The De Soto Effect:

Property Rights, Social Networks and Productivity

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Motivation

- The Problem of "Dead Capital":

  "What the poor lack is easy access to the property mechanisms that could legally fix the economic potential of their assets so that they could be used to produce, secure, or guarantee greater value in the expanded market...Just as a lake needs hydroelectric plant to produce usable energy, assets need a formal property system to produce significant surplus value." Hernando de Soto, *The Mystery of Capital* (2001)

- This is a very specific story about institutional failure which limits trading possibilities.

- This paper explores the *causes* and *consequences* of the problem of "dead capital" due to imperfect property rights

- Imperfect property rights leads to distortions in credit markets
  - Segments economy into formal and informal sector
  - Credit rationing, agency costs

- Results in loss of output

- Given this, what explains relatively little focus of government policy to improve contracting institutions?

- We show that there may be insufficient support for reform even with a competitive formal sector *and* democracy

- Part of a broader project looking at the microeconomics of market-supporting public goods and their interaction with economic outcomes

Framework & Main Results

- The model has producers (or borrowers) and suppliers (or lenders) trading in the presence of
  - agency costs due to imperfect information (moral hazard)
  - transactions costs due to imperfect contract enforcement
- We embed contracts in a "general equilibrium" setting – markets (the formal sector) and networks (the informal sector)
- Producers can trade in either networks and markets
  - markets are anonymous whereas networks use transactions technologies that are match specific
  - markets allow for competition between suppliers

I. Impact of Changes in Property Rights

- Formally characterize the de Soto effect (reducing transactions costs by titling):
  - direct effect on output, loan size and terms of credit contract in a relationship
  - indirect effect by improving outside option of producers
- The latter can be important for interpreting recent empirical work

- Studies of land titling in agriculture generally find positive effects on credit supply (e.g., Feder et al 1988)

- However, mixed evidence when no formal credit markets are available
  - no effect in Migot Adholla et al 1994 but positive effect in Christensen et al 1994)

- The first can be interpreted as a direct effect

- The second can be interpreted as an indirect effect through outside options

- Using data from Peru's urban land-titling programme Fields and Torero (2004) find that for borrowers with titles
  - loan approval rates went up by 9-10% in the public sector bank that gives loans for housing construction materials
  - in private banks for general loans, interest rates went down even though there was no change in collateral requirement
- Here too, the second can be interpreted as an indirect effect

II Endogenize Property Rights

- Governments coordinate the quality of the market transactions technologies (a general public good)

- Network enforcement reflects private investments (a local public good)

- Study optimal and endogenous policy (political economy).

- Finding: preferred quality of formal sector institutions non-monotonic in producer wealth

- For poor agency costs high but as they have little wealth to offer as collateral gains too small

- For rich, agency costs low as they can put up sufficient collateral even with poor contracting institutions, and so not much demand

- With sufficient wealth inequality rich and poor may block property rights reform favoured by the middle

- Transitions to democracy where the poor gain more political influence will improve contract enforcement only if
  - the poor have sufficient collateralizable wealth
  - there is a large middle class

Comparison with Other Policies

I. Direct wealth redistribution

- For standard reasons that have been covered in the literature on inequality and agency costs, there can be higher output.

- However, clearly the rich will lose while the poor gain.

- When the policy is increasing investment in legal institutions then it is possible that provision of legal services can make *all* producers better off, at least when there is initially a moderate level of inequality.

II. Microfinance

- Microfinance can be seen in terms of this model as a means of harnessing the enforcement potential of networks in delivering credit.

- If networks have low τ_{ij} then what are the means to harness that while bypassing local monelenders

- Make borrowers jointly liable for each other

- By its very nature, there is a limit on its scale.

- Also there is no guarantee that microfinance institutions are lost cost suppliers (e.g., poor diversification opportunities)

- de Soto's argument is rather to do away with networks altogether and try to bring the poor to the formal sector

Relationship to the Literature

- Property rights improvements and their consequences (e.g., Besley, 1995, Field and Torrero, 2004)

- Consequences of social networks and interaction of formal and informal sectors (e.g., Banerjee and Newman, 1998)

- Political economy of property rights (e.g., Acemoglu, 2004, Rajan and Zingales, 2005)

Economic Actors

- There are M suppliers (lenders) labelled $j = 1, ..., M$ and N producers (borrowers) labelled $i = 1, ..., M$.

- Everyone is risk neutral

- Each producer owns a unit of land and commits effort e to produce output using his labour.

- Output also depends on an input (capital) $x \in (0, 1)$ that can be supplied by supplier j at unit cost $\gamma_j \in \{\underline{\gamma}, \bar{\gamma}\}$ with $\bar{\gamma} > \underline{\gamma} > 0$

- We assume that each supplier has unlimited capacity to supply the market.

Production Technology

- Output is stochastic and takes the value $Q(x)$ with probability $\sqrt{e}$ and 0 with probability $1-\sqrt{e}$ where

$$Q(x) = 2\left(q + \sqrt{x}\right)$$

- The cost of effort is e and the cost of x is $\gamma_j x$.

- Expected output is therefore $\sqrt{e}Q(x)$ which is concave in e and x

- Expected surplus is $\sqrt{e}Q(x) - e - \gamma_j x$

Information and Contracting

- Effort is subject to moral hazard.

- Since everyone is risk neutral, this can be solved if producers have sufficient wealth or if non-monetary punishments are possible

- Making failure sufficiently costly solves the incentive problem

- We assume that producer i has wealth w_i *and* that there is a **limited-liability condition**

- The most that can be taken away from him in any state of the world is his wealth plus any output he produces (no non-monetary punishment)

- The input x is fully contractible.

- An input supply contract is a triple (x, r, c) where r is the interest payment that he has to make when the project is successful and c is the payment to be made when the project is unsuccessful, i.e. *collateral*.

- The payoff of a typical producer is:

$$\sqrt{e}[Q(x) - r] - \left(1 - \sqrt{e}\right) c - e.$$

  and of a supplier is:

$$\sqrt{e}r + \left(1 - \sqrt{e}\right) c - \gamma_j x.$$

- Outside option of producer: either go to another supplier or autarchy ($x = 0$)

- For the latter, solve

$$\max_{e} \sqrt{e} Q(0) - e$$

- Yields: $\underline{e} = q^2$ and $\underline{u} = q^2$

- Therefore, outside option is $u_i \geq q^2$

Property Rights and Contract Enforceability

- After the state of the world k ($k = 1$ if output high, $k = 0$ if output low) is revealed, producer can refuse to honor contract

- Supplier can appeal to an external "judge".

- Conditional on observing the true state of the world *and* being able to enforce the contract, the judge awards a fine F_k in state k to the supplier in addition to contractual obligations

- Let σ_{ij} probability that the court can observe the true state of the world *and* successfully enforce a contract (measure of court effectiveness).

- If state cannot be observed, the outcome depends on relative "power" or "influence" of supplier and producer.

- With probability p_{ij} the producer gets their most preferred outcome, with probability $\left(1 - p_{ij}\right)$ supplier gets to enforce contract.

First Best (No Moral Hazard)

- Suppose effort is contractible

- First consider a producer of type i and a supplier of type j in partial equilibrium (u_i given exogenously)

- The level of effort and the input will be chosen to maximize *joint* surplus:

$$\max_{\{e,x\}} \left\{ \sqrt{e} Q(x) - e - \gamma_j x \right\}.$$

- Solving the first order conditions yields:

$$\begin{aligned} e &= \left(\frac{q\gamma_j}{\gamma_j - 1} \right)^2 \\ x &= \left(\frac{q}{\gamma_j - 1} \right)^2. \end{aligned}$$

- **Assumption 1 (for interior solution)**: $\underline{\gamma} > \frac{1}{1-q}$

- This implies $q < 1$ and $\bar{\gamma} > \underline{\gamma} > 1$

- Effort and input supply will be higher when q is higher and when the cost γ_j is lower.

- The first-best surplus is now given by

$$S(\gamma_j) = \frac{q^2 \gamma_j}{\gamma_j - 1}.$$

- Pareto-frontier given by a straight line with slope -1 (Figure 1)

- Notice that
  - There is gains from trade as S exceeds autarchic payoff q^2
  - The net payoff of any party cannot exceed this: in particular, $u_i \leq \frac{q^2 \gamma_j}{\gamma_j - 1}$.

- Now introduce competition where u_i is determined endogenously

- Property rights do not matter

- Matching between suppliers and producers will depend only on γ

- Producers will seek suppliers with low γ's

- So long as there exists more than one supplier with $\gamma = \underline{\gamma}$ (Bertrand) competition ensures all producers getting loans at $\underline{\gamma}$ and $\pi = 0$.

- No entry barriers

- With moral hazard, lower transactions costs of a supplier may enable him to enjoy some monopoly power

Second Best Contracts

- Effort is not contractible

- Efficient contracts between supplier j and producer i in partial equilbrium will solve:

$$Max_{\{e,x,c,r\}}\ \sqrt{e}r + \left(1 - \sqrt{e}\right)c - \gamma_j x.$$

subject to

(i) the voluntary **participation constraint (PC)** of the producer

$$\sqrt{e}[Q(x) - r] - \left(1 - \sqrt{e}\right)c - e \geq u_i. \qquad (1)$$

(ii) an **incentive compatibility constraint (ICC)** on effort by the supplier:

$$\sqrt{e} = q + \sqrt{x} - \frac{(r-c)}{2}. \qquad (2)$$

As expected, effort is increasing in x (complementary input) and decreasing in "tax on success" $(r - c)$

(iii) **enforceability plus limited liability constraints imply**

$$\left[1 - \tau_{ij}\right] w_i \geq c \tag{3}$$

$$\left[1 - \tau_{ij}\right] (w_i + Q(x)) \geq r. \tag{4}$$

- τ_{ij} is the parameter capturing **"transactions costs"**:

$$\tau_{ij} \equiv \frac{\left(1 - \sigma_{ij}\right) p_{ij}}{\left(1 - \sigma_{ij}\right) p_{ij} + \sigma_{ij}}$$

- It lies between 0 (corresponding to $\sigma_{ij} = 1$) and 1 (corresponding to $\sigma_{ij} = 0$)

- Captures the extent (or probability) of borrower opportunism

- Since we are interested in the de Soto argument, we will focus on the implications of a binding collateral constraint.

- This will be true if

$$0 \leq \tau_{ij} \leq \overline{\tau} < 1.$$

- To keep the notation simple, we drop the subscripts.

- Let

$$v \equiv u + (1 - \tau)\, w.$$

- This is the gross reservation payoff of the producer.

- For the same *net* reservation payoff u, two producers with different effective wealth levels $(w(1-\tau))$ will have different *gross* reservation payoffs.

- Let $\overline{v} \equiv \frac{q^2\gamma^2}{(\gamma-1)^2}$

- Then we have

Proposition 1: The optimal second-best supplier contract (r, c, x) when $v \leq \overline{v}$ is given by:

$$\begin{aligned} r &= f(v) + (1-\tau)\, w \\ c &= (1-\tau)\, w \\ x &= \frac{v}{\gamma^2}. \end{aligned}$$

where $f(v)$ is decreasing in v.

The corresponding effort level is

$$e = v.$$

For $v \geq \overline{v}$ the first-best allocation is attained.

- The optimal second-best contract has a simple structure
  - The collateral level is set at the maximum level, i.e., the borrower's *effective* wealth.
  - The interest payment is strictly higher than the collateral level (otherwise no incentive to supply effort)
  - The interest payment is lower the higher is the borrowers effective wealth and/or reservation payoff
  - The effort level and the input level are both below the first-best levels (although their ratio is the same as the first-best).

- When will the first-best be attained?

- If v exceeds a certain threshold.

- Since $u \in [q^2, S]$, it is clear for any given u in this interval, there is a wealth level for which the first-best will be attained.

- In particular, even if $u = q^2$, there is a wealth level, given by $\overline{w} \equiv \frac{\overline{v}-q^2}{1-\tau}$ such that for $w \geq \overline{w}$ the first-best is attained.

- Under the first best contract $r = c$, the producer receives a net expected payoff of u, and the supplier receives a net expected payoff of $\max\{S - u, 0\}$.

- The second-best arises if the producer has insufficient pledgeable wealth and/or low reservation payoff

- The supplier can always achieve the first-best by setting $r = c$ but since c cannot exceed $w(1-\tau)$ this will not maximize his expected profits.

- The only feasible instrument in this situation is r and raising it above c will increase his profits conditional on success, but will reduce effort

- Note: a higher (net) reservation payoff u alleviates the agency problem too, but cannot get the first-best if w is very low.

- Intuitively, even if $u = S$ the supplier has a reservation payoff of γx, and it is not possible to satisfy the zero-profit constraint of the supplier, and give the producer strong enough incentives to ensure first-best effort.

- Given the optimal contract, we can explicitly characterize the (constrained) Pareto-frontier:

$$\hat{u}\left(\pi, w, \gamma, \tau\right) =$$

$$\left(\frac{q + \sqrt{q^2 + (2 - \frac{1}{\gamma})((1-\tau)\, w - \pi)}}{(2 - \frac{1}{\gamma})} \right)^2 - (1-\tau)\, w$$

- This is the utility level that a producer who has wealth w gets when a supplier with cost efficiency γ earns profit $\pi \in [0, \overline{\pi}]$ and the contract enforcement technology is τ.

- As one would expect, it is increasing in w, decreasing in π, γ, and τ.

- However, for any given π, γ, and τ there is a w high enough such that the first best is achieved and $\hat{u} = S(\gamma) - \pi$.

The De Soto Effect

- Expected output in this economy is:

  $$2\sqrt{e}\left(q+\sqrt{x}\right)=\left(q+\sqrt{x}\right)\left[\left(q+\sqrt{x}\right)-\frac{r-c}{2}\right]$$

  after using the first order condition for effort by the producer.

- It is clear from this that there are three possible effects of improvements in contract enforcement (decrease in τ)
  - a *collateral* effect which implies that c is higher
  - a *repayment* effect if r is lower
  - an *input* effect if x is higher.

- The equilibrium value of expected output is:

$$2\sqrt{u+(1-\tau)\,w}\left(q+\frac{\sqrt{u+(1-\tau)\,w}}{\gamma}\right)$$

  for $u+(1-\tau)\,w \leq S$

- It is clear that improving property rights (fall in τ) raises output via all these three channels

- *However, the size of the De Soto effect depends on the producer's collateralizable wealth.*

- *For very poor (low w)* producers, the gains will be small

- For very rich producers the gains will be zero.

- Therefore, i*n the aggregate, the size of the de Soto effect depends on the distribution of wealth.*

- *In very rich, very poor, or very unequal societies (comprising only very rich or very poor) the overall de Soto effect will not be large.*

Networks and Markets

- So far the analysis was partial equilibrium
- Did not endogenize which producer chooses to borrow from which supplier
- Took the set of trading opportunities open to producers summarized by the parameter u_i as exogenous
- Someone borrowing from a network (the informal sector) might switch to the market (the formal sector) if transactions costs fall
- In networks we expect low τ_{ij} (high "social capital") but high γ (lack of competition)

- By their very nature networks are likely to have less competition than in a market because of their relationship-specific nature

- Can survive competition from formal sector due to lower transactions costs

- What happens if transactions costs in markets fall?

Markets

- We assume in the market there is a common externally enforced contracting technology so that all trades have $\tau_{ij} = \tau_M$.

- Market competition affects the cost of supply γ_M and the rents that are earned by suppliers π_M.

- Then the utility of a producer who has wealth w and who uses the market is:

$$u_M = \hat{u}\left(\pi_M, w, \gamma_M, \tau_M\right). \tag{5}$$

- In a competitive market, suppliers compete freely to serve producers and rents are bid to zero.

- That is $\pi_M = 0$ and $\gamma_M = \underline{\gamma}$

Networks

- Networks use specific enforcement technologies τ_{ij}
- There is a critical level of network enforcement efficiency and supply efficiency at which a network supplier can compete with the market.
- This is defined by:

$$\hat{u}\left(0, w, \gamma_j, \tau_{ij}\right) = u_M.$$

- This gives us a negatively-sloped indifference curve in the (τ_{ij}, γ_j) space (see Figure 5).
- This is due to the fact that $\hat{u}$ is decreasing in γ and τ.

- Observe also that $(\tau_M, \underline{\gamma})$ is a point on this curve.

- Let $\hat{\tau}\left(\gamma_j, w, u_M\right)$ be the value of τ_{ij} that solves the implicit equation that characterizes the indifference curve.

Networks versus Markets

- Let $j(i)$ denote the supplier to whom producer i has access to via a network.

Proposition 2: **If** $\tau_{ij(i)} < \hat{\tau}\left(\gamma_j, w, u_M\right)$ **then producer** i **will trade in a network. Otherwise he will trade in the market.**

- **Corollary:** *If* $\tau_{ij(i)} \geq \tau_M$ *and* $\gamma_{j(i)} \geq \gamma_M$ *then producer* i *will trade in the market.*

"General Equilibrium" de Soto Effect

- Suppose τ_M goes down
- Shift from point A_0 to point A_1
- Now there are further "general equilibrium" de Soto effects:
  - **Extensive margin**: market trades are now more attractive and this causes some to switch from trade in networks (point B no longer viable)
  - **Intensive margin**: a higher u_M leads to the standard de Soto effects in markets *and* in networks.
  - **Distributional**: a reduction in supplier rents in the networks but producers gain all around

Policy

- So far took τ_M as exogenous
- Suppose now that there is a government that can improve contract enforcement (lower τ) in the market
- Let $\mu(1-\tau_M) = \frac{1}{2}(1-\tau_M)^2$ be the cost per contract for $\tau_M \in [0, \bar{\tau}]$
- $\mu(.)$ is increasing and convex (lower is τ the higher is cost per contract, both total and marginal)
- The cost of running the systems is financed via a "user charge" on the supplier.
- In a competitive market, this cost is "shifted" to the producer.

- The payoff of a producer whether in a market or a network is:

$$\hat{u}\left(\mu\left(1-\tau_M\right), w, \gamma_M, \tau_M\right).$$

- Thus, the legal system preferred by producers is characterized by:

$$\tau_M^*(w) = \arg \max_{\tau \in [\underline{\tau}, \bar{\tau})} \left\{\hat{u}\left(\mu\left(1-\tau\right), w, \gamma_M, \tau\right)\right\}$$

- We show

Proposition 3: The optimal τ for producers is non-decreasing in w up to a critical level of w and is non-increasing thereafter.

- Intuition for non-monotonicity
  - For the very rich even with poor legal enforcement, the first best is attainable.
  - For the very poor it is not worth incurring the cost of investing in a legal system as they have little or no wealth to use as collateral.

- Corollary: the worst possible legal system ($\bar{\tau}$) may be desired both by the very rich and very poor producers.

- Therefore, with sufficient wealth inequality, the majority of producers may prefer the worst possible legal system, $\bar{\tau}$.

- Next look at suppliers' preference for contract enforcement

  - Those who trade in competitive markets always ended up with zero profits and hence have no interest in improving τ since all costs are passed on to producers.

  - Network suppliers earn rents and are worse off if τ_M goes down

Political Economy

- Suppose there are two wealth groups, w_P and w_R
- Consider two contrasting institutional settings
- Elite model where the rich control policy and democracy
- We show that:

Proposition 4: Elite rule will result in low levels of market contract enforcement if inequality is large enough. Such economies will tend to have large informal sectors, low productivity and low levels of output per capita.

- The contrast between elite rule and democracy is most striking when the ma $\tau_M^*(w_P) < \bar{\tau}$.

- This is a case where the poor have sufficient wealth to demand improved contract enforcement (the de Soto world)

- However, if $\tau_M^*(w_P) = \bar{\tau}$ so that the poor have insufficient wealth to benefit from an improved contracting environment, then political institutions may not affect the kind of legal system that is implemented.

- We summarize this as:

  Proposition 5: Transitions to democracy where the poor gain more political influence will improve contract enforcement only if the poor have sufficient collateralizable wealth. Thus democratic transitions in situations of high inequality may have a negligible impact on contract enforcement.

- This is a theme in Engerman and Sokoloff (2002) who emphasize the centrality of initial factor endowments and their distribution in shaping policy in Latin America.

- Many accounts of democracy see the middle class as the pivotal group in democracies.

- The standard median voter insight would imply this, but here policy preferences are not single-peaked

- Consider three wealth groups, w_P, w_M, and w_R

- Then we have

Proposition 6: Since policy is not monotonic in wealth, democracy does not necessarily favor middle-class interests. With sufficient wealth inequality, investment in an effective legal system requires the middle class to be a large enough group.

Concluding Comments

- We looked at a very specific aspect of institutions and organizations

- But it suggests that it will be hard to generalize about the links between institutional development and economic change

  - there is a lot of richness even in the simplest example.

- Any proper empirical appraisal of de Soto's arguments requires looking at both partial and general equilibrium implications of contracts and matching

- We also need to understand why the existing property rights equilibrium prevails.

Additional Material

1. Derivation of the Enforceability cum Limited Liability Constraints

- **Enforceability Constraints**

- In state L

$$\begin{aligned} -c \;\; \geq \;\; & -\sigma_{ij}\left(c + F_0\right) \\ & + \left(1 - \sigma_{ij}\right)\left(p_{ij}\left(0\right) - \left(1 - p_{ij}\right)c\right) \end{aligned}$$

- In state H

$$\begin{aligned} \left(Q(x) - r\right) \;\; \geq \;\; & \sigma_{ij}\left(Q(x) - r - F_1\right) \\ & + \left(1 - \sigma_{ij}\right) * \\ & \left(p_{ij}Q(x) + \left(1 - p_{ij}\right)\left(Q(x) - r\right)\right) \end{aligned}$$

- These simplify to

$$c\left(1-\sigma_{ij}\right)p_{ij} \leq \sigma_{ij}F_0. \tag{6}$$

$$r\left(1-\sigma_{ij}\right)p_{ij} \leq \sigma_{ij}F_1. \tag{7}$$

- **Limited liability constraints**:

$$F_0 \leq w_i - c \tag{8}$$

and

$$F_1 \leq Q(x) + w_i - r. \tag{9}$$

- F_0 and F_1 will be set as high as possible and so the above should hold with equality

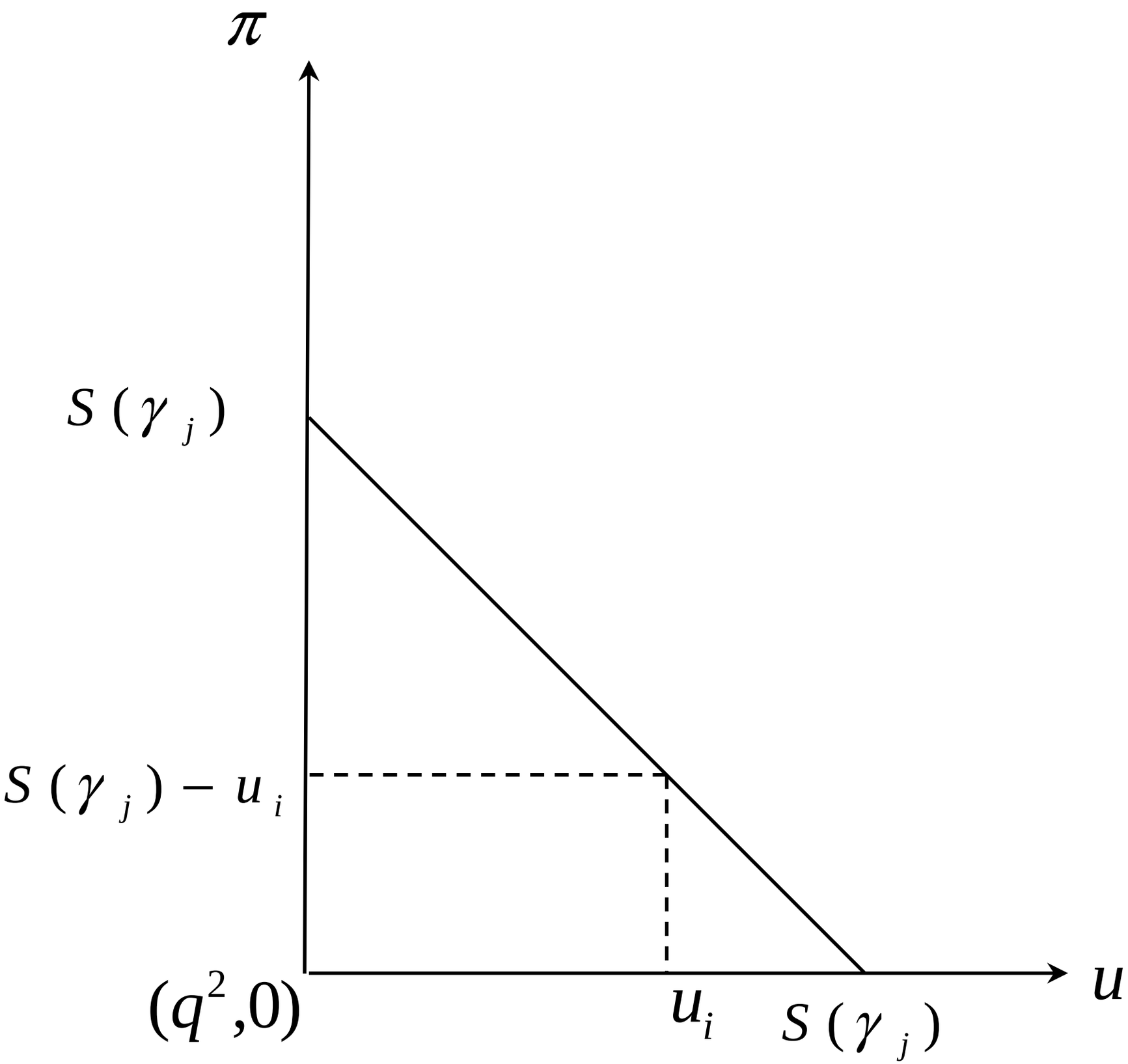

Figure 1

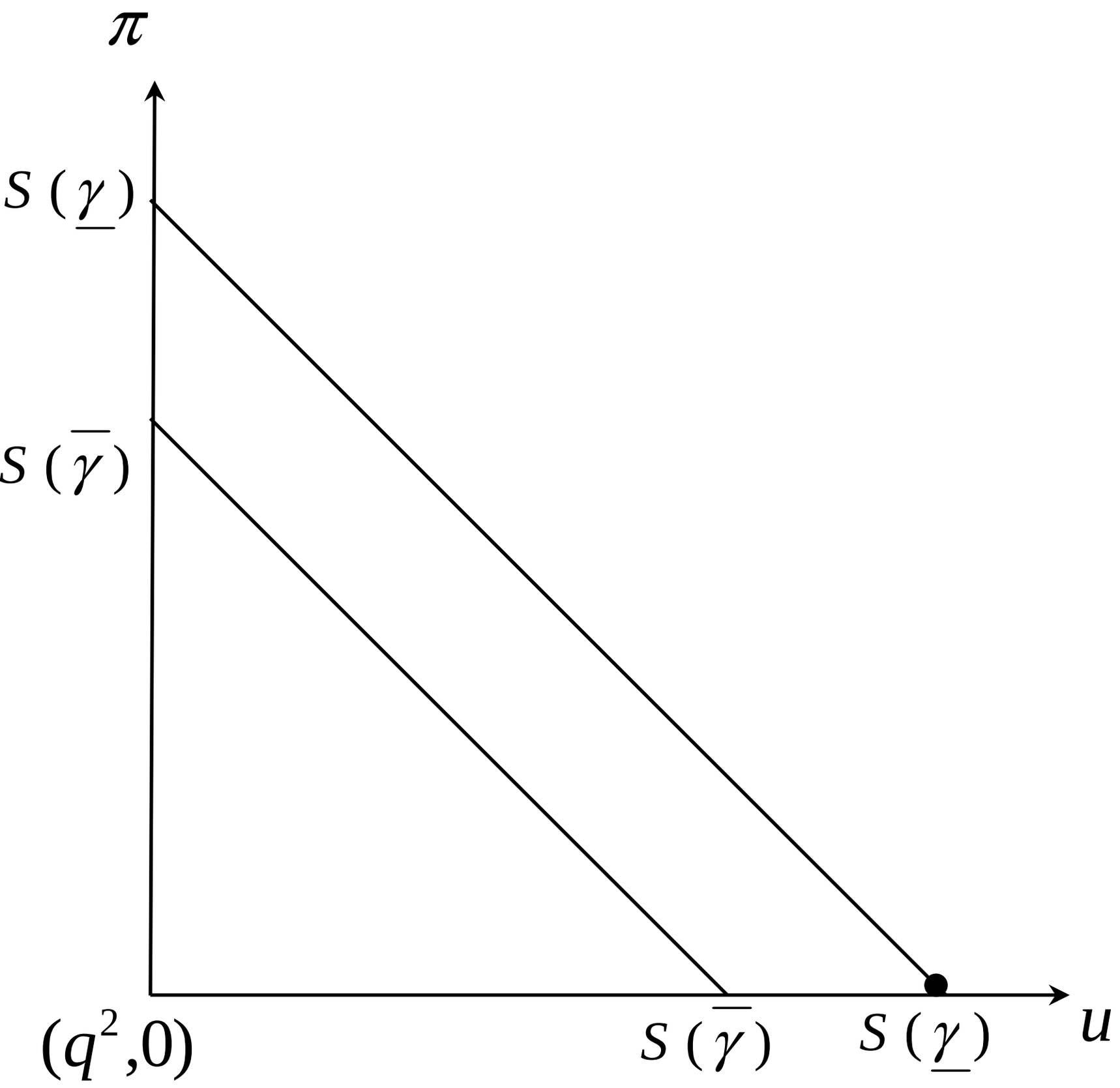
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Figure 2

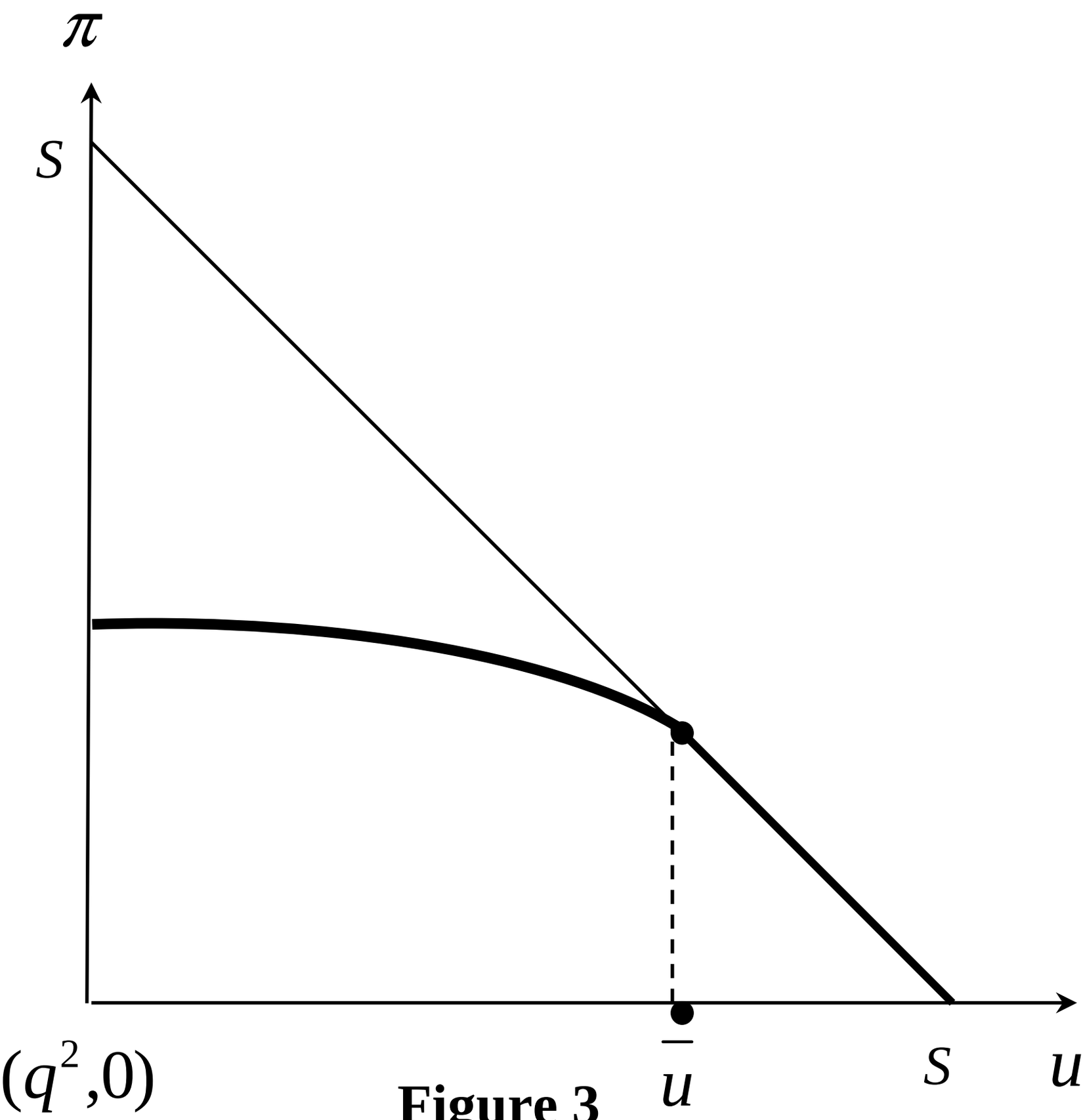

Figure 3

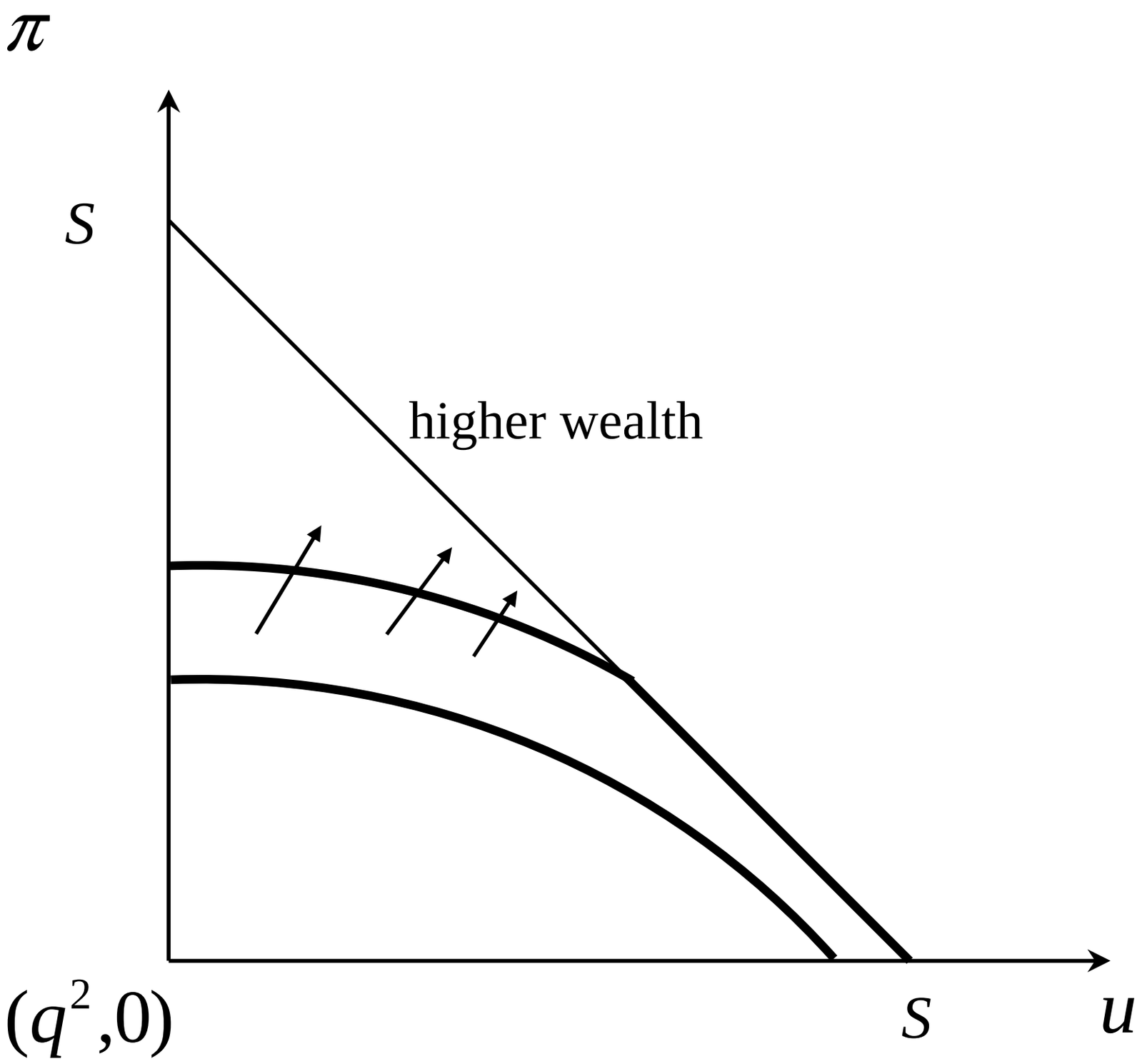

Figure 4

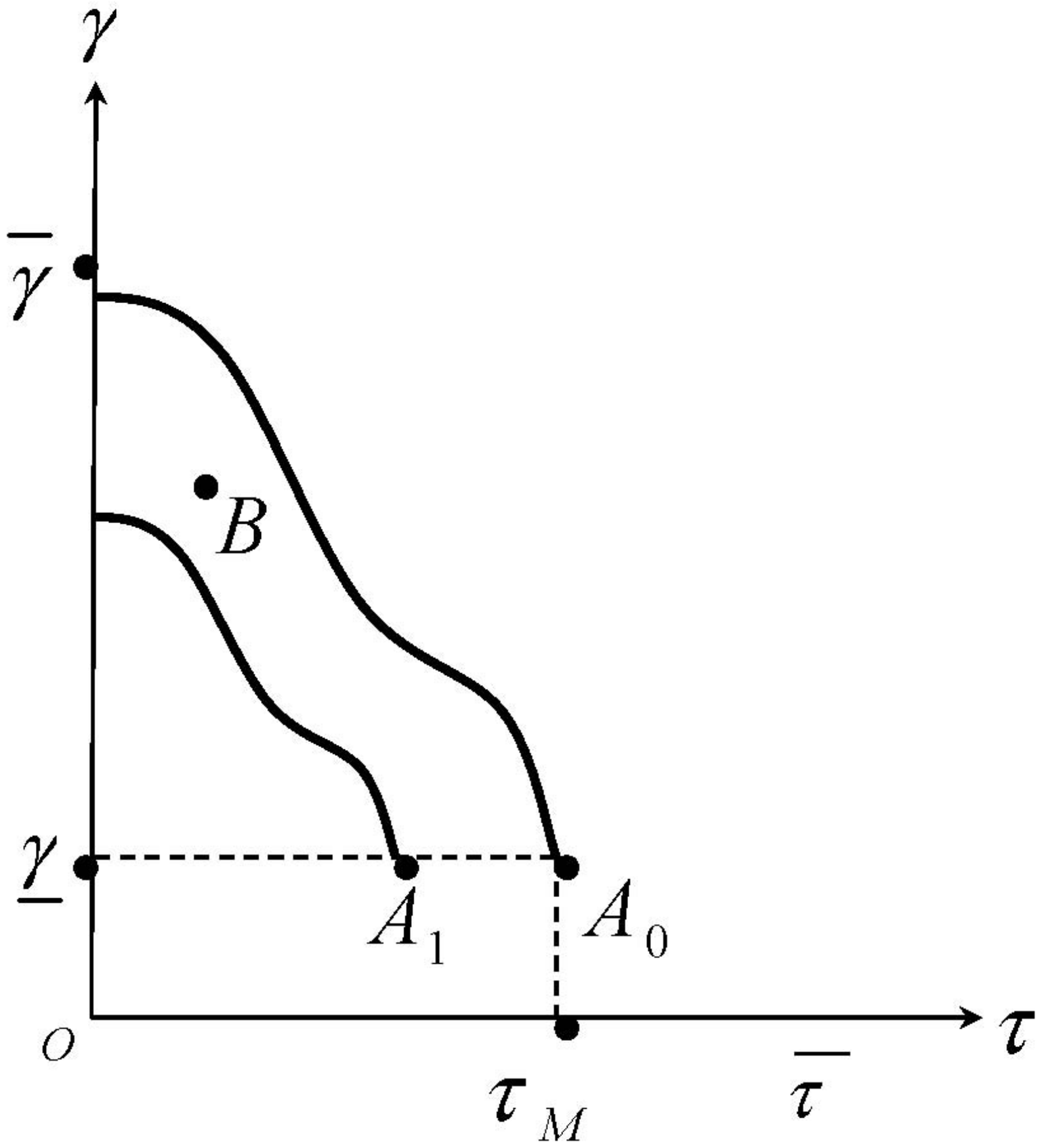

Figure 5