Markets and Values

The Evolution of Intrinsic Motivation

Tim Besley and Maitreesh Ghatak

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Motivation

- Many commentators e.g. Durkheim, Weber and Polanyi remark on how culture changes with economic development
  - a key example is changes in the nature of employment relations from systems based on reciprocity and trust towards modern wage-labor contracts
  - economists have not paid much attention to cultural dynamics
- However, there has been some recent interest in the importance of intrinsic motivation
  - the possibility that people do not need to be incentivized to perform tasks
  - indeed, incentives can sometimes be counter-productive
- But there is not much on what socializes people into being intrinsically motivated.
  - or are preferences just fixed genetic endowments?

This Project

- To study the dynamics of intrinsic motivation when preferences respond to workplace socialization
- Basic set up has
  - firms offer wage contracts
  - workers sort across firms
  - workers influence those with whom they work but socialization does depend on the "fitness" of each type
- Core outputs
  - show how intrinsic motivation in the population as a whole can increase or diminish over time
  - show how this dynamic path responds to technological change and migration
  - draw some policy implications

Link to Literatures

- Literature on intrinsic motivation
  - anomie when intrinsically motivated workers are monitored and incentivized
- Optimal and Equilibrium Labor contracts
  - show that we cannot have a separating equilibrium with unobserved heterogeneous motivation, moral hazard and team production
- Literature on cultural evolution
  - mostly in anthropology but recently small literature in economics

Cultural Evolution Literature

- Key contributions by Boyd & Richerson (1985) and Cavalli-Sforza & Feldman (1981)
  - uses evolutionary models with exposure to a range of "cultural parents"
  - emphasizes dynamics due to social learning
- In economics Bisin & Verdier (2001)
  - adds a strategic dimension to intergenerational socialization
  - applied, for example, in Tabellini (2008).
- Approach taken here is essentially the indirect evolutionary approach of Guth & Yaari (1992) and Guth (1995)
  - mainly focused on small group interactions and preference change
  - espoused by Ostrom (2000) to study collective action.

Road Map

- Lay out core model with three features
  - team production with moral hazard
  - heterogeneous motivation and firms
  - competition for workers
- Derive optimal labor contracts
- Dynamic model of socialization
- Role of productivity growth and migration
- Welfare results

Framework

- A measure $N < 1$ of producers (firms) and a measure 1 of workers who are of two types: $\tau \in \{m, s\}$ where m stands for motivated and s for selfish.
- Time is infinite and indexed by t.
- Let μ_t be the fraction of motivated workers in the population at date t.
- Workers can choose to put in one unit effort $e \in \{0, 1\}$.
- Effort costs c to a selfish agent, who decides whether to put in effort or not
- Intrinsically motivated agents get $\theta > 0$ from effort & puts in effort automatically
- But they incur a cost of $\nu \in (0, \theta)$ if they are incentivized (e.g., resents the lack of trust).

Production

- Two workers are needed to produce output.
- Output is produced only if *both* agents put in effort.
- Firm owner then gets $\pi \in [2(c+z), \Pi]$ with cdf $G(\pi)$ where $z \geq 0$ is subsistence consumption.
- Workers are matched with firms who post employment contracts which comprise a type-specific wage, w_τ, and an output contingent payment (bonus) b_τ which is strictly positive.
- Effort is not contractible and workers have no wealth which they can post as a bond against poor performance.
- Workers have a common outside option $\bar{u}$.

Contracts

- Equilibrium contracts $\{w_m, b_m, w_s, b_s\}$ in a market equilibrium where firms compete for workers.
- The model therefore has both adverse selection and moral hazard.
- We will require that contracts are incentive compatible in two senses:
  1. workers select the contract intended for their type and
  2. effort decisions are optimal (for selfish types).

Effort Decisions

- Let $E(b, \tau)$ be the effort decision of type τ when the bonus is b. ($E(b, m) = 1$ for all $b \geq 0$)

Lemma

If $b \geq c$, then there is an equilibrium in which all selfish agents put in effort whether they are matched with a selfish or a motivated agent.

- Focus on the case where:

$$E(b, s) = \begin{cases} 1 & \text{if } b \geq c \\ 0 & \text{otherwise.} \end{cases} \tag{1}$$

- The payoff of the selfish agent is:

$$V(b, s) = E(b, s)[b - c].$$

while

$$V(b, m) = \begin{cases} \theta & \text{if } b = 0 \\ \theta + b - \nu & \text{otherwise.} \end{cases}$$

is the utility of a motivated agent when the bonus is b.

Self-Selection

- Standard conditions

$$\begin{aligned} w_s + V(b_s, s) &\geq w_m + V(b_m, s) \\ &\text{and} \\ w_m + V(b_m, m) &\geq w_s + V(b_s, m) \end{aligned} \tag{2}$$

Outside Opportunities

- Outside option is unemployment where a worker receives a subsistence consumption level of $z > 0$.
- This implies that total remuneration cannot fall below z, i.e.

$$b_\tau + w_\tau \geq z. \tag{3}$$

- This will create a bound on the ability of firms to extract back from the utility rent θ which motivated workers earn.
- Also suppose that there is a small disutility $\varepsilon > 0$ from being unemployed so that all workers strictly prefer to work if they can even if the consumption level is z under both options.
- Hence the outside option for both types of worker is $z - \varepsilon \geq 0$.

Competition and Profit Maximization

- Contracts must also be consistent with competitive profit maximization by firms.
- Firms offer a common contract $C = \{w_m, b_m, w_s, b_s\}$ and are atomistic and take the outside utility of workers, denoted by $\{u_m, u_s\}$, as fixed.
- Suppose that a firm hires two worker's i and j of type $\tau(i)$ and $\tau(j)$.
- Let $\mathcal{P}$ be the set of permutations of the types of worker pairs, i.e. $\{(s,s),(s,m),(m,s),(m,m)\}$ with typical element p.
- Then we define the set $\mathcal{S}$ with elements $\{i,j\}$ such that for all $p \in \mathcal{P}$, there exists $\{i,j\} \in \mathcal{S}$ such that $\{\tau(i),\tau(j)\} \in \mathcal{P}$.
    - Intuitively, when we consider $\{i,j\}$ from S we cover all permutations of worker types that a firm could choose from.

Competition and Profit Maximization

- Focus on contracts where (1) and (2) hold then the profits of the firm are:

$$\begin{aligned}\Pi\left(i,j:\pi,C\right) &= E\left(b_{\tau(i)},\tau\left(i\right)\right)E\left(b_{\tau(j)},\tau\left(j\right)\right)\left\{\pi-b_{\tau(i)}-b_{\tau(j)}\right\}\\ &\quad -w_{\tau(i)}-w_{\tau(j)}.\end{aligned}$$

- Given any equilibrium contract C, the equilibrium utilities of workers are $w_s + V\left(b_s, s\right)$ and $w_m + V\left(b_m, m\right)$.
- Profit maximization requires that, for all $i, j \in \mathcal{S}$ there does not exist $C' = \left\{w_m^{'}, b_m^{'}, w_s^{'}, b_s^{'}\right\}$ which satisfies (1), (2) and (3) such that:

$$\begin{aligned}w_s^{'} + V\left(b_s^{'}, s\right) &\geq w_s + V\left(b_s, s\right) \;\&\; w_m^{'} + V\left(b_m^{'}, m\right) \\ &\geq w_m + V\left(b_m, m\right).\end{aligned} \tag{4}$$

and $\Pi\left(i,j:\pi,C'\right) > \Pi\left(i,j:\pi,C\right)$.

Timing

1. There is a fraction μ_t of motivated workers in the population
2. Firms post contracts $\{w_m, b_m, w_s, b_s\} \in C^*$.
3. Firms and workers match and workers choose their effort levels.
4. Socialization takes place and the fraction of motivated workers is updated to μ_{t+1}.

We will work backwards through each stage of the model.

Socialization

- Given a set of equilibrium contracts C^* and a fraction of motivated workers, let $U(C^*, \mu, \tau)$ be the expected utility of being a type τ and let

$$\Delta(\mu) = U(C^*, \mu, m) - U(C^*, \mu, s)$$

  be the utility difference between the motivated type and the selfish type.
- We will characterize $\Delta(\mu)$ below.
- Co-workers serve as "cultural parents".
- Suppose that socialization has bite in situations where there is non-assortatively matching.
- Probability of becoming motivated in a mixed setting is

$$\rho(\Delta(\mu_t)) = \frac{\exp[\Delta(\mu_t)]}{1 + \exp[\Delta(\mu_t)]}.$$

Socialization (continued)

- This implies that

$$\mu_{t+1} = \sigma\mu_t + (1-\sigma)\left[\mu_t^2 + 2\mu_t(1-\mu_t)\rho(\Delta(\mu_t))\right].$$

  where σ is fraction of assortative matching.
- Rewrite as

$$\mu_{t+1} - \mu_t = (1-\sigma)\mu_t(1-\mu_t)\left[2\rho(\Delta(\mu_t)) - 1\right].$$

- Thus the sign of the change is determined by $\rho(\Delta(\mu_t)) \gtrless 1/2$ or equivalent $\Delta(\mu_t) \gtrless 0$.

Equilibrium Contracts

- Equilibrium contracts C^* which satisfy (1), (2) and (3) and are profit maximizing for all $\pi \in [2(c+z), \Pi]$.
- Show that C^* comprises two sets of pooling contracts both of which are typically on offer in a market equilibrium.

Proposition

All contracts in C^* set subsistence wages, i.e. $w_m = w_s = z$. For bonuses, the market offers two possible contracts: a bonus contract where $b_s = b_m = c$ and a fixed-wage contract where $b_s = b_m = 0$. Firms choose which contract to offer as follows:

1. *if $\pi \geq \frac{2c}{1-\mu^2}$ then $b_s = b_m = c$*
2. *if $\pi < \frac{2c}{1-\mu^2}$ then $b_s = b_m = 0$*

Dynamics

- Last result shows that $\sigma = 0$
- Focus on case where

$$0 > \theta + c - \nu > -\varepsilon. \tag{5}$$

- This is the *anomie* condition where values or norms have broken down causing a state of anxiety to workers, a form of personal demoralization.
  - Requires ν to be large enough and will be enough to generate the possibility of breakdown an intrinsic motivation norm.
- In the contracting equilibrium, the probability that any type of worker is employed is N.
- Thus,

$$U(C^*, \mu, s) = -(1 - N)\varepsilon,$$

- The expected utility of a motivated worker is

$$U(C^*, \mu, m) = N\Delta(\mu) - (1 - N)\varepsilon.$$

Dynamics

- Key expression is

$$\Delta(\mu) = \left[\theta + \left(1 - G\left(\frac{2c}{(1-\mu^2)}\right)\right)(c-\nu)\right]$$

  which is increasing in μ.
- Expected payoff to being motivated agent is greater when there are more motivated workers around since firms offer more fixed wage opportunities.
- Define $\hat{\mu}$ from

$$\theta = \left(1 - G\left(\frac{2c}{(1-\hat{\mu}^2)}\right)\right)[\nu - c].$$

  Then $\Delta(\mu) \geq 0$ for all $\mu \geq \hat{\mu}$ and if $\mu < \hat{\mu}$, then $\Delta(\mu) < 0$.

Dynamics

Proposition

For $\mu_t < \hat{\mu}$, $lim_{t-\infty}\mu_t = 0$ *and for* $\mu_t > \hat{\mu}$, $lim_{t-\infty}\mu_t = 1$.

- Thus there is a "tipping point" around $\hat{\mu}$
- Extent of worker motivation either increases or decreases over time depending on which side of the tipping point the starting point is
- Thus the economy naturally has multiple steady states: $\mu = 1$ or $\mu = 0$.

Implications

1. Structure of production

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2. Migration

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1. Structure of production
2. Migration
3. Welfare and nature of rewards

Structure of Production

Proposition

Consider two distributions of productivity A and B where the first dominates the second in a first order sense, i.e.

$$G^A(\pi) \leq G^B(\pi) \text{ for all } \pi \in [2[c+z], \Pi].$$

then the threshold fraction of motivated individuals for economy A, $\hat{\mu}^A$ will be everywhere above the threshold fraction of individuals in economy B, $\hat{\mu}^B$.

- Thus more productive economy is likely to have less intrinsic motivation all else equal.
- So technological change can lead to a move towards an economy dominated by selfish individuals.

Migration

- Pool of migrants of measure M and two economies A and B with the same structure of productivity and other parameters where the first economy has more motivated workers, $\mu^A > \mu^B$.
- Among the migrants, let μ^M be motivated and let $\Delta^A = \Delta\left(\mu^A\right)$ and $\Delta^B = \Delta\left(\mu^B\right)$ be the expected gain from being a motivated worker in each economy.
- Motivated migrant will pick the economy to migrate to based on $\max\left\{\Delta^A, \Delta^B\right\}$.

Proposition

Potential migrants will sort according to the fraction of motivated workers in each country. Specifically, if $\Delta^A > \Delta^B$ $\left(\Delta^A < \Delta^B\right)$ the fraction of motivated workers in A increases (decreases) to $\frac{\mu^A + \mu^M M}{N + M\mu^M}$ $\left(\frac{\mu^A}{N + M(1-\mu^M)}\right)$.

- So migration reinforces the dynamics.

Welfare

- Aggregate surplus when the fraction of workers is μ is:

$$\begin{aligned} S(\mu) &= N[\mu\theta + G\left(\frac{2c}{(1-\hat{\mu}^2)}\right)\left[\mu^2 E\left(\pi : \pi \leq \frac{2c}{(1-\hat{\mu}^2)}\right)\right] \\ &+ \left(1 - G\left(\frac{2c}{(1-\hat{\mu}^2)}\right)\right)\left[E\left(\pi : \pi \geq \frac{2c}{(1-\hat{\mu}^2)}\right) - v\right]] \\ &- (1-N)\,\varepsilon. \end{aligned}$$

Proposition

In the long-run economies based on intrinsic motivation will have higher welfare and similar income levels to those which rely on incentives

- This is because we allow motivated workers to earn θ.

Concluding Comments

- We have put forward a framework for studying cultural dynamics when there is endogenous motivation due to workplace socialization
- Contracts and labor allocation is endogenous
- Allows us to think about a range of issues
- Part of a wider agenda to understand situations where preferences and institutions interact.