Food system from a developed country perspective

David Zilberman

Department of Agricultural and Resource Economics, UC Berkeley

GTAP Conference

June 25 2021

Overview

- Motivation- Mars
- Static Model
- Multiple dimension
- Conclusions
- Implications

Rethinking Economics: Understanding the Mechanisms LinkingInnovators and Consumers

Economic theory was formed when agriculture was the dominant industry

- Therefore perfect competition was natural model

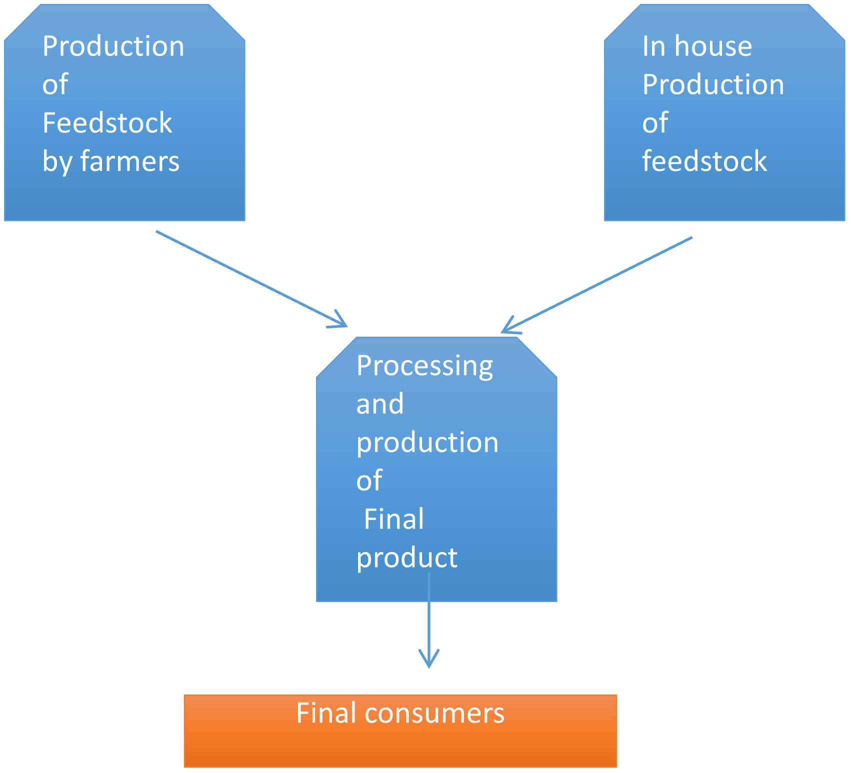
- But economy changed and even agriculture changed
- Schultz – modern economy is changing by new technologies
  - While traditional systems were in equilibrium
  - Modern system change – innovation
  - Main human capital component – ability to deal with dis-equilibrium
- Schumpeter – the crucial role of innovation and creative destruction
- Coase – and Williamson Investigated the the role of the firm and the market
- Our starting point – **an entrepreneur wants to implement an innovation**
- **Implementation requires multiple stages and designing a supply chain**
- Questions
  - Scale of operation
  - Structure – contracting vs vertical integration
  - Impact on market rules of policies

The education industrial process and innovation

- Supply chain of innovation –the **educational industrial complex** where academia comes with innovation and private sector implements it
  - Discovery
  - Testing
  - Upscaling (GMO_ new food prodcuts)
- Scientists are entrepreneurs
- Relationship between universities, start ups and major companies
- Agriculture has high rate of innovation
- Expansion of supply of commodities results in low prices
- Therefore emphasis on value added, enhancing innovation
- Product supply chain- once innovation is available how to commercialize it
  - Cereal
  - New crop
- Traditional ag. Econ. and emphasized farmers and competitive markets
  - Theory of the firm, adoption
- The new challenge: understanding the economics of value chains and their implications
- We have a supp

Two Stage Supply Chain

- Innovation is new ways to do things-technology institution
- A minimal supply chain
  - Producer of the feedstock
  - Bio-refinery (Processor) who sells the final product.
  - A supply chain may be much more complex.
- Examples
  - biofuel
  - Flowers in Kenya for export
  - Supermarket
  - Even Apple /Amazon



The supply chain design optimization problem

- Determining optimal scale of [production (X)
- Degree of vertical integration X_h, X_m
- $f(X_h + X_m)$ *producing function farm level*
- $D^{-1}\big(f(X_h + X_m)\big)$*- output demand*
- $C_p(X_h + X_m)$*-cost of processing*
- $C_h(X_h)$ *- cost of feedstock production in house*
- $X_m MC_m(X_m)$ *expenditure on purchased feedstock*
- $L = \underset{X_h, X_m}{Max} f(X_h + X_m) D^{-1}\big(f(X_h + X_m)\big) - C_p(X_h + X_m) - \ C_h(X_h) - X_m MC_m(X_m)$
- subject to
- $X_m \geq 0$ and $X_h \geq 0$ *the non-negativity constraint*.
- $R = f(X_h + X_m) D^{-1}\big(f(X_h + X_m)\big)$ enterprise revenue
- $C = [C_p(X_h + X_m) + \ C_h(X_h) + X_m MC_m(X_m)$ enterprise cost
- equation 4 is equal to the maximization of revenue minus cost subject to the non-negativity constraint

The first order condition

- (6) $MR(Q)MP(X) = MC_P(X) + MC_h(X_h)$
- At the optimal level of X_h (In house production)
- the marginal contribution of a unit of X_h to the enterprise revenue=
- the sum of marginal cost of processing and the marginal cost of producing Feedstock in house.
- 8) $MR(Q)MP(X) = MC_P(X) + ME(X_m)$
- at the optimal level of X_m (Contracting)
- the marginal contribution of a unit of X_m to the firm revenue =
- the sum of marginal cost of processing and the marginal outlay on purchased inputs
- $MC_h(X_h) = ME(X_m) \geq MC_m(X_m)$
- at the optimal solution the enterprise may produce more in-house and purchase less from external sources in order to reduce the price of purchased inputs

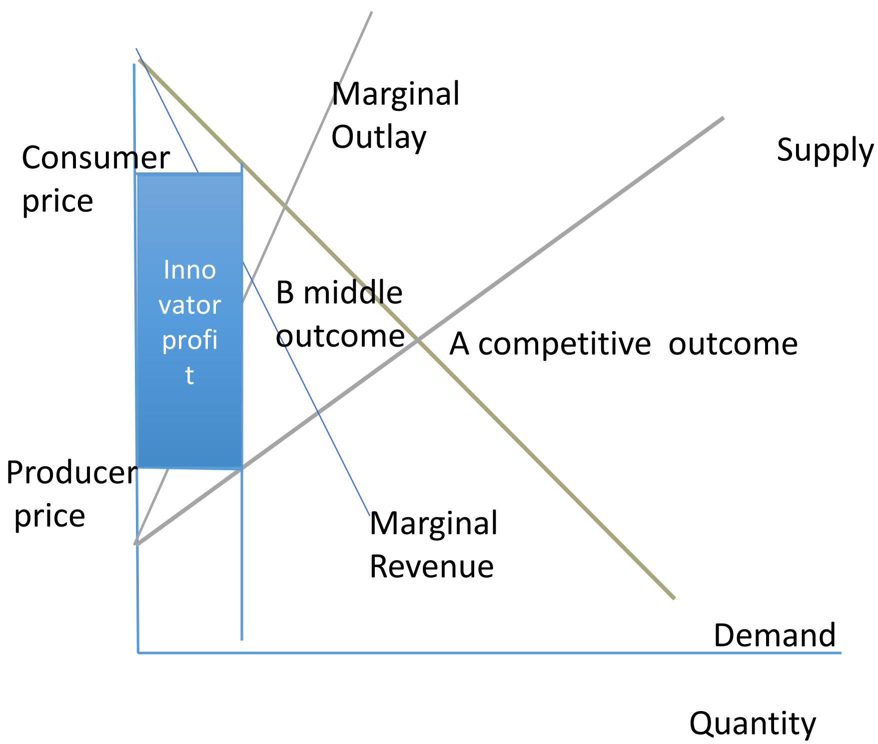
The supply chain design optimization problem

- Objective: Maximize revenue minus
  - processing costs
  - Costs of production in-house
  - Expenditures to suppliers
- Optimal condition: Marginal revenue = marginal processing costs plus marginal production costs in-house = marginal processing costs plus marginal expenditures
- Implications
  - Entrepreneurs make monopoly and monopsony profits
  - They may diversify production between external and internal sources
  - Reducing processing costs and increasing demands will increase volume
  - You may have specialization in vertical integration or contracting
  - Conditions change over time
- More realistic model needs to include
- Dynamics
- Credit and capital constraints
- Risk

In an innovative economy markets are endogenous

- If innovation results in a new product – it starts a market for the product and its feedstock
- The enterprise determines the market structure
- The enterprise has a monopoly in the output market and a monopsony in the purchased input market.
  - This means that it will produce less output overall than would occur under competition and it will use fewer inputs overall.
- This extra profit is the compensation for the entrepreneurial effort. From a traditional welfare economics perspective, this outcome is inefficient, but entrepreneurs or firms may not engage in implementing a new innovation in the absence of this extra profit.

With contracting, innovators can gain middleman profit, assuming zero processing cost



Alternative institutions for two stage systems

- Vertically integrated plantation
  - Includes production, processing, packing, and shipment
- Contract farming
  - A processing facility with satellite farms
- Nucleus–plasma model (a mixed model)
  - A central unit with both a plantation and processing facility, with satellite farms surrounding it
- Decentralized system
  - Small producers sell to middlemen who sell to processors
    - Efficient from an economic perspective under certain assumptions
    - When there are economies of scale, you may move to alternative systems.

Considerations of system choice

- Credit and capital
  - Vertically integrated plantations require capital and access to land.
    - Limited capital and restriction on labor availability may lead to alternatives.
    - A nucleus-plasma model may be a diversified strategy where processors produce some of the feedstock, but buy the rest from contractors.
- Risk Diversification
  - Vertical integration may reduce production risk, but may be vulnerable politically.
  - The nucleus-plasma model is a reasonable risk diversification strategy.
- Intellectual property and innovation
  - If a processor develops a proprietary technology, he may consider vertical integration.
  - Processors may use the nucleus to develop and expand the technology.

- **The analysis is dynamic**

Dynamic Optimization problem

- (3) $L = \underset{I_t, X_t}{Max} \sum_{t=1}^{T} \frac{1}{(1+r)^t} \left[f(X_t, K_t, t) D^{-1}(f(X_t, K_t, t)) - C_p\left(X_{t,} K_t\right) - X_t MC_m(X_t, t) - I_t \right] - I_0 \quad L = -I_0$
- Subject to
- $K_t = K_{(t-1)}(1-\delta) + I_t$ t$= 0 \ldots T-1$ *the equation of motion of capital*
- $X_t, I_t, K_t \geq 0$ *non negativity constraints*
- K_0 No initial capital
- The temporal profit of the enterprise at each period from *1* to *T* is equal to the revenue minus processing costs, purchased input costs and investment costs.
- These profits are discounted to compute the NPV, and then the initial investment is subtracted

Optimal feedstock

- $MR(Q_t)MP_x(X_t) = MC_{Px}(X_t) + ME(X_t)$
- marginal contribution of feedstock to firm revenue,$MR(Q_t)MP_x(X_t)$
- is equal to the sum of marginal contribution of feedstock to the processing cost,$MC_{Px}(X_t)$ $MC_{Px}(X_t)$,
- $plus\ the\ marginal\ outlay\ on\ purchased\ inputs\ ME(X_t)$

Temporal marginal benefits of capital

- 5) $MB_K(K_t)MB_K(K_t) = MR(Q_t)MP_K(K_t) - MC_{PK}(K_t)$
- The temporal marginal benefits of capital at each period, denoted by $MB_K(K_t)$
- equal to its marginal contribution to the firm's revenue, $MR(Q_t)MP_K(K_t)$
- plus the marginal reduction in processing costs due to increased capital, $- MC_{PK}(K_t)$

The marginal benefits of investment

- (6) $MB_I(I_t) = \sum_{j=t+1}^{T} MB_K(K_j) \frac{(1-\delta)^{j-t-1}}{(1+r)^{j-t}}$
- the temporal marginal benefit of investment at any moment, $MB_I(I_t)$. is the net present value of marginal contribution of the capital goods generated from this investment throughout the life of the project, taking into account discounting and depreciation.
- the temporal marginal benefit of investment in period 0 will start at period 1 and will continue till time T
- this benefit will decline because of discounting and depreciation
- $MB_I(I_t) = \sum_{j=t+1}^{T} MB_K(K_j) \frac{(1-\delta)^{j-t-1}}{(1+r)^{j-t}} = 1.$
- the volume of investment in period t is such that the temporal marginal benefit of the investment is equal to 1 monetary unit, which is the temporal marginal cost of investment

Implications

- I every period the enterprise operates as a middleman in the output and feedstock market. The extent that it gains monopoly or monopsony rents depends on its market power at each period. If over time more competitors enter – so that the innovation is losing its uniqueness – the above normal profits of the enterprise decline
- The volume of operation of the enterprise increases over time when learning by doing increases the productivity of processing the feedstock or the supply of feedstock is increasing and becomes cheaper, or the demand for the final product is increasing
- Since the enterprise starts with no capital it must investment in the early period to build capital stock. Smaller interest rate and/or depreciation rate increases the size of initial investment. The investment is likely to grow the larger is the demand for the final product.
- Capital goods that increase feedstock use efficiency are more valuable when demand for final product is high, and feedstock costs are high.
- If the interest rate and the depreciation are high and the demand is expected to grow over time, the investment may be spread over the years.
-

Further dynamic consideration

- Diffusion and adaptation of agri-food supply technologies
  - There is a process of diffusion of these systems over space and time
  - Aid, foreign direct investments and regulations are mechanisms that may affect these processes
  - Local constraints affect pattern introduction of supply chain – its scale and institutional component
- Transition towards competition
  - Firm will introduce product similar to existing successful product
  - Leading to competitive equilibrium structure and models Like Zhang and Sexton
- Supply creates demand
  - One of the role of innovator is to create demand
  - Build marketing network
  - Marketing strategy
  - Hedonic pricing
  - Change in preference
    - Organic - avocado
- Need to be incorporated in our model

Conclusions

- **The educational-industrial complex is a key driver of innovation**
- **Agriculture and the system of innovation has become more privatized**
- **Agriculture needs to develop systems of innovation supported by both private and public sector. Public can support public goods but also a sustainable financial system**
- **Technological change results in innovation and new markets that tend to be non-competitive; Over time, the structure moves towards competition**
  - **Highly innovative economy has a high rate of monopolization**
- **Markets are endogenous – innovators create markets**
- **Magnitude of supply chains depend on the ability of an innovator to deal with credit and risk**
- **Society needs to tolerate some degree of monopoly power in the short-term, otherwise the rate of innovation is slower**

Gtap

- Develop modeling of sector- with non-competitive behavior
- Allow choices of institution markets – Contract – vertical integration
- Allow dynamic behavior where market structure change
- Big believer in these modeling world food summit/need for numbers
- Will take time – but be aware of it

Implications

- Research needs to go beyond the farm gates:
  - Study value chains: explain their design, role of uncertainty and institutions
  - Linkages between research systems and product supply chains, constraints to implementation of innovation
  - Understand adaptation of supply chain to new technologies (robots, IT, biotech, etc) and climate change and their implications
  - Assess impacts of various value chain designs on various groups in the economy
    - Which population segments may lose from new value chains – how to protect?
  - Impact of policy on innovation and behavior and performance of supply chains- trade policy, IPR, regulation
- Investment in data, infrastructure, research, human capital (marketing, credit, inventory management) need to recognize evolution of value chain
- Move from ag policy to agri-food policy
- International Organizations should develop mechanisms to (i) enable transformation to improve sustainability and well-being and (ii) allow underdeveloped groups to benefit from value chain and enhance resilience to side effects of global value chain

Added material

Opportunities and threats

- Technology development
  - A large operation that is the nucleus of a system with contractors and can invest in new technologies.
    - Harvesting is labor intensive and should be automated once a new harvesting technology is introduced (can learn from other crops).
    - Harvesting can affect orchard architecture and production processes.
  - Contracting may lead to strategic dependence.
    - Holdups by contractors
    - Emergence of competing processors that will poach contractors
    - Overall supply increases
    - When the number of contractors is large, collaboration costs are high.
    - There is the potential for win-win contracts, but the nucleus farm has to be alert and not fall behind compared to competitors.

Political economic issues

- Access to land
  - When land can be owned or leased for a long period of time, vertical integration or large farms are relevant.
- Accommodations of smallholders
  - Political systems may prefer to promote independent, small farmers (family farms is part of American lore), resulting in:
    - Competitive systems
    - Contract farming
    - Nucleus-plasma system (to some extent)

Supply chains evolve

- May start with vertical integration or joint venture and then to accelerate supply emphasize contract farming.
  - There may be a region of origin when technology is developed
  - IN other regions processor may have a processing facility and contract farming or a nucleus plasma

Patents as incentives for development

- Patents serve not only as incentives for innovation, but are key for investment in product development
  - Development and innovation are not done by the same organization
  - Commercialization requires significant investment
- The key challenge of the innovation process is to obtain financing for up-scaling
- Patents are not ideal for all innovations
  - Some innovations are better protected by trade secrets
  - Some managerial innovations are difficult to patent and easy to imitate
    - They may require establishing a supply chain for the final product rather than benefiting from royalties of patent protection

Case studies and supplemental material

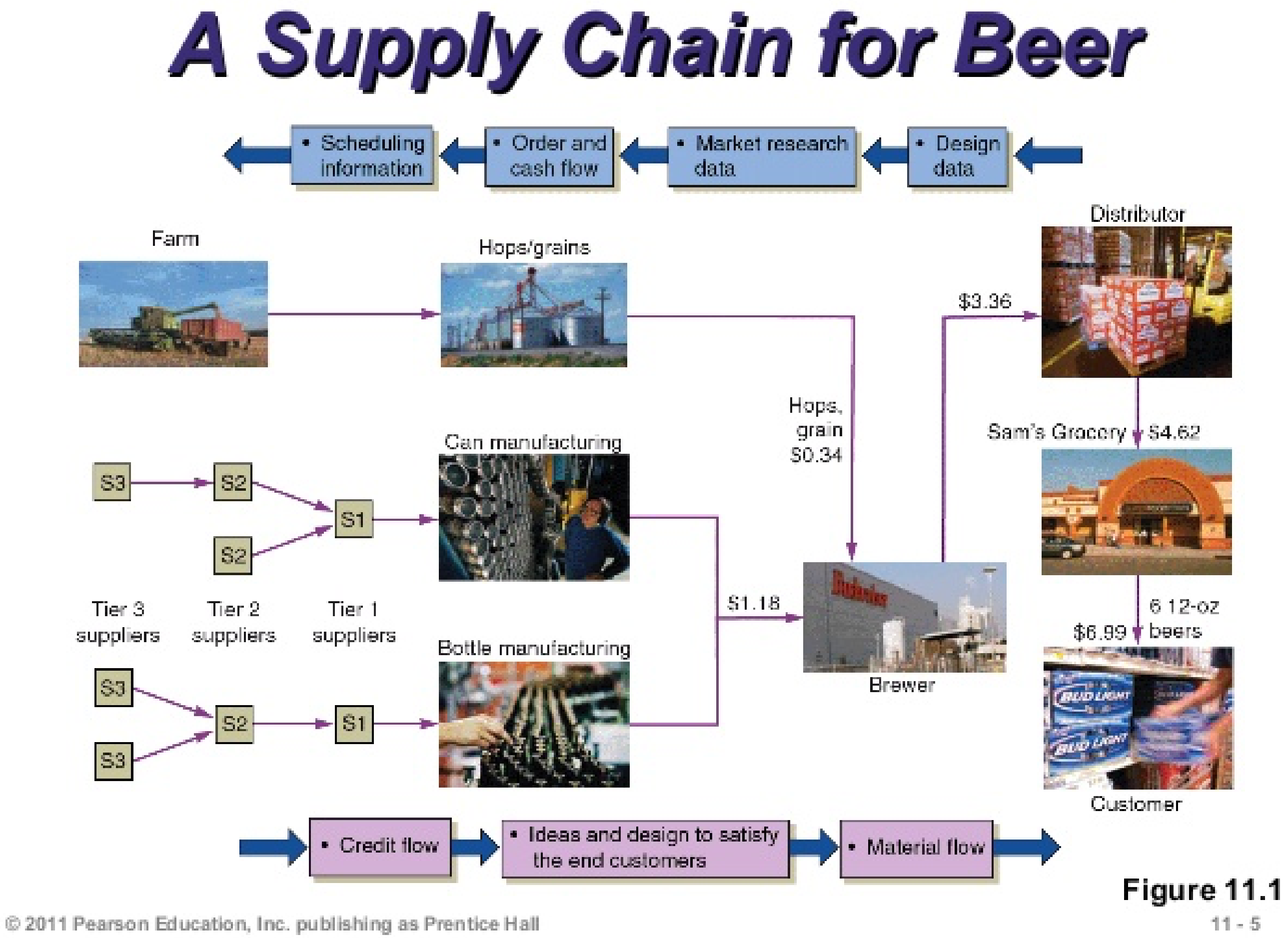
Examples: Tyson Foods

- Initial supply chain
  - Chicken farmers in Arkansas contracted with Tyson
  - Tyson shipped chicken to New York.
- More advanced supply chain
  - Tyson breeds unique chicks and buys feed
  - Farmers grow chicken for Tyson
  - Tyson processes the chicken and distributes in different markets
- Tyson gains from
  - More efficiently produced chicken that they own
  - Volume discount on feed
  - Splitting the chicken and selling different parts in different markets.
  - More advances in preparing pre-cooked chicken

Examples: Water Systems

- Main elements
  - Water withdrawal (from lake, groundwater, etc)
  - Conveyance from source to users (e.g. Central Valley Project)
  - Distribution to users
- In California, water projects are managed by the government, but outcomes would have been different if managed by private companies
  - Prices vary based on supply system
- Water supplier may have monopoly power
- Aqueducts have market power, in principle

Examples: Beer



Source: Slideshare - LinkedIn

Cocoa

- Demand is growing
- Yield / hectare is small
- New varieties technique available
- One solution Plantation supported by Processor
- Another a processing facility buying from many small holders
  - Need private extension
  - Credit for farmers to replant
  - Companies may support it
- Government is worried that high yield will reduce price
- Solution reduce plowed area
- Grow palm oil instead

Walmart suppliers finance themselves

- Intermediaries have hard time to finance their project not to mention their suppliers
- The suppliers (including farmers) obtain their own finace
- But what will you do I

Aquaculture

- Fish and sea food aquaculture production are growing sectors
- Algae production is also producing new income through production of Fine coloring – protein and biofuel.
- The aquaculture sector is requiring creative biofuels
- Where the feedstock – fish algae is moved to a processing plant and produce several product line
- Getting value of much of the feedstock is a big challenge
- The industry is now knowledge intensive but as research and development are progressing it generates jobs to farmers and other low income individuals
- It success depends on
    - Research in developing an industry
    - Effective development and commercialization – that may entails seed publcicor private investment
    - Commercialization and good supply chain design

Table – putting example together

Apple	Middle men	
Tyson	contracting	Credit , path dependent
Chips	Verticla integration	
Gallo	Nucleus plasma	
Church (salad)		
Foster farm	nuclearplasma	

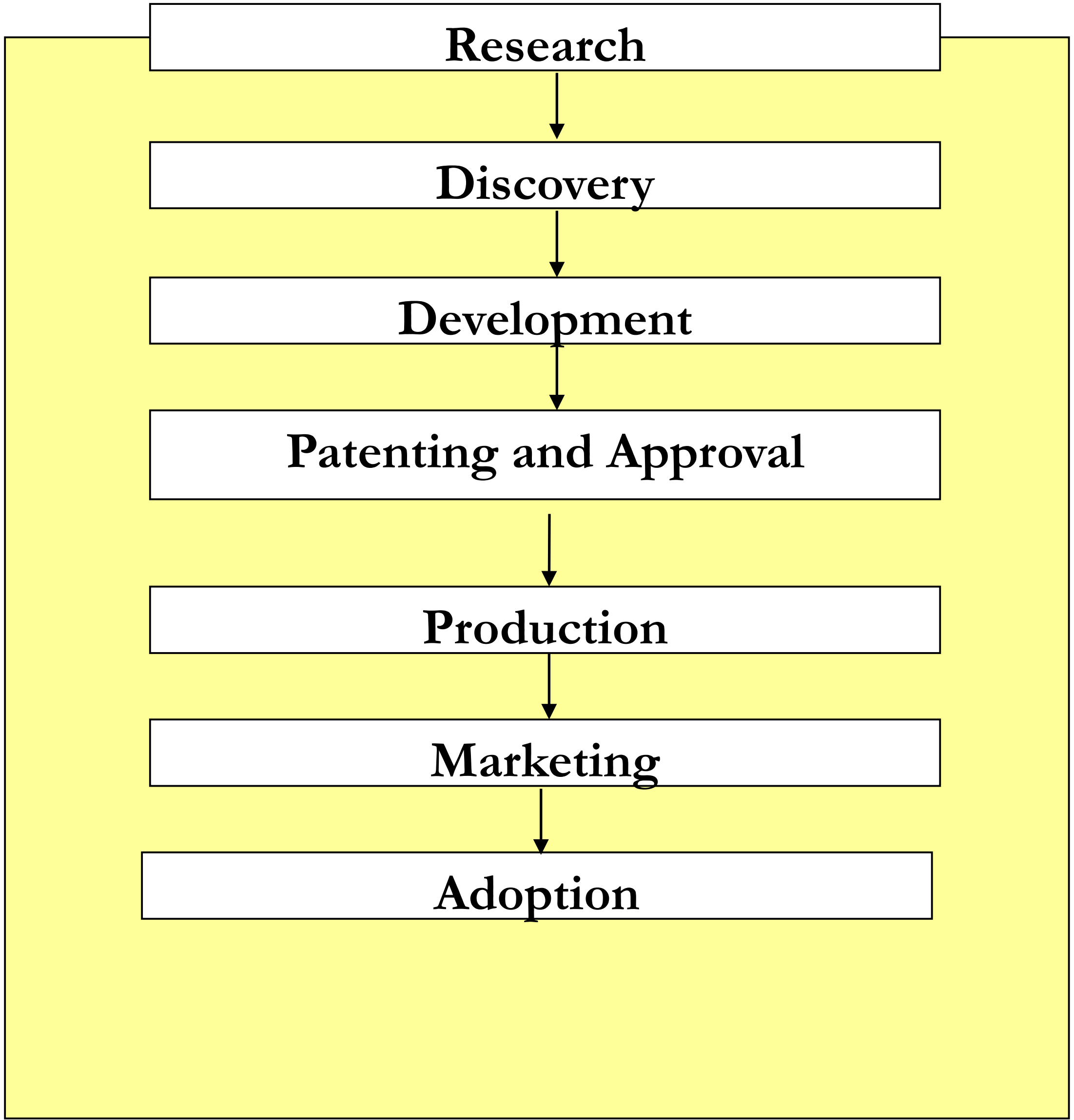
Conclusions

- In a dynamic economy, innovations are implemented by companies that build supply chains with monopolistic power
- We develop a method to assess the productive capacity as well as extent of reliance on these companies
- In this environment, this model gives rise to creative destruction; therefore, anti-trust policy needs to be targeted and selective
- There are many opportunities for further theoretical development as well as case studies and empirical work

EXTRA MATERIAL

The Innovation Process- and supply chain

Innovations evolve and have their its own supply chain



Innovations in Supply Chain Educational/Industrial Complex

Step	University	Start-up	Multi-national
Discovery	***	**	*
Development	*	***	**
Commercialization		**	***
Marketing		**	***

- Universities have Offices of Technology Transfer, who sell rights to patents and may help faculty start companies
- Multinationals may take over start-ups
- Multinationals have relative advantage in products that require investment in testing
- Different countries have different innovation supply chains

Varying capacities to innovate

- Tier I Countries:Established innovators, essentially the OECD countries that have already become technology-intensive economies.
- Tier II Countries: Emergent innovators, including China and India, which are in transition and overcoming all three types of obstacles discussed above.
- Tier III Countries: Long term importers of technology. These are the majority of today's economies, and a much larger majority of developing economies
- Need to go up the scale
- Let your scientists contribute to industry
- Develop education industrial complex

.

Economic factor in dynamic analysis of supply chain design-stock of capital for processing facility

- We will assume a planning horizon of $T + 1\ years$
- the time indicator, $t, runs\ from\ t = 0\ to\ t = T$
- initial investment denoted by I_0
- $investment\ in\ year\ \ t\ I_t$
- $K_t\ be\ the\ capital\ stock\ at\ the\ beginning\ of\ period\ t$
- $K_t = K_{(t-1)}(1 - \delta) + I_{t-1}$
- where δ is the depreciation constant
- Steady state $I_t = \delta K_t$

Production function, cost functions, demand

- The processing facility is refining X_t
- Refined output Q_t
- Production function $Q_t = f(X_t, K_{t,}, t)$
- the processing cost at period t $C_p(X_t, K_t)$
- Assuming no internal production of feedstock
- $MC_m(X_t, t)$ The marginal cost of processing
- The expenditure on the purchased input, $X_t MC_m(X_t, t)$
- inverse demand $P_t = D^{-1}(Q_t, t)$

Optimization problem

- (3) $L = \underset{I_t, X_t}{Max} \sum_{t=1}^{T} \frac{1}{(1+r)^t} \left[f(X_t, K_t, t) D^{-1}(f(X_t, K_t, t)) - C_p\left(X_{t,} K_t\right) - X_t MC_m(X_t, t) - I_t \right] - I_0 \quad L = -I_0$
- Subject to
- $K_t = K_{(t-1)}(1-\delta) + I_t$ t$= 0 \ldots T - 1$*the equation of motion of capital*
- $X_t, I_t, K_t \geq 0$ *non negativity constraints*
- K_0 No initial capital
- The temporal profit of the enterprise at each period from*1* to *T* is equal to the revenue minus processing costs, purchased input costs and investment costs.
- These profits are discounted to compute the NPV, and then the initial investment is subtracted

Optimal feedstock

- $MR(Q_t)MP_x(X_t) = MC_{Px}(X_t) + ME(X_t)$
- marginal contribution of feedstock to firm revenue,$MR(Q_t)MP_x(X_t)$
- is equal to the sum of marginal contribution of feedstock to the processing cost,$MC_{Px}(X_t)$ $MC_{Px}(X_t)$,
- $plus\ the\ marginal\ outlay\ on\ purchased\ inputs\ ME(X_t)$

Temporal marginal benefits of capital

- 5) $MB_K(K_t)MB_K(K_t) = MR(Q_t)MP_K(K_t) - MC_{PK}(K_t)$
- The temporal marginal benefits of capital at each period, denoted by $MB_K(K_t)$
- equal to its marginal contribution to the firm's revenue,$MR(Q_t)MP_K(K_t)$
- plus the marginal reduction in processing costs due to increased capital, $- MC_{PK}(K_t)$

The marginal benefits of investment

- (6) $MB_I(I_t) = \sum_{j=t+1}^{T} MB_K(K_j) \frac{(1-\delta)^{j-t-1}}{(1+r)^{j-t}}$
- the temporal marginal benefit of investment at any moment, $MB_I(I_t)$. is the net present value of marginal contribution of the capital goods generated from this investment throughout the life of the project, taking into account discounting and depreciation.
- the temporal marginal benefit of investment in period 0 will start at period 1 and will continue till time T
- this benefit will decline because of discounting and depreciation
- $MB_I(I_t) = \sum_{j=t+1}^{T} MB_K(K_j) \frac{(1-\delta)^{j-t-1}}{(1+r)^{j-t}} = 1.$
- the volume of investment in period t is such that the temporal marginal benefit of the investment is equal to 1 monetary unit, which is the temporal marginal cost of investment

Implications

- I every period the enterprise operates as a middleman in the output and feedstock market. The extent that it gains monopoly or monopsony rents depends on its market power at each period. If over time more competitors enter – so that the innovation is losing its uniqueness – the above normal profits of the enterprise decline
- The volume of operation of the enterprise increases over time when learning by doing increases the productivity of processing the feedstock or the supply of feedstock is increasing and becomes cheaper, or the demand for the final product is increasing
- Since the enterprise starts with no capital it must investment in the early period to build capital stock. Smaller interest rate and/or depreciation rate increases the size of initial investment. The investment is likely to grow the larger is the demand for the final product.
- Capital goods that increase feedstock use efficiency are more valuable when demand for final product is high, and feedstock costs are high.
- If the interest rate and the depreciation are high and the demand is expected to grow over time, the investment may be spread over the years.
-

Development and investment in supply chains

- The dynamic analysis suggests that under plausible conditions, introduction of a supply chain to implement an innovation of a new product or production in a new place may require a significant initial investment to overcome the initial condition ($K_0 = 0$)
- The optimal initial investment for implementing an innovation is larger and the net present value is larger as well when the investor faces a lower interest rate.
- Foreign investors that obtain their capital in developed countries with lower interest rates may have an advantage in introducing new production systems in developing countries.
- As the interest rate in China and other developing countries has declined, their dependence on finance from foreign and hedge funds has decreased

The behavior of innovator over time

- It reflects a constrained dynamic optimization
- At every period the enterprise operates as a middleman in the output and feedstock market.
  - The extent that it gains monopoly or monopsony rents depends on its market power at each period. If over time more competitors enter –profits decline
- The volume of operation of the enterprise increases over time with
  - learning by doing increases
  - demand for the final product is increasing
- .
- Capital goods that increase feedstock use efficiency are more valuable when demand for final product is high, and feedstock costs are high.
- If the interest rate and the depreciation are high and the demand is expected to grow over time, the investment may be spread over the years.
-

Development and investment in supply chains

- The dynamic analysis suggests that under plausible conditions, introduction of a supply chain to implement an innovation of a new product or production in a new place may require a significant initial investment
- The optimal initial investment for implementing an innovation is larger and the net present value is larger as well
  - when the investor faces a lower interest rate.
  - the larger is the demand for the final product
- Foreign investors that obtain their capital in developed countries with lower interest rates may have an advantage in introducing new production systems in developing countries.
- As the interest rate in China and other developing countries has declined, their dependence on finance from foreign and hedge funds has decreased

Learning

- Learning is another important feature of our analysis.
- In cases with large potential gain from learning by doing, the enterprise may not invest much in the early years, but instead wait so that learning reduces the cost of processing and feedstock.
- An enterprise may implement an innovation at a slower pace if the early demand for the final product is low but they expect the demand to grow substantially over time.
- Of course they can affect this growth by marketing. If the learning increases, it may reduce the volume of investment at late periods as the marginal gain from capital declines. This is especially the case when demand for the final product is not growing much.

Credit and finance

- The ability to obtain credit increases as the performance and profitability of the enterprise are more apparent.
- Thus in the early years credit constraints may restrict the volume of the enterprise and limit its ability to take advantage of its potential.
- Promising but resource limited enterprises that control a new innovation, may be taken over by established companies or hedge funds with sufficient resources to invest.
- Several innovative small but creative agricultural biotechnology or seed firms have been taken over by major companies such as Monsanto and Pioneer.

Policy

- To what extent to apply anti trust against monopsonistic pricing
  - Do we develop a period that allows it?- akin to patent
- Environmental regulation- sharing cost of pollution between integrator and contractors
- Optimal public investment in research- going beyond farm activities and enabling agribusiness development
- Develop policies and enable institutions that will enable creating supply chain for new products and activities
- Appropriate Supply chain management is essential for introducing bio-economy product

Conclusion

- Supply chain is optimization subject to constraints
- The details of the problem drive the analysis
- Markets and supply chains are not fixed and given they change
- Innovators search for market power
- Know you constraints – they may shape your strategy
- Deal with Credit and risk

Conclusion

- Farming system are forming complex supply chains
- Old firm and market centric models are inadequate
- need to understand the role, emergence performance of supply chains
- Key for better policy
- Research may include
  - Case studies and factual learning
  - Theory
  - Empirics
- You need to know what is going on to be relevant

Impact for development policy

- Go beyond the farm gate- look at development as a larger process
- Form entrepreneurs and recruit entrepreneurial knowledge for development process
- If you wish to develop differentiated, value added products
  - You need to accept vertical integration of contract farming
  - You may need to enable entrepreneurial profits and non competitive behavior
- Fostering environment that enable change and initiative will reduce concentration
- Research aimed in developing Adaptive capacity should include introducing new crop and practices and understanding the managerial and agribusiness strategy that will implement their introduction
- This new activities may include fuel fiber and other bio-economy elements
- Old farm centered development effort should be reflect by agribusiness and supply chain management strategies

extra

Related Work

- Coase (1937) The nature of the firm
  - transaction costs determine business structure
    - But what are transaction costs?
- Abba Lerner on the middle man
- Zusman’s work on contracts
- Asymmetric information
  - In particular, principal-agent problems
- Contract farming literature in development