

More equal than others

Thomas Piketty — know the name? Most people now do, for this French economist is the author of this year's publishing phenomenon: a dense, 700-page tome of history and data describing global trends in wealth inequality over more than a century, entitled *Capital in the Twenty-First Century*. Published two months ago, it's an unlikely non-fiction best-seller, although I'm sure most people who have bought it haven't read it, nor will they.

Piketty argues — based on the most accurate data set assembled to date — that economies around the world have recently emerged from a special period, extending roughly from 1910 until about 1980. During this time, a conspiracy of factors, including two world wars and the Great Depression, created an unusually broad dispersal of wealth and, in many societies, a sizeable middle class. Since then, Piketty contends, the global economy has gone back to working as it did before the turn of the twentieth century, with the wealth-creating advantages of capital ownership over labour ensuring a vast and growing disparity between rich and poor.

Is he right? And, as he suggests, is this the future we inevitably face, unless we enact policies to counteract this trend? I don't know, of course. The book has kicked off a storm of debate, most of it politically motivated in fairly obvious ways. But it might be instructive to step back and ask what we really know, at the level of basic science, about wealth inequality. When did it first come about, and how? If there is one 'most important' mechanism for producing it, what might that be? We do have some ideas about answers to these questions.

Naively, one might think that there has always been a distinctive rich and poor through the entire history of our species. Before the industrialists of the early twentieth century, wealthy landowners linked to royalty controlled vast fortunes in medieval Europe, as did an elite in ancient Rome before them, and the chiefs and warlords of battling European tribes before that. Human history is one long story of pronounced inequality.

But this story doesn't go all the way back. It's actually a relatively recent part of human history. Anthropologists now place the origins of significant individual wealth inequality at about 10,000 years ago. Before then — which is to say, for the vast majority of the history of mankind since



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emerging from Africa — our ancestors lived in small bands of hunter-gatherers, itinerant, and not yet capable of farming. In those societies, more or less strict egalitarianism was the norm for good reason: such bands could only defend themselves, hunt large game and find dispersed food sources effectively if each individual suppressed his or her interests for the betterment of the group and if all members of the group were well nourished and strong.

In fact, in today's few remaining hunter-gatherer societies, social norms deter any behaviour departing from egalitarian distribution. Individuals of the !Kung people of the Kalahari Desert, for example, systematically downplay their individual hunting exploits. !Kung hunters, as well as those of many other extant hunter-gatherer societies, also exchange arrows at random before heading out, and the owner of the arrow — not the successful hunter — then decides how the food is distributed (E. Pennisi *Science* 344, 824–825; 2014).

Archaeological evidence suggests that the first burial sites showing marked distinctions between the buried — some with lavish ornamentation, others without — appeared around 10,000 years ago. What happened? Well, the original cause seems to be just about what anyone might guess: the emergence for some people of an ability to control resources or technology and to pass these on to offspring. This happened in close coincidence with the rise of farming, and the static storage and mass accumulation of goods (although it might have taken place even before farming, among some hunter-gatherers, who gained control over particular areas rich in resources). Wealth discovered a way to multiply itself, as the growing sophistication of technology and industry gave controlling groups the ability to invent new ways to gain better control — eventually even over the labour and wealth-creating activities of other people (H. Pringle *Science* 344, 822–825; 2014).

Historical details aside, there's another way to think about this: technology in a general sense, including things like fences and means of food preservation and storage, made the homogeneous distribution of wealth unstable, by allowing wealth concentrations to create ever more wealth. This mechanism, apparently responsible for the original emergence of significant inequality, remains hugely important today. It's obvious, I think, that people with the highest incomes don't tend to get them from their wages, but from returns they receive on the wealth they already own, and generally in proportion to such wealth.

This isn't surprising from the perspective of natural sciences, as we know that similar multiplicative growth processes lead to broad power-law or scale-free distributions throughout nature, from earthquake dynamics based on fracture mechanics to river drainage networks. Random multiplicative growth isn't the only mechanism leading to such unequal distributions, but it is a generic mechanism of broad importance.

This only means, of course, that the skewed distribution of wealth is quite natural. There remains the important practical puzzle of why it has become so much more significant recently, which is what the Piketty controversy is all about. Science at least helps to identify the most probable factors, as any recent changes that have in any way enhanced the power of wealth to create more wealth, such as the explosive growth of finance over the past three decades, or perhaps advances in technology. Or likewise, any diminution of the countering forces — taxes, for example — that tend to erode wealth differences once created.

Science doesn't have any easy lessons about what we should do, but it can help us to think more clearly about the mechanisms behind inequality — the forces that create wealth as a self-reproducing force, and how new technologies might feed into those basic mechanisms. The hunter-gatherer norms are those of a lost age, and we're not going back.

If Piketty is right, however, we might be on our way back to inequality of the kind seen in the late nineteenth century — or perhaps to something even more extreme. □

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