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
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