In Soviet Union, Optimization Problem Solves *You*

by Cosma Shalizi on May 30, 2012

> *Attention conservation notice*: Over 7800 words about optimal planning for a socialist economy and its intersection with computational complexity theory. This is about as relevant to the world around us as debating whether a devotee of the Olympian gods should approve of transgenic organisms. (Or: centaurs, yes or no?) Contains mathematical symbols (uglified and rendered slightly inexact by HTML) but no actual math, and uses *Red Plenty* mostly as a launching point for a tangent.

There's lots to say about *Red Plenty* as a work of literature; I won't do so. It's basically a work of speculative fiction, where one of the primary pleasures is having a strange world unfold in the reader's mind. More than that, it's a work of science fiction, where the strangeness of the world comes from its being reshaped by technology and scientific ideas — here, mathematical and economic ideas.

Red Plenty is also (what is a rather different thing) a work of *scientist* fiction, about the creative travails of scientists. The early chapter, where linear programming breaks in upon the Kantorovich character, is one of the most true-to-life depictions I've encountered of the experiences of mathematical inspiration and mathematical work. (Nothing I will ever do will be remotely as important or beautiful as what the real Kantorovich did, of course.) An essential part of that chapter, though, is the way the thoughts of the Kantorovich character split between his profound idea, his idealistic political musings, and his scheming about how to cadge some shoes, all blind to the incongruities and ironies.

It should be clear by this point that I loved *Red Plenty* as a book, but I am so much in its target demographic[1] that it's not even funny. My enthusing about it further would not therefore help others, so I will, to make better use of our limited time, talk instead about the central idea, the dream of the optimal planned economy.

That dream did not come true, but it never even came close to being implemented; strong forces blocked that, forces which *Red Plenty* describes vividly. But could it even have been tried? Should it have been?

"The Basic Problem of Industrial Planning"

Let's think about what would have to have gone in to planning in the manner of Kantorovich.

I. We need a quantity to maximize. This objective function has to be a function of the quantities of all the different goods (and services) produced by our economic system.

> Here "objective" is used in the sense of "goal", not in the sense of "factual". In Kantorovich's world, the objective function is linear, just a weighted sum of the output levels. Those weights tell us about trade-offs: we will accept getting one less bed-sheet (queen-size, cotton, light blue, thin, fine-weave) if it lets us make so many more diapers (cloth, unbleached, re-usable), or this many more lab coats (men's, size XL, non-flame-retardant),or for that matter such-and-such an extra quantity of toothpaste. In other words, we need to begin our planning exercise with relative weights. If you don't want to call these "values" or "prices", I won't insist, but the planning exercise has to begin with them, because they're what the function being optimized is built from.
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> It's worth remarking that in *Best Use of Economic Resources*, Kantorovich side-stepped this problem by a device which has "all the advantages of theft over honest toil". Namely, he posed only the problem of maximizing the production of a "given assortment" of goods — the planners have fixed on a ratio of sheets to diapers (and everything else) to be produced, and want the most that can be coaxed out of the

inputs while keeping those ratios. This doesn't really remove the difficulty: either the planners have to decide on relative values, or they have to decide on the ratios in the "given assortment".
Equivalently, the planners could fix the desired output, and try to minimize the resources required. Then, again, they must fix relative weights for resources (cotton fiber, blue dye #1, blue dye #2, bleach, water [potable],water [distilled], time on machine #1, time on machine #2, labor time [unskilled], labor time [skilled, sewing], electric power…). In some contexts these might be physically comparable units. (The first linear programming problem I was ever posed was to work out a diet which will give astronauts all the nutrients they need from a minimum mass of food.) In a market system these would be relative prices of factors of production. Maintaining a "given assortment" (fixed proportions) of resources used seems even less reasonable than maintaining a "given assortment" of outputs, but I suppose we could do it.
For now (I'll come back to this), assume the objective function is given somehow, and is not to be argued with.

IIA. We need complete and accurate knowledge of all the physical constraints on the economy, the resources available to it.
IIB. We need complete and accurate knowledge of the productive capacities of the economy, the ways in which it can convert inputs to outputs.

(IIA) and (IIB) require us to disaggregate all the goods (and services) of the economy to the point where everything inside each category is substitutable. Moreover, if different parts of our physical or organizational "plant" have different technical capacities, that needs to be taken into account, or the results can be decidedly sub-optimal. (Kantorovich actually emphasizes this need to disaggregate in *Best Use*, by way of scoring points against Leontief. The numbers in the latter's input-output matrices, Kantorovich says, are aggregated over huge swathes of the economy, and so far too crude to be actually useful for planning.) This is, to belabor the obvious, a huge amount of information to gather.
(It's worth remarking at this point that "inputs" and "constraints" can be understood very broadly. For instance, there is nothing in the formalism which keeps it from including constraints on how much the production process is allowed to pollute the environment. The shadow prices enforcing those constraints would indicate how much production could be increased if marginally more pollution were allowed. This wasn't, so far as I know, a concern of the Soviet economists, but it's the logic behind cap-and-trade institutions for controlling pollution.)

Subsequent work in optimization theory lets us get away, a bit, from requiring complete and *perfectly accurate* knowledge in stage (II). If our knowledge is distorted by merely unbiased statistical error, we could settle for stochastic optimization, which runs some risk of being badly wrong (if the noise is large), but at least does well on average. We still need this unbiased knowledge about everything, however, and aggregation is still a recipe for distortions.

More serious is the problem that people will straight-up *lie* to the planners about resources and technical capacities, for reasons which Spufford dramatizes nicely. There is no good mathematical way of dealing with this.

III. For Kantorovich, the objective function from (I) and the constraints and production technology from (II) must be linear.

Nonlinear optimization is possible, and I will come back to it, but it rarely makes things *easier*.

IV. Computing time must be not just too cheap to meter, but genuinely immense.

It is this point which I want to elaborate on, because it is a mathematical rather than a practical difficulty.

"Numerical Methods for the Solution of Problems of Optimal Planning"

It was no accident that mathematical optimization went hand-in-hand with automated computing. There's little point to reasoning abstractly about optima if you can't actually *find* them, and finding an optimum is a computational task. We pose a problem (find the plan which maximizes this objective function subject to these constraints), and want not just a solution, but a *method* which will continue to deliver solutions even as the problem posed is varied. We need an algorithm.

Computer science, which is not really so much a science as a branch of mathematical engineering, studies questions like this. A huge and profoundly important division of computer science, the theory of computational complexity, concerns itself with understanding what resources algorithms require to work. Those resources may take many forms: memory to store intermediate results, samples for statistical problems, communication between cooperative problem-solvers. The most basic resource is time, measured not in seconds but in operations of the computer. This is something Spufford dances around, in II.2: "Here's the power of the machine: that having broken arithmetic down into tiny idiot steps, it can then execute those steps at inhuman speed, forever." But how many steps? If it needs enough steps, then even inhuman speed is useless for human purposes…

The way computational complexity theory works is that it establishes some reasonable measure of the size of an instance of a problem, and then asks how much time is absolutely *required* to produce a solution. There can be several aspects of "size"; there are three natural ones for linear programming problems. One is the number of variables being optimized over, say n . The second is the number of constraints on the optimization, say m . The third is the amount of approximation we are willing to tolerate in a solution — we demand that it come within h of the optimum, and that if any constraints are violated it is also by no more than h . Presumably optimizing many variables ($n >> 1$), subject to many constraints ($m >> 1$), to a high degree of approximation ($h \sim 0$), is going to take more time than optimizing a few variables ($n \sim 1$), with a handful of constraints ($m \sim 1$), and accepting a lot of slop ($h \sim 1$). How much, exactly?

The fastest known algorithms for solving linear programming problems are what are called "interior point" methods. These are extremely ingenious pieces of engineering, useful not just for linear programming but a wider class of problems called "convex programming". Since the 1980s they have revolutionized numerical optimization, and are, not so coincidentally, among the intellectual children of Kantorovich (and Dantzig). The best guarantees about the number of "idiot steps" (arithmetic operations) they need to solve a linear programming problem with such algorithms is that it's proportional to

$$(m+n)^{3/2}\, n^2 \log(1/h)$$

(I am simplifying just a bit; see sec. 4.6.1 of Ben-Tal and Nemirovski's *Lectures on Modern Convex Optimization* [PDF].)

Truly intractable optimization problems — of which there are many — are ones where the number of steps needed grow exponentially[2]. If linear programming was in this "complexity class", it would be truly dire news, but it's not. The complexity of the calculation grows only polynomially with n , so it falls in the class theorists are accustomed to regarding as "tractable". But the complexity still grows super-linearly, like $n^{3.5}$. Where does this leave us?

A good modern commercial linear programming package can handle a problem with 12 or 13 million variables in a few minutes on a desktop machine. Let's be generous and push this down to 1 second. (Or let's hope that Moore's ~~Law~~ rule-of-thumb has six or eight iterations left,and wait a decade.) To handle a problem with 12 or 13 billion variables then would take about 30 billion seconds, or roughly a thousand years.

Naturally, I have a reason for mentioning 12 million variables:

> In the USSR at this time [1983] there are *12 million identifiably different products* (disaggregated down to specific types of ball-bearings, designs of cloth, size of brown shoes, and so on). There are close to 50,000 industrial establishments, plus, of course, thousands of construction enterprises, transport undertakings, collective and state forms, wholesaling organs and retail outlets.
> — Alec Nove, *The Economics of Feasible Socialism* (p. 36 of the revised [1991] edition; Nove's italics)

This 12 million figure will conceal variations in quality; and it is not clear to me, even after tracking down Nove's sources, whether it included the provision of services, which are a necessary part of any economy.

Let's say it's just twelve million. Even if the USSR could never have *invented* a modern computer running a good LP solver, if someone had *given* it one, couldn't Gosplan have done its work in a matter of minutes? Maybe an hour, to look at some alternative plans?

No. The difficulty is that there aren't *merely* 12 million variables to optimize over, but rather many more. We need to distinguish between a "coat, winter, men's, part-silk lining, wool worsted tricot, clothgroup 29–32" in Smolensk from one in Moscow. If we don't "index" physical goods by location this way, our plan won't account for the need for transport properly, and things simply won't be where they're needed; Kantorovich said as much under the heading of "the problem of a production complex". (Goods which can spoil, or are needed at particular occasions and neither earlier nor later, should also be indexed by time; Kantorovich's "dynamic problem") A thousand locations would be *very* conservative, but even that factor would get us into the regime where it would take us a thousand years to work through a single plan. With 12 million kinds of goods and *only* a thousand locations, to have the plan ready in less than a year would need computers a thousand times faster.

This is not altogether unanticipated by *Red Plenty*:

> A beautiful paper at the end of last year had skewered Academician Glushkov's hypercentralized rival scheme for an all-seeing, all-knowing computer which would rule the physical economy directly, with no need for money. The author had simply calculated how long it would take the best machine presently available to execute the needful program, if the Soviet economy were taken tobe a system of equations with fifty million variables and five million constraints. Round about a hundred million years, was the answer. Beautiful.So the only game in town, now, was their own civilised, decentralized idea for optimal pricing, in which shadow prices calculated from opportunity costs would harmonise the plan without anyone needing to possess impossibly complete information. [V.2]

This alternative vision, the one which Spufford depicts those around Kantorovich as pushing, was to find the shadow prices needed to optimize, fix the monetary prices to track the shadow prices, and then let individuals or firms buy and sell as they wish, so long as they are within their budgets and adhere to those prices. The planners needn't govern men, nor even administer things, but only set prices. Does this, however, actually set the planners a more tractable, a less computationally-complex, problem?

So far as our current knowledge goes, no. Computing optimal prices turns out to have the same complexity as computing the optimal plan itself [3]. It is(so far as I know) *conceivable* that there is some short-cut to computing prices alone, but we have no tractable way of doing that yet. Anyone who wants to advocate this needs to show that it is possible, not just hope piously.

How then might we escape?

It will not do to say that it's enough for the planners to *approximate* the optimal plan, with some dark asides about the imperfections of actually-existing capitalism thrown into the mix. The computational complexity formula I quoted above already allows for only needing to come close to the optimum. Worse, the complexity depends only very slowly, logarithmically, on the approximation to the optimum, so accepting a bit more slop buys us only a very slight savings in computation time. (The optimistic spin is that if we can do the calculations at all, we can come quite close to the optimum.) This route is blocked.

Another route would use the idea that the formula I've quoted is only an upper bound, the time required to solve an arbitrary linear programming problem. The problems set by economic planning might, however, have some special structure which could be exploited to find solutions faster. What might that structure be?

The most plausible candidate is to look for problems which are "separable", where the constraints create very few connections among the variables. If we could divide the variables into two sets which had nothing at all to

do with each other, then we could solve each sub-problem separately, at tremendous savings in time. The supra-linear, $n^{3.5}$ scaling would apply only within each sub-problem. We could get the optimal prices (or optimal plans) just by concatenating the solutions to sub-problems, with no extra work on our part.

Unfortunately, as Lenin is supposed to have said, "everything is connected to everything else". If nothing else, *labor* is both required for all production, and is in finite supply, creating coupling between all spheres of the economy. (Labor is not actually extra special here, but it is traditional[4].) A national economy simply does not break up into so many separate, non-communicating spheres which could be optimized independently.

So long as we are thinking like computer programmers, however, we might try a desperately crude hack, and just *ignore* all kinds of interdependencies between variables. If we did that, if we pretended that the over-all high-dimensional economic planning problem could be split into many separate low-dimensional problems, then we could speed things up immensely, by exploiting parallelism or distributed processing. An actually-existing algorithm, on actually-existing hardware, could solve each problem on its own, ignoring the effect on the others, in a reasonable amount of time. As computing power grows, the supra-linear complexity of each planning sub-problem becomes less of an issue, and so we could be less aggressive in ignoring couplings.

At this point, each processor is something very much like a firm, with a scope dictated by information-processing power, and the mis-matches introduced by their ignoring each other in their own optimization is something very much like "the anarchy of the market". I qualify with "very much like", because there are probably lots of institutional forms these could take, some of which will not look much like actually existing capitalism. (At the very least the firm-ish entities could be publicly owned, by the state, Roemeresque stock-market socialism, workers'cooperatives, or indeed other forms.)

Forcing each processor to take some account of what the others are doing, through prices and quantities in markets, removes some of the grosser pathologies. (If you're a physicist, you think of this as weak coupling; ifyou're a computer programmer, it's a restricted interface.) But it won't, in general, provide enough of a communication channel to actually compute the prices swiftly — at least not if we want *one* set of prices, available to all. Rob Axtell, in a really remarkable paper, shows that *bilateral* exchange can come within h of an equilibrium set of prices in a time proportional to $n^2 \log(1/h)$, which is *much* faster than any known centralized scheme.

Now, we might hope that yet faster algorithms will be found, ones which would, say, push the complexity down from cubic in n to merely linear. There are lower bounds on the complexity of optimization problems which suggest we could never hope to push it below that. No such algorithms are known to exist, and we don't have any good reason to think that they do. We also have no reason to think that alternative computing methods would lead to such a speed-up[5].

I said before that increasing the number of variables by a factor of 1000 increases the time needed by a factor of about 30 billion. To cancel this out would need a computer about 30 billion times faster, which would need about 35 doublings of computing speed, taking, if Moore's rule-of-thumb continues to hold, another half century. But my factor of 1000 for prices was quite arbitrary; if it's really more like a million, then we're talking about increasing the computation by a factor of 10^{21} (a more-than-astronomical, rather a chemical, increase), which is just under 70 doublings, or just over a century of Moore's Law.

If someone like Iain Banks or Ken MacLeod wants to write a novel where they say that the optimal planned economy will become technically tractable sometime around the early 22nd century, then I will read it eagerly. As a serious piece of prognostication, however, this is the kind of thinking which leads to"where's my jet-pack?" ranting on the part of geeks of a certain age.

Nonlinearity and Nonconvexity

In linear programming, all the constraints facing the planner, including those representing the available technologies of production, are linear. Economically, this means constant returns to scale: the factory need put no more, and no less, resources into its 10,000th pair of diapers as into its 20,000th, or its first.

Mathematically, the linear constraints on production are a special case of *convex* constraints. If a constraint is convex, then if we have two plans which satisfy it, so would any intermediate plan in between those extremes. (If plan A calls for 10,000 diapers and 2,000 towels, and plan B calls for 2,000 diapers and 10,000 towels, we could do half of plan A and half of plan B, make 6,000 diapers and 6,000 towels, and not run up against the constraints.) Not all convex constraints are linear; in convex programming, we relax linear programming to just require convex constraints. Economically, this corresponds to allowing decreasing returns to scale, where the 10,000 pair of diapers is indeed more expensive than the 9,999th, or the first.

Computationally, it turns out that the same "interior-point" algorithms which bring large linear-programming problems within reach also work on general convex programming problems. Convex programming is more computationally complex than linear programming, but not radically so.

Unfortunately for the planners, increasing returns to scale in production mean non-convex constraints; and increasing returns are very common, if only from fixed costs. If the plan calls for regular flights from Moscow to Novosibirsk, each flight has a fixed minimum cost, no matter how much or how little the plane carries. (Fuel; the labor of pilots, mechanics, and air-traffic controllers; wear and tear on the plane; wear and tear on runways; the lost opportunity of using the plane for something else.) Similarly for optimization software (you can't make any copies of the program without first expending the programmers' labor, and the computer time they need to write and debug the code). Or academic papers, or for that matter running an assembly line or a steel mill. In all of these cases, you just can't smoothly interpolate between plans which have these outputs and ones which don't. You must pay at least the fixed cost to get any output at all, which is non-convexity. And there are other sources of increasing returns, beyond fixed costs.

This is bad news for the planners, because there are no general-purpose algorithms for optimizing under non-convex constraints. Non-convex programming isn't roughly as tractable as linear programming, it's generally quite intractable. Again, the kinds of non-convexity which economic planners would confront might, conceivably, universally turn out to be especially benign, soeverything becomes tractable again, but why should we think that?

If it's any consolation, allowing non-convexity messes up the markets-are-always-optimal theorems of neo-classical/bourgeois economics, too. (This illustrates Stiglitz's contention that if the neo-classicals were right about how capitalism works, Kantorovich-style socialism would have been perfectly viable.) Markets with non-convex production are apt to see things like monopolies, or at least monopolistic competition, path dependence, and, actual profits and power. (My university owes its existence to Mr. Carnegie's luck, skill, and ruthlessness in exploiting the non-convexities of making steel.) Somehow, I do not think that this will be much consolation).

The Given Assortment, and Planner's Preferences

So far I have been assuming, for the sake of argument, that the planners can take their objective function as given. There does need to be some such function, because otherwise it becomes hard to impossible to chose between competing plans which are all technically feasible. It's easy to say "more stuff is better than less stuff", but at some point more towels means fewer diapers, and then the planners have to decide how to trade off among different goods. If we take desired output as fixed and try to minimize inputs, the same difficulty arises (is it better to use so less cotton fiber if it requires this much more plastic?), so I will just stick with the maximization version.

For the capitalist or even market-socialist firm, there is in principle a simple objective function: profit, measured in dollars, or whatever else the local unit of account is. (I say "in principle" because a firm isn't a unified actor with coherent goals like "maximize profits"; to the extent it acts like one, that's an achievement of organizational social engineering.) The firm can say how many extra diapers it would have to sell to be worth selling one less

towel, because it can look at how much money it would make. To the extent that it can take its sales prices as fixed, and can sell as much as it can make, it's even reasonable for it to treat its objective function as linear.

But what about the planners? Even if they wanted to just look at the profit (value added) of the whole economy, they get to set the prices of consumption goods, which in turn set the (shadow) prices of inputs to production. (The rule "maximize the objective function" does not help pick an objective function.) In any case, profits are money, i.e., claims, through exchange, on goods and services produced by others. It makes no sense for the goal of the economy, as a whole, to be to maximize its claims on itself.

As I mentioned, Kantorovich had a way of evading this, which was clever if not ultimately satisfactory. He imagined the goal of the planners to be to maximize the production of a "given assortment" of goods. This means that the desired ratio of goods to be produced is fixed (three diapers for every towel), and the planners just need to maximize production at this ratio. This only pushes back the problem by one step, to deciding on the "given assortment".

We are pushed back, inevitably, to the planners having to make choices which express preferences or (in a different sense of the word) values. Or, said another way, there are values or preferences — what Nove called "planners' preferences" — implicit in any choice of objective function. This raises both a cognitive or computational problem, and at least two different political problems.

The cognitive or computational problem is that of simply *coming up* with relative preferences or weights over all the goods in the economy, indexed by space and time. (Remember we need such indexing to handle transport and sequencing.) Any one human planner would simply have to *make up* most of these, or generate them according to some arbitrary rule. To do otherwise is simply beyond the bounds of humanity. A group of planners might do better, but it would still be an immense amount of work, with knotty problems of how to divide the labor of assigning values, and a large measure of arbitrariness.

Which brings us to the first of the two political problems. The objective function in the plan is an expression of values or preferences, and *people have different preferences*. How are these to be reconciled?

There are many institutions which try to reconcile or adjust divergent values. This is a problem of social choice, and subject to all the usual pathologies and paradoxes of social choice. There is no universally satisfactory mechanism for making such choices. One could imagine democratic debate and voting over plans, but the sheer complexity of plans, once again, makes it very hard for members of the *demos* to make up their minds about competing plans, or how plans might be changed. Every citizen is put in the position of the solitary planner, except that they must listen to each other.

Citizens (or their representatives) might debate about, and vote over, highly aggregated summaries of various plans. But then the planning apparatus has to dis-aggregate, has to fill in the details left unfixed by the democratic process. (What gets voted on is a compressed encoding of the actual plan, for which the apparatus is the decoder.) I am not worried so much that citizens are not therefore debating about exactly what the plan is. Under uncertainty, especially uncertainty from complexity, *no* decision-maker understands the *full* consequences of their actions. What disturbs me about this is that filling in those details in the plan is just as much driven by values and preferences as making choices about the aggregated aspects. We have not actually given the planning apparatus a tractable technical problem(cf.).

Dictatorship might seem to resolve the difficulty, but doesn't. The dictator is, after all, just a single human being. He (and I use the pronoun deliberately) has no more ability to come up with real preferences over everything in the economy than any other person. (Thus, Ashby's "law of requisite variety" strikes again.) He can, and must, delegate details to the planning apparatus, but that doesn't help *the planners* figure out what to do. I would even contend that he is in a worse situation than the *demos* when it comes to designing the planning apparatus, or figuring out what he wants to decide directly, and what he wants to delegate, but that's a separate argument. The collective dictatorship of the party, assuming anyone wanted to revive *that* nonsense, would only seem to give the worst of both worlds.

I do not have a knock-down proof that there is no good way of evading the problem of planners' preferences. Maybe there is some way to improve democratic procedures or bureaucratic organization to turn the trick. But any such escape is, now, entirely conjectural. In its absence, if decisions must be made, they will get made, but through the sort of internal negotiation, arbitrariness and favoritism which Spufford depicts in the Soviet planning apparatus.

This brings us to the *second* political problem. Even if everyone agrees on the plan, and the plan is actually perfectly implemented, there is every reason to think that people will not be happy with the outcome. They're making guesses about what they actually want and need, and they are making guesses about the implications of fulfilling those desires. We don't have to go into "Monkey's Paw" territory to realize that getting what you think you want can prove thoroughly unacceptable; it's a fact of life, which doesn't disappear in economics. And not everyone is going to agree on the plan, which will not be perfectly implemented. (Nothing is ever perfectly implemented.) These are all signs of how even the "optimal" plan can be improved, and ignoring them is idiotic.

We need then some systematic way for the citizens to provide feedback on the plan, as it is realized. There are many, many things to be said against the market system, but it *is* a mechanism for providing feedback from users to producers, and for propagating that feedback through the whole economy, without anyone having to explicitly *track* that information. This is a point which both Hayek, and Lange (before the war) got very much right. The feedback needn't be just or even mainly through prices; quantities (especially inventories) can sometimes work just as well. But what sells and what doesn't is the essential feedback.

It's worth mentioning that this is a point which *Trotsky* got right.(I should perhaps write that "*even* Trotsky *sometimes* got right".)To repeat a quotation:

> The innumerable living participants in the economy, state and private, collective and individual, must serve notice of their needs and of their relative strength not only through the statistical determinations of plan commissions but by the direct pressure of supply and demand. The plan is checked and, to a considerable degree, realized through the market.

It is conceivable that there is some alternative feedback mechanism which is as rich, adaptive, and *easy to use* as the market but is not the market, not even in a disguised form. Nobody has proposed such a thing.

Errors of the Bourgeois Economists

Both neo-classical and Austrian economists make a fetish (in several senses) of markets and market prices. That this is crazy is reflected in the fact that even under capitalism, immense areas of the economy are not coordinated through the market. There is a great passage from Herbert Simon in 1991 which is relevant here:

> Suppose that ["a mythical visitor from Mars"] approaches the Earth from space, equipped with a telescope that revels social structures. The firms reveal themselves, say, as solid green areas with faint interior contours marking out divisions and departments. Market transactions show as red lines connecting firms, forming a network in the spaces between them. Within firms (and perhaps even between them) the approaching visitor also sees pale blue lines, the lines of authority connecting bosses with various levels of workers. As our visitors looked more carefully at the scene beneath, it might see one of the green masses divide, as a firm divested itself of one of its divisions. Or it might see one green object gobble up another. At this distance, the departing golden parachutes would probably not be visible.
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> No matter whether our visitor approached the United States or the Soviet Union, urban China or the European Community, the greater part of the space below it would be within green areas, for almost all of the inhabitants would be employees, hence inside the firm boundaries. Organizations would be the dominant feature of the landscape. A message sent back home, describing the scene, would speak of "large green areas interconnected by red lines." It would not likely speak of "a network of red lines connecting green spots."[6]

This is not just because the market revolution has not been pushed far enough. ("One effort more, shareholders, if you would be libertarians!") The conditions under which equilibrium prices really are all a decision-maker needsto know, and really are sufficient for coordination, are so extreme as to be absurd.(Stiglitz is good on some of the failure modes.) Even if they hold, the market only lets people "serve notice of their needs and of their relative strength" up to a limit set by how much money they have. This is why careful economists talk about balancing supply and "effective" demand, demand backed by money.

This is just as much an implicit choice of values as handing the planners an objective function and letting them fire up their optimization algorithm. Those values are not pretty. They are that the whims of the rich matter more than the needs of the poor; that it is more important to keep bond traders in strippers and cocaine than feed hungry children. At the extreme, the market literally starves people to death, because feeding them is a less"efficient" use of food than helping rich people eat more.

I don't think this sort of pathology is *intrinsic* to market exchange; it comes from market exchange plus gross inequality. If we want markets to signal supply and *demand* (not just tautological "effective demand"), then we want to ensure not just that everyone has access to the market, but also that they have (roughly) comparable amounts of money to spend. There is, in other words, a strong case to be made for egalitarian distributions of resources being a complement to market allocation. Politically, however, good luck getting those to go together.

We are left in an uncomfortable position. Turning everything over to the market is not really an option. Beyond the repulsiveness of the values it embodies, markets in areas like healthcare or information goods are always inefficient (over and above the usual impossibility of informationally-efficient prices). Moreover, working through the market imposes its own costs (time and effort in searching out information about prices and qualities, negotiating deals, etc.), and these costs can be very large. This is one reason (among others) why Simon's Martian sees such large green regions in the capitalist countries — why actually-existing capitalism is at least as much an organizational as a market economy.

Planning is certainly possible within limited domains — at least if we can get good data to the planners — and those limits will expand as computing power grows. But planning is only possible within those domains because *making money* gives firms (or firm-like entities) an objective function which is both unambiguous and *blinkered*. Planning for the whole economy would, under the most favorable possible assumptions, be intractable for the foreseeable future, and *deciding on a plan* runs into difficulties we have no idea how to solve. The sort of efficient planned economy dreamed of by the characters in *Red Plenty* is something we have no clue of how to bring about, even if we were willing to accept dictatorship to do so.

That planning is not a viable alternative to capitalism (as opposed to a tool within it) should disturb even capitalism's most ardent partisans. It means that their system *faces no competition*, nor even any plausible threat of competition. Those partisans themselves should be able to say what will happen then: the masters of the system, will be tempted, and more than tempted, to claim more and more of what it produces as monopoly rents. This does not end happily.

Calling the Tune for the Dance of Commodities

There is a passage in *Red Plenty* which is central to describing both the nightmare from which we are trying to awake, and vision we are trying to awake into. Henry has quoted it already, but it bears repeating.

> Marx had drawn a nightmare picture of what happened to human life under capitalism, when everything was produced only in order to be exchanged; when true qualities and uses dropped away, and the human power of making and doing itself became only an object to be traded. Then the makers and the things made turned alike into commodities, and the motion of society turned into a kind of zombie dance, a grim cavorting whirl in which objects and people blurred together till the objects were half alive and the people were half dead. Stock-market prices acted back upon the world as if they were independent powers, requiring factories to be opened or closed, real human beings to work or rest, hurry or dawdle; and they, having given the transfusion that made the stock

> prices come alive, felt their flesh go cold and impersonal on them, mere mechanisms for chunking out the man-hours. Living money and dying humans, metal as tender as skin and skin as hard as metal, taking hands, and dancing round, and round, and round, with no way ever of stopping; the quickened and the deadened, whirling on. … And what would be the alternative? The consciously arranged alternative? A dance of another nature, Emil presumed. A dance to the music of use, where every step fulfilled some real need, did some tangible good, and no matter how fast the dancers spun, they moved easily, because they moved to a human measure, intelligible to all, chosen by all.

There is a fundamental level at which Marx's nightmare vision is *right*: capitalism, the market system, whatever you want to call it, is a product of humanity, but each and every one of us confronts it as an autonomous and deeply *alien* force. Its ends, to the limited and debatable extent that it can even be understood as having them, are simply inhuman. The ideology of the market tell us that we face not something inhuman but superhuman, tells us to embrace our inner zombie cyborg and loose ourselves in the dance. One doesn't know whether to laugh or cry or running screaming.

But, and this is I think something Marx did not sufficiently appreciate, human beings confront *all* the structures which emerge from our massed interactions in this way. A bureaucracy, or even a thoroughly democratic polity of which one is a citizen, can feel, can *be*, just as much of a cold monster as the market. We have no choice but to live among these alien powers which we create, and to try to direct them to human ends. It is beyond us, it is even beyond all of us, to find "a human measure, intelligible to all, chosen by all", which says how everyone should go. What we *can* do is try to find the specific ways in which these powers we have conjured up are hurting us, and use them to check each other, or deflect them into better paths. Sometimes this will mean more use of market mechanisms, sometimes it will mean removing some goods and services from market allocation, either through public provision[7] or through other institutional arrangements[8]. Sometimes it will mean expanding the scope of democratic decision-making (for instance, into the insides of firms), and sometimes it will mean *narrowing* its scope (for instance, not allowing the *demos* to censor speech it finds objectionable). Sometimes it will mean leaving some tasks to experts, deferring to the internal norms of their professions, and sometimes it will mean recognizing claims of expertise to be mere assertions of authority, to be resisted or countered.

These are all going to be complex problems, full of messy compromises. Attaining even second best solutions is going to demand "bold, persistent experimentation", coupled with a frank recognition that many experiments will just fail, and that even long-settled compromises can, with the passage of time, become confining obstacles. We will not be able to turn everything over to the wise academicians, or even to their computers, but we may, if we are lucky and smart, be able, bit by bit, make a world fit for human beings to live in.

[1] Vaguely lefty? Check. Science fiction reader?Check. Interested in economics? Check. In fact: family tradition of socialism extending to having a relative whose middle name was "Karl Marx"? Check. Gushing Ken MacLeod fan? Check. Learned linear programming at my father's knee as a boy? Check. ^

[2] More exactly, many optimization problems have the property that we can *check* a proposed solution in polynomial time (these are the class "NP"), but no one has a polynomial-timeway to *work out* a solution from the problem statement (which would put them in the class "P"). If a problem is in NP but not in P, we cannot do drastically better than just systematically go through candidate solutions and check them all. (We can often do a *bit* better, especially on particular cases, but not *drastically* better.) Whether there are any such problems, that is whether NP=P, is not known, but it sure seems like it. So while most common optimization problems are in NP, linear and even convex programming are in P.^

[3]: Most of the relevant work has been done under a slightly different cover — not determining shadow prices in an optimal plan, but equilibrium prices in Arrow-Debreu model economies. But this is fully applicable to determining shadow prices in the planning system. (Bowles and Gintis: "The basic problem with the Walrasian model in this respect is that it is essentially about allocations and only tangentially about markets — as one of us (Bowles) learned when he noticed that the graduate microeconomics course that he taught at Harvard was easily repackaged as 'The Theory of Economic Planning' at the University of Havana in 1969.") Useful references here are Deng, Papadimitriou and Safra's "On the Complexity of Price Equilibria" [STOC'02. preprint],Condenotti and Varadarajan's "Efficient Computation of Equilibrium Prices for Markets with Leontief Utilities", and Ye's "A path to the Arrow-Debreu competitive market equilibrium". ^

[4]: In the mathematical appendix to *Best Use*, Kantorovich goes to some length to argue that his objectively determined values are compatible with the labor theory of value, by showing that the o.d. values are proportional to the required labor in the optimal plan. (He begins by assuming away the famous problem of equating different kinds of labor.) A natural question is how seriously this was meant. I have no positive evidence that it wasn't sincere. But, carefully examined, all that he proves is proportionality between o.d. values and the required consumption of the *first component* of the vector of inputs — and the ordering of inputs is arbitrary. Thus the first component could be any input to the production process, and the same argument would go through, leading to many parallel "theories of value". (There is a certain pre-Socratic charm to imagining proponents of the labor theory of value arguing it out with the water-theorists or electricity-theorists.) It is hard for me to believe that a mathematician of Kantorovich's skill did not see this, suggesting that the discussion was mere ideological cover. It would be interesting to know at what stage in the book's "adventures" this part of the appendix was written.^

[5]: In particular, there's no reason to think that building a quantum computer would help. This is because, as some people have to keep pointing out, quantum computers don't provide a *general*exponential speed-up over classical ones. ^

[6]: I strongly recommend reading the whole of this paper, if these matters are at all interesting. One of the most curious features of this little parable was that Simon was red-green color-blind.^

[7]: Let me be clear about the limits of this. Already, in developed capitalism, such public or near-public goods as the protection of the police and access to elementary schooling are provided universally and at no charge to the user. (Or they are supposed to be, anyway.) Access to these is not regulated by the market. But the inputs needed to provide them are all bought on the market, the labor of teachers and cops very much included. I cannot improve on this point on the discussion in Lindblom's *The Market System*, so I will just direct you to that(i, ii).^

[8]: To give a concrete example, neither scientific research nor free software are produced for sale on the market. (This disappoints some aficionados of both.) Again, the inputs are obtained from markets, including labor markets, but the outputs are not sold on them. How far this is a generally-viable strategy for producing informational goods is a very interesting question, which it is quite beyond me to answer.^

{ 209 comments }

1

Henry 05.30.12 at 3:11 pm

> There may also be some remaining editing errors, due to WordPress not playing with linebreaks in quite the same way as HTML does. If you spot em, let me know by email henry.farrellREMOVETHISBIT@gmail.com

2

Luis Enrique 05.30.12 at 3:22 pm

> ** applauds **

3

CarlD 05.30.12 at 3:24 pm

> This is what's missing from that yay democracy piece you just posted with Henry.

4

William Timberman 05.30.12 at 3:36 pm

> In a just and merciful world, every Serious Person from Washington D.C. to Beijing would now be trying to get you on the phone. Not with questions like *Do we really need 150 linear feet of different*

brands/flavors of toothpaste or soda in our supermarkets, or Should I try to keep Jamie Dimon or Bo Xilai out of jail? but more like *Is the logic of capitalism REALLY the logic of the cancer cell?*

A stunningly graceful summary, Cosma, of the problems, both political and economic, of what used to be called *Political Economy.* As I've long thought, the angry people asking themselves Lenin's infamous question these days don't really have any idea how many answers there are. One hopes that this is a momentary lapse….

5

Sebastian 05.30.12 at 3:36 pm

"That planning is not a viable alternative to capitalism (as opposed to a tool within it) should disturb even capitalismâ€™s most ardent partisans. It means that their system faces no competition, nor even any plausible threat of competition. Those partisans themselves should be able to say what will happen then: the masters of the system, will be tempted, and more than tempted, to claim more and more of what it produces as monopoly rents. This does not end happily."

Yes, a thousand times yes. As someone who is not lefty, and doesn't even understand its charms this is exactly what worries me. In my mind, the best thing that came out of communism's past (not worth its actual brutality, not worth the spectacular evils it came up with, but at least a silver lining to a very dark cloud) was that it challenged systemic capitalism in a way that helped avoid the "this does not end happily". I see a US which I desperately wish would come to terms with its political idiocies, but which appears that it will not be forced to do so before the time of internal collapse, because the EU is collapsing so spectacularly first. I see a US where public spending on health care already is enough that it should be getting us UK-level universal coverage, and private market spending is already *more* than enough to get us German level universal coverage, but *both together* aren't even getting us universal coverage–a fact which should put pause to both sides of the planning/market debate in US health care, but which is steadfastly used only to tar whichever side you don't happen to be on. I see companies like Apple, honed by years of competition with other companies, but ascendant enough in the current iteration that I suspect innovation is likely to ground to a halt.

I see the danger. And it worries me.

6

ajay 05.30.12 at 3:38 pm

If someone like Iain Banks or Ken MacLeod wants to write a novel where they say that the optimal planned economy will become technically tractable sometime around the early 22nd century, then I will read it eagerly.

They have done so! Specifically, Ken MacLeod, in "The Cassini Division" – though he rather pessimistically puts the date around the 24th century (IIRC) and doesn't go into much detail about how it's done. "Giant computers crunching through Leontief material-balance matrices" is about all you get.

Also, and more seriously, aren't you missing something by basing all your feasibility calculations on "A good modern commercial linear programming package can handle a problem with 12 or 13 million variables in a few minutes on a desktop machine"?

Because a good desktop machine will run at about 100 gigaflops (10^11 per second) or so, and there are Cray supercomputers right now that will run in the 50 petaflop (5 x 10^16) range – so while it might well take your desktop computer a thousand years to crunch through the latest Five Year Plan, a Cray XK6 , fifty thousand times faster, will get it done by this time next week.
Apologies if I've missed something here.

7

JW Mason 05.30.12 at 3:38 pm

> What a magnificent essay.
>
> I wish I had something more substantive to add, but it turns out it's much easier to tear down arguments you don't like than to build on ones that you do. That's why we can't have nice things, on the Internet.
>
> (In that spirit, one quibble. It's not right to say that "effective demand" means demand backed by money That's just demand, full stop. Keynes use of the term"effective" was more in the sense of "in effect" than "having effect." He introduced the term "effective demand" to call attention to the possibility of multiple equilibria based on different sets of consistent expectations of businesses. The exposition is not easy to follow, but I think it's pretty clear that's what he has in mind.
>
> > the effective demand is simply the aggregate income (or proceeds) which the entrepreneurs expect to receive, inclusive of the incomes which they will hand on to other factors of production, from the amount of current employment which they decide to give. The aggregate demand function relates various hypothetical quantities of employment to the proceeds which their outputs are expected to yield; and the effective demand is the point on the aggregate demand function which becomes effective because, taken in conjunction with the conditions of supply, it corresponds to the level of employment which maximises the entrepreneurâ€™s expectation of profit.
>
> You can see here that demand that is *in*effective is not expenditure that doesn't take place because of the low incomes of those who would otherwise make it, but expenditure that does not take place because entrepreneurs' expectations lead them to choose a lower level of output.)

8

Watson Ladd 05.30.12 at 3:45 pm

> How do you explain the historical success of New Kingdom Egypt, with its centrally planned and rationed economy? That unemployment is at whatever the value it is demonstrates that modern technology has rendered humans unimportant to the process of production. No serf ever went a day without work. A politics devoted to recreating freedom in the face of alienation may very well have set itself an unobtainable goal, but only such politics can address the problems we face today.

9

ajay 05.30.12 at 3:51 pm

> 9: "there were no beggars in New Kingdom Egypt" is an interesting hypothesis but I think you'll need to back it up somehow.

10

Sebastian 05.30.12 at 3:52 pm

> "How do you explain the historical success of New Kingdom Egypt, with its centrally planned and rationed economy? "
>
> Slaves.
>
> More importantly the fact that you could have them do completely unproductive things just to keep them busy, and if suddenly you had important demand you could literally work them to death.

11

Henry 05.30.12 at 3:53 pm

> bq. How do you explain the historical success of New Kingdom Egypt, with its centrally planned and rationed economy?
>
> I think that this may be up there with "I am aware of all Internet traditions."

12

ajay 05.30.12 at 4:11 pm

> Henry: I am rather fond of "That unemployment is at whatever the value it is demonstrates that modern technology has rendered humans unimportant to the process of production".
>
> The facts, whatever they may be, support my opinion!

13

wolfgang 05.30.12 at 4:12 pm

> I think Cosma mentions briefly the *real* problem of central planning when he writes
> "there is every reason to think that people will not be happy with the outcome".
>
> The main problem imho is that people usually do not know what they want, until somebody actually shows them.
> We did not know that we want iPads until Steve J. showed us one.
>
> As somebody wrote recently on C.T.: The real problem of socialism is innovation.
>
> The market solves this problem by people and companies tinker with existing products and try out new ones all them time. The majority of those fails and only a few become accepted.
> This trial-and-error method is actually quite expensive and the only reason people like Steve J. or Mark Z. etc. keep working on new stuff is of course the profit which can be expected once the right kind of product is found.

14

Luis 05.30.12 at 4:21 pm

> *This trial-and-error method is actually quite expensive and the only reason people like Steve J. or Mark Z. etc. keep working on new stuff is of course the profit which can be expected once the right kind of product is found.*
> I hate to derail the conversation about Cosma's excellent article, and I even strongly agree with your main point (that the finite, specified list of "12 million identifiably different products" does not contain an iPad or a Facebook) but the record quite clearly shows that Jobs kept working on new stuff because *he felt it was important.* Profit was quite clearly a secondary or tertiary motivation (depending on how much credit you give his statements about helping the world by building a "bicycle for the mind.") From what little birdies tell me Zuckerberg is the same way. The reductionist "people only innovate because of the profit motive" argument is a zombie that really should die.

15

gwern 05.30.12 at 4:26 pm

I believe Stross's _Accelerando_ includes a planned economy as the end-stage of the post-singularity civilization occupying the Sun (which makes sense given the computational power required…)

16

JW Mason 05.30.12 at 4:26 pm

The reductionist â€œpeople only innovate because of the profit motiveâ€□ argument is a zombie that really should die.

Yes.

Which raises the question, why socialism can't do it just as well.

More broadly, if innovation rather than optimization is the secret of capitalism's success (and they are not just different, but significantly in conflict), then it's not clear how relevant the discussion here, fascinating tho it is, is to the actual historical and prospective performance of different economic systems.

17

NickT 05.30.12 at 4:30 pm

"How do you explain the historical success of New Kingdom Egypt, with its centrally planned and rationed economy?"

Specify data sets that support this claim, please. Also, define term "success" in relation to socio-economic groups.

18

carl caldwell 05.30.12 at 4:34 pm

"either the planners have to decide on relative values, or they have to decide on the ratios in the â€œgiven assortmentâ€□"

Thanks for the wonderful essay. Note what happens at the very start. In order to overcome the logic of the commodity, the law of exchange value (Wert), through complex planning, the planners have to assign individual things an exchange value. That necessarily implies enough knowledge to assign value in the first place–knowledge of specific products' natures, of their "quality" (which somehow has to be quantified), of the level of demand, and so on. Not only is the total amount of information required–even with significant abstraction–daunting; all the qualities are also in flux in a dynamic economy. The problem is not so much daunting as impossible–especially if one takes into account the way the plan itself is going to affect all the economic inputs.

This is, of course, the starting point of the critique of planning. (And here, Henry, I find Hayek at his most useful and interesting–not in his discussion of the road to serfdom, but in his discussion of calculation, value, and the limits of knowledge.)

Perhaps more interesting is how this approach to planning finds itself, as already noted, forced to reinvent exchange value, whether arbitrarily (trying to keep prices fixed over long periods of time and treating them merely as counters) or through direct measurement (as though the labor exists in a commodity before the commodity itself is sold). In this connection, I'm not so sure that Kantorovich's reference to the measurability of labor can simply be set aside as a concession to ideology–a real problem of how to measure value is necessarily part of the entire problem. Comprehensive planning finds itself, then, seeking to recapitulate the totality of exchanges in capitalism, and then to trump that totality by putting a shell of planning over it.

> Perhaps no surprise, then, that in the world of really existing socialism, the plans themselves often appeared long after the plan periods had begun.

19

marcel 05.30.12 at 4:36 pm

> Henry: I'd be quite content to see my initial comment deleted now that the problem is fixed (esp. since I mispelled Cosma's name). pretty please, with a cherry on top? and whipped cream and nuts … ? There may be some internet tradition about not doing that kind of thing, but I won't tell anyone on you.

20

Jed Harris 05.30.12 at 4:37 pm

> Lots of interesting points and questions.
>
> Cosma, what kind of result does the market compute? (Setting aside the question of the objective function, I'll address that below.) Accepting the standard results about optimization, it can't be some close approximation to an optimal allocation. But an implicit premise of a lot of what you say is that it is a pretty good approximation to a (pretty bad) objective function defined by effective demand.
>
> Making the computation distributed and stochastic (as in real markets) shouldn't free us from the constraints of the results you cite. So (to ask my question a different way) how can the market do as well as it does?
>
> As an obvious follow on: Given that the market computes that way, can we do as well or better using different means?
>
> Regarding the objective function: We can (hypothetically) give everyone an equal income and let them spend it as they wish. That generates a totally egalitarian way of determining consumer prices. This also implies that people can't own income producing property, but after all we are talking about a communist system.
>
> My question for you here is: Given this sort of flat income distribution, what problems remain with determining the objective function?
>
> I have lots of other comments and questions but I'll wait for the context of your reply.

21

Luis 05.30.12 at 4:43 pm

> JW Mason: some form of market socialism might "do [innovation] just as well" (though I would agree that the profit motive is an important motivator for many, even if not exclusive) but it's hard to see how a centrally-planned economy, as discussed in Red Plenty and Cosma's post, can do product innovation at all well. This is both because of the calculation problem (how do you calculate the resource allocation for things that don't exist yet?) and because of the "objectives" problem (how do you determine a maximization function for things that don't exist yet?)
>
> Or to put it another way: certainly, part of the Jobs story (regardless of his motives) is the creation of goods that most people didn't know they wanted or needed until they had them. This represented a great gamble of resources. For every Jobs-like success story, there are a hundred failures. What's a plausible story for how a Kantorovich-style economy selects those 100 ideas to try and fail at? How does it allocate resources to that 101st good idea? (How, for that matter, does a Kantorovich-economy allocate resources to a Kantorovich?) Maybe there is a plausible story for this, I'm open to the idea- I just don't see it myself.

22

Russell L. Carter 05.30.12 at 4:45 pm

Ok, this post is now in competition with Holbo's Frummery for the best blog post I've ever read. Just on a meta level the structure of the argument is superb. I am not unfamiliar with the techniques for solving the big problems and my initial objections from the early paragraphs were methodically disposed of one by one as the piece unfolds. Very very satisfying. Even if the practical implications aren't.

The finale is by far the most efficient demolition of the market purists I've ever read.

I wonder why Cosma's arguments against totalitarian planning and against market purism and for people (all people, not just batches of sorted out sets of people) can't be the foundation for the left today. If you look at Democratic Party rhetoric, all I see is the market is always right, except where we need to fund (health care, food, education… for) the poor or unlucky, with no mention that constraining inequality as a corrective to the pure market's inherent suicidal tendency is the right method for much of the funding.

Anyway, a heartfelt thanks for this, Cosma. It kind of makes my day.

p.s., the links in the piece are really really great. I spent waaayyy too much time following them.

23

wolfgang 05.30.12 at 4:49 pm

@JW Mason #17

>> why socialism canâ€™t do it just as well

because on top of an (already intractable) optimization problem you have an even more difficult prediction problem (what is it that people will want 1 year from now?).

24

geo 05.30.12 at 4:55 pm

Sebastian @6: *As someone who is not lefty, and doesnâ€™t even understand its charms*

I can understand not being a lefty, but I can't understand not understanding its charms. Its charms are what underlies the first half of that old chestnut: "Anyone who's not a radical at 20, has no heart … " Anyone with a heart is deeply disturbed that, in virtually every society, present or past, the rich grind the faces of the poor and many, many lives are blighted by unnecessary suffering. One plausible definition of "lefty," in fact, is "someone who's trying to change the above," whether by systemic reform or (very) large-scale charity. It's not that the right simply has a different way of going about trying to relieve the world's vast unnecessary suffering, it's that it seems to have no interest in doing so.

Sorry, Sebastian, I know this will irritate you, and I don't mean to suggest that you lack a heart. But that's only to say that I believe you have an inner lefty yearning to be liberated.

25

JanieM 05.30.12 at 4:58 pm

Holboâ€™s Frummery

How about a link? (Search engines reveal nothing useful for that phrase as such.)

26

Luis 05.30.12 at 5:04 pm

> Janie: here. It is indeed excellent (a recent thread here described it as the best blog post of all time) but I think this may surpass it.

27

JanieM 05.30.12 at 5:08 pm

> Luis — thanks!

28

blavag 05.30.12 at 5:09 pm

> Great essay and once again brings up the question of whether linear programing and optimization are adequate tools for understanding economics. They are the tools we have got but that is a different issue. Mendelbrot offers an interesting take on this in The Misbehavior of Markets but the best discussion, also covering the socialist calculation debate and so overlapping the present discussion, is still Phil Mirowski's Machine Dreams: Economics Becomes a Cyborg Science which could use an extended symposium like this one. There is also the question raised by Mirowski and explicitly put forward by S. Amadae in Rationalizing Capitalist Democracy of the explicitly ideological use of both optimization and linear programming. The irony of that in a discussion of the socialist calculation debate is considerable.

29

Henry 05.30.12 at 5:13 pm

> Marcel – the comment has been diligently airbrushed out of the historical record (if you squint closely, you will see a funny gap in the row of dignitaries reviewing the missiles at the May Day parade, around about where your comment used to be, but you will have to _squint hard._

30

Barry Freed 05.30.12 at 5:16 pm

> Wow! Now that's a what I call a post. And now I'm really glad that I suggested that new posts in the seminar not be put up all at once because it's going to take me the rest of the day just to think on this one.

31

Data Tutashkhia 05.30.12 at 5:30 pm

> *how do you calculate the resource allocation for things that donâ€™t exist yet?*
>
> And even when they already do exist. A transistor radio, for example. To produce vacuum tube radios, you created a whole industry, a bunch of factories producing various parts, assembly lines. Built to last. Suddenly someone brings you a transistor prototype, and it clear that this is the way to go. Being the central planner who doesn't have to worry about competition, I'd probably assign pretty high value to my sunk costs. Let it roll for a few years.

32

Stephen Frug 05.30.12 at 5:32 pm

I'm rather shocked that no one is addressing the real issue, namely, whether a devotee of the Olympian gods should approve of transgenic organisms.

Oh, and, btw, Centaurs 4eva!

33

Luis 05.30.12 at 5:39 pm

Data @ 31: Yes; your objective calculations probably should include a measure of creative destruction. But how much? (Of course, it's easy to make that larger when you have a GBI, presumably at a level set outside of the calculation – suggesting that on top of all the other shifting things the calculation would have to deal with, constantly changing political priorities would be in there too.)

34

JW Mason 05.30.12 at 5:43 pm

itâ€™s hard to see how a centrally-planned economy, as discussed in Red Plenty and Cosmaâ€™s post, can do product innovation at all well. This is both because of the calculation problem (how do you calculate the resource allocation for things that donâ€™t exist yet?) and because of the â€œobjectivesâ€ problem (how do you determine a maximization function for things that donâ€™t exist yet?)

Tricky problems, for sure. So how does capitalism solve them? Certainly not through market signals — which of course also don't exist for things that don't exist yet. Rather, through *planning*: A designated group of experts considers various proposals for new firms or projects, and allocates a portion of the social surplus to them based on their assessment of their prospects. Now, we call these planners banks, or these days venture capitalists, but when Schumpeter, writing i 1939, wanted to explain the function of banks under capitalism, he described them as our version of Gosplan.

Innovation under capitalism has nothing to do wit markets. It is organized by our Gosplans in the financial system, and they — as Jed Harris suggests above — are no better able to solve the optimization problem than the original Gosplan was. Everything Cosma says about the intractability of that problem, applies with just as much force to capitalism.

This is not to say there's no difference. Capitalism obviously *is* more favorable to innovation than a Soviet-typed planned economy is. But the reason, I think, is orthogonal to the subject of this post. Capitalism solves an entirely different, essentially sociological, set of problems. What it does, is remove the biggest obstacles to innovation by disempowering incumbents (workers foremost of course, but also those further up the hierarchy) and breaking the links between economic activity and social life. In other words, the success of capitalism, IMO, has as much to do with primitive accumulation as with markets.

35

JP Stormcrow 05.30.12 at 5:46 pm

8 et seq.: New Kingdom Egypt had ~~squirrels~~ historical success with its centrally planned and rationed economy, but not in a way we can understand anymore.
</unfogged>

36

JP Stormcrow 05.30.12 at 5:50 pm

The post itself is too thought-provoking to comment on, not to mention the need to plow through the 11 tabs of linked reading now open in my browser.

37

Luis 05.30.12 at 6:09 pm

> JW @ 34: Calling VCs planners is… generous. They're dart-throwers, and sometimes you can even get them to admit that. But more importantly, even if you want to call them planners, they're *decentralized* planners, answerable to a variety of entities with a variety of metrics for success. (When they fail, as in Boston in the '70s-'80s and arguably in Silicon Valley in the present day, it is often because while formally decentralized, in practice they have become centralized – with the same risk-averse positions (Boston) or all placing bets on the same nominally risky positions (mobile, cloud in today's SV).) You can certainly imagine replicating the diverse dart-throwers inside a Kantorovich-economy, but they'd have to be quite explicitly not part of the calculated plan – they'd be humans making intuitive, non-numeric judgments, with the intent of failing often in hopes of attaining the uncalculable forward leap.

38

bob mcmanus 05.30.12 at 6:18 pm

> It was an excellent article, a classic, and has led me to too much reading to be able to comment at any length. In any case, I spend too much time trying to understand actual historical wildly successful centrally planned economies, three in particular in Japan (Tokugawa, Meiji, Post-War) to have time understanding why they were impossible.

39

JW Mason 05.30.12 at 6:25 pm

> *: Calling VCs planners isâ€¦ generous. Theyâ€™re dart-throwers, and sometimes you can even get them to admit that.*
>
> Dart-throwing is a kind of planning. The point is they are decision makers consciously allocating resources with the intention of producing specific results, as opposed to automatically responding to market signals.
>
> *more importantly, even if you want to call them planners, theyâ€™re decentralized planners, answerable to a variety of entities with a variety of metrics for success.*
>
> OK, but *why* is that important? Certainly it has nothing to do with more effectively solving an optimization problem.

40

Sebastian 05.30.12 at 6:33 pm

> "Profit was quite clearly a secondary or tertiary motivation (depending on how much credit you give his statements about helping the world by building a â€œbicycle for the mind.â€)"
>
> This is a harder question than you're giving credit to. Steve Jobs wanted the ability to do what he wanted to do, on a large scale, involving lots of expensive research for things that lots of people (maybe even most techie people if we're talking about the ipad–until it was released there was a large contingent of people who thought it was a waste of resources–see especially Microsoft) thought were stupid ideas when in the planning stages. The way he got the freedom to do what he wanted on such a large scale was that he made enormous amount of profit by pleasing a lot of people and selling them stuff. It is true that very few innovators want money *just for its own sake*. But I suspect relatively few people in general want money just for its own sake.

> “I can understand not being a lefty, but I canâ€™t understand not understanding its charms….Anyone with a heart is deeply disturbed that, in virtually every society, present or past, the rich grind the faces of the poor and many, many lives are blighted by unnecessary suffering. One plausible definition of â€œlefty,â€ in fact, is â€œsomeone whoâ€™s trying to change the above,â€ whether by systemic reform or (very) large-scale charity. Itâ€™s not that the right simply has a different way of going about trying to relieve the worldâ€™s vast unnecessary suffering, itâ€™s that it seems to have no interest in doing so.”
>
> I don’t believe that, I’ve seen extreme heartlessness from the left and extremely charitable acts from the right, and all sorts of things in between. My problems with both sides is about lack of balance. Neither side seems interested in the fact that rights/responsibilities/needs/wants are about *balance* not elevating one fetishistic concept above all others. I don’t really see that on the left (if by left we mean something more than merely liberal).
>
> But back to the topic at hand, I’ve always felt that communism tends toward scary authoritarianism because the planners fail to understand the scope of the problem, and when that failure bears fruit, they must get rid of the evidence in increasingly messy ways. (Which is not to say that all sorts of other systems are willing to get rid of the failures in similar ways, but the hubris of the command economy planners creates extra-spectacular failures which call into question the whole system in ways that capitalist failures do not. You’ve given up the material engine of captialism, and huge amounts of freedom, and you get more famines than before? That can’t be tolerated).

41

Watson Ladd 05.30.12 at 6:36 pm

> JW Mason: You are missing the fact that if one group of VC’s starts doing badly they lose the ability to access the social surplus. Markets also sever production from ordinary social relation in an ongoing way: the obvious hazard of GOSPLAN is the temptation of the planner to overvalue his work.

42

Luis 05.30.12 at 6:45 pm

> *more importantly, even if you want to call them planners, theyâ€™re decentralized planners, answerable to a variety of entities with a variety of metrics for success.*
>
> *OK, but why is that important? Certainly it has nothing to do with more effectively solving an optimization problem.*
>
> Sure it is. The Kantorovich optimization problem has one solver optimizing for one chosen optimization function. Perhaps that optimization function is complex and multifaceted, but at the end of the day, there is no fallback when the function is wrong – i.e., when it solves for iPad and says “nope, no one will want it.”[1] The VC system (except, as I said earlier, when it breaks down because of herd mentalities) will have someone else trying to solve the same problem, using a slightly different optimization function, and one of them will, at least potentially, say “ah-ha! iPad sounds great!”
>
> Again, this is not to say that markets are the One True Answer (for all the reasons Cosma points out), just to point out yet another way in which a mere optimization problem (as best as I can tell) is not just not the One True Answer, but is very hard to imagine as even a component of the universe of answers.
>
> [1] If you have multiple optimization functions, then you’re just a market again.

43

Sebastian 05.30.12 at 6:51 pm

> "The point is they are decision makers consciously allocating resources with the intention of producing specific results, as opposed to automatically responding to market signals."
>
> I'm not sure I understand the distinction you're getting at here. You are doing something with 'automatically'. People in the market rarely respond 'automatically' to market signals. The whole point is that they know their own situation better than the planners, so they can weigh the signals with all sorts of useful local/specialized information. Venture capitalists like to think that they are leveraging some kind of expertise into success. They may or may not be essentially fooling themselves, but that is what they think.

44

JW Mason 05.30.12 at 6:52 pm

> *If you have multiple optimization functions, then youâ€™re just a market again.*
>
> I don't think this is true, at all.

45

Luis 05.30.12 at 6:55 pm

> Sebastian @ 40: You're of course correct that it was access to resources (which I deliberately did not call capital in my original comment) that allowed Jobs the freedom to experiment and create the iPad. But:
>
> *But I suspect relatively few people in general want money just for its own sake.*
>
> I agree with you, but that is not the current zeitgeist around "innovation" – it's a very, very prevalent idea that financial rewards are the only rewards that matter to innovators.

46

ezra abrams 05.30.12 at 7:06 pm

> what is wrong with a dynamic central solver – The programmers, or whoever, adjust the system as needed. At a fine level (miles of railroad cars of soybeans per day) they can adjust hourly; for more complex things, like ipad vs x, they can adjust monthly.
> In any event, the ipad discussion suffers from a serious flaw: we don't know what the other solutions are, cause in a free market economy, particularly for IT systems, there are economys of scale, so you get this butterfly effect where an initial system takes over.
> I bet if you went back, and looked at what ipad competitors were doing *at the time* some of em were better then jobs, but they got shut out fo the media light and $

47

Miracle Max 05.30.12 at 7:09 pm

> It's not obvious to me that a government that throws resources at a problem, including extra-normal rewards to the innovators, cannot buy innovations. I suspect the USSR made some great military hardware. The AK-47 has certainly been a big hit. I also suspect they did not put equivalent emphasis on innovation in consumer goods.
>
> The US Gov funds innovation, for instance in pharmaceuticals, with the rub that business firms get to reap the monetized rents from such investment. Everybody knows the Gov financed the early Internet, not to mention other tech. I like Josh's point that innovation under capitalism within for-profit business organizations entails planning, of which as Galbraith pointed out there is already a lot for other purposes.

I join the praise for this post and reiterate my boredom with the book. For one who studied planning the book's revelations are old news and not spiced up with enough sex and violence. It's the kind of thing somebody from George Mason Univ would write, if they could write.

Don't hate me, CTers, I dig China MiÃ©ville the most.

48

Luis 05.30.12 at 7:18 pm

If you have multiple optimization functions, then youâ€™re just a market again.

I donâ€™t think this is true, at all.

Sorry, should have been more general: if you have multiple optimization functions, you've got a coordination problem again (between the groups controlled by optimization function A and optimization function B), which you can solve by a market, or by another optimization function, or by something else. But if it is an optimization function, its turtles all the way ~~down~~ up: at some point, someone has to attempt to value risk-taking, and guide how/where that risk-taking occurs. And that's a particularly intractable problem for mere calculators. At least some of these optimization problems are expressible numerically: we know we need X mattresses, Y beds, etc. And then you solve for X and Y. As Cosma points out, X and Y may be a subject of debate, but at least they are numerical, can be given units, and can hypothetically be solved for. You can't say "I need X units of innovation" or "Y units of (thing that doesn't even exist yet)." So you need some non-numerical (hence non-computable) guide.

Again, not that markets do this terribly well, but I don't see any solution for a Kantorovich economy that is more than "have smart people make guesses about how to throw money at smart people, see what happens" – i.e., to use a decidedly non-Kantorovich approach. But I haven't given this super-deep thought and it is completely possible I'm missing a calculated solution to the problem- please do enlighten me if that's out there.

[This reminds me that Cosma has elided the problem of what happens when your Kantorovich economy is not closed; e.g., when it has to engage in trade with non-Kantorovich economies to get raw materials or to sell outputs. If you have to do that, then you have to recalculate the whole solution literally every time an external price changes, right? Or, again, am I missing something?]

49

Luis 05.30.12 at 7:19 pm

(And, argh, WP is eating some my formatting- apologies.)

50

Luis 05.30.12 at 7:21 pm

(And of course gov't can buy innovations- they do it all the time, often much more efficiently than markets because they aren't paying overhead for self-important MBAs. But at root they do it the same way VCs do – throw money at it, see what sticks. There is no magic, calculable metric for it, that's all I'm trying to say.)

51

Peter Dorman 05.30.12 at 7:21 pm

Before saying anything else, I want to join the chorus that praises this post for its elegance, insight and very intuitive explanation of computational complexity in optimal programming. Excellent!

Now on to the other stuff.

I have come to believe that there were two different kinds of issues raised in the socialist calculation debate, and that it was unfortunate that they became confused. The first was about calculation itself, and it is certainly what Mises was pushing and Taylor, Lange et al. were trying to overcome. More or less, the market socialists one that one, although the convergence problem in their algorithm has not been given enough consideration in my opinion. The second was about discovery of costs and values. Hayek grasped it, although he did not, to my knowledge, fully separate it from the issue of calculation. And discovery is the killer.

Here is the summary of the argument I posted at EconoSpeak a year ago:

1. The key concept is discovery: discovering what consumers need and want, and discovering the true costs of providing these things. Since they are subject to tacitly known and otherwise irreducibly qualitative determinants, values and costs cannot be ascertained apart from the actual processes of producing and marketing, so the technical problem of number crunchingâ€"devising algorithms to calculate equilibrium prices and quantities out of cost and demand informationâ€"is secondary. Any reasonably efficient economic system has to have processes of discovery, some for costs, others for the value of goods and services as determined by consumers. These processes need to be specified concretely.

2. Discovery requires trial and error. In an economy with a vast number of goods, and with complicated production and consumption relationships surrounding each good, it is inconceivable that trial and error can be sequential. Rather, there have to be many trials simultaneously, along with a process for determining which succeed or fail. That is the role of rivalry (competition) in a market economy, with the market test assessing success and failure. â€œCostâ€ is discovered by firms that succeed in being low-cost producers; â€œvalueâ€ is discovered by those who succeed in marketing. This information is transmitted via prices to other firms, telling them whether they are producing at- or above-cost, and whether they are producing and selling at- or below-value. Any plausible economic system has to have a structure of multiple, simultaneous trials, a â€œhardâ€ test that tells enterprises whether their trials are succeeding, and a vehicle for transmitting the results of these tests to all participantsâ€"in real time. On top of this, of course, there needs to be an incentive structure that causes those who failed the test to abandon the methods that were retrospectively unsuccessful.

I think an Austrian socialism is conceivable, but it wonâ€™t look like a â€œplanned economyâ€, at least not in most respects.

Incidentally, regarding Simonâ€™s vast spaces of private planning (inside firms): it seems so obvious to me that the reason firms exist is due to local nonconvexities in production that I donâ€™t understand why Iâ€™m the only person on the planet who says this. (Iâ€™m thinking mainly of interactive, off-diagonal nonconvexities, not those due to increasing returns.) The significance is that a planning structure is needed to bring about allocations that wouldnâ€™t be arrived at decentrally, i.e. by adding up bilateral exchanges. My shorthand for markets/planning is convexity/nonconvexity. I think that the real separability at the heart of feasible socialism is identifying and separating the significantly nonconvex regions of the economy, where planning is essential, from those nice, well-behaved convex regions where adding up is more or less OK.

52

Sebastian 05.30.12 at 7:25 pm

"And of course govâ€™t can buy innovations- they do it all the time, often much more efficiently than markets because they arenâ€™t paying overhead for self-important MBAs."

I'll sort of give you the first clause, but 'often much more efficiently than markets'? No. The major government innovator is the military, and whatever good things people say about technology and military hardware, 'efficient' is not one of them.

53

Ken MacLeod 05.30.12 at 7:31 pm

ajay #7: I'm not sure The Cassini Division or Iain M. Banks's Culture novels describe, even in a hand-waving way, an optimal planned economy in the sense that Cosma is talking about. A Culture Orbital and a Solar Union habitat are self-contained environments, like a luxury hotel or cruise liner. From the point of view of the artifical intelligences that they embody, supplying human wants – even elaborate and fanciful human wants – is something that goes on the AIs' bodies, in processes quite possibly as unconscious to them as cellular activity in our bodies is to us.

54

Colin Danby 05.30.12 at 7:40 pm

A post for the ages, and great comments as well. At the risk of lowering average comment quality, I'm interested in the time-indexing problem. It worried me in the novel: if the plan period is a year, how do you coordinate and stage deliveries between units during the year? But in any economic system, especially once you have some level of technical complexity, the timing of production-critical deliveries, and the inherent unreliability of such timing, must be dealt with somehow — whether through massive warehousing, deliberate excess capacity, duplications of various kinds. (There must be a huge operations-research lit on this…)

You can see this in a small way in contemporary internet vendors, who have incentives to lie about whether a product is in stock.

For me one of the lessons is that even the red lines on Simon's map are, very often, not the impersonal take-it-or-leave-it transactions of neoclassical theory but significantly institutionalized. A purchasing manager builds relationships with counterparts at other firms, and a lot if that is about negotiating timing problems as they arise (as well as quality issues).

55

Bruce Wilder 05.30.12 at 7:41 pm

Sebastian @ 40

I think I understand what you are saying about balance. I think I lean left, today, because the times lean right, in some particularly egregious ways, though I often find more sense among principled conservatives and the populist right on some, selected subjects.

Any economic system has to find ways to reconcile and resolve conflict. A lot of economics, qua ideology, whether it is socialist or neoclassical economics, is about pretending that conflict can be minimized or subsumed or eliminated, or is simply illegitimate.

The problem in a communist state, as in our own decadent crony capitalism of universal banks and media conglomerates and giant "energy" companies, is the inability of a unified authority to break the incentive bound. It is not about markets, or allocative efficiency, per se. It is, primarily about achieving technical efficiency, and it is why a team needs a boss, who is not doing the work and who can give rewards and penalties unbounded by actual outputs of the production process, and unphased by effort or discomforts involved. We need conflict. We need "arm's length" negotiations. We need government regulatory agencies, responsible for, say, public health, but not responsible for, say, food preparation as a balanced whole; we need a restaurant inspector, who can say, "your restaurant is unsanitary and must be closed till you fix it" and who doesn't care whether the restaurant employees work or the restaurant patrons eat. Ditto

for bank regulation — the regulator has to be detached from the results for the bank, someone, who doesn't much care, whether the bank is able to pay a bonus out of its quarterly results.

The story that says "markets" are about price and allocative efficiency misses an important point, which is that "markets" (or the de-couplings that we whimsically call "markets") are critically important points of conflict, which are dangerously eliminated in a monolithic hierarchy of authority.

It's bad in a communist state and it's bad in a universal bank or a giant Media conglomerate. It's bad, when we eliminate labor unions.

56

geo 05.30.12 at 7:43 pm

Sebastian @52: But government also buys innovation for industry, both through civilian applications of military technology (like DARPANET) and by supporting basic research in universities, for which it does not (in general, at least as far as I know) demand a share of profitable applications.

57

Luis 05.30.12 at 7:43 pm

The major government innovator is the military,

The medical research complex would disagree with you (on whether the military is the major government innovator) and lots of people are waking up to the fact that VC is quite inefficient (as measured by ROI), so even if I grant that the military is the major government innovator, I'm still not clear it is particularly inefficient with respect to the private alternatives.

58

William Timberman 05.30.12 at 7:46 pm

One of the insights I take away from this post has to do with the function of planning in both its good and bad aspects. Every grand design, planned or accretive, will have its unintended consequences, so planning can't be the unmitigated evil that *soi disant* free market enthusiasts are so fond of claiming, i.e., it doesn't have to result in a Stakhanovite nightmare in some commissar's dark satanic mill somewhere.

More simply put, the way to optimize the benefits of planning might be to make our plans smaller, and the communications between them more robust. Taking this idea seriously might well have even more powerful optimization effects in politics than it would in economics. (Cue discussions of participation, democracy, investment of individuals in macro outcomes, etc.)

And no, contra Hayek, it doesn't seem to me that the market price is the greatest of all imaginable discovery mechanisms, although it does point the way to others which might share its advantages.

59

Bruce Wilder 05.30.12 at 7:58 pm

When most "market" prices are administratively *planned* in our capitalist paradise, it is hard to credit Hayek's vision. Have you seen the price of the iPhone fluctuate? Movie tickets? Ever been to a supermarket?

60

William Timberman 05.30.12 at 8:08 pm

Well, yes, if we had genuine market prices in anything other than simple commodities (at best), it would be harder to scoff at all the ideological superstructures built on their supposed magical efficacy. On the other hand, *why* we don't have them, and why producers think it's so important to game them in the ways that they have, is very instructive about some of the things we too would have to worry about if we woke up tomorrow in a universally declared Socialist New Jerusalem.

61

Andrew Fisher 05.30.12 at 8:13 pm

Footnote 4 is beyond praise.

62

j 05.30.12 at 8:13 pm

This was a very fascinating read! I'm naively trying to intuit up ways to avoid both the problem and as much of capitalism as possible. Here is a first attempt.

As a matter of unconditional right each citizens freely receives
– modest housing, and
– a personal fabrication unit (fab) and a bundle of raw input materials, and
– sufficient nutrients as specified by the science, and
– access to internet where all open source hardware/software are available

Would a centrally planned economy within the limits set by the above also be unfeasible for the sorts of reasons detailed in the original post?

63

rf 05.30.12 at 8:14 pm

Oh wow, Cosma Shalizi, youâ€™re my new intellectual crush. I really didnâ€™t understand half of that, but still, thanks.

And to be honest, thanks to all involved with this site, (commenters included), for all this free knowledge youâ€™ve been relentlessly shoving down our throats these past years. Itâ€™s genuinely much appreciated.

This could only be topped if Francis Spufford were to barge in here knocking over chairs screaming delegitimisation…..

64

blavag 05.30.12 at 8:23 pm

Why can't GOSPLAN throw darts too?

65

Henry 05.30.12 at 8:24 pm

Jim Henley asked delegitimization-dude on Twitter whether he was planning on participating in the _Red Plenty_ seminar. I think it's fair to say that he didn't get the joke …

66

Adrian Kelleher 05.30.12 at 8:26 pm

As the headline post makes clear, the problem is not with communism per se but is a problem of planning more generally and, more generally again, one of rationalism. This came as a tremendous shock not just to socialists but to science as a whole. Capitalism does not solve these problems however. Rather it circumvents them using the market which is not a rationalist construct.

Markets have no theoretical foundation. Q. What is the market price? A. Check the market. Q. What will be the market price tomorrow? A. Check the market… but you have to wait until tomorrow.

Markets are a powerful analytical tool (indeed an indispensable one). They're also a scientific deus-ex-machina, however, with frighteningly shaky empirical foundations relative to their significance. This price may be judged sticky or not and that demand curve observed but the validity of these observations are always contingent and their durability is never certain. Given enough time, all such observations will become untrue. This may occur due to cultural shifts or due to changes in circumstances; the markets for diamonds and grain will differ inside a besieged castle from those in the larger world. Market economics makes certain problems tractable at the expense of accepting that other more general questions can never be solved — precisely those questions dealt with in the OP. This is not an advantage to be dismissed, however market evangelists habitually go on to make much greater claims — essentially to take assumptions about efficient markets as fact — without any proof whatsoever.

But the erosion of rationalism in the 20th century was not restricted to economics. Along with the analytical limits such as those proven by Bertrand Russell and Kurt GÃ¶del, there were limits to what was calculable such as NP complete problems, theoretical limits to observation such as the Heisenberg uncertainty principle and observational constraints in fields such as chaotic systems or economics that appear superficially to be practical but are in reality fundamental.

These developments came at a time when scientists' capabilities were widely thought to be limited solely by time and resources. The shock was profound and not just to the scientific community. It was a trauma to rival the Copernican revolution.

Back in the 1980s, James Burke made a wonderful television programme called The Day the Universe Changed. It was a brilliant inversion of normal scientific discourse, pointing out that prior to each scientific or philosophical revolution people lived in a world built around a more flawed understanding of reality. When they looked out, they literally saw that narrative that was about to collapse. So, when Copernicus wrote his treatise, as contemporaries saw it he didn't just improve our understanding of the solar system; rather, he wrenched humanity away from the centre of creation where not just the bible but all prior observations had placed it. The universe ceased to be for and about us, a trauma that contributed to centuries of religious turmoil that have yet to fully unravel.

The 20th Century added insult to injury. Not only was the position we occupied of no special importance, in many spheres we were now also condemned to ignorance in perpetuity. The universe had changed once more. It's interesting to speculate as to the role this shock played in the convulsions of the 20th Century or about the extent to which its reverberations will continue to echo in the 21st.

Though it started with science, its impact can be felt much more broadly. Artistic modernism for instance was ultimately an aesthetic and hypothetically any modernist aesthetic could be expressed as a system of rules, that's to say as a rationalist construct just like law or mathematics. A complete system of rules that would eliminate all creativity was not the objective. On the other hand rules motivated by critical argument could separate the artistic from the purely technical: content from form.

The rise of postmodernism, which denies any absolute distinction between high and low art or indeed between any two artistic artefacts, closely paralleled the scientific and philosophical changes outlined. Its claim is that all cultural expressions are imbued with all other such expressions and if there were ever any

> doubt that there's at least some truth in this the subsequent explosion of referentiality in art has dispelled it.
>
> Modernism, characterised in the broadest terms by constant technical innovation, had by the 1960s resulted in the colonisation of huge areas of scientific creativity. Worse again, the helter-skelter rush to occupy the new territories had left much of them patchily covered but the number proved to be small of artists modest enough to limit themselves to at best the second rank by working in the shadows of the technical innovators. Certain arts, music and painting in particular, came to be seen as essentially complete by the 1960s.
>
> While postmodernism is itself arguably just such an acknowledgement of the technical innovators' greater significance it unquestionably opened up vast new areas just as the well of modernism ran dry. But this all came with a catch. Whereas art for art's sake was a clever joke, if all artworks were inescapably imbued with every stimulus to which its creator had ever been exposed then all causal relationships in art really did become circular. This didn't just alter aesthetics, it made any aesthetic impossible.
>
> Postmodernism never did catch on in the USSR and for obvious reasons. It was not a society where fools could prosper, and any fool could see that an assault rationalism would constitute an assault on communism itself. The world of today is the opposite; when there is an artistic controversy everybody comes away with what was sought: offender, reporter, offendee. Identities are reassured rather than unsettled. The rituals and superficial forms of creativity remain, abstracted of intent.
>
> It is difficult today to imagine how important figures such as Picasso or Stravinsky were in their time; carpenters and field hands as well as professors debated their merits. Henri Rousseau demonstrated that with commitment and integrity it was possible then for the individual to leap ahead of the cultural elite. Derided as an idiot, his creations are universal and eternal.
>
> I don't know that any civilisation has prospered for long while exhibiting the cultural stagnation of the current age. We need to remember that only at the margins is postmodernism incontrovertible. Its arguments can be applied to Mozart or Picasso but such examples reveal its limits as a perspective because the ways in which they extended human expression simply had no precedent.

67

Bruce Wilder 05.30.12 at 8:34 pm

> William Timberman @ 60: " On the other hand, why we donâ€™t have them, and why producers think itâ€™s so important to game them in the ways that they have, is very instructive . . . "
>
> I don't feel instructed. I feel distracted.
>
> Not your fault. (And, certainly not the fault of Cosma, who has written a fabulous essay.)

68

Sebastian 05.30.12 at 8:40 pm

> The market is an emergent system. One of the funny things about scientific leftists is that they believe in emergent systems in evolution, but have trouble believing in them in markets. They want god/planner in charge somewhere in economies.

69

Substance McGravitas 05.30.12 at 8:46 pm

> > One of the funny things about scientific leftists is that they believe in emergent systems in evolution, but have trouble believing in them in markets. They want god/planner in charge

somewhere in economies.

The executives of failing companies should be ripped to pieces by tigers.

70

John Howard Brpown 05.30.12 at 8:49 pm

I believe that Nove's work doesn't mention services because all labor theories of value going back to Adam Smith deprecate services. There may be a class aspect to this since in Smith's time provision of services had a definite tinge of submissiveness to it.

Also, the ln(1/h) in the expression about computability reminds me of information theory, any connections?

71

Chris Williams 05.30.12 at 9:03 pm

Mmm, nice post. There are echoes in it, and in _Red Plenty_ itself, of some of my conclusions from having worked on the history of a project of a similar era, the UK's Police National Computer, which was in development between about 1962 and about 1975. It worked, but the reason that it did so was that the planners very wisely stuck to files (with millions of entries) containing pre-registered digital data such as names, addresses, fingerprint index numbers and car registration details. At the start of the process they were hoping to include the various Modus Operandi indices run by British police: in essence, to code up criminal behaviour in order to identify it. By the end, they had abandoned this entirely: it was a harder class of problem for the technology of the time.

I do, though, have one yabbutt: During the Second World War, the Middle East Supply Centre seems to have run quite well… Is that because it was essentially (mainly) about distribution and the managing of transport bottlenecks, not about maximising production all the way to the consumer?

72

Zamfir 05.30.12 at 9:35 pm

@sebastian, markets are surely emergent, but we seem to understand them far less than evolution. The turnover of firms and products is not fast enough for an equivalent process to natural evolution, for example, and the standard economist's model of them is strangely off as well.

Without understanding 'emergent' is just another word for 'exists'.

73

lupita 05.30.12 at 9:46 pm

planning is not a viable alternative to capitalism

There is no alternative? Bechtel did a lot of capitalist planning to get to the point where they could profit from charging Cochabambans to gather rainwater from their rooftops. On the other hand, the anti-capitalist Cochabambans just spontaneously exploded and ran Bechtel out of their town.

The clearest explanation of capitalism I have encountered is Varoufakis' who defines it as extracting capital from the future, loaning it out in the present, and recovering it, plus interest, back in the future. Of course, there is always Marxâ€™ classic explanatory formulas to maximize capital as in "money->commodity->money" (commodity speculation) and M->M, as in the stock exchange.

When the aim of planners is to maximize commodities, they are not capitalists, no matter how much planning they do. When they are maximizing capital (as most states have been doing during the past few decades) then they are capitalists, no matter how little time they spend looking at their exchange rate, credit rating, stock index, and bond spread.

74

bianca steele 05.30.12 at 10:00 pm

It was interesting to see who funded Spufford's book (e.g., Target). There's a lot of scholarly interest in the big retail chains, who have some of the same problems as the commissars in *Red Plenty* (though most of the interest seems to have been from the social side). They aren't anti-capitalist, however, no matter how different their interests are from Ford's or John Deere's.

75

Maynard Handley 05.30.12 at 10:46 pm

"I donâ€™t think this sort of pathology is intrinsic to market exchange; it comes from market exchange plus gross inequality. "

I think there's more to it than just this, that this view is a little optimistic.
As I've said a few times, the Plan, even the decentralized price-based plan, is not self-fulfilling. If prices are to indicate successful vs unsuccessful business models, then the unsuccessful have to be allowed to fail and the successful to thrive. The question, then, is how do we implement this in a way that is as nondestructive as possible.

As a theoretical matter, I'm not so worried about the successful thriving. We know in principle what to do about that — limits to the extent money can buy political speech, high income taxes on the rich, high estate taxes, etc. (Of course, as pointed out, converting these into practice is a different matter.)

More problematic is the issue of failing. Let's start with sole proprietorships and small businesses. Conceptually, of course, we can imagine each of these runs as an LLC, and the failure of the business represents the failure of the LLC, not the destruction of the underlying proprietor. But, of course, one has to put some sort of limits and constraints on this, otherwise we'll see a rash of sole proprietors living it up in a series of company housing and driving company cars.

A similar version of the problem exists with respect to choice of major in college. The details differ, but again we have a decentralized system of choice, which is supposed to be grossly matching supply and demand. Again we have the problem of what to do with the student who, in good faith studied cardiac surgery [ie open heart surgery] only to practice in a world where cardiology [ie catheter based intervention, a rather different set of skills] has taken over the market and rendered her skills irrelevant. Again we have the companion problem of what to do with the student who, in bad faith, studies History of Video Games at college — and only managed to achieve a D.

Finally we have the problem of the large enterprise which fails. At a conceptual level, yes, this is like the power of imagination over evolution — our ideas die in our stead — and the death of a large corporation, per se, is no tragedy. BUT in the real world, the death of even a large enterprise means the loss of a large amount of accumulated skill, and the loss of a large number of jobs.

So what's my point? For prices to actually do their job, failure has to have consequences.
If we want failures to have consequences, but also to live in a civilized society, we then need a whole lot of auxiliary mechanisms (government attempts to save, or have bought out, failing large enterprises; unemployment insurance; this sort of thing), and THEN we need a whole lot of limitations on these auxiliary mechanisms precisely to get back to the original point — failure should have a cost.

76

Maynard Handley 05.30.12 at 11:04 pm

> ” So how does capitalism solve them? Certainly not through market signalsâ€”which of course also donâ€™t exist for things that donâ€™t exist yet. Rather, through planning: A designated group of experts considers various proposals for new firms or projects, and allocates a portion of the social surplus to them based on their assessment of their prospects. Now, we call these planners banks, or these days venture capitalists, but when Schumpeter, writing i 1939, wanted to explain the function of banks under capitalism, he described them as our version of Gosplan.”
>
> It’s important, in understanding the way the US REALLY works (as opposed to the nonsense ideological versions) to also include in this list of planners
> – DARPA (THE Ministry of Planning for the US, but don’t call it that, of course), and
> – NIH and all the other science funding agencies: NASA, NSF, DoE etc

77

Francis Spufford 05.30.12 at 11:10 pm

> *It was interesting to see who funded Spufford’s book (e.g., Target)*
>
> *I think you must be thinking of some other book. Nothing funded Red Plenty except a publisher’s advance.*

78

Francis Spufford 05.30.12 at 11:13 pm

> Damn, how do I turn the italics off?

79

bianca steele 05.30.12 at 11:19 pm

> Sorry, I was referring to the grant mentioned on the copyright page. I don’t know a lot about how that works, but I assume it could mean anything from minimal research support or archive access to anything at all.

80

JW Mason 05.30.12 at 11:20 pm

> *Itâ€™s important, in understanding the way the US REALLY works (as opposed to the nonsense ideological versions) to also include in this list of planners â€“ DARPA (THE Ministry of Planning for the US, but donâ€™t call it that, of course), and â€“ NIH and all the other science funding agencies: NASA, NSF, DoE etc*
>
> Fair enough.
>
> Luis: I am happy to stipulate, at least for the moment, that a number of independent planning agencies will approve a greater number of blue-sky projects than a single centralized agency, and that this kind of decentralization is more likely in an economy with private ownership of the means of production. What I object to, first, is the idea that decentralization decision-making is definitionally equivalent to markets, and second, that the greater innovation it results in has anything to do with “optimization” in the sense discussed in Cosma’s post. What is the optimal frquency of iPhone-like innovations? How on earth could you know?

81

rf 05.30.12 at 11:22 pm

> Malfunctioning italics. Accusations of corporate sponsorship. The delegitimisation begins (I couldnâ€™t resist â€“ but I should)

82

Francis Spufford 05.30.12 at 11:23 pm

> Oh. [Looks hastily at book.] I think that's a grant from Target to Graywolf Press to support it as a publisher, presumably as a piece of Minnesota-to-Minnesota philanthropy. It didn't come my way.

83

JW Mason 05.30.12 at 11:24 pm

> *: it seems so obvious to me that the reason firms exist is due to local nonconvexities in production that I donâ€™t understand why Iâ€™m the only person on the planet who says this.*
>
> Isn't this Chandler's argument, sort of?

84

Watson Ladd 05.30.12 at 11:27 pm

> Capitalism can have institutions: think about Toyota and its subcontractors. Each subcontractor has a contract specifying what it produces and when, but this is an incredibly complicated contract, and one that is always changing as Toyota's needs change. What makes this noncapitalist? Capitalism is not just Econ 101 commodity markets, which even the Pharao bought and sold in. There is a developed theory of the firm to address the existence and behavior of firms, which is worth looking into.

85

Maynard Handley 05.30.12 at 11:32 pm

> 72
>
> > @sebastian, markets are surely emergent, but we seem to understand them far less than evolution. The turnover of firms and products is not fast enough for an equivalent process to natural evolution, for example, and the standard economistâ€™s model of them is strangely off as well.
> >
> > Without understanding â€˜emergentâ€™ is just another word for â€˜existsâ€™.
>
> I'd say "emergent" means that the emergent phenomenon is more the consequence of the RELATIONSHIPS between the lower level entities than a consequence of the PROPERTIES of the lowere level entities. So, to give two examples
> – you learn about liquids, as an emergent phenomenon, by studying the forces between atoms, not by ever more careful study of the properties of an individual atom OR
> – to put it a little differently, you can create a usefully realistic model of highway traffic jams by simulating actors with the correct relationships (response time, breaking distance and so on); you don't need a full or even a partial model of human psychology and different car models.

> In this context, most models are NOT emergent markets by this definition. The financial markets (where so much is driven by the rules in place) are the closest, but even they rise and fall based on human psychology — and the whole point of emergence is that this underlying specific trait of humans shouldn't matter. As we move to other markets — the market for cell phones, the market for clothes — we get further and further into territory that is very much determined by specific human psychology.

86

Francis Spufford 05.30.12 at 11:34 pm

> *Malfunctioning italics. Accusations of corporate sponsorship. The delegitimisation begins (I couldnâ€™t resist â€“ but I should)*
>
> *Let it all come! Nothing can quench my sublime and funky love.*
>
> *I think I'm going to try and keep my serious comments for the responses, though. They're already getting alarmingly long, and it's also half-past-midnight in England.*

87

guest passing through 05.30.12 at 11:41 pm

> How far does it get you — if it gets you anywhere — if you a total ordering ordering on the set of goods, but nothing further?

88

david 05.30.12 at 11:43 pm

> For The Market to tÃ¢tonne its way to equilibrium requires rather well-behaved excess-demand functions on the part of the economy anyway, so is there some reason in principle that The Planner cannot assume that the same?
>
> There is a shortage of something: so make more, comrade! Central planning is easy under the conditions which the market works perfectly.

89

John Quiggin 05.30.12 at 11:52 pm

> Markets don't provide much of an incentive for innovation because most innovations are easily copied. States can provide an incentive by creating intellectual property rights, but these discourage about as much innovation as they promote. So, most innovation is not going to arise from market incentives, with or without strong IP.
>
> OTOH, central planning is also adverse to innovation, since the whole idea is that all the possibilities are known in advance. Some kinds of innovation can be 'planned' . Dor example, if you want to build a rocket that can go into outer space or, less happily, deliver a nuclear weapon to the other side of the planet, you can throw lots of resources at the problem, specify the goals and let the boffins come up with the means.
>
> But lots of innovations don't work like that, and historically, most of the interesting ones have come neither from profit-driven firms or from goal-driven publicly funded research. The big example is the Internet, which got a little bit of startup money from the US, but was largely built by academics in their spare time, until it got big enough to wipe out the similar attempts of the private sector (Delphi etc) and some public competitors (Minitel), after which private firms got interested. That produced the dotcom bubble, which also did not show market-driven innovation in a good light.

90

JW Mason 05.31.12 at 12:06 am

> 80 seems exactly right.

91

Joe 05.31.12 at 12:07 am

> even if it were efficient, would that be optimal? quoting schumpeter: “a system- any system, economic or other- that at every given point of time fully utilizes its possibilities to the best advantage may yet in th elong run be inferior to a system that does so at no given point of time, because the latter’s failure to do so may be a condition for the level or speed of long-run performance.” setting aside the gulag and the corruption, i think this gets right to the heart of why planned economies don’t work all that well in the long-run.

92

Barry Freed 05.31.12 at 12:15 am

> 80 is you (?)

93

Bruce Wilder 05.31.12 at 12:20 am

> It is common, but still problematic to identify “innovation” with “novel invention”, when the economically significant process is the grinding out of technical economies from progressively improving the architecture of control, once a production process is under control. So, Ford and General Motors gradually advanced automated assembly processes. General Electric and Westinghouse worked out electrical generation and distribution. U.S. Steel and Bethlehem Steel. Proctor & Gamble and Colgate, etc. Standard Oil and its progeny worked out the worldwide production and distribution of oil. IBM. Boeing and Douglas and the other aircraft makers. Warner Bros.and the other movie studios. AT&T and GT&E (Verizon). F.W. Woolworth down to Wal-Mart. Container shipping. Coke and Pepsi.
>
> This is where “capitalism” has shined, at least since the beginning of the Second Industrial Revolution in the mid-19th century, with the growth of the railroads. Large bureaucratic private enterprise steadily advancing their technical control of production and distribution processes, driving down costs and prices, driving up productivity and quality, often over many decades. Railroads are still scoring productivity gains from applying innovations in motors and engines and control systems.
>
> You can deride “central planning”, but these are large bureaucracies, which are not adverse to mobilizing the state on behalf of their schemes, nor is the state adverse to mobilizing these bureaucracies, when it suits.
>
> “Market incentives”? There’s a story about First Mover advantage, although that may be more a case of the *surviving* winners writing history. The firms that do most of the long-run work of innovation in the sense of refining control regimes tend to be the ones that follow up on a key innovation, and acquire a dynamic capacity to continue progress along those lines, taking advantage of a dominant market position, which makes it easy to capture returns from innovation. Innovation carries no magic virtue, to ensure that the sunk cost investments can be recovered; market power is necessary for that, and IP is weak tea at best in most industries.

94

Matt 05.31.12 at 12:56 am

> Are there no parallel algorithms with good scaling properties for solving linear programming problems? Like ajay, I don't understand why the computational reference unit is one desktop computer; many scientific problems solved by computer today would not be tractable on one desktop computer.
>
> *More serious is the problem that people will straight-up lie to the planners about resources and technical capacities, for reasons which Spufford dramatizes nicely. There is no good mathematical way of dealing with this.*
>
> Governments and corporations have developed and continue to rapidly improve electronic panopticons for the purposes of waging war, enforcing laws, and optimizing advertising. Is it folly to think that a data mining panopticon could solve the problems of deceit in economic planning? Merely creepy?
>
> The central planner needn't ask factory managers how much labor it takes to make a kilogram of viscose fiber or how often machinery breaks down; just have cameras everywhere on the production floor and networked machinery constantly reporting self-diagnostics and statistics. Everything that happens is recorded; if central planner and lower managers alike are competent and acting in good faith, it aids them both, and if not it identifies the weak point. The instance of elaborate sabotage and its twisty motivations, described in *Red Plenty*, came about only because planners could lie about how much production a given machine was capable of and lower managers could lie about how much was actually achieved.
>
> If a machine reports as idle for a day when it was supposed to be in production, maybe the machine is faulty. Check the video camera footage to see what was happening with the workers and the machine. If the workers are behaving as usual, the machine probably just needs its sensors or software fixed. Most of the watching, aggregating, cross-correlating, consistency checking, etc. can be done by computer, otherwise you'd just be solving one problem with a worse one (lying replaced by enormous amounts of oversight labor).
>
> Thanks for an extremely engaging, thought-provoking piece. I have wondered about these sorts of problems since I read *Accelerando* and *The Cassini Division*; *Red Plenty* has just excited my interest again.

95

Alex K. 05.31.12 at 1:02 am

> *DARPA (THE Ministry of Planning for the US, but donâ€™t call it that, of course)*
>
> The 2012 DARPA budget is about $3 billion — about the size of the R&D budget of Google and about a third of the R&D budget of Microsoft. Hardly close to anything resembling "The Ministry of Planning."

96

Keshav 05.31.12 at 1:36 am

> Matt @ 93 – I found slides for a 2005 talk by Jacek Gondzio, â€œMassively Parallel Implementation of Interior Point Methods for Very Large Scale Optimizationâ€ in which he reports that a linear programming problem with 1bn variables and 353m constraints can be solved in 50 minutes using 1280 processors. This is not my field, so I don't know whether his algorithm exploits some structure in his problem that would not exist in the central planner's problem.
>
> On a related note, Cockshott and Cottrell have a number of papers arguing that central planning is feasible with modern computer technology. As I understand it, the algorithm they present (e.g. in â€œTowards a New Socialismâ€) does not consider a linear programming problem; rather, it takes as given a target for final goods production (determined elsewhere in their model, which includes some markets for consumer

goods) and solve for the gross output levels required to meet this target. They exploit the fact that the input-output structure of the economy is sparse (only a small fraction of the goods in the economy are directly used to produce any single good). Their algorithm's complexity increases with n*m, where m is the number of direct inputs for each product, which seems manageable even with n=12 billion.

Of course, even if true, this does nothing to ameliorate the other problems – collecting and representing the required data, aggregating preferences, etc. – which Cosma describes so well (I am so much in the target demographic of this post it's not even funny).

97

Sandwichman 05.31.12 at 1:44 am

Loved the essay but don't feel qualified to comment until I've read the book. But I will anyway.

The whole socialist calculation debates seems to me to be predicated on two misconceptions or fictions: one, that there is a system of production and distribution of goods and services that consists fundamentally of markets operating on a logic of markets and, two, that to replace it one had to develop a system of production and distribution that consists fundamentally of planning operating on a planning logic.

Aside from primitive accumulation, residual feudal relations, reproductive labor, the structure of the firm and monopoly power *some* strategically important market interventions do indeed occur in a so-called capitalist economy. Why then should a socialist economy require a complete non-market retrofit from the ground up (including those elements that are already outside markets in a so-called market economy?) rather than just some strategically vital tweaking here and there?

98

David Childers 05.31.12 at 2:11 am

There's a lot more here to comment on than I could cover, aside from to express agreement and appreciation, but as an economist-in-training (for what that's worth), there are a few related points which I think are worth elaborating upon.

I would like to focus on the statement that there is no good mathematical way of dealing with the propensity of individuals to lie to planners. This seems to miss important recent developments in economics, by no means obscure, which have taken the effort to attempt to alleviate this. The rise of mechanism design as a major paradigm in economic theory has not only provided a way to approach the issue of lying, but has come up with a set of ideas and results which ought to reshape the way people think about markets and exchange in general. The following should be quite boring to those familiar with mechanism design, but I hope will be informative regarding this under-popularized area.

While game theory, including the branch of game theory which deals with games of incomplete information, focuses on determining the actions of individuals in a given social environment (formally a tuple consisting of, for each individual, a space of possible actions, an information set, and an objective), mechanism design reverses the process. Given a group of ex ante diverse agents, one seeks to design an environment which induces them in equilibrium to voluntarily*1 take desired actions optimizing a given social objective, which might be a social welfare function, or just the whims of the planner. The application to the problem of lying is direct: take your God-given social welfare function (the issues with which you have ably described here), open up your Contract Theory textbook*2 and program in the optimization problem over the set of all societies such that the technological structure of production is given and that all individuals will behave according to their individual objectives. Incorporating this extra structure adds to the computational difficulty of course, but as with the use of convexity in standard optimization, under some regularity conditions the problem of searching over the space of all possible societies, calculating equilibrium behavior in that society, and then optimizing over the resulting set of outcomes, can be drastically simplified. Indeed, the revelation principle reduces the problem to ensuring

that each agent truthfully reports their type (say, their exact valuation for every kind of good), which mathematically amounts to adding a bunch of additional inequality constraints to the original programming problem of deciding what allocation to give them.*3 Adding these constraints of course takes you away from the unconstrained optimum, but one can at least attempt to achieve the best possible outcome over any society which is feasible given technology AND human nature, which sounds to me like pretty close to the goal of feasible planning. This does not overcome computational difficulties (and relaxing the assumption of quasilinear preferences takes it from impractical to computationally nightmarish, according to my colleagues who work in the area), and the social welfare function is still not something one can realistically define, but the problem is at least mathematically well-defined.

The relevant question to ask, once the setup is well defined, is what kind of restrictions are imposed by taking into account these difficulties, and here is where the results become somewhat ugly. Some of the more important results in mechanism design, aside from some clever tricks on the forms of institutions ("mechanisms") which make people willing to reveal their information, are impossibility theorems. Once you take into account unverifiable actions, it becomes generally impossible to achieve a system which both ensures maximal productive efficiency without also imposing undesirable risks on workers: this is the well-known issue of moral hazard, though what is not well known is that except under extremely restrictive informational assumptions, it is NOT the case that the solution to moral hazard is to increase the size of the punishment for bad outcomes and reward for good ones. The relationship is in general nonmonotonic, a finding which strongly contradicts the moral intuitions of the kind of people most likely to talk about moral hazard. It also has some unfortunate implications for decentralization: the Myerson-Satterthwaite theorem, my vote for the result in economic result which is least recognized relative to its importance, is that there exists no possible mechanism under which bilateral exchange between agents who do not know each other's valuation for the good can be conducted efficiently: completely decentralized voluntary trade, contra Hayek, is informationally inefficient. It has been shown in the one homogenous good case that as the number of agents grows, efficient exchange from sellers to buyers can be achieved asymptotically using a mechanism that looks like a market price, suggesting that the Walrasian fiction of exchange by informed agents under competitive market prices can be approximated in large markets even in the absence of knowledge of valuations by both buyer and seller, though how this applies to more general situations I can't say. I believe most of the familiar limitations should apply (though, since allocations are being decided by a planner, things like public goods and pollution and other externalities can be handled in a similar way to the full-information social planning case, modulo the need to elicit valuations for such objects).

The approach also brings about the issue of who, precisely is designing the mechanism, and whether it is possible to force the mechanism designer to commit to the allocations prescribed by the mechanism ex post. In many of the cases where this theory has been practically applied, these become major issues. Small scale mechanisms, like an employer designing a labor contract, generally don't have social welfare as the objective: usually the goal is to extract as much rent as possible. In the case of a government, this should also be an issue, with the additional complication that even if an objective is decided upon democratically, ensuring truthful voting will become even more difficult because votes not only make a decision but also reveal information, creating possibly conflicting incentives for voters. Ensuring that the contract is fulfilled by all parties is also difficult: clearly in the case of an employer, who has incentive to promise high pay and good conditions and then renege, but also for a benevolent government, which may want to implement a mechanism which ex ante entails bad outcomes for some people in some states, but may ex post want to forgo punishment or reward. One could always attempt to put an incentive structure for the government which attempts to remove this, but then you have to ask who will impose that on them and it's turtles all the way down.

None of this suggests that at any point a centrally planned society could overcome the practical difficulties entailed by lack of knowledge and processing power, even with optimal mechanisms. Optimization is hard and approximately optimizing over a criterion that is approximately right is not a guarantee of approximate optimization (at least in the absence of uniformity in that approximation). Even if finding an ideal were approximately achievable in a centralized fashion (my suspicion is that in practice, since goods

and services would need to indexed by time, location, and state of the world at a minimum, even without nonconvexities or social interactions which make the problem NP-hard it would be infeasible for the foreseeable future), it would be cheaper and easier to decentralize many aspects of the process, allowing individuals and organizations to make substantial fractions of their decisions individually or in small groups and so participate in activities that look something like (regulated) "markets" and "firms" and "social organizations", while only some aspects would be carried out in a centralized fashion, with decisions informed by gathering information in some way from the populace. In other words, even with the ability to formalize the problem of extracting decentralized information, computational capability is likely to change the scale and type of activities which are carried out in firms, markets, and governments, and may even result in a greater degree of centralization as it becomes more practical to organize some activities in a way which takes advantage of capabilities for more complex economic arrangements to be determined mathematically, but it's not likely to facilitate a planned economy. Instead, just as linear programming has become a part of the standard toolkit for operations research, affecting the way some businesses manage sales and inventories but not strongly changing the structure of the economy, mechanism design is today primarily used by companies like Microsoft and Google to find more profitable ways to sell advertising, and practical applications to government mostly consist of somewhat more efficient tax schedules.

So, in practice, although economists have given a lot of thought to the problem of social decision making in the presence of decentralized information and have some relatively intriguing results suggesting forms of allocation which often differ in details from Walrasian markets, most of the conclusions regarding the infeasibility of large scale planning seem to hold up.

*1 "Voluntarily", meaning, of course that given the induced structure of society, it is in an individual's best interests to do as told. This is perfectly compatible with said structure of society consisting of: "Do X or I will shoot you and your entire family," see, e.g. Acemoglu and Wolitzky (2011) "The Economics of Labor Coercion". Note also that in general such a social structure is not necessarily sufficient to ensure ideal response, as not all actions are verifiable, as aptly illustrated in the process of dekulakization.
*2 In our first year theory courses, we use Salanie's "The Economics of Contracts," but as this is not my area and it is a mature field, I suspect that just about any textbook on contracts, auctions, or market design will contain the relevant details
*3 These are usually referred to as "incentive compatibility constraints." If you want to do more than just allocate goods, but also, say, force workers to do something when they have the possibility of doing something else, you also need participation constraints, but these can often be handled along the lines of Footnote 1

99

blavag 05.31.12 at 2:17 am

Why do planners have to know all outcomes in advance? Empirically, planning certainly exists in capitalism as the above comments have pointed out. Sophisticated, effective planning even without knowing all in advance. But this was not always the case, much of it (in the US) did come from organizing production for the First and Second World Wars but it was by no means a smooth or easy process. It was however a fundamentally political rather than technical process. See for example Brian Waddell's War Against the New Deal. Which brings up the role and weight of the military industrial complex in the US economy for which there is still nothing better than the various works of Seymour Melman.

100

js. 05.31.12 at 2:32 am

Wow. This was awesome. A lot of it went right over my head, but I still learned a ton. Cheers.

101

gordon 05.31.12 at 3:04 am

Some quotes from the post and remarks on them, and a thought.

â€œI donâ€™t think this sort of pathology [that the whims of the rich matter more than the needs of the poor; that it is more important to keep bond traders in strippers and cocaine than feed hungry children] is intrinsic to market exchange; it comes from market exchange plus gross inequality. If we want markets to signal supply and demand (not just tautological â€œeffective demandâ€), then we want to ensure not just that everyone has access to the market, but also that they have (roughly) comparable amounts of money to spend. There is, in other words, a strong case to be made for egalitarian distributions of resources being a complement to market allocation. Politically, however, good luck getting those to go togetherâ€.

But inequality isnâ€™t fixed; it has been increasing in Anglophone countries for a while now. That seems to show that the authorâ€™s despair is ill-founded; if a lower-inequality regime has existed once, it can prima facie exist again. It isnâ€™t impossible.

â€œâ€¦planning is not a viable alternative to capitalismâ€¦[the partisans of capitalism] themselves should be able to say what will happen then: the masters of the system, will be tempted, and more than tempted, to claim more and more of what it produces as monopoly rents. This does not end happilyâ€.

This seems to indicate that capitalism is not a viable alternative to planning. So now we have two non-viable options.

â€œWhat we can do is try to find the specific ways in which these powers we have conjured up are hurting us, and use them to check each other, or deflect them into better pathsâ€.

So the author would like democratic government to work. Well, wouldnâ€™t we all? I suspect the real problem here is that it isnâ€™t working (at least not in the realms he is thinking about) and that worries the hell out of him. But if that is the case, why not just say so?

Overall, I find it remarkable that there is no historical perspective. Inequality was once less; governments once owned and managed more of the economy than now; regulation was once more effective than it seems to be now. Yet he talks about the need for â€œbold, persistent experimentationâ€ as though we confront new problems which have never been addressed before. That isnâ€™t the case.

102

Sandwichman 05.31.12 at 3:22 am

“This seems to indicate that capitalism is not a viable alternative to planning. So now we have two non-viable options.”

That’s what it seems to indicate. Stephen Leacock covered much of this territory nearly a century ago in “The Unsolved Riddle of Social Justice.” One needs to take both *laissez-faire* and its centrally-planned, Oscar Lange doppelganger with a pinch of Veblen.

103

Nobody 05.31.12 at 3:29 am

Wanted to address the idea that there was no extant alternative to the market pricing system for determining individual preferences — What is internet advertising then?

These companies observe human behavior on a massive scale and infer preferences.

I'd go so far as to hazard that every good Web 2.0 site is a non-pricing/market solution to revealing preferences. The attention this blog post gets, in hits, comments, referrals, etc. are all non-marketplace indicators of relative worth. A nice, open letter to the universe for more of this. Thanks for sharing your thoughts!

104

Lee A. Arnold 05.31.12 at 4:10 am

A terrific essay and absolutely the way into the future. Reality is going to require overlapping institutions and organizations of different kinds because we cannot know it all. It is not simply complexity that it the issue; it is that your brain can't wrap around it.

Any institution allows you to act, while depending upon some pieces of information being held in the category of "being held by all others", so that you do NOT have to re-obtain it locally. This saves your information budget. For example, the market system works by establishing that you don't have to recalculate the value of the currency at each transaction, and you don't have to establish the validity of consumer protection laws for each new thing you buy. Working for a business firm is the process of doing what is required without having to know the final ends of the owners, or even necessarily the next step in the production process. Having a government policy for climate or retirement security saves the citizenry from enormous cogitations on risk and the vagaries of life. Etc. etc… Market institution, business institutions, government institutions are the same sort of thing, at a deep formal level. Nescience is allowed, and indeed it is depended upon. You are freed from having to learn, or to re-establish everything. This reduces your time cost, and you don't have until the end of time. All institutions do this, including government ones. It goes even deeper: any organization whatsoever, ideas, individuals, inventions, and institutions are all the same kind of thing: they are rings of transactions/transformations around a central context or central agreement that rules them, and that local central context (1) allows specialization among the parts, and the central context also (2) reduces the transaction cost between the parts, by making the repetition of common information unnecessary. All institutions must have radial connections between the members and the central rules — connections of focus, transparency, responsibility, and redress. Thus there are two types of basic connections in economics, the transaction between two parts, and the connection to the rules. Finally to work well, institutions should be narrowly focused. Even the market institution is quite narrowly focused, on balancing scarcity and desire by the use of the scarcity of money. That is all it really does. That is precisely why it works well, when it does work well. The "knowledge problem" assertion that all local information is communicated in markets is incorrect and has led people to fantasize that such a systemic calculation is being made. In fact, the local knowledge is specifically NOT transmitted; this non-transmission is the market institution's function, that is how it reduces transaction costs: you do not need to know the other fellow's business. We must look at the operation of negative information, of nescience, in information and organization of all types. The only way forward is to solve problems as they arise, which may require adjusting old institutions or creating new ones, to allow us to hardwire the common information, thus saving our information and energy budgets for new flexibilities.

105

Frank Ashe 05.31.12 at 5:02 am

Please make all this disappear for the next few days! I have work to do and very little will power to overcome such a great temptation.

106

Maynard Handley 05.31.12 at 5:14 am

[blockquote]
DARPA (THE Ministry of Planning for the US, but donâ€™t call it that, of course)

> The 2012 DARPA budget is about $3 billionâ€”about the size of the R&D budget of Google and about a third of the R&D budget of Microsoft. Hardly close to anything resembling â€œThe Ministry of Planning.â€
> [/blockquote]
>
> The issue is not the raw money involved, it is the directions that are set.
>
> What do you think a Ministry of Planning would refer to? Hint — the word Planning is not the same as the word Production.

[107](#)

JW Mason 05.31.12 at 5:30 am

> *80 is you (?)*
>
> 80 is now 89 — John Quiggin. A lot of new commenters in the moderation queue on this one it seems.
>
> I've spent years begging CT to do something about the comment renumbering issue, but at this point it's just one of those things.

[108](#)

The Raven 05.31.12 at 6:07 am

> Yet…the Soviet Union did not need an optimum solution. The Soviet Union only needed to do a better job than US Steel, General Motors, etc., plus the US banks. Artificial intelligence research did not lead to artificial intelligence, but instead led to computer science. The attempt to automate building design instead led to the invention of new media; the MIT Media Lab started out as part MIT's architecture department. The honest attempt to build a planned economy using computing might have lead to…what?
>
> Water under the bridge, of course; the Soviet leadership didn't want that. They scorned the beginnings of information technology, much as capitalists did and for, it seems to me, very similar reasons.
>
> Awesome essay, BTW.

[109](#)

The Raven 05.31.12 at 6:35 am

> "But, and this is I think something Marx did not sufficiently appreciate, human beings confront all the structures which emerge from our massed interactions in this way. A bureaucracy, or even a thoroughly democratic polity of which one is a citizen, can feel, can be, just as much of a cold monster as the market. "
>
> Or perhaps a family? Turn it around: the human response to participating in larger social systems is similar to the ape response to existing within a tribe. With its status divisions, um. Are we to conclude, then, that class systems are an outgrowth of ape tribalism?

[110](#)

The Raven 05.31.12 at 6:42 am

> BTW, the Mac, the iPad, and the iPod/iPhone were anticipated at Xerox PARC, roughly two decades earlier. These were pure research projects. Jobs's role was marketer and popularizer; he is perhaps more akin to Edison or Sarnoff.

Ref: http://nchu-eucl-1st-speech-tips.blogspot.com/2011/11/third-paradigm-computing-ubiquitous.html 111

Peter Dorman 05.31.12 at 6:44 am

This is one of the best posts-plus-comments Iâ€™ve read in a long time. Kudos to all of you.

I wish I had more time to take part in this discussion, since Iâ€™ve been wrestling with this stuff, and occasionally writing about it in obscure venues, for over 30 years. But I donâ€™t.

1. I agree with many of the comments as well as Mirowskiâ€™s *Machine Dreams*, among others, that the programming interpretation of prices is somewhat of a distraction. Yes, the Soviet Union in the 1950s faced a problem of dysfunctional pricing, but reformers were as hoodwinked into the programming concept as were the Cowlesians etc. in the west. Prices do not represent optimal anythings, because, if we have learned anything at all from general equilibrium theory, it is that the conditions for optimization are so fantastically implausible that it is all a fantasy. It has nothing to do with why some prices are â€œbetterâ€ than others.

I wish Hayek had not been so mushy on this matter. In â€œThe Use of Knowledge in Societyâ€ he seems to say that prices actually convey social costs and benefits, as if they were optimal in the programming sense, the output of a social algorithm that fine-tunes and makes compatible all our economic choices. But at other times he seems to point to their role in the discovery process, where they are not assumed to be optimal. The distinction is important, because the optimality argument is indefensible.

Prices (a) set a standard for producers to meet, through production methods, quality, timing, marketing and so on, that is set by the ones that are most financially successful, and (b) offer an incentive for everyone, producers and consumers alike, to find ways to improve on the choices implied by existing price ratios. If the price of cloth diapers is very low compared to bedsheets, consumers become smarter at finding new uses for diapers. (When my kid was new, we used diapers very creatively.) Firms find new ways to use cheap resources, etc. None of this is optimal. We have gross price distortions in every real economy that can be seen with the naked eye. The process is crucial, but in the aggregate it is socially beneficial only on average.

2. JWM: Sometimes I get the impression that Chandler goes in the same direction I do; he refers to but does not really analyze things like economies of scheduling, assigning tasks, and so on. These things are more effectively done via administration if there are nonconvexities; otherwise just identify the specs for intermediate products and let it be arranged through a market. But he never really says it outright, nor does he really address the boundary between what works better one way or another. I think he had a gut feeling for the issue, but not more than that.

3. I disagree with John Quiggin about the evanescence of innovation. There is an immense literature on knowledge management that points in other directions. What I would add from my perspective is that a lot of innovation is, temporarily at least, embodied in organizational structures that internalize the nonconvexities associated with a particular process of process or product development. Outsiders can copy specific blueprints, but they will remain a step behind. This matters if the technology is dynamic. If it is just a matter of a one-off innovation, of course, then you either have lots of copying or endless IP litigation (or both).

4. There has been a lot of discussion here about innovation. Iâ€™ve written about this elsewhere and donâ€™t want to repeat myself, so Iâ€™ll be elliptical: genuine innovation nearly always involves nonconvex recombinations of existing, or potentially existing, activities. So they canâ€™t be assembled through markets; they need an agent that is engaged in planning over the relevant activity space. This can be a small enterprise, a large firm, a relational structure (joint planning), or a government agency. But this planning, in order to be tractable, has to be tightly bounded, and in this way it takes as given the routine

choices of the agents that make up its external environment. Moreover, the planner needs to learn whether the innovation is successful or not, and not at some hypothetical final moment, but in an ongoing process. Markets are not the only way to do these things, but they are the simplest and most versatile. (War does it too, for example.)

The point is that, while there is a tradeoff between markets and planning at the margin (and there are millions of such margins in a modern economy), at a higher level there is symbiosis: neither can function tolerably without the other.

5. The real systemic problem in capitalism, in my opinion, is political-economic. Identifying the margins where more should be planned, or less, and making choices democratically and intelligently is at odds with the pervasive power of capitalists. (And, agreed, there was a terrible problem with the Soviet state, too.)

112

The Raven 05.31.12 at 6:47 am

Thoughts just seem to be coming…

Here's an optimization constraint for you: survival of human civilization.

Can we frame a sustainable economy as an optimization problem?

113

j 05.31.12 at 7:00 am

I think Sandwichman #97 is on the right track. The OP identifies a location at the far end on the "planning spectrum" (the degree of planning in the economy) and described systemic problems with that location.

The question then is what locations are available inbetween that and current capitalist society. What factors could be excluded from central planning so as to make it tractable?

114

Nine 05.31.12 at 7:25 am

Great essay.
I wonder though if it wouldn't be the case that a world with the computational power
and/or theory and tools to solve intractable problems like GOSPLAN wouldn't also be a world where GOSPLAN is unnecessary because said computational power & tools could be used to create surplus' by solving other hard problems – mapping the brain, whatever. What purpose would central planning serve in such a world ?

115

Tim Worstall 05.31.12 at 7:26 am

"The reductionist â€œpeople only innovate because of the profit motiveâ€ argument is a zombie that really should die."

One economist who has done much work here is William Baumol. He divides the process into two. There is invention (the design and making of a spiffy new thing, Job's iPad for example) and then there's innovation, people actually using this spiffy new thing to do old things in new ways or entirely new things.

He's quite clear that either a planned or market system (with the caveats that JQ mentions, like being able to appropriate some measure of the value add through patents etc) can do the invention. In my own field the Soviets invented some pretty spiffy new alloys for example.

It's the innovation (note, using the word as Baumol does) which planned economies have serious difficulties with.

How good a distinction this is is for others to make up their own minds. But it does neatly solve, say, the internet point. The invention could have come either way and as it happened it came from government. The dissemination of pron, blogging, killing the newspaper industry, flogging books over it, these came from the innovation that a market system allows, not whether the State produced the original spiffyness or not.

116

Neville Morley 05.31.12 at 7:33 am

Like, wow. This has arrived about a fortnight too early for me to have time to join in the discussion properly, but only a week early for me to take full advantage of it in finishing a speculative paper on 'The Market in Classical Antiquity', trying to engage with similar issues in a much less elegant and coherent fashion (not least because of the need to engage with the debate as it actually exists in ancient economic history, rather than the debate we ought to be having).

> Indeed, and each of these structures embodies a different spirit, logic and ethos and requires different things from us; we never have complete knowledge or understanding of how best to orientate ourselves towards them, even assuming that we're conscious of how differently we ought to behave in different contexts; and however much we try to conform, the system is never consistent or coherent enough for this to guarantee success. I'm reminded for some reason of *The Magic Mountain* as well as Kafka.
>
> I do wonder about scale; how far does this presupposed systems operating at a global or trans-national or national level, and how far does it go all the way down? One, very partial, reading of the collapse of the Roman system is that the effort involved in sustaining a pan-Mediterranean structure simply became too great in the face of external shocks and pressures, not least because there were too many conflicting if not contradictory forces and organising principles within which those in authority had to work and everyone else had to live. The establishment in many areas of societies based on dependence relationships with a local warlord and his clan, rather than societies involving complex relationships with state systems and markets, appears to come as something of a relief to many.

117

Neville Morley 05.31.12 at 7:35 am

Damn, blockquote failure; the following should have appeared between my first and second paragraphs:

"Human beings confront all the structures which emerge from our massed interactions in this way. A bureaucracy, or even a thoroughly democratic polity of which one is a citizen, can feel, can be, just as much of a cold monster as the market. We have no choice but to live among these alien powers which we create, and to try to direct them to human ends. "

118

Robert 05.31.12 at 8:16 am

I, too, thoroughly enjoyed Cosma's essay.

I found insightful the point in the book that the rulers were not going to turn the most important decisions over to the computer, even if they were convinced that planning would work.

I know Kornai had a two level planning algorithm, where the center's problem is formulated as a game. I don't think the game was set up to address lying. (I liked the novel's depiction of the sabotage of one factory's machinery, the whys, and the consequences.)

Anyways, suppose almost all commodities had embedded some sort of Radio Frequency chip. Being bought and sold are state changes to be recorded on the chip. Our phones provide a wireless sensor network to collect this information and forward it on to the center. How much of the problem of collecting the information on what, of currently existing goods, is wanted is then solved?

(I suppose the calculations of the plan can be distributed across this network too. Vector multiplication is easily parallelizable, but, I guess, matrix inversion is a bit more difficult. Maybe we make to with iterative approximations with matrix inverses. But I'm getting beyond what I know here. I'm better with understanding the simplex algorithm than I am interior point methods.)

119

Robert 05.31.12 at 8:20 am

Better grammar:

Maybe we make do with iterative approximations to matrix inverses. But Iâ€™m getting beyond what I know here. Iâ€™m better with understanding the simplex algorithm than I am with interior point methods.

120

Data Tutashkhia 05.31.12 at 8:28 am

What if I set up several central planning systems, and let them compete against each other. I'd establish the rules: same initial conditions, define what exactly the 'central planning' entails, allow and facilitate free flow of populations between the systems, prevent any flow of goods/materials/capital. With any luck, in fifty years you'll have the central planning system that people like. Well, and why not add other, decentralized models into the mix? Same rules.

Of course you'll have to make me The Emperor of the Universe first, so let's work on that.

121

Peter Erwin 05.31.12 at 9:04 am

Robert @ 117:

> Anyways, suppose almost all commodities had embedded some sort of Radio Frequency chip. Being bought and sold are state changes to be recorded on the chip. Our phones provide a wireless sensor network to collect this information and forward it on to the center. How much of the problem of collecting the information on what, of currently existing goods, is wanted is then solved?

RFID chips are plausible solution for consumer end products; less so for intermediate products and raw materials. (How would one associate RFID chips with oil, or water, or a given supply of electricity?)

In any case, I don't see how that solves the problem of what is *wanted* (e.g., over the next year, or the next five years), which is largely orthogonal to solving the problem of where things currently are. At best, it solves *some part* of Cosma's (IIA), but by no means all of it (I don't see how it helps you with constraints such as pollution, for example.)

122

Peter Dorman 05.31.12 at 9:05 am

> Data:
>
> In an essay in the late 70s I also proposed a "market in plans". My focus was on severing the link between planning and political authority, and I think that part was OK, but I was still quite naive about planning itself. It is symptomatic that I never even mentioned the issue of time — how long a plan would be in effect until it was subject to review/revocation. I had no idea how important it was for there to be ongoing feedback. How do you integrate the market or competitive aspect which generates this feedback and still have planning? Looking back, I now think I was trying to plan far too much and had not raised the question of how to identify the core choices where planning was needed. Even there, though, the time dimension matters a lot.

123

ajay 05.31.12 at 9:14 am

> 68: *The market is an emergent system. One of the funny things about scientific leftists is that they believe in emergent systems in evolution, but have trouble believing in them in markets. They want god/planner in charge somewhere in economies.*
>
> This is quite clever in a junior common room sort of way, but the problem is that I think it's not a joke: Sebastian actually is confused between believing in something in the way that we believe in dogs, or clouds, or Canada (dsquared excepted), and believing in something in the way that we believe in the scientific method or the system of trial by jury. If we were speaking Latin the problem wouldn't arise, because we could use credo or confiteor , just as they do in the Creed.

124

ajay 05.31.12 at 9:15 am

> 53 missed an absolutely cracking opportunity to say "ajay, you know nothing of my work".

125

Alex 05.31.12 at 9:51 am

> I don't think the USSR did have a problem innovating. I think they had a problem of quality control. One of the things about innovation is that a lot of ideas are bad ideas.
>
> Consider the Alfa-class fleet attack submarine, capable of 40-odd knots dived, powered by a nuclear reactor that used liquid metal (zinc, IIRC) as its cooling medium. It scared the NATO navies shitless, but the Soviets had endless problems with maintaining them because the reactor couldn't be allowed to cool down or the metal coolant would set hard and the entire cooling system would be a block of cast zinc. This meant that while the boat was in port and the engines shut down, high temperature steam had to be pumped from shore into the submarine's secondary cooling circuit to keep the primary molten.
>
> Now, the kicker: repeatedly, the shoreside equipment broke down and there would be an epic flap as they either restarted the reactor in a hurry or else towed the sub across the harbour to moor alongside a ship with steam-turbine propulsion that happened to have steam up at the time, before it all went horribly wrong and they lost a first-class naval unit for good. Eventually, the Northern Fleet decided to keep the reactor going at minimum power in harbour, which basically set the boat's life at her time between refuelling overhauls. In 1991-1992, predictably, all the Alfas lost power and froze solid at their moorings and they're still there as so much radioactive scrap metal.

So, they could build a giant submarine speed boat driven by a nuclear reactor that sounds like it was designed for a space ship…but not keep a boiler house on the quayside going reliably, even for a major national priority.

Now, there's an important distinction between product innovation and process innovation, and I have the impression Soviet industry was awful at the latter, hence their dreadful environmental impact and epic waste of energy.

126

Scott Martens 05.31.12 at 9:59 am

Wonderful essay! This fills in one of the big gaps in the previous essay on cognitive democracy: The notion of democracy not as elections but as feedback, and effective democracy as adequate feedback. It's just that this is not the standard way of understanding democracy and it's difficult to see how it can be aligned with the notion that the legitimacy of government comes from the election of representative agents. The whole core of your argument screams "representative government is flawed for all the same reasons as central planning." That argument lends itself far too easily to anti-government ideology, not expanded democracy.

Specific things:

"Computer science, which is not really so much a science as a branch of mathematical engineering, studies questions like this." Actually, I've come to the conclusion that computer science is a branch of the humanities (what are algorithms if not the work of man?) and has far more in common with art and literature theory than with any physical science. I'm still on the fence about whether the same can be said for all of math, but it's definitely true about foundationalist problems in mathematics like the interpretation of probability.

"If someone like Iain Banks or Ken MacLeod wants to write a novel where they say that the optimal planned economy will become technically tractable sometime around the early 22nd century, then I will read it eagerly." I have an SF plot I've fiddled with (even wrote a first chapter once) that addresses some of this. The economy is run by software agents with a significant amount of artificial intelligence and a capacity to modify their own code and copy themselves. They engage in barter and exchange of complex barter-backed derivatives in a large free market on behalf of humans who own or rent them. For a piece of software itself to survive and perpetuate its code, it has to pay for its runtime and storage space by acting as an accountant/buyer/broker for humans, who are paid at their jobs in certificates that constitute futures on their own production. Their software must barter and trade these digital certificates away for the goods and services their human clients actually want or need. No person ever has to see or touch money, no consolidated balance book exists, but if a human is dissatisfied with how well their electronic agents are providing for their needs, they can replace them at any time. It would be a true dog-eat-dog capitalism and free market for software, but practically a nanny state for humans, since all a person has to do is enough productive work to have what they want, and the entire system organizes itself around their needs.

If I was looking for a reason to argue in favor of quasi-socialist planning, I would ask how, from the perspective of human workers, such a world is different from a large, comprehensive, detailed economic plan. The market exists only in the computer as part of the algorithm. Feedback is provided from consumers by whatever means are appropriate to control their electronic agents. It's more or less Lange's vision for the socialist firm combined with a kind of deconstruction of Iain Banks' Culture novels (imagine a million Minds per human instead of the other way around) and a bit of old fashioned cyberpunk, but it poses a problem for the planning vs market argument: Plan construction is an algorithm of some kind. So is the market. Ergo, there exists an adequate planning algorithm, and the computational resources to construct the plan. To get away from this, you have to claim that market allocation is, in some way, non-algorithmic, but doing is counterintuitive.

> *"But, and this is I think something Marx did not sufficiently appreciate, human beings confront all the structures which emerge from our massed interactions in this way. A bureaucracy, or even a thoroughly democratic polity of which one is a citizen, can feel, can be, just as much of a cold monster as the market."* Indeed, this is a problem. My efforts to get decent Internet access in Germany attest to how alienating even fairly responsive governments can be. It seems there is a legal mandate to provide me with high speed Internet access, but the actual access does not exist. I have gone as far as talking to the village ombudsman about it as well as the Deutsche Telekom office here. No one seems to have any clear idea why I can't have decent 'Net access, since the village wants the infrastructure and DT wants to put it in. This feels very disempowering. Although it doesn't quite rise to the level of Greek tragedy, I do feel pretty alienated.
>
> I have my doubts that any solution to this problem exists at all. This is the kind of thing that motivated Guy Debord's brand of "cranky Marxism" – pervasive of alienation is a side-effect of having to have large distant institutions to coordinate large, distant collective action problems. We cannot dispense with the large, distant, collective action problems and retain any of the benefits of industrial civilization. At the same time, alienation from distant coordinators of large scale collective action leads to things like, for example, Greece's current mess.

127

ajay 05.31.12 at 10:15 am

> *One of the things about innovation is that a lot of ideas are bad ideas.*
>
> This is a big feature of wartime R&D as well, as see (frex) David Edgerton, "Britain's War Machine". Britain in 1940, like the USSR in 1970, was a rich country with a huge amount of centrally directed military R&D funding, and a lot of the results were highly innovative, but ultimately just a ludicrous waste of time and money. The trench-digging Mole. The Grand Panjandrum. The fluvial mine project. The U.P. anti-aircraft system. Project Habbakuk. PLUTO.
>
> (Lead-bismuth, apparently, rather than zinc, btw, Alex.)

128

Gareth Rees 05.31.12 at 10:24 am

> Great essay! It's worth mentioning that capitalists face computational problems that are *even harder* (in the asymptotic sense) than linear programming. For example, the best algorithms we know for finding a single-round Nash equilibrium for a non-zero-sum 2-player game are *exponential* in the number of available pure strategies.

129

Richard J 05.31.12 at 10:34 am

> *I donâ€™t think the USSR did have a problem innovating. I think they had a problem of quality control. One of the things about innovation is that a lot of ideas are bad ideas.*
>
> I think it's fair to say that the performance of the Soviet economy in WW2 suggests that a planned economy can be very effective when you're able to narrow down an economy's output to just three key deliverables: weaponry, munitions, and cannon fodder. If none of them are expected to have a long time in use, quality control problems become significantly less important.

130

Chris Bertram 05.31.12 at 10:52 am

Brilliant essay: many thanks!

Are there alternatives? Well surely it depends what people want. Marx wanted both to turn us from puppets of the economic system into its masters and to have an economy productive enough to dispense with scarcity. You show that if we want high levels of output, with lots of choice in a large-scale and complex society then we had better put up with being puppets to a larger extent than we like. Correct.

Alternatively we could be (much) poorer and have smaller-scale simpler societies run through participatory democracy. The Rousseauist option. (Cf. the 18th-century problem of the incompatibility of "luxury" and democracy.)

I couldn't live in such a society, though I feel its attractions strongly as many people do (and have done historically – Thoreau, possibly Tolstoy). One thing we can do, though, perhaps, is to try to find ways of getting some of Simon's "green areas" to have more of the look and feel of that alternative in their internal operations. But maybe this is also, like Marx, trying to have and eat one's cake.

131

derrida derider 05.31.12 at 11:49 am

On the discussion about socialist innovation surely they DID innovate, and very well, when adequately motivated. The T-34 tank, the Energiya rocket, even the Mig 27. But notice in what sphere they innovated? And note how so much innovation in late-capitalist US stemmed from exactly the same sphere with exactly the same motivation?

Which I suppose is just reinforcing the point previously made that Schumpeter et al were quite wrong – innovation is not mostly driven by the prospect of monopoly profits. Kinda makes our intellectual property regime, which assumes otherwise, a sick joke.

132

Alex 05.31.12 at 12:50 pm

Well, for an interesting cross-check, how about NREL? I've seen some truly impressive estimates for the economic value of its work since the late 1970s, based on energy savings. Someone will probably point out that a lot of DARPA work fed into it. But my point is that US industry did internalise it, alter its objective functions, and of course other Western and developed Asian industries did even more so.

Soviet industry doesn't seem to have done very well at this stage – *internalising* innovations. Mind you, *was* there even a Soviet Academy of Sciences Renewable Energy and Efficiency Laboratory?

133

Cosma Shalizi 05.31.12 at 2:02 pm

Thanks to everyone for the really gratifying response. Unfortunately, I'm on deadline, so replying will take a few days.

134

Neel Shah 05.31.12 at 2:09 pm

@ 89
"Markets donâ€™t provide much of an incentive for innovation …
OTOH, central planning is also adverse to innovation, …"

> This is a vague argument, but innovation essentially perturbs the objective function, whatever it is by adding new parameters, as many have observed above. Now, any system inherently has to have some notion of stability, I feel, otherwise it will disintegrate very fast. Communism (or whatever it was) in Soviet Russia did have this problem to an extent. There is in fact a trade-off between stability and the random permutations we call innovations (much like evolution). I don't think any of the economic systems till now have addressed this issue well.

135

Anarcissie 05.31.12 at 2:36 pm

> Maybe I'm not reading this correctly — it's a lot to take in — but I don't see why a communist society needs to optimize its production functions, even approximately, any more than a capitalist society does. It just has to be good enough at producing stuff and moving it around. The communist society might produce other values besides material goods, like political equality and freedom, which are impossible for traditional capitalism, and which would compensate the people for having to live in a big shabby hippie commune or whatever the communist society would evolve into. (Not the Soviet Union.)

136

marcel 05.31.12 at 2:51 pm

> Today I actually have time to read the comments. Thanks to Andrew Fisher, I looked at fn 4. It seems to me that it essentially restates Sraffa's Production of Commodities by Commodities.
>
> Also, Henry, get with the times: photoshop, not airbrushing! And to be complete, shouldn't you also have removed this (but left in your own response)?

137

JP Stormcrow 05.31.12 at 2:57 pm

> *Unfortunately, Iâ€™m on deadline, so replying will take a few days.*
>
> A failure of planning? Computation? Markets?

138

JP Stormcrow 05.31.12 at 3:00 pm

> *Not the Soviet Union*
>
> The next serious attempt at collectivism on a national/trans-national scale should name itself precisely this.

139

Matt 05.31.12 at 3:07 pm

> *It just has to be good enough at producing stuff and moving it around.*
>
> That turns out to be really hard, though. Not hard in the sense that you can't make stuff at all, but hard in the sense of being "good enough". Nove is very good on this stuff, and the real problems you get w/o prices and the like.
>
> *which would compensate the people for having to live in a big shabby hippie commune*
> I'm not sure anything could compensate for that, and not just because most people really don't want to live in a shabby hippie commune, either.

140

Doctor Slack 05.31.12 at 3:08 pm

> 134: I think the idea is that "optimizing" production is what is theoretically meant to guarantee the "plenty" in perpetuity.

141

Sebastian H 05.31.12 at 3:15 pm

> " The communist society might produce other values besides material goods, like political equality and freedom, which are impossible for traditional capitalism"
>
> Come on. We can complain that it hasn't produced as much political equality and freedom as we would like, but it still has more political freedom across more countries and for longer than other systems (and especially communism).

142

Peter Erwin 05.31.12 at 3:49 pm

> *I donâ€™t see why a communist society needs to optimize its production functions, even approximately, any more than a capitalist society does. It just has to be good enough at producing stuff and moving it around.*
>
> To give a practical example, right now we're faced with the problem of figuring out how to reduce or eliminate our use of traditional energy sources (e.g., oil and especially coal) without needlessly impoverishing ourselves. This implies, among other things, a lot of optimization of production functions under constraints of using less energy and/or emitting less carbon dioxide. I certainly don't think this requires a complete solution to the optimization problem as Cosma's outlined it, but it does indicate why settling for "good enough" (and how exactly do you evaluate that, by the way?) isn't necessarily good enough.

143

J. Otto Pohl 05.31.12 at 3:53 pm

> The second big attempt at communism (Not the Soviet Union) was China under Mao and it too lacked freedom, had a horrible human cost (See Frank Dikotter's Mao's Great Famine for some examples), and was considerably worse than the USSR in terms of economic success and standard of living. In fact the USSR, the Eastern European socialist states, and to a lesser extent Cuba were pretty good by the 1960s at providing a decent material standard of living, particularly for urban dwellers. Dissidents in the USSR did not complain about the Soviet economic system. They complained about a lack of intellectual and political freedom, ethnic discrimination, and KGB repression. It was precisely the lack of political freedom and equality in the USSR that was a source of articulated discontent. Socialist economics and material standards of living are almost completely ignored in dissident _samizdat_ literature.

144

Watson Ladd 05.31.12 at 4:10 pm

> J. Otto Pohl: My impression was that by the 1970's and 1980's this was increasingly not true. Solidarity was motivated by increases in the rice of food at factory canteens, and the rates of alcoholism and premature death increased during these decades. My high school teacher who had lived in Soviet Russia

told me that when they let a Woody Allen film in which he is a poor person in, everyone got exactly the wrong impression because he had oranges.

145

Luis 05.31.12 at 4:12 pm

were pretty good by the 1960s

Is Nove the right place to go for a summary of why the post-60s were… well, not that good? Or is that someone else?

146

J. Otto Pohl 05.31.12 at 4:26 pm

Things got worse in the 70s and 80s, but the really bad economic times were after Gorbachev's reforms and the early post-Soviet era. Alcoholism also worsened in the early 1990s. But, the point still stands that in the 1970s that people in the USSR openly expressing opposition to the Soviet system did so largely because they disagreed with either its nationality policies, its general lack of freedom and democracy, or its moral decay. They did not protest the state's ownership of the means of production or the various welfare provisions provided by Moscow.

Attitudes in Poland which had private agriculture and had only been communist for a generation were considerably different. But at the same time even at its worst the standard of living in Poland at this time was better than for most of the USSR. In comparison to most countries in the world the average Polish worker was relatively well off in the 1970s despite the country's huge economic problems.

147

The Raven 05.31.12 at 4:27 pm

Chris Bertram, #129: "Alternatively we could be (much) poorer and have smaller-scale simpler societies run through participatory democracy. The Rousseauist option."

Does it have to be poorer? Why not a smaller-scale high-tech society? Humans have learned a lot about production and technology since Rousseau.

148

JW Mason 05.31.12 at 5:02 pm

Chris Bertram, #129: â€œAlternatively we could be (much) poorer and have smaller-scale simpler societies run through participatory democracy. The Rousseauist option.â€□ Does it have to be poorer?

It seems to me this should be considered an empirical question. In any case, why is it a binary? Surely Chris would agree that we could haver somewhat more meaningful participation in our economic lives, at the cost of somewhat less efficiency?

Last time round we discussed this in the context of food. How about clothing? Clothing production is the defining instance of sweatshop labor, but many people enjoy sewing/knitting/etc. as hobbies, and many more are fascinated by fashion and design. What if every item of clothing we had was made by someone who had an active voice in the whole process of designing it and who took the same pride in their work, and enjoyed the same autonomy, social status, working conditions, etc. as, say, a tenured faculty member [1] does now? And of course you'd know the name of the person and not just the company that made each item in your closet, and, if you were interested, their distinctive style, philosophy, etc. Some people — Chris B. maybe — will say that's completely impossible, prohibitively costly, etc. But how costly exactly?

If organizing the production of clothing like that increased its cost by, say, a factor of ten, wouldn't that be a very favorable tradeoff in a place like the US or northern Europe? Certainly the technological requirements of clothing production don't inherently preclude an active decision-making role for workers.

Or how about construction? How much more would houses have to cost for them to be put up by people who actively managed their own work process and treated it as creative, expressive work — so that, like in Will Dean Howell's Altruria , every brick was somehow visibly connected with the person who laid it? (Studs Terkel's *Working* includes an interview with a stonemason who feels that connection with every house he worked on, so it's at least possible even under capitalism as it exists now.) If that doubled the cost of houses, would it not be worth it, in the rich countries, at least?

Perhaps more complex, integrated (non-convex?) technological processes can't be run without some alienated labor. But on the other hand, it doesn't seem to me it's ever been really tried.

Chris B. (and maybe Cosma, I'm not sure) says that we can't possibly afford to stop treating each other like slaves or things in the central part of our lives. But it might turn out to be much more affordable than he thinks. In any case the returns to greater material production in the US and Northern Europe are so low at this point, in terms of human well-being, that it must make sense to try to get at least a bit less alienation at the margin. No?

[1] Not a sneer – I really do think academia should be a model for other worlds of work.

149

Chris Bertram 05.31.12 at 5:07 pm

Surely Chris would agree that we could haver somewhat more meaningful participation in our economic lives, at the cost of somewhat less efficiency?

Surely Chris does agree and indeed was gesturing in that direction when I wrote:

bq. One thing we can do, though, perhaps, is to try to find ways of getting some of Simonâ€™s â€œgreen areasâ€ to have more of the look and feel of that alternative in their internal operations.

Maybe it was too tentatively expressed for you.

150

blavag 05.31.12 at 5:31 pm

This might interest some: Robert S. Whitsell, Why Does the Soviet Economy Appear To Be Allocatively Efficient? in Soviet Studies, vol 42, no.2 April 1990.

To Peter Dorman @ 111–see also Nitzan and Bilcher's Capitalism as Power at http://bnarchives.yorku.ca/259/

To Anarcrissie @ 134 and Matt @138: A big shabby hippie commune is its own reward and does not need additional compensation…

151

mds 05.31.12 at 6:21 pm

> We can complain that it [traditional capitalism] hasnâ€™t produced as much political equality and freedom as we would like

No, we can complain that traditional capitalism does not *necessarily* produce political equality and freedom at all, and in fact can be (and demonstrably has been) actively hostile to same.

Robert Vienneau @ 118:

> Vector multiplication is easily parallelizable, but, I guess, matrix inversion is a bit more difficult.

Keshav @ 96 has mentioned Cockshott and Cottrell's assumption of sparse matrices, as notwithstanding how complicated a coat's raw materials are, making a coat does not require input from *every other commodity* in the economy. They invoke linked lists to treat sparse matrices, which is how they arrive at an order of n*m*r (where n is the dimension of the product matrix, r is the number of iterations in one's approximation method, and m is the average number of inputs for a particular product) rather than n^3, but linked lists don't exactly lend themselves to parallelization. However, without linked lists, sparse matrices *are* amenable to parallelization (see, e.g., PaStiX, whose readme page also has links to other solvers). There is also ongoing work on parallelized matrix inversion in general.

152

lupita 05.31.12 at 6:27 pm

Does it have to be poorer?

If there were justice in the world, yes, the West would be poorer. Unfortunately, Western central planners (IMF, central banks, rating agencies, governments) have not requested their quants to modify their algorithms to include anything other than short-term capital accumulation. The system is imploding just like the Soviets'.

153

JW Mason 05.31.12 at 7:00 pm

Maybe it was too tentatively expressed for you.

More that "we could be (much) poorer and have smaller-scale simpler societies run through participatory democracy" wasn't tentative enough.

Sorry for referring to you in third person.

154

j 05.31.12 at 7:03 pm

@147 J W Mason

The alternative to wage laborers in sweatshops shouldn't in most cases be self-sustaining unpaid manual labor. The alternative should be automation.

The ongoing small scale fabrication revolution will be able to handle many of the products you mention. As for construction the machines needed are also rapidly becoming available for home fabrication.
http://opensourceecology.org/gvcs.php
http://www.ted.com/talks/marcin_jakubowski.html
http://reprap.org/wiki/Wealth_Without_Money

I don't see the technology as the biggest hurdle there but rather the political resistance that will be mounted by those currently gaining most from intellectual property protection over physical designs.

155

JW Mason 05.31.12 at 7:11 pm

> *The alternative to wage laborers in sweatshops shouldnâ€™t in most cases be self-sustaining unpaid manual labor. The alternative should be automation.*
>
> Why should it?
>
> > after the enslaving subordination of the individual to the division of labor, and therewith also the antithesis between mental and physical labor, has vanished; after **labor has become not only a means of life but life's prime want**; after the productive forces have also increased with the all-around development of the individual, and all the springs of co-operative wealth flow more abundantly — only then then can the narrow horizon of bourgeois right be crossed in its entirety and society inscribe on its banners: From each according to his ability, to each according to his needs!
>
> Why would we want to deny people their prime want?

156

Anarcissie 05.31.12 at 7:33 pm

> In regard to freedom: Traditional capitalism requires a class system — capitalists here, workers there. The class system requires class differences of power, that is, inequality, and a state to maintain this social order, by force if necessary. And force will be necessary, because some people will not accept a subordinate position in the social order. Therefore, freedom in the social order of capitalism will always be limited to those persons, ideas and activities which do not threaten the position of its ruling class. In hard times, and if the technology of surveillance and repression is available, this freedom may become very restricted indeed. Look around at present developments.
>
> In the case of the Soviet Union, China, and other countries, the victory of the Communist Party simply led to the replacement of the old bourgeoisie with a new pseudo-bourgeoisie, the party apparatus — 'state capitalism' I think Lenin called it. So the same sort of problem arose. There was no actual communism as far as I know.

157

Watson Ladd 05.31.12 at 7:37 pm

> The problem with small scale is small scale means low tech. The Aboriginal tribes of Tasmania lost the ability to fish because they had insufficient population to support a boatmaker, and so the skills got lost. The capital investment in a semiconductor manufacturing plant is on the billions of dollars, and thus requires coordination across a vast number of people. There is one plant that produces vast amounts of nylon-2, which gets transformed into thousands of products, etc. Small-scale production would require far more supervision and cost.

158

Matt 05.31.12 at 7:51 pm

> *There was no actual communism as far as I know.*
>
> You know, I find this every bit as tiresome as when some libertarian trots out the idea that the problems we have is that we've not yet tried pure capitalism. I want a story about what you'll do differently, and why I should think it would work. "who knows what free people will do?" isn't enough, either.

JW Mason- how sure are you that you're not unjustifiably univrsalizing your own preferences? What percentage of people do you think would enjoy and do better being their own bosses? It's much more stressful, if success is required.

159

Data Tutashkhia 05.31.12 at 8:00 pm

There was no actual communism as far as I know.

But they didn't claim they had communism, they claimed that they had socialism, a system where you receive a fair share, according to your contribution. And I think that was, more or less, the case. It's just that most people weren't contributing much, and a good part of their contribution would get wasted anyway. Which is why this discussion (and the book) is kinda relevant.

160

leederick 05.31.12 at 8:03 pm

Great essay. I want to pick out and disagree with a small part.

"For the capitalist or even market-socialist firm, there is in principle a simple objective function: profit, measured in dollars, or whatever else the local unit of account is."

I'm not sure about this. Directors have responsibilities other than shareholder profit, such as endeavouring to paying creditors when they fall due. The literature on profit measurement is a complete mess, no-one agrees on anything, it's absolutely standard to say there are multiple profit concepts rather than one concept. I'm not sure that translates to a simple objective function.

"In any case, profits are money, i.e., claims, through exchange, on goods and services produced by others. It makes no sense for the goal of the economy, as a whole, to be to maximize its claims on itself."

I don't think profits are money. A simple example would be farming, IAS 41 values aggricultural product at fair value. So if all you have is stock of 2 potatoes fair valued at $2 each at the start of the year, and 6 valued at $1 at the end, and no other items or transactions – you've made a profit of (6 * $1) – (2 * $2) = $2. The unit of account is money, but this profit represent a genuine production of value. If means you can consume $2 and still be as well off at the beginning of the year in terms of financial capital as you were at the end.

161

Ken MacLeod 05.31.12 at 8:20 pm

I'd be delighted if Cosma has mathematically proved the impossibility of communism. It would be a second monkey off my back. (The first was the Bible, a long time ago.) Then I could happily get on with being the evil utility-maximizing selfish bastard I instinctively am.

But I'm still sufficiently partisan to bristle at '*even* Trotsky *sometimes* got [this point] right'. This is the Trotsky who wrote: 'Economic accounting is unthinkable without market relations'? And the Trotsky who wrote (in the same article, and also the same one as Cosma cites) this?

> "If a universal mind existed, of the kind that projected itself into the scientific fancy of Laplace â€“ a mind that could register simultaneously all the processes of nature and society, that could measure the dynamics of their motion, that could forecast the results of their inter-reactions â€“ such a mind, of course, could a priori draw up a faultless and exhaustive economic plan, beginning with the number of acres of wheat down to the last button for a vest."

The point being, of course, that Gosplan, not to mention the CPSU, had no such mind at its beck and call.

That article is far from a one-off. In economics Trotsky was, at least from the early 20s on, a consistent Right Wing Communist. This has been shown, albeit by a Trotskyist who is now something of an admirer of Deng Xiaoping, in this seriesof articles.

If the real socialist challenge in today's world is represented by the economic policies of China and Vietnam, rather than those of Cuba and North Korea, perhaps the problem of the lack of a feasible alternative to capitalism is less pressing than Cosma thinks.

162

Barkley Rosser 05.31.12 at 9:10 pm

Just back from Moscow where I gave a lecture at the Central Economics and Mathematics Institute (TsEMI), which dates from 1963 and was founded by the immediate followers of Kantorovich such as Nemchinov, the people who really believed that they would achieve proper mathematically founded central planning. Some of those folks are still there. Anyway, a few practical problems I did not see in either the essay or the comments noting so far.

1) The mathematical planners never had their programs at the level of detail that the actual GOSPLAN planning was occurring. Think of it in terms of the SIC levels. As of the mid-80s at the last gasp of the dreamed effort, the input-output model of the Soviet economy was essentially at the three to four digit code level, whereas the actual planning was going on at the four to five digit code level. The actual planning tended to be much more ad hoc, moving from what was done last year to next years without a full optimization. The "plannification" involved in aggregating up to make everything coherent (and implicitly solve the GE problem) was never done in a mathematically proper way. It was ad hoc all the way.

2) Part of why they could not get to the proper level of detail was indeed information problems of a Hayekian sort, the really relevant details were either local or buried deep into the lower level niches of the GOSPLAN and other planning entities (this went on at several levels). Lower levels did not report accurate information to the higher levels. Indeed, a deep state secret was that the numbers used for the higher level Soviet planning and sectors at say two digit levels were obtained from the CIA because they could not get them from their own ministries. That the CIA numbers themselves were problematic, as was much touted and whined about at the time of the fall of the USSR simply emphasizes how bizarre the whole situation was.

3) Oh, the old mathematicians at TsEMI are still very interested in deep issues of computational complexity and even deeper into the foundations of mathematics, particularly regarding the recent efforts to reconstitute mathematics itself on a constructivist foundation. This was something strongly advocated by some of the top Soviet mathematicians before Kantorovich did his work and who operated at a much higher and deeper level than he did, although I believe he was in agreement with them. I am thinking in particular of Kolmogorov and Markov. This stuff is being studied now seriously in the West through category theory coming out of computer science and in economics by people like Velupillai, who seek to reconstitute the foundations of mathematical economics on a constructivist foundation. These old guys at TsEMI are all for this.

163

Maynard Handley 05.31.12 at 9:32 pm

@Matt 157
"JW Mason- how sure are you that youâ€™re not unjustifiably univrsalizing your own preferences? What percentage of people do you think would enjoy and do better being their own bosses? Itâ€™s much more stressful, if success is required."

George Mosse had very interesting things to say about proto-communism in the 19th century, stressing precisely this point: most people don't WANT to be President of the USA, or CEO of GM, and constructing a social theory around the assumption that they do is unlikely to improve the world.

164

j 05.31.12 at 9:44 pm

@154 JW Mason: Because so much labor is toil that break down the body and hasten death and make us so tired that we are sapped of energy to pursue other things of great value.

Let's turn the tables: what is the moral argument for thinking that labor is life's prime want i.e. the intrinsically best activity for any human? On the automation alternative you can of course freely pause your robots and toil as much as you want. But what is wrong with not wanting unnecessary toil?

Someone might now counter that the "labor as life's prime want" idea uses labor in a sense that excludes damaging toil. Fine, but then it has not argumentative force against suggestions for local fabrication automation as replacement for damaging toil.

165

John 05.31.12 at 10:07 pm

To echo and amplify Watson Ladd at 156, and to agree with Chris Bertram's original comment, I'm pretty sure that moving away from some sort of vast alienating economic system of production means less production of a lot of things. To take one example I know a bit about, the physical IT and display infrastructure delivering this page from Cosma's screen to yours is massively complex, with tens of thousands of components derived from almost as many sources across the globe. Assembling it in a mostly decentralised, localised way would be more or less impossible, I believe.

Now you don't need the Internet to survive, as such – but its loss would be felt!

166

Joseph Brenner 05.31.12 at 10:12 pm

Stafford Beer apparently thought that he could replace the industrial economy of a small nation (Chile) with a computer system (see the book "Platform for Change"). Any idea on how he missed the intractable complexity of the problem? (For bonus points: how did he manage to miss the incentives problem?).

167

Barkley Rosser 05.31.12 at 10:22 pm

Of course from a computational complexity perspective the other big problem is precisely the Godel incompleteness one as transmuted through Turing, with a bow at the Lucas Critique: How does one model the reactions of the agents to the fact that they are being modeled and how they react to that? Does one model how the model should react to their reactions and then their reactions to that alteration and so on ad infinitum? There is fundamenatlly an unavoidable halting problem here.

Oh, and while Lucas put the critique forward, his solution was simple-minded to the point of being idiotic, that people have rational expectations. Bah humbug!

168

Peter Erwin 05.31.12 at 10:37 pm

JW Mason @ 147:
(Apologies for the piling-on…)
What if every item of clothing we had was made by someone who had an active voice in the whole process of designing it and who took the same pride in their work, and enjoyed the same autonomy, social status, working conditions, etc. as, say, a tenured faculty member does now? And of course youâ€™d know the name of the person and not just the company that made each item in your closet, and, if you were interested, their distinctive style, philosophy, etc. Some peopleâ€”Chris B. maybeâ€”will say thatâ€™s completely impossible, prohibitively costly, etc. But how costly exactly?

That's a pretty good description of bespoke clothing. How costly is that? Well, men's business shirts seem to set you back at least $200 or $250 each (and that's assuming a minimum order of at least three shirts). Some of that is due to expensive cloth, but not all of it. (And, if you're going for lovingly hand-made, non-exploitative clothing, you may also decide you want organically grown cotton, etc., in which case the cost of the fabric will probably go up even if it's not super high quality). Pants will probably cost at least $300, probably something closer to $400 or $500. Bespoke (men's) leather shoes are, at the very minimum, about $1000 a pair (*maybe* as low as $500 a pair for funkier casual shoes).

(A hand-waving justification for the shoes: a talented shoemaker can probably average only one or two pairs a week[1], which means less than 100 pairs in a year. So they need to make at least ~ $500 per pair *in profit*, after materials and other expenses, to have a decent living, given your "tenured faculty member" standard. Also, you'd need about 3 million shoemakers in the US alone just to produce one pair of shoes per year per person….)

Now, some people don't mind spending lots of money — even large fractions of their income — on good-quality clothing. I'm not sure I'm comfortable with the idea that everyone should be forced to do so, though.

[1] I've seen references suggesting that something really simple like ballet slippers can take as little as ten hours, while lace-up dress shoes might require 40 hours.

169

Tim Wilkinson 05.31.12 at 11:07 pm

The most obvious problem here is that the conclusion *That planning is not a viable alternative to capitalism (as opposed to a tool within it)* is not clearly supported by the argumentation.

Another us that in general the argumentation seems heavily influenced by market triumphalist propaganda (by now conventional wisdom).

1. Note that the fact that we know capitalist economies to be supported (and kept from disaster) by a large state planning element is not held to show that "capitalism is not a viable alternative to planning (as opposed to a tool within it)".

2. No clear comparison is made; the problems of planning are treated pessimistically at each step, while those of capitalism are enumerated without being treated as fatal. We read that *if the neo-classicals were right about how capitalism works, Kantorovich-style socialism would have been perfectly viable*. But how deficient capitalism is compared to the neoclassical ideal is not examined, while the problems arising for planning are dwelt on at great length. In general, it seems capitalism doesn't even have to be good enough, while 'planning' has to be almost perfect.

3. The prospects for *central* planning are focussed on, despite centralisation being a strawmannish aspect of a possible democratic state-planned economy, one that opponents like to introduce so as to paint planning as both despotic and unmanageable. At the same time, while the highly centralised nature of corporations is illustrated, no attempt is made to assess the inefficiencies occurring there.

4. ‘Markets’ are filed under capitalism, and allowed to encompass far more than markets as we know them. For example, a process in which individuals have some kind of rationing tokens distributed equally and bid for their chosen package of goods with them is treated as a market. ‘Shadow prices’ are mentioned; as if the very act of keeping track of costs counts as market allocation. This is similar to the way in which any unit of account tends to be assimilated to capitalist money. The essay comes close to treating any distributed system as ipso facto a market (and so why not stick with the existing markets, which are the same in name, however different they may be in fact).

5. At the same time, the magic of markets is exaggerated: despite the bit where Austrians are berated for their excessive market fetishism and despite caveats about transaction costs, the essay continually – by omission and implication – treats market allocation as though basically costless, overlooking all the real work, mostly done by those insulated from direct profit motivations, that goes into price- and output-setting in firms (work whose underlying analytical core could be carried over into state ownership).

6. The benefits of the profit motive are falsely presented as unique: *Planning is certainly possible within limited domains â€” at least if we can get good data to the planners â€” and those limits will expand as computing power grows. But planning is only possible within those domains because making money gives firms (or firm-like entities) an objective function which is both unambiguous and blinkered.* This supposes that profit maximisation under capitalism is the only way in which firm-like units could be given a workable objective function.

6a. It’s asserted that *It makes no sense for the goal of the economy, as a whole, to be to maximize its claims on itself.* But this is not so – if the claims in question will be/are honoured. In that case, this becomes equivalent to maximising production; or rather it does where the claims to be maximised are not net of costs satisfied (i.e. profit), but all claims (revenue), subject to a cost-covering proviso. Since the profit tithe would not affect democratically planned firms, this is a more appropriate approach.

—-

Capitalism seems to get the benefit of actually existing and muddling through (though as above, note the ‘planning’ that undergirds it), while ‘planning’ is measured against high standards. I’d suggest this is misguided. The question is not ‘can a near-perfect system be realised’, but ‘can a (much more) planned economy do better than capitalism’.

We know that capitalism does what it does, so that is possible. We could improve on its (implied) objective function (skewed as it is by differential wealth, easily remedied information deficiencies, etc.) or on how close it gets to maximising it, or both, and that would be, if not good enough, still an improvement.

Starting from where we are and approaching a democratically planned egalitarian economy in a much more piecemeal way would have a number of advantages: comporting with the strategy of democratic socialist reform, providing a pathway to utopia, and making unambiguous improvements on capitalist organisation without setting a problem too vast and daunting to solve, and too madly risky to put suddenly into operation. Instead, all the real work done in planning within corporations might be gradually shifted into public ownership, making the improvements that the new ownership model enables (eliminating infrastructure duplication, slashing advertising and branding budgets, etc) while maintaining the important functions.

Both specifying an objective function and complex computation would be made more tractable if trade-offs are made only as they arise; much of this work is already done – and often duplicated – within corporations.

I would expect a hierarchy of levels of planning, too: short-term planning would have detailed information and try to adjust to (temporally) local conditions: above this, a five-year plan might be developed using less detail but more scope for change; above this, 15 or 20 year plans aimed at long-term commitments and also at slow transitions, and above that ‘blue skies thinking’ models based on (normally commercially

confidential) research prospects, anticipating threats like global warming, etc. It would be interesting to investigate how such multiple levels of planning can be made to cohere…

In short, a system in which spending power per month is equalised and from which the profit motive is absent would not count as a market except under a highly prejudicial stipulation which might (depending on just how much like bilateral exchange the best planning method turns out to be) define planning out of the race, preveresely leaving markets-as-we-know-them victorious.

Further, very few of the actual mechanisms involved in market research, technical efficiency, etc actually involve direct input from the profit motive, so these could be done under a different system – and probably produce better results.

This is not just a matter of *dark asides about the imperfections of actually-existing capitalism thrown into the mix*; capitalism is exactly the thing to be improved on, and to be replaced, so those imperfections are really the key issue.

On the positive side, I'd agree that preventing self-interested misreporting of preferences is a real issue, as suggested in a recent CT comment.

170

Tim Wilkinson 05.31.12 at 11:10 pm

Sorry, didn;t have time for a shorter response.

171

Watson Ladd 05.31.12 at 11:53 pm

Tim, if a corporation is too inefficient it goes bankrupt. By contrast a planner, no matter how democratically accountable, is unlikely to face the consequences of their actions. (Think about the mayor of New London, who in an act of planning decided Pfizer could use a house more efficiently then the owner) I find it unlikely that a powerful workers movement will decide that strategic planning should be nationalized as the first priority, or that a socialist state would ever adopt a single official view of the future.

Planning is of course highly variable: the US Army defends the American Ruhr from drying up, because of the petroleum and natural gas industry already there. Chicago is a bottleneck to trains because it was the leading western city in the era of the civil war. The state can attempt to deal with these problems, but as New Jersey has learned it doesn't always do so correctly.

172

Maynard Handley 05.31.12 at 11:58 pm

@168

Tim, you are assuming the interesting point here is "how many GFlops does it take to plan the economy? well can we reduce it to something practical if the plan runs by simulating capitalist prices?"

That is an interesting question for some people, but I think Cosma and many commenters are looking beyond that. In particular what I, and quite a few other commenters have focussed on are issues like behavior and incentives. As I stated above — the plan is not self-fulfilling — and prices don't just act to propagate information and co-ordination, they act as a reward/punishment system.

You appear to want to claim that you can get prices (or their plan equivalent) to perform the "propagate information and co-ordination" role without requiring the "reward/punishment system" role. This strikes

me as a highly dubious claim. (And note that I say this as a leftist, not a libertarian — but a leftist interested in schemes, realistic possibilities, that could actually change the world, not schemes of no relevance to actually existing humanity.)

173

mds 06.01.12 at 12:16 am

> Tim, if a corporation is too inefficient it goes bankrupt. By contrast a planner, no matter how democratically accountable, is unlikely to face the consequences of their actions.

An executive whose decisions helped drive a corporation into bankruptcy, no matter how theoretically accountable to the market, is unlikely to face the consequences of their actions.

174

Anarcissie 06.01.12 at 12:59 am

> *'There was no actual communism as far as I know.'*
>
> *'You know, I find this every bit as tiresome as when some libertarian trots out the idea that the problems we have is that weâ€™ve not yet tried pure capitalism.'*

Usually you'll find that the libertarian is defining capitalism in a rather peculiar manner, omitting such features as the class system, the exploitation of labor power, and so on, but without saying so. Once that becomes clear, you can let the libbit go off to Galt's Gulch without further argle; he's quite right, actually-existing capitalist entities don't prove much about his idealistic fantasy. Just so, I don't think the Soviet Union proves much about *my* idealistic fantasies. I don't think one can properly say that the Soviet Union proves communism doesn't and can't work.

Just a quibble. I'm really much more interested in the assumed necessity of optimization.

175

blavag 06.01.12 at 3:03 am

On 134 and earlier: its true that we do not need to keep beating the dead horse of actually existing socialism but we should remember that whatever its ideological pretensions the actual historical task, what it actually did, was to industrialize and urbanize agrarian societies. It actually did that rather well in brutal fashion in the USSR what with 2 or 3 wars depending on how you count them until its means and relations of production came into conflict and the system(s) collapsed.

Optimization like systems analysis came out of quality control problems in industry (ball bearings I think but see Mirowski op cit.) before it became fetishized. Optimization is not an intellectual necessity but an instrument of control.

176

Peter Dorman 06.01.12 at 5:24 am

Joseph Brenner has raised an interesting question that shouldnâ€™t get lost in the comment thicket: what about Stafford Beerâ€™s dream for Chile?

I am not a Beer expert, but Iâ€™m one degree of separation from one, so Iâ€™ve picked up a little. Beer was a cybernetics theorist; his main interest was in thinking through and formalizing the feedback process at the heart of an interactive (or adaptive) management system. In a way, at a societal level, this means

elaborating the process sketched by the 1930s market socialist crowdâ€”Dickinson, Taylor and Lange. It is also much richer in principle, not beholden to simple mechanical rules like â€œset price equal to marginal costâ€□. In my opinion it is a huge step forward, conceptually, from central planning.

Beerâ€™s main work was at the enterprise level. Ask anyone who has heard of him and who isnâ€™t a socialist, and theyâ€™ll say he was a pioneering management theorist. He conceived the enterprise as a hierarchy of functions that adjust to each other cybernetically, and he was especially interested in the challenge of combining innovation and flexibility with organizational coherence. There is a school of management theory that draws on his ideas, and it seems to me to be as realistic and practicable as another other. It also provides, in my opinion, a possible foundation for a healthy compromise (and partial overlap) between democracy and efficiency within firms, which socialists ought to be pursuing. I can get references later if anyone is interested.

His hope was to build a functioning cybernetic planning apparatus for Chile, but the coup cut it short. Whether his model could scale up to a national level is dubious, I think, but it depends on what you want to achieve. Beerâ€™s approach leaves maximal room for autonomous decision-making at the base, subject to the constraint of coherent decision-making at higher levels. To say it this way sounds contradictory, but only if you think about it statically, which Beer didnâ€™t. Itâ€™s an interactive model.

I should add that, as far as I am aware, Beerâ€™s apparatus would better be described as computer-assisted than computerized. He wanted to support human decision-making at all levels, and the machinery was for facilitating and organizing the necessary information flows. Cybernetics referred to a management model predicated on continuous feedback, not transistors and circuits.

177

wolfgang 06.01.12 at 6:27 am

@Tim Wilkinson

>> it seems capitalism doesnâ€™t even have to be good enough

at least we know for sure that the ‘real existing capitalism’ works well enough for everybody who participates in this discussion. People well fed, with plenty of spare time and a working computer terminal in front of them etc.

178

Paul Cockshott 06.01.12 at 9:10 am

In the original article there is a serious error. Complexity in practice is not of order n^3.5 but substantially lower due to very high sparseness of the i/o matrix and to the acceptability of solving using approximative iterative methods. It appears that as N the number of products grows, the number of direct inputs to each product grows as Log N, so that to represent the data in matrix form is pathologically inefficient. I published an algorithm in Future Computer Systems, vol 2, Num 4, 1990, that uses this sparseness to solve the problem with complexity kNLog N where k is the number of iterations used and where the accuracy of the answers is proportional roughly to to 2^{-k}

179

reason 06.01.12 at 9:11 am

@176
You mean like in Bangladesh?

180

Chris Williams 06.01.12 at 9:28 am

> Paul – are you not losing with the approximations what you gained with the sparseness? And if not, what's the actual relationship for an acceptable degree of approximation? Is it closer to N^2 or N^3?

181

Emily 06.01.12 at 9:50 am

> @176 The Australian CSIRO recently confirmed the world us on track to meet the limits of growth by 2030 (17 years) depending on global growth and resource use from now. How can capitalism work in the future under these circumstances without recourse to constant war?

182

Emily 06.01.12 at 10:24 am

> From: A Comparison of the Limits of Growth with 30 Years of Reality by Graham Turner CSIRO 2008
>
> CONCLUSION Appropriate and publicly available global data covering 1970-2000 has been collected on the five main sub-systems simulated by the Limits to Growth World3 model: population, food production, industrial production, pollution and consumption of non-renewable resources. In the style of predictive validation, this data has been compared with three key scenarios from the original LtG publication (Meadows et al., 1972). This comparison provides a relatively rare opportunity to evaluate the output of a global model against observed and independent data . Given the high profile of the LtG and the implications of their findings it is surprising that such a comparison has not been made previously . This may be due to the effectiveness of the many false criticisms attempting to discredit the LtG.
>
> As shown, the observed historical data for 1970-2000 most closely matches the simulated results of t he LtG 'standard run' scenario for almost all the outputs reported; this scenario results in global collapse before the middle of this century. The comparison is well within uncertainty bounds of nearly all the data in terms of both magnitude and the trends over time. Given the complexity of numerous feedbacks between sectors incorporated in the LtG World3 model, it is instructive that the historical data compares so favorably with the model output. By comparison, the 'comprehensive technology' scenario is overly optimistic in growth rates of factors such as food, industrial output and services per capita, and global persistent pollution.
>
> Similarly, significant departures in the trajectory of key factors such as population, food and services per capita and global persistent pollution are evident between the data and the 'stabilized world' scenario.

183

Anarcissie 06.01.12 at 2:14 pm

> *'How can capitalism work in the future under these circumstances without recourse to constant war?'*
>
> Capitalism thrives on scarcity. It is scarcity which makes the direction of the community by elites (capitalists) necessary. When scarcity becomes scarce, it must be replenished. From that point of view, recourse to constant war is a feature, not a defect.

184

Emily 06.01.12 at 2:33 pm

> Anarcissie, I agree that liberal-capitalism can and has provoked wars, but in a world with several nuclear powers and a profusion of other dangerous weapons wouldn't the sort of chaos of perpetual global

> resource wars, on top of the effects of climate change, be a direct threat to the holders of capital (and their families) as much as to everyone else, bar, perhaps, military commanders (whose safety is only ensured as long as those under their command don't mutiny)?

185

Maynard Handley 06.01.12 at 3:12 pm

> @178, @180
> "@176
> You mean like in Bangladesh?"
>
> Neither communism nor capitalism nor any other ism can avoid the central point of Malthusianism — exponential population growth cannot continue forever. That has nothing to do with the current discussion.

186

Alex 06.01.12 at 3:26 pm

> Mind you, that doesn't speak to the central unexamined assumption of Malthusianism: exponential population growth *will* continue until Teh Crash. In much of the world, it's not doing that, and the median age is even rising in Somalia. Forecasts for population have been repeatedly revised down.

187

Emily 06.01.12 at 3:28 pm

> Correct me if I'm wrong (I haven't read the book so I may be completely off track, and have avoided commenting on the other threads) but isn't a large part of the current discussion about computer modeling (such as 1972s limits to growth) and that neither side of the cold war fully followed such modeling?

188

ajay 06.01.12 at 3:36 pm

> *Capitalism thrives on scarcity. It is scarcity which makes the direction of the community by elites (capitalists) necessary. When scarcity becomes scarce, it must be replenished. From that point of view, recourse to constant war is a feature, not a defect.*
>
> And certainly we can see that, as this hypothesis predicts, capitalist states are more warlike than non-capitalist states, and pre-state societies are the least warlike of all.
>
> Oh, wait, that's not true at all, is it?

189

chrismealy 06.01.12 at 3:37 pm

> Am I the only Cosma superfan slightly disappointed by this piece? The whole time I was reading it I kept thinking, "Now he's going to talk about machine learning or complex systems!" but he never did. Maybe he's saving that for his own book.

190

The Raven 06.01.12 at 5:20 pm

Paul Cockshott, #177: I would really like to see Cosma's comments on this. Maybe the problem is not hopelessly intractable after all.

191

Keshav 06.01.12 at 5:49 pm

Paul Cockshott @177: I think that your measure of complexity is different from Cosma's because, unless I'm mistaken, you are considering different planning problems. Your 1990 paper considers the case where the planning authority starts with a given target for the net output of each good, and solves for the gross output required to meet this target. Cosma seems to be considering the standard linear programming problem in which the planner *chooses* the output of each good to maximize a given linear objective function defined over these goods, subject to the constraints (although at times he talks about the production of a 'given assortment of goods', which would imply Leontief rather than linear preferences, so maybe I have misunderstood).

192

Nathanael 06.01.12 at 7:21 pm

FYI, the problem of nonlinear optimization has largely been solved; look up the work of Kohn and Nerode if you're up to the mathematics.

(Not that that really helps in this case: the primary problem is the problem of bad input data due to people lying to you. Garbage in, garbage out.)

193

geo 06.01.12 at 7:42 pm

Alex @185: *the central unexamined assumption of Malthusianism: exponential population growth will continue until Teh Crash.*

Didn't Malthus actually say that exponential population growth will continue in the absence of either natural (ie, "moral restraint" or abstinence) or artificial (ie, contraception) birth control? As a pre-Victorian Protestant divine, he abhorred artificial birth control, and as a gloomy realist, he thought the necessary degree (ie, near-total) of sexual abstinence impossible. Since no one except the Pope abhors artificial birth control anymore, Malthusianism is moot (which is not the same as invalid) . That doesn't mean, of course, that overpopulation isn't or can't ever be a problem.

194

Anarcissie 06.02.12 at 2:20 am

> *'Capitalism thrives on scarcity. It is scarcity which makes the direction of the community by elites (capitalists) necessary. When scarcity becomes scarce, it must be replenished. From that point of view, recourse to constant war is a feature, not a defect.'*
>
> **ajay 06.01.12 at 3:36 pm:**
> *'And certainly we can see that, as this hypothesis predicts, capitalist states are more warlike than non-capitalist states….'*

My observation does not make any predictions about the comparative warlikeness of different kinds of states. I was responding to #180, in which Emily proposed that war would prove inconvenient for the capitalist variety.

195

JW Mason 06.02.12 at 4:19 am

> *how sure are you that youâ€™re not unjustifiably univrsalizing your own preferences? What percentage of people do you think would enjoy and do better being their own bosses?*
>
> Well, I'm not very sure.
>
> But you know, I was just tonight at the Luthiers Co-op in Easthampton, where a couple dozen people were engaged in a quite complex, closely coordinated process of producing bluegrass music. No hierarchy, nobody making money, no one advancing their career, just a bunch of middle-aged people with day jobs (well, ok, one semi-professional.) Why do people do that?
>
> Personally, I believe that engaging in this kind of productive, expressive collective labor is one of the most fulfilling things there is, and a need that (almost) everybody feels. Maybe I'm wrong. Maybe most people are ok being farm animals.
>
> So I read something like "the human power of making and doing itself became only an object to be traded," and I feel an intense and painful recognition that, yes, that's the way the world is, and it's intolerable. Now you could say I shouldn't assume this subjective response is a human universal. But I could just as well say to you, maybe you find it comforting to think that if the world we've made is horrible, it's because it has to be horrible.

196

JW Mason 06.02.12 at 4:22 am

> *Am I the only Cosma superfan slightly disappointed by this piece?*
>
> By the evidence of this thread, you are. But Id be interested in seeing you develop the thought.

197

JoshM 06.02.12 at 9:53 am

> Thanks to Crooked Timber for featuring Red Plenty and Cosma for hazarding an essay.
>
> We should clarify which planning problem we're trying to solve. The original contention of Mises and Hayek was that if all big industries were nationalized a) factor markets would be impossible, b) only factor markets could provide firms and central planners of information about the relative scarcity of different raw materials, c) that absent such information it would be impossible to make economizing substitutions, and d) that this would lead to microeconomic inefficiency throughout an entire economony.
>
> Let's bracket a) off to one side (avoiding a discussion about market socialism) and focus on b). In the first place, I'm just going to go ahead and concede that as far as in the 1920s technology goes, they were right about that. The question is where things stand now.
>
> One approach to b) would be to truncate the time horizon of the plan. Then we don't have to ask the computer to decide between diapers and towels, or between polyster and cotton, etc., for every item in the economy for a whole five year plan. That really would be a computationally complex problem. Suppose instead we focus instead on generating up-to-date information about the relative scarcities of various production factors to guide firms and planners. Then they wouldn't be asking the computer to tell them whether to plant more cotton, or build another factory and substitute polyester in men's shirts this year. It would just have to provide a numerical measure of the supply each production factor relative to every other product in the economy, i.e. a price.

> Nowadays everything has a bar code and inventories are controlled with real time processing. TIBCO founder Vivek Ranadive recently boasted in the New Yorker that “when a certain type of shoe isnâ€™t selling at your corner shop, itâ€™s not six months before the guy in China finds out. Itâ€™s almost instantaneous, thanks to my software.” Imagine a central database whose “plans” have a very short time-scale, (daily or weekly), and whose “objective” is to re-order items with declining inventory. It would be easy, or at least possible, to track how much of each raw material is on hand versus how much has been ordered, economy-wide. I honestly don’t know enough about shadow pricing to know whether the computer could also assign a “price” to each production factor reflecting its relative contribution to the final mix of goods ordered that day, that would automatically rise and fall relative to the other production factors depending on how much of each material is on hand. But I do think that that would address the b) part of Mises argument.
>
> I also lack the training to know how to estimate the complexity of -this- planning problem. There would still be millions of production factors. (Personally, I think Nove’s 12 million number is low for a modern economy. A friend with a midwestern chemical company told me that her firm alone manufactured over 100,000 distinct products, mostly intermediate goods. For the whole economy the real number of finished consumer goods must be more like 100s of millions than 10s of millions.) But I can see that it would be much simpler than a planning problem with a larger time horizon, because here the computer would not be responsible for “knowing” what materials can be substituted for each other to make each of millions of items, or what the effect of building different combinations of new factories might be, etc.
>
> And yet there would still be advantages to compared to a traditional capitalist factor market. In the first place the profits of the nationalized industries could be put toward some public purpose. And it would be easier for the state to keep the industrial base within environmental limits. Also the shadow prices would not be subject to the speculation, volatility and distortions of real markets. Factor prices would become a kind of public utility.

198

Agog 06.02.12 at 1:25 pm

> Very off topic…
>
> Am I the only one to wonder how to get superscript working properly here? Like this maybe, or like ^this^?
>
> (Sorry)

199

Agog 06.02.12 at 1:26 pm

> (I see – put a caret before and after)

200

Sam Clark 06.02.12 at 3:36 pm

> JW Mason at 194:
>
> > But you know, I was just tonight at the Luthiers Co-op in Easthampton, where a couple dozen people were engaged in a quite complex, closely coordinated process of producing bluegrass music. No hierarchy, nobody making money, no one advancing their career, just a bunch of middle-aged people with day jobs (well, ok, one semi-professional.) Why do people do that? … Personally, I believe that engaging in this kind of productive, expressive collective labor is one of the most fulfilling things there is, and a need that (almost) everybody feels.

I think that's important, and not just J W Mason's personal taste. For whatever it's worth, I argued at length for that claim about what fully human work would be like, and used the same musical analogy, in a recent public lecture. Anyone interested can download a recording from archive.org here

Apologies for the self-advertisement, but it is at least on topic…

201

JW Mason 06.02.12 at 4:28 pm

I also would like to see Cosma's response to Paul Cockshott.

202

Evan 06.02.12 at 4:57 pm

I suppose that I'm more on the Cockshott side than the Shalizi side here; but I think that all of the discussion of complexity misses the point, made in the essay, that even if you could calculate these things effectively, the real difficulty lies in selecting democratically valid objective functions and adjusting them in real time to the situation on the ground.

Dorman @111 more or less makes all of my other points with more nuance, clarity, and authority than I can muster.

203

roger nowosielski 06.02.12 at 7:08 pm

Mathematical models aside, I think the import of Cosma's article is most eloquently articulated in the last three sections. Economic activity and well-being must be viewed in the larger context provided by human aims and purposes. So again, I'd like to re-open Anarcissie's question about the ultimate value of "optimization." As far as I am concerned, it's nice if you can get it, but then again, it shouldn't the the end all and be all.

204

JoshM 06.03.12 at 6:47 pm

@ Anarcissie 134

I recently read Sheila Fitzpatrick's Everyday Stalinism, and it left me with the impression that the failure to solve the optimization problem was a hidden cause of many of the bad features of soviet society. People behave badly when there's not enough to go around.

It went something like this: The transition (in the early 30s) from the quasi-market policies of the NEP period to centrally directed planning immediately produced economy-wide shortages. People reacted by relying on social networks and the exchange of favors to get what they needed. That led to widespread ebezzlement, corruption, the establishment of patron-client networks and local personality cults. Harsh labor laws were introduced to try to get workers to produce more. Confronted by an unresponsive bureacracy, ordinary people were encouraged to inform on misbehaving officials to the secret police, whose power grew.

People didn't understand the cause of the problem, and it was natural to look for scapegoats. It all came to a head with the great terror of 1937-38, which, unlike previous waves of persecution, was directed at managers and senior party officials who were accused of the same behaviors the system had itself caused: building client networks, embezzling to support friends and clients, mismanagement (either not meeting impossible production targets or else trading on the black market in order to meet the targets), etc.

Fitzpatrick represents the terror as being as being supported by some less privileged people who were glad to see local the bureaucrats get their commupence. Peversely, it looked like the system was self-correcting.

Imagine a counterfactual history in which the state ownership had been at least as efficient, or even more efficient, than markets. Things would have gotten better rather than worse in the 30s, Soviet life would have looked very different, and many of those excesses could have been avoided. So I regard the the viability of the whole socialist project as depending on whether the optimization problem can be successfully resolved, and I wish more attention were paid to it by other lefties. (That's why I was so glad to see Red Plenty featured by Crooked Timbers.)

205

Anarcissie 06.04.12 at 2:51 pm

If lack of optimization caused Stalinism, famines, wars, and so forth, then we should observe more of the same in the Soviet Union of the '60s, '70s and '80s, but we don't, at least not according to what I've read (spotty, I admit) and the ex-Soviet citizens I've spoken to. Going a bit further back in history, we observe large-scale famines, oppression and wars in areas where the economy is ordered by markets, for example Ireland and India under British liberal colonialism, so markets don't seem to have all that much to recommend them in the area of feeding people or making things nice otherwise. I think the political conditions, the competition for power, which followed revolution, invasion and civil war in the Soviet Union produced the economic problems, not the other way around. The government was not just failing to optimize the production of the people, it was actively stealing from them, in part to build domestic industrial power in anticipation of future isolation and war. (A correct prediction.)

Agreed, the Soviet Union after Stalin was slow to improve, slow to change in any way, was rife with corruption and other inefficiencies, but as we witness the very serious, perhaps fatal, deterioration of the capitalist world (where there is also a great deal of waste and corruption), its stodgy, unoptimized conservatism may turn out to have been a feature rather than a defect.

206

roger nowosielski 06.05.12 at 7:10 pm

Perhaps we need to re-conceptualize the problem. Instead of thinking up an ideal, one-size-fits-all scenario on some macro scale, why not parcel out the problem and suggest a grab bag of mixed solutions? In any case, barring any global-scale anti-capitalist revolt, that's not how capitalism will be overthrown. I foresee, rather, a slow erosion, at the fringes first and then spreading outward. So yes, some of the market elements of the capitalist system may well remain intact whether other areas of the economy may be subjected to economic planning. In any case, that's what Cosma seems to be arguing for.

Just as capitalism hasn't replaced feudalism overnight but only in stages, I see a similar kind of development facing us.

207

Ken MacLeod 06.05.12 at 7:37 pm

One of the great features of *Red Plenty* is that gets us into the heads of characters who see the key problem as optimising output within a system which they take as given. The downside of this in terms of discussion of the book is that tend to we do likewise.

But the question of whether the optimization would have worked in principle (while enormously interesting) is not the same as the question of why it wasn't adopted. The answer to that question is made painfully clear in the book: the social relations and political structures of the Soviet Union.

> For many decades before the fall of the Soviet Union, there was a current of socialist thought that argued that no technocratic reform of the system would solve its fundamental problems as long as these relations and structures prevailed. That current furthermore advocated quite different relations and structures for the Soviet Union and other Soviet-type societies.
>
> That current, of course, was Trotskyism, in particular as represented by the famous Belgian, Ernest Mandel.
>
> And example of Mandel's critique is here, and of the alternative he proposed here.

208

Pave Low John 06.06.12 at 12:53 pm

> After reading this essay, the first reaction I had was pondering that the one real advantage that free markets have over central planning is in the reaction to friction, as the term is understood by military planners and commanders. Which motivated me to reach for the Clausewitz and see what ol' Carl had to say about that. From Book One, Chapter 7 of 'On War':
>
> "If one has never personally experienced war, one cannot understand in what the difficulties constantly mentioned really consist, nor why a commander should need any brilliance and exceptional ability. Everything looks simple: the knowledge required does not look remarkable, the strategic options are so obvious that by comparison the simplest problem of higher mathematics has an impressive scientific dignity. Once war has actually been seen the difficulties become clear; but it is still extremely hard to describe the unseen, all-pervading element that brings about this change of perspective.
> Everything in war is very simple, but the simplest thing is difficult. The difficulties accumulate and end by producing a kind of friction that is inconceivable unless one has experienced war….countless minor incidents-the kind you can never really foresee-combine to lower the general level of performance, so that one always falls short of the intended goal."
>
> In short, Murphy's Law always rules supreme. As it applies on the battlefield, so it applies to economics, markets and especially to central or any other kind of planning. And the more complex the system, the worse the friction.
>
> The inventor of the OODA Loop, John Boyd, had a possible solution to solving the friction problem but I'll save that for a later post….
>
> PLJ

209

chrismealy 06.06.12 at 5:01 pm

> Josh, it's just that machine learning is the big thing right now and that's what Cosma does. A post on socialist calculation in the light of machine learning and massive parallelism would be super interesting but Cosma's the only guy I know of who could write it.

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