The Nanotech Economy

Not: Will we all be unemployed

We won't be

Or All rich

We might be

But how the economic structure of the society will be different

Broad and Narrow Nanotech

- Offer money for nanotech, and the definition will expand accordingly
  - Offer enough and we'll get it up to a meter.
- Broadly defined: Making very small things
  - That might let us live longer
  - Get us into space
  - Do lots of other nice things
  - But it isn't economically interesting
- Molecular manufacturing, on the other hand, ...

The Economics of advanced Nano

- The world is a lot of very small legos
- An assembler is a very small kid
- Once you have one assembler
- One of things it can assemble is another assembler
- Atoms are cheap
- Designing a car with every atom in the right place is expensive

A Software Economy

- We already have an economy like that
- The first copy of MS Word cost a lot to produce
- The second copy almost nothing

Consequences: Part I

- Natural monopoly—the more cars you make, the lower the average cost.
- Sequential competition: A dominant car, but it changes when an innovator comes up with a better design
- Monopolistic Competition—Not all cars are alike
  - Traditional model: The street of barbers.
  - Competition in characteristic space.
  - One car is very safe, one very stylistic, one very fast
  - Or the same process down to the component level
  - Consider books
    - Far more are published than any one person reads
    - Since the cost of writing a book is fixed, why not publish just enough?
    - Because different people like different books.

The Street of Barbers

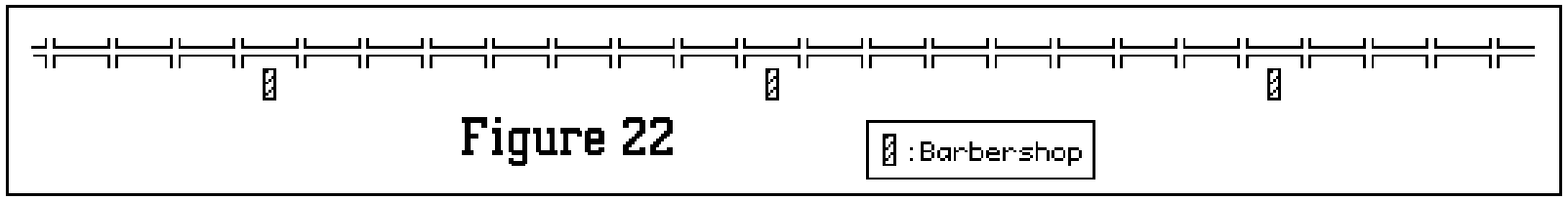

Figure 22

Consequences: Part II

- Suppose we have disassemblers
  - Now, once I have a nanotech object, micro or macro
  - I can take it apart and end up with the design
  - And make another one
- There might be ways of designing something that can't be disassembled
  - Describing the location of every atom in a car is a lot of information
  - Perhaps extracting the compressed version can be made hard
- Suppose that doesn't work
  - We now have a world where you can Xerox a car.
- This raises an old problem

How do you get paid

- to create the first copy
- When whoever buys it can make as many copies as he likes
- And sell them

Possible solutions

- Intellectual Property Protection
- Customized Product
- Tie-ins
- Open Source

Intellectual Property Protection

- Which looks more like copyright than like patent
- Since you are protecting a particular design, not the ideas that go into it
- How easy it is to enforce depends on how easily objects can be copied
  - If it takes an expensive printing press, yes
  - If just a disk drive, probably no.
  - The more advanced nanotech gets, the easier it is to disassemble and assemble, and the harder to enforce I.P.

Customized product

- It's a wonderful car, and all yours
- You don't even need a key
  - The steering wheel checks your fingerprints
  - And your DNA—a few dead skin cells
  - Say "open sesame"—it knows your voice
  - You are the key
- You can make a copy for a friend if you like, but …
  - Only you can drive it, so you have made him
  - A very large paperweight
- That's how Lexis and Westlaw work today
  - I can do a search for cases relevant to my law case
  - And give you a copy
  - But it won't help much for your law case

Tie ins

- Advertising
  - This time the car is generic—anyone can drive it
  - And free
  - And you can’t turn off the ads
  - Consider how we pay for web pages
- Other tie-ins
  - support
  - upgrades
- anything that can be best produced by the designers of the car
- And sold

Open Source

- Make the design for the fun of it
- Or because you want the end product
- Or for indirect benefits

For details see:

“The Magic Cauldron” by Eric Raymond

The Down Side of Nanotech

- Advanced nanotech is here
- Now any teenage American geek
- Can turn the world to grey goo

Two Models of Defense

- National Defense by Government: A public good
- Defense against Computer Viruses: A private good

Choose One

- If protection against nano attacks is done by government
- That means regulation of private nanotech
- Including private defenses
- Consider the contrast between FDA time lag and computer virus defense time lag

For the Longer Version

Future Imperfect: Chapter XVII

Linked to my web page:

www.daviddfriedman.com

Or go directly to

http://patrifriedman.com/prose-others/fi/commented/Future_Imperfect.html