

Response to Clendaniels

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In his generally favourable review of our book, John Clendaniels raises four significant points of criticism that I would like to reply to.

1. The first relates to our criterion for when a theory is scientific. John says that “the falsification standard that he then puts forward for scientific socialism curiously appears to have been borrowed from Karl Popper. American and British philosophy of science have largely moved away such positivist standards and the focus has instead shifted to the explanatory power of theories and other types of theory confirmation.”
2. John is sceptical about the benefits of using the apparatus of statistical physics in political economy because “We are dealing here with fundamentally different processes that belong to different spheres of being, that of inorganic physical processes and that of a highly developed and complex component of social existence and although quantitative relationships exist within both types of processes, we have no reason to expect such a direct analogy.”
3. He is also doubtful of the merits of our advocacy of direct democracy via plebiscites and selection by lot since “there is no serious attempt to describe why the political forms of ancient Greece can or should be applied to societies with a monopoly capitalist or socialist economic base.”
4. We are also accused of a utopian detachment with respect to the question of nationalism in Europe since, he argues, the hope of the left in the poorer countries of Europe lies in the strengthening of national sovereignty.

These are well chosen points of criticism by our reviewer, since he has homed in on the points of our arguments which will be most unfamiliar to the average left reader. The points he has raised range from the purely philosophical to very acute political questions and he has raised them in a measured and serious way which merits a similar response on our part. I will respond to only the first 3 of his criticisms in order not to burden the editor’s patience with a too lengthy reply.

1 Refutability

On the first point, our emphasis on testability as a criterion of science, are we wrong to advocate this?

It is certainly true that Popper also advocated it, but it is not clear why this is a serious objection.

Testability is taken very seriously indeed within the scientific community. Either in methodology courses, or in tutorials, young scientists are taught that science works by putting forward hypotheses that are then subject to test. The whole structure of literature in leading scientific journals is built around this procedure. Your ability to get papers accepted in high impact journals depends on your having empirical

evidence to back up any claims that you make. If your peer reviewers think that claims are not adequately supported by the evidence, you will be told to resubmit the paper with more test results.

The explanatory power of theories is indeed important, but explanatory power can mean different things. Ideology as well as science has explanatory power. Alternative therapists, homeopaths and fashionable nutritionists are good at giving explanations but these explanations contain a large portion of hokum, assertions that are either unsupported by any evidence, or at best supported by very equivocal evidence[17]. Moving to something more political there are a plethora of reports in the science columns of the popular press in which the behaviour of men and women is 'explained' by some putative evolutionary advantage that stereotyped sexual behaviour gave our ancestors in the paleolithic. These claims frequently go way beyond what can be established by systematic tests, and acquire the character of explanatory Just So Stories.

In *Lenin and Philosophy*[1], a work inspired by Lenin's *Materialism and Empirio-criticism*[22], Althusser argued that the position of philosophy was to represent science to ideology and represent ideology within science. He observed that philosophy's origin coincided with the development of deductive mathematics, particularly geometry in classical Greece and argued that its function was to handle the potential challenge to traditional class ideologies that were caused by the irruption of an alternative form of explanation : scientific knowledge. This historically gave rise to conflicting trends of materialist and idealist philosophy which represented respectively the dominance of scientific knowledge on the one hand, and religious and other class ideologies on the other.

Since the industrial revolution, as the economy has become ever more dependent on scientific knowledge, materialist or realist philosophy has gained ground. The state in the capitalist world can not go back to the open anti scientific obscurantism shown by the church in the days of Galileo. There are ferocious attempts by the religious right in the USA and some Islamic countries to restrict the teaching of evolution, for example, but given the importance of science to the economy such interference is strongly resisted. Popper was an establishment philosopher wedded to the advance of science, but given the situation of the cold war, he had to confront the threat to the political legitimacy of the western capitalist order posed by scientific socialism and the USSR which advocated it. His writings thus contain a mixture of anti-idealist elements with anti-marxist elements. His *Logic of Scientific Discovery* is basically compatible with a materialist perspective. The same goes for his polemics against the Machian idealism of the Copenhagen interpretation of quantum mechanics. Popper shared with Lenin an opposition to the instrumentalist school of philosophy which underlies the Copenhagen interpretation.

On the other hand there is open polemic against Marxism in *The Open Society and its Enemies*[25]. I think a very good response to this was produced by Maurice Cornforth in his *Open Philosophy and the Open Society*[11]. Basically Cornforth argued that there was no disagreement between Marxist philosophy and Popper on the basic structure of the scientific method, and the centrality of testability to science¹.

¹ See for example "If Marxist theories were irrefutable in this sense they would be unscientific."(*Open Philosophy and the Open Society*, p 19), "Dr Popper is, of course quite right in stressing the necessity of applying tests in the development of scientific knowledge and in stressing that none of these tests is ever final and that scientific theories are therefore always provisional"(op. cit, p84).

But, Cornforth says, the very criteria of scientificity that Popper defends when applied to Marxism, show that it is a scientific theory which does make falsifiable predictions. Cornforth's work spanned the high tide of the old communist movement from the 40s to the 60s. Years when its advance, and the economic advance of the USSR were strongest. As such he had the type of communist self confidence that too many more recent writers lack. When I advocate a return to scientific socialism I am arguing for a return to the basic philosophical positions that Cornforth was defending.

2 Use of Statistical Physics

The properties of gases and the behaviour of capitalist economies seem at first sight to be such radically different phenomena that it seems surprising that some Marxist thinkers are now proposing to apply the mathematics of the first to the study of the second. The economy is made up of human beings with intentions bound up by a complex system of legal and conventional relationships, whereas statistical mechanics studies simpler systems, so the hesitation that John expresses is an understandable caution.

What we are dealing with here is the relationship between human intentions and the way that blind laws may impose themselves on these people behind their backs. Although human society and the systems studied by statistical physics are very different at one level, they both share what physicists call a high degree of freedom. Although gases seem simple compared to societies, even a modest volume of gas contains immense complexity.

Each molecule has a position which requires 3 numbers or degrees of freedom to express, and a velocity with components in each of the 3 dimensions giving 6 degrees of freedom per molecule. A cubic meter of air contains about 2.5×10^{25} molecules, so it has about 1.5×10^{26} degrees of freedom or different ways in which it can be configured. It is impossible for science to model all of these directly, but what statistical mechanics shows is that by means of probabilistic reasoning you can derive very useful predictions about the bulk behaviour of air. A human society contains huge numbers of people, nothing like as many as the air molecules I have just described, but its degrees of freedom again enough to ensure that scientific laws about society have to have a statistical character. This similarity between natural and social phenomena is not a new observation. The idea that bulk human behaviour is subject to constraints similar to natural laws was expressed clearly by Engels.

That which is willed happens but rarely; in the majority of instances the numerous desired ends cross and conflict with one another, or these ends themselves are from the outset incapable of realisation, or the means of attaining them are insufficient. thus the conflicts of innumerable individual wills and individual actions in the domain of history produce a state of affairs entirely analogous to that prevailing in the realm of unconscious nature².

Or Cornforth saying:

Nearly all predictions, whether they concern human beings or not, are similarly based on estimates of probability. Thus for example, the prediction that a kettle of water placed on a fire is (as modern science

² Engels, Ludwig Feuerbach & the End of Classical German Philosophy (1886)

has shown) based on the estimate that more heat will pass from the fire to the kettle than the kettle to the fire, and that when enough has passed the agitation of the molecules of water in the kettle will produce the phenomenon of boiling. Predictions about working-class organisation and other human activities depend on the same kind of estimates of probability³.

Philosophically, both these writers were saying that society and physical systems were governed by the same sort of laws but this idea did not reach the level of quantitative scientific theory until the work of Farjoun and Machover. John is worried that the use of these methods will result in “very crude models of economic processes where it is unclear what exactly, if anything, these tell us about the capitalist economy”.

That is a fair enough initial objection. The beef is in the detail. Let me take 3 quantitative examples of quantitative predictions that statistical Marxism can make, that could not be made earlier

The law that the exchange value of commodities would be proportional to their labour content, what was termed in Soviet economic discourse ‘the law of value’ was an empirical observation made by pre-marxian classical economists. In this sense it was similar to the empirical observations of classical thermodynamics. Observations of heat engines had established the laws of thermodynamics empirically before Boltzman’s statistical mechanics had put them onto a materialist atomic basis. Boltzman showed the *necessity* of the laws of thermodynamics[4]. Farjoun and Machover similarly showed why, due to bulk statistical processes, prices must approximate to labour values.

Boltzmann faced great skepticism from contemporaries like Mach⁴, who doubted that atoms really existed, and could not see the advantage of his theory as opposed to earlier versions of thermodynamics. It was not until 1905 in his doctoral dissertation on Brownian motion that Einstein came up with an observational test of Boltzmann’s theory and accurately estimated the dimensions of the until then hypothetical molecules⁵.

The comparable critical observation with respect to the labour theory of value lies in the attack on the labour theory of value by Samuelson who argued that the theory was both redundant and unscientific[27] since a better prediction of actual prices could be obtained by using a Sraffian model of the economy[29]. This criticism by Samuelson had, by the mid 1970s practically discredited the labour theory of value even among many left wing economists. Farjoun and Machover’s statistical Marxism[14] on the contrary predicted that actual prices would correlate closely with labour values - something which has subsequently been tested and found to be true[28, 34, 8, 9, 23, 31], that Sraffian prices would not be a better model. Crucially it predicts that the rate of profit in industries with a high labour to capital ratio will be higher than in industries with fewer workers to exploit - a direct confirmation of the Marxian theory of exploitation. Again this has turned out to be true[35].

This was not a minor result. It directly refuted the main criticism of Marxian economics being put forward in the late 20th century.

³ Cornforth, op. cit., p 144.

⁴ This conflict between Mach and Boltzmann over the objectivity or otherwise of atoms provides part of the scientific background for Lenin’s polemic against Mach in *Materialism and Empiriocriticism*.

⁵ See <http://www.aip.org/history/einstein/essay-brownian.htm>

If we now look at the work of Yakovenko[13], he was able to use statistical mechanics to give a prediction about the distribution of money in a commodity producing economy: the Gibb's Distribution. What he said is that the anarchy of the market will result in a precise form of statistical distribution of money between people. Even in the absence of exploitation this is a relatively uneven distribution with most people having little money and a few having a lot. This is a precise quantitative prediction about the amount of inequality that even simple commodity production will give rise to. He has shown that for 99% of the population their monetary wealth follows this law. John says these predictions are crude. No doubt they can be improved upon, but did Marxian economists prior to Yakovenko come up with quantitative predictions that were even this good? No.

The top 1% of the population though have much more wealth than Yakovenko's initial model would account for. Yakovenko, a solid state physicist whose University education was in the USSR, and who had to read Capital as part of that education, concludes that this extra wealth of the top 1% proves that Marx was right - that the extreme wealth of the capitalist class could not be accounted for by simple commodity exchange[33]. Ian Wright, in a subsequent paper[32] built on Yakovenko's results and showed that if you allow the buying and selling of labour power, rather than just simple commodity exchange, then the statistical distributions of income that arise account for the observed wealth of the top 1%.

It is in terms of these specific results that the methods of statistical mechanics are validating and explaining the basic results of Marxian political economy, just as — Einstein and Boltzmann used them to provide a materialist explanation of the behaviours of gases and liquids.

3 Direct Democracy

John says that in our book “there is no serious attempt to describe why the political forms of ancient Greece can or should be applied to societies with a monopoly capitalist or socialist economic base”.

Well in a sense John, I or anyone else arguing about forms of state can not help borrowing forms from ancient Greece or Rome. If we talk of democracy we are using a Greek term. If we talk of dictatorship or republics we are using Roman terms. This is not something we can avoid. Just as in philosophy the basic opposition between materialism and idealism has been with us since the classical era, the same applies to the basic repertoire of state forms. They had all been discovered by the ancients. Indeed the variety of forms then was greater than it is now, a veritable Burgess Shale[18] of forms.

The question is which of these basic forms is most favourable to the working class.

The USA today holds up 'democracy' with a specific meaning as the state form towards which the whole world is expected to approach. It is the ideologically dominant model of politics. If the worker's movement internationally is present a challenge to this model, it requires both a root and branch scientific critique of it, and an alternative model that can capture the hopes and imaginations of the peoples.

I will argue here that the presentation of the USA as a democracy is wrong. The appropriation of the label *democracy* by the USA involved a fundamental corruption of what the democracy originally meant.

In fact the constitutional structure of the US is a compromise between the wishes of independent peasants and artisans in the northern states and the slave holding

aristocracy of the south at the time of independence. All though only 25% of white families owned slaves, slavery was crucial to commercial production and the export trade. The US was predominantly a slave state in terms of the surplus produced, thus the upper class was dominated by the slave owners until the civil war.

The slave owners wanted not a simple democracy but a Republic in which real power would be concentrated in the slave owners and other wealthy sectors. The structure they chose was closely modeled on the constitution of the Roman republic.

In slave societies like ancient Rome or the USA in the early 19th century there were three main classes[30]. At the top was the slave owning aristocracy who did no direct productive work, but lived off the labour of the slaves they owned. Below the aristocracy was a class of free citizens who worked for a living. These would be small family farmers or artisans. At the bottom was a class of slaves who had no political or civil rights and were the private property of the aristocrats. The main class conflicts in this system were between the slaveowners and the slaves on the one hand, and between the slave owners and the free citizens on the other. Since the slaves had no political rights either in Rome or the USA the conflict between them and the slave owners was brutally physical, with the owners dominance enforced by whips and chains. Free citizens on the other hand had civil rights, and the fact that they outnumbered the richer slaveowners meant that the political power of the slave owners was potentially threatened by the free peasants and artisans. The main conflict between the slave owners and free peasants was typically over land ownership. The progress of slavery meant that more and more land tended to be fall under the control of the big slave estates, threatening to proletarianise the free citizens[26].

The Roman constitution was cleverly designed to give the semblance of power to these free citizens whilst actually concentrating real power in a senatorial class. The state structure in Rome was made up of :

1. The two Consuls who were elected for a year and who alternated in office on a monthly basis. They were equivalent to the President of the USA today. They had supreme command of the army and civil administration.
2. The Roman Senate, which could pass decrees and provide the class from which the consuls were generally chosen. The US Senate was explicitly modelled on this.
3. The *comitia centuriata* or assembly of the centuries which elected the consuls. It worked by indirect election. The centuries were originally military units, and there were different centuries for different ranks of soldiers. The lowest ranking class of soldiers, *proletarii*, were only allowed to vote if there was a tie among the higher ranks. Each century voted on who they wanted for consul, and sent a representative to the *comitia centuriata* to cast one vote for the consul they had chosen. The exact same indirect electoral system was adopted by the USA for the election of the President. The states elect delegates to the Electoral College, where they cast their vote for the president.
4. The Plebian Council. This was a mass democratic assembly that could pass laws. It could not however set its own agenda, having to vote on motions put to it by magistrates who were invariably from the upper classes. There is no directly equivalent institution to this in America where its place is taken by the House of Representatives.

The effect of this structure was that executive power in Rome was always held by a member of the slave owning patrician class. The Roman Senate likewise was always made up of slaveowners rather than common people. Similar effects were achieved in the USA. Of the first ten presidents of the USA only two, John Adams and John Quincy Adams, were not slave owners.



Figure 1: The meaning of the Hitler salute: millions stand behind me. The cover of German Communist Party magazine Arbeiter Illustrierte Zeitung parodying Hitler's elections slogan 'millions stand behind me'. Hitler meant that millions of voters stood behind him, the magazine suggests that these are votes bought with the money of his millionaire backers.

But a republic also relied on the free citizens, particularly as members of the army. These people had to be given the semblance but not the reality of power. In Rome the two mechanisms used to achieve this were elections, specifically indirect elections,

and control over the agenda at the popular assembly by upper class magistrates. Elections, ancient political theorists argued, always favour the wealthy. Aristotle said “it is thought to be democratic for the offices to be assigned by lot, for them to be elected is oligarchic⁶”. The wealthy can spend money to influence the election and are also likely to have an education that prepares them to be convincing public speakers. Secondly an indirect election tends to increase the effects of any bias in the initial results: for example Bush won the 2000 election on the electoral college system even though he had fewer popular votes than Gore.

A constitution in which executive power is concentrated in the hands of one elected official is advantageous for the wealthy. It takes a huge sum of money to win a presidential election⁷ so the candidates inevitably become dependent on wealthy patrons. At times of heightened social conflict a powerful presidency can be used by the wealthy to impose draconian programmes that would not have popular support (Figures 1 and 2). The example of such a presidential constitution in Russia, and the effect it had on that country’s subsequent economic and social development, is probably relevant to all readers.



Figure 2: Tanks sent by President Yeltsin attack the Russian parliament to impose presidential rule when parliament opposed his privatisation programme.

Whilst ancient Rome at least allowed some element of direct democracy, in the US this element, the popular assembly was removed and replaced by the elected house of representatives, where again, money speaks. Election to this body is completely controlled by the two official political parties Republicans and Democrats, both of which are in turn dependent on funding by wealthy individuals and companies. In

⁶ [2] 4.1294b

⁷ The 2012 US election is anticipated to cost \$6 billion dollars, (*U.S. vote in 2012 will be record, \$6 billion election*, Reuters, Patricia Zengerle, Aug 30, 2011.)

consequence, the supposedly representative bodies of the US are, on statistical grounds, ridiculously unrepresentative of the population as a whole.

Officeholders in every level of government are, on average, better-off than the people they represent by virtually any measure of class or social attainment. The median individual net worth among members of Congress, for instance, is estimated at almost \$800 thousand (Center for Responsive Politics 2009), or more than six times the median net worth among American families [5]. The alumni of thirteen prestigious universities have constituted about 15% of the House of Representatives and 25% of the Senate in every Congress since the 1950s, whereas their living graduates make up less than 1% of all adults. And lawyers and businesspeople, who comprised approximately 10% of the nation throughout most of the 20th century, made up more than 75% of every Congress that served during that time. Similar patterns have been documented among presidents, Supreme Court justices, state and local lawmakers, and high-ranking bureaucrats.[7]

If all this were not enough to protect the interests of the US elites, the constitution provides an elaborate system of veto powers so that it becomes very hard to enact any system of radical reforms. Those fighting for reforms would first have to gain control of one of the political parties or set up a new party. That party would then have to gain control of all 3 elected bodies : the presidency, the senate and the house of representatives. Even after that, reform measures could be struck down by an unelected Supreme Court.

The last time that such a process occurred successfully in the USA was with the foundation of the Republican Party as an anti-slavery party in 1854, and the election of their candidate Lincoln in 1860.

How can the unrepresentative character of US or Roman republican style elections be overcome?



Figure 3: Kleroterion. This device was used for the jury selection system in Athens. Bronze identification tickets were inserted to indicate eligible jurors who were also divided into tribes. There was an attached tube filled with different-colored dice. The dice were released one by one, each die corresponding to a row of tickets. The color of each die determined whether the owners of the ticket in the corresponding row were selected to hold office or to become jurists. There was a kleroteria in front of each court. Others were used for selection to the council. Ancient Agora Museum in Athens. Bottom left the identification tickets. Bottom right, ballot tokens use to vote yes or no with.

The word *democracy* comes from the Greeks, *republic* from the Romans. Ancient Athens provides an alternative constitutional model to Rome. In ancient Athens, like Rome, slavery was an important part of the economy, but here, the free peasants and artisans rather than the rich slave owners controlled the state. It is worth therefore getting some understanding of what democracy originally meant to the Athenians[15]. They used three principles:

1. Participation of all citizens in a mass democratic assembly which carried out all legislation and decided on issues like the declaration of war, treaties etc.
2. The day to day administration was in the hands of a randomly selected council drawn by lot from among the citizens. This council also drew up the agenda for votes to be taken by the assembly.
3. Control of the law by the people. All courts were controlled by large randomly selected juries. There were no professional judges.

The aim of all this was to ensure that all decisions were made either by the people as a whole or by a scientifically representative sample of the people. It is a well known in social science that if one wants to carry out an accurate opinion survey of the population you have to do this by asking a largish ran

domly selected sample of the whole population their opinion. The reason why this works is the statistical phenomenon of regression to the mean. If you select a random sample from a population, the mean of the sample will tend towards the mean of the population from which the sample was drawn. The ancient Greeks made direct use of this scientific law in their political system. In order for samples to be reliable they must be unbiased and in order to get these random samples they had a sophisticated system of bronze age technology[12] illustrated in Figure 3.

The selection by lot is the principle used today in all scientific opinion polling. It is also used in anglo saxon judicial systems to select juries. In the latter case its use is very ancient dating back possibly to pre-feudal Scandinavia[16].

Whilst voting by the whole people on key issues was practical in a city state it is hard in a big country. It is not impossible. Referendums are occasionally held in some countries, but it is certainly expensive and time consuming to organise. These difficulties are one justification given for the replacement of direct democracy with representative democracy. But we have argued above that the actual procedures used in countries like the USA, ensure that what is called representative democracy turns

out to be very unrepresentative indeed. Random sampling on the other hand does allow the creation of genuinely representative legislative and deliberative assemblies, and we believe that there is a strong case for these being re-introduced in 21st century democracy. Indeed Time Magazine reports that some areas of China are already introducing this system:

Actually, the Chinese coastal district of Zeguo (pop. 120,000) has its very own kleroterion, which makes all its budget decisions. The technology has been updated: the kleroterion is a team led by Stanford professor James Fishkin. Each year, 175 people are scientifically selected to reflect the general population. They are polled once on the major decisions they'll be facing. Then they are given a briefing on those issues, prepared by experts with conflicting views. Then they meet in small groups and come up with questions for the experts — issues they want further clarified. Then they meet together in plenary session to listen to the experts' response and have a more general discussion. The process of small meetings and plenary is repeated once more. A final poll is taken, and the budget priorities of the assembly are made known and adopted by the local government. It takes three days to do this. The process has grown over five years, from a deliberation over public works (new sewage-treatment plants were favored over road-building) to the whole budget shebang. By most accounts it has succeeded brilliantly, even though the participants are not very sophisticated: 60% are farmers. The Chinese government is moving toward expanding it into other districts.([20])

Modern information technology makes the random selection of citizens by electronic lottery technically very simple. But there are political drawbacks to performing such allotment by computers. It is very hard for the ordinary citizen to be sure that electronic allotment procedures are fair. How can they tell what the software in the computer is actually doing when it selects some people to serve on a council rather than others. Can they be sure that the sampling is really random or might it be rigged to select people who were previously known to favour a particular view?

The difficulty of having trust in such electronic equipment is probably why financial lotteries still typically use systems of highly visible numbered balls being shaken before selection – essentially the same sort of physics as the old Athenian machines used.

But one area where electronic technology can certainly be applied is to national direct democracy. On very major constitutional issues, national referenda or plebiscites are held in some countries. Their infrequency stems both from their complexity and expense, and also from the reluctance of elected politicians to give up any of their power to the people they are supposed to represent.

Contrast this to what happens on TV. Every week there are reality TV shows, or competitions in which the viewers are asked phone in to decide which contestant is to win or lose. What makes them worth doing, from the TV companies' point of view, is that they are able to charge viewers phone bill every time they vote. What has made them possible is the digital technology which allows incoming phone calls and Short Text Messages to be rapidly counted. Commercial interests have resulted in a technology being developed, which, if applied in the field of national politics, would give citizens real democratic control over the executive.

The advantage of cell phones as a means of allowing direct democracy is that they are cheap simple and widely distributed across most countries. They allow text messages to be sent from anywhere to anywhere in seconds. They use a network that is in place already for conversations, and since they do not rely on wires they can be used in country areas with a low penetration level of landline phones. In contrast, computers are much more expensive and they have to use wired connections. An additional problem with using computers for electronic voting is that most proposals to do this rely on software running on the computers. It is bound to be difficult for a voter to be sure that voting by computer is really confidential. How do you know that the software does not have a back door in it allowing manipulation of the votes?

If you remember the two elections that George W Bush won were marred by controversy over voting technology. In his first election, the technology was old computer punched cards. He only scraped by in this election thanks to the discounting of voting cards that Florida voting machines had difficulty counting. After his victory had been declared by the Supreme Court, counting of these discarded cards showed that he had actually lost the election. In his second election, he won on votes cast via electronic voting machines. prior to the 2004 presidential election there was considerable controversy over the fact that one of the most widely used new voting machines, the Diebold one, was made by a company whose director had pledged that he would ensure that Ohio's vote went to Bush:

Inviting Bush supporters to a fund-raiser, the host wrote, "I am committed to helping Ohio deliver its electoral votes to the president next year." No surprise there. But Walden O'Dell — who says that he wasn't talking about his business operations — happens to be the chief executive of Diebold Inc., whose touch-screen voting machines are in increasingly widespread use across the United States. For example, Georgia — where Republicans scored spectacular upset victories in the 2002 midterm elections — relies exclusively on Diebold machines. To be clear, though there were many anomalies in that 2002 vote, there is no evidence that the machines miscounted. But there is also no evidence that the machines counted correctly. You see, Diebold machines leave no paper trail.[21]

This prompted *Science*, the leading scientific journal in the USA to print an editorial[19] which said:

Computer science and cryptography experts can get passionate about the science issues here. The consensus view, with which a few will disagree, is that for traceability, electronic machines should provide for a voter-verifiable audit trail in which a computerized system prints a paper ballot that is read and verified by the voter. Such paper confirmation can be given to the voter privately, as well as be retained by officials for later verification. Most of the machines aren't equipped for this (including the ones that Maryland purchased, though Nevada has fared better with a vendor whose e-machines are fitted with voter-verifiable receipt printers). Although some machines can print vote totals and transactional information at the close of an election, these are not considered "voter-verifiable."

For the moment, never mind who's right about the need for paper. Most of the machines out there don't allow for such an auditable paper trail, so let's ponder the following hypothetical scenario. It's the morning after

Election Day, and it's still a tight race in the battleground state of Ohio. It looks as if the incumbent president will win the national election if he takes Ohio, but his lead there is only 2000 votes. A team of Democratic lawyers is already challenging the count from several downstate jurisdictions in which voters are claiming that the vote recorded from their precincts shows large majorities for Bush—in sharp disagreement with exit polls. Unfortunately, Diebold machines that do not provide voter-verifiable receipts are in use in this particular district, and public controversy is already high in the state (owing to an actual pre-election statement by Diebold's chief executive officer, a prominent Bush fundraiser, that he would "deliver" the state of Ohio to the president). Thus, the aftermath of a savagely partisan U.S. election turns into a field day for conspiracy theorists, and trust in government takes another hit.

Science had good foresight in this because a remarkably similar situation did arise in a number of closely contested states giving rise to widespread suspicion that the voting machines had been rigged to deliver the vote to Bush.

Most revealing, the discrepancies between exit polls and official tallies were never random but worked to Bush's advantage in ten of eleven swing states that were too close to call, sometimes by as much as 9.5 percent as in New Hampshire, an unheard of margin of error for an exit poll. In Nevada, Ohio, New Mexico, and Iowa exit polls registered solid victories for Kerry, yet the official tally in each case went to Bush, a mystifying outcome. In states that were not hotly contested the exit polls proved quite accurate. Thus exit polls in Utah predicted a Bush victory of 70.8 to 26.4 percent; the actual result was 71.1 to 26.4 percent. In Missouri, where the exit polls predicted a Bush victory of 54 to 46 percent, the final result was 53 to 46 percent. One explanation for the strange anomalies in vote tallies was found in the widespread use of touchscreen electronic voting machines. These machines produced results that consistently favored Bush over Kerry, often in chillingly consistent contradiction to exit polls.[24]

A study in the Review of Economics and Statistics [6] concluded that there was a clear correlation between the use of Diebold voting machines and whether the vote went to Bush or to Kerry, though they were hesitant about concluding that this was evidence of fraud. Instead they argued that voting machines could have had a disincentive effect on Hispanic voters who tended to be Kerry supporters. Whether the 2004 US election was manipulated or not will probably never be known, but the existence of the controversy indicates that any electronic voting system must be designed to provide the public with assurance that everything is fair and open.

Before the phone voting currently used on TV could be used in anything other than games, something would have to be done to make it not just efficient, which it already is, but secure, which it certainly is not. In TV phone voting, there is nothing to stop you voting as often as you wish for the candidate of your choice, provided that you are willing to pay the charges. If this were the only problem with phone voting, there would be an easy answer, simply design the vote counting software so that it only counts a single vote from each phone, but this would not prevent somebody with both a landline and a mobile phone from voting twice. If everyone trusted the state one solution would be for voters to register their phone number when they registered

to vote. This would ensure one person one vote, but what if you feared the government?

Would you not be afraid that they could now easily find out how you had voted?

Might that information affect the way the government dealt with you in the future?

What is needed is a way of identifying each voter so that they can only vote once, but at the same time preventing the government from discovering how they voted. A possible mechanism for holding electronic plebiscites by telephone[10] goes as follows:

- There is a fixed period during which people have to register to vote. When you go to register your name is ticked on the list of electors, then you put your hand into jar and pull out a voters card. This has a voters number on it like a credit card number. The number on each card is unique, but the electoral officials do not know who has picked up which card.
- The card number is divided into two fields a unique voter ID which for China would have to have 9 or 10 digits, and a secret PIN of 4 digits like an ATM card PIN.



Figure 4: Voter Card with PIN

- Whenever there is an electronic vote, the numbers to phone for YES or NO are prominently advertised on TV and in the news papers. You phone in and use your voter's number to record your vote. Alternatively you put your voter's number into an SMS message and send that to the YES or the NO telephone number.
- Software ensures that each each number can only be counted once, and nobody but the voter, knows who the numbers belonged to.
- If you are afraid that Caller Identification will be used to track down who sent in the number, you simply withhold your number when making the call. Alternatively you place the call on a public telephone and key your voters number in after the phone is automatically answered. It would be arranged that calls to the voting number were free.
- In order to prevent fraud in the counting process, the electoral commission will publish on its website two files listing all the yes voter numbers and all no voter numbers. If a voter wishes to check that her vote was correctly registered she downloads the file onto her computer and uses an editor

program to search for her number in either the YES file or the NO file. The published voter numbers will only include the unique voter ID but will have the PIN hidden, to prevent illicit subsequent use of the published numbers.

- The election authorities will publish the totals who voted YES and NO.

Publication of the list of votes also allows independent verification of the count of votes cast for each proposition. This avoids the secrecy that has bedeviled electronic voting in the USA where it leads to suspicion that the voting machine firms, who sympathise with the Republican party, have rigged the results of recent elections.

It would be important in this system that the voting cards are properly accounted for. Each electoral district would have to publish the ranges of voting card numbers it had issued, and the numbers on voting cards that remained unissued at the end of registration. This is to prevent someone using unissued cards to vote with. Each person registering to vote would have to have their identification card or passport photocopied, and the electoral registration officer would be responsible for ensuring that the number of issued voters cards was equal to the number of identifications that he had recorded.

Assuming that registration was annual, it would be possible to have several popular votes a year using the same card numbers. The fact that the PIN is never disclosed allows the same voter cards to be used several times.

In the pilot project in Zeguo district mentioned above, the randomly selected council made decisions on budgetary questions affecting the district. Budgeting is a harder problem than plebiscites for participatory democracy. A plebiscite allows just a YES or a NO as its answer. The only way in which the decision about district or provincial budgets could be put to a YES/NO vote would be if some other body first drew up detailed budget proposals and put them to the people for ratification. Procedurally, this is not unlike what happens with the parliamentary vote on the national budget in many countries. Again the voting body, parliament in this case, only has the option of outright veto if it does not like the budget.

An alternative would be to develop some form of voting that allowed the population to alter the internal structure of the budget before approving it. Framing a budget differs from a simple YES/NO vote in that the decision contains more information. A binary vote contains only one bit of information, whereas a budget:

- Has multiple sub headings : defence, health, transport, education etc.
- There are positive and negative headings : positive for taxes, negative for spending.
- Each of these is itself a number : billions of Euros, Dollars or Yuan.
- There are dependencies between the headings. If we ignore borrowing by the government, the basic dependency is that the sum of expenditures must equal the sum of tax revenues⁸.

This more complex structure raises all sorts of problems. The numbers that are spent by the government on main headings are vast and beyond the experience of ordinary

⁸ This is a simplification introduced for explanatory purposes. In practice the state has some non tax forms of revenue, and may also choose to borrow. These could be factored into the decision making process in a real system.

people. If you just got individual citizens to suggest how much China should spend on health for example, they would be very likely to underestimate what was needed. This is not an impossible problem though. If you asked instead : should health spending be increased or reduced or left the same, then people are more likely to have a firm view. The concrete choice might be, for each item of expenditure the people vote to increase expenditure by 10%, reduce by 10%, or leave the same. Suppose 300 million vote to increase health expenditure by 10%, 200 million vote to leave it the same and 100 million vote to reduce it by 10%, it is easy to work out the average result:

	voters	change	weighted change
	300,000,000	+10%	30,000,000
	200,000,000	0%	0
	100,000,000	-10%	-10,000,000
total	600,000,000		20,000,000
	divide by voters	3.3%	0.0333

So in this case the net choice would be a rise in health expenditure by 3.3%. This provides a feasible solution for voting on the large sums the state spends and then aggregating individual voter choices to get a final number.

This then gives rise to a subsequent problem. What if everyone wants to have expenditure increased but does not want taxes to rise?

There would be a danger of people voting inconsistently for a combination that was not possible.

There would have to be an agreed procedure for resolving the difference. Suppose the population voted to increase total expenditure by 4% but only voted to increase taxes by 2%. There are then three approaches that could be taken.

1. We assume that the decision on expenditure is binding and that this overrides the tax decision, so the upshot is that tax and expenditure both rise by 4%.
2. We do the opposite and assume that the tax decision is binding, so that in this case both tax and expenditure would rise by 2%, with the increase in expenditure for each sub heading set to half of what the average vote had been for that heading.
3. We split the difference and increase both tax and expenditure by 3%. This is probably the course of action which is least unsatisfactory to the most people.

If the people are to make sensible decisions on these issues there has to be plenty of prior public debate. This could take the form of opposing articles in papers, television debates between experts, television debates between members of the public. One can be sure that if such votes were to occur today, there would also be extensive discussions of the issues on the internet and on social media sites. It might well be worth also organising public debates in a big hall in each town or village to allow people direct face to face opportunities to debate the questions.

From the early 20th century until today political decisions have been taken by the leaders of mass political parties. The leadership of these parties controls the agenda and puts through the decisions in assemblies in which their party members have an overall majority. The role of the public has been limited to conferring legitimacy on

one or other group of political leaders. In a direct or participatory democracy the role of leaders and parties would change radically.

- They would no longer be mobilising to win support for politicians.
- They would have to be working to mobilise public opinion.
- They would become much more ideological much more overt struggle between different ideologies.
- The people in them would be there because of conviction not career calculations.

While this is very different from the way political parties operate in multi-party states, it has some similarities to the way the CPC operated in its early years when it did not command direct power. China is currently debating how to extend democracy without running into the dangers that hit the USSR under Gorbachov. There is a real danger that were it to adopt a US style presidential multi party system that it would end up as the sort of corrupt oligarchy that Yeltsin introduced to Russia.

An alternative is to harness the power of information technology to bring the great mass of the people into direct political participation. These mechanisms provide a solution to many of the problems faced by socialist polities. They ensure that no minority class can dominate the state. Major decisions by plebiscite are directly by the people preventing any minority class from imposing its objectives. Since the working classes, at least in a non-rentier state, are a majority of the population, they will predominate. A traditional objection to plebiscitory democracy is that it has been a tool of tyrants who, it is alleged, selected the agenda on which the plebiscites were to be held. In Britain there has historically been suspicion on the issue of referenda. Atlee the Labour Prime Minister in the late 1940s turned down a proposal by Churchill to hold a referendum with the words:

I could not consent to the introduction into our national life of a device so alien to all our traditions as the referendum, which has only too often been the instrument of Nazism and Fascism. Hitler's practices in the field of referenda and plebiscites can hardly have endeared these expedients to the British heart.[3]

His fear was that a dictator like Hitler could manipulate the topics that were put to the popular vote so that only topics that he knew would be approved were put to the vote. Under these circumstances, rather than giving real power to the people, the referendum would act simply as a means of increasing the prestige of the dictator. But if a 21st century democracy were to follow the Athenian principle that a randomly selected council drew up motions to be voted on by the people, these fears would be groundless since the council is itself socially representative of the population at large.

With these genuine forms the tendency of parliamentary systems to be dominated by the upper classes is removed, whilst at the same time the possibility of a entrenched revolutionary aristocracy or tyranny can not establish itself. But, suppose that the people, 'win the battle for democracy' in this sense; why should it lead to socialism. Might it not lead to a stable bourgeois republic like Switzerland, which has many of these constitutional features?

It all depends.

On two things. First the socioeconomic structure of the country and the relative weight within this of the working classes, and secondly on the level of political development of the working class movement.

A true participatory democracy can only be established in a country today if it has a highly organised mass movement, with a coherent radical democratic ideology. The original concept of an avant-gard movement, still applies.

The idea of a party as a force for mobilising and ideologically developing the mass movement remains valid. But in a participatory democracy leadership and command are two different things. A party can only get things done by influencing opinion, by persuasion. It can not just rely on the power of command as the Soviet communists did in the later years. But to do this it still needs a clear vision of the future, and clear political economy.

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