International Trade and Monetary Systems

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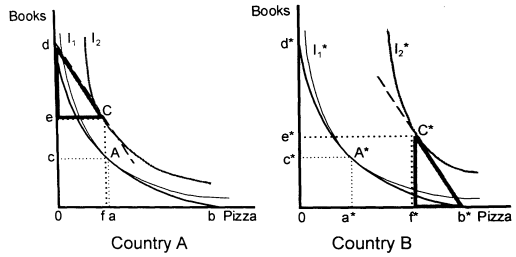
Explain how trade based on comparative advantage derived from the expansion of increasing returns to scale industries points to potentially bene, cial strategic trade policies.

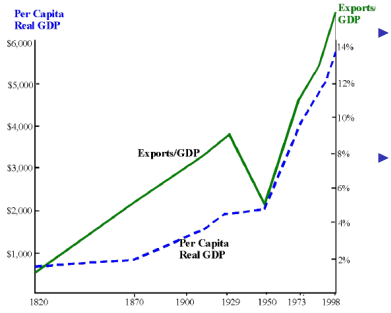
Unequal Gains from Specialization with Increasing Returns



1. All three countries are exactly the same in every way except Country A has no corporate pro, ts tax while B and C have 30 percent corporate pro, ts taxes.
2. All three countries are exactly alike except Country C has a 25 percent import tari: while A and B impose no restrictions on the importation of sewing machines.
3. All three countries are identical except Country A does not allow foreign TNCs to send their pro, ts out of the country.
4. All three countries are identical except Country B has a much higher pro, ts tax than the other two while Country C has an import tari: while the others do not.

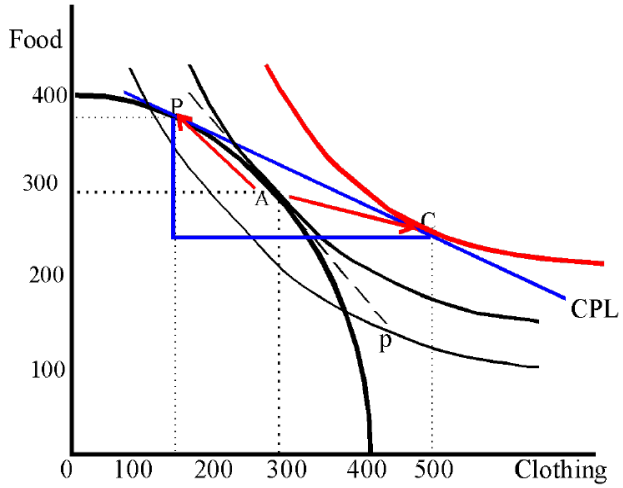
International Trade and Economic Growth

- Statistical analysis suggests trade & growth are related.
- But, correlation does not imply causality.
- Growth could be RausingS more trade!

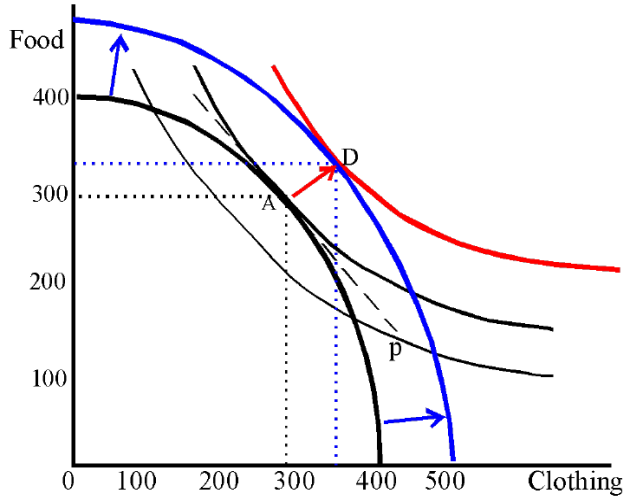


- That globalization and economic growth move in tandem has important business implications.
- Business not only faces global competition, but it must deal with the continually changing economic environment that accompanies growth.

Gains from Trade

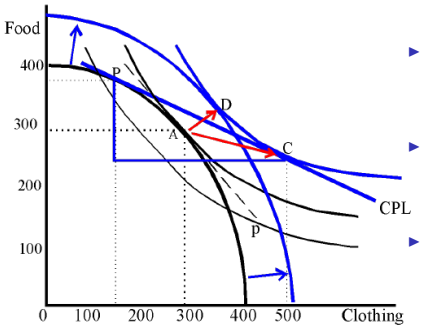


Gains from Growth



Trade and Growth Achieve Similar Gains in Welfare

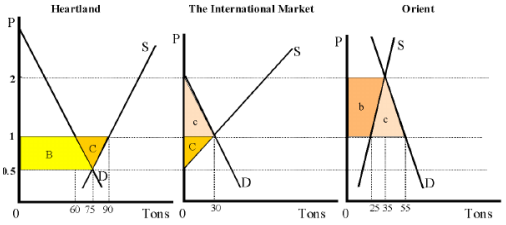
Trade and growth both enable the economy to reach a higher indi: erence curve.



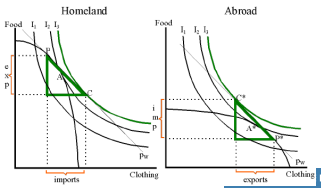
- Trade leads to a new consumption point at C.
- Growth leads to a new consumption point at D.
- Both points lie on the same higher indi: erence curve.

How Large are the Gains from Trade?

When we add up all the triangles in the partial equilibrium model of trade, net welfare gains are about 1% of GDP.

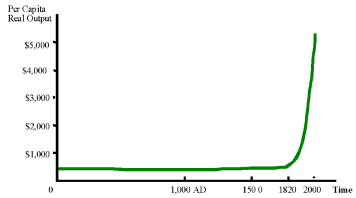


Computable general equilibrium models do not generate much larger estimates.



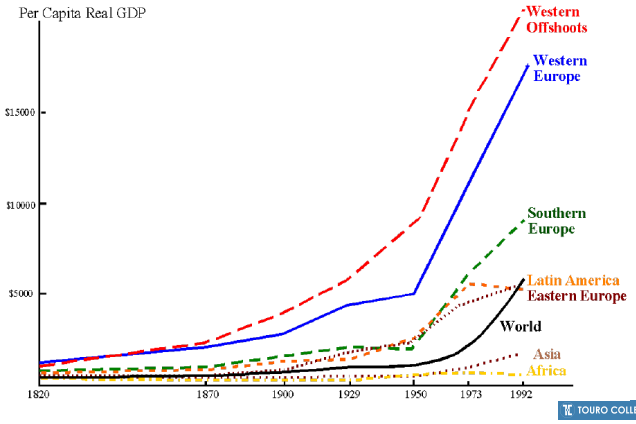
Trade's Growth Ef ect

World Economic Growth During the Past 200 Years Has Been Impressive

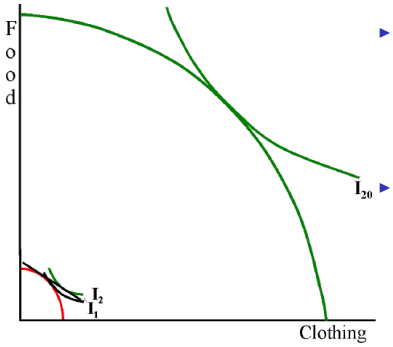


- There is much evidence that international trade, and globalization, strengthens economic growth.
- This dynamic consequence of trade is not covered by the static models of trade.
- Recent research points to the need for dynamic models of trade.

The Recent Growth Has Varied Greatly Across Regions of the World



It Takes Growth to Close the Gap Between Rich and Poor Nations



- An economy with the red production possibilities frontier can reach the indi: erence curve I2 with trade.
- It takes continued growth (a large shift in the indi: erence curve) to reach the much higher level of welfare given by I20.

The Power of Compounding

- Growth has the potential for raising people's welfare well beyond what the static gains from trade can accomplish.
- Economic growth is a compound process that builds each successive increase on top of previous increases.
- Continuous growth, no matter how slow, will eventually lead to very large gains.
- If, say, per capita GDP this year is equal to $10,000, and if the economy grows at 10% each year for ten years, then in ten years per capita GDP will be:

$$\$10,000(1.1)^{10} = \$25,937$$

- If, as before, per capita GDP this year is equal to $10,000, but now the economy grows at 10% each year for 20 years, then in 20 years per capita GDP will be:

$$\$10,000(1.1)^{20} = \$67,275$$

The Power of Compounding

Two countries that grow at 1 percent and 2 percent, respectively, for 100 years will , nd their standards of living growing far apart:

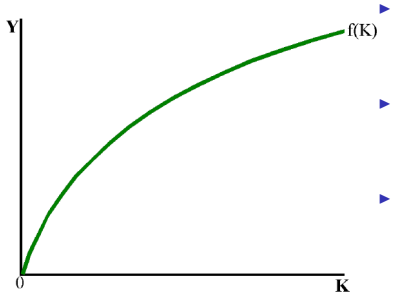
$$PCGDP_{T=100} = \$3,000(1+.01)^{100} = \$8,114$$
$$PCGDP_{T=100} = \$3,000(1+.02)^{100} = \$21,734$$

The power of compounding is great.

The Relationship Between Trade and Growth

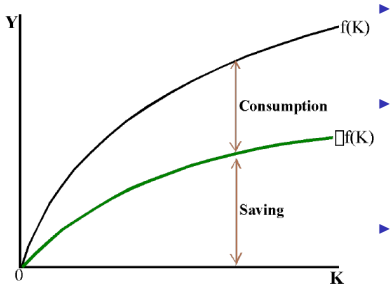
- The huge di: erences between rich and poor countries point to the need for continued economic growth in poor countries.
- The static gains from international trade are one-time gains that are not very large.
- Whether international trade is good for humanity thus comes down to the question: Can international trade, or other forms of international economic integration, help to accelerate economic growth?

The Solow Growth Model



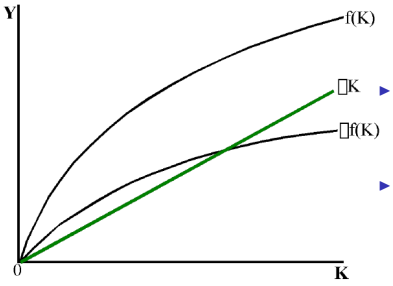
- Production function $Y = f(K, L)$ with diminishing returns.
- If labor supply is , xed, then the function can be written as $Y = f(K)$.
- Diminishing returns implies a decreasing slope; each additional unit of capital adds less to output than the previous unit.

The Solow Growth Model: saving rate



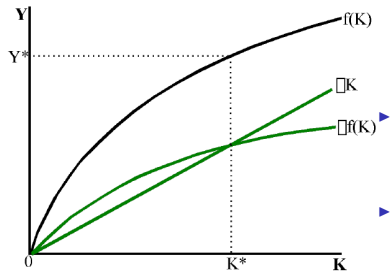
- Solow assumes that the saving rate is constant and between 0 and 1.
- The saving function is a reduced image of the production (income) function.
- The saving function depends on the production function and the saving rate.

The Solow Growth Model: Depreciation



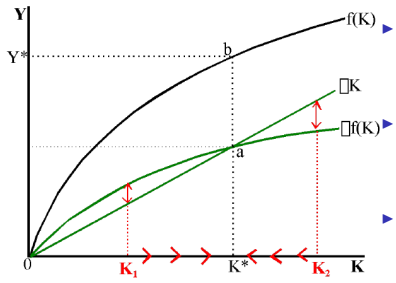
- Depreciation is assumed to be a constant fraction δ of the stock of capital K.
- Thus, depreciation is a straight-line function of K.

The Solow Growth Model: steady state



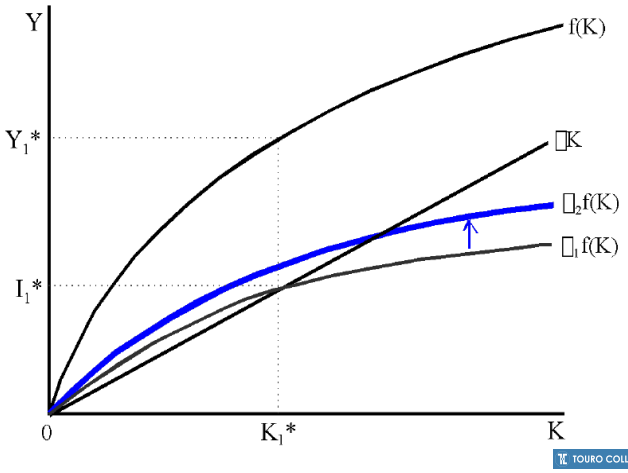
- Saving and investment are equal where the depreciation line and the savings function intersect.
- In equilibrium, a capital stock of K^* results in output $Y^* = f(K^*)$.
- K^* and Y^* are referred to as the steady state levels of capital and output/income.

The Solow Growth Model: stable equilibrium

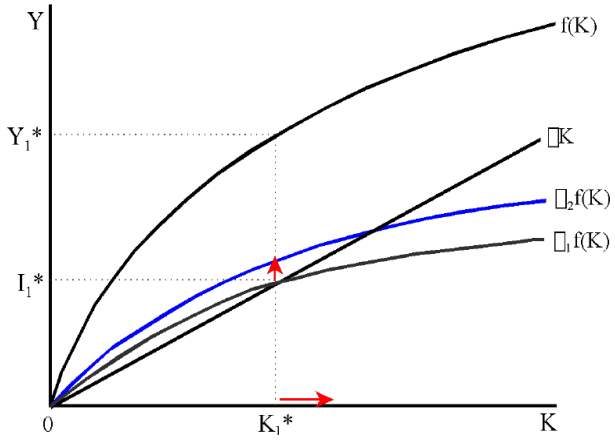


- The steady state level of K^* is a stable equilibrium.
- If $K < K^*$, investment exceeds depreciation and K grows.
- If $K > K^*$, depreciation exceeds investment and K shrinks.
- Output/income depends on the rate of saving, the rate of depreciation, and the shape of the production function.

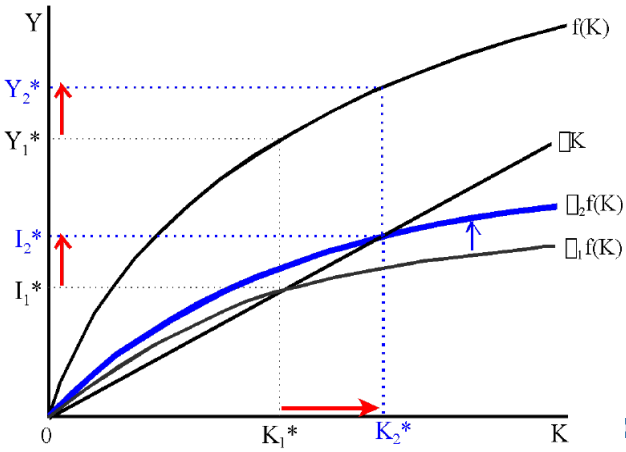
A Rise in the Rate of Saving



Implies $I = \sigma f(K) > \delta K$, and the Capital Stock Grows



And There is a Transition to Higher Steady State Levels of Capital and Output



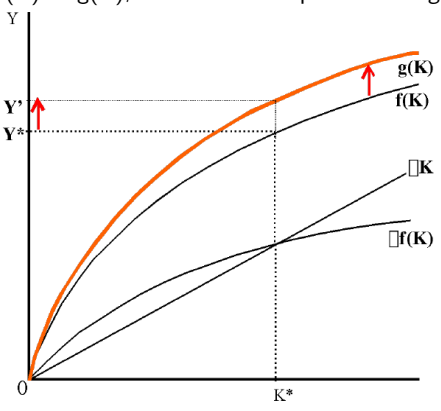
Transitional Growth vs. Permanent Growth

- An increase in saving cannot maintain economic growth permanently.
- Once the new steady state is reached, the economy stops growing.
- A further increase in saving would generate another sort of medium-term growth.
- The saving rate cannot increase forever; it cannot be greater than 1!
- Can international trade generate continued growth?
- The opening of an economy to trade increases the economy's e: ective capacity to produce output, given its resources and technology.
- In the Solow model, opening the economy to trade is represented as an upward shift in the production function.

Trade's Transitional Ef ect on Output

in the Solow Model

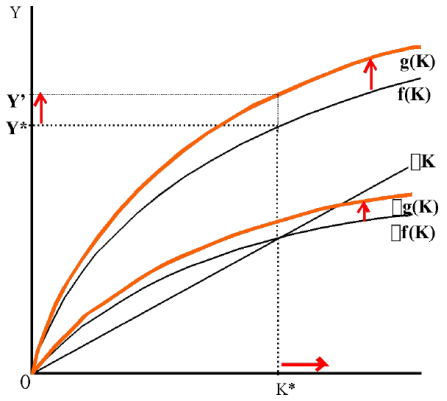
The static gain from trade raises the production function from f(K) to g(K), which raises output to $Y' = g(K^*)$.



Trade's Transitional Effect on Output

in the Solow Model

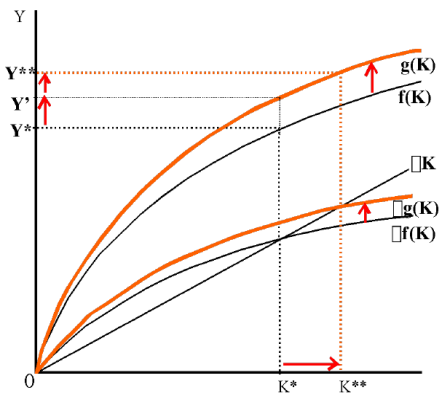
Given a constant saving rate, the saving function shifts up to the production function from $\sigma f(K)$ to $\sigma g(K)$.



Trade's Transitional Effect on Output

in the Solow Model

Trade leads to transitional growth as the economy adjusts to a new steady state equilibrium at K^{**} and $Y^{**} = g(K^{**})$.



Trade and Growth

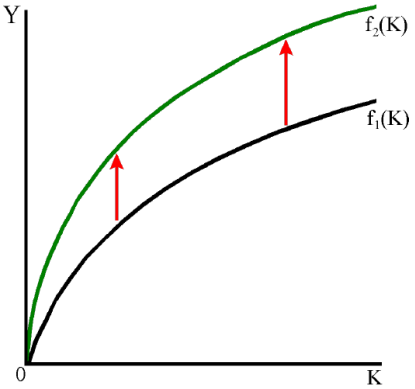
- International trade seems to produce only temporary growth according to the Solow model.
- Indeed, the Solow model suggests that continued economic growth is not possible without technological progress.
- Hence, for trade to raise standards of living in the long run, it must induence technological progress.

Transitional Growth vs. Permanent Growth

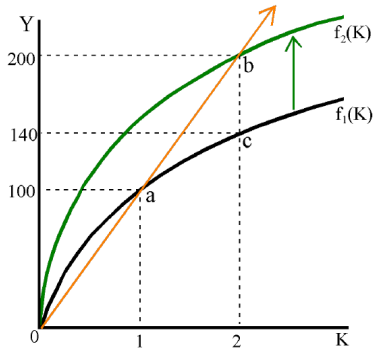
- The static gains from trade provide only medium-term transitional growth.
- These gains in output are greater than just the static gains from trade, but they are still limited by the path to the new steady state.
- How can permanent growth be generated within the Solow model?
- Permanent growth requires continuous upward shifts in the production function.
- This requires technological progress.

Technological Progress in the Solow Model

Technological progress is represented by a shift to a new production function. There is technological progress if the same capital stock, K, produces a higher level of Y.

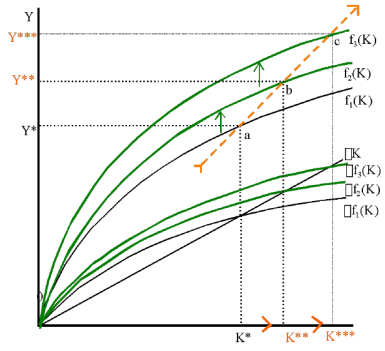


Technological progress neutralizes diminishing returns



- Output doubles when the capital stock is doubled.
- Without technological progress, an increase in capital from 1 to 2 would only have shifted the economy to c, a 40% rise in Y.

Continued Technical Progress Implies Continued Growth



If technological progress continues to shift the production function upward, capital stock and output can continue to grow without reaching a steady state with zero growth.

The Solow Model and Technological Progress

- The Solow growth model shows that continued economic growth is only possible if the production function continually shifts up, which requires continued technological progress.
- Thus, the Solow model establishes the importance of technological progress, but it does not explain how to achieve it.
- Several insightful models of technological progress have been developed to complement the Solow growth model.

What is technology?

Case Study: Electricity and Manufacturing

- Early factories had most often been powered by central sources of power, a water wheel or a steam engine, which were usually linked to factory machines by large shafts.
- All machines on the factory door turned when the shaft turned, whether they were being used or not.
- Electric motors would revolutionize the way factories powered their equipment.
- The impact of electric motors on the e$ ciency of factories occurred only gradually, however.
- The , rst electric motors were relatively large and were designed to simply replace water wheels or steam engines.
- This example is typical of technological progress: it comes in steps.

Case Study: Electricity and Manufacturing

- Only after the turn of the century did industrial engineers realize that machines driven by their own motors permitted much more dexibility than centralized power systems.
- Ford introduced electrically-powered conveyors that moved partially-assembled automobiles from machine to machine along an assembly line.
- By 1920, still fewer than one-third of U.S. factories had converted to individually-controlled electric machines.
- By 1929 over half of all factories had converted, as competition forced manufacturers to match the gains in e$ ciency of their competitors.
- It takes decades for powerful innovations to boost an economy, but the delayed payo: can be immense.

Important Characteristics of Technological Progress

- Technology is a complex set of knowledge, ideas, and methods and is likely to be the result of a variety of di: erent activities, both intentional and accidental.
- Technological progress is a sequence of small increments lying along a continuous path.
- While the growth path of technology is continuous, it does not generally exhibit a constant slope or growth rate.
- Technology is at least partially nonrival in nature.
- Technology is often not excludable.

Technology is a Nonrival Good

- The creation of new technology is di: erent from the production of ordinary products that economists have been modeling for years.
- Most goods are rival, in that if one person uses them, others are necessarily excluded from using them.
- But, technology is nonrival: If one person uses an idea or method, that does not prevent another from using it.
- If the marginal cost of using a particular form of technology is zero, competitive market forces will tend to drive the price of existing technology toward zero.
- At such a low price, why would anyone create new knowledge?
- If it cannot be pro, tably marketed, how can the creator of technology recoup the costs of creating technology?

Technology is a Nonrival Good

- Even though they may be nonrival in nature, new ideas may still be excludable.
- That is, the creator of a new idea may be able to prevent people from using it, thus giving the creator the power to limit supply and charge for the use of her ideas.
- Patent laws of course seek to do exactly that, giving the creator of an idea, product, or process exclusive use for a given number of years.

The Uncertain Ef ect of Patents

- All other things equal, the excludability of ideas will increase the rate at which ideas are produced.
- However, excludability can also dampen the rate of technological progress.
- New knowledge builds on old knowledge.
- Patents can also block entry to some potentially promising paths of innovation.
- Internationally, patents are not equally distributed Y most innovation takes place in a very few places around the globe.

Stationary Equilibria vs. Evolution

- The classical view of the market system is that it is inherently stable, always moving to some stationary equilibrium.
- Joseph Schumpeter, on the other hand, saw the capitalist system as an evolutionary process that was ever-changing.
- Schumpeter described the capitalist system as one that internally generates change and technological progress.
- Each , rm sought to gain an advantage in the marketplace through innovation.
- Such RcreativeS activity RdestroysS the monopoly power that its competitors had gained as a result of earlier innovations.
- Each new monopoly would only be temporary because the creative innovation of its competitors would, sooner or later, destroy it.
- This continual creation and destruction would prevent permanent monopolies from developing, and society

Perfect Competition vs Monopoly Power

- Perfect competition is not useful for analyzing technological progress.
- Innovation does not take place in industries with large numbers of identical , rms producing identical products.
- The greatest amount of innovation and technological progress results from the intentional research and development e: orts of potentially large , rms, who use the technological breakthroughs to gain monopoly pro, ts.
- Monopoly pro, t is necessary to cover the cost of innovation.
- Innovation requires the use of real costly resources, and without the possibility of recovering the costs of innovation, innovation will not occur.

Perfect Competition vs Monopoly Power

- It is this quest for monopoly pro, ts that generates the continual stream of innovation and technological progress that so bene, ts society.
- Standard microeconomic theory clearly suggests that monopoly pro, t is a form of Rmarket failureS that is costly to society.
- Schumpeter suggests that pro, ts are in fact necessary if the economy is to grow and raise standards of living.
- Schumpeter saw ferocious competition among , rms, but it was technological competition, not price competition.

Schumpeter's Creative Destruction

- Central to the process of creative destruction is the entrepreneur, who initiates the process of innovation.
  - The entrepreneur is the one who sees the opportunities for introducing a new product, changing a r rm's management organization, exploiting a new market, r nding a new source of raw materials, cutting the costs of production, or motivating the labor force.
  - An entrepreneur is a social deviant because his or her attitude is di' erent from the average member of society.
- Schumpeter attached great importance to the social climate.
- If technological progress depends on how aggressively entrepreneurs innovate, the incentives and barriers they face are critical to the process of economic growth.
- Schumpeter included among the critical institutions society's attitude toward business success, prestige of business activity, the education system, and economic freedom.

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Schumpeter's Creative Destruction

- Schumpeter's concept of creative destruction captures an important characteristic of economic growth: the creation of something new usually requires that something old be eliminated.
- Schumpeter's ideas have been incorporated into models to explain technological progress.
- In Schumpeterian innovation models R&D activity depends on:
  - The productivity with which R&D activity generates innovations.
  - The costs of acquiring the resources to carry out R&D activities.
  - The bener ts that entrepreneurs expect to reap from an innovation.
- The equilibrium level of R&D activity is found by maximizing bene, ts subject to the costs of innovation.

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Schumpeter's Creative Destruction

- All other things equal, innovation will be greater:
  - The larger is the pror t from successful innovation;
  - The more innovators value future gains relative to current costs;
  - The more resources are available to innovators;
  - The more e; cient innovators are in turning resources into innovations.
- Notice that the Schumpeterian model presented here generates a constant quantity of innovations each period so long as all functions remain the same.
- As the stock of knowledge grows, a constant number of new innovations divided by a growing stock of innovations implies a slowing rate of innovation!
- Is the Schumpeterian model also subject to diminishing returns?

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Is it Getting Easier to Innovate?

Knowledge is the only instrument of production not subject to diminishing returns. J.M.Clark

- Romer's Optimistic View:
  The more we learn, the more new avenues of research are opened up to us. R.. every generation has underestimated the potential for , nding new recipes and ideas. We consistently fail to grasp how many ideas remain to be discovered. The di$ culty is the same one we have with compounding. Possibilities do not add up. They multiply.S
- Weitzman's Correlary: Romer is Pessimistic
  Technological progress is not a multiplicative process, it is an even more powerful combinatorial growth process. R..an abstract case could be made that all innovations, being expressions of human imagination, are in a sense combinatoric.S

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Trade and Creative Destruction

- There must be destruction as well as creation.
- Joseph Schumpeter became increasingly pessimistic about the sustainability of creative destruction.
- First, innovators often seek to obstruct further innovation.
- Secondly, innovation was becoming Rroutinized,S and thus focused on Rnormal scienceS rather than Rrevolutionary science.S
- Can international trade make innovation more revolutionary?

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