Cash at Your Fingertips: Biometric Technology for Transfers in Resource-Rich Countries

Alan Gelb and Caroline Decker

Abstract

Cash transfers are often a good way for developing countries to address economic and social problems. They are less expensive than directly providing goods and services and allow recipients the flexibility to spend on what they need the most, but for many developing countries, the technical requirements for large-scale programs have been prohibitive. Now, however, biometric technologies have improved and become ubiquitous enough to allow the confident identification and low cost needed to implement successful cash-transfer programs in developing countries. This paper surveys the arguments for and against cash-transfer programs in resource-rich states, discusses some of the new biometric identification technologies, and reaches preliminary conclusions about their potentially very large benefits for developing countries. The barriers to cash-transfers are no longer technical, but political.

Keywords: cash transfers, biometric technologies, resource-rich states, developing countries

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1 Introduction

Cash transfers are increasingly being used by developing countries and development agencies to address a range of economic and social problems, including human investment and greater equity. Usually, resources for these programs, whether conditional or otherwise, must come from taxation or development assistance. But the option to make direct transfers to citizens may also be especially relevant for the considerable number of resource-rich developing countries with a high share of natural rent in national income and fiscal revenues. Such an approach, it is sometimes argued, can encourage better resource management and head off the governance problems associated with the concentration of large rents in the hands of the state. But can developing countries, many with a record of corruption and leakage in the management of public finances, successfully operate a cash-transfer program, especially one motivated by the long-run objective of creating the conditions for better governance and public accountability? This paper considers this question, in general and with a special focus on resource rich countries. It argues that new technology has opened up an option that for many countries has only been a theoretical possibility up till now. The barriers to cash-transfers are no longer technical, but political.

Any cash-transfer program must include two basic elements – unique personal identification to indicate who is eligible for the cash-transfer, and a system for making payments. In some societies there are "human" alternatives to formal national identification systems that can be used to underpin cash-transfer programs. An example would be village-level cash-transfers which are distributed within a community on the basis of local personal knowledge. But these have severe limitations on a wider canvas. People migrate, including towards urban areas, and community structures evolve. Human-based identity systems are also prone to local capture and discrimination if used to underpin cash-transfer programs. The movement towards formal systems of identity is part of the natural process of development.

Over the last decade, biometric identification, mainly fingerprinting, iris and facial recognition to date, has become a more widespread component of identification technology. In developed countries, biometrics are most associated with the areas of law enforcement and security. But its use has been spreading -- in total, over 450 million[1] people in developing countries have had their biometric data recorded for a variety of purposes, and over the next five years this number

[1] Authors' calculation based on information from over 40 individual cases. We are aware this may not be a comprehensive list and that some of these projects may have expanded, thus the actual number may be much higher. For a breakdown of these cases, please see charts attached to Gelb 2010.

is expected to triple.[2] In at least fifteen countries it has been used to provide the identifier that underpins a cash-transfer program.[3] Some of these programs have been on a relatively small scale, experiments financed by donors with no link to any nation-wide registration system. Others, such as the Watan card issued by the Government of Pakistan, have drawn on national biometric population registries to enable the rapid creation of emergency support. The Watan card program is targeted to over 1.5 million flood-affected households and draws on Pakistan's fingerprint based National Database & Registration Authority (NADRA) that covers some 96 million citizens (Visa 2010, Watan Card website).

Technology has also moved rapidly in the area of payments, in particular with the development of smartcards and electronic banking. These do not entirely solve the problem of getting actual cash in the hands of people; there still needs to be some point-of-service (POS) agent, whether a manned or unmanned ATM, a bank or post-office branch or a network of airtime vendors, grocery stores and other shopkeepers, who can offer encashment services to their clients. Technology can cut the administrative costs of payments however, and also expand the service network and increase convenience for recipients. Traditional payments methods can require a day and up to 20% of the grant amount in transport costs to collect (Johnson 2008, Arora and Metz Cummings 2010, UIDAI 2010b). And with improved payment flexibility and physical accessibility, disabled individuals or citizens with rigid work schedules are not excluded from collecting. One feature of electronic payments of interest to resource exporters – as shown by the example of the Malawi DECT relief program—is that the amount to be transferred can be changed easily in response to needs or funds available (Devereux 2008). Another is that they leave a complete auditable trail that runs all the way from the issuing agency to the final recipient.

No system can be perfect. More information is needed about the performance of the new technology in real-world conditions, both on the identification and payments sides. Few rigorous studies compare the new mechanisms of distribution against more traditional programs. Efficient cash-transfer programs are certainly possible without new technology, especially in countries that already have well-working systems of national identification. But the available evidence suggests that even if they involve upfront costs the new approaches can save on administrative costs, and potentially provide much larger savings through reducing waste and fraud[4]. Even in initially well-managed payments systems, including pensions, payrolls, and

[2] Authors' calculation. This increase is mostly due to programs in both India and China, but also incorporates a number of other countries' plans that have either been announced or are not fully completed.

[3] Countries include: Pakistan, Afghanistan, DRC, Malawi, South Africa, India, Ghana, Namibia, Botswana, Kenya, Nigeria, Iraq, Philippines, Bolivia, and Indonesia.

[4] For example see Johnson 2008, Bezuidenhoudt 2008, Pickens, Porteous and Rotman 2009, Dutta et al. 2010, RHVP 2010a, Barca et al. 2010.

other cash transfers, leakage can cumulate over time. We argue that the revolution in digital information systems opens up a range of new options, including in the conditions that prevail in many resource exporters where "cash exceeds capacity" and where population data are poor. Moreover, identification systems can have potentially large externalities for other applications, including access to savings accounts and other financial services, cleaning up the voter roll, and generally in streamlining documentation.

Section 2 briefly surveys the arguments for and against direct cash-transfers, particularly in resource-rich settings where special issues arise. In most countries natural resource rents are considered to be the property of the nation, but there is little clarity on what this actually means. Do citizens own resources equally, or do those in the resource-rich areas deserve more? Do future citizens have a stake, or only current citizens? A great deal of discretion is often left to the government of the day. In practice, most resource-rich countries, especially oil exporters, have transferred a considerable part of their rents to citizens. Transfers have, however, typically been made through indirect, non-transparent mechanisms, heavily distorting, often with high leakages, and with a tendency to become fiscally unsustainable (as also true in many countries that are not resource-rich). Not surprisingly, they come under heavy criticism from a number of perspectives, but the political reality in many countries is that citizens do expect some tangible benefits. Iran offers a recent example of shifting from indirect subsidies to direct cash-transfers. New technologies permit a much clearer articulation of the principle of "citizen ownership".

Section 3 discusses some of the choices of identification and payments systems using new technology. Countries face a wide range of choice of both identification and payments systems, and can mix and match to accommodate their particular circumstances. Both sides raise the possibility of externalities, including official identification systems, cleaner voting rolls and increased access to financial services, such as insurance, banking, credit, etc.

Section 4 considers some experiences of cash-transfer programs implemented with new technology. The increasing number of cases includes South Africa, Malawi, Pakistan, and Andhra Pradesh in India. Some other examples, such as DRC and Afghanistan, include applications in post-conflict situations, and demonstrate the robustness and practicality of the technology.

Section 5 considers the costs and benefits of adopting new technology with some illustrative estimates. Costs of the new approach include initial registration and the possible need to build an alternative point of service (POS) network to enable cash-transfers to be made on a widespread basis in poor countries with limited banking or post office systems. Direct benefits include lower per transaction unit costs, potentially large savings from reductions in error and fraud, more convenience for clients of the system, and the empowerment of previously disadvantaged groups, such as women in rural India, that follows from clear personal identification. Externality benefits may also be considerable.

Section 6 concludes on the benefits of the new technologies and also notes some common concerns. While stressing the need for more rigorous study of the functioning of the technology, we argue that the benefits are potentially very large. While there are risks, including the important question of citizen privacy, it is not clear that these are larger under a biometric-based system than under other approaches.

2. Direct Cash Transfers: The Practice and the Principles.

Whether for short-term emergency relief or long-term development initiatives, cash-transfers have shown to be an effective development tool and an efficient mechanism to deliver resources directly to the population. A full discussion is beyond the scope of this paper but they can be less expensive to implement than the direct provision of goods and services, and provide recipients the flexibility to choose what to purchase (Harvey, Slater and Farrington 2005). Transfers are typically spent on food, education, health, and business investment (Case 2001, Creti and Jaspars 2006, Davies and Davey 2007, Delany et al. 2008), and the influx of cash into communities stimulates the local economy as recipients spend the money locally, rather than aid agencies shipping in supplies (Harvey, Slater and Farrington 2005, Davies and Davey 2007).

Currently, most cash-transfers address a specific issue or target group, such as emergency response after conflict or natural disaster, welfare payments to elderly and low-income populations, or conditional cash-transfers (CCTs) that aim to encourage behavior change.[5] But cash-transfers can also be used by natural resource rich countries to increase equity and improve resource use and governance.

Transfers in Resource-Rich Nations

Natural resource rents are often substantial in mineral exporters, especially those endowed with hydrocarbons. In absolute terms, OPEC oil revenues averaged $500 per head during the long slump of the 1990s, and they soared to $2,500 per head during the 2006-8 boom[6]. Bornhorst, Gupta and Thornton 2008 cover 30 oil exporters over the period 1992-2005. During this period, a time when oil prices were mostly moderate or low in historical context, oil and gas revenues represented on average 16.2% of GDP or 49.1% of total fiscal revenue. For some regions the average was higher; for the 14 Middle East exporters, the averages were 20.0% and 57.2% respectively. Projected revenue ratios are typically lower for new producers, at around 10% of GDP for Uganda and Ghana; nevertheless this is very substantial.

[5] For more information on cash transfers see Davies and Davey 2007, Son 2008, Bankable Frontier Associates 2008, Zimmerman and Moury 2009, Pickens, Porteous, and Rotman 2009, Bard, McIntosh, and Ozler 2010.

[6] Revenues/head are expressed in 2004 Dollars. Real oil revenues per head peaked a little lower than in the 1974-81 boom because of population growth in the interim.

The Potential Impact on Poor Citizens

The share of income received by the poorest quintile in a typical low-income developing country is typically less than 10%. It is around 5% in a relatively unequal middle income country, with the top quintile typically disposing of 50% or more of total income (IMF 2007). A uniform across-the-board distribution of rents averaging 15% of GDP would therefore boost the average income of the poorest quintile in a low-income country by 150%. For a country with GDP/head of $700, this would imply an annual transfer of $105 per head; for a family of 6 the transfer would be $630. The increment would be larger in percentage terms in a middle-income country with higher inequality.

In absolute terms the potential cash-transfer is very large in some countries. With rent set at $80 per barrel, Libya's exports of 1.5 million barrels/day represents an annual windfall of $6250 for every one of its 6.4 million citizens. Currently proven reserves would sustain this flow for 88 years but, as in most resource producers, new discoveries and improved technology are likely to increase reserves substantially (Gelb, Kaiser and Vinuela 2011).

Even if grants are not targeted on the basis of income, for the poorer parts of the population the impact of redistributing even a portion of resource rents can be substantial. Simulations for Iran made in 2003 estimated the income effect of re-distributing energy subsidies across the population in the form of direct grants. Even though world oil prices were relatively low over the period analyzed, these subsidies represented an estimated 21.7% of GDP.[7] A uniform across-the-board cash-transfer compensated by increasing prices to world levels would have boosted the income of the poorer groups by 112% (World Bank 2003 Table 6.3). [8]

Distribution Mechanisms in Practice

Most resource exporters do distribute a share of their oil rents to citizens, but in indirect ways. One approach is to reduce non-oil taxation relative to levels in other countries. Bornhorst *et al* 2008 find that on average 1% of GDP in oil taxes is reflected in 0.2% lower non-oil taxes. The average tax relief for the 30 exporters identified in that study would then be 3.2% of GDP. Is this sound policy? On the positive side, a low-tax environment could be a useful part of a strategy for improving the business climate and encouraging investments to diversify the non-oil economy. This has been a cornerstone of the policy followed by Dubai, which has been successful in attracting a range of export industry to its Free Zone. Low taxes could compensate for the adverse effect on profitability of an exchange rate boosted by oil exports. A lower tax

[7] Based on estimates of 1991-2000 budgets, actual and adjusted for implicit subsidies. World Bank 2003, Table 4.2.

[8] As another example of the redistributive potential of transfers, South Africa's transfer system, which costs somewhat over 3% of GDP and is loosely means-tested but broadly received, consists mostly of pensions and child allowances. It accounts for some two thirds of the income received by the poorest quintile of the population (Woolard and Leibbrandt 2010).

burden might be expected to reduce the deadweight costs of taxation if the quality of tax administration does not decline at the same time. However, this policy may be regressive if taxes are paid by only a small part of the population. Also, sooner or later most oil exporting countries will need to turn to their non-oil tax systems to finance spending programs, so that a low-tax period should be used as an investment to improve administration, encourage compliance and broaden the tax base. But few countries follow this path; while non-resource tax yields in resource-rich countries are certainly lower, estimates of the quality of non-resource tax administration suggest that it is typically worse (Knack 2008).[9]

A second widely-used approach is to subsidize domestic prices for energy and sometimes other essentials to far below world market levels. Many producing countries hold petroleum prices to far below market levels, incurring implicit fiscal costs equivalent to several percent of GDP. With oil prices reaching very high levels in 2008, estimates of the costs of Iran's subsidy program reached as high as $100 billion, almost 30% of GDP (Tabatabai 2010). While this may be an overestimate for long-run subsidies it may be less wrong in times of very high oil prices. With demand and low-efficiency use spurred on by extremely low domestic prices (energy use per unit of GDP is double that of European OECD countries) Iran has become one of the world's largest energy users; domestic oil consumption has soared to account for almost half of its total output.

In December 2010 Iran launched a massive program of direct cash-transfers using electronic transfers into bank accounts, as a mechanism to compensate citizens for the removal of huge subsidies on food and fuel. In the first stage of the program, bread prices were tripled and fuel prices increased by a multiple from very low levels averaging around 7 cents/liter. A total of $15 billion was transferred to 20 million families through payments of $80 per family into bank accounts; this first installment was intended to cushion the increase for two months. Subsidies reached some 60 million people, about 80% of the population, with the remaining citizens tending to be richer.[10] This program was motivated by the need to reduce the unsustainable subsidies in an equitable manner as well as by political considerations -- richer urban citizens,

[9] Least prudent is Alaska's approach of eliminating state sales and income taxes rather than just lowering rates and broadening the base. Public opinion strongly supports the Permanent Fund's dividend program and the dismal record of efforts to gain public support for tapping the Fund to help finance deficits in the general fund suggests that, at least up to now, Alaska's voters believe that the marginal value of private goods exceeds that of public goods. It remains to be seen whether such a view will prevail in the longer run if declining oil production really cuts into revenues.

[10] Iran intended to means-test the subsidy but this ran into difficulties of income classification so it became universal. Applicants still had to register and to provide a range of personal information on income and assets that some might not have wanted to make available. The relatively small size of the subsidy would not have provided a great incentive for an upper-income Iranian family to do so (Tabatabai 2010).

who had benefited most from the subsidies in absolute terms, tend to be less supportive of the current government. Iran's cash-transfer system took several years of planning and detailed data collection after its first consideration in 2003, and could build on experience with a variety of cash-transfer programs. It was targeted to household heads not individuals and not underpinned by a formal biometric registration program, but biometric registration could strengthen longer-run audit and accountability.

A third approach, more widely used in the Middle East than elsewhere, involves expanded levels of public employment for nationals. At the turn of the century, public sector jobs represented around 80 percent of employment in the oil-rich countries of the Gulf (World Bank 2004). In Kuwait, for example, employment for nationals is virtually guaranteed, together with a wide range of benefits including housing loans, marriage bonuses and retirement income. Dubai too provides guaranteed employment for its nationals, at wage levels that far outstrip those of similarly-educated migrants.

Arguments for Direct Cash-Transfer Programs

A powerful argument for direct, transparent cash-transfers in resource-rich countries is that in their absence many countries are forced into something worse. All of the indirect transfer mechanisms have serious side-effects. Price subsidies are generally regressive – the analysis for Iran, for example, concluded that the richest quintile received more than 6 times the per-head fuel subsidy of the poorest quintile. They promote inefficient resource use and diversion, including through fuel smuggling. They tend to become fiscally unsustainable because they increase automatically with inflation unless controlled prices are frequently adjusted, something that is very difficult to do.[11] Yet in many countries such inefficient and inequitable transfer programs are the only way in which citizens perceive their share of the "oil dividend", especially if there is little faith in the integrity and productivity of public spending. Citizens are quite rational in protesting fuel price hikes if their expectation is that the resulting revenues will only be stolen or misused.[12]

A second argument is that a "transfer-out-tax-back" system will improve governance and accountability. The need to tax citizens has been an essential component of the process of state-building; it has both forced states to develop capacity and encouraged demands for

[11] Indonesia, for example, only managed to implement major cuts in energy subsidies when domestic consumption had risen to the point of eliminating its exportable surplus.

[12] This argument is also made in non-resource-rich settings. Kapur, Mukhopadhay and Subramanian 2008 estimate the expenditure on India's myriad subsidy and anti-poverty programs. They note that a transfer program allocating this level of resources equally to the 70 million households below the poverty line would provide more than the poverty line income for rural households and 70% of the poverty line income for urban households. Currently India is in the process of switching its subsidy programs to direct cash-transfers to the poor.

accountability to the public for money spent.[13] In Latin America and Africa, studies of well-governed countries such as Costa Rica and Mauritius suggest that taxation has been one of the main ingredients in the making of an accountable and effective state (OECD 2008).

A less political interpretation of the tax-accountability link is that governments that need to rely on the taxation of income produced by normal business activity have more interest in encouraging investment, employment and growth and more incentive to pull back from bad policies, such as the protection of inefficient industries, when these suppress economic dynamism and revenue growth. Even if there is no shared culture of "representation via taxation" resource-poor governments are constrained to manage well (Auty 2000 Chapter 1). Redistributing rents to the people will not fully eliminate this problem, but by making government more dependent on tax revenues from a wider set of non-resource sectors it will reduce it.

Concerns for Cash-Transfers

Despite their theoretical and conceptual appeal, direct cash-transfer systems face four major questions. The first two apply more directly to rent distribution, the second two apply more broadly to all cash-transfers:

Reinvestment

Cash-transfers could conflict with the objective of reinvesting exhaustible resource wealth into alternative capital to preserve national wealth. This principle, the "Hartwick Rule," is included in the Resource Charter and is stressed by some governments, such as Uganda, which emphasize the investment of future oil rents in infrastructure. One complication with this argument is that extraction does not, in fact, simply deplete proven reserves on a one-for-one basis. Discovery and new technology have been increasing proven reserve levels for many resources, including oil and gas, even in the face of continued extraction. Exploiting a reserve discovery also appears to be part of the learning process of finding additional reserves (Gelb, Kaiser and Vinuela 2011). Consuming a portion of resource income may be more defensible than previously thought, especially for countries with an extended reserve horizon.

To some extent this concern could also be mitigated by making cash-transfers conditional, for example, on school attendance to build human capital. But assuming that direct cash-transfers are spent in much the same way as other income, a high proportion will be consumed. As argued elsewhere, this comes down to the tradeoff between possible gains in governance from a distribution program versus the possible payoff from a larger public investment program (Gelb and Majerowicz 2011). The tradeoff might be viewed in different ways, depending on the country. No such tension arises of course when the alternative to transfers is an inefficient and non-transparent program of indirect distribution through subsidies.

[13] This case has been made by Birdsall and Subramanian 2004, Ross 2004, Brautigam, Odd-Helge and Mick 2008, Moss, Pettersson, and van de Walle 2008, Moss and Young 2009.

Volatility

A second concern is the great volatility of resource revenues and the implications of transmitting this to households through cash-transfers. The problem can be addressed by paying resource rents into a stabilization account, and using this to smooth the transfers to households; there are many examples of such stabilization approaches, such as the Copper Stabilization Fund in Chile. The Permanent Fund mechanism solves the problem by saving the oil revenues and distributing only dividends, but this comes at the cost of a substantial lag in payments. Stabilizing payments is essential, but any mechanism will introduce a degree of complexity into the relationship between resource rents and transfers, even if the mechanism itself is fully transparent.

Incentives

The third concern is that cash-transfers may discourage labor supply and weaken the incentive to build human capital. A full discussion is beyond the scope of the present paper, except to note that the evidence is mixed.[14] Some studies suggest that unconditional cash-transfers to the very poor may actually increase participation by relaxing constraints on mobility. Woolard and Leibbrandt 2010 provide evidence for South Africa. A study of the introduction of a modest Basic Income Grant in Namibia comes to a similar conclusion, finding that the incomes of families that received the grant increased by more than the grant amount because it provided working capital for small-scale business ventures (Haarmann et al. 2009). However, the argument is probably the most powerful at low income levels and for modest levels of transfer. In countries with small populations, very rich resource endowments and high rents, any major universal cash-transfer system will probably need to be complemented by a package of measures to encourage skills upgrading and labor force participation. The levels of transfers received by citizens of the UAE through guaranteed employment and other mechanisms probably discourage work effort and education aspirations for many individuals, and they would also do so if received directly, unless transfers were tied to some active programs. These could include generous education and training supplements, and state funding of payroll taxes for citizen employees to reduce the cost to employers. Countries with adequate fiscal resources could also consider an income subsidy, possibly with payments actually increasing with earned income up to a generous level to encourage skills upgrading.[15]

[14] For examples and more information see: Bertrand, Mullainathan, and Miller 2003, Edmonds, Mammen and Miller 2005, Posel, Fairburn, and Lund 2006, Barrientos and Scott 2008, Hanlon, Barrientos and Hulme 2010, RHVP 2010a.

[15] Gelb and Grassmann 2010. Considering guaranteed employment policies, an assessment of the business climate in Dubai finds very large differences in firm productivity between the Free Zone, which does not have employment set-aside provisions for nationals, and Dubai central, which does (Ramachandran et al 2011).

Feasibility and Accountability

The final concern is whether a well-working fully accountable cash-transfer system is possible in the first place, especially in countries marked by poor governance and corruption. Cases compiled for the African Development Indicators suggest that leakages of 30% and more are not uncommon in public spending programs, especially for lines that involve transfers between multiple levels of government (World Bank 2010). An expenditure tracking survey in Chad's health system found the astonishing level of 99% leakage for non-wage recurrent expenditures for local health centers (Gauthier 2006). It is believed that over the next five years up to US$110 billion, or 44% of the total intended to be spent on India's government social welfare programs including subsidies would be diverted by "leakage and corruption" (Dutta et al. 2010).

While these estimates are not for cash payments programs alone, audits of pension systems and public payrolls have uncovered large leakages in many countries' government to people (G2P) payments associated with "ghost" workers and pensioners. In Nigeria, biometric audits reduced the number of Federal Pensioners from 97,000 to 60,000, a cut of almost 40% (NetNewsPublishers 2011). An audit some years previously had reduced the number of Federal employees by 40,000 (Hodess 2001). An audit of the Nairobi City Council found 4,000 ghost workers, about a fifth of the reported 21,000 workforce (BBC 2003). In Zimbabwe, an audit indicated 75,000 ghosts on the government payroll, out of a total of 260,000 civil servants, costing taxpayers $20 million a month (Ncube and Radio VOP 2011, Muleya 2011).

Traditional systems have proven to be susceptible to leakages and as long as income transfers are made, leakage will continue. Biometrics cannot directly address some problems, such as those relating to income-based targeting, but can drastically reduce certain others. When Botswana transferred its pension and social grants registration to biometric enrollment, the numbers in these programs reportedly reduced by 25% by cutting out ghosts, multiple entries, and those already deceased but still issued benefits. Botswana reported a savings of 10 million pula or about $1.7 million a year by switching to biometric identification (Smit 2010). A similar readjustment of spending was reported for South Africa when it transferred its program to biometric IDs (Smit 2010). The introduction of biometric registration in Andhra Pradesh showed some 12% of social transfer recipients to be non-existent in a state program considered as one of the best-run in India (Johnson 2008). Estimates for one program in India suggest that 38% of total costs will be saved once India's national biometric identification system is established (Dutta et al. 2010).

Nor is the problem confined to developing countries. Audits have found ghost workers and pensioners in many industrial countries including in the US (Detroit school system; New York pension system), the UK (Defense contracting) and Japan (elderly ghost pensioners).[16] In 1995, a senior U.S. Secret Service official suggested that "biometrics would put a sudden and complete

[16] Detroit (Kellogg 2009); New York (New York City Comptroller 2010); UK (Evans 2008); Japan (Economist 2010).

stop to as much as 80% of all fraud activity" saving up to $32 billion a year (Woodward 1997).[17] In 1999, it was estimated that $4 billion was stolen from the United States' welfare program from double dippers alone (Shen and Tan 1999). These diversion estimates are distinct from the problems associated with means-testing and other forms of targeting. While close administration and audit may limit diversion, errors tend to cumulate over time even in well-managed systems, sometimes as a result of the politicization of the programs.

A particular strength of electronic systems is that they automatically generate an auditable trail which, in the case of biometric registration and payment identification, runs all the way to the final recipient. This is beneficial not only to the agency, but also to civil society as this data can be made available to facilitate transparency and improve program oversight. Other mechanisms of cash-based distribution do not automatically provide this trail, especially at the lower levels close to the final payee. Signatures can be forged, as well as phantoms added to the roll. Clerks may refuse to disburse cash without a bribe, especially if they have a monopoly on the mechanism of payment. Smartcards and electronic payments offer ways to address this problem, including through ATMs and by expanding the number of final POS to break local monopolies on payments. In this way, new technology provides the possibility that governments can be held fully accountable for payments to citizens.

3 Some Technology Choices.

New technology offers many choices to countries on how to implement transfer programs. We consider three dimensions of choice: national versus programmatic identification; the choice of biometric identifier; and alternative payments systems. Countries can "mix and match" across these dimensions, employing a range of identification and payments options even within a single program.

National Versus Program Identification

The first question for any transfer program is whether the system of identification used for the program has the necessary reach and integrity to underpin it successfully. Most countries already have a patchwork of systems for demonstrating identity, including birth certificates, drivers' licenses, residence cards and ration cards. These are often not tied together by any unique identifier, and are often inconsistent, only reaching a portion of the population. Most countries have some form of identification card; it can be mandatory or voluntary; some cards include biometric data while others do not. The picture is evolving quite rapidly, but Bennett and Lyon (2008) provide a comprehensive picture as of December 2007 covering some 118 countries. Many had either voluntary or mandatory citizen cards; a few had such cards only for non-citizen residents. Thirty six countries with mandatory citizen cards included biometric

[17] Originally quoted in Milbank "Measuring and Cataloguing Body Parts May Help Weed Out Welfare Cheats". *Wall Street Journal* Dec. 4, 1995.

identifiers.[18] These included a number of resource exporters: Brunei, Chile, Ecuador, Egypt, Malaysia, Nigeria, Oman, Russia, Syria and the UAE. There was no clear pattern to card issue; mandatory cards with biometric identification are issued by low, middle and high-income countries and by countries with high and low scores on indicators of political freedom and civil rights.

Many high-income countries with the greatest technical capacity to introduce such cards have chosen not to do so, but these countries typically already have relatively complete birth registration and functional existing systems of identification. In the US, for example, this function is performed by the social security card and driver's license.[19] In contrast to the situation in rich countries where some 98% of births are registered, the average proportion registered in Sub-Saharan Africa is estimated to be only 50% (Bequele 2005); it is only 9.6% in Zambia. Many deaths are also not officially recorded in these countries.

The benefits and risks of formal identification systems in general, and of choosing a biometric basis for it in particular, are subjects of much ongoing debate that is beyond the scope of this paper.[20] We agree with the position of Rose (1999), that some system of formal identification is central to the concept of a nation-state, because it delineates who is a member of the nation, with the rights to participate in its institutional and material endowments, and who is not. A citizen who is invisible has no rights; he/she cannot participate in either the political or economic sphere of national activity. Indeed, experience suggests that formal identification is welcomed by many disenfranchised citizens in developing countries, many of whom will not have been recorded in birth registries.[21]

The debate cannot therefore be on the merits of identification *per se* (although some criticisms seem to have in mind an implicit alternative of very limited formal identity), but on the nature of the information collected and the potential uses and abuses of the databases created, including the use of a common identifier (such as a biometric identifier or more traditional identifiers like

[18] Several more countries are planning to upgrade their cards to include biometric data, including Mongolia and South Africa.

[19] Of the 20 original OECD countries only four are identified in Bennett and Lyon's survey as issuing mandatory biometric cards; Germany (fingerprint), Netherlands (iris) and Spain and Portugal (fingerprint). Low-income countries include Zimbabwe, Pakistan, Mali, Nigeria, Mauritania and Cambodia.

[20] See Cavoukian 1999, Caplan and Torpey 2001, Vandenabeele and Lao 2007, Bennett and Lyon 2008, Lyon 2009, and Harbitz and Boekle-Giuffrida 2009)

[21] "...[A]t the close of the twentieth century citizenship …[is realized] …through active engagement in a diversified and dispersed variety of private, public, corporate and quasi-corporate practices…we might consider the securitization of identity as a strategy for securing the obligatory access points for active citizenship. This strategy produces….the obligation to continuously and repeatedly evidence one's citizenship credentials" Rose 1999 p 246.

names or national ID numbers) that can be used to cross-link them, and the adequacy (or even the existence) of privacy and data-protection legislation (Woodward 1997, Cavoukian 1999, Mordini and Petrini 2007, Iyer et al. 2010, Greenleaf 2010). Some countries, such as Malaysia, include a very wide range of applications into a single national identity card.[22] As discussed by Breckenridge (2008), it may, in the end, be more practical to specify a limited range of applications for a particular identity system. Much depends on the particular history of a country, including the systems of identification that it has already implemented.

For any transfer program, a basic question is whether the identification system is viewed as a nation-wide initiative or as an instrumental part of the transfer program. A nation-wide approach offers many benefits for the implementing country, including benefits of scale and scope. Equipment can be procured in bulk; enrollment staff only needs to be trained once; except for later updating rounds, stations will make one visit to villages and towns. Individual citizens will only be asked to register once; the same identification database will be available for electoral rolls and other applications. Some countries already have a nation-wide identification system constructed to underpin the electoral roll that could be rolled out to facilitate identification for transfer programs[23]. However, nationwide systems sometimes lack political and popular support. Without a history of official identification, citizens and governments may not see the potential benefits of such a system, which are actually greater the less functional is the existing system of identity. Some citizens will be suspicious of any program that helps government to monitor them in any way (Bequele 2005, Vandenabeele and Lao 2007)

Biometric identification systems may alternatively be introduced on the basis of programmatic needs. They have been used in the developing world to improve the administration of pensions, demobilization stipends, and disaster relief: Chart 1 summarizes a number of cases of transfer programs. It may be easier to justify the cost of the ID system in this way and the benefits, in terms of more effective administration and easier access, are easier to understand. For the individual citizen, the promise of a transfer is usually incentive enough to enroll in the identification program: enrollment is just a means to an end. This is an important distinction

[22] Malaysia's card can accommodate up to 256 pockets or applications, including driver's license, health information, banking data, etc. The personal information included in Malaysia's card includes ethnic identity, which some see as intrusive and possibly dangerous in facilitating discrimination. At the same time its inclusion is more understandable given that Malaysia has a long and deliberate policy of economic discrimination in favor of autochthonous Malay citizens (Yeow, Loo, and Chong 2007, Fadzil).

[23] For example Bolivia, Mexico, Costa Rica, Haiti and Jamaica have used biometric databases for elections in the past. Though these systems could provide the foundation for identification in other programs, separate databases would typically be established to reduce the risk that voting information is linked with other individual details.

since many would not voluntarily enroll in a nation-wide system without some tangible benefit such as eligibility for a cash transfer or some other payment.[24]

Program-specific identification does raise the issue of how to avoid pre-empting future possible economies of scope by ensuring that the technology is not incompatible with that likely to be used by possible future programs. Some countries, such as South Africa, already have several different systems geared towards different purposes; as discussed by Breckenridge (2008) there is a tension between the use of proprietary systems, some of which already have a large global footprint, and open systems. This remains a problem, despite the progress made in developing common international standards.

Selection of Identifier: Biometric Choices

Biometric identification can be well-suited for transfer programs, particularly those distributing resource rents. Transfers that continue for a long time-- resource-rent distribution, pensions, welfare grants, etc.-- allow setup cost to be recovered more easily although even short-term transfer programs can benefit from biometrics if the scale is large enough. While resource-based transfers may not be universal they will probably cover a large part of the population. For this reason, even though biometrics is not essential to underpin a transfer program, we consider only this approach.

Many biometric identifiers have been developed, including palmprints, tongueprints, earprints, voiceprints, retinal scans, gaitprints and dynamic signature. Facial recognition is a special case for its ability to be used from afar and without the knowledge of the subject. Currently the two main identifiers being used in the developing world are fingerprints and iris scans, with some using facial recognition (digital photographs) as well.

When applying biometric technology to cash transfer systems, it is important to take into consideration the requirements of enrollment and payment points, the size and occupational

[24] There is still the question of whether enrollment in program registration is voluntary or whether the conditioning of the benefit program on registration makes it *de facto* coercive. While this may be debated, the position of this paper is that it is not possible for the state to provide an entitlement to citizens without some form of clear identification. The question has more to do with access to and uses of the data gained out of the registration process. In the extreme case – as for refugee resettlement grants in Afghanistan --unique identification is possible without maintaining any permanent database at all. Applicants could simply be finger-or-eye-printed *de novo* each time they arrive at the payment point, with the objective of eliminating double-payment. This approach requires the ability to instantly check every print against all other prints collected to ensure de-duplication, which is administratively impractical for large ongoing payments programs. The approach would also not distinguish between citizens who have a claim on a nation's mineral resources and non-citizens who do not.

mix of the population, and the coverage, duration and budget of the program. Enrollment and service-point identification have very different characteristics. The first places a very high premium on high accuracy for the de-duplication of identity in order to secure an accurate database, a challenge especially in large populations. For the latter, convenience and the cost of equipment become more pressing priorities as the network of POS stations needs to be dense to enable citizens to receive their funds in a convenient manner. The occupational structure of the population may also influence the type of biometrics used or the combination of types. Programs which benefit miners or farmers, jobs that result in wear and damage to the hands, will encounter greater error if based on fingerprinting.[25] A program for metal workers in shipyards, where eyes are often damaged, may find some difficulties with iris scans. Biometric identifiers do not solve completely the registration of very young citizens. Fingerprint patterns do not stabilize until around the age of fourteen; iris patterns stabilize at around eight months, but may be difficult to record in very young children (Dunker 2003, UIDAI "Ensuring Uniqueness"). Iris scans may also be more culturally acceptable since no physical contact is required and only the eyes need to be visible. This could be particularly useful in Muslim communities where the burqa is common. Though photographing women is traditionally prohibited, since only the eyes are captured few have objected and iris scanning is currently in use in many Arab states.[26]

Fingerprint technology is relatively cheap and provides small digital files for transmission but has fewer matching points for accuracy than iris scans.[27] A country with a large population might therefore want to implement a dual or multiple system, including iris scans for registration, as in India, while still retaining fingerprint identification for payments. If a photograph is taken at registration, there is little additional cost to including facial identification.

[25] For more discussion of registration problems and approaches to them see Weibel et al. 2008, SonLa Study Group 2007, Paik et al. 2010, Pearson and Kilfoil 2007, Smit 2010.

[26] The United Arab Emirates has been using iris scans for immigration and boarder control since 2001 (Daugman and Malhas 2004). UNHCR, since 2002, has collected iris scans from Afghan refugees returning home from Pakistan (UNHCR- Islamabad 2003, UNHCR 2007b). And iris scans are currently in use in Afghanistan for security, border control and for national IDs (O'Brien 2010).

[27] Iris scans collect 266 verification markers, compared with 40 for fingerprints (Wu 1998).

Payments Mechanisms

Payment mechanisms are of two main types: 'pull' and 'push'. With the more traditional 'pull' system, cash is distributed at a fixed time and location. This can be useful if other services are being offered to recipients, such as group education, training, and service announcements. It can also be inefficient and time-consuming for both payments staff and recipients, and increases security risks due to the large amount of cash on hand in a single location. Some countries use this system for pension disbursement by requiring recipients to gather at post offices on a certain day each month. It can be a last resort in very sparsely populated areas where there are few other cash payment options. Pull systems can also use mobile stations as in South Africa and Malawi, such as a vehicle with an ATM attached to the back. In South Africa, the ATM is able to both verify identification and pay the recipient, creating a full auditable trail (Smit 2010).

'Push' systems allow more flexibility and convenience for recipients, disbursing the payments into bank accounts which can be accessed across any number of POS stations throughout the country, such as mobile phone airtime vendors and grocery stores. India has begun using such a 'push' system for cash transfers. Shopkeepers can purchase small POS devises that verify the fingerprint scan, connect with the central database, and transfer funds into the shop account which is immediately passed along in cash to the recipient. The transaction fee received by the POS owner creates business opportunity and additional income. Similar systems are in use in South Africa, Malawi, Botswana, Pakistan, and Namibia. 'Push' systems are helpful to both recipients and the program since they do not require agency staff to be on hand for distribution, allowing for a more flexible payment arrangement. They also encourage competition between POS agents, limiting the potential for extortion. The biometric scan is an important part of the system, as it provides proof that funds were disbursed to the correct recipients.[28] Biometrics can also help participants open bank accounts by fulfilling identification requirements. Effecting payments through bank accounts, either regular accounts or a system of "basic transactions accounts" made available to all citizens will also help to provide them a mechanism of saving and smoothing the use of transfers (Pickens, Porteous, and Rotman 2009, DFID 2007).

4 Some Examples of the Use of New Technology for Transfers

New technology has been used for transfer programs in very different conditions. Five cases are summarized to provide some lessons. The programs in the DRC and Afghanistan/Pakistan show the possibility of implementation in an extremely challenging environment. The small emergency cash distribution program in Malawi highlights the need to achieve economies of scale for the approach to be cost-effective, but also some of the externalities, including facilitating access to savings accounts. Following the use of biometric systems in state-wide programs, in particular Andhra Pradesh, India is now implementing the largest biometric

[28] PIN-based systems can of course be used, but these can be lost or transferred to others; in addition, the use of a PIN-based system provides no proof that the claimant is still alive.

registration project ever undertaken. Following Pakistan's severe flooding, its established biometric national ID system is helping to distribute reconstruction aid. Finally, South Africa offers the example of the oldest biometric-based transfer program in the developing world.

Demobilization and Refugees: DRC and Afghanistan/Pakistan

In 2004, the World Bank began co-funding the disarmament, demobilization, and reintegration program (PNDDR) in the Democratic Republic of the Congo. Upon disarming, ex-combatants were enrolled in a program providing 13 cash payments to be disbursed over a year. Beginning in 2006, biometric identification systems were used to enroll 110,000 individuals and verify identity at payment for this program. Because of damage to fingers, including the high prevalence of calluses on trigger fingers, it was decided to use iris scans (Burckhart 2010). Virtually all scans were captured by local staff, trained by technicians in a short time. When enrolling, ex-combatants had their iris scanned; these scans were then compared against the entire database to prevent multiple enrollments, and an ID card was issued with the ex-combatant's photo and identification number.

For the first year a modified 'pull' method was used for cash distribution. Airtime vendors were able to download a free application on their cell phone which allowed them to access the ex-combatant database and serve as a payment center. At the peak of the program, 8,000 airtime sales agents had this application on their phones. An ex-combatant would present their card to the agent who would confirm that they matched the picture on the card. The ID number on the card was then entered into the phone along with the ex-combatant's PIN and the application approved or denied payment. On approval, the vendor paid the ex-combatant and a deposit into the vendor's account reimbursed the payment.[29] This system proved to be quite successful in urban areas, but difficult in sparse rural communities where vendors had less cash on hand to pay the allowance. In its second phase the program switched from vendors to a standard 'pull' system using 10 mobile payment teams in rural areas. Recipients were required to visit once a month to receive their payments. These required iris scans for identification, rather than PINs and photos; this was possible because there were only 10 teams rather than 8000 vendors. No identification document was needed in this phase.[30]

In 2002, UNHCR began using iris scans to distribute refugee resettlement grants on the Afghanistan-Pakistan border. As Afghani refugees left Pakistan, UNHCR provided each refugee with basic supplies and a one-time grant of between $30-100. Before providing assistance, UNHCR scanned each refugee's iris and compared it to the database of previous recipients. Upon confirming that the individual had not received assistance before, he/she was given the

[29] Biometrics was used to prevent fraud at the enrollment point, but at payment security was left up to the vendors checking the photo ID and the PIN used to access the account

[30] Information on this program comes from Bezuidenhoudt 2008, MDRP 2008, Burckhart 2010, and MDPG "Screening, Verification and Registration".

money and supplies. Since no follow-up or additional payments were required, UNHCR chose not to collect other information from the refugees; iris scans served as the only record. [31]

The DRC and Pakistan/Afghanistan cases show how technology can underpin transfer programs in very difficult conditions; also that particular factors can necessitate a pull-back to more traditional pull payments systems. Assessments of the programs by those involved report that they operated with very low levels of fraud and leakage, and that there was no difficulty in finding and training local operators (UNHCR 2003, Bezuidenhoudt 2008, Burckhart 2010).

Food Security: Malawi

In 2006 the Northern Dowa area of Malawi experienced a critical drought. Food assistance was desperately needed, although the rest of Malawi was experiencing a surplus. Concern Worldwide had used a partial cash transfer system the year earlier in Malawi and decided to move to a full cash transfer. To address a number of problems with the last cash transfer, Concern used biometric identification this time around (Pearson and Kilfoil 2007, Devereux 2008). Villages affected were divided into three groups (women, men, elders); each group was asked to compile a list of those most affected by the drought. Those lists were then compared and debated in a public gathering to ensure no one person or group could purposely exclude others. Once the lists were finalized, the female head of each of the 11,000 households on the list registered with Concern. Each woman submitted fingerprints to prevent multiple registrations, and received a smart-card containing her basic information and fingerprint.

Concern partnered with Opportunity International Bank Malawi (OIBM), which set up basic savings accounts for participants linked to the smart-cards. Payments were made into the accounts and mobile banking stations would visit villages once a month for five months to disperse cash to participants. Fingerprints were used to check the identity of the women when they came to pick up their funds, but cash was distributed by a bank teller rather than an ATM. Even with these mobile banking stations, at least one third of participants reported having to walk for over an hour to reach the payments centers. Concern acknowledges that a 'push' mechanism secured by biometrics would have lessened this burden and provided a number of other benefits, including being more efficient for donor staff (Pearson and Kilfoil 2007, Devereux 2008).

An evaluation commissioned by Concern found that biometrics was not cost-effective for such a small, temporary, program (Pearson and Kilfoil 2007). However, Concern's own assessment noted that one of the stated goals of the program was "to develop and refine modalities for the delivery of cash transfers in emergency food security contexts, and to draw lessons regarding these modalities for longer-term social protection programming" (Devereux 2008). Both reports

[31] Originally, UNHCR only captured iris scans of returnees over 12 years of age, but after discovering that some children were recycling through with different adults, the age was dropped to six. (UNHCR 2007b, UNHCR 2003, UNHCR-Islamabad 2003).

agree that for larger or longer programs, biometrics could easily prove to be financially justified. Concern also noted a number of non-financial benefits to the use of biometrics including accessibility, facilitation of access to financial services, and the official recognition, and status improvement for those involved. Access to formal savings facilities received such positive feedback that Concern funded an additional year of mobile banking for participants after the end of the program (Devereux 2008).

India: From Andhra Pradesh to UIDAI

India has seen numerous projects using biometric identification. Central and local governments have actively experimented with modest projects to monitor school attendance (Gujarat) and municipal staff attendance (Delhi, etc), and with large scale payment systems using third party biometric platforms[32]. In 2007, Andhra Pradesh became one of the first states to use biometrics to deliver government payments. Concerned about leakage in traditional payment mechanisms, the state government began using smartcards and rural POS to deliver pensions and guaranteed employment payments (Johnson 2008).[33] It partnered with FINO, an Indian technology company which uses a platform based on biometric identification to link rural citizens with the formal banking system. Once their fingerprints have been captured, each recipient receives a bank account and smart-card. To effect payment, FINO established POS stations in the villages and trained educated local women to operate them. Beneficiaries could visit any FINO-enabled POS. Identification was confirmed by comparing their fingerprints to those stored on their smartcard. The POS would then indicate the amount of funds available based on information stored in the smartcard. Payment information was then recorded on the smartcard and the POS. The central database was updated daily, when the POS synced with it. Though money was transferred through bank accounts, most recipients withdrew their entire grant, not using the savings feature. In addition to reducing recipient rolls by 12%, this payment system proved to be more convenient and empowering for the beneficiaries, with women who had previously been excluded from collecting in person coming forward to claim their own entitlements (Johnson 2008). Due to its success, the government now uses this system to deliver grants to 5 million citizens.[34]

India is now poised to create the largest biometric database in the world. In early 2009, the government announced that they would create a national ID program for its 1.1 billion people, with the goal to enroll 600 million people in the first five years. The Unique Identification

[32] Gujarat (ESSL Biometric Securwatch), Delhi (Verma 2010). FINO and A Little World use biometrics to connect rural communities with financial services (Johnson 2008, Dutta et al. 2010, Arora and Cummings 2010).

[33] Both are national programs. The SSP provides Social Security Pensions. NREGA, the National Employment Guarantee Act, ensures that every citizen has the opportunity to work at least 100 days a year.

[34] Other sources used: Dutta et al. 2010, Bankable Frontier Associates 2008.

Authority of India (UIDAI) was created to manage this colossal task. The Biometric Committee, created under the authority of UIDAI, researched the available forms and attributes of alternative biometrics; in the end they decided to collect both fingerprints and iris scans, along with a face scan. [35] To accomplish this goal, estimates suggest that about 12,000 mobile and fixed enrollment stations would be needed throughout the country (Dutta et al. 2010). At its peak, UIDAI believes it will be able to enroll up to one million people per day (UIDAI 2010b). Names, birth dates, gender, iris scan, 10 fingerprints, and photo will be recorded in the system.

The UIDAI decided to record iris scans at enrollment due to the huge number of citizens' biometrics being recorded. Fingerprinting can provide a 95% assurance of no overlap, but due to the size of the population, iris scans provide a far more rigorous identifier (UIDAI "Ensuring Uniqueness"). The iris scans are sent to the central database to be compared against all previous scans: once uniqueness is confirmed, an individual is sent his or her unique AADHAAR number together with other summary personal information which, though not in card form, can be interpreted as the equivalent of an identity card. This creates an official identity which can be built on to access a range of programs and services. For people registered with social grant programs, there is a grace period of a few years during which they can have either their number or name registered with the corresponding grant agency. But after this grace period, every citizen receiving social grants must be registered with UIDAI and must receive their money through their AADHAAR number.

For identification at collection points, the biometric committee recommends using fingerprints (UIDAI "Ensuring Uniqueness"). Fingerprint scanners are currently cheaper than iris-scanners (though the differential is reducing) and a fingerprint scan is a smaller digital file than an iris file. Small POS devices are being sold across the country which will enable the 'push' system to be used for the disbursement of grants. To withdraw funds, citizens can go to any of these POS, enter their AADHAAR number and identify themselves with their fingerprint. This is sent to the central database for verification.[36] Once verification is received, the funds for the grant are transferred into the POS owner's bank account, and the citizen receives cash from the POS owner. POS proprietors receive a small fee for each transaction as well as develop clientele for other services.

This program is partly motivated by estimates of very large leakages in India's social programs. Of $250 billion to be spent over the next five years by the government, it was estimated that up

[35] UIDAI originally decided on iris scans, but found that adding fingerprints would cost only 4 cents more per citizen. (UIDAI "Ensuring Uniqueness"). Its ability to de-duplicate so large a citizen database is still to be fully tested.

[36] It is this online requirement that necessitates the use of fingerprints for their smaller digital information signature. Although some more remote parts of India do not yet have cellphone access, there are already over 600 million cellphone subscribers in the country.

to $110 would be lost to leakages; two thirds through "corruption and malpractice" and the rest through "misdirection" (Dutta et al. 2010). Reducing this even by a small amount would more than pay for the program. India has also sought to build its IT capability and to save public resources by engaging the private sector and market-based mechanisms for payment.[37]

National Flood Relief: Pakistan, NADRA and Watan Cards

Since 2000, Pakistan's National Database & Registration Authority (NADRA) has registered over 96 million citizens in their biometric national database and distributed over 70 million computerized national identity cards (CNIC) (NADRA website). Citizens use this official identity as the base to access a range of services, including welfare programs. When extensive floods hit in 2010, the government used this database to establish an emergency cash transfer system, similar to one used in 2009 to assist 500,000 IDPs (Visa 2009). NADRA was able to identify citizens eligible for assistance based on their registered address. Since most of the affected population had previously registered with NADRA, their identities were easily confirmed by comparing their fingerprints to those in the database. This proved particularly useful since many victims had lost all other forms of identification.[38] Heads of households were then issued a Visa-supported Watan debit card which could be used at numerous POS and ATMs across the country. Thus far, over 1.5 million Watan cards have been issued (Visa 2009, Watan official website); the first phase payments were made quickly and with little diversion. This example demonstrates the potential benefits of a national ID program based on biometrics. In addition to expanding banking services, facilitating payments, and improving identification systems, NADRA allows the government to quickly assist citizens in time of crisis.

South Africa

Fingerprints of non-white citizens began to be collected by the South African government in 1925 for the purpose of racial registration. In the 1980s collection was extended to citizens of all races due to national security concerns related to the anti-Apartheid movement (Breckenridge 2008). In 1992, the province of Kwa-Zulu Natal hired Net1, a South African company, to set up a system of mobile and fixed centers for the payment of pensions and other social grants using fingerprints as identification. All enrolled in welfare programs at the time of the switch were required to re-register, and submit their fingerprints. Fingerprint scans were compiled into a database and checked to ensure that individuals were only registered once. Scans of each 10 fingers are recorded on a smartcard which also holds that individual's grant information, including payment schedule, amount, and date of last payment received. Having all of this information on the smart card allows the system to operate offline; a POS does not need to connect to a central database, but can check identity and verify payment all through the card.

[37] For more information on the UIDAI program http://uidai.gov.in/.

[38] Those who had not registered were required to register at NADRA to prevent against multiple claims and ghost recipients. An assessment of the first phase of the program is in process.

With government insisting that no citizen should have to commute more than 5kms to receive their payments, a network was created of 5,000 POS terminals in stores and another 3,500 vehicles equipped with POS stations. These mobile POS comprise a small truck with an ATM strapped into the bed; the vehicles service 8,257 locations and operate on a 15 day rotation, ensuring that each location is visited roughly twice a month. When collecting payments, the smart card enables offline verification and disbursement, but for the POS owner to be reimbursed, they must connect to the central database through a phone or internet line.[39]

South Africa's approach provides a useful alternative for a sparse country with limited internet and cell network coverage. The system has been extended, in some cases with modifications, across the entire country, and currently distributes grants to over 15 million beneficiaries. Additional payments mechanisms have been added, including electronic transfers into bank accounts; these now account for about 20% of payments (Bankable Frontier Associates 2008). Offered in partnership with ABSA bank, the Sekulula card operates like a traditional debit card. Welfare payments are made directly into recipient's ABSA no-frills bank account; money can be access at ATMs or participating POS. Recipients have the option to withdraw part or their entire grant, and to make deposits. Those using this option can access other services offered by private providers, such as insurance, as small contracts become more feasible when dues can be automatically deducted from guaranteed pension payments.[40]

5. The Economics of Transfer Systems: Some Illustrative Calculations.

Only fragmentary information is available on the costs of implementing transfer systems. Much depends on the nature of the cash-transfer, and whether the program faces additional costs of targeting or monitoring compliance with conditionality. The costs of registration, database and the payments system are usually not separated out clearly from other costs and compared with alternatives. Costs will depend on the scope of the program and its geography, with cash-transfers in sparse regions being far more costly than in dense ones. Many costs are fixed per recipient and/or per transfer, so that their relative size will be larger for modest systems transferring small amounts of money.[41] The costs of biometric registration and smartcard technology are also subject to variation. It should be remembered that other mechanisms of registration and maintaining databases will involve costs also. Recognizing this dearth of information, we provide illustrative estimates of the potential economics of using the new technologies for both payments and identification.

[39] To prevent against robbery, the system has an "emergency finger" alert built in. If someone is being forced to withdraw their payment under duress, they submit their pre-chosen "emergency finger" for scanning and the system will only issue a small amount. Given the violence associated with robbery in South Africa, such a choice might be thought to involve some risk.

[40] Additional sources include Smit 2010, InWEnt/World Bank Institute 2006, Breckenridge 2005.

[41] In 2011 the administrative cost of social security grants was 6% of the total value of the grants program (South African Treasury 2011, Table 7.2).

A recent CGAP report by Pickens, Porteous and Rotman (2009) provides a first basis for these calculations, with the estimate that traditional mechanisms of making cash payments typically cost $2 per transaction. In addition, payees will face the cost and inconvenience of having to travel to a relatively few points of service to collect their payments, a particular problem for dispersed rural recipients.

Against this baseline, the report considers the financial implications of setting up a system of branchless banking for a hypothetical monthly payment program with 1 million recipients and making payments through this system. Based on data from case studies, and applying typical ratios for the number of POS agents (one agent for every 100 payees) and the training and equipment required by these agents, they estimate that an upfront cost of $12 million would be required to establish the infrastructure for such a program. Payments through the branchless system are estimated to cost $1.59. Using these numbers, the branchless banking system would pay for itself in a little over two years, and after five years, the program would have saved $13 million by using branchless banking. Convenience savings to payees would also be substantial.

To add biometric enrollment to this scenario, we need to include the cost of establishing a biometric database, including registration stations and additional training for enrollment staff. Based on limited evidence from previous programs, we estimate that it will cost roughly $5 million to enroll 1 million people. This includes training and salary for enrollment staff, transportation and logistics, establishing the database, and $90,000 for computer hardware at enrollment stations. If biometric identification is to be used at payment, an additional $2 million each is needed for POS equipment and training and smartcards, bring the overall startup cost to $9 million.[42]

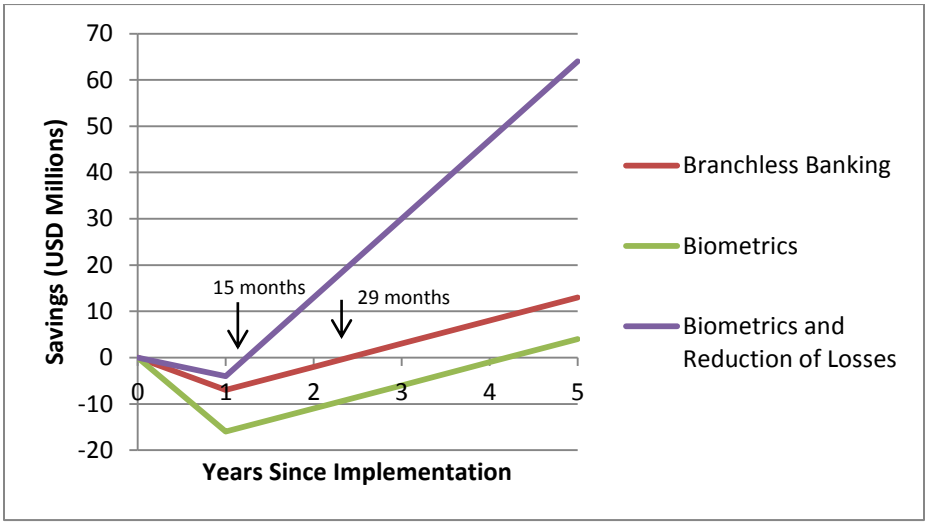
With an additional upfront cost of $9 million, the payback period of our program increases from 2 to 4 years (see Figure 1). However, cash transfer programs which have implemented biometric systems have reported savings as high as 10-20% from fraud reduction.[43] To be conservative, we assume a much smaller savings rate of 5% on a cash-transfer system delivering only $20 per month to each claimant or a total of $240 million annually. De-duplication saves the system $12 million each year. The program will recover its initial costs after only a year, much faster than with branchless banking alone. After five years, the program would have saved $64 million, and savings cumulate over time. Since the numbers for both the size of the transfer

[42] See annex 1 for more detail on assumed costs. Using biometrics at payment is not required to realize most of the savings from eliminating double dippers and ghost recipients. But it does establish a more thorough record of transparency and can ensure only the intended beneficiaries collect payments. Our cost estimates are broken down to distinguish the cost of using biometrics for enrollment, for payment, and with smartcards.

[43] More information is needed on savings; estimates include 10% from Andhra Pradesh (Zelazny 2010) and 12% from Andhra Pradesh case study (Johnson 2008); 20% southern African experience (Smit 2010).

and the amount of leakage are deliberately conservative, the payoff in practice would probably be far larger.

Figure 1: Potential Savings from Branchless Banking and Biometrics



These are only illustrative numbers but they demonstrate the possible savings from the introduction of new identification and payment technologies. These go together naturally: having a secure system of identification on both the registration and payments side and a clear auditable trail enables far greater flexibility in terms of POS arrangements and convenience for users. Additional gains are possible by using such systems for the payment of civil service and other public wages. No other alternative offers citizens the same transparency, and the ability to ensure that they are indeed receiving the benefits to which they are entitled.

6. Conclusions and Concerns.

New technology offers many advantages for countries implementing cash-transfer programs. They include cost, convenience, and the automatic creation of an auditable trail running down to the level of the individual citizen. While payments technology facilitates the transfer and can provide the externality of financial access, identification technology can clarify the beneficiaries, including citizens with "ownership" rights over natural resource rents. As shown by the variety of cases, identification and eligibility can be established even in countries facing severe capacity constraints and difficult conditions.

Technology does not provide a silver bullet for cash-transfer systems. While the reported incidence of fraud and leakages in programs using the new approaches suggests that this is very low and that the programs can be inclusive, more research is needed on how these systems operate in practice relative to alternatives. No system is totally foolproof. Technology can help to monitor some aspects of conditionality in transfer programs (for example, it can be used to report on school attendance or mothers' visits to health clinics), but it offers no quick fix for other possible requirements, such as income-based targeting. However, options always need to be weighed against counterfactuals and, especially for resource-rich countries, the latter raise major concerns.

A particular advantage of new technology is the auditable trail that it generates. Without such a trail, there is far less possibility of citizens holding government to account for the use of resource rents, even if some form of transfer system is on the books. This advantage of e-government has been recognized by activists in some countries. In India, for example, concern among NGOs for the possibility that biometric identification could be used to undermine civil liberties is countered by the recognition that the new approach offers the first real opportunity to hold government accountable for ensuring that funds are received by those entitled to them (Sheth 2010). Resource rich countries that face a window of opportunity to improve the management of their resources can therefore use the new technology to help lock in gains for the long-term.

The new technologies raise a number of issues which are beyond the scope of this paper. They impact political power relations, bypassing levels of local government that may be accustomed to using discretion in awarding benefits. Direct cash-transfers can substitute for a variety of services delivered, for example, through NGOs or through price controls administered by bureaucracies with an interest in perpetuating their existence. Not surprisingly, tensions can arise (as they have in India) and they will have to be dealt with.

A second concern is the threat of lock-in to proprietary systems. While there is progress on inter-operability, the most efficient technologies are still in the hands of leading firms.

Data protection and privacy is a third area of concern. Laws are relatively uncharted in many developing countries; some fear encroachment on civil liberties and the potential for function and data creep. These are often more related to database management than biometrics, although biometric linkages can facilitate the flow of information across different databases. Some suggest that biometrics may even increase privacy. By negating the need for other basic information to be recorded, as was done by UNHCR in Pakistan, biometrics can actually make it harder to trace information back to a specific individual (Boukhonine, Krotov, and Rupert 2005, Mordini and Petrini 2007, The SonLa Group 2007). And if set up correctly, biometrics could even improve security if used as the passcode to access information (Woodward 1997, Whelan "Biometrics Technology", Cavoukian 1999). And in any type of system, these entries may be the first established record of "invisible" citizens, and could serve the basis for establishing their official identity and finally having access to a wide range of services.

Chart 1: Transfer Systems Using Biometrics

Country	Name of Program	Objective	Bio ID used for Registration	Bio ID used for Payment	Push vs. Pull	Scale	Duration	Notes	Amount distributed
Pakistan/Afghanistan	UNHCR Voluntary Repatriation	Resettlement grants	Iris (later also fingerprints)	N/A	N/A	+3.8 million	2002-Present	Used for one-time grant	$60-100
DRC	PNDDR (National Program of DDR) (World Bank)	Demobilization grants	Iris	Originally used photo ID, but switched to iris	Originally Push&Pull system using airtime vendors. Final year Pull with mobile payment systems	180,000 individual, 110,000 ex-combatants	Each individual participated for a year. It ran for 4 years.	Banking options were originally intended to be offered, but they were not ready for the program. Regretted	Initial payment of $110, followed by 12 monthly payments of $25
Malawi	Dowa Emergency Cash Transfer (DFID/Concern)	Cash transfer for those affected by drought	Fingerprints	Fingerprints	Pull system using mobile payment centers	11,000 households	5 months	Banking system failed and was not used, but BioID still used. Bank accounts were created	$10/month
South Africa	South African Social Security Agency (SASSA)	Pension and unemployment payments	Fingerprints	Fingerprints (For Pull)	80% Pull using mobile POS. 20% Push paid into	5 million grants using Pull	Since 1990	Began in KZN but has expanded nationwide. Smartcard	Pension: $140/month. Child Support: $30/month

					bank accounts			used. Option for direct payment for insurance	
India	National Rural Employment Guarantee Scheme (NREGA) and the Social Security's Pension Scheme	Pension and welfare grants (Andhra Pradesh)	Fingerprints	Fingerprints	Biometrics used for Push system using smart cards and local POS. Other options available (Pull and Push).	5 million	2008-Present	More convenient for recipient by reducing transaction time, wait time, and distance to POS.	SSP $4.34/month. NREGA $1.74 per day
Ghana	E-zwich (Gov't)	General banking and G2P transfers	Fingerprints	Fingerprints	Push system using bank accounts. ATMs, POS, SmartCards	340,000	2008-Present	Geared to underbanked, but expanding	
Namibia	Universal Pension Scheme	Pension	Fingerprints	Fingerprints	Pull system using NamPost accounts and mobile POS	100,000 (2005)	Since 1996	Aim is that pensioners need to travel less than 10km. 15% go to post office, other have closer POS	N$300/month
Namibia	Basic Income Grant	Universal Income Grant	Fingerprint	Fingerprint	Pull system using NamPost accounts	930-pilot	2008-09	Using NamPost accounts which issue smart cards to	N$100/month

								all account holders	
Botswana	Food Coupon Program (Gov't)	Social Welfare Grants	Fingerprints	Fingerprints	Push system using ATMs and debit cards (smartcards)	55,000 (2008)	2008	Operating on the SmartSwitch system	
Pakistan	Benazir Income Support Program	Social Welfare Grants	Fingerprints	Fingerprints when required	Push system using post office accounts, ATMs, smart cards, mobile banking	5 million grants	2008-Present	Identification takes place through NADRA system and National ID cards	Monthly grant of about $13
Pakistan	Watan Card	Cash transfer for those affected by the floods	Fingerprints / NADRA used	N/A	Pull system (88 centers). Debit cards issued through Visa	1.5 million	2010	Additional Rs80,000 for rebuilding discussed	Rs 20,000
Pakistan		Assistance for IDPs	Fingerprints / NADRA used	N/A	Pull system. Visa debit card distributed	300,000 (1.5 million expected)	2009	Expanded upon the BISP program	Rs. 25,000 per family

Kenya	Hunger Safety Net Program	Long term welfare assistance for food	Fingerprints	Fingerprints	Push system using smartcards and POS and banks	60,000. 1.5 million goal	2008-Present	Program provided solar panels for POS operators due to lack of electricity	Each recipient receives $27, bi-monthly
Nigeria	Integrated Personnel & Payroll Information System	Salary and pension payment	Fingerprint	Transferred into a bank account not requiring	Push using established bank accounts	Pilot in 16 ministries, soon to include all	Pilot 2007-10. Universal rollout 2011	Pilot saved N12 billion in three years	
Iraq		Salary, pension and welfare grants	Fingerprints	Fingerprints	Pilot used Push&Pull, but moving toward Push	1.5 million current	2008-Present	Net 1 operating system	
Philippines	Social Security System	Pension payments	Fingerprints	N/A (fingerprints used for other transactions)	Push through banking and mailed checks	29 million (registered, not necessarily receiving benefits)	1998-Present	Now expanded to include other government programs	P6.4 billion a month total
Bolivia	PRODEM FFP	Banking, pension and work program salaries	Fingerprints	Fingerprints	Push using bank accounts and ATMs	530,000 (total clients)	2003-Present	Gov't payment system an add-on to system.	
Indonesia	Cash Grants for Livelihood Recovery	Emergency relief (tsunami)	Iris	N/A	Push using bank accounts and ATMs	10,000	2005-2008	Admits that iris scans and bank accounts may have been a burden	$10 million

Mexico	Disconsa	Welfare payment	Fingerprint	Fingerprint	Push using POS in local stores	200,000	Pilot in 2008	Paying Opportunidad payments through Disconsa stores	

Annex 1: Cost details for including biometrics

Detailed information on the costs of including biometrics for payment systems is limited. Our estimates are based on data from interviews and case studies and build upon cost estimates for branchless banking by Pickens, Porteous and Rodman 2009 (Chart 2). Starting off from this scenario we estimate that including biometrics for a cash transfer program for one million would cost an additional $9 million. This would include $5 million for registration, $2 million for fingerprinting at payment and $2 million for smart cards (chart 4).

Our guesstimate of $5 million, or $5 per person, for registration is based on overall cost information from several cases. Unfortunately, these sources typically do not include a breakdown of costs. Some items are illustrated in Chart 3: registration equipment alone should cost roughly $90,000; additional costs will include training and salaries for the enrollment staff (2 per unit), establishing the database, and the logistics of the enrollment program (travel, etc).

Chart 2: Calculating Savings to Government (US$) (Pickens, Porteous, and Rotman 2009)

Line	Item	Value	Notes
1	Recipients	1000000	
2	Payments/year	12	
3	Cost/recipient/month via traditional arrangement	2.00	Lowest cost quoted among program studies
4	Cost/recipient/month via electronic delivery	1.59	Average of six social transfer programs in Argentina, Brazil, Colombia, India, Mexico and South Africa
5(a)	Clients/POS terminal/ month	100	Selected to conservatively depict a nationwide agent network that reaches deep into rural areas and that might begin only with G2P recipients
5(b)	Cost per POS terminal	400	Assumes preferential pricing justified by bulk order with single manufacturer
5 (c)	Total cost for POS terminals	4,000,000	Line 1 / by line 5(a) x line 5(b)
5(d)	Cost per debit card	2.00	Prevailing price in multiple countries
5 (e)	Cost to replace recipient cards 1x every five years	2.00	Prevailing price in multiple countries
5(f)	Total cost of cards	4,000,000	Line 5(d) + line 5(e) x line 1
5(g)	Cost to identify, train and set-up one agent	400	Average among CGAP technology program partners where data available
5(h)	Number of agents	10,000	Line 1 / by line 5(a) (hypothetical for nationwide coverage)

5(i)	Total cost to create agent network	4,000,000	Line 5(g) + line 5(h)
5(k)	Total up-front investment	12,000,000	Line 5(c) + line 5(f) + line 5(i)
5(l)	Cost/recipient/month to put branchless banking infrastructure into place	1.00	Line 5(k) / line 1 / line 2.
6(a)	Monthly cost of delivery via traditional arrangement	2,000,000	Line 1 x line 3
6(b)	Total cost of delivery via traditional arrangement over five years	120,000,000	Line 6(a) x 60 months x 5 years
7(a)	Cost of upfront infrastructure	12,000,000	Line 1 x line 5(l) x 12 months
7(b)	Cost/recipient to deliver grant via branchless banking over five years	95,400,000	Line 1 x line 2 x five years x line 4
7(c)	Total cost of delivery via new arrangement over five years	107,400,000	Line 7(a) + line 7(b)
8	Total Cost Savings	12,600,000	Line 6(b) - line 7(c)
9	Total Cost Savings (%)	10.5	Line 8 / line 6(b). Ratio by which new payment arrangement is cheaper than traditional

Chart 3: Cost of Enrollment Equipment (US$)

10	Recipients	1,000,000	
11	Time to register each recipient	10 minutes	Conservative estimate based on case information
12	# of recipients each station could enroll per year	11,520	Assuming operational for 8 hours a day, five days a week, for 48 weeks a year
13	# of enrollment stations	90	Line 10 / Line 12
14	Cost per enrollment station	$1,000	
15	Total cost of enrollment stations	$90,000	Line 13 x Line 14

Chart 4: Additional Cost to include Fingerprinting at Payment and Smart cards (US$)

16	# of payment agents and POS	10,000	Estimate from original scenario
17	Cost for basic POS station	$400	Estimate from original scenario
18	Cost for biometric POS station	$500	
19	Additional cost for using biometric POS stations	$1,000,000	Difference of cost times number of POS stations (Line 18 - line 17 x line 16)
20	Additional cost for POS agent training	$100	In addition to basic training costing $400 each
21	Total cost of additional training	$1,000,000	Line 16 x line 20
22	Total to add fingerprinting at payment	$2,000,000	Line 19 + line 21
23	Cost of basic banking card	$2	Estimate from original scenario
24	Cost of smart card	$4	
25	Additional cost of using smartcards	$2,000,000	Line 24 - line 23 x line 10

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