

Opinion

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Demonising data results in Modi being even more cut-off

NSSO consumption data is problematic, but by censoring data, govt is signalling that it only wants a certain narrative

EVENTHOSE WHO, like former prime minister Manmohan Singh, believe the “perilous state of fear, distrust and lack of confidence among citizens is a fundamental reason for our sharp economic slowdown” (*bit.ly/2Kzqzqi*) would agree that, at least right now, the economy isn’t contracting; nor is near-zero growth. Yet, that is what the latest household consumption survey of the NSSO indicates is happening. *Business Standard* carried a scoop of the latest report, which says consumer spending has contracted for the first time after four decades—in real terms, it fell 3.7% on average in FY18. If consumer spending, which is over 55% of the economy, is contracting, and we know that investments, which comprise a third of the economy, are growing at just 9-19%, this means the economy nearly stalled in FY18 despite the 15% hike in government expenditure; government spend comprises around a tenth of total GDP. Plug in the 3.7% NSSO-contracting into the GDP numbers, and you find the economy contracted around 1% while the official GDP data says it grew 7.2% in real terms! The government, on its part, has refused to make the NSSO report public, saying that its findings are flawed. And, they are flawed since, as economist Surjit Bhalla has been pointing out for years, each survey of the NSS seems to capture less and less of India’s consumption as measured by the GDP data.

Similarly, in the case of the jobs data where, at the beginning of the year, the government held back NSSO’s Periodic Labour Force Survey (PLFS) that showed a poor jobs-creation—once again, *Business Standard* scooped the report—as the government pointed out, there were problems with the survey. A major one, for instance, was that while less than a fifth of Indians have studied beyond Class 10, over 75% of those covered by the PLFS survey had studied beyond Class 10; in other words, the sample was not representative of India, and it certainly did not compare with previous surveys which had a sample whose educational qualifications that better mirrored those of the country’s population.

None of this, however, can justify suppressing reports. Why not release the reports and let researchers point to flaws in them? If the government is going to decide what report is *kosher*, every report that is contrary to the official view is in danger of getting dropped. Nor is it true that all reports that are released, such as those on GDP or IIP, are completely without error. A very large number of reputed economists/statisticians have said, after the GDP series was re-based some years ago, that they found the sudden jump in GDP growth quite unbelievable—the 7% growth, they said, felt like the old 5%—and even government economists find it difficult to justify the sharp swings in the IIP. The frequent, and sharp, revisions of GDP/WPI/IIP data also seem to suggest there is a problem with the series. Apart from the fact that, like in communist dictatorships, no one will ever know just what is happening if the government decides what data to release, this poses a real danger to the government itself. If the Modi government doesn’t, for instance, know that investment levels are falling—or if people who see the official data don’t keep pointing this to the government as its failure—how will it come up with policies to fix it? Or, in the case of agriculture distress, how will it know it needs to take action? The higher you go up in any organisation—and this applies even more strongly to government—the less you know about what’s going on; if even the data is going to be censored, how is prime minister Modi to know what is going on? Those censoring the data are only ensuring that the prime minister is more cut-off from reality; they can’t be his well-wishers.

Fixing deposit insurance

Charge different premium depending on bank quality

APART FROM A generous hike in the value of bank deposits that are insured by the RBI-owned Deposit Insurance and Credit Guarantee Corporation (DICGC)—India’s GDP has risen 25 times since the ₹1 lakh limit was set in 1993—one of the first things DICGC must do is to charge differential premiums based on the riskiness of the bank whose deposits are being insured. For several decades, almost all the money paid out by DICGC when a bank fails has been to deposit-holders of cooperative banks; to that extent, since the bulk of the premium paid to DICGC is by the deposit-holders of commercial banks—that is where the bulk of bank deposits are—they are really giving a free ride to the cooperative banks. If, instead, the DICGC starts charging the premium based on riskiness, deposit-holders of better banks like HDFC Bank or SBI will pay a lower premium than those of, say, a Punjab & Maharashtra Co-operative (PMC) Bank Limited; these banks, then, will pass on this charge to their deposit-holders by giving them a lower interest rate on their deposits. And, since cooperative banks really attract deposit-holders by their higher interest rates, this will curb some of that. Since not all commercial banks are as sound as HDFC Bank, say, and they too will have to pay higher deposit insurance, this will also give them an incentive to improve their functioning.

Ideally, of course, DICGC should insure all deposits, or RBI should encourage banks to do this beyond the levels that DICGC insures. But, it is not clear if there are insurers/reinsurers who would like to take on such a large liability even if the default risk is low; and even if they do, the premiums may become too high. Of course, since the credit risk really depends on how well RBI is regulating these banks—it is, hopefully, to finally get complete powers over cooperative banks—the premiums will decline once RBI regulation is seen as more effective.

While fixing the new level of deposit insurance, the government would do well to keep in mind that, if a large number of depositors—or depositors with large deposits—don’t feel their money is safe and move it to post-office accounts or to the stock markets or somewhere else, interest rates will rise and this will hurt the economy. Politicians are happy not to insure big deposits on grounds these are owned by the well-heeled, but as SBI data shows, while just 0.2% of bank deposits are of more than ₹1 crore, these comprise a third of the value of all bank deposits. And while it is true that, in the last several decades at least, there has been no failure of a commercial bank—RBI has ensured several weak private banks were taken over by other banks—it is worth keeping in mind that when US-64 collapsed around two decades ago, all but the small investors took a 30% hit; so, if big depositors are worried about the safety of their deposits, it is not without reason.

FeeFOLLY

Delhi government needs to check its performance before deciding to take over schools over fee hike

THE DELHI GOVERNMENT has threatened Apeejay, a private school, with takeover or a cancellation of its recognition over the school’s decision to hike fees. This, despite the matter of capping of fee hikes by private schools still being heard by the Delhi High Court. While it is true that school fees have skyrocketed, increasing the cost of education for households, the fact is that teachers’ salaries, infrastructure requirements, etc, have also risen.

The Delhi government will do well to look at its own record before it threatens private schools with takeover. An analysis of Delhi budget 2018-19 numbers by Praja Foundation shows that the average annual per student spending at Delhi government schools was ₹75,056. With many vacancies remaining unfilled, this cost would have actually increased in this year’s budget. The 2018-19 figure is a 44% jump over the figure for the year before, which was a 31% increase over the 2016-17 figure. While a school like Apeejay charges roughly ₹1.25 lakh per annum, private schools are allowed to increase fees by just 5-10% per annum. Praja analysis also shows that the government has precious little to show for it—of the 2,59,705 students enrolled in Class 9, 56% did not reach Class 12; the figure was 19% for Central schools, and 26% for private schools. Pass percentage in Class 10 declined from 99.09% in 2011-12 to 68.9% in 2017-18 while in private schools, it declined from 97.9% to 89.5%. It is true the Delhi government granted land to 325 schools, but the purpose of land grants was to increase schools, not dictate fee hikes.

THE REAL MAINSTREAM

HYDROGEN CANNOT COMPETE WITH ELECTRIC VEHICLES TODAY; ITS VIABILITY WILL FALL FURTHER AS ELECTRICITY PRODUCTION MOVES TO RENEWABLE SOURCES

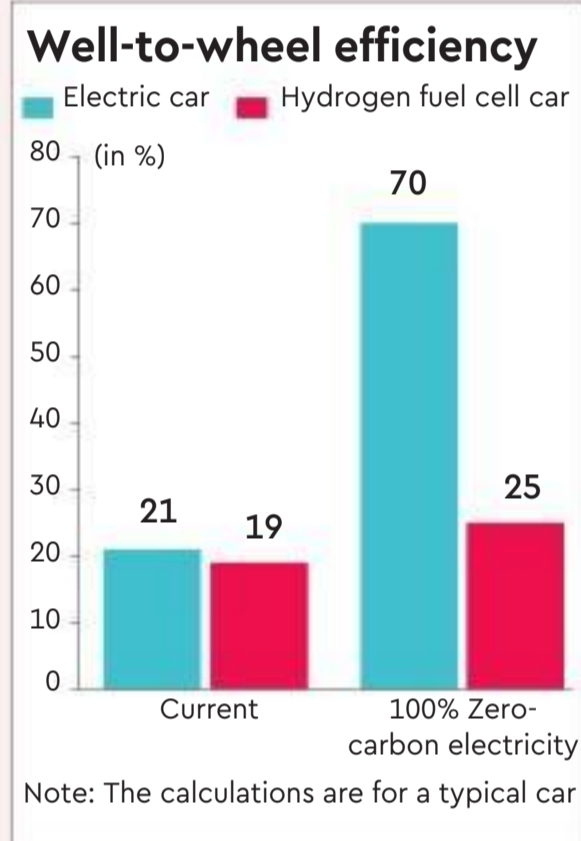
Hydrogen or electric vehicles?



LOCAL BODY ELECTIONS
Rajasthan chief minister Ashok Gehlot

It is a matter of happiness that people have given mandate considering the performance of the government ... We would not leave any stone unturned to do people’s work

EXASPERATED WITH THE status of air pollution in the region, the Supreme Court recently directed the Union government to explore the feasibility of using hydrogen technologies as a permanent solution to the air pollution in Delhi-NCR and other parts of North India. In the past also, the Supreme Court has shown interest in getting hydrogen-fueled buses on NCR roads. The question is: Are hydrogen vehicles the best solution to clean the air of Delhi-NCR? Worldwide, there is a race between hydrogen and electric vehicles (EVs) to capture the market of the zero-emission vehicles. While China and the US have put their money behind electric cars, Japan and Korea are betting big on hydrogen. Currently, EVs have taken the lead, with millions of electric cars and two-wheelers already on the roads. This year alone, companies across the world are going to unveil at least one hundred models



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of electric cars and two-wheelers. But, the Japanese companies are investing heavily in hydrogen technology, and lobbying across the world (including with NITI Aayog) to push for hydrogen mobility. Should India be promoting hydrogen vehicles?

Fundamentally, a hydrogen vehicle (HV) is also an EV; it runs on a motor powered by electricity. What makes it different from an EV is the source of electricity. While EVs have a big battery bank to store electricity, HVs have a small battery continuously charged from an onboard fuel cell. This fuel cell produces power from the hydrogen gas stored in the vehicle tank.

Both EVs and HVs have zero-emissions from the tail-pipe, and hence, both will significantly improve local air quality. HVs have the significant advantage of faster refuelling. Like a petrol vehicle, it takes a few minutes to refill the hydrogen tank. EVs, on the other hand, require hours to charge their batteries. Even the most expensive Tesla car needs at least an hour to charge. But, this is where the advantage of HVs ends.

HVs have a significant disadvantage of cost, efficiency, and emissions as compared to EVs. Let us understand this in a little more detail.

Vehicle technologies are evaluated on the basis of their energy consumption, efficiency, and emissions performance in two separate areas: Well-To-Tank (WTT), and Tank-To-Wheel

(TTW) phases. WTT refers to the efficiency in delivering the fuel from the oil/gas well to the vehicle tank. TTW evaluates the efficiency of the vehicles themselves. The Well-to-Wheel (WTW) efficiency combines these two components, and is the universally accepted measure for comparing different technologies.

Currently, both electricity and hydrogen are produced from fossil fuels. Most hydrogen is produced by natural gas, while power is produced by burning coal and natural gas. Studies done in India indicate that with the current fuel mix, HVs have a slightly lower efficiency than EVs.

The efficiency during the WTT phase of EVs is low compared to that of HVs because the efficiency of coal power plants is about 30%, and the transmission and distribution losses are above 20%. But, EVs outperform HVs on vehicle performance. EVs lose about 10-15% of their energy in battery and motors while HVs lose 45-50% because of high losses in the conversion of hydrogen to electricity. Overall, the WTW efficiency of a typical electric car in India is about 21% compared to 19% of a similar hydrogen car. As the percentage of electricity produced from coal plants reduces and more and more power is produced from renewable sources, the WTW efficiency of EVs will keep outpacing the HVs.

In a climate constrained world,

both hydrogen and electricity will have to be produced from renewables and other zero-carbon energy technologies like hydropower, nuclear, and biomass. Hydrogen will be produced by water electrolysis (a process in which electricity is used to break the water molecule into hydrogen and oxygen). In a zero-carbon electricity world, it will make no sense to have HVs. HVs would first use electricity to make hydrogen, and then, hydrogen in a fuel cell to produce electricity. EVs, on the other hand, can use the energy from the grid straight away. That is why in the future, EVs will be at least two to three times more efficient than HVs.

But, perhaps the biggest problem is the creation of separate infrastructure for hydrogen. An EV can be charged at home, or at a commercial charging station, with minor changes in the existing electricity infrastructure. For HVs, we will have to create a brand new, expensive infrastructure to produce, transport, compress, store, and then dispense hydrogen from a hydrogen pumping station. The cost of infrastructure required for EVs is minuscule compared to that of setting-up the hydrogen infrastructure. The question we need to ask is why do we need a new infrastructure to run our cars when an existing one is already available for use?

While I respect the sentiments of the honourable court, I can vouch that HVs will not make any dent in the air pollution levels of Delhi-NCR in the near future. The reason is simple: it will take time, and massive amounts of money to set up the hydrogen infrastructure required for a large-scale deployment of HVs. But, we can get EVs on the road faster, cheaper, and in large numbers. It, therefore, makes sense to push for a consistent policy that leads to quick large-scale deployment of EVs.

Climate change is a financial crisis, too

Financial institutions face climate-related risks that go far beyond the issue of social responsibility. One way or another they could end up facing trillions of dollars in cumulative losses

GRAHAM STEELE & GREGG GELZINIS

Bloomberg

THE PEOPLE WHO oversee America’s financial system seem to think that climate change isn’t their problem. As one official quipped in recent congressional testimony, he is “not a meteorologist or a climate scientist.” They should think again. By failing to take action, regulators are leaving the country exposed to a devastating crisis.

Financial institutions, from banks to insurers to asset managers, face climate-related risks that go far beyond the issue of social responsibility. One way or another—be it through natural disasters and forced migration, or decisive moves to transform energy use—they could end up facing trillions of dollars in cumulative losses. These could come in the form of defaulted mortgages in flooded areas, soured investments in regions that become uninhabitable, or non-performing loans to shuttered coal-fired power plants.

Worse, the financial sector is compounding the problem by supplying capital to the industries driving climate change. Over the past three years alone, the six largest US banks provided more than \$700 billion in financing to the fossil-fuel industry. As of 2016, large insurers held \$528 billion in such investments, including coal, oil, gas and related utilities. Even as some financial intermediaries have reduced their exposures to carbon-intensive sectors, the largest asset managers increased their holdings by 20% from 2016 to 2018, with the three biggest US asset managers among the leading holders of coal investments.

This willingness to finance carbon-intensive activities, without adequate regard for the longer-term consequences, jeopardises the goal of achieving net-zero greenhouse gas emissions. The world will never close the production gap, the disparity between energy produced by fossil

fuels and clean energy, without addressing the financing gap between those respective industries. By one estimate, some \$200 billion in capital must be reallocated in each of the next 40 years just to limit global warming to 2 degrees Celsius—the scenario outlined in the Paris Agreement.

Some might take comfort in the idea that losses will be spread over many decades, providing ample time to adjust. Don’t. Environmental changes and policy responses are inherently unpredictable, as is the market’s propensity to suddenly re-evaluate the prospects of entire industries. Dislocations can happen globally and at a moment’s notice—a

scenario that Bank of England governor Mark Carney has called a “climate Minsky moment.” At the moment all we have are estimates, but the damage could exceed the scale and scope of the 2008 financial crisis.

Financial institutions need to prepare and change their behaviour. To that end, they must accurately price the risks that they are assuming. This is where regulators come in. For example, they could include climate change in bank stress tests, and restrict payouts to shareholders if institutions lack the capital needed to survive losses. They could also directly increase capital requirements, requiring banks to have more skin in the game when making climate-intensive investments. Also, the Financial Stability Oversight Council—charged with monitoring and addressing systemic risks wherever they might

appear—should be focused on mitigating climate-related risk outside the banking system.

Unfortunately, these and other powers are useless in the hands of watchdogs who lack the will to use them. The inertia of the current crop of US financial watchdogs stands in stark contrast to the International Monetary Fund and central banks in England, France and Australia, which are all waking up to the risks. So far, though, even the most ambitious proposals have focused primarily on approaches such as greater disclosure and monitoring of climate risks—the shortcomings of which are evidenced by the fact that the dirtiest industries are already largely in compliance.

Officials must act more aggressively, lest the carbon bubble keep expanding until it pops. Financial losses can cascade through the real economy and threaten the retirement funds of regular folks, many of whom may not even know that their pensions are filled with risky investments. Effective regulation can ease the transition to a clean energy economy, and protect manufacturing jobs and vulnerable communities.

Dithering will leave the world exposed to a threat much greater than the human error that precipitated the last crisis. Science is not a counterparty that can be negotiated with, the planet is not a contract that can be restructured, and there is no bailout for a climate catastrophe.

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LETTERS TO THE EDITOR

Licence to skill

It is a prerequisite to focus on skill development, and allocate sufficient funds to accomplish the objective, especially when leading international economies have already created inroads, and India has a bit of catching up to do in areas of 5G/IOT & blockchain to promote innovation during design of sophisticated products and services. It is important to accelerate the pace of digitisation—authorities ought to ensure that well-established pioneer institutions retain their sheen in the longer run. Recent global education rankings highlight the rising need to improve upon global academic perception, strategic partnerships, and impact generating research publications. Top-notch technology and management institutes are expected to lead to gain greater global recognition. It is also essential to inculcate a culture of concept based learning, and move away from the rote approach, especially within the professional streams. Although, an element of social commitment and gender equity in education does assume priority, numbers cannot undermine the need for quality and competitiveness in the sector. It is rarely feasible to render higher education at a low cost and meet global benchmarks as well. It is also important to curb the rising brain drain by generating lucrative growth-opportunities, provide the desired level of funding to universities, incentivise staff, and facilitate a controlled autonomy. Relaxed norms on foreign students and faculty, too, must be established to promote exchange of ideas, and encourage the adoption of best practices. The authorities have their work cut out as development, advanced digitisation, job growth, and a higher capacity utilisation demand relentless attention and effort.

— Girish Lalwani, Delhi

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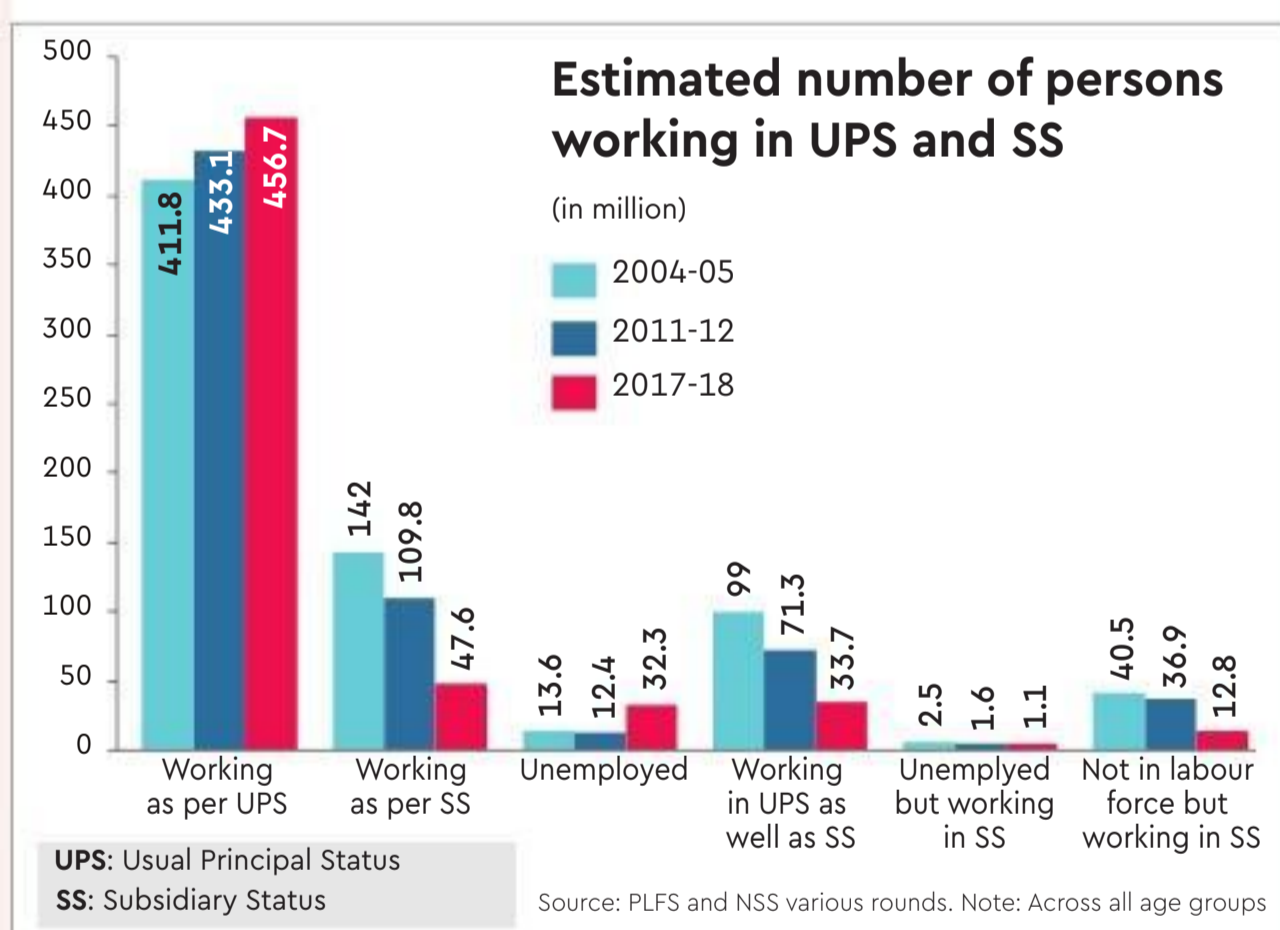
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Apples, oranges and employment

It's time India moves away from the larger sob-stories of falling/stagnating employment, towards where the light and dark spots are, and what they reveal about a rapidly-changing economic structure



EMPLOYMENT HAS BEEN the subject of much argument over the past few years, and it appears that it will continue to be so. We conducted a simple exercise to understand how employment patterns are changing over time—we used the comparable PLFS and NSSO data of surveys conducted in 2004-05, 2011-12 and 2017-18. And within that, we analysed the employment reported as per usual primary status.

But first the methodology. Within the ambit of NSS surveys, there are two methods of calculating employment and unemployment—the Usual Primary method and the Usual Primary Subsidiary method. We use the former; some others use the latter. There is nothing extraordinary about what we do and what others do, except that our aggregate results differ. Note that only the aggregate results differ, the patterns don't, because we have a primary look at the underlying patterns that make up the whole, while others concentrate on the aggregate figures—be they related to employment or the other side of the coin, unemployment.

So, what is the difference? To put it simply, the NSS and later PLFS questionnaire ask each person whether they were employed and what was the primary and subsidiary work? Those who report their usual primary status to be homemakers, students, retired or unable to work tend to be classified as out of the labour force. Now, the interesting thing is that some people who classify their primary activity to be not in the labour force may also take up some employment for a limited amount of time (less than six months). This is subsidiary employment that is for only a minor part of the preceding year.

The question, then, is, should it be included in total employment figures? What are the pros and cons for subsidiary employment inclusion or exclusion? We argue here that it is time policy focused only on primary employment and discarded the Planning Commission method of adding subsidiary work to total employment figures.

In the accompanying table, please note that while the Usual Principal Status figures show a rise of about 45 million, that of Subsidiary Status shows a

fall of about 94 million. Of this 94 million, about 65 million already have a Principal Status, so it is not that they are out of a job. That mostly leaves those not in the labour force with a Subsidiary Status denoting work, their numbers have fallen by about 27.7 million and were about 12.8 million in 2017-18—falling steadily throughout the period.

Moreover, adding Subsidiary Status jobs with Principal Status jobs will necessarily yield wrong insights into how employment is changing in an economy marked by rapid technology changes.

That primary employment is rising gives us much hope to build upon. Analysing its patterns, as mentioned, will provide insights into how to accelerate those changes that are creating greater opportunities. The fall in subsidiary employment has a different colour, and it needs to be addressed separately.

Finally, what work is done under Subsidiary Status? The bulk of the work is for household enterprises and most of those are unpaid. And if that is falling, why is it of policy interest? There is a very large literature in the country on disguised unemployment and unproductive and extremely small household enterprises. Employment marked by Subsidiary Status largely reflects that element. We, instead, focus on the larger problem of primary employment.

We find many such dark spots—less educated, self-employed, the agricultural-cropping sector, many manufacturing segments, less educated women, rural areas, etc. But we also find many bright spots—middle school educated, graduates, many personal services, live-stock sector, agricultural services, etc. There is a deep structural shift occurring in the Indian economy, and a fascinating and rich picture is emerging as more data is accessible.

We would be more keen on seeing a wider discussion on these patterns, because that will better help devise economic policies that can impact employment more. Whoever estimates the numbers, it is time we moved away from the larger sob-stories of falling/stagnating employment, towards where the light and dark spots are and what they reveal about a rapidly-changing economic structure.

Gold standard for gold in India

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Creating a robust gold ecosystem in India and setting a world-class standard

ALTHOUGH GOLD'S CONTRIBUTION to the current account deficit has reduced since 2012, the net dollar outflow has more to do with the design of the trade than the affinity of people towards gold. Some large consuming countries (like Turkey), when faced with a similar issue, redesigned gold trading in their countries, making it integral to economic growth. The result is, these countries have active mining, refining and bullion banking, and gold trading is now transparent, with material contribution to GDP.

Streamlining supply and demand requires an ecosystem that carries incentive for all the stakeholders, including consumers, that encourages one to operate within the official network. This ideal scenario can get quickly shot down with a 15.5% tax (customs duty plus GST) arbitrage that exists. We need a holistic approach to gold with regulatory change, infrastructural development and phased implementation. The timing to bring this transition can't get better than now.

Indian households combined hold more than a trillion dollars of gold, and it's possible another trillion would get accumulated in the next 25 years. Failing to streamline flow and consumption through an organised trade or taking a more straightforward path by imposing curbs on consumption, both can have a detrimental effect on the economy.

A holistic approach: Let us fast forward to an era following appropriate reforms in the Indian gold market—the consumer should be active in gold accumulation plans sold through scheduled commercial banks. Jewellers would in no form be able to collect deposit even against advance receipt from retail consumers. Consumers will have an option to redeem this gold in the form of jewellery from jewellers empanelled by banks. Banks would be leasing or selling this gold to jewellers. Consumers would be able to use the same as collateral, it'll be just as fungible as holding physical gold 24/7, they could liquidate at the hit of a button and transfer cash to their savings account. Banks, if the opportunity so suggests, will export bullion sourced from accredited refiners. Refiners get accreditation, subject to adherence to pre-defined guidelines on refining and compliance related to sourcing; sourcing could be in the form of locally-sourced scrap, imported dore (unrefined gold) or gold mobilised through a revamped gold monetisation scheme. With more accredited refiners and an increase in the scale of operations, there will be stronger reasons for opening the Indian gold mining sector. Domestic bullion banks get to structure a financing arrangement between miners and refiners.

Economy first: Retail consumers' trust in the system grows with banks and post offices in the distribution system. It brings an end to fraudulent practices, while not draining liquidity. There will be a gradual shift to investment gold than ornamental gold. There will be a significant shift to jewellery with higher value addition over plain gold; artisans would be a more dignified class of workers. A substantial part of the scrap market would have shifted to the formal sector. The network of vaulting and logistics companies would be on global standards, as volumes would support scale. Banks would have developed a local lease market, detached from international lease rates. Through all these, traceability and accountability would be established across the value chain for a majority section of the trade. More importantly, gold imports would be current account-neutral.

Making it world-class: Look at the developed markets for gold, such as the UK (trading or supply market), the UAE, Switzerland, Singapore (centres for refining and trading), Turkey and China (closest we can relate India to). But China is battling gold being smuggled out at volumes more than volumes that get smuggled into India, while Turkey has its geopolitical uncertainties. India is just at the beginning of growth curve in gold supply chain—it is supported by lessons that highlight the importance of speed of transaction and settlement, traceability, better compliance and the significance of data analytics. Spot exchange is a means of getting to a more robust, organised, traceable and liquid gold market. But a spot exchange has to be supported with appropriate India good delivery standards, a robust gold monetisation system, and bullion banking supported by technology.

DELHI IS CONSIDERED one of the most polluted cities in the world. Air pollution is caused due to rising number of vehicles, industrial pollution, construction activities and a lessening green cover not commensurate with rapid urbanisation. Air quality from mid-October to mid-November is worst, often slipping from severe to hazardous category. A major reason ascribed to poor air quality is stubble burning in Punjab, Haryana and parts of UP. The situation gets compounded by lighting of fire crackers on Diwali. Regulatory actions in Delhi (odd-even scheme) or cajoling farmers through sops (or drastic actions) have not proved successful. The National Green Tribunal (NGT) and State Pollution Control Boards have issued several directions to states to control stubble burning, but without noticeable outcomes.

Are there no solutions to tackle stubble burning? Scientists working in this field, environmentalists, farmers' organisations and agricultural economists have suggested responsible solutions. The authors have first-hand experience in the field; they interacted with scientists, policy-makers, farmers adopting prescribed technological solutions, and analysed the body of 'limited' literature on the subject in the past few years. Based on these, an actionable framework, in short and medium to long term, is suggested that needs political will and cooperation of all the stakeholders, mainly the farming community.

How did the problem start?

Earlier, farmers of Punjab and Haryana used to grow three crops in a year: short-duration paddy (termed Sathi) in May that was harvested by mid-July; during Kharif

How long will Delhi gasp for breath?

An actionable framework to end stubble burning in India

ARABINDA K PADHEE & ML JAT

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(rainy season), farmers would go for late-sown high-yielding paddy, for which free irrigation and procurement by government agencies were favourable (few farmers started cultivating Basmati rice during this season); and after harvest of Kharif paddy, high-yielding varieties of wheat were grown in the winter. Cultivation of Sathi was possible because of plenty shallow groundwater to irrigate the water-guzzling crop even during peak summer. But unsustainable cropping practices led to a steep decline in water table, prompting both Punjab and Haryana to enact laws to ban early transplanting of paddy. As per law, paddy nurseries can only be started from May 10 and transplanting from June 13 in Punjab (dates for Haryana are May 15 and June 15, respectively).

These fixed dates led to delayed harvest of the crop to October, a time when farmers are supposed to prepare land for wheat. Although tech solutions are available,

farmers take the easiest option to clear the fields, by burning the stubble/residue. And then there are other factors—increased straw production surpassing the demand of fodder, drastic decline in agricultural workforce (labour) and increased mechanised harvesting operations.

What are the solutions?

The Kharif paddy crop sowing cannot be advanced—the existing Preservation of Subsoil Water Act in Punjab and Haryana can't be relaxed because of a fast depleting water table (studies say it is reducing at 0.3 to 1 metre/year). So we need technological alternatives to stubble burning.

Short-term solutions: Happy seeder is a tractor-mounted machine that sows (wheat) seeds without the need to till the field or remove existing paddy straw. The remains of rice crop residue act as mulch, conserving soil moisture and improving soil health. Research shows such climate-



to operate custom-hiring centres. Gram Panchayats may also be made responsible to take up such activities. Banks and financial institutions should provide capital assistance to desirous individuals/groups.

Machinery would displace manual labour. It could, therefore, be suggested to engage agricultural labourers in the collection of paddy straws for production of manure and other purposes. Wages of these labourers could be met from the MGNREGA funds by Panchayati Raj institutions. This will generate employment.

A new cadre of trained human resource would be needed to provide technical know-how to farmers. For this, attracting youth in agriculture would greatly help.

Till kharif paddy is substituted with other crops, cultivation of short-duration rice varieties suited for direct-seeded-rice (DSR) method coupled with micro-irrigation could be tried as an alternative. DSR paddy takes less time for establishment and there is no transplanting shock to the plant. This method may significantly save irrigation water and advance the growing season (as no transplanting is done). This would widen the gap between paddy harvest and wheat sowing, thus potentially reducing burning problem.

Baling of straw by suitable machines can clear the field for next sowing, and scientific binding of straw can be employed to address fodder scarcity in nearby areas.

Adoption of zero-tillage farming for crop residue management has been advocated by ICAR and CIMMYT. Zero-tillage using happy seeder alone has the potential to solve half of the residue burning issues. It reduces GHG emissions, and also ensures remunerative income to farmers.

Medium to long-term solutions: Phasing out current subsidies provided on

piecemeal basis and transitioning towards a holistic farming approach through provisioning of payments for ecosystem services will provide farmers better opportunities to take wise decisions in accordance to their local circumstance. In addition to conservation agriculture, high-value crops like fruits, vegetables, maize, soybean, etc, could be replaced in stubble burning areas. Climate-resilient crops like sorghum and millet (nutri-cereals) could be planned. Processing infrastructure to support a vibrant value chain linking to the market would, however, be needed. Also, making pellets/briquettes from paddy straw for their use in (thermal) power plants, use of stubble in bio-refineries (bio-ethanol), biomass gasification, etc, have been suggested as solutions to utilise paddy straw.

Non-basmati paddy cultivation is preferred by farmers, mainly because of assured procurement under MSP. A gradual reduction of the common paddy area and substitution with other crops (including Basmati) may reduce environmental footprint. Subsidies for power/irrigation water, fertilisers, etc, have compounded the problem. Diversification of existing cropping system is also fraught with high political dynamics. A strong will from top political leadership (maybe with a direction from the judiciary) may change the behaviour of all actors in the policy arena.

India is world's third-largest emitter of GHGs. As per a report submitted by the government of India to the UNFCCC, crop residue burning accounts for 2% of GHG emissions within the agriculture sector. Effective mitigation measures with contextual adaptation practices as suggested above would reduce stubble burning, thus lessening the load on the environment and possibly making the Delhi air cleaner.