Competitive search**
  - Rocheteau and Wright [2005]
  - Faig and Huangfu [2007]

- **Prior production:**
  - Dutu and Julien [2008]
  - Jafarey and Masters [2003]

- **Hot potato effect**
  - Liu, Wang and Wright [2009]
  - Nosal [2009]

- **Private information**
  - Ennis [2008]
  - Faig and Jerez [2006]
Time is discrete and continues forever.
ENVIRONMENT: Time and Demography

- Time is discrete and continues forever.
- Every period of time is divided into 2 subperiods: day and night.
Time is discrete and continues forever.

Every period of time is divided into 2 subperiods: day and night.

- **Day**: Centralized frictionless market for a homogeneous and perfectly divisible good.

- **Night**: Trade occurs in a decentralized market characterized by search frictions.

There are two types of infinite-lived individual in the model:

- **Buyers**: Mass 1. Consume the good produced in the night market.
- **Sellers**: Mass $\bar{n}$. Produce the night market good.

Both buyers and sellers produce and consume the day market good. All buyers enter the night market but for sellers, it's a choice.
ENVIRONMENT: Time and Demography

- Time is discrete and continues forever.
- Every period of time is divided into 2 subperiods: day and night.
  - **Day**: Centralized frictionless market for a homogeneous and perfectly divisible good.
  - **Night**: Trade occurs in a decentralized market characterized by search frictions.
ENVIRONMENT: Time and Demography

- Time is discrete and continues forever.
- Every period of time is divided into 2 subperiods: day and night.
  - **Day**: Centralized frictionless market for a homogeneous and perfectly divisible good.
  - **Night**: Trade occurs in a decentralized market characterized by search frictions.
- There are two types of infinite lived individual in the model:
ENVIRONMENT: Time and Demography

- Time is discrete and continues forever.
- Every period of time is divided into 2 subperiods: day and night.
  - **Day**: Centralized frictionless market for a homogeneous and perfectly divisible good.
  - **Night**: Trade occurs in a decentralized market characterized by search frictions.
- There are two types of infinite lived individual in the model
  - **Buyers**: (Mass 1) Consume the good produced in the night market
Time is discrete and continues forever.

Every period of time is divided into 2 subperiods: day and night.

- **Day:** Centralized frictionless market for a homogeneous and perfectly divisible good.
- **Night:** Trade occurs in a decentralized market characterized by search frictions.

There are two types of infinite lived individual in the model

- **Buyers:** (Mass 1) Consume the good produced in the night market
- **Sellers:** (Mass $\bar{n}$) Produce the night market good.
ENVIRONMENT: Time and Demography

- Time is discrete and continues forever.
- Every period of time is divided into 2 subperiods: day and night.
  - **Day:** Centralized frictionless market for a homogeneous and perfectly divisible good.
  - **Night:** Trade occurs in a decentralized market characterized by search frictions.
- There are two types of infinite lived individual in the model
  - **Buyers:** (Mass 1) Consume the good produced in the night market
  - **Sellers:** (Mass $\bar{n}$) Produce the night market good.
- Both buyers and sellers produce and consume the day market good
Time is discrete and continues forever.

Every period of time is divided into 2 subperiods: day and night.

**Day:** Centralized frictionless market for a homogeneous and perfectly divisible good.

**Night:** Trade occurs in a decentralized market characterized by search frictions.

There are two types of infinite lived individual in the model

- **Buyers:** (Mass 1) Consume the good produced in the night market
- **Sellers:** (Mass $\bar{n}$) Produce the night market good.

Both buyers and sellers produce and consume the day market good

All buyers enter the night market but for sellers it’s a choice.
Time is discrete and continues forever.

Every period of time is divided into 2 subperiods: day and night.

- **Day:** Centralized frictionless market for a homogeneous and perfectly divisible good.
- **Night:** Trade occurs in a decentralized market characterized by search frictions.

There are two types of infinite lived individual in the model

- **Buyers:** (Mass 1) Consume the good produced in the night market
- **Sellers:** (Mass $\bar{n}$) Produce the night market good.

Both buyers and sellers produce and consume the day market good

All buyers enter the night market but for sellers it’s a choice.

Both day and night goods are perishable
ENVIROMENT: Preferences

Date $t$ Instantaneous utility

buyers: $U^b_t = v(x_t) - y_t + \beta_d \varepsilon u(q_t)$

sellers: $U^s_t = v(x_t) - y_t - c(q_t)$

$x_t$ is the quantity of the day good consumed

$y_t$ is the quantity of day good produced

$q_t$ is quality of the night good consumed/produced

$v(.):$ increasing, strictly concave,

$\beta_d \leq 1$ is a common discount factor between day and night.

$\varepsilon \sim G(.)$ is match-specific taste shock (support $[0, \bar{\varepsilon}]$)

$u(.):$ increasing, strictly concave, $u(0) = 0, u'(0) = \infty$

$c(.):$ increasing, strictly convex, $c(0) = c'(0) = 0$
ENVIRONMENT: Preferences (cont.)

- Special values, \( x^* \), \( \bar{\epsilon} \) and \( \bar{q} \):

  \[
  v'(x^*) = 1, \text{ normalization } v(x^*) = x^* \\
  \bar{\epsilon} = \mathbb{E}(\epsilon) \\
  \beta_d \bar{\epsilon} u(\bar{q}) = c(\bar{q})
  \]
Special values, $x^*$, $\bar{\varepsilon}$ and $\bar{q}$:

- $v'(x^*) = 1$, normalization $v(x^*) = x^*$
- $\bar{\varepsilon} = E(\varepsilon)$
- $\beta_d \bar{\varepsilon} u(\bar{q}) = c(\bar{q})$

Lifetime utility of an individual type $i = b, s$ is

$$\sum_{t=0}^{\infty} \beta^t U^i_t.$$ 

where,

$$\beta = \beta_n \beta_d$$

$\beta_n \leq 1$ is a common discount factor between night and day.
In a market where the ratio of sellers to buyers is $n$, 

\[ \alpha(n) \]

\[ \frac{\alpha(n)}{n} = 0, \quad \alpha_0(0) > 0, \quad \alpha_{00}(n) < 0 \text{ and } \lim_{n \to \infty} \alpha(n) = 1. \]

For $\alpha(n)$, $\alpha(n)/n$ to be probabilities, $\alpha(n)$ decreasing, guaranteed if $\alpha_0(0) = 1$. 

A. Masters (SUNY Albany)
In a market where the ratio of sellers to buyers is \( n \),
- The probability with which a buyer meets a seller is \( \alpha(n) \)
In a market where the ratio of sellers to buyers is $n$,

- The probability with which a buyer meets a seller is $\alpha(n)$
- The probability with which a seller meets a buyer is $\alpha(n)/n$
In a market where the ratio of sellers to buyers is $n$,

- The probability with which a buyer meets a seller is $\alpha(n)$
- The probability with which a seller meets a buyer is $\frac{\alpha(n)}{n}$

$\alpha(0) = 0$, $\alpha'(n) > 0$, $\alpha''(n) < 0$ and $\lim_{n \to \infty} \alpha(n) = 1$. 
In a market where the ratio of sellers to buyers is $n$,
- The probability with which a buyer meets a seller is $\alpha(n)$
- The probability with which a seller meets a buyer is $\frac{\alpha(n)}{n}$

$\alpha(0) = 0$, $\alpha'(n) > 0$, $\alpha''(n) < 0$ and $\lim_{n \to \infty} \alpha(n) = 1$.

For $\alpha(n)$, $\frac{\alpha(n)}{n}$ to be probabilities, $\alpha(n) \leq \min\{1, n\}$.
ENVIRONMENT: Matching (night market)

- In a market where the ratio of sellers to buyers is \( n \),
  - The probability with which a buyer meets a seller is \( \alpha(n) \)
  - The probability with which a seller meets a buyer is \( \frac{\alpha(n)}{n} \)

- \( \alpha(0) = 0, \alpha'(n) > 0, \alpha''(n) < 0 \) and \( \lim_{n \to \infty} \alpha(n) = 1. \)
- For \( \alpha(n) \), \( \alpha(n)/n \) to be probabilities, \( \alpha(n) \leq \min\{1, n\} \)
- CRS of underlying technology requires \( \alpha(n)/n \) decreasing, guaranteed if \( \alpha'(0) = 1. \)
Planner’s objective function,

\[ W(x, n, q; \tilde{n}) \equiv [v(x) - x] (1 + \tilde{n}) + \beta_d \alpha(n) \tilde{\epsilon}u(q) - nc(q) \]
Planer's objective function,

\[ W(x, n, q; \bar{n}) \equiv [v(x) - x] (1 + \bar{n}) + \beta_d \alpha(n) \bar{e}u(q) - nc(q) \]

Planer's problem:

\[
\max_{x, n, q} W(x, n, q; \bar{n}) \quad \text{subject to } n \leq \bar{n}.
\]
F.O.C’s:

\[ x : \quad \nu'(x_p) = 1 \]
\[ n : \quad \beta_d \alpha'(n_p) \tilde{\epsilon}u(q_p) - c(q_p) = 0 \]
\[ q : \quad \beta_d \alpha(n_p) \tilde{\epsilon}u'(q_p) - n_p c'(q_p) = 0 \]
F.O.C’s:

\[ x : \quad \nu'(x_p) = 1 \]
\[ n : \quad \beta_d \alpha'(n_p) \bar{\epsilon} u(q_p) - c(q_p) = 0 \]
\[ q : \quad \beta_d \alpha(n_p) \bar{\epsilon} u'(q_p) - n_p c'(q_p) = 0 \]

\( x_p = x^* \), a solution, \( (n_p, q_p) \) exists in \( (0, \bar{n}] \times (0, \bar{q}) \)
EFFICIENCY (cont.)

- F.O.C’s:

\[
\begin{align*}
x : & \quad v'(x_p) = 1 \\
n : & \quad \beta_d \alpha'(n_p) \tilde{\epsilon} u(q_p) - c(q_p) = 0 \\
q : & \quad \beta_d \alpha(n_p) \tilde{\epsilon} u'(q_p) - n_p c'(q_p) = 0
\end{align*}
\]

- \(x_p = x^*\), a solution, \((n_p, q_p)\) exists in \((0, \bar{n}] \times (0, \bar{q})\)

- Dividing the \(n\) equation by the \(q\) equation and multiply through by \(q\):

\[
e_u(q_p) = \eta(n_p) e_c(q_p)
\]

where \(e_u(.)\) is the elasticity of \(u(.)\), \(e_c(.)\) is the elasticity of \(c(.)\) and \(\eta(.)\) is the elasticity of \(\alpha(.)\).
Lack of a coincidence of wants makes money essential in the search market.
Market Economy: Money

- Lack of a coincidence of wants makes money essential in the search market.
- Money is perfectly divisible and agents can hold any non-negative amount.
Market Economy: Money

- Lack of a coincidence of wants makes money essential in the search market.
- Money is perfectly divisible and agents can hold any non-negative amount.
- Aggregate nominal money supply: $M_t$
Lack of a coincidence of wants makes money essential in the search market.

Money is perfectly divisible and agents can hold any non-negative amount.

Aggregate nominal money supply: $M_t$

Grows at constant gross rate $\gamma \geq \beta$ so that $M_{t+1} = \gamma M_t$. 
Lack of a coincidence of wants makes money essential in the search market.

Money is perfectly divisible and agents can hold any non-negative amount.

Aggregate nominal money supply: \( M_t \)

Grows at constant gross rate \( \gamma \geq \beta \) so that \( M_{t+1} = \gamma M_t \).

New money is injected or withdrawn by lump-sum transfers.
The day market price of goods normalized to 1

In steady-state (aggregate real variables are constant over time)

$$\phi_t + 1 = \frac{\phi_t}{\gamma}.$$ 

So real value in \(t + 1\) of \(m_t\) is 

$$\frac{\phi_t m_t}{\gamma} = \frac{z_t}{\gamma}.$$
The day market price of goods normalized to 1
The relative price of money is denoted $\phi_t$. 
The day market price of goods normalized to 1
The relative price of money is denoted $\phi_t$.
$z_t = \phi_t m_t$ used as choice variable
The day market price of goods normalized to 1

The relative price of money is denoted \( \phi_t \).

\[ z_t = \phi_t m_t \] used as choice variable

In steady-state (aggregate real variables are constant over time)

\[ \phi_{t+1} = \phi_t / \gamma. \]
The day market price of goods normalized to 1
The relative price of money is denoted $\phi_t$.
$z_t = \phi_t m_t$ used as choice variable
In steady-state (aggregate real variables are constant over time)
$\phi_{t+1} = \phi_t / \gamma$.
So real value in $t + 1$ of $m_t$ is $\phi_t m_t / \gamma = z_t / \gamma$. 
In the morning, sellers announce their intention to enter and $(q, d)$
In the morning, sellers announce their intention to enter and \((q, d)\).

- \(q\) is the quality of the good they will bring to the night market.
In the morning, sellers announce their intention to enter and \((q, d)\)
- \(q\) is the quality of the good they will bring to the night market
- \(d\) is the real price at which they will part with it \((\phi_t p_t)\)
In the morning, sellers announce their intention to enter and \((q, d)\)
- \(q\) is the quality of the good they will bring to the night market
- \(d\) is the real price at which they will part with it \((\phi_t p_t)\)

Buyers use the announced values of \((q, d)\) to direct their search.
In the morning, sellers announce their intention to enter and \((q, d)\)
- \(q\) is the quality of the good they will bring to the night market
- \(d\) is the real price at which they will part with it \((\phi_t p_t)\)

Buyers use the announced values of \((q, d)\) to direct their search.

Buyers choose cash holding \(z = d\)
Market Economy: submarkets and directed search

- In the morning, sellers announce their intention to enter and \((q, d)\)
  - \(q\) is the quality of the good they will bring to the night market
  - \(d\) is the real price at which they will part with it \((\phi_t p_t)\)
- Buyers use the announced values of \((q, d)\) to direct their search.
- Buyers choose cash holding \(z = d\)
- Submarkets characterized by \(\omega = (z, q, n)\) \((n\) is sellers per buyer)
In the morning, sellers announce their intention to enter and \((q, d)\)
- \(q\) is the quality of the good they will bring to the night market
- \(d\) is the real price at which they will part with it \((\phi_t p_t)\)

Buyers use the announced values of \((q, d)\) to direct their search.

Buyers choose cash holding \(z = d\)

Submarkets characterized by \(\omega = (z, q, n)\) \((n\) is sellers per buyer\)

In submarket \(\omega\), meeting probabilities are \(\alpha(n)\) and \(\alpha(n)/n\)
Market Economy: value functions

- $W^i(z)$, is value to entering the day market with (current period) real money holding $z, i = s, b$
Market Economy: value functions

- $W^i(z)$ is value to entering the day market with (current period) real money holding $z$, $i = s, b$
- $V^i(\omega)$ is (present discounted expected) value to entering (night) submarket $\omega$ for $i = s, b$
Market Economy: day market

- **Buyers**: choose production, consumption and which night market to enter

\[
W^b(z) = \max_{x,y,\hat{\omega}} \left\{ v(x) - y + \beta_d V^b(\hat{\omega}) \right\}
\]

subject to \( \hat{z} + x = z + T + y, \quad y \geq 0 \)
Market Economy: day market

- **Buyers**: choose production, consumption and which night market to enter

\[ W^b(z) = \max_{x,y,\hat{\omega}} \left\{ v(x) - y + \beta_d V^b(\hat{\omega}) \right\} \]

subject to \( \hat{\omega} + x = z + T + y, \quad y \geq 0 \)

- **Sellers**: choose production, consumption and which night market to enter

\[ W^s(z) = \max_{x,y,\hat{\omega}} \left\{ v(x) - y + \max \left[ \beta_d V^s(\hat{\omega}) - c(\hat{q}), \beta W^s(0) \right] \right\} \]

subject to \( \hat{\omega} + x = z + y, \quad y \geq 0 \)
Day market outcomes

- Ignore non-negativity of $y$ ($v(.)$ can be chosen so it does not bind)
Day market outcomes

- Ignore non-negativity of $y$ ($v(.)$ can be chosen so it does not bind)
- $x = x^*$ for both buyers and sellers
Ignore non-negativity of $y$ ($v(.)$ can be chosen so it does not bind)

$x = x^*$ for both buyers and sellers

For sellers, $\hat{z} = 0$
Day market outcomes

- Ignore non-negativity of $y$ ($v(.)$ can be chosen so it does not bind)
- $x = x^*$ for both buyers and sellers
- For sellers, $\hat{z} = 0$
- For buyers, $\hat{z}$ does not depend on $z$. 
Day market outcomes

- Ignore non-negativity of $y$ ($v(\cdot)$ can be chosen so it does not bind)
- $x = x^*$ for both buyers and sellers
- For sellers, $\hat{z} = 0$
- For buyers, $\hat{z}$ does not depend on $z$.
- $W^i(z) = z + W^i(0)$
Market Economy: night market,

- **Buyers:**

\[
V^b(\omega) = \alpha(n) \mathbb{E}_\varepsilon \left[ \max \left\{ \varepsilon u(q) + \beta_n W^b(0), \beta_n W^b \left( \frac{z}{\gamma} \right) \right\} \right] \\
+ (1 - \alpha(n)) \beta_n W^b \left( \frac{z}{\gamma} \right)
\]
Market Economy: night market,

- **Buyers:**

\[
V^b(\omega) = \alpha(n)\mathbb{E}_\varepsilon \left[ \max \left\{ \varepsilon u(q) + \beta_n W^b(0), \beta_n W^b \left( \frac{z}{\gamma} \right) \right\} \right] \\
+ (1 - \alpha(n))\beta_n W^b \left( \frac{z}{\gamma} \right)
\]

- If \( \varepsilon_R = \beta_n z / \gamma u(q) \), reservation value of \( \varepsilon \).

\[
V^b(\omega) = \alpha(n)u(q)S_G(\varepsilon_R) + \beta_n W^b \left( \frac{z}{\gamma} \right)
\]

where

\[
S_G(\varepsilon_R) = \int_{\varepsilon_R}^{\overline{\varepsilon}} [\varepsilon - \varepsilon_R] dG(\varepsilon)
\]
Sellers:

\[ V^s(\omega) = \frac{\alpha(n)}{n} [1 - G(\varepsilon_R)] \beta_n W^s \left( \frac{z}{\gamma} \right) \]

\[ + \left( 1 - \frac{\alpha(n)}{n} [1 - G(\varepsilon_R)] \right) \beta_n W^s(0) \]
Sellers:

\[ V_s(\omega) = \frac{\alpha(n)}{n} [1 - G(\varepsilon_R)] \beta_n W_s \left( \frac{z}{\gamma} \right) \]

\[ + \left( 1 - \frac{\alpha(n)}{n} [1 - G(\varepsilon_R)] \right) \beta_n W_s(0) \]

or

\[ V_s(\omega) = \frac{\alpha(n)}{n\gamma} [1 - G(\varepsilon_R)] \beta_n z + \beta_n W_s(0) \]
Market Economy: equilibrium

Definition

A symmetric, competitive search equilibrium is a submarket, \( \tilde{\omega} = (\tilde{z}, \tilde{q}, \tilde{n}) \) such that given all other buyers and sellers enter \( \tilde{\omega} \), then \( \tilde{\omega} \) solves both the individual buyer’s (morning) problem, and the individual seller’s (morning) problem subject to

\[
\beta_d V^s(\hat{\omega}) - c(\hat{q}) = \beta_d V^s(\tilde{\omega}) - c(\tilde{q}) \begin{cases} 
= \beta W^s(0) & \text{for } \tilde{n} \leq \bar{n} \\
\geq \beta W^s(0) & \text{for } \tilde{n} = \bar{n}
\end{cases}
\]
Degenerate $G$ (a spike at $\bar{\varepsilon}$):

- Under **free entry** (duality implies),

$$\tilde{\omega} \in \arg \max_{\omega} \left\{ \beta_d V^b(\omega) - z \right\}$$

subject to $\beta_d V^s(\omega) - c(q) = \beta W^s(0)$
Market Economy: characterization

Degenerate $G$ (a spike at $\bar{e}$):

- Under **free entry** (duality implies),

$$\tilde{\omega} \in \arg \max_{\omega} \left\{ \beta_d V^b(\omega) - z \right\}$$
subject to $\beta_d V^s(\omega) - c(q) = \beta W^s(0)$

- Substituting for value functions and eliminating $z$, $(\tilde{n}, \tilde{q})$ solves

$$\max_{(n,q) \in [0,\bar{n}] \times [0,\infty)} \left\{ \beta_d \alpha(n) \bar{e}u(q) - nc(q) - \left( \frac{nc(q)}{\alpha(n)\beta} \right) [\gamma - \beta] + \beta W^b(0) \right\}$$

At Friedman rule, $\gamma = \beta$, same as Planner's problem

In general, ...rst-order conditions imply $e_u(q) = \eta(n) [\gamma \beta + \alpha(n) \beta] + c(q)$.

Equilibrium unique if $u(n), c(q)$ isoelastic and $\eta(n)$ monotone.
Degenerate $G$ (a spike at $\bar{e}$):

- Under **free entry** (duality implies),

$$
\tilde{\omega} \in \text{arg max}_{\omega} \left\{ \beta_d V^b(\omega) - z \right\}
$$
subject to $\beta_d V^s(\omega) - c(q) = \beta W^s(0)$

- Substituting for value functions and eliminating $z$, $(\tilde{n}, \tilde{q})$ solves

$$
\max_{(n,q) \in [0,\bar{n}] \times [0,\infty)} \left\{ \beta_d \alpha(n) \bar{e} u(q) - nc(q) - \left( \frac{nc(q)}{\alpha(n)\beta} \right) [\gamma - \beta] + \beta W^b(0) \right\}
$$

- At Friedman rule, $\gamma = \beta$, same as Planner’s problem
Market Economy: characterization

Degenerate \( G \) (a spike at \( \bar{\epsilon} \)):

- Under **free entry** (duality implies),

  \[ \tilde{\omega} \in \arg \max_{\omega} \left\{ \beta_d V^b(\omega) - z \right\} \]
  subject to \( \beta_d V^s(\omega) - c(q) = \beta W^s(0) \)

- Substituting for value functions and eliminating \( z \), \((\tilde{n}, \tilde{q})\) solves

  \[ \max_{(n,q) \in [0,\bar{n}] \times [0,\infty)} \left\{ \beta_d \alpha(n) \bar{e}u(q) - nc(q) - \left( \frac{nc(q)}{\alpha(n)\beta} \right) [\gamma - \beta] + \beta W^b(0) \right\} \]

- At Friedman rule, \( \gamma = \beta \), same as Planner’s problem

- In general, first-order conditions imply

  \[ e_u(q) = \left( \frac{\eta(n) [\gamma - \beta + \alpha(n)\beta]}{(1 - \eta(n))(\gamma - \beta) + \alpha(n)\beta} \right) e_c(q). \]
Market Economy: characterization

**Degenerate** $G$ (a spike at $\bar{\varepsilon}$):

- Under **free entry** (duality implies),

  $$\tilde{\omega} \in \arg \max_{\omega} \left\{ \beta_d V^b(\omega) - z \right\}$$

  subject to $\beta_d V^s(\omega) - c(q) = \beta W^s(0)$

- Substituting for value functions and eliminating $z$, $(\tilde{n}, \tilde{q})$ solves

  $$\max_{(n,q)\in[0,\bar{n}]\times[0,\infty)} \left\{ \beta_d \alpha(n)\bar{\varepsilon}u(q) - nc(q) - \left( \frac{nc(q)}{\alpha(n)\beta} \right) [\gamma - \beta] + \beta W^b(0) \right\}$$

- At Friedman rule, $\gamma = \beta$, same as Planner’s problem

- In general, first-order conditions imply

  $$e_u(q) = \left( \frac{\eta(n) [\gamma - \beta + \alpha(n)\beta]}{(1 - \eta(n)) (\gamma - \beta) + \alpha(n)\beta} \right) e_c(q).$$

- Equilibrium unique if $u(\cdot)$, $c(\cdot)$ isoelastic and $\eta(n)$ monotone
**General $G$:**

- **Under free entry,**

\[
(\tilde{\omega}, \tilde{\epsilon}_R) \in \arg \max_{\omega, \epsilon_R} \left\{ \beta_d V^b(\omega) - z \right\}
\]

subject to \( \beta_d V^s(\omega) - c(q) = \beta W^s(0) \)

and \( \gamma u(q)\epsilon_R = \beta_n z \)
Market Economy: characterization

**General $G$:**

- Under **free entry**, 
  
  \[ (\tilde{\omega}, \tilde{\varepsilon}_R) \in \underset{\omega, \varepsilon_R}{\text{arg max}} \{\beta_d V^b(\omega) - z\} \]
  
  subject to \( \beta_d V^s(\omega) - c(q) = \beta W^s(0) \)
  
  and \( \gamma u(q)\varepsilon_R = \beta_n z \)

- Substituting value functions and eliminating \( z \) means \( (\tilde{n}, \tilde{q}, \tilde{\varepsilon}_R) \) solves

  \[
  \max_{(n,q,\varepsilon_R) \in [0,\tilde{n}] \times [0,\infty) \times [0,\tilde{\varepsilon}]} \left\{ \left[ \alpha(n)\beta S_G(\varepsilon_R) - (\gamma - \beta)\varepsilon_R \right] u(q) / \beta_n \right\} 
  \]

  subject to: \( \frac{\alpha(n)}{n} \beta_d [1 - G(\varepsilon_R)]\varepsilon_R u(q) - c(q) = 0 \)
**Welfare** (due to night market activity)

\[
\tilde{W}_m(\gamma) \equiv \alpha(\tilde{n})\beta_d[1 - G(\tilde{e}_R)]\mathbb{E}\{\varepsilon|\varepsilon \geq \tilde{e}_R\}\varepsilon u(\tilde{q}) - \tilde{n}c(\tilde{q})
\]
Welfare (due to night market activity)

\[
\tilde{W}_m(\gamma) \equiv \alpha(\bar{n})\beta_d[1 - G(\tilde{\epsilon}_R)]\mathbb{E}\{\epsilon|\epsilon \geq \tilde{\epsilon}_R\}u(\tilde{q}) - \bar{n}c(\tilde{q})
\]

Planner would set \(\tilde{\epsilon}_R = 0\) – market not generally efficient
**Market Economy: Policy**

- **Welfare** (due to night market activity)

\[
\tilde{W}_m(\gamma) \equiv \alpha(\tilde{n})\beta_d[1 - G(\tilde{\epsilon}_R)]\mathbb{E}\{\epsilon|\epsilon \geq \tilde{\epsilon}_R\}\epsilon u(\tilde{q}) - \tilde{n}c(\tilde{q})
\]

- Planner would set \(\tilde{\epsilon}_R = 0\) – market not generally efficient
- Using the free-entry constraint,

\[
\tilde{W}_m(\gamma) = \alpha(\tilde{n})\beta_d S_G(\tilde{\epsilon}_R) u(\tilde{q})
\]
Market Economy: Policy

- **Welfare** (due to night market activity)

  \[ \tilde{W}_m(\gamma) \equiv \alpha(\tilde{n}) \beta_d [1 - G(\bar{\varepsilon}_R)] \mathbb{E}_{\{\varepsilon | \varepsilon \geq \bar{\varepsilon}_R\}} \varepsilon u(\tilde{q}) - \tilde{n} c(\tilde{q}) \]

- Planner would set \( \bar{\varepsilon}_R = 0 \) – market not generally efficient

- Using the free-entry constraint,

  \[ \tilde{W}_m(\gamma) = \alpha(\tilde{n}) \beta_d S_G(\bar{\varepsilon}_R) u(\tilde{q}) \]

- At Friedman rule \( \frac{d\tilde{W}_m(\gamma)}{d\gamma} = 0 \) by envelope theorem.
Market Economy: Policy under free-entry

Under, $u(.)$, $c(.)$ isoelastic, $\eta(n)$ monotone decreasing, $G$ uniform on $(0, \bar{\varepsilon}]$

- All margins active
Market Economy: Policy under free-entry

Under, \( u(\cdot) \), \( c(\cdot) \) isoelastic, \( \eta(n) \) monotone decreasing, \( G \) uniform on \((0, \overline{\varepsilon}]\)

- All margins active

\[
\frac{d\tilde{\varepsilon}_R}{d\gamma} \bigg|_{\gamma=\beta} < 0 \quad \frac{d\tilde{n}}{d\gamma} \bigg|_{\gamma=\beta} > 0 \quad \frac{d\tilde{q}}{d\gamma} \bigg|_{\gamma=\beta} < 0
\]
Market Economy: Policy under free-entry

Under, $u(.)$, $c(.)$ isoelastic, $\eta(n)$ monotone decreasing, $G$ uniform on $(0, \bar{\varepsilon}]$

- **All margins active**

\[
\left. \frac{d \tilde{\varepsilon}_R}{d \gamma} \right|_{\gamma=\beta} < 0 \quad \left. \frac{d \tilde{n}}{d \gamma} \right|_{\gamma=\beta} > 0 \quad \left. \frac{d \tilde{q}}{d \gamma} \right|_{\gamma=\beta} < 0
\]

\[
\left. \frac{d \tilde{W}_m(\gamma)}{d \gamma} \right|_{\gamma=\beta} = 0.
\]
Market Economy: Policy under free-entry

Under, \( u(.) \), \( c(.) \) isoelastic, \( \eta(n) \) monotone decreasing, \( G \) uniform on \((0, \bar{\varepsilon}]\)

- **All margins active**

\[
\frac{d\tilde{\varepsilon}_R}{d\gamma} \bigg|_{\gamma=\beta} < 0 \quad \frac{d\tilde{n}}{d\gamma} \bigg|_{\gamma=\beta} > 0 \quad \frac{d\tilde{q}}{d\gamma} \bigg|_{\gamma=\beta} < 0
\]

- **Exogenous** \( q \),

\[
\tilde{\mathcal{W}}_m(\gamma) = \alpha(\tilde{n})\beta d S_G(\tilde{\varepsilon}_R) u(q)
\]
Market Economy: Policy under free-entry

Under, $u(.)$, $c(.)$ isoelastic, $\eta(n)$ monotone decreasing, $G$ uniform on $(0, \bar{\varepsilon}]$

- **All margins active**

$$\frac{d \tilde{\varepsilon}_R}{d \gamma} \bigg|_{\gamma=\beta} < 0 \quad \frac{d \tilde{n}}{d \gamma} \bigg|_{\gamma=\beta} > 0 \quad \frac{d \tilde{q}}{d \gamma} \bigg|_{\gamma=\beta} < 0$$

$$\frac{d \tilde{W}_m(\gamma)}{d \gamma} \bigg|_{\gamma=\beta} = 0.$$

- **Exogenous** $q$,

$$\tilde{W}_m(\gamma) = \alpha(\tilde{n}) \beta_d S_G(\tilde{\varepsilon}_R) u(q)$$

$$\frac{d \tilde{\varepsilon}_R}{d \gamma} \bigg|_{\gamma=\beta} < 0 \quad \frac{d \tilde{n}}{d \gamma} \bigg|_{\gamma=\beta} < 0 \quad \frac{d \tilde{W}_m}{d \gamma} \bigg|_{\gamma=\beta} = 0.$$
Market Economy: Policy without free-entry

Under, \( u(.) \), \( c(.) \) isoelastic, \( \eta(n) \) monotone decreasing, \( G \) uniform on \((0, \bar{e}]\)

- **Shutting down seller free-entry** \((n = \bar{n})\)

\[
\frac{d\bar{e}_R}{d\gamma} \bigg|_{\gamma=\beta} < 0 \quad \frac{d\bar{q}}{d\gamma} \bigg|_{\gamma=\beta} < 0
\]
Under, $u(\cdot)$, $c(\cdot)$ isoelastic, $\eta(n)$ monotone decreasing, $G$ uniform on $(0, \bar{\varepsilon}]$

- **Shutting down seller free-entry** $(n = \bar{n})$

$$
\frac{d \tilde{\varepsilon}_R}{d \gamma} \bigg|_{\gamma=\beta} < 0 \quad \frac{d \bar{q}}{d \gamma} \bigg|_{\gamma=\beta} < 0
$$

$$
\tilde{W}_m(\gamma) = \frac{1}{2} \alpha(\bar{n}) \beta_d \left[ 1 - \tilde{\varepsilon}_R^2 \right] u(\bar{q}) - \bar{n} c(\bar{q}).
$$
Market Economy: Policy without free-entry

Under, \( u(.) \), \( c(.) \) isoelastic, \( \eta(n) \) monotone decreasing, \( G \) uniform on \((0, \bar{\varepsilon})\]

- **Shutting down seller free-entry** \((n = \bar{n})\)

\[
\left. \frac{d\tilde{\varepsilon}_R}{d\gamma} \right|_{\gamma=\beta} < 0 \quad \left. \frac{d\tilde{q}}{d\gamma} \right|_{\gamma=\beta} < 0
\]

\[
\tilde{W}_m(\gamma) = \frac{1}{2} \alpha(\bar{n}) \beta d \left[ 1 - \tilde{\varepsilon}_R^2 \right] u(\tilde{q}) - \bar{n} c(\tilde{q}).
\]

- At the Friedman rule, after substituting for \( \frac{d\tilde{\varepsilon}_R}{d\gamma} \) and \( \frac{d\tilde{q}}{d\gamma} \),

\[
\left. \frac{d\tilde{W}_m(\gamma)}{d\gamma} \right|_{\gamma=\beta} \geq 0?
\]
Under, $u(.)$, $c(.)$ isoelastic, $\eta(n)$ monotone decreasing, $G$ uniform on $(0, \bar{\varepsilon}]$

- **Shutting down seller free-entry** ($n = \bar{n}$)

\[
\frac{d\bar{\varepsilon}_R}{d\gamma} \Big|_{\gamma=\beta} < 0 \quad \frac{d\tilde{q}}{d\gamma} \Big|_{\gamma=\beta} < 0
\]

\[
\bar{\mathcal{W}}_m(\gamma) = \frac{1}{2} \alpha(\bar{n}) \beta_d \left[ 1 - \bar{\varepsilon}_R^2 \right] u(\bar{q}) - \bar{n}c(\bar{q}).
\]

- At the Friedman rule, after substituting for $\frac{d\bar{\varepsilon}_R}{d\gamma}$ and $\frac{d\tilde{q}}{d\gamma}$,

\[
\frac{d\bar{\mathcal{W}}_m(\gamma)}{d\gamma} \Big|_{\gamma=\beta} \geq 0?
\]

- positive if $\bar{n}$ small enough.
Under, $u(.)$, $c(.)$ isoelastic, $\eta(n)$ monotone decreasing, $G$ uniform on $(0, \bar{\epsilon}]$

- **Shutting down seller free-entry** ($n = \bar{n}$) and quality choice, $q = \bar{q}$.

\[
\frac{d\bar{\epsilon}_R}{d\gamma}_{\gamma=\beta} < 0
\]
Under, $u(.)$, $c(.)$ isoelastic, $\eta(n)$ monotone decreasing, $G$ uniform on $(0, \bar{\varepsilon}]$

- **Shutting down seller free-entry** ($n = \bar{n}$) and quality choice, $q = \bar{q}$.

\[ \frac{d\bar{\varepsilon}_R}{d\gamma} \bigg|_{\gamma=\beta} < 0 \]

\[ \tilde{\mathcal{V}}_m(\gamma) = \frac{1}{2} \alpha(\bar{n}) \beta_d \left[ 1 - \bar{\varepsilon}_R^2 \right] u(\bar{q}) - \bar{n}c(\bar{q}). \]
Under, $u(.)$, $c(.)$ isoelastic, $\eta(n)$ monotone decreasing, $G$ uniform on $(0, \bar{\varepsilon}]$

- **Shutting down seller free-entry** ($n = \bar{n}$) and quality choice, $q = \bar{q}$.

$$
\begin{align*}
\frac{d\bar{\varepsilon}_R}{d\gamma} \bigg|_{\gamma=\beta} &< 0 \\
\bar{\mathcal{W}}_m(\gamma) &= \frac{1}{2} \alpha(\bar{n}) \beta_d \left[ 1 - \bar{\varepsilon}_R^2 \right] u(\bar{q}) - \bar{n}c(\bar{q}).
\end{align*}
$$

- At the Friedman rule, after substituting for $\frac{d\bar{\varepsilon}_R}{d\gamma}$,

$$
\begin{align*}
\frac{d\bar{\mathcal{W}}_m(\gamma)}{d\gamma} \bigg|_{\gamma=\beta} &\geq 0
\end{align*}
$$
Lucky bags: buyers pay for good before they see it.
Alternative Market Structures

- **Lucky bags:** buyers pay for good before they see it.
  - Model same as if there were no match specific preferences
Alternative Market Structures

- **Lucky bags**: buyers pay for good before they see it.
  - Model same as if there were no match specific preferences

- **Market Makers** (Faig and Huangfu [2007]):
  - Empowered to charge entrance fees to buyers and sellers
  - Free-entry of market makers drives their profits to zero
  - They distribute buyers' entrance fees to sellers
  - Sellers take the money and hand over goods free of charge.
  - Efficiency is restored at the Friedman rule
  - Model eliminates holding of idle cash balances
  - Does better than lucky bags away from the Friedman rule

- Lotteries
  - Don't work - same as price-only model.
  - Free-entry equilibrium constrained efficient
Alternative Market Structures

- **Lucky bags:** buyers pay for good before they see it.
  - Model same as if there were no match specific preferences

- **Market Makers** (Faig and Huangfu [2007]):
  - Empowered to charge entrance fees to buyers and sellers
  - Free-entry of market makers drives their profits to zero
  - They distribute buyers' entrance fees to sellers
  - Sellers take the money and hand over goods free of charge
  - Efficiency restored at the Friedman rule
  - Model eliminates holding of idle cash balances
  - Does better than lucky bags away from the Friedman rule

- **Lotteries**
  - Don't work - same as price-only model.
Alternative Market Structures

- **Lucky bags:** buyers pay for good before they see it.
  - Model same as if there were no match specific preferences

- **Market Makers** (Faig and Huangfu [2007]):
  - Empowered to charge entrance fees to buyers and sellers
  - Free-entry of market makers drives their profits to zero
Alternative Market Structures

- **Lucky bags**: buyers pay for good before they see it.
  - Model same as if there were no match specific preferences

- **Market Makers** (Faig and Huangfu [2007]):
  - Empowered to charge entrance fees to buyers and sellers
  - Free-entry of market makers drives their profits to zero
  - They distribute buyers’ entrance fees to sellers
Alternative Market Structures

- **Lucky bags**: buyers pay for good before they see it.
  - Model same as if there were no match specific preferences

- **Market Makers** (Faig and Huangfu [2007]):
  - Empowered to charge entrance fees to buyers and sellers
  - Free-entry of market makers drives their profits to zero
  - They distribute buyers’ entrance fees to sellers
  - Sellers take the money and hand over goods free of charge.
Alternative Market Structures

- **Lucky bags:** buyers pay for good before they see it.
  - Model same as if there were no match specific preferences

- **Market Makers** (Faig and Huangfu [2007]):
  - Empowered to charge entrance fees to buyers and sellers
  - Free-entry of market makers drives their profits to zero
  - They distribute buyers’ entrance fees to sellers
  - Sellers take the money and hand over goods free of charge.
  - Efficiency is restored at the Friedman rule
Alternative Market Structures

- **Lucky bags:** buyers pay for good before they see it.
  - Model same as if there were no match specific preferences

- **Market Makers** (Faig and Huangfu [2007]):
  - Empowered to charge entrance fees to buyers and sellers
  - Free-entry of market makers drives their profits to zero
  - They distribute buyers’ entrance fees to sellers
  - Sellers take the money and hand over goods free of charge.
  - Efficiency is restored at the Friedman rule
  - Model eliminates holding of idle cash balances
Alternative Market Structures

- **Lucky bags:** buyers pay for good before they see it.
  - Model same as if there were no match specific preferences

- **Market Makers** (Faig and Huangfu [2007]):
  - Empowered to charge entrance fees to buyers and sellers
  - Free-entry of market makers drives their profits to zero
  - They distribute buyers’ entrance fees to sellers
  - Sellers take the money and hand over goods free of charge.
  - Efficiency is restored at the Friedman rule
  - Model eliminates holding of idle cash balances
  - Does better than lucky bags away from the Friedman rule
Alternative Market Structures

- **Lucky bags**: buyers pay for good before they see it.
  - Model same as if there were no match specific preferences

- **Market Makers** (Faig and Huangfu [2007]):
  - Empowered to charge entrance fees to buyers and sellers
  - Free-entry of market makers drives their profits to zero
  - They distribute buyers’ entrance fees to sellers
  - Sellers take the money and hand over goods free of charge.
  - Efficiency is restored at the Friedman rule
  - Model eliminates holding of idle cash balances
  - Does better than lucky bags away from the Friedman rule

- **Lotteries**
Alternative Market Structures

- **Lucky bags:** buyers pay for good before they see it.
  - Model same as if there were no match specific preferences

- **Market Makers** (Faig and Huangfu [2007]):
  - Empowered to charge entrance fees to buyers and sellers
  - Free-entry of market makers drives their profits to zero
  - They distribute buyers’ entrance fees to sellers
  - Sellers take the money and hand over goods free of charge.
  - Efficiency is restored at the Friedman rule
  - Model eliminates holding of idle cash balances
  - Does better than lucky bags away from the Friedman rule

- **Lotteries**
  - Don’t work - same as price-only model.
Alternative Market Structures

- **Lucky bags**: buyers pay for good before they see it.
  - Model same as if there were no match specific preferences

- **Market Makers** (Faig and Huangfu [2007]):
  - Empowered to charge entrance fees to buyers and sellers
  - Free-entry of market makers drives their profits to zero
  - They distribute buyers’ entrance fees to sellers
  - Sellers take the money and hand over goods free of charge.
  - Efficiency is restored at the Friedman rule
  - Model eliminates holding of idle cash balances
  - Does better than lucky bags away from the Friedman rule

- **Lotteries**
  - Don’t work - same as price-only model.
  - free-entry equilibrium constrained efficient
Conclusions

- This project introduces:
This project introduces:

- Production prior to retail
Conclusions

This project introduces:

- Production prior to retail
- Private information over match specific preferences

Under seller free-entry the Friedman rule is optimal policy but not necessarily efficient. When free-entry is shut down, and $n$ is small enough low levels of inflation can improve welfare.
Conclusions

• This project introduces:
  • Production prior to retail
  • Private information over match specific preferences

• Under seller free-entry the Friedman rule is optimal policy but not necessarily efficient
This project introduces:

- Production prior to retail
- Private information over match specific preferences

Under seller free-entry the Friedman rule is optimal policy but not necessarily efficient.

When free-entry is shut down, and $n$ is small enough low levels of inflation can improve welfare.