Digital Payments as a Platform for Improving State Capacity

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Abstract

A government official in New Delhi or Nairobi can now deposit money directly into the account of a citizen in a distant village. This government-citizen payment link will improve public service delivery by making existing government payments more efficient and transparent. Citizens will no longer have to go through a local official to access their social transfer. They will receive their money, in full, directly into their account. And each transaction will be backed by a digital record detailing when, where, and how much money was transferred, making it harder to divert public funds without detection. These are important first order impacts of a government-citizen payment connection. But we need to look beyond existing payment flows to grasp how payment technology can strengthen state capacity. The biggest impacts will stem from new policy levers that become available when a government-citizen payment connection is in place. We describe four such levers: reducing fuel subsidies while helping the poor, taxing dirty fuels and reimbursing citizens, improving food subsidy programs, and boosting government transparency and accountability. By describing several new policy levers that become available when a government-citizen payment link is in place, we aim to position payment connectivity as more than a narrow tool to digitize a government's existing payment flows, but as a far-reaching platform for strengthening energy policy, food security, government transparency, and other core policies.

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Preface

Rapid advances in digital technology have opened up new possibilities for governments to interact and transact with their citizens. Digital payments present a unique opportunity in this realm. The World Bank estimates that 62 percent of adults globally now have a bank account. The number of mobile devices has surpassed 7 billion, while the number of mobile accounts is growing by over 100 million per year, with most of this growth occurring in developing countries. The number of people with actual and potential access to digital payment systems in developing countries is therefore growing explosively.

This rapid expansion in digital payment connectivity can enable faster, more transparent, and lower cost delivery of government transfers. Digital payments can also be coupled with other emerging technologies to ensure that transfers reach their intended beneficiaries. Improvements in the accuracy and cost-effectiveness of biometric identification and authentication technology, for example, can increase the security of transactions while also helping to curb corruption and leakages of funds.

While governments are increasingly using payments and identity technology to shift their cash-based transfer payments into digital channels, they have only begun to exploit the full range of policy levers enabled by these technologies. This essay by Dan Radcliffe provides an overview of how digital payment systems can help expand the capabilities of governments, enhance the efficiency of public programs, and improve the lives of the poor.

One focus of the paper is the potential for shifting from fuel price subsidies to better targeted and more impactful digital transfers. This is a pressing issue. Price subsidies on fossil fuels are a huge burden on some public budgets and they are typically regressive. Fuel subsidies also promote harmful consumption and production patterns, calling for carbon taxes as a response to the problems of climate change and pollution. The paper explores whether digital payment connections can enable governments to tax dirty fuels and re-direct a portion of the fuel tax revenues into politically popular "green dividend" payments to citizens. In addition to unlocking fuel price reforms, advanced payment technologies could also help achieve other development goals in areas such as improved nutrition and more accountable government institutions.

Finally, the paper draws attention to the large remaining knowledge gaps which hinder widespread adoption of digital payment systems. These include the political economy around the introduction of payments and identity technology, the functionality required to sustain public confidence in government cash transfer systems, and the infrastructure constraints which limit coverage and the speed of implementation. Future CGD research will seek to - at least partially - fill these knowledge gaps.

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Executive Summary

A government official in New Delhi or Nairobi can now deposit money directly into the account of a citizen in a distant village. This government-citizen payment link will improve public service delivery by making existing government payments more efficient and transparent. Citizens will no longer have to go through a local official to access their social transfer. They will receive their money, in full, directly into their account. And each transaction will be backed by a digital record detailing when, where, and how much money was transferred, making it harder to divert public funds without detection.

These are important *first order* impacts of a government-citizen payment connection. But we need to look beyond existing payment flows to grasp how payment technology can strengthen state capacity. The biggest impacts will stem from new policy levers that become available when a government-citizen payment connection is in place. We describe four such levers:

1) **Reducing fuel subsidies while helping the poor**: The IMF estimates that governments spent $333 billion in 2015 subsidizing fuel prices. Fuel subsidies are not only a drag on national budgets, they also tend to benefit the rich, who consume more fuel than the poor. Despite the economic logic for reforming fuel subsidies, they are difficult to remove because citizens in weak capacity states often see cheap fuel as one of the few tangible benefits they receive from the state. Governments in India and Iran have found a politically feasible alternative: they reduced fuel subsidies while re-directing a portion of the savings into direct payments to citizens. This made the reforms politically palatable and put more money into the hands of the countries' poorest citizens.

2) **Taxing dirty fuels and reimbursing citizens**: The world urgently needs a politically feasible way to price energy correctly. But pricing energy correctly requires more than phasing out subsidies; it also requires taxing fuels to pay for their social costs, such as illness and premature deaths caused by local air pollution. On their own, fuel taxes are politically unpopular. But with a payment connection in place, governments can tax dirty fuels and re-direct a portion of fuel tax revenues into politically popular cash transfers to citizens. The IMF estimates that eliminating fuel subsidies and taxing dirty fuels to pay for their negative externalities would generate $2.9 trillion in government revenues and cut global CO_2 emissions by 20 percent. Government-citizen transfers can help make this politically possible.

3) **Improving food subsidy programs**: Many governments spend significant sums physically delivering subsidized food to poor households. However, mass delivery of food is an enormous logistical challenge, with high leakage rates and administrative costs. Several randomized control trials demonstrate that—*in certain settings*—governments can save administrative costs by converting physical food subsidies into freely usable cash, without hurting the poor's nutrition.

4) **Boosting government transparency and accountability**: Building a responsive state requires a base of citizens who put pressure on government to improve those services. Cash transfers can be combined with emerging "transparency technologies" to strengthen the fiscal contract between citizens and their government, thus strengthening citizen oversight over government programs.

By describing several new policy levers that become available when a government-citizen payment link is in place, we aim to position payment connectivity as more than a narrow tool to digitize a government's *existing* payment flows, but as a far-reaching platform for strengthening energy policy, food security, government transparency, and other core policies.

1. The impact of digitizing *today's* government payments

Governments hold in their hands a powerful tool to improve the delivery of public services—their existing payment flows with their citizens. As shown in the table below, more than one billion people received a government payment in 2014 and 160 million received these payments in cash.[1] The World Bank estimates that migrating cash-based government payments into a digital account would reduce the global unbanked population from 38 percent to 30 percent of adults.[2]

	Adults Receiving Govt. Payments	Adults Receiving Govt. Payments in Cash		Adults Receiving Govt. Payments	Adults Receiving Govt. Payments in Cash
1. China	198,010,250	28,118,360	6. Ukraine	15,777,394	5,630,108
2. India	104,011,603	23,189,713	7. Mexico	20,647,846	5,474,930
3. Indonesia	40,923,651	21,088,014	8. Vietnam	7,645,826	3,383,725
4. Russia	41,250,943	6,764,350	9. Pakistan	6,583,696	2,962,149
5. Philippines	16,117,142	6,753,066	Other	549,377,841	56,467,578
			Total	**1,000,346,192**	**159,831,993**

World Bank (2015) Global Findex Survey

A growing body of evidence suggests that digitizing these payments would not only provide citizens a first entry point into the formal financial system, it would also save governments money, boost transparency, and cut leakages to unintended beneficiaries.[3]

Karthik Muralidharan, Paul Niehaus, and Sandip Sukhtankar conducted the largest randomized control trial (RCT) testing the impact of government payment digitization. They tested the impact of digitizing India's National Rural Employment Guarantee Scheme (NREGS) payments and pension payments.[4] The study area included eight districts in the state of Andhra Pradesh, with a combined rural population of 19 million. Here payment "digitization" had two components: First, recipients authenticated their identity using a biometric smart card. Second, payments were delivered directly into the recipient's account, which (s)he could access through a banking agent equipped with a card reader.

After two years, only 50 percent of payments in the treatment areas were made using smart cards because the state government had not managed to enroll everyone in this period, and hence did not mandate use of the new system. Even with only 50 percent adoption of the smart card solution, treatment districts reduced payment leakages by $38.5 million per

[1] Demirguc-Kunt, Klapper, Singer, and Van Oudheusden (2015)
[2] Ibid
[3] Klapper and Singer (2014) provide a comprehensive review of the evidence linking payment digitization with improved government efficiency, transparency, and household welfare.
[4] Muralidharan, Niehaus, and Sukhtankar (2016)

annum—over nine times the $4 million it cost the government to migrate to the new system. As leakages fell, NREGS earnings per household increased 24 percent while fiscal outlays for NREGS remained the same. And the time NREGS beneficiaries spent collecting payment fell by 19 percent (21 minutes per transaction). The authors calculate that the value of the time savings to the poor alone exceeded the cost of implementing the new smart card-based payment system.

In another RCT in Niger, Jenny Aker and colleagues found that enabling women to receive food security payments through their mobile phones reduced the time required to access a payment by 40 minutes.[5] Based on average wages in the area, the time savings translated into an amount large enough to feed a family of five for a day. And because the funds were deposited directly into an account rather than in cash, the women in the treatment group reported having more control over their money. Treatment households also had higher diet diversity and depleted 11 percent fewer assets during the study period. Moreover, the variable cost of administering the mobile transfer was 20 percent lower than cash distribution.

Several non-randomized studies provide *country-wide* estimates of how governments can benefit from payment digitization. McKinsey (2010) estimated that connecting every Indian household to a digital payment system and automating all government payment flows would save the government $22 billion a year - 8 percent of the total flows between the government and its citizens.[6] 80 percent of these savings would come from reduced leakages to unintended intermediaries, while 20 percent would come from the lower administrative cost of making payments digitally rather than using cash or checks. Another study in Mexico estimates that the government's shift to digital payments (which began in 1997) reduced its spending on wages, pensions, and social welfare by 3.3 percent annually, or nearly $1.3 billion.[7] A third study found that the Brazilian Government's Bolsa Família program reduced its transaction costs from 14.7 percent of total payments to 2.6 percent when it consolidated several benefits onto a single e-payment card.[8]

The early evidence is clear: both governments and citizens stand to gain from migrating cash-based government payments into digital channels.[9] However, a narrow focus on *existing* government payments understates how payment technology can improve state capacity. The biggest impacts will stem from new policy space that is created by a government-citizen payment connection. We turn now to a powerful policy lever unlocked by payment access: energy subsidy reform.

[5] Aker, Boumnijel, McClelland, and Tierney (2015)
[6] McKinsey (2010)
[7] Babatz (2013)
[8] Lindert, Linder, Hobbs, and de la Briére (2007)
[9] This is not to say that government payment digitization is without risks. We summarize these risks on page 13.

2. Using payments to reduce fuel subsidies while helping the poor

The IMF (2015) estimates that governments spent $541 billion (0.7 percent of global GDP) on fuel subsidies in 2013, falling to around $333 billion (0.4 percent of global GDP) in 2015 due to a drop in global energy prices.[10] To put this figure into perspective, total foreign aid spending was $135 billion in 2013—less than 25 percent of the amount governments spent on fuel subsidies.[11] The table below highlights a sample of countries which spent more than 10 percent of their government revenues on fuel subsidies in 2013.[12] While some governments have managed to cut fuel subsidy spending in response to the recent drop in global energy prices, fuel subsidies still consume a large share of government budgets and are expected to increase when global oil prices rebound.

Percent of government revenues spent on fossil fuel subsidies				
	Petrol products	Electricity	Natural Gas	Total
Iran	17	15	19	51
Bangladesh	8	22	13	43
Pakistan	1	10	20	31
Yemen	19	5	N/A	24
Venezuela	16	3	2	21
Cameroon	9	11	N/A	20
Indonesia	15	4	0	19
Saudi Arabia	14	5	0	19
Ghana	3	15	NA	18
India	7	2	1	10

IMF (2013) Energy Subsidy Reform: Lessons and Implications

Fuel subsidies benefit the rich far more than the poor

Fuel subsidies are not only a drag on national budgets; they are highly regressive. In 2010, the IMF examined fuel subsidies across 20 countries in Africa, Asia, the Middle East, and Latin America. As shown in the table below, the IMF found that the wealthiest 20 percent of households capture *six times* more subsidy benefits than poorest 20 percent (43 percent of

[10] IMF (2015) The IMF's fuel subsidy estimates encompass both explicit subsidies, such as those included as line items in the national budget, and implicit subsidies, such as foregone public revenue due to below-market fuel pricing.
[11] OECD (2014)
[12] IMF (2013)

benefits versus 7 percent).[13] The rich benefit disproportionately from fuel subsidies because they consume more fuel than the poor. Gasoline subsidies are the most regressive, with 61 percent accruing to the wealthiest 20 percent of the population. This is money that could be spent on health care, education, or simply direct payments to the poorest households; instead, it is primarily being used to encourage wealthy households to consume more fossil fuels.

Distribution of fuel subsidy benefits by consumption quintile

	Bottom	2	3	4	Top
Total Impact	7.1	11.4	16.2	22.5	42.8
Total Direct Impact	7.1	10.7	14.0	19.9	47.6
Gasoline	3.0	5.7	9.7	19.4	61.3
Kerosene	19.0	19.7	20.6	20.1	20.6
LPG	3.8	7.6	12.6	20.8	53.8
Indirect Impact	7.3	11.7	16.3	22.6	42.0

IMF (2010) The unequal benefits of fuel subsidies: A review of evidence for developing countries

Why are fuel subsidies politically popular?

If fuel subsidies are so regressive, why do they comprise such a significant share of government spending? The IMF's Christian Ebeke and Constant Lonkeng Ngouana examined the political economy of fuel subsidies and concluded that high fuel subsidies tend to emerge in countries that are struggling to deliver core public services, such as health or education.[14] When health clinics, schools, and other government services are barely functioning, the poor support fuel subsidies because they provide a small *but certain* benefit. In turn, the middle class and wealthy advocate for fuel subsidies because they stand to benefit the most from cheap fuel. These dynamics combine to create a broad coalition for public spending on fuel subsidies. When faced with such strong public support for cheap fuel, governments *unilaterally* remove fuel subsidies at their peril. The IMF (2013) chronicles a long list of recent fuel subsidy reform efforts that had to be reversed after widespread public protest.[15]

[13] Arze del Granado et al (2012). The study examined fuel subsidy programs in Bangladesh, Bolivia, Burkina Faso, Cambodia, Cameroon, Central African Republic, El Salvador, Gabon, Ghana, Honduras, India, Indonesia, Jordan, Lebanon, Madagascar, Mali, Peru, Republic of Congo, Senegal, and Sri Lanka.
[14] Ebeke and Ngouana (2015)
[15] IMF (2013)

Credibly signaling that citizens will benefit from fuel subsidy reform

If citizens in weak capacity states see cheap fuel as one of the few benefits they receive from the government, they are likely to protest if the government threatens to remove that benefit. This is because weak capacity states find it difficult to credibly signal that they will use the subsidy savings effectively through the general budget process. But once government-citizen payment links are in place, governments can reduce the fuel subsidy and re-direct a portion of the savings into direct payments to citizens, thus making the reform politically palatable. Indeed, many citizens will prefer freely usable cash to slightly cheaper fuel.[16] Successfully implementing such a reform is also likely to encourage more efficient fuel consumption, create fiscal space for higher-return public investments, and put more money into the hands of a country's poorest citizens.

Iran's fuel subsidy reforms

The link between payment access and fuel subsidy reform was powerfully demonstrated by Iran's reform efforts in 2010-11. At this time, the Iranian Government was spending $70 billion per year on fuel subsidies—a clearly unsustainable subsidy bill.[17] But the government couldn't raise fuel prices without offering citizens something in return, lest it face a political backlash. So it decided to replace fuel subsidies with cash transfers, setting aside $30 billion to deliver $40 per month to every citizen, plus another $15 billion to help energy-intensive businesses reduce their energy intensity. By making the payments equal across all households, the reform was highly redistributive: Iran's poor consume less fuel than the rich and thus gain little from the fuel subsidies; by contrast, $40 per capita per month represents a large share of a poor Iranian household's income.

To make the reform possible, the Iranian Government had to deliver monthly payments to every Iranian household. The prospect of fuel subsidy reform thus created a strong political imperative to expand the payment grid. In a country of 60 million adults,[18] the government worked with banks to open 16 million new accounts to ensure every family could receive a subsidy payment - a 36 percent expansion in account access in one year. Iran's ATM network was also expanded to ensure rural households could access their funds. In its first year, the reform reportedly saved the government $6 billion[19] and directed $30 billion directly to Iranian citizens. Today, 67 percent of Iranian adults receive a government payment—higher than any country in the world—and 92 percent of these payments are delivered digitally into an account.[20]

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[16] One caveat is that middle class households may oppose payments-linked subsidy reforms if they benefit disproportionately from subsidized fuel. Future research should examine how middle class households respond to payments-linked subsidy reforms and what measures can help broaden political support for these reforms.
[17] Guillame, Zytek, and Farzin (2011)
[18] World Development Indicators (2014)
[19] Tehran Times (2011)
[20] Demirguc-Kunt, Klapper, Singer, and Van Oudheusden (2015)

Recent evidence suggests that Iran's fuel subsidy reforms led to significant gains in household welfare. Using Iran's Household Expenditure and Income Survey, Ali Enami, Nora Lustig, and Alireza Taqdiri estimate that Iran's fuel subsidy reforms reduced the poverty headcount index in rural Iran by 20 percentage points (from 37 percent to 17 percent), while reducing the urban poverty headcount by five percentage points (from 8 percent to 3 percent).[21] Iran's reform efforts thus demonstrate that cash transfers do not only provide a politically feasible pathway to reform fuel subsidies; they also create a political imperative to expand the payment grid to poor households and can trigger meaningful gains in household welfare.

India's reform of cooking gas subsidies

In 2013, the Indian government launched its own effort to migrate fuel subsidies into digital payments. The program was first applied to the $8 billion liquid petroleum gas (LPG) cooking gas subsidy program. Under the legacy system, every Indian household was entitled to one subsidized canister of LPG per month, while commercial consumers had to pay the market price. This dual price system created an incentive for intermediaries to create "ghost" household accounts, and then divert subsidized household LPG onto the commercial market. Under the new system, beneficiaries input their biometric ID, buy an LPG canister at the market price, and receive the subsidy directly into their account. By biometrically authenticating recipients and selling all canisters at market prices, the reform culled ghosts from the LPG rolls and eliminated the incentive to divert subsidized canisters onto the commercial market.

But to make the reform work, the government needed to deliver subsidy payments to the 140 million households who were previously receiving subsidized canisters. As in Iran, India's subsidy reforms thus created a powerful political imperative to expand the payment grid. To ensure every household could receive a transfer, Prime Minister Modi launched the Pradhan Mantri Jan Dhan Yojana (PMJDY) financial inclusion program. As of July 2016, 225 million accounts had been opened under PMJDY.[22] Meanwhile, a nationally representative survey found that account access grew from 47 percent of Indian adults to 68 percent in just two years—a massive expansion of India's payment grid in support of the subsidy reform effort.[23]

[21] Enami, Lustig, and Taqdiri (2016)
[22] http://www.pmjdy.gov.in/home
[23] Intermedia (2015)

India's efforts to reform fuel subsidies through universal payment connectivity

The early evidence is promising: the Indian Government estimates that the LPG reforms reduced subsidized sales of LPG canisters by 24 percent and could save the government up to $2 billion per annum, though subsequent studies question the scope of the savings to-date.[24] While we do not yet know definitively how the reforms impacted household welfare, the Abdul Latif Jameel Poverty Action Lab (JPAL) recently launched a Delhi-based research unit that will randomize future "commodity to cash" subsidy reforms. This will allow researchers to measure how shifting commodity subsidies into direct payments impacts household welfare, nutrition, corruption, and other key indicators.

Converting fuel subsidies into digital payments: A summary

To sum up, India and Iran have demonstrated that converting fuel subsidies into digital payments has several attractive policy characteristics:

1) **It makes business sense for the government**: The reforms can be paid for by converting existing fuel subsidies into digital payments. In both India and Iran, the reforms actually *created* fiscal space as only a portion of the reduced subsidies were passed on to citizens.
2) **It is politically feasible**: Most citizens will prefer freely usable cash to slightly cheaper fuel.
3) **It is redistributive**: The wealthy tend to capture most of the benefits from fuel subsidies. Making equal payments to all citizens will thus be highly redistributive.

[24]George and Subramanian (2016) estimate that the reforms led to a 24% reduction in subsidized sales of LPG canisters and could save the government over $2 billion per annum, based on FY2015 cylinder prices. More recently, the International Institute for Sustainable Development (2016) argue that the actual savings is far lower.

4) **It provides a powerful social protection foundation**: Several RCT's demonstrate that cash transfers are an effective, low-cost social protection tool and that the poor do not waste the cash on alcohol or tobacco (as is commonly assumed).[25]

5) **It is environmentally friendly**: By removing fuel subsidies and increasing the price of fuel, citizens and businesses will consume energy more efficiently.

6) **It creates a powerful political impetus to expand payment access**: In both India and Iran, the reform efforts led to a massive expansion in the payment grid over a very short period of time.

These arguments are starting to gain a foothold beyond India and Iran: in April 2016, Saudi Arabia announced plans to establish a digital transfer system to soften the impact of fuel subsidy reform on low and middle income citizens.[26] But not all countries subsidize fuel. Some countries, like Kenya, have liberalized fuel prices across the board. In the next section, we analyze how countries with no fuel subsidies could use payment links to tax dirty fuels, raise precious public revenues, and direct more money into the hands of its citizens.

3. Using payment connections to tax dirty fuels, reimburse citizens, and encourage green energy use

"The next IMF study needs to link getting energy prices right in developing countries to getting on with cash transfer and ID programs. Trillion dollar gains to local economies and to global welfare are a no-brainer." [27]

The world urgently needs a politically feasible way to price energy correctly to reflect the social costs of consuming fossil fuels. But pricing energy correctly requires more than phasing out subsidies. It also requires taxing fuels to pay for their negative externalities, such as pollution-caused illnesses and premature deaths, road congestion, and global warming. According to the IMF (2015), the taxes that *should be* imposed on dirty fuels to pay all of their social costs amount to $4.9 trillion - 15 times the $333 billion governments spend on fuel subsidies.

The primary barrier to pricing energy correctly is political. On their own, fuel taxes are unpopular. But India and Iran have already demonstrated that fuel price increases can be bundled with cash transfers to make the reforms politically palatable. Why can't the same principle be applied to fuel *taxes*? There is no obvious technical reason why cash transfers can unlock only some forms of fuel price increases (subsidies), but not others (taxes).

[25] Overseas Development Institute (2016); Evans and Popova (2014)
[26] Bloomberg (2016)
[27] Ibid

We could thus envision governments taxing dirty fuels and passing on a portion of the fuel tax revenues to citizens in the form of monthly "green dividend" payments. As with fuel subsidies, the direct transfers to citizens could make fuel taxes politically popular and could help shift considerable resources into the hands of a country's poorest citizens. And if payment connections ultimately provide a politically feasible pathway to raise fuel prices, the potential benefits to national governments and the planet alike would be enormous: the IMF (2015) estimates that pricing energy correctly by eliminating fuel subsidies and taxing dirty fuels to pay for their negative externalities would raise government revenues by $2.9 trillion (3.6 percent of global GDP), cut global CO_2 emissions by 20 percent, and reduce premature air pollution deaths by 55 percent.[28] Nancy Birdsall and Anna Diofasi at the Center for Global Development describe the potential to achieve so many positive outcomes with a single intervention a "trillion-dollar bill on the sidewalk."[29]

Returning 100 percent of fuel tax revenues to the public

Climate scientist James Hansen takes the fuel tax dividend argument one step further. Hansen argues that *100 percent* of carbon tax revenues should be returned directly to citizens in monthly checks of equal amounts.[30] Hansen believes this model would make carbon taxes more politically palatable by sidestepping the contentious political debates around how carbon tax revenues are spent. The proposal has a powerful political appeal: fuel tax revenues would be insulated from politically connected interests; they would simply be passed on to citizens. Moreover, the incentives are clear: a family with several cars and a large house will pay a carbon fee which exceeds their monthly dividend payment, while a family which reduces its carbon footprint to less than average will earn money each month.

Of course, Hansen's proposal comes with a trade-off against public revenues. While returning 100 percent of carbon taxes to citizens might make the reforms politically palatable, it would also deprive governments in poor countries of much-needed revenues to pay for basic social services. This creates a tension between two competing objectives: 1) making fuel taxes politically acceptable, which would argue for returning 100 percent of fuel tax revenues to citizens, versus 2) using fuel taxes to raise public revenues, which would argue for returning only a portion of the revenues to citizens. We will not attempt to resolve these tensions here; we aim merely to highlight how payment connections can unlock fuel taxes and the tensions which emerge when determining how fuel tax revenues are spent.

Using payment connections to encourage green energy use

Governments can use payment connections to do more than price energy correctly. They can also use the same channel to encourage their citizens to use clean energy. In East Africa, for example, several companies are using mobile payment systems to expand off-grid solar energy systems into poor and rural communities. Customers acquire the systems for a small

[28] Coady, Parry, Sears, and Shang (2015)
[29] Birdsall and Diofasi (2015)
[30] Citzens Climate Lobby (2016) http://citizensclimatelobby.org/carbon-fee-and-dividend/

deposit and then purchase usage credits on a pay-as-you-go (PAYGO) basis. Revenues are collected via mobile payment systems and embedded sensors in each solar system allow providers to remotely regulate usage based upon payments. One PAYGO energy company, M-KOPA, has connected 375,000 homes in East Africa and is adding 500 new homes per day.[31] Governments could accelerate adoption of these systems by converting fuel tax revenues into incentive payments which nudge citizens to adopt off-grid PAYGO energy solutions.

To sum up, payment connections unlock a key policy lever: the ability to tax dirty fuels and reimburse citizens with cash transfers. If this lever creates a politically feasible pathway to price energy correctly, it would reduce deaths and illness caused by local air pollution, reduce CO_2 emissions, put more money into the hands of a country's poorest citizens, and help poor countries raise precious revenues. The task now is to identify countries willing to test this intervention at scale.

4. Using payments to improve nutrition while reducing costs

We turn now to the link between digital payments and nutrition. While the case for eliminating fuel subsidies may be clear, the link between payments and nutrition is more nuanced, not least because the poor's nutrition is at stake. We describe the arguments both for and against governments physically delivering food to poor households, and then examine several RCTs which have directly tested the nutritional impact of delivering food versus cash.

Arguments for and against physically delivering food to the poor
There are three key arguments for governments physically delivering food to the poor:

1) **Weak or absent food markets**: In areas where food markets are weak or non-existent, such as war zones or disaster regions, government delivery of food may be the only way to ensure that vulnerable households can access nutritious foods.
2) **Food price volatility**: Physical food delivery ensures that the items distributed retain their value in the face of food price fluctuations. Stable food prices can be particularly important in poor, remote communities where distance and exploitative pricing can expose poor households to high and variable food prices.[32]
3) **Risk of cash being spent on non-food items**: While several RCTs demonstrate that the poor do not waste their transfers on alcohol or tobacco,[33] cash can still be spent on items other than food, which may lead to a deterioration in a household's nutrition. Physical delivery of nutritious foods may increase the likelihood that families consume a balanced diet.

[31] http://solar.m-kopa.com/about/company-overview/
[32] Dreze and Sen (2014)
[33] Evans and Popova (2014)

On the flip side, mass delivery of food is an enormous logistical challenge, with high administrative costs and leakage rates. The Indian Government, for example, spends $21 billion per annum on food subsidies. Meanwhile, 54 percent of subsidized wheat, 48 percent of subsidized sugar, and 15 percent of subsidized rice is lost as leakage before it ever reaches the poor.[34] What's more, most food subsidy programs are premised on the idea that the poor need a greater *quantity* of food. Banerjee and Duflo (2011) argue that the problem is often less the quantity of food than its *quality* - specifically the shortage of nutrients, such as iron and iodine. [35] Rather than physically deliver grains and pulses, governments could save administrative costs by delivering freely usable cash and then working through food regulators to ensure that private food providers fortify foods with micro-nutrients.[36] Digital transfers also give beneficiaries flexibility by allowing them to make their own decisions about their household's needs, including the opportunity to make non-food expenditures. Lastly, receiving a digital payment carries less social stigma than forcing poor citizens to stand in line at a government food depot.

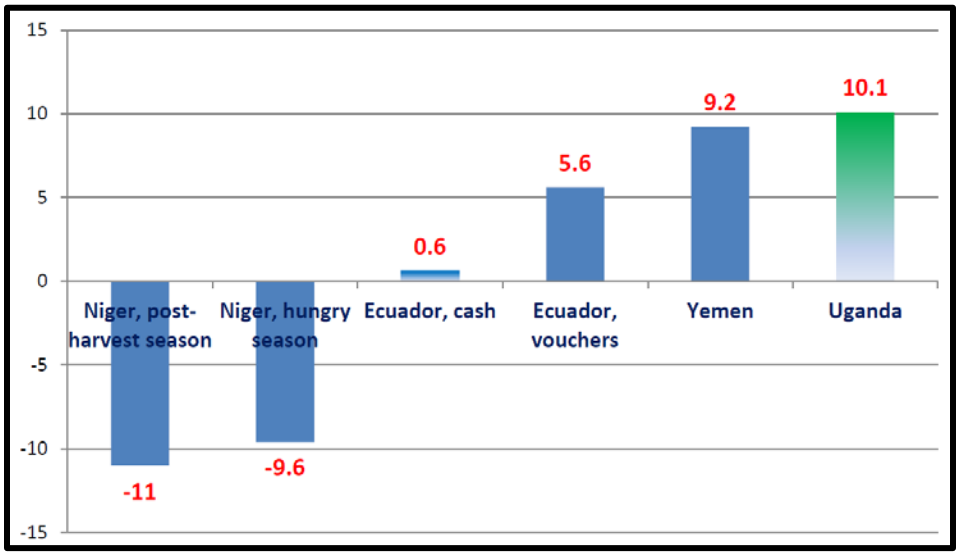
The World Food Program's food versus cash experiments

Food versus cash is a difficult choice, with sound arguments on both sides. Fortunately, we have rigorous evidence on this question. Researchers from the International Food Policy Research Institute (IFPRI) partnered with the World Food Program to conduct "food versus cash" RCTs in four settings: Ecuador, Niger, Uganda, and Yemen.[37] In all four settings, the researchers randomly allocated recipients into groups who received cash, food, or food vouchers which could be converted into food. The experiments measured the impact of each intervention on the World Food Program's principal food security indicator—the Food Consumption Score (FCS)[38]—and the cost of delivering cash versus an equivalent amount of food. While in all four RCTs, food delivery was managed by NGOs rather than government, the lessons are broadly applicable to government-funded food subsidy programs.

Across the four studies, delivery of cash, vouchers, and physical food all improved nutrition. The key question, then, is their *relative* impacts. As shown in the figure below, in three of four settings - Ecuador, Uganda and Yemen - cash improved nutrition more than food, as the money gave recipients the ability to purchase a greater diversity of foods in the market and to space out food consumption more evenly over time. By contrast, in Niger, food transfers improved nutrition more than cash.

[34] Government of India (2015)
[35] Banerjee and Duflo (2011)
[36] Bhagwati and Panagariya (2013)
[37] Hoddinott, Gilligan, Hidrobo, Margolies, Roy, Sandstrom, Schwab, and Upton (2013)
[38] The FCS combines data on food diversity, food frequency, and the nutritional importance of different foods.

Impact of cash transfers relative to food: Percentage change in FCS

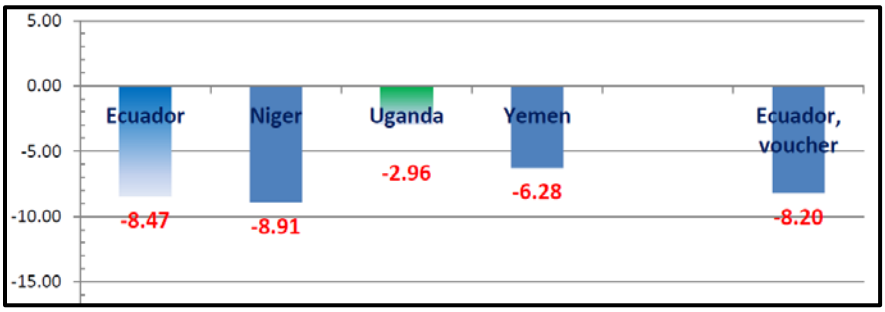


Hoddinott et al (2013)

Why did food transfers lead to better nutrition in Niger when compared to cash? Compared to the other three settings, this region of Niger has particularly severe seasonal food shortages. Confronted with chronic food insecurity, households in Niger used a large portion of their cash windfall to stock up on cheap grains—the cheapest form of calories available. As a result, physical delivery of food packets which contained multiple forms of nutrition led to higher diet diversity than cash transfers.

Before returning to the nutritional impacts, we touch briefly on the cost of delivery. As shown in the figure below, cash was cheaper to deliver in all four study settings, ranging from savings of $2.96 per transfer in Uganda to $8.91 per transfer in Niger. Notably, the cost estimates for cash transfers include the fixed costs of procuring debit cards and negotiating contracts with payment providers. The researchers stress that as WFP gains experience with cash transfers, the costs of cash delivery will come down, which will widen this cost differential.

Per transfer cost of cash transfers relative to food (USD)



This leads to a surprising conclusion: In three of four countries, cash transfers led to better nutrition at lower cost. And by saving $3-$9 per transfer, the World Food Program could expand the number of people it reaches with cash transfers. [39] However, the Niger case makes clear that we cannot eliminate food subsidies in all cases. In areas with severe food insecurity or weak/non-existent food markets, physical delivery of food may be needed to ensure the poorest households receive adequate nutrition. But in areas with reasonably functioning food markets and low to moderate food insecurity, digital transfers may be a cheaper and more impactful alternative to physical food delivery.

Innovations to improve food subsidies and nutrition-linked payments

Food subsidies and nutrition-linked payments are not just interventions we can research, but interventions we can shape and improve. We describe below several innovations that could improve nutrition-linked food subsidy and cash transfer programs:

- **Price indexing**: Food prices tend to be higher in more remote regions. If cash payments are equal, food prices could erode the value of the cash transfer, leading to gaps in coverage. To mitigate the risk of local food price inflation eroding the value of cash transfers, governments could spatially index subsidy payments to local food prices.[40]
- **Labelled cash transfers**: One drawback with cash is that it can be spent on anything. Najy Benhassine and co-authors conducted an RCT in Morocco which found that labelling an *unconditional* transfer against a goal (e.g. education) increases the likelihood that the transfer will be spent on that goal.[41] Governments could apply a similar approach to food payments by labelling them "Family Nutrition Payments."
- **Restricted disbursement**: Going one step further than a label, governments could employ "restricted disbursement" technologies which deliver some portion of the transfer into a sub-account that can only be used at approved food shops that have been registered in a database. This would be akin to a digital voucher redeemable only at certain outlets.
- **Women-held accounts**: Some evidence suggests that women are more likely than men to spend transfers on food and other household items.[42] Governments could consider directing food payments into women-held accounts rather than the head of household.

To conserve space, we have restricted this analysis to only two commodities—fuel and food—though payment connectivity could similarly be used to strengthen fertilizer, water, and other commodity subsidy programs. To be clear, we are not advocating for the dismantling of *all* commodity subsidy programs in favor of digital transfers. Subsidies can play a key role in making items affordable for the poor. Payment reforms also pose risks of

[39] In addition to the IFPRI RCTs listed above, Aker (2013) conducted an RCT which tested the impact of offering cash versus food vouchers to refugees in the Democratic Republic of the Congo. She found that cash was less costly to administer and there were no differences in dietary diversity or food security between the two groups.
[40] Devereux (2008)
[41] Benhassine, Devoto, Duflo, Dupas, and Pouliquen (2015)
[42] Duflo (2003)

their own, as described in the box below. Our goal here is merely to highlight how payment technology unlocks policy alternatives to traditional price subsidy programs.

Three Risks Posed by Digital Payment Reforms

Government payment reforms pose several key risks which, if not addressed in advance, can doom well-intentioned reform efforts. We highlight below three such risks:

- *Exclusion errors:* Exclusion errors are the inadvertent denial of benefits to legitimate participants. Exclusion errors can stem from several factors, including citizens being unable to navigate some aspect of the new system, such as opening an account or securing an identity card. Governments should establish concurrent evaluation systems which collect real-time data from payment recipients and non-recipients to quickly spot and correct exclusion errors.

- *Distribution gaps:* Without adequate coverage of branches, ATMs, or banking agents, citizens may not be able to convert their government payment into cash. To mitigate this risk, MicroSave developed District Readiness Assessments which allow governments to assess whether the banking infrastructure in a district is sufficient to disburse government payments.[43]

- *Perverse consequences:* Governments should be wary of unintended consequences, particularly when migrating in-kind subsidies into cash. For example, if physical food is converted into cash transfers, local food vendors in remote communities may respond by raising food prices. Similarly, cash recipients may spend the funds on less nutritional foods, thus worsening nutrition among the target households. Perverse consequences can be difficult to detect, underscoring the importance of coupling payment reforms with rigorous measurement efforts to identify whether negative effects are occurring.

5. Boosting government transparency and accountability

"Every citizen of the republic ought to consider himself an unofficial policeman, and keep unsalaried watch over the laws and their execution." —Mark Twain, Traveling with a Reformer

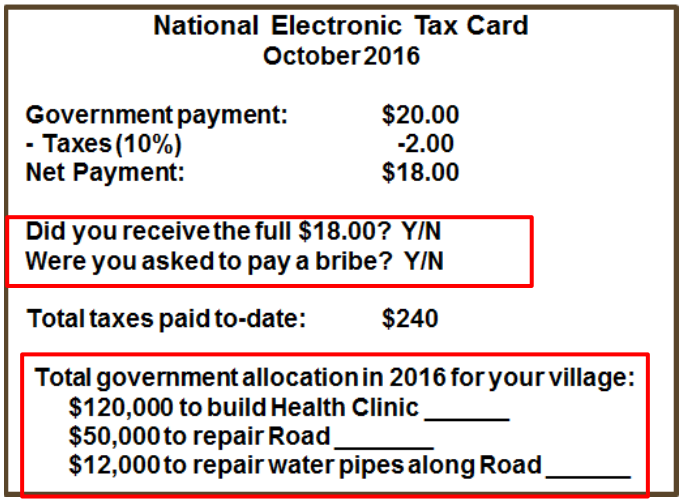
We turn now to the fifth (and most speculative) impact channel through which payments can improve state capacity: government accountability. Building a responsive state requires a broad base of citizens who feel financially invested in the quality of public services and put pressure on government to improve the quality of those services.[44] The process of building a fiscal contract between governments and their citizens is fiendishly complex and outside the

[43] Sharma (2015)
[44] See Kaldor (1963), Tilly (1975), North and Weingast (1989), and Ross (2004)

scope of this paper. Here, we merely argue that payment technologies can play a small, but meaningful role in making governments more accountable.

Let's start by assuming that it is a political non-starter for governments to start collecting tax payments from their poorest citizens. This would be a logistical (and possibly moral) challenge, and might also nudge poor citizens into cash transactions that are hidden from the tax net. In lieu of building tax collection systems in poor communities, Todd Moss and Stephanie Majerowicz at the Center for Global Development argue that governments can start to build a fiscal contract among the poor by taxing government-citizen payments *at source*, such that citizens receive a government transfer, minus a small tax.[45] Citizens would receive - through an SMS or other digital channel—an electronic tax card which tallies her monthly transfer and the tax she has "paid" in a given year. Critically, even with a tax, the transfer would be perceived as a net gain to the end recipient, so informal workers outside the tax net would have incentive to formally register to receive their benefit.

The card could also become a tool for communicating information that boosts citizen visibility into public service delivery. In the figure below, we combine Moss and Majerowicz's notion of a tax card with two "transparency technologies" promoted by Vivek Srinivasan at Stanford University. Srinivasan argues that governments can stimulate citizen oversight by sending a breakdown of how taxes are spent in their village, along with prompts for citizens to report whether they received their payment in full or were asked to pay a bribe.[46] Both messages could easily be delivered through a basic low-end phone.



To be clear, no one will spend their free time monitoring government spending just because they pay taxes and have visibility into how those taxes are spent. However, we need to compare this solution with the status quo, where many citizens in poor countries feel no financial stake in public services and have little visibility into how tax dollars are spent in their community. An e-tax card with transparency technologies may not activate a thriving,

[45] While Moss and Majerowicz (2013) propose this tax at source model in the context of natural resource-rich countries paying dividend payments to citizens, we apply it here to government payments more broadly.

[46] Srinivasan (2016)

accountable public sector overnight. But it will make it harder for officials to divert government funds, give poor citizens visibility into how taxes are spent in their community, and make clear to citizens that they too are part of a government-citizen fiscal contract.

6. Looking to the future: Four unanswered questions that will determine how payment technology impacts state capacity

Once a government-citizen payment connection is in place, a range of policy levers become available, each of which can boost revenue, create fiscal space, combat corruption, and put more money into the hands of a country's poorest citizens. But how do we establish widespread payment connectivity in the first place? While the nuts and bolts of expanding payment access are well outside the scope of this paper,[47] we highlight four unanswered questions which will shape whether and how payment technology is ultimately used to improve state capacity:

First, will governments voluntarily adopt digital payment technologies? Thus far we have assumed that government has the public's interest at heart, and is willing to adopt technologies that improve public service delivery. But not everyone benefits from increased transparency and efficiency. Vested interests who are threatened by a new technology will cite myriad reasons for not adopting that technology. The smart cards RCT in Andhra Pradesh, for example, found that the new payment system had 92 percent customer satisfaction rates; however the feedback that bubbled up to top administrators through the state bureaucracy was disproportionately negative.[48] This was a classic case of small, but concentrated losses for corrupt officials resulting in vocal complaints against an effort that would yield large, but diffuse benefits to the public at large.

Daron Acemoglu and James Robinson caution that countries struggle to improve governance not because they are ignorant of the right policies, but because they have an interest in preserving the status quo."[49] Like any reform effort, payment reforms are as much a political economy challenge as a technical challenge. Future research should examine the political economy of payment reforms, identifying the winners and losers in payment reform efforts and how reforms can be designed to overcome vested interests.

Second, what can a government do to expand the payment grid? Most analysis of how to expand payment access focuses on the role of central banks and commercial providers - and for good reason. The payment grid will not expand without enabling payment regulations and commercial investment. While government *on its own* cannot ensure

[47] The UN-based Better than Cash Alliance has published several detailed studies and toolkits detailing the core components of a national strategy to digitize government payment flows. See www.betterthancash.org
[48] Muralidharan, Niehaus, and Sukhtankar (2015)
[49] Acemoglu and Robinson (2012)

widespread payment access, it can play a more active role than most realize. We describe three levers governments can employ to expand the payment grid:

- **Building shared infrastructure**: Governments can expand the payment grid by building shared payment and identity infrastructure that is open, fraud resistant, and inclusive. By building shared infrastructure at the core of a payment system, government can cut costs for each individual provider, while encouraging innovation at the edges (or customer end) of any solution. Peru, for example, recently launched a shared mobile payments platform called Bim which centralizes account management and anti-fraud functions, rather than distributing these functions across all providers. Similarly, the National Payments Corporation of India built (among other pieces of shared infrastructure) a tool called the Aadhaar Payments Bridge which maps all Aadhaar identity numbers to bank account numbers. Government departments can then send payments to a recipient's Aadhaar number and the bridge routes it to her account. This simple piece of infrastructure makes it easy for consumers to change banks and take their government benefits with them, thus boosting competition among banks vying to disburse government payments. Future research should explore the range of shared payment and identity infrastructure that can unlock payments at scale.[50]

- **Priming the pump**: In addition to building shared payment infrastructure, India and Iran successfully expanded the payment grid by nudging banks to open accounts, while also committing to drive current government payments and future subsidy payments through those accounts. This guaranteed banks a minimum level of transaction revenues, thus encouraging them to expand the payment grid in the first place. Yet in both India and Iran, the government exerts considerable influence over the financial sector through state-owned banks. This made it easier to encourage banks to expand the payment grid, even before government payments were flowing through the accounts. Future research should explore whether governments with less control over the financial sector can employ a similar government-led strategy to increase payment access.

- **Working with the central bank to cultivate enabling payment regulations**: In many countries, payment regulations are the binding constraint preventing the expansion of the payment grid into poor and rural communities. While central banks ultimately oversee payment regulations, government can work alongside central banks to craft more enabling regulations. One key ingredient is to craft regulations which harness the extensive distribution networks of non-banks, such as telecoms providers and fast-moving consumer goods companies. Central banks can do this by develop regulations which permit non-banks to offer deposit accounts and payments, but not credit.[51] Another ingredient is tiered know-your-customer guidelines which allow poor people to join the payment system without facing onerous documentation requirements.[52]

[50] The World Bank's Payment System Practice, the Bank's ID for Development (ID4D) initiative, and the Gates Foundation's Level One Project (L1P) are all leading efforts to help governments and central banks develop shared infrastructure for expanding the payment grid.
[51] Tarazi and Breloff (2010)
[52] Gelb (2016)

Third, what identification functionality is required to sustain public confidence in a government cash transfer system? In any government transfer system, corrupt actors will have incentive to acquire multiple identities in order to receive additional transfers. This, in turn, could undermine public confidence in the government transfer program. To address this problem, India has built the world's largest biometric identification database, which has allowed the government to eliminate millions of "ghost" beneficiaries from its rolls. At the other end of the technological spectrum, Ethiopia has no national ID, but instead relies on community identity systems to uniquely identify individuals, though this system is gradually weakening with increased mobility among Ethiopian citizens. Iran's ID system sits somewhere in the middle: Iran does not have a biometric ID system; instead, it relies on a robust birth anc civil registration system and bank know-your customer (KYC) requirements to identity payment recipients. While a full-fledged biometric ID system might help clean up Iran's beneficiary rolls, it is difficult to quantify what additional savings biometric technology would generate relative to Iran's current ID system. Future research should seek to quantify the economic impacts of various ID systems and identify the minimum ID functionality required to sustain public confidence in a government cash transfer system.

Fourth, are there certain settings where the transition to digital payments would not be feasible or desirable? As mentioned earlier, direct digital payments may not be appropriate in certain settings. For example, in extremely food insecure regions, government delivery of food may be the only way to ensure that vulnerable households access nutritious foods. In other remote settings, banks may not have commercial incentive to build the cash disbursement networks needed to deliver government payments. In such settings, the cost to government of subsidizing the build-out of cash distribution networks may outweigh the benefits of the reform. In turn, very small countries may lack the payment volumes needed to justify the cost of building shared payment and identity infrastructure. Future research should examine the conditions under which it makes sense for governments to transition to digital payments, and the conditions where alternative subsidy arrangements are preferred.

Answers to these questions will emerge when policymakers and development practitioners ramp-up research and experimentation to explore the intersection between payment technology and state capacity. Research and experimentation in this domain will remain limited as long as a government-citizen payment connection is viewed as a narrow tool for delivering *existing* cash-based government payments more efficiently. By describing new policy space that becomes available when a government-citizen payment connection is in place, we hope to position payment technology as a far-reaching platform for strengthening energy systems, food security, government transparency, and other core policies.

Appendix A: Energy subsidies and macroeconomic policy[53]

The adverse impacts of fuel subsidies extend beyond their fiscal and environmental costs. The IMF (2013) chronicles a range of adverse impacts, including:

1) **Discouraging investment in the energy sector**: Low energy prices can result in lower profits or outright losses for producers, making it difficult for state-owned energy producers to expand production and reducing the private sector's incentive to invest in the energy sector. The result is often chronic energy shortages that hamper economic activity.
2) **Crowding-out growth-enhancing public spending**. Some countries spend more on energy subsidies than on public health and education. Reallocating some of the resources freed by subsidy reform to more productive public spending could help boost growth over the long run.
3) **Diminishing the competitiveness of the private sector over the longer term**. While in the short-run subsidy reform will raise energy prices and increase production costs, over the longer term there will be a reallocation of resources to activities that are less energy and capital intensive and more efficient, helping spur the growth of employment. That said, the IMF stresses that governments may want to couple subsidy reforms with financial support to energy-intensive businesses to help them migrate to more energy efficient technologies.

Appendix B: Do cash transfers pull people out of poverty?[54]

While several RCTs demonstrate that cash transfers are an effective, low-cost social protection tool, [55] there is little evidence that transfers, *on their own*, lead to a sustained progression out of poverty. For that, you also need health, education, job training, and other interventions. The BRAC-inspired ultra-poor "graduation model," tested through RCTs in six countries, give us a glimpse of the type of multi-faced program that could be layered onto a government cash transfer system.[56] By combining unconditional consumption support, a productive asset grant (e.g. livestock), technical skills training, health education, and a savings account, these programs generated lasting improvements in well-being among the poorest of the poor in all six study settings. We can thus view cash transfers not as a *stand-alone* intervention for poverty reduction, but rather as a social protection *foundation*, on which governments can layer health, job training, and other interventions.

[53] This section draws heavily from IMF (2013) "Energy Subsidy Reform: Lessons and Implications."
[54] This section pulls heavily from Bakhshi and Radcliffe (2015)
[55] Overseas Development Institute (2016); Haushofer and Shapiro (2013)
[56] Banerjee, Duflo, Goldberg, Karlan, Osei, Pariente, Shapiro, Thuysbaert, and Udry (2015)

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