handsomely. Wages are therefore expected to outpace productivity for the next few years, despite the government's promise to use EU funds to boost skills.

Wage growth, in turn, could lead to price rises. The IMF expects Lithuanian inflation to exceed the euro zone's for the next few years, meaning that over time Lithuanian goods may become relatively more expensive.

The worry is that history will repeat itself. Lithuania may gradually lose competitiveness, just as Greece and Portugal did before the euro crisis. According to DNB, a bank, its current-account deficit will hit 2% of GDP by 2016, a 3.5 percentage point deterioration from 2013. Euro-zone membership and the associated cheap debt may amplify the country's weaknesses, not reduce them. ■

Private equity

Last hurrah

When buy-out funds throw good money after bad

COULD Four Seasons Health Care, Britain's biggest chain of homes for the elderly, be the latest business backed by private equity to topple over? Terra Firma, the private-equity group that owns it, has called in the advisory arm of Blackstone, another private-equity outfit, to ponder its future (there is no suggestion that Four Seasons will cease to operate). An analysis of how Terra Firma's ward got into trouble will undoubtedly focus on the debt that its owner piled onto it. But inducing the firms in which they invest to borrow sums they will struggle to repay is not the only way in which private-equity firms can be careless with other people's money.

Terra Firma bought Four Seasons for £825m ($1.3 billion) in mid-2012 from RBS, a bank, which took control of the struggling business at the height of the financial crisis. It paid with £325m of the funds it manages on behalf of outside investors and with £500m it had borrowed. As is common in private-equity deals, the debt of Terra Firma's fund was repaid using new loans taken out by Four Seasons. Higher-than-expected nursing costs and lower-than-expected payments from local governments, Four Seasons's main customers, have since squeezed its earnings, leaving it struggling to service its debts.

If Four Seasons defaults and investors in the Terra Firma fund concerned (it has several) end up losing money on the deal, it will be a depressing vindication for those who questioned Terra Firma's motives back in 2012. The deal was part of a last-minute shopping spree using money that, if not spent, would have had to be returned soon afterwards to investors in the fund. Some of them had asked Terra Firma not to spend the money, to no avail.

Such misaligned interests are relatively rare in private equity: a firm that riles investors will struggle to raise money for future funds. But Terra Firma had little hope of raising more money anyway, since the same fund had also been involved in one of the biggest private-equity fiascos of all time, the disastrous purchase of music label EMI in 2007, which cost investors £1.75 billion. Since then, few apart from Terra Firma's boss, Guy Hands, have been very upbeat about the firm's future.

If a private-equity firm's chances of raising new money evaporate halfway through a fund's life, spending its remaining cash willy-nilly becomes rational. There is always the hope of making up for past losses if new ventures pay off. Moreover, buying something (anything!) prolongs the fund's life, and thus the period during which the private-equity firm that manages it gets to collect management fees of 2% a year.

Some investors saw Terra Firma's eleventh-hour investments in 2012 as a desperate bet. The purchase of Four Seasons has certainly not worked out, although the smaller acquisition of a chain of garden centres may still turn a profit. This means investors will suffer big losses: according to PitchBook, a data provider, the Terra Firma III fund's internal rate of return this year is -8.8%, a shocking performance compared to similar funds such as Carlyle Europe Partners (9.3%) and Bridgepoint Europe (11.23%). On top of that loss, of course, will come the fees investors must still pay. ■

The status of economists

The power of self-belief

A new paper looks at how economists became so influential

"IF ECONOMISTS could manage to get themselves thought of as humble, competent people, on a level with dentists, that would be splendid!" said John Maynard Keynes, a British economist. Despite their collective failure to predict the financial crisis, let alone follow Keynes's injunction, economists are still very influential. They write newspaper columns, advise politicians and offer expensive consulting services to business-folk far more than other academics. A new paper* tries to explain why.

One reason, say the authors, is that economists have come to believe that they are superior. A survey in 1985 found that just 9% of graduate students in economics at Harvard strongly believed that economics was "the most scientific of the social sciences". But as economics became ever more mathematical, its practitioners grew in self-confidence. By 2003 54% of the graduate economists studying at Harvard strongly agreed with the statement. A glance at a popular blog for doctoral students in economics, econjobrumors.com, gives a taste of the contempt in which its users hold other disciplines. Sociologists "play around with big important ideas without too much effort or rigour," one econo-nerd asserts.

The authors point out that economists demonstrate their self-belief in subtler ways too. Articles in the *American Economic Review* cite the top 25 political-science journals one-fifth as often as the articles in the *American Political Science Review* cite the top 25 economics journals. Another study found that American economics professors were less likely

than their peers in other subjects to agree with the notion that "interdisciplinary knowledge is better than knowledge obtained by a single discipline."

The odd thing, the authors argue, is that we believe in economists almost as much as they believe in themselves. Journalists and politicians seek strong arguments and clear answers. Most academics are reticent types: historians, for instance, question whether you can learn anything from history. "For a moderate fee," jokes Deirdre McCloskey, an economic historian, "an economist will tell you with all the confidence of a witch doctor that interest rates will rise 56 basis points next month or that dropping agricultural subsidies will increase Swiss national income by 14.8%."

* "The superiority of economists", by M. Fourcade, E. Ollion and Y. Algan, MaxPo Discussion Paper 14/3.

Free exchange | Poor behaviour

Behavioural economics meets development policy

A BAT and a ball cost $1.10 between them. The bat costs $1 more than the ball. How much does each cost? By paying attention to how people actually think, behavioural economics has qualified some of the underlying assumptions of classical economics, notably that everyone is perfectly rational. In fact, the mind plays tricks, dividing up $1.10 (in this example) neatly into $1 and 10 cents, rather than correctly into $1.05 and 5 cents. People also tend to copy others and often prefer to co-operate rather than compete. For these reasons, some of the simplifying assumptions of economics are not always correct: people do not act in every instance in their long-term self-interest; they do not weigh up all the costs and benefits before taking a decision.

Many of the insights of behavioural economics were based on studies of American university students and other privileged folk. But they apply with greater force to the poor—both the poor in rich countries and the more numerous inhabitants of developing ones. Behavioural economics therefore has profound implications for development. The new "World Development Report", the flagship publication of the World Bank, considers them*.

As the report shows, the poor are more likely than other people to make bad economic decisions. This is not because they are irrational or foolish but because so much is stacked against them. They are more likely to lack the basic information needed to make good choices, such as which fertiliser to use or when to apply it. They are more likely to live in societies which hold mistaken or harmful views, such as that girls should not go to school.

Conventional economic thinking assumes the poor will want to earn their way out of poverty. But as studies from countries as different as Ethiopia and France show, poverty makes people feel powerless and blunts their aspirations, so they may not even try to improve their lot. When they do, they face obstacles everywhere. They have no margin for error, making them risk averse. If they do not know where their next meal is coming from, saving and investing for the future is hard. George Orwell said, "Within certain limits, the less money you have the less you worry." He was wrong. The poor are subject to exceptional levels of stress: childhood sickness is more likely to be life-threatening; crop failure can lead to destitution. And stress makes good decision-making harder. Above all, the poor lack the institutional framework which, in the West, improves decisions. Everywhere, people underestimate the benefits of education and save too little for their retirement. But children in the West go to school as a matter of course; pension systems make some savings automatic. Poor countries provide few such props.

All this helps explain why the poor stay poor; why (for example) subsistence farmers do not buy fertiliser or put children into secondary school, though they would benefit from doing so. More important, though, behavioural economics provides a different way of thinking about some of the problems of poverty.

Traditional development programmes stress resources and markets. People are poor, the argument goes, because they lack resources: not just money but roads, clinics, schools and irrigation canals. The job of development is to provide those things. And since resources also need to be allocated properly, prices have to be right. So a lot of development is about freeing prices and making markets more efficient.

A behavioural approach to development is different. It focuses on how decisions are made and how they can be improved. For example, in Bogotá a conditional-cash transfer programme paid mothers a monthly stipend if they took their children to school. Attendance during the school year was good but re-enrolment rates were low. A shift in the timing of the hand-out—withholding a part of the regular payment until just before the start of the school year—boosted enrolment sharply. This makes little sense in conventional economic terms: going to school is so beneficial that families should not need extra incentives and the overall sum available did not change. Yet the pay-off was substantial.

Actions like this sound marginal. Economists should be paying attention to the details of policy anyway. It may not seem to amount to a profoundly different approach—but it actually might.

A tweaking revolution

Some small-scale policies turn out to be far from marginal. A programme in Jamaica in the 1990s taught mothers of chronically malnourished toddlers how to play with them in such a way as to encourage greater verbal and physical skills—a behavioural tweak. Twenty years later, the average earnings of these children (among the most deprived in the country) were higher than those of children who had not been malnourished, and far higher than malnourished children who were not part of the programme. Paying attention to how the poor actually think would also imply big changes to financial-inclusion policies, encouraging financial products that people want to buy.

Moreover, development experts have their biases and blind spots, like anyone else. In principle, behavioural development could sit happily alongside the traditional sort. In practice, the two will compete for resources and professional attention.

A behavioural approach to poverty is not new. The World Bank has long had a behavioural unit. The Poverty Action Lab at the Massachusetts Institute of Technology has championed randomised control trials to test tweaks to policy. But by making this the subject of its main annual publication, the Bank has brought behavioural economics into the mainstream of development. It is likely to prove a challenge to traditional ways of combating poverty, as well as a complement to them. ■

* "World Development Report 2015: Mind, society and behaviour".

Economist.com/blogs/freeexchange

ets, and is planning a heavy-launch vehicle which could compete with the SLS. If that comes to fruition, it will almost certainly be cheaper than the government's machine. SpaceX has spent less than $1 billion developing both the Dragon and the mid-sized rocket needed to take it into orbit. Officials at the Government Accountability Office guess that NASA might spend $22 billion on Orion and the SLS by 2021, when the first crewed flight is due.

Then there is history. Apollo had a clear goal: beat the Soviets to the Moon and thus demonstrate that capitalist science was better than the communist sort. No such spur exists today, though India and China have both made noises about Moon missions. As part of the ideological knife-fight that was the cold war, America was willing to spend huge amounts of money on what was, basically, a gigantic piece of propaganda. In 1966, at the height of its pomp, NASA consumed 4.4% of the American government's spending. Today, the figure is 0.5%.

Veteran space-watchers might therefore be forgiven for being cynical about Orion's prospects. Apollo was originally (at least, in the minds of space scientists) intended to lead to a permanent Moon base. Plans to explore Venus and Mars in the 1970s came to nothing. At the end of the 1980s, George Bush senior also had plans to explore Mars. So, in the early years of this century, did his son, George Bush junior. It may be that, if its mission succeeds, the mere fact that Orion has actually flown in space will give it enough momentum to stop it being cancelled. And if China really does plan a trip to the Moon, then America may feel compelled to fight another expensive propaganda war. But it would take a brave person to bet on it. ■

Neutrino astronomy

Balloon with a view

An experiment in Antarctica may solve the mystery of cosmic rays

MEET ANITA. Strictly, ANITA III—for she is the third iteration of the Antarctic Impulsive Transient Antenna. Her job, when she is launched sometime in the next few days, will be to float, suspended from a giant balloon, over Antarctica's ice, in order to record radio waves which that ice is giving off. These radio waves are generated by neutrinos passing through the ice, making Antarctica the biggest neutrino-detection laboratory in the world.

The particular neutrinos that ANITA seeks are of extremely high energy. Where they come from, no one knows—nor, strictly speaking, is it actually known that they exist, for ANITAS I and II, which were smaller devices, failed to find them. But theory says they should be there, generated in whatever giant explosions also create cosmic rays.

Up, up and away!

Cosmic rays are high-velocity protons, sprinkled with a smattering of heavier atomic nuclei, that fly through space until they hit something such as Earth's atmosphere, when they disintegrate into a shower of other particles. They have been known for a century, but their origin remains mysterious because, being electrically charged, their paths are bent by the galaxy's magnetic field. That means the directions they come from do not point to whatever created them.

Neutrinos, however, are electrically neutral, as their name suggests. Their paths should thus point back towards their origins. Neutrinos do not interact much with other sorts of matter, but when one of ultra-high energy does so, the result is a shower of particles travelling at speeds which exceed that of light in ice. An object travelling faster than light's speed in the medium through which it is passing will generate electromagnetic waves. These are known, after their discoverer, as Cherenkov radiation. And it is pulses of radio-frequency Cherenkov radiation, the electromagnetic equivalent of a sonic boom, which ANITA is looking for.

Once airborne under her balloon—an object made of cling-film-like plastic that, when fully inflated, will be a fifth of the size of a football stadium—ANITA will take advantage of the polar vortex, a wind in constant revolution around the pole. She will fly at an altitude of 35-40km, which will mean her antennae can see 1.5m km^2 of ice. Ultra-high-energy neutrinos travelling through the ice are thought to interact with it and produce Cherenkov radiation about once per century per km^2, so an area of this size would be expected to yield about 40 bursts a day. ANITA will complete several laps of the continent, each lasting about 15 days. Then the balloon will be cut loose, and she will deploy a parachute and be guided back to the surface for re-use.

Astrophysicists are not the only people rubbing their mittens together in expectation of the results of this experiment. The neutrinos ANITA is looking for are far more energetic than anything produced by the Large Hadron Collider, the world's most powerful particle accelerator. That means they may obey hitherto unperceived extensions of the laws of physics. One possibility is that, among the Cherenkov-radiation-generating particles produced when a neutrino collides with the ice, there may be an occasional miniature black hole.

That would be particularly exciting, because such black holes might themselves disintegrate in a characteristic puff of radiation named after another physicist, Stephen Hawking. If Hawking radiation exists, it means black holes are not truly black—a discovery which would almost certainly win Dr Hawking a Nobel prize.

Though it is not designed to search for Hawking radiation, ANITA would probably see it if it were there. And, since Hawking radiation is created, quite literally, out of nothing (the particles it is made from emerge from the vacuum of space and then steal the energy needed to become real from the black hole itself), that would assist understanding of a very strange piece of physics indeed. ■

Disseminating science

Lighten our darkness

The revolution in academic publishing continues

PUBLISHING scientific journals used to be pretty straightforward. You received manuscripts describing researchers' latest work, ran them past a few experts in the field, typeset them, printed the result, and sold it to libraries, universities and interested individuals—often at deliciously high margins.

Not any more. Such journals, like in every other corner of publishing in the digital age, are in flux. Increasingly, publishers are competing by offering additional services that make their lives more complicated, but help authors and readers.

One such service, based on the principle of, "if you can't beat 'em, join 'em", is to let subscribers share papers of interest with their peers and colleagues, but to do so in a way that allows the publisher to ▸▸

keep control, and also to extract useful information from the process. Two of the big boys, Elsevier and Springer, do this already. Now, they are being joined by Nature Publishing Group (NPG), whose flagship magazine *Nature* is the highest-profile science journal in the world.

Starting this week, subscribers to any of NPG's 49 periodicals can create a link to any article they have legitimate access to and share it with others in any online forum. Clicking the link opens the paper (together with any annotations the sharer may have added) using software called ReadCube. This program, devised by Digital Science, a firm not at all coincidentally owned by NPG's parent company, Macmillan, lets people view the paper, but not download or print it.

A hundred media outlets, including *The Economist*, will receive the same privilege. For at least the duration of a year-long trial, links to NPG papers from these organisations' apps and websites will open the paper in question, so that those who wish to follow something up in more detail may do so.

Share and share alike

On the face of it, this move brings into the 21st century one of the two founding aims of *Nature*: "to place before the general public the grand results of scientific work". But as to the other, "to aid scientific men (sic) themselves, by giving early information of all advances made", the effect is less clear. The effort is entirely different from open-access publishing (making papers freely available to all and sundry from the outset), and detractors worry it will draw attention away from the campaign to move the whole of science publishing into the realm of open accessibility.

That concern is probably misplaced. NPG is merely making use of the new digital marketplace. Though "dark sharing", as the existing, informal circulation of papers is known, is technically a violation of copyright, publishers have turned a blind eye to it, since cracking down on it would annoy an awful lot of their readers. However, dark sharing denies publishers data about who is sharing what with whom. This is information their marketing departments would love to have and, by permitting widespread sharing, NPG's plan will harvest it.

Publishers will continue to build up their digital business parks, offering more and more services beyond article sharing. Along the way, they will try to help science itself. For example, by making papers more readily available, ReadCube and its confrères make them more likely to stimulate, and be cited in, other work. Open access it is not, but NPG's latest move looks like a useful attempt to find a compromise between the interests of authors, publishers and subscribers. ■

Animal culture

Left or right wing?

To great tits, tradition seems important

IN THE days when milk was delivered each morning to the doorstep of almost every house in Britain, enterprising great tits sometimes learned to peck through the foil bottle-tops to get at the goodies beneath. These avian pioneers were quickly imitated by others, with the result that cream-pillaging populations emerged in several parts of the country. Cream-pillaging was one of the first recognised examples of animal culture: the transmission of behaviour from one individual to another, so that it persists down the generations. But, oddly, it was never followed up experimentally in the wild, to understand the nuances of the process.

That has just changed, with the publication in *Nature* of an experiment which Lucy Aplin of Oxford University conducted in nearby Wytham Wood—probably the most intensively studied habitat on the planet. Most of the great tits in this wood are known individuals, and are fitted with transponders so that they can be followed around. Dr Aplin was thus able to track in some detail how behaviour spreads, and also how tits, like people, often seem pressed into social conformity.

Red? Blue? I prefer gold

Wytham has several subpopulations of great tits, each living in its own neck of the wood. Dr Aplin captured two males from each of eight of these areas, to act as her initial experimental subjects. Instead of milk bottles, she and her colleagues used specially devised boxes that, if manipulated correctly, deliver a tasty mealworm to a tit. Each box has a sliding door at the front, painted blue on the left and red on the right. Opening it either way will yield a worm, but the captured tits did not know this. Those from two of the subpopulations were taught, by letting them watch how a savvy demonstrator bird did it, that sliding the door leftward was a rewarding behaviour. Those from three other subpopulations were taught to slide it rightward. Those from the remaining three parts of the wood were taught nothing, and acted as controls. The team then scattered the wood with boxes, 250 metres apart, and released the captured birds whence they had come.

In the areas where the released birds knew how to open the boxes, the others quickly learned to do so. After the boxes had been out for 20 days over the course of a month, three-quarters of the resident tits had opened a box at least once, almost always using the method introduced by the re-released males. In one of the three control areas, half managed it, by copying birds who had worked the mechanism out by trial and error. But in the other two controls, only a pitiful 9% and 31% of the tits opened a box even once.

These results suggest that, for great tits, traditions are easy to create. To find out how persistent such traditions are, Dr Aplin and her colleagues came back nine months later (a period in which, on average half the resident tits had died and been replaced by other individuals) and put some of the boxes out again. They found three things. First, enough tits in each area remembered the old days well enough to raid the boxes, thus enabling others to learn how to do so. Second, the tradition of whether to open to the left or to the right was preserved. Third, tits that had moved (as some did) from an area with a different tradition changed their behaviour to conform with local practice.

Why that should be, Dr Aplin does not know. But it suggests that, like human beings, great tits are conformists at heart. ■