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**Administrative Requirements
and Prospects for Universal NDCs
in Emerging Economies**

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Abstract

Many public policies are impossible to implement without adequate administrative systems in place. This is true for modern pension schemes and in particular, notional defined contribution (NDC) schemes. Today these systems must be digital yet most pension systems predate computerization and must find a way to bridge past and present. The shift from defined benefit (DB) to NDC brings particular challenges in recordkeeping. This paper briefly reviews the administrative requirements of NDCs and offers a simple checklist for countries considering this type of reform. The last section describes a universal NDC scheme that harnesses the modern digital infrastructure that may allow developing countries to overcome the limitations of traditional contributory systems and their reliance on payroll taxes.

Key words: Pension Administration, Pension Policy

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Abbreviations and Acronyms

DB	Defined Benefit
DC	Defined Contribution
FDC	Funded Defined Contribution
GDP	Gross Domestic Product
NDC	Notional Defined Contribution

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1. Introduction

Many public policies – from expanding health insurance coverage to collecting taxes – are impossible to implement (or at least to implement well) without adequate administrative systems in place. This is true for modern pension schemes and notional defined contribution (NDC) schemes in particular. Today these systems must be digital; yet most pension systems predate computerization and must find a way to bridge past and present to implement reforms. The shift from nonfinancial defined benefit (NDB) to NDC schemes brings special challenges in recordkeeping. This paper briefly reviews some of the administrative requirements of NDCs and offers a simple checklist for countries considering this type of reform. The last section describes a universal NDC scheme that harnesses the modern digital infrastructure, including unique identification systems and digital commerce, that may allow developing countries to overcome the limitations of traditional contributory systems and their reliance on payroll taxes.

2. The evolution of pension policy and pension administration

Few pension systems that exist today were started in the digital age. Exceptions are those recent cases like Korea in 1988 and Ethiopia in 2011.¹ The vast majority of contribution-based schemes predate computers and began with paper records. Aside from the former Yugoslavia, most of the former socialist countries relied on paper records until very recently. While digitization was introduced in most systems in recent years, it has sometimes proven to be too difficult or costly to include historical records.

In defined benefit (DB) schemes, the reliance on paper was not a major problem since the benefit formula was applied to a final salary, which was easy to track. The first civil service pension was awarded in 1684 to Martin Horsham and was simply defined as one-half of his salary. No formula was applied. Only later did the British civil service pension formula emerge and account for years of service in the calculation. This noncontributory DB was

¹ This applies to Ethiopia's new scheme for private sector workers. The public sector workers' scheme is 50 years old and has a backlog of 2.5 million paper records. Ethiopia intends to digitize them when funding is available.

later introduced in countries ranging from Nigeria to India to Hong Kong. The calculation was relatively simple – number of years in service multiplied by the accrual rate multiplied by the final salary.

In the last few decades, however, starting with the more advanced economies, a shift to electronic records occurred. This development is especially important to those seeking to reform pension systems. Almost all Organisation for Economic Co-operation and Development (OECD) countries now effectively use lifetime average earnings (or close to lifetime) valorized by wages or prices instead of final salary to determine the pension value. They also index benefits to inflation, wages, or a combination of the two. Making such calculations for millions of people manually would result in delays, errors, and added costs. These policies became feasible only with the shift to digital systems.

At the same time, systemic reforms that introduced privately managed and funded defined contribution (FDC) schemes² made electronic recordkeeping for individual account tracking even more of a necessity. Chile was the first case, but by the late 1990s, more than a dozen countries had introduced this type of reform, a figure that has now more than doubled. Major hiccups arose in many of the countries and the term “rezagos” came to be used in the Latin American context to refer to funds collected that could not be matched to a worker and were placed into a suspense account, sometimes forever.

Similarly, though the first NDC schemes were introduced in the 1990s, the demands of an individual account-based system led to teething problems in almost every country that introduced this kind of reform. Additional requirements for good administration beyond recordkeeping also arose. Some of these are common to FDC and NDC schemes while a few were specific to NDCs.

² Many former British colonies have provident funds including India, Hong Kong, and Malaysia. Their accounting was simpler in that the interest rates were administered and applied at the start of each year. Nevertheless, recordkeeping was onerous as were transaction costs for members.

3. The demands of NDCs on administrative systems

One of the arguments made by proponents of defined contribution (DC) schemes generally and NDCs in particular is that they are relatively transparent. At any given moment, contributors should, in principle, be able to see how much pension wealth they have accumulated in their individual account. In contrast, while such a calculation is technically possible, it is not generated by DB scheme administrators. Even if it were, it would be difficult to understand as it involves a complex calculation and relies on a number of assumptions. To achieve this level of transparency for FDC or NDC accounts, however, records must be continually updated and should be accessible to account holders.

Most legacy information systems, even when computerized, are not set up to perform these functions. Migrating from the old to the new system is a major project itself, even when the database includes all relevant information. In many cases, the database will not contain the entire history of contributions, reflecting an earlier shift from paper to electronic records. In Greece, the original NDC plan of 2013 was to convert contributions to notional capital starting in 2002. The choice of this cutoff date was due to the fact that digitized contribution records were not available before this date. In fact, electronic contribution records for both public and private sector workers were first available only in 2015 after a new centralized information system was installed.³

One extreme example is Mongolia.⁴ Prior to 1994, there were no contributions in the Soviet-style DB scheme. Between 1994 and 1999, paper-based records were available and eventually digitized and a new computer system has kept track of contributions since 2000. It is still not clear how those years of service were credited in the NDC system. A similar conversion of paper booklets to digital form had to be done in Latvia and the struggles of the Polish pension fund administration in this regard and the significant delays that they caused are well documented (Chłoń-Domińczak and Gora 2006).

³ Personal communication with George Symeonidis (2018).

⁴ Thanks to Mark Dorfman for this information (personal communication, 2018).

Accuracy and timeliness are also required both for reporting in real or close to real time and for the purposes of accruing interest. In the case of a typical DB scheme, delays in crediting contributions, even for years, do not affect the pension value as long as they are credited before the calculation. The loss in interest, if there are reserves, is borne by the fund, not the individual. This is not the case with DC schemes and for this reason, the time lag between when funds are collected and then reflected in the accounts must be minimized.

Even if the pension fund's information system is sound, delays and errors can start with the submission of data on individual contributions from employers. In many countries, these submissions are still made on paper. Only recently, and in most cases partially, is electronic filing possible. Among the 12 countries surveyed by employers, only the United Kingdom and Maldives received e-filings of contribution records from most employers (Table 3.1). On the other hand, because large employers tend to participate more, the share of covered workers whose reporting is done electronically is much higher. These figures – from the mid-2000s – are certain to have improved, but in many low-income countries, the infrastructure that would allow the pension fund to mandate e-filing is unavailable to all but the largest employers.⁵

⁵ In Azerbaijan for example, the paper workbooks used since 1938 were transitioned to a consolidated online system in 2014. Now information provided by employers can be accessed by relevant government agencies and employees.

Table 3.1: E-filing prevalence in selected countries, mid-2000s

	Armenia	Czech Republic	Chile	Hungary	Kosovo	Maldives	Mexico IMSS	Moldova	Morocco	Philippines	St. Chris. & Nevis	United Kingdom
Mandate	NA	NA	Voluntary	NA	100+ emp'ees	Public sector	NA	NA	NA	NA	NA	Yes(*)
Participating employers	0.8%	15%	NA	2%	8%	100%	NA	NA	8%	23%	1%	98%
Covered employees	17%	48%	Around 80%	71%	49%	100%	>60%	75%	26%	74%	4%	NA
E-payment available	NA	NA	Yes	NA	No ^(*)	No	Yes	NA	Yes	NA	NA	NA

Source: Compilation based on data from national social security agencies (Sluchynskyy 2015).

Note: (*) In the United Kingdom, e-filing was made mandatory for large employees (250+ employees) in 2004/05/; for medium employers (50–250 employees) in 2005/06; and for small employers (<50 employees) in 2010.

In Myanmar, for example, large amounts of cash and a handwritten list of contributors and the relevant amounts are brought by someone from the employer to the social security fund branch office monthly. The paper record is brought manually to the capital, where the data are entered and, eventually, reconciliation with the cash that has been since deposited in the bank takes place. This process allows for many errors and obviously cannot be quickly reflected in individual accounts.

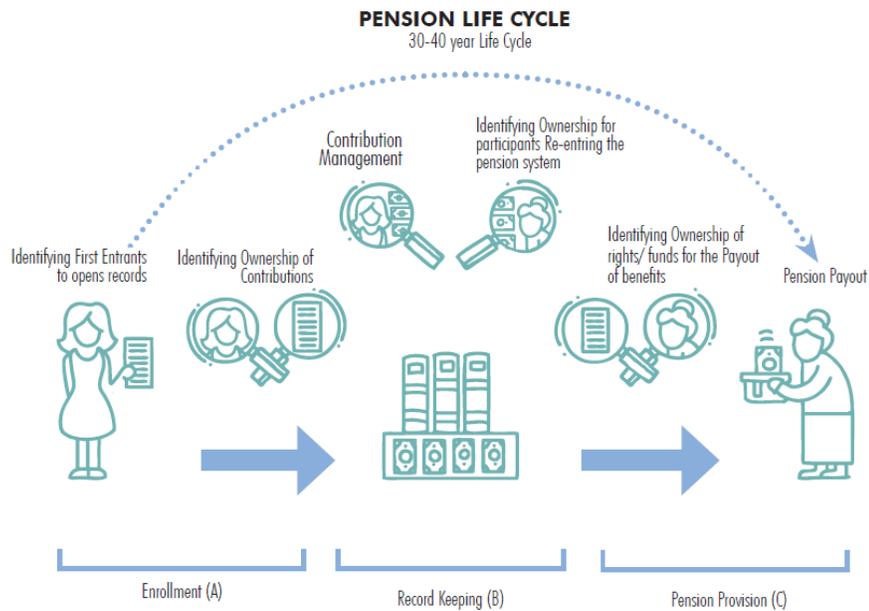
Another key building block of the database is the identification number of each contributor. In many DC schemes, the lack of a unique identifier leads to multiple individual accounts as workers are registered each time they change employer. This leads to inconvenience and often to lower pensions as workers are unable to connect all of their work histories. While this is also a problem for DB schemes, it may be more complicated to correctly value broken individual account histories than to credit DB accounts with past years of service once they are located due to the impact of compound interest in the DC schemes. It is also not possible to report a worker's individual account balance upon request, raising again the question of transparency and trust in the system.

Indonesia provides an interesting example. After the biometrically based unique digital ID was introduced in 2010, it was incorporated into the database of the pension fund. As a result, the pension fund administration found that close to 40 percent of the accounts were actually duplicates. The actual coverage rate was only two-thirds of what had been estimated. India's Employees' Provident Fund Organization is in the process of implementing a similar exercise using the well-known Aadhaar unique ID number and is already finding millions of multiple accounts. Another example is Uganda, which conducted a national campaign to register, update, and clean records in 2005 using biometrics and in the process dramatically reduced the number of duplicate accounts.

In fact, the verification of identity should take place earlier in the process, starting at registration. When an employer or a self-employed person registers, the unique ID number should be checked against the database of the agency that issues it. The more robust this ID, the fewer problems will occur down the line (e.g., uncertainties about date of birth). Subsequently, when contributions are being collected, the records should be accepted by the pension fund only after the unique ID number is checked and found to exist in the pension fund database. Otherwise, the submission should be rejected and the employer asked to correct the information. In Mexico, US\$400 million had accumulated in a suspense account because the ID number entered was incorrect or nonexistent. Figure 3.1 shows the various stages in the pension lifecycle to emphasize that any break in the chain over a 30- or 40-year period affects the final pension.

In addition to digitized inflow and management of contribution records based on robust identification, the information system may need to generate the notional interest rate. In contrast, the valuation for FDCs is the same as for other assets. It must be able to use market prices to generate a value for the individual account balance, ideally as a daily net asset value (NAV) calculation. This calculation can be especially difficult in developing countries because either the data required for the notional interest rate calculation are not available or the assets in the FDC portfolio are largely illiquid.

Figure 3.1: Identification through the pension lifecycle
Pension Provision Stages



Source: Elaborated by authors

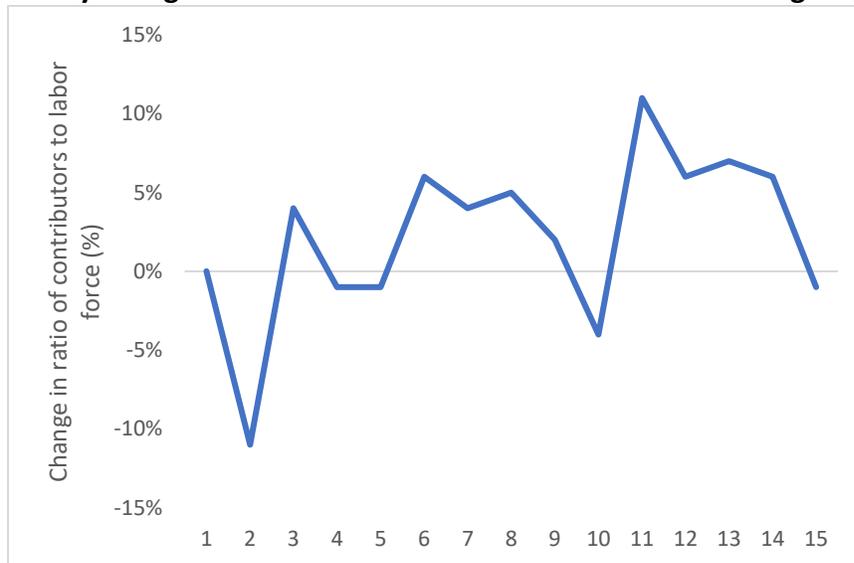
Source: Brodersohn and Palacios 2017.

Notional interest rates are mostly linked to the growth of wages or to the covered wage bill of the scheme in question. Links to the latter can be especially problematic, particularly in the case of an increase in coverage. This means that to generate a notional interest rate, the system must be able to calculate and resolve most or all contribution claims in a timely manner.⁶ This essentially means that the system can aggregate the individual-level contribution histories and generate the wage bill growth figure. To the extent that it becomes difficult to finalize these figures, notional rate calculations may be delayed. The same can be said for gross domestic product (GDP) growth, which is used as an alternative indicator and is often revised substantially.

⁶ Interestingly, wage growth in the Greek NDC scheme is calculated by the statistical agency, which uses a sampling approach.

The issue is more serious for countries that are characterized by more volatile movements in these key indicators (Disney 1999). Countries like Italy and Sweden have very stable movements in employment and average wages as well as GDP growth. In many developing countries, however, especially those that rely heavily on commodity prices and are subject to external shocks, the fluctuations can be much larger. Once again, the case of Mongolia is instructive. The country experienced large discrete changes in the period from 2000–2015 in the ratio of contributors to labor force (Figure 3.2).⁷ The same figure for Italy or Sweden would hover close to zero throughout the period. With such volatility, the timing effects on individual cohorts can be huge in the same way that FDC schemes can be affected by sudden changes in asset prices.⁸ This may argue for some mechanism to smooth notional returns, which would require even more sophisticated calculations.

Figure 3.2: Yearly change in ratio of contributors to labor force in Mongolia, 2000–2015



Source: World Bank 2017.

⁷ In their influential report on China, Barr and Diamond (2010) recognize the problem in the context of secular growth in the covered labor force and recommend using wage rather than wage bill growth.

⁸ This is one reason that many funded DC schemes now use lifecycle defaults, which shift workers nearing retirement to less volatile portfolios.

The final administrative requirement applies to both NDC schemes and FDC schemes that mandate annuitization. To convert account balances of either type into annuities, cohort mortality tables must be available. In the FDC world, these can be prescribed by the regulator or some flexibility can be allowed to insurers who can use different tables, subject to some limitations. In NDC schemes, this is the responsibility of the government. In both cases, the accuracy of these tables will affect the financial outcome.⁹ Underestimated life expectancy will increase the NDC deficits and will reduce profits for insurance companies offering annuities to the FDC system. The converse will have the opposite effect and will shortchange pensioners.¹⁰

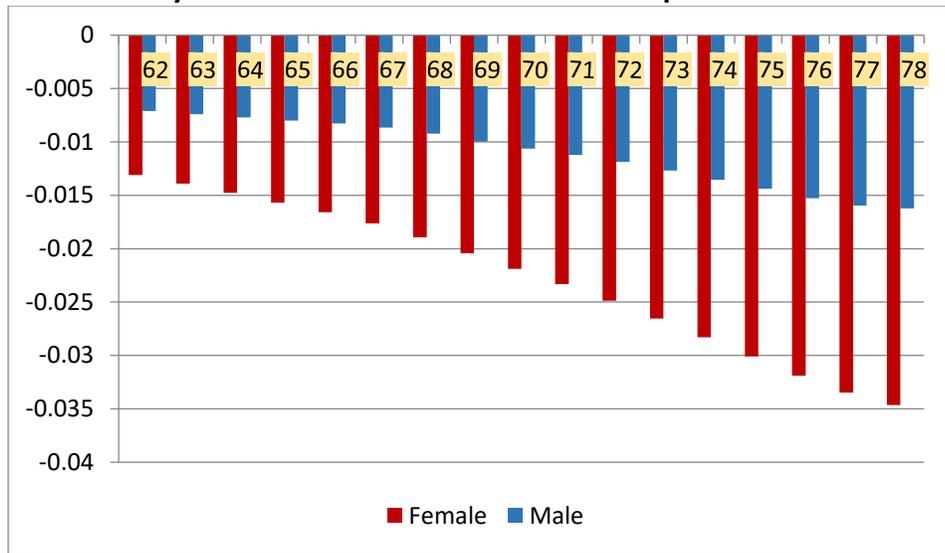
In developing countries with low or even moderate coverage, this poses a special challenge. The fact that workers contributing to pension schemes tend to have higher incomes than those in the informal sector is well documented.¹¹ At the same time, empirical evidence supports the intuitive relationship between mortality and income level (Bannerjee and Duflo 2007; Pal and Palacios 2008; Ayuso, Bravo, and Holzmann 2017). As a result, it is clear that using national mortality tables to convert NDC balances to flows will end up costing more than it would if the actual mortality rates were applied. Yet surprisingly few countries calculate these rates, despite the fact that they should be fairly easy to generate from individual records. Using such data from Ghana, Majoka (2014) found significant differences in annual mortality rates with up to a 3 percentage point difference at age 78 (Figure 3.3). Figure 3.4 shows similar magnitudes of mortality differentials for Mexico.

⁹ See Palmer and Zhao de Gosson de Varennes (2019) for evidence of the potential impact of inaccurate mortality tables.

¹⁰ It may be easier for an NDC than an FDC scheme to adjust annuity values as life expectancy changes as the NDC scheme does not require changes to assets.

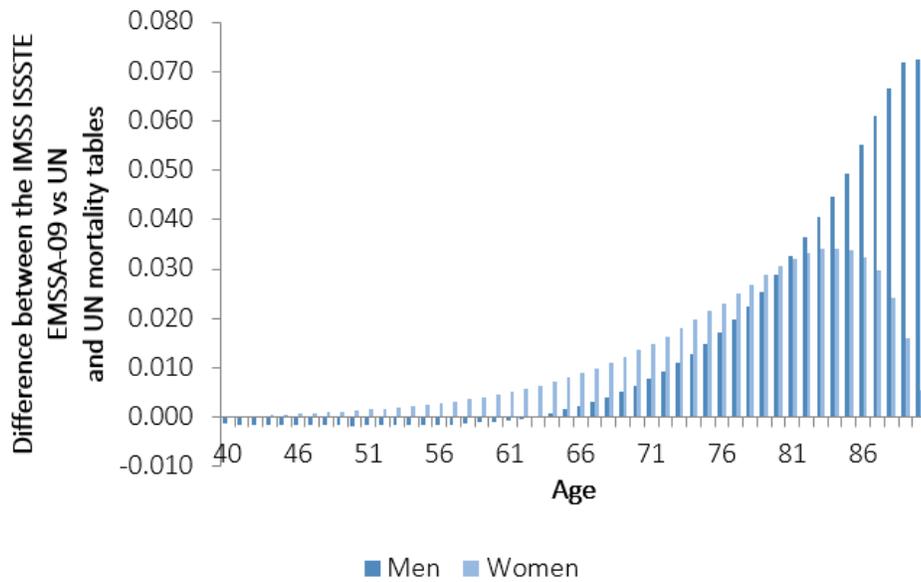
¹¹ For one recent example using a large cross-country sample, see Evans and Palacios (2015).

Figure 3.3: Mortality rates of Ghanaian contributors compared to United Nations data



Source: Majoka 2014.

Figure 3.4: Mortality rate differentials by gender in Mexico, national versus covered population



Source: World Bank 2016.

Note: IMSS= Instituto Mexicano de Seguridad Social and Instituto; ISSSTE = Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado.

4. A checklist to assess readiness for NDC reform implementation

The administrative system must be able to perform several functions that are not necessary in a traditional DB scheme but are crucial for good implementation of an NDC scheme. Most of these functions are also needed to administer an FDC scheme, albeit with some differences that tend to affect developing countries more than developed ones. The resulting checklist includes:

- Digitized, complete, and accurate historical contribution records linked to unique identifiers
- Digitized contribution data that flow from employers/self-employed using unique identifiers
- Information system configured to generate individual account balances with accuracy and timely reporting
- Information system capable of generating aggregate indicators used for notional interest rate calculations (possibly using some techniques to smooth volatility)
- Cohort life (mortality) tables by age and sex that correspond to the covered population

Many countries would not be able to show that all or even most of the items on this list are in place. That is not to say, however, that they could not be achieved with some preparation and investment. Policy makers tend to ignore these implementation challenges until after the reform is supposed to begin. As a result, these teething problems can undermine the credibility of the scheme from the start. As one reformer put it:

“IT support for the administration was not designed sufficiently well to reconcile individual information with aggregate employer payments; in fact, it took about two years after the implementation of the reform to do this. The chaos thus created directed the public discussion away from the content of the reform and toward the perceived incompetence of the administration (Chłoń-Domińczak 2002). And once

the mistake had been made, reconciliation of pension accounts in Poland was a lengthy process.” (World Bank 2012)

The desired increase in transparency from an NDC reform also makes recordkeeping mistakes much more obvious than in DB schemes, where few people understand exactly how their pensions are being calculated. Most DB scheme members do not see their contribution records during their working life, while NDC balances can be checked at any time. The credibility of the scheme depends crucially on those balances being accurate. Transition from DB to NDC that involves converting past contributions to “notional capital” is especially challenging, as historical records are often in poor condition.

In addition to these items, the ability to manage liquidity reserves, which are recommended to absorb short-term volatility (Holzmann 2019), is an important element of capacity. Finally, local expertise or at least familiarity with the underlying theory behind NDCs as a model within the framework of pension economics is obviously important. The absence of such local expertise in some cases signals a lack of ownership in the reform process itself.

5. Feasibility of a universal NDC

In developing countries, the debate over the appropriate contributory pension model took a back seat as the focus over the last decade or more shifted to coverage. Over the last 25 years, the ratio of contributors to the working-age population hardly changed in most countries. This led to the introduction of noncontributory or social pensions in many countries, especially in Asia and Latin America (Rofman, Apella, and Veza 2014). At the same time, experiments with special schemes aimed at informal sector workers were rolled out in a wide range of countries (World Bank 2015). With the exception of China, however, with its unique social pension-linked rural pension, none of these attempts managed to scale up. At the same time, some economists have expressed concern that noncontributory schemes may discourage participation in contributory schemes by making informality more attractive. Mexico and Thailand, for example, exclude those with formal sector pension income from the social pension program.

In 2013, Anton, Hernandez, and Levy proposed an innovative reform plan that would result in universal coverage. Using Mexican data and parameters, the authors simulated a shift from the payroll tax-based social insurance scheme for pensions and health to a universal scheme where an earmarked value added tax (VAT) would be used to make deposits into individual accounts of all adults. It was similar to a proposal made by Kotlikoff, Smetters, and Walliser (1999) for the United States whereby the social security program would be ended and a national sales tax would help finance the transition to an individual account-based scheme. Both studies found that the positive general equilibrium effects of moving from a payroll to a consumption tax were likely to be significant.

Was implementation of such a plan feasible? Mexico introduced FDC plans managed by specialized pension firms (AFORES) in 1997, but at any given time only about 40 percent of workers were contributing to the system. Nevertheless, the individual account infrastructure required for such a program was arguably in place and could be leveraged for this innovative approach. The title of the book, "The End of Informality," suggested the objective of such a proposal (Anton and Levy 2013). By delinking coverage in the pension system from formality, this plan would eliminate this distinction. Unlike the US proposal, the plan was apparently seriously considered by the Mexican government but never implemented.

Had such a scheme gone forward, the implications for the fiscal situation and for the capital markets would have been profound. A massive increase in the size of pension fund assets would be matched by a huge increase in government spending financed by the increased VAT revenues. The impact of the growth of pension fund assets on the capital markets would depend on the absorption capacity of those markets and portfolio regulations (including the ability to invest abroad). In short, it would have been a complex affair.

There is no reason that the same reform could not be done using the NDC model. This approach might have certain advantages over the FDC model.¹² First, unlike Mexico, few countries have a well-developed infrastructure for managing pension funds, regulatory capacity, or capital markets that could efficiently channel the massive inflows that such a scheme would imply. Conversely, the potential for these funds to increase savings and encourage capital market development would not be harnessed in an NDC approach.¹³ The other advantage of an NDC scheme is that it does not require additional revenues to be raised nor does it require a well-developed capital market. On the other hand, the NDC version of the universal system creates a large unfunded liability and foregoes the potential benefits of capital market development.

What would the parameters of a universal NDC look like? First, the contribution amount would be calculated to generate an acceptable minimum benefit level under reasonable assumptions about the notional interest rate. It could, for example, be set as a percentage of median income per capita so as to accumulate enough to produce an annuity equivalent to the relative poverty line, also measured in terms of median income per capita. It could also use a notional interest rate based on a moving average of GDP growth (as is done in Italy).

The equivalent amount could then be exempt from the payroll tax so that the formal sector contribution rate would only apply to wages above, say, twice the minimum wage. In this way, the redistribution would be financed from taxes while the consumption-smoothing function would by definition be financed by contributions. This would encourage employment, especially for low-skilled workers affected most by automation and regulations such as the minimum wage. Mandated contributions over and above the government-financed minimum would then generate higher replacement rates for formal sector workers with higher incomes up to a ceiling, providing for further consumption

¹² Either DC model would seem to be superior to an attempt to extend a DB model, with its reliance on regular and monitorable wages.

¹³ It is true, however, that an NDC scheme design can include partial funding, as in the case of “buffer” funds.

smoothing and reducing the moral hazard that may result from the provision of the minimum annuity. This segment could take the form of an FDC or an NDC scheme. In either case, one pension should be paid out that is the sum of both elements of the system.

Implementation would rely crucially on the government's ability to identify every person of working age¹⁴ in the country so that his/her individual account balance can be reported. Few countries are able to do this but many are in the process of creating such population registers.¹⁵ Notable examples are India, Peru, Pakistan, Rwanda, and Thailand. As is true for any pension scheme, the administrative database should be directly linked to the civil registry, in which deaths would be automatically reflected.¹⁶ As mentioned above, the ability to calculate annuities based on projected, cohort-specific mortality rates would be required.¹⁷

Voluntary contributions, perhaps with an incentive in the form of a flat match, would also allow informal sector workers to smooth consumption. This could be facilitated through emerging technology for payments. The explosive growth of mobile money, especially in Africa and Asia, has reduced transaction costs dramatically. Thailand and Uganda¹⁸ recently began to allow pension contributions through mobile phones, following the lead of the Mbao scheme in Kenya.

Looking forward in time, the shift away from cash could be a major opportunity to formalize a large portion of the economy. In a growing number of countries, the value of mobile transactions and digital commerce is already larger than the formal sector wage bill. In Kenya for example, the value of M-Pesa transactions is four to five times higher than the wage bill covered by the pension schemes for public and private sector workers. While East

¹⁴ Countries with significant migrant worker populations would face an additional complication.

¹⁵ Interestingly, the same prerequisites apply to the implementation of a universal basic income (UBI) program.

¹⁶ This raises another important constraint for many developing countries, where deaths are not systematically reported to the civil registration system. This can be partly addressed with mechanisms to authenticate the contributors or pensioners but would add to the administrative cost and complexity of the system.

¹⁷ An advantage of a universal scheme is that these population-wide forecasts are produced by the United Nations Demographic section and are available for most countries.

¹⁸ <http://allafrica.com/stories/201709130154.html>

Africa historically led the world in the use of mobile money, China is the clear leader today and the rest of developing Asia is moving very quickly in this direction (GSMA 2018).

Voluntary savings plans, including for pensions, could be devised that add a pension contribution to an individual account every time a purchase is made. Features that “nudge” individuals to save every time they consume could be added. Depending on the context, the voluntary contributions could go into an NDC or an FDC scheme, or some combination of both. The government would essentially be adding to the available asset choices by offering a GDP- or wage-indexed instrument that does not otherwise exist in the market.¹⁹

A universal NDC or FDC scheme financed by the government to achieve a basic pension level would address the intractable coverage problem that has plagued contributory pension schemes in developing countries. The NDC version would do so without adding a significant short-term fiscal burden or testing the limits of regulatory capacity. As it matured, it would achieve the goal of ensuring a minimum income in old age and would preempt the need for social pensions. By doing essentially the same thing but in the context of an individual account, mandatory and voluntary contributions over and above this minimum NDC layer would be seamlessly integrated. These could also be set up to be partially or fully funded. Everyone would be in the same pension scheme, one that minimized labor market distortions and automatically adjusted to increasing life expectancy. As an added bonus, everyone would now have a stake in achieving higher GDP growth so as to raise their future pensions – perhaps a new and more robust version of Drucker’s (1976) “pension fund socialism.”

¹⁹ A similar logic could allow for a transition from a pay-as-you-go DB scheme to an individual DC arrangement, although this would involve securitizing past revenues (Valdes-Prieto 2005).

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ABSTRACT

Many public policies are impossible to implement without adequate administrative systems in place. This is true for modern pension schemes and in particular, notional defined contribution (NDC) schemes. Today these systems must be digital yet most pension systems predate computerization and must find a way to bridge past and present. The shift from defined benefit (DB) to NDC brings particular challenges in recordkeeping. This paper briefly reviews the administrative requirements of NDCs and offers a simple checklist for countries considering this type of reform. The last section describes a universal NDC scheme that harnesses the modern digital infrastructure that may allow developing countries to overcome the limitations of traditional contributory systems and their reliance on payroll taxes.

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