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**Pensions in a Globalizing World:
How Do (N)DC and (N)DB Schemes
Fare and Compare on Portability
and Taxation?**

Bernd Genser and Robert Holzmann

Abstract: Pensions and broader forms of retirement income do not stop at national borders. As part of globalization, individuals increasingly spend part of their working or retirement life abroad but want to keep or move their acquired rights, accumulated retirement assets, or benefits in payment freely across borders. This raises the issue of the portability and taxation of cross-border pensions in accumulation and disbursement. This paper addresses both portability and taxation issues from the angle of which type of pension scheme – defined benefits (DB) or defined contributions (DC) – is more aligned with globalization in establishing individual fairness, fiscal fairness, and bureaucratic efficiency. The paper shows that DC schemes tend to dominate DB schemes both at the level of portability and taxation.

Key words: Benefit Portability, Cross-Border Pensions, Front- and Backloaded Taxation, Comprehensive Income Taxation, Expenditure Taxation

JEL codes: F22, H21, H55

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Abbreviations and Acronyms

BA	Bilateral Agreement
DB	Defined Benefit
DC	Defined Contribution
DTA	Double Taxation Agreement
EU	European Union
MA	Multilateral Arrangement
NDB	Nonfinancial Defined Benefit
NDC	Nonfinancial Defined Contribution
OECD	Organisation for Economic Co-operation and Development

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1. Introduction

Pensions and broader forms of retirement income do not stop at national borders. As part of globalization and the increasing mobility of labor and capital, an increasing number of individuals spend at least part of their working life abroad and acquire benefit rights that they want to take home or on to a new country of work or residence. Some individuals want to spend part or all of their retirement life in places with a better climate, a lower cost of living, and/or more benign taxation of their retirement income. However, the increasing mobility of individuals before and after retirement creates issues of the portability and taxation of cross-border pensions in accumulation and disbursement. Both topics – portability and taxation – have found limited attention in pension economics so far.

Simply put, full portability of pensions allows labor migrants to accumulate, keep, and/or transfer pension rights and to receive benefits in disbursement anywhere in the world. Without that ability, potential migrants may decide not to migrate, or to migrate although they risk losing their acquired rights. In the first case, international labor mobility is impeded; in the second, risk management is constrained and reduces the welfare of the migrant over his lifecycle. Such obstacles may also arise even if pension benefits are portable but other benefits are not, particularly health care benefits during retirement.

The income taxation of cross-border pensions may increase or reduce individuals' migration incentives, as the tax burden of the retired migrant abroad may rise or fall depending on the total tax burden in working and residence countries. For the relevant tax burden of the migrant's pension, the tax treatment across his whole lifecycle matters as taxes may be levied at the time of contribution/premium payment, return receipt, and disbursement.

Differences in the portability of social benefits and in the taxation of cross-border pensions raise issues of individual fairness (i.e., do I get out what I paid in, and is my tax treatment equivalent to that of a nonmobile individual?). Portability also raises issues of fiscal fairness at the country level (i.e., does the portability arrangement favor one country due to tax arrangements under double taxation treaties?). A final issue concerns the bureaucratic

efficiency by which individual and fiscal fairness can be achieved (i.e., how burdensome and time-consuming is tax compliance for all involved?).

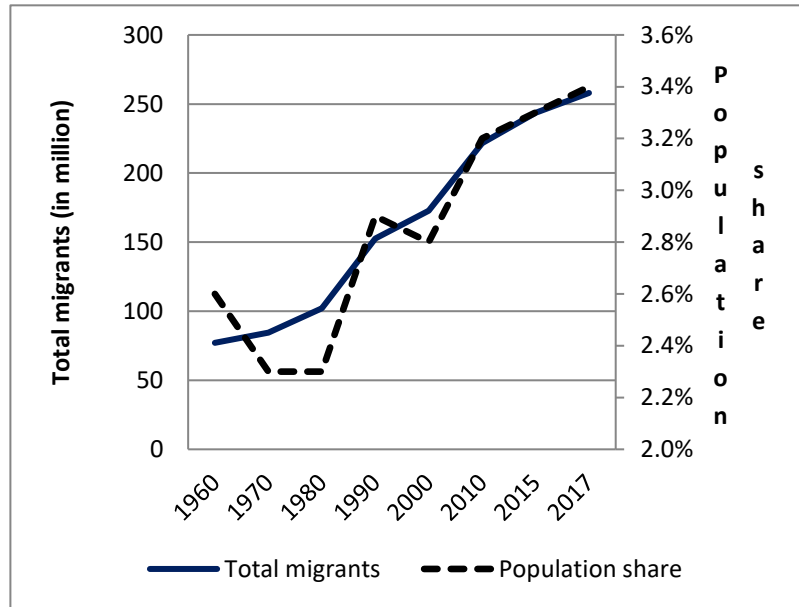
This paper addresses both portability and taxation issues from the angle of which type of pension scheme is more aligned with globalization by better establishing individual fairness, fiscal fairness, and bureaucratic efficiency. The focus is mostly on the benefit type – defined benefits (DB) versus defined contributions (DC) – with funding and administrative issues given secondary importance. The relevant literature on both topics is briefly summarized or referenced.

Section 2 briefly establishes the facts of rising labor/benefit mobility across the world. Section 3 presents portability issues (absent taxation), how portability can be achieved, and the role of benefit types. Section 4 presents cross-border issues in case of income taxation of benefits, the current international disarray, and how it can be addressed. Section 5 extends the analysis and asks whether the type of scheme matters for the possible solutions. Section 6 summarizes and concludes on the ease of pension scheme alignment in a globalized world.

2. The rise of international labor and benefit mobility

The share of individuals living outside their home country is increasing again after a temporary low in the 1970s, reaching 3.4 percent of the world population in 2017 (up from 2.3 percent in 1980), or an estimated 258 million people (United Nations 2017). Figure 2.1 presents the dynamics of the number of migrants and their share in the world population since 1960. On January 1, 2016, the number of people living in the EU-28 who were citizens of nonmember countries was 20.7 million, representing 4.1 percent of the EU-28 population, while the number of people living in the EU-28 who were born outside of the European Union (EU) was 35.1 million. In addition, 16.0 million persons were living in one of the EU member states on January 1, 2016, with the citizenship of another EU member state (Eurostat 2017).

Figure 2.1: Number and share of migrants in world population, 1960–2017



Source: United Nations 2017; Migration Policy Institute, Data Hub; authors' compilation.

These migrant stock numbers—impressive as they are—underestimate the underlying labor mobility dynamics, because the numbers in Figure 2.1 only capture individuals who have lived outside their traditional country of residence in the observation year. As individuals may take multiple migration spells of varying length, sometimes in different countries, the relevant number of individuals with past migration spells is significantly higher. Evidence from across the world is strong that the number of spells spent abroad is increasing. The EU figures for individuals who spend at least some of their adult life living outside their home country (as a student, intern, intra- or interfirm mobile employee, labor migrant, or “snowbird” retiree) are definitely rising and may soon be as high as one out of every five individuals (Holzmann 2015). Past labor market spells abroad translate into rising numbers of pension payments to and from abroad. For example, these amounted to about 11.1 percent of the total number of pensions paid in Germany in 2013, up from 9.8 percent in 2005. Table 2.1 details the composition and trends in former labor and more recent retirement mobility to and from Germany.

Table 2.1: Recipients of statutory German pensions – in Germany and abroad

Number of pensioners in millions (in % of total pensioners)	2013	2010	2005
Pensioners with non-German citizenship	2.562 (100%)	2.367 (100%)	2.032 (100%)
- living in Germany	1.059 (41.3%)	0.944 (39.9%)	0.774 (38.1%)
- living outside Germany	1.503 (58.7%)	1.423 (60.1%)	1.258 (61.9%)
Pensioners with German citizenship	22.602 (100%)	22.646 (100%)	22.452 (100%)
- living outside Germany	0.222 (0.98%)	0.206 (0.91%)	0.170 (0.76%)
Total number of pensioners	25.164 (100%)	25.013 (100%)	22.484 (100%)
- living outside Germany	1.725 (6.85%)	1.629 (6.51%)	1.427 (5.83%)
- non-German citizens living in Germany	1.059 (4.21%)	0.944 (3.77%)	0.774 (3.44)
- potential recipients of cross-border pensions	2.784 (11.1%)	2.573 (10.3%)	2.201 (9.8%)

Source: Genser and Holzmann 2018, based on Eurostat Online Database (June 2015).

Warnes (2009) presents data for Germany, the United Kingdom, and the United States on the popularity and dynamics of their respective retirement destinations for the period mid-1990s to 2005. His data show a dynamic similar to that presented in Table 2.1.

3. Portability issues: Objectives, instruments, and DB–DC comparison

The topic of cross-border portability of pensions (and other social benefits) is a relatively new area in pension economics. While the portability of pension benefits within countries and between occupational plans has been explored for quite some time (e.g., Foster 1994), portability between countries has received little attention by economists. This field was generally left to social policy and social law experts.

This paper focuses on the economic issues of portability, which might be captured by the following working definition:¹

“Cross-border portability of pension benefits is the ability of labor migrants to preserve, maintain, and transfer both acquired pension rights and rights in the process of being acquired from one private, occupational, or statutory pension scheme, to another independent of nationality and aligned with the country of residence. Pension rights refer, in principle, to all rights stemming from contributory payments or residence criteria in a country. Not portable typically are benefit components that are not based on contributions such as benefit top-ups for low-income individuals or minimum income guarantees.”²

Section 3 presents the economic foundation of portability based on three elements: a brief discussion of the economic objectives of international portability of pensions and more broadly of social security benefits (section 3.1); a brief presentation of the key instruments used to establish pension benefit portability (section 3.2); and an assessment of the implications for the DB–DC selection (section 3.3).

3.1. Objectives of portability

Establishing portability of social benefits should be straightforward, as three key considerations—economic, social, and human rights—favor it (Holzmann and Koettl 2015).

From a first-best economic point of view, individuals’ labor mobility decisions should not be hampered by the lack of portability of social benefits for which they have acquired rights. Global efficiency and global growth is increased if distortionary obstacles toward portability are absent. To ensure that international labor mobility profits the home as well as the host country, select and appropriate bilateral interventions may be necessary.

¹ For early economic research on the topic see Holzmann, Koettle, and Chernetsky (2005). Later work includes Holzmann and Koettl (2015), Jousten (2015), and Holzmann (2016).

² This definition draws on the general definition of the portability of social security benefits developed by Cruz (2004) and Holzmann, Koettle, and Chernetsky (2005).

The lack of benefit portability can influence labor migrants' international mobility decisions. Workers may decide not to take a job abroad if they have to pay social security contributions in the host country but cannot profit from its benefit coverage or cannot take their acquired rights home. Nonportability is particularly relevant for the long-term benefits of pensions and health care. For pensions, this may exist due to long vesting periods of 10, 15, or more years or to restrictions on cross-border benefit payments. Access to health care services in retirement is typically linked to the eligibility of pension benefits and residence in the host country, unless cross-country legal arrangements exist.

From a social policy point of view, such acquired rights are a critical element of individuals' (or families') lifecycle planning and social risk management. Denying portability – particularly once the mobility decision has been made and cannot be reversed – increases the risk of lifecycle planning for individuals and their families and creates substantial welfare losses.

For emigrants a lack of portability of acquired rights means that they can establish pension rights only in their host country. While a higher (comparable) wage rate in the host country may provide some compensation, labor emigrants will face a lower replacement rate after retirement. This typically happens for mid-career labor migrants. A migrant who plans to return home but cannot transfer pension rights acquired abroad or receive cross-border benefits will need to increase private saving or to continue working. These adjustments in lifecycle planning are beneficial, but they do not avoid welfare losses compared to the portability case.

From a human rights point of view, migrants have the right to enjoy social protection according to national legislation and international conventions. These rights should carry over when individuals leave the country or change profession. A key question is whether these human rights apply only to acquired (contributory or residential) pension rights or to all social rights. As they are resource-consuming, economic and human rights tradeoffs will emerge.

3.2. Instruments of portability

Essentially three approaches are available to establish cross-border portability of pension benefits between countries:

- Binding portability arrangements between countries
- Using multinational private pension providers
- Changing the pension benefit design to make benefits portable without further government action

3.2.1. Portability arrangements between countries

Most portability analyses and discussions focus on bilateral agreements, but the scope is much larger and includes unilateral and multilateral arrangements.

Unilateral actions (UA) can be taken by the country where migrants earn labor income and are able to acquire pension rights. Examples of UAs include:

- Denying migrants access to the national social security scheme³ can be substituted by giving them the option to contribute to pension systems in their home country, as is feasible in Mexico, the Philippines, and Sri Lanka.
- Denying migrants access to the national security scheme can be substituted by voluntary access to either the host or the home country pension system. Enrollment in the home country pension system avoids host country constraints on cross-border benefit payments.⁴
- Granting migrants full access to the statutory national pension scheme as well as full exportability of eligible pension rights may establish full portability. Hence all pensioners with a contribution length beyond the vesting period keep their acquired

³ As occurs in the Gulf Cooperation Council countries for essentially all expatriates, and for some categories of foreign workers in Hong Kong, Malaysia, and Singapore.

⁴ The Philippines and Mexico fall somewhere between the first and second examples. The Philippines allows workers to contribute to national pension schemes but independent of access in the host country. Similarly, Mexican migrants can get access to health care benefits for a flat-rate premium (for their families left behind or themselves when they return) independent of their insurance in the host country (i.e., the United States).

pension rights and receive pension benefits after the minimum retirement age is reached and other eligibility conditions are fulfilled. Ineligibility typically emerges because of a contribution record below the vesting period.

Bilateral agreements (BAs) are the centerpiece of current portability arrangements between countries. While they can, in principle, cover the whole range of exportable social benefits, they typically focus on long-term benefits such as old-age, survivors', and disability pensions, and to a much lesser extent on health care benefits, if at all.^{5,6}

With regard to pensions, BAs can:

- Focus on temporary migrants only (e.g., waiving the contribution requirement to the pension scheme in the host country while making contributions mandatory in the home country).
- Establish mutual exportability of pension claims between the two countries.
- Allow migrants to continue paying their social security contribution to their home country for an extended period of time.
- Establish “totalization” (i.e., summing up) of the insurance periods across both countries, thus eliminating or at least reducing the binding effects of vesting periods in individual countries.
- Cover all (legal or even illegal) migrants who have established acquired rights.
- Establish full eligibility across the two agreement countries.
- Establish benefits for migrants in the case of different benefit types between countries, such as the complex case between a residence-based basic benefit

⁵ For a historical and legal background on BAs, see Strban (2009).

⁶ No single study (inventory) captures the content of BAs across the world or even of subregions such as Europe; to the authors' knowledge, no single evaluation has been undertaken to assess the effectiveness of BAs and MAs.

country (such as Australia) and an earnings-related/contribution-based benefit country (such as Germany).

Multilateral arrangements (MAs) represent a general framework of portability for a group of countries for all or a subset of social benefits. These general rules are in most cases supported by more detailed BAs. Traditional MAs have been established in Latin America (MERCOSUR) and the Caribbean (CARICOM) and in 15 French-speaking countries in Africa (CIPRES); one was recently established between Latin America and Spain and Portugal (Ibero-American Social Security Convention); and one is under development for the Association of Southeast Asian Nations (ASEAN) countries.

The most developed MA is the one among EU member states (plus Norway, Liechtenstein, and Switzerland). Strictly speaking the EU arrangement is not an MA but an EU Directive that obliges EU member countries to adjust their existing regulations accordingly (i.e., to revise their existing BAs). The main objective of the Directive is to essentially make all social benefit claims portable among EU member states, including unemployment and family benefits, in order to avoid discrimination and to establish full labor mobility, one of four core freedoms of the EU Treaties.⁷

For portability of statutory pension benefits, exportability works well for private sector schemes in principle, but is not frictionless; hence, benefit losses are possible for those moving between countries' public sector schemes.⁸ Issues emerge with the portability of occupational and personal pension schemes – as within countries – when individuals leave a DB scheme that is, for example, linked to their final salary. This also happens with DC schemes, which are essentially individual savings plans. Here the tax privileges granted at

⁷ The four freedoms were set out in the Treaty of Rome (1958), extended by the Single European Act (1987), and strengthened in the Lisbon Treaty (2009).

⁸ Both authors experienced this when leaving their (former) civil servants scheme as Austrian academics to join a similar scheme in Germany; in Austria, their acquired rights in the civil servants schemes were transferred to private sector schemes with substantial reductions in pension wealth. For one author this happened again when he left German academia to move to the World Bank in the United States.

the level of contribution/premium payments and rates of return received render their simple export difficult and the EU has not yet found an effective way to establish comprehensive portability (see sections 4 and 5). Even when transfers can be made, they may inhibit the original intention of the pension policy, for example, when a pension plan offers a lump sum in cash to workers when they leave the country. If there is no requirement to invest the money into another pension plan, then the likelihood is higher that the money will be partly spent on short-term consumption rather than contributing to retirement saving. So portability should ideally be portability of assets from one pension vehicle to another.

3.2.2. Multinational private sector providers

A promising approach, at least for supplementary benefits, is to use the services of privately organized multinational providers (MPs). MPs exist and function well for health care benefits. For example, Cigna, a Belgium-based service provider, services World Bank staff and retirees residing in Europe, as well as staff of the European University Institute. MP arrangements have been discussed, and sometimes implemented, for supplementary pensions of international workers in multinational enterprises so that these insured persons are tied to a single pension vehicle even if they work in various countries. Multinational providers may prove superior to national providers with respect to interjurisdictional risk sharing, because of risk pooling, transmission of best practices and innovations across countries, and better information on the state of the world.

3.2.3. Changes in benefit design

The key idea behind changing the benefit design is to transparently disentangle the components that are lumped together in the pseudo-actuarial benefit design of social security schemes. For all social benefits, these components are the period insurance element, the presaving element, and the redistributive element (Holzmann and Koettl 2015, 378–80).

The period insurance component is only valid for one period, in which it is consumed; hence, it does not require portability. This element is relevant in health insurance, does not exist in old-age pension schemes, but does exist in the form of survivors' or disability claims if all are lumped together under one contribution rate.

The presaving (or asset accumulation) component exists in all social benefit systems in one form or another. It is huge in health care and old-age benefit schemes, amounting to a high multiple of annual contributions. In a health care scheme without age-related contribution rates, this component serves to accumulate reserves for health care costs that rise with age and for catastrophic health care. In (old-age) pension schemes, the financial or nonfinancial presaving is the constituent component. Conceptually, a pure accumulation phase is followed by a decumulation phase in which annuities or phased withdrawals are paid out.

The redistributive component can be thought of as the deviation between accumulated individual contributions (including returns) and individual pension wealth (i.e., the present value of expected future pension benefit payments) at the end of each period. The redistributive component is the consequence of a nonactuarial benefit design due to explicit or implicit redistributive considerations within the pension scheme. For individuals the redistributive component may be positive or negative. A dominantly positive redistributive component typically emerges when a pension scheme is not only fed by contributions but also receives transfers from the general budget.

If the three components can be separated conceptually and technically, then benefit portability between countries is substantially facilitated:

- In the most drastic separation, there is no period insurance component, as disability and survivors' pensions are separately organized; there is no redistributive component, as all redistribution is done outside the pension scheme; and the remaining presaving component is purely actuarial and can be transferred across borders upon migration.

- In a less complete separation, there is again no period insurance component, and no redistributive component due to interpersonal transfers, but the presaving component is not actuarially fair due to government transfers. Although this component is ready for portability, the question that emerges is: To what extent should the transferred amount be corrected to account fairly for the presaving increment, which is financed through the budget of the source country?

3.3. NDB and NDC schemes compared

Against the background of the objectives, instruments, and evaluation criteria presented above, how do DB and DC schemes compare on portability? To simplify and shorten the comparison, the focus is only on nonfinancial DB and DC schemes (NDBs and NDCs), but most results are believed to also hold for financial DBs and DCs (FDBs and FDCs).⁹

The following properties of NDC and NDB schemes are relevant for cross-border portability:

- Ideally, an NDC scheme has no period insurance component, as disability insurance is separately financed and organized (but coordinated with the NDC scheme); long-term survivors' benefits are financed by own accounts and shared accumulations of spouses; and short-term transitional benefits during child-rearing periods are financed by other structures and resources (Holzmann 2017; Kruse and Ståhlberg 2017).
- The “textbook” NDC scheme has no redistributive component within the insurance pool, and no redistributive component of budget subsidies to support financial sustainability.¹⁰ The existing redistributive components are explicit and financed

⁹ A main difference may emerge between funded and unfunded provisions with regard to the actual portability of financial assets when changing residence versus the mere recognition of rights while the assets remain in the source country. The latter is always the case in unfunded provisions as the pay-as-you-go (PAYG) asset remains in the source country. In funded provisions the assets can remain in the source country (as is typically the case under FDBs) but may also be transferred to the new residence country under FDC schemes, but there is no obligation and possibly no incentives to do so.

¹⁰ Abstracting from heterogeneity in longevity, which can be corrected for (Holzmann et al. 2019).

through earmarked government transfers and reflect purposeful social policy objectives. These social policy objectives emerge if individuals cannot make own contributions due to disability, unemployment, maternity leave, family leave, etc., and are financed by the respective programs (typically by earmarked contributions). Beyond that one can also imagine selective matching or lump-sum contributions to individual accounts to incentivize formal labor market contributions and/or to render the NDC scheme explicitly redistributive (Holzmann, Robalino, and Winkler 2019).

- Because of the above-mentioned characteristic features of an NDC scheme, the accumulated individual account values reflect own contributions, rates of return that are consistent with financial sustainability, and an external contribution earmarked for individual circumstances. Thus, these accounts are fully portable as NDC annuities or as accumulated pension wealth amounts prior to eligibility.
- In a traditional NDB scheme, disability and survivors' pensions are typically part of the old-age benefits scheme design. Survivors' pensions lose importance under reformed NDB schemes as receipt of an own pension above a certain amount increasingly disqualifies one from receiving a widow/widower's pension, and one's children receive flat-rate amounts. Again, these reforms reduce the contemporaneous insurance component but do not eliminate it. No good answers arise regarding which acquired rights for these risks should be portable.
- Traditional NDB schemes have a few explicit and many implicit redistributive components because of their design. Most countries also have a variable redistributive component to keep these schemes afloat. Making explicit redistributive components portable raises little objection from the perspective of family or other social policy considerations (often expressed by assimilated insurance periods and/or earlier retirement age); the problem is their costing. The implicit and often unknown redistributive components should, in principle, not become portable. But serious problems arise in establishing appropriate adjustment

mechanisms to account for characteristic NDB features like last salary assessment period, variable annual accrual rate, or nonactuarial decrements for earlier or later retirement. Some of these components could be mitigated, for example, by basing the pension benefit on lifetime income or introducing actuarial increments/decrements for early retirement.

- As a result of the difficulties of eliminating the contemporaneous component and of reducing the redistributive component to meaningful, measurable components, the presaving component cannot be well defined; it also requires cumbersome actuarial calculations for which objective estimates are difficult if not impossible to establish. Consequently, the amount of pension benefit to be sent abroad may still require a BA to establish portability, for example if the vesting period cannot be reduced to a few months. Making the acquired rights portable before retirement will not work unless the sustainability transfers are eliminated. This is possible with the introduction of an automatic balancing mechanism, but is technically much more challenging in an NDB scheme compared to an NDC scheme.

Summarizing the comparison of NDB and NDC schemes to establish cross-border portability, the following conclusions emerge:

- Textbook NDC schemes promise full portability even in the absence of BAs and MAs. Full exportability of benefits in disbursement and preservation of the acquired rights are required. Full exportability can be established unilaterally; the full preservation until eligibility is a design component of an NDC scheme as the account values are annually indexed with the notional (sustainable) rate of return.
- Whether acquired rights in an NDC scheme prior to eligibility should become portable and transferred in real cash is a question of convenience and reciprocity with another NDC country, as only the annual balance of notional inflows and outflows needs to be settled in cash. However, as the annuity at retirement is determined by country-specific cohort life expectancy, such portability before retirement may invite benefit arbitrage. It would not affect the source country but

- would affect the receiving country if its cohort life expectancy was well below that of the sending country, while it offers access to groups with a higher life expectancy.
- NDB schemes will always need BAs or MAs to achieve portability. But the closer NDBs are to NDCs, the simpler are cross-border portability arrangements. BAs or fully-fledged MAs will still exist for NDC corridor countries for purely administrative reasons as well as to establish portability for other benefits, such as health care.
 - While BAs exist between most industrialized countries, they are the exception, not the rule, between industrialized and emerging/developing economies. As a result, in 2013 only 23.3 percent of worldwide migrants lived in countries with BAs between home and host countries, and over 80 percent of these migrants were from high-income countries (Table 3.1). The global progress since 2000 – the other year for which comparable data estimates are available – has been moderate and amounts to 1.4 percentage points (Table 3.2). Further progress on BAs is likely to be slow too, as their establishment depends on demanding conditions in lower-income countries (Holzmann 2016).

Table 3.1: Global migrant stock estimates by origin country income group and portability regime, 2013

Percentage per regional income group

Origin country income group	Regime I (Portability)	Regime II^a (Exportability)	Regime III^b (No Access)	Regime IV^c (Informality)	Total (millions)
High-income non-OECD	50.7	40.2	4.3	4.8	5.1
High-income OECD	76.3	19.0	0.4	4.3	33.0
Upper-middle-income	23.3	54.4	0.5	21.8	33.6
Low-middle-income	20.2	58.5	8.7	12.6	104.8
Low-income	2.7	61.2	18.7	17.3	75.9
Total (%)	23.3	53.2	9.4	14.0	252.3

Source: Holzmann and Jacques 2018.

Notes:

- Legal migrants with access to social security in the host country in the absence of a bilateral or multilateral arrangement;
- Legal migrants without access to social security in their host country;
- Undocumented immigrants.

Table 3.2: Global migrant stock estimates by origin country income group and portability regime; change between 2000 and 2013

Percentage points per regional income group

Origin country income group	Regime I (Portability)	Regime II ^a (Exportability)	Regime III ^b (No Access)	Regime IV ^c (Informality)	Total (millions)
High-income non-OECD	10.3	-14.1	0.8	3.0	-0.4
High-income OECD	-8.4	5.9	-0.6	3.0	4.1
Upper-middle-income	9.6	-4.4	-0.2	-5.0	8.2
Low-middle-income	6.1	-4.2	4.2	-6.1	26.9
Low-income	1.2	-7.9	8.9	-2.2	21.8
Total (%)	1.4	-3.0	4.5	-2.9	60.6

Source: Holzmann and Jacques 2018; Holzmann, Koettl; and Chernetsky 2005.

Notes: See Table 3.1.

4. The taxation of cross-border pensions: Facts, issues, and suggested solutions

The topic of taxing cross-border pensions is terra incognita in economics. No single recognized or competing paradigms explain how internationally portable pensions should be taxed. Yet countries typically have many bilateral double taxation agreements (DTAs) that include rules on how the rights are assigned to tax income from pensions and other retirement saving instruments. But this agreed tax treatment of pensions in a DTA for one migration corridor is not necessarily the same for another corridor, even if the corridor partners are neighbors. Furthermore, the tax treatment typically differs substantially across pension pillars (statutory, occupational, and personal). The guidance that exists on pensions is established in the Organisation for Economic Co-operation and Development (OECD) model tax convention on income and capital. Its relevant articles 18 and 19 suggest different tax treatment of cross-border pensions for private and public sector pensions – namely residence- versus sourced-based (see Appendix 2). Furthermore, they are also highly incomplete as they deal only with the disbursement phase of pension taxation, leaving out the contribution payment/saving and return receipt phases. Hardly any other area in economics has such a conceptual void, which has led to operational complexity and inconsistency in the taxation of cross-border pensions (Genser and Holzmann 2016, 2018).

This section summarizes recent attempts to highlight issues and offers a new proposal on how pensions should be taxed to address the double fairness dilemma of current pension taxation (Holzmann 2015; Genser 2015; Genser and Holzmann 2016, 2018): individuals risk unfair treatment due to the differences between and within countries, with some individuals paying the income tax on pension benefits twice – once during accumulation in the source country and again during decumulation in the residence country; others may benefit from tax exemption of pension wealth accumulation and disbursement in two countries. Of course, the latter case gives rise to tax arbitrage by strategic migration. Countries risk substantial fiscal unfairness as the current rules propose the taxation of cross-border pension benefits in the residence country, while income tax losses emerge in the source country, if income spent on contributions and income from pension wealth returns are tax-exempt. In view of the rising share of international mobility and benefit eligibility abroad (recall section 2), such a situation is unfair and unsustainable.

To substantiate this proposal, this section highlights three areas: the state of taxation of cross-border pensions (section 4.1); the incompatibility of deferred income taxation and the OECD model tax convention (section 4.2); and a new framework for pretaxed pension/retirement income (section 4.3).

4.1. The state of taxation of cross-border pensions

Income taxation in most OECD countries is codified according to the Schanz/Haig/Simons principle of comprehensive income taxation, which regards any annual increase in personal wealth as taxable income. This is uncontroversial for individual pension wealth accumulated in financial institutions like pension funds, insurance companies, or banks, because wealth accruals increase individuals' ability to pay and should therefore be taxed as a component of comprehensive income. Economically this is also true for notional pension wealth accruals within a statutory or mandatory occupational pension system, because individual pension claims under these systems increase ability to pay, although pension benefits are not capital-funded but financed on a pay-as-you-go (PAYG) basis. In fact, this difference

between funded and unfunded pensions has led to a different tax treatment of these pensions.

To compare national pension tax practices, three phases of capital accumulation are distinguished in which income taxes can or should be levied: pension wealth accumulation through contributions or savings, returns on accumulations, and dissaving or withdrawal of pension wealth. Technically, comprehensive income taxation of savings can be characterized by a T-T-E income tax, where T indicates that the respective income flow is taxed at the going tax rate and E indicates that it is tax-exempt. With respect to old-age pensions' comprehensive income taxation, T-T-E requires that income used to contribute to a pension system should be taxed; growing pension claims as returns to pension wealth should be taxed as well; but withdrawals of pension wealth are tax-exempt. In contrast to the comprehensive income principle, most national income tax codes tax PAYG financed pensions as E-E-T, which implies exempting income spent on pension contributions and income from accruals in pension claims and taxing withdrawals of pension benefits. While a long-lasting dispute persists among public economists whether to tax capital income according to either T-T-E (Schanz/Haig/Simons) or E-E-T (Fisher/Kaldor), tax lawyers argue that the difference in taxing pensions is nondiscriminatory if statutory pensions are preferentially taxed as (deferred) labor income and funded pensions are double taxed as capital income.

A survey of pension taxation in OECD countries shows a much broader variety of tax rules for different forms of pensions (Table 4.1). To capture the different tax rules, "t" and "s" are introduced to indicate that in a certain phase of the pension cycle a lower tax rate, $t < T$, or even a subsidy rate s , is applied. In this sample a majority of countries apply expenditure taxation (E-E-T) and none of them comprehensive income taxation (T-T-E) to statutory pensions. A few of them impose a slightly higher income tax burden, but many offer additional tax preferences to statutory pensions, down to a complete tax exemption through all three phases of the pension cycle. Sweden is the only country that grants

pension tax relief by not only deducting social security contributions from the personal income tax base but by granting a full tax credit for these contributions. The taxation of occupational and personal pensions reveals a similar pattern, with a less dominant cluster of countries using E-E-T. But columns 3 and 4 also exhibit a significantly broader scope of complexity, reaching from comprehensive income taxation down to full exemption of occupational as well as personal pensions over all three phases of the pension cycle. In addition to the different forms of tax treatment represented in Table 4.1, country-specific personal pension schemes are often connected with direct subsidy payments¹¹ that are granted to encourage voluntary enrolment in supplementary pension saving by further reducing the individual pension tax burden.

¹¹ For more remarks on these direct financial incentives, see OECD (2015, section 7).

Table 4.1: Income taxation of pensions in OECD countries

Tax regime	Statutory Pension	Occupational Pension¹	Personal Pension¹
T-T-E		NZ, TR	NZ, TR
T-t-E		AU, DK	AU
T-E-t			DE
t-T-E			SK
t-E-T	CA, FR, GB, MT, NL	BE, HR, NO	AT, FI, HR, NO
t-t-t		FR	
E-t-T		DK, LV, SE	DK
T-E-E		LV, PL	AT, HU, US
t-t-E		AU	AU
t-E-t	CH, DE, EE, LI, NO,	AT, BE, FR, LU, MT, PT	AT, BE, FR, MT, PT
E-E-T	AT, BE, CH, CY, DE, DK, ES, FI, GR, HR, IR, IS, IT, LU, MK, PL, RO, SI, SK	CA, CH, ES, FI, DE, GR, HR, IS, NL, SI, US	CA, CH, ES, GR, HR, IS, NL, PL, SE, SI, US
E-t-t	CZ	IT	IT, LV
sET	SE		
t-E-E	AL, HU, LT, ME	CZ, HU	CZ, EE,
E-t-E	ME	CY	CY
E-E-t	LI, LV, PT; TR, US	EE, GB, IR, IS, RO	GB, IR, LU, PL, RO
E-E-E	AM, AZ, BG, BY, GE, MC, MD, RS, RU, UA	BG, SK	BG, LT

Source: IBDF 2017; OECD 2015; and Genser and Holzmann 2016, 2018.

Notes: Country abbreviations follow the two-letter ISO 3166 code listed in Appendix 1.

1/ The OECD 2015 study does not cover AL, AM, AZ, BY, GE, LI, MD, MC, ME, RS, RU, and UA.

The complexity of the tax treatment of pensions increases when pensions accrue across borders. The avoidance of international double taxation of cross-border pensions is codified in bilateral DTAs. Although these treaties usually follow the recommendations of the OECD model tax convention, room for variance arises in income tax assignments for different forms of foreign income. Table 4.2 reveals the tax assignment of cross-border pension flows in treaties signed by Germany. The residence principle shows a marked dominance, but statutory pensions are frequently assigned exclusively to the source country. Shared tax assignments allowing for limited source country tax credited in the residence country are rare.

Table 4.2: Tax assignment of cross-border pensions in German double taxation treaties

Tax assignment	Statutory	Occupational	Personal
Exclusive residence taxation	CA, CH, CZ, EE, ES, FI, GR, HU, IR, IT, LU, PT, SE, SI, GB, US	AT, BE, CH, CZ, EE, ES, FI, FR, GR, HU, IR, IT, LU, MT, NL, PL, SE, SI, GB, US	AT, BE, CH, CZ, DK, EE, ES, FI, FR, GR, HU, IR, IT, LU, MT, NL, PL, PT, SE, SI, GB, US
Exclusive source taxation, progression proviso in residence country	AT, BE, DK, FR, IT (citizens), MT, NL, PL, SE	FR (mandatory)	
Nonexclusive source taxation, residence taxation with tax credit		CA, DK	CA, DK (rents)

Source: Genser and Holzmann 2018; Wellisch et al. 2008; and tax treaties.

Note: The country abbreviations follow the two-letter ISO 3166 code listed in Appendix 1.

A closer look at the bilateral network of DTAs for a richer set of countries reveals three fundamental complexities of cross-border pension taxation (Genser and Holzmann 2016, 2018). First, countries tax cross-border pension benefits differently for different forms of retirement income. Second, countries tax inbound cross-border pension benefits differently depending on the source country. Third, outbound pension benefits paid by Germany are taxed differently depending on the residence country of the pensioner.

Based on Table 4.1 and Table 4.2, application of different tax rules within and between countries for different forms of pensions risks violating horizontal fairness, motivates strategic pension planning, and is a source of interpersonal fiscal unfairness. In addition, inconsistent and uncoordinated assignments for income taxes on retirement income create fiscal unfairness between countries and induce strategic migration of pensioners and international competition in pension taxation.

4.2. The incompatibility of deferred income taxation and OECD model tax convention

The OECD model tax convention addresses pensions explicitly in Article 18 (see Appendix 2). According to this article, pensions disbursed across-borders “in consideration of past employment” are taxable only in the residence country of the recipient. However, the article contains a provision clause for pension benefits paid out to a recipient in the residence country who had been employed in the source country by a public body. In this case the pension is taxable in the source state unless the recipient is also a national of the resident state.

The dominance of the residence principle is motivated by administrative arguments. On the one hand, the residence state of the recipient of a foreign pension is “in a better position than the source state to take into account the recipient’s overall ability to pay, which depends on the worldwide income and the personal circumstances” (OECD 2014). On the other hand, residence taxation eases tax compliance of the recipient of foreign pension benefits because tax obligations are concentrated in the residence country only. Source taxation on public pensions according to Article 19 was originally a byproduct of income taxation of public employees “inherited from traditional rules of international courtesy.” However, the scope and fiscal importance of Article 19 increased with the growth of the public sector in many countries and with the extension of public activities abroad. The OECD model tax convention thus changed the assignment of taxes on public salaries and wages (and subsequent pensions) from a potential to an exclusive right of the source state.

From an economic perspective, it is important to recognize that the assignment of tax competences in the OECD model tax convention is restricted to the third phase of the pension cycle, when pension benefits are paid out across the border. The possibility of taxing pensions while pension wealth is accumulated is addressed neither in the model tax convention nor in the elaborate commentaries on the particular articles. An immediate consequence of this gap is that pensions that were pretaxed in the source country during the accumulation period will be double taxed if the residence country taxes pension benefits.

This undesirable result can be avoided if the source country's tax code determines deferred income taxation on pensions, as proposed by the EU Commission. Under an E-E-T regime no income tax is levied when contributions are paid and pension wealth earns returns, and income tax only becomes due when pension benefits are paid out. For a pensioner who emigrates after retirement, and for whom pension benefits are taxed exclusively in the immigration country, double taxation cannot occur.

Table 4.3 presents a set of simplified treaty examples that illustrate the constrained capability of the model tax convention to solve the double equity dilemma. For a given set of parameters, the table illustrates the interaction of three different tax regimes in country A and two assignments of income taxation for a pensioner who migrates to country B after retirement. To interpret the numbers, keep in mind that income taxation subject to the source principle replicates the tax situation in the no migration case. The pensioner's tax burden differs under the three tax regimes, depending on the tax policy: expenditure taxation E-E-T; prepaid expenditure taxation with exempt returns T-E-E; or comprehensive income taxation T-T-E.

Three results reveal the problems of the OECD model tax convention with respect to pension taxation:

- The last row shows that application of the residence principle avoids international double taxation only in the case of expenditure taxation, whereas the treaty rules do not eliminate double taxation if pensions are pretaxed, because tax credits only account for source country taxes on pension benefits.
- For the source country, deferred income taxation under the residence principle implies that the deferred income tax revenue on cross-border pension benefits is zero.
- For the residence country, income taxation under the source principle implies that the income tax revenue on cross-border pension benefits is zero.

Table 4.3: Income tax on pensioners migrating from country A to B under different tax assignments and tax regimes

Parameter selection:						
Labor income	Contribution rate		Income tax rate	Return rate		
120	0.2		0.3	0.5		
	Residence principle			Source principle		
	E-E-T	T-E-E	T-T-E	E-E-T	T-E-E	T-T-E
A1 income	120	120	120	120	120	120
A1 pension contributions	24	24	24	24	24	24
A1 income tax base	96	120	156	96	120	156
A1 income tax	28.8	36	46.8	28.8	36	46.8
A2 pension benefit	36	36	36	36	36	36
A2 income tax base	0	0	0	36	0	0
A2 income tax	0	0	0	10.8	0	0
B2 tax base	36	36	36	0	0	0
B2 income tax	10.8	10.8	10.8	0	0	0
Total income ^{1/}	132	132	132	132	132	132
Total tax ^{1/}	39.6	46.8	57.6	39.6	36	46.8

Source: Authors' calculations.

Note: A1 is working period in country A, A2 is retirement period in country A, and B2 is retirement period in country B. ^{1/} Net present value, normal return rate zero.

4.3. A new framework for pretaxed pension income

To address the incompatibility outlined in the prior section, a new framework is proposed here. The starting position is the weakness of the prevailing taxation architecture outlined at the beginning of this section. The framework then proposes to move toward frontloaded taxation of pensions and to codify source taxation in DTAs. In addition, three pension tax payment options are suggested to implement the framework.

4.3.1. The starting position

The starting point for a new framework for pension taxation is the existence of two unsolved problems in the prevailing architecture of existing pension tax systems. First, there

is the simultaneous orientation of tax equity along two mutually exclusive equity standards: comprehensive income taxation and expenditure taxation.¹² These standards imply different time patterns of capital income taxation over the accumulation and use of capital. The Schanz/Haig/Simons principle requires taxation while capital wealth accrues (in other words, T-T-E), whereas the Fisher/Kaldor principle defers taxation until capital wealth is used for consumption (in other words, E-E-T). The Fisher/Kaldor approach forgoes the double taxation of savings and establishes intertemporal neutrality on consumer spending decisions. Countries typically apply comprehensive income taxation for capital income not related to retirement and apply various forms of Fisher/Kaldor-type taxes on different forms of retirement income. Pure expenditure taxation is frequently applied for statutory pensions, and less frequently for occupational pensions. Highly differentiated and country-specific forms of taxation are applied to personal pensions (Table 4.1).

Second, tax assignment and balancing methods in DTAs that try to avoid double taxation of pensions are codified only for cross-border pension benefit flows. These tax regulations ignore the fact that pensions might have already been pretaxed when pension wealth was accumulated.

4.3.2. The proposal

Double taxation of pensions can be avoided by requiring that:

- Pensions are taxed according to the Fisher/Kaldor principle, and
- Fair taxation of pensions has to account for pension taxes over the whole pension cycle.

¹² The inconsistencies in cross-border taxation of pensions are grounded in theoretical ambiguities of taxation of pensions and their implementation in the national context. For the state of the theory of pension taxation and the implementation of pension taxation in key industrialized countries, consult Holzmann and Piggott (2018). Mirrlees et al. (2010) offer broader perspectives on the taxation of labor and capital and call for an integrated approach for the design of pensions and their taxation.

To satisfy the first requirement the proposal makes use of a fundamental equivalence property of the Fisher/Kaldor approach. The nonneutrality of comprehensive income taxation can be avoided not only by expenditure taxation (E-E-T), but also by a corresponding frontloaded income tax regime (T-t-E), which shares the intertemporal neutrality property of the backloaded Fisher/Kaldor-type expenditure tax and is economically equivalent under a set of simplifying assumptions.¹³ Under a T-t-E regime, income spent on pension savings is taxed when contributions are made and exempted when pension benefits are withdrawn from accumulated pension wealth. Moreover, returns on pension wealth are only liable to tax if they exceed normal returns that are tax-exempt. This partial income tax exemption of returns is indicated by t . $t < T$ also reveals that the tax liability under the two equivalent forms of Fisher/Kaldor taxation is smaller than under comprehensive income taxation.

The second requirement makes use of the time pattern of T-t-E taxation. Pensions are pretaxed in the source country, while pension benefits are exempt. To avoid double taxation of cross-border benefits, it is necessary to exempt pension benefits in the residence country as well. Compared to deferred income taxation, under T-t-E, the source country does not suffer from income tax revenue losses on exempt contributions when individuals migrate as retirees nor when they emigrate before retirement, as their pension wealth has been appropriately taxed upon accrual.

¹³ Standard assumptions are that the tax schedule remains unchanged over the pension cycle, the tax schedule is perfectly adjusted to inflation, and the tax regime treats positive and negative incomes symmetrically. Another crucial issue is the implicit assumption of progressive tax systems of what is considered tolerable and not regarded as violating tax equity under fluctuating period incomes over the lifecycle, which affects the lifetime tax burden of individuals with exactly the same present value of lifetime income. Perfect lifetime tax equity would require applying the progressive tax schedule to a notional average gross period income over the lifecycle. The same implicit assumption is necessary for lifetime pensions, although the tax burden differences are salient: In contrast to T-t-E taxation, deferred income taxation E-E-T implies that low pension benefits after retirement may go untaxed if they fall below the general income tax allowance. Perfect equivalence is attained under the implicit assumption that taxable lifetime earnings including taxable pension benefits are taxed by calculating the notional gross period income over the pension cycle.

Pretaxing pensions following the Fisher/Kaldor principle should facilitate the achievement of a consensual solution between treaty partners on the assignment of the taxing right on cross-border pension benefits:

- Pretaxation of pension implies that the recouping pressure of deferred income taxation is absent upon migration.
- No income tax is due for pension benefits paid out to migrants and nonmigrants.
- Pretaxation of pension income accounts for the personal circumstances of the income earner and his ability to pay under unlimited tax liability as a resident of the source country.
- Two key arguments that gave reason to assign the competence of taxing cross-border pensions benefits in the residence country no longer apply: the recipient is not taxed under limited tax liability on pension benefits in the source country after migration, because his pension benefits were already pretaxed under unlimited tax liability when he was a resident of the emigration country; and the recipient would only have to comply with the tax authority in the residence country after migration, because his pension benefits are tax-exempt in the source country.
- If pensions are pretaxed and pension benefits are not taxed in both treaty countries, the likelihood of agreeing on exclusive source taxation to avoid double taxation should be much higher than under deferred income taxation.

The solution to the double taxation problem of cross-border pensions is simple if countries are willing to switch from deferred income taxation to frontloaded expenditure taxation. The revision to the OECD model tax convention would then only need to codify exclusive source taxation on pension benefits, replacing the present mixture of residence and source taxation depending on the type of pension.

4.3.3. Three tax payment options

The frontloaded pension tax approach suggests that tax liabilities must be cleared immediately upon income tax assessment. But this is not a necessary consequence. The tax

authority may be ready to accept deferred payment of the assessed tax liability in the same fiscal way as expenditure taxation defers taxation of saved income. Deferred down payment of tax debt is neutral for the intertemporal government budget constraint as long as the present value of deferred tax payments is equal to the present value of the assessed tax liability. For this reason, three proposals are presented that complement the T-t-E frontloaded pension tax regime by decoupling the tax statement of the tax authority and the prescription of the tax payment.

(i) *The frontloaded tax payment option* requires that tax liabilities are immediately settled when they occur. This does not (and in this proposal should not) imply a higher tax payment by the pension saver. Taxes can be settled when an appropriate share of the individual contribution to the pension system is used to pay the tax bill, which implies that individual pension wealth accumulation is reduced by the tax factor $(1-T)$. The same procedure can be applied to settle the income tax liability on excess returns. Pension funds are obliged to pay income tax to the tax authority and pension wealth returns are reduced by the tax factor $(1-t)$. No income tax is due when pension benefits are disbursed after retirement. Since all income tax liabilities on pension wealth are settled immediately, no revenue loss arises if the pension saver emigrates as a worker or a pensioner.

(ii) Under the *deferred tax payment option*, the tax liabilities are assessed according to the T-t-E regime, accumulated until retirement, and then turned into a tax annuity that must be paid to the tax administration in line with the disbursement of the monthly pension benefits (Holzmann 2015). The approach combines the formal frontloading of tax assessment (T-t-E) with a material backloading (E-E-T) of tax payment and defers the net income loss by paying out pension benefits net of the tax annuity. If a pension saver emigrates before retirement and the gross pension assets remain in the source country, the tax annuity is withheld when pension benefits are paid out and transferred to the treasury in the same way as for a resident retiree. If the pension wealth is transferred abroad upon migration, then the accumulated tax liability becomes due as a form of exit tax that is also paid by the pension fund, and the migrant's transferrable pension wealth is reduced accordingly. If a pensioner

dies before the accumulated tax liability is redeemed, the pension fund is again required to settle the open tax debt.¹⁴

(iii) Under the *distributed tax payment option*, the payments of the accumulated tax liability are spread evenly across the whole pension cycle by charging a constant rate t^* on contributions, pension wealth returns, and pension benefit payouts. The rate t^* should be chosen to balance the expected aggregate present value of tax payments and the expected present value of the frontloaded pension tax liability. To balance tax liability and tax payment at the individual level may be left to a recalculation of the monthly payment upon retirement by means of a supplemental tax annuity, which could either be an individual surtax or a tax decrement on t^* . Emigration or death of the pensioner should be settled by the pension fund as outlined above. A constant tax payment rate t^* , which should be between one third and one-half the average income tax rate, may increase political support because the advanced tax revenue inflows and later tax revenue losses level out over the lifespan of individuals. Moreover, t^* increases the toolbox of national tax policy and mitigates the fiscal transition effects that accompany the switch from the traditional deferred to a new pretaxed pension taxation.

Decoupling the tax assessment and tax payment has no direct effect on migration and tax assignment in DTAs. The exclusive right to tax pension benefits in the source country and to exempt them when pensions are pretaxed precludes international double taxation. Unlimited income tax liability in the source country where income is earned and where pension wealth is accumulated as resident, and unlimited tax liability in the new residence country after migration, are in full accordance with objectives of equitable ability to pay and low costs of tax compliance and tax administration. Individual fairness with respect to residence taxation after migration can be achieved by applying the progressivity proviso in

¹⁴ Note that the progressivity erosion effect of deferred income taxation does not occur in the deferred tax payment option (or in the distributed tax payment option) because the tax liability under frontloading is fixed in present value terms and only the income tax payment is deferred.

DTAs, ensuring that tax-exempt cross-border pension benefits increase the income tax rate on other taxable income in the residence country.

5. Frontloaded taxation, payment options, and DB and DC in comparison

The proposed frontloaded taxation of cross-border pensions and the three payment options naturally raise the question of whether a DB or a DC scheme is better able to address the challenges that may emerge.

5.1. The frontloaded tax assessment and immediate payment option

This option seems possible in both DB and DC schemes. No difference should arise in the taxation of contributions/savings efforts, as in both cases traditional exemptions are simply not applied.

Differences will emerge in the contribution taxation, however, if a DB scheme is redistributive and offers a higher benefit level compared to an actuarial calculation. This redistributive effect would be captured in a backloaded scheme at the level of benefit disbursement, even under a linear income tax. For lower-income groups with relatively high pensions, the tax payment would be higher under deferred income taxation; for higher-income groups with relatively lower pensions, the tax burden would be lower under deferred income taxation. This is not the case under a frontloaded tax system, which compared to a backloaded system makes a redistributive DB scheme even more redistributive. Under the frontloaded approach, both lower- and higher-income groups escape higher tax payment when government transfers keep the system afloat. For a pseudo-actuarial NDC scheme without redistribution those considerations will not matter. However, if redistribution is introduced with transfer payments to the individual accounts (as discussed in section 3) and treated as returns to individual pension wealth, then the frontloaded tax captures these higher pension benefits in a similar way as the backloaded taxation. If, however, these redistributive transfers are not recognized as returns to pension wealth and are only taxed under the backloaded tax system, then this tax escape for lower-

income groups makes the frontloaded approach under an NDC scheme more progressive than the backloaded approach.

No difference should emerge in the taxation of the excess returns on pension wealth if both DB and DC schemes are funded, as the financial returns can be easily assessed at individual fund level and taxed. Of course, this would amount to taxing the excess returns at equal rates across individuals, in line with dual income taxation but at odds with differentiated rates under a progressive income tax schedule. Progressive taxation is possible but complicated and never really considered. In unfunded schemes a difference may emerge as the rate of return in an NDC scheme is the notional interest rate, equal for all and well known. But this is not likely to matter as only the excess returns should be taxed, which are likely to be zero as the notional/nonfinancial rate of return should be equal or close to the riskless rate of return.¹⁵ This may not be the case for NDB schemes, where the rate is typically unknown and likely to differ across individuals. The individual rates of return under an NDB scheme are likely to differ by pensioners' socioeconomic characteristics and the difference may be substantial. Ignoring such differences would make a progressive scheme that offers high rates of return for lower-income groups less progressive.

While under the immediate payment option differences between DC and DB schemes are likely to emerge with regard to their redistributive effects (that may also differ by their funding approach), these effects may be mostly moderate. Avoiding such effects may, in some cases, be easier handled by a DC scheme, yet this does not result in a strong dominance over DB schemes under this payment option.

5.2. The frontloaded tax assessment and deferred payment option

This option also seems possible in DB and DC schemes, but is not as easily implemented. The distributive issues outlined above remain valid under the deferred payment option, but

¹⁵ The excess rate of return is conceptually the difference between the rate of return of an asset minus the risk-free rate of return, typically proxied by the long-term government bond rate. Under steady-state conditions and other reasonable assumptions, the long-term government bond rate and the notional rate of return should not be different and should be equal to the gross domestic product growth rate.

are not addressed here. In addition, differences between DB and DC schemes emerge as the taxes due are accumulated with interest until retirement and then translated into a tax annuity that is subtracted from the gross benefit as calculated.

Under both DB and DC schemes, the taxes due on contributions and the rates of return can be easily calculated, and with a selected interest rate accumulated until retirement. For unfunded DB and DC schemes, the rate of return proposes itself: in NDC schemes, the notional interest rate keeps the scheme sustainable – its calculation is part of the scheme design and is well known; in NDB schemes, the rate is normally unknown and requires a complex estimation for which the data may not be fully available. If traditionally estimated, should this (likely unsustainable) rate be used, or a hypothetical sustainable rate as for NDC schemes (which may be even more difficult to estimate for NDB schemes)? Good arguments exist to use the higher, unsustainable internal rate of return for indexing, as this would also increase the taxes due at retirement. The approach may thus overcome the distributive issues under the direct payment and proxy the $T-t-E = E-E-T$ condition. For funded pensions, similar considerations are valid but a bit more complex.¹⁶

At retirement the accumulated tax liability due needs to be translated into the tax annuity. This is straightforward in an NDC scheme, as all the information for calculating the benefit annuity can be used for the tax annuity, most importantly the remaining cohort life expectancy. This is no minor issue, as few countries have official cohort (and not only period) life expectancy tables estimated and published. The difference between cohort and period life expectancy at age 65 can be sizable, and currently reaches up to nine years for both genders in some countries (Ayusa, Bravo, and Holzmann 2018). Applying a too-low

¹⁶ As this paper deals primarily with NDC versus NDB schemes, FDB and FDC schemes are discussed only briefly here. The FDC rate of return suggests itself to be used to accumulate the taxes due as it also indexes the funds from which the benefits can be paid. Again, this proxies the $T-t-E = E-E-T$ condition. Good arguments exist to use the annual internal rate of return for FDB schemes, as for NDB schemes. But the balancing of FDB schemes (which do not exist at national level and have mostly been closed at occupational level for new entrants, or transferred to FDCs) can have many forms, including partial or full default. Calculating the resulting (negative) internal rate of return and translating this into reduced and zero tax accumulations due would be very complex.

period life expectancy would result in a too-high tax annuity and, compared to an annuity calculated with cohort life expectancy, an incorrect, too-high tax payment. However, a typical NDB scheme uses period life expectancy to estimate its financial solvency, which implies too-high pension annuities but also too-high tax annuities if the available period life expectancy were to be used. But if individuals actually live according to the survival probability of the cohort life expectancy, they have a higher pension wealth and a higher tax liability at retirement. With high differences between cohort and period life expectancies, as in Australia, this may amount to an increase of pension wealth of up to 50 percent at retirement, of which only a share is recovered by future higher taxes (e.g., 20 percent).

To summarize, the deferred tax payment option is potentially possible under an NDB scheme but requires more technical effort and faces more estimation and implementation challenges than under an NDC scheme, the implementation of which should be quite straightforward. This assessment also holds for the comparison between funded provisions if both were to be centralized. Under a decentralized FDC implementation the differences in achieved rates of return and applied life expectancies across pension funds and annuity providers may not ensure comparability and fairness.

5.3. The frontloaded tax assessment and distributed payment option

This option needs no tax annuities, in principle. The identical lower tax rate t^* is applied for each payment phase – contribution, return receipt, and benefit disbursement – and should ex ante be fully aligned with frontloaded tax equivalence; i.e., $t^* - t^* - t^* = T - t - E = E - E - T$. Hence a perfectly chosen tax rate t^* can be applied to both DB and DC schemes without any differences or technical complications.

However, in an imperfect world of information constraints and unexpected economic and demographic changes, a periodic adjustment in the tax rate t^* may be needed to assure that frontloaded and backloaded taxation benchmarks for individuals broadly match, ensuring that fiscal fairness across individuals and countries holds. To do so requires shadow tax accumulation accounts and a correction at retirement: either of the tax rate t^*

or of the tax annuities applied. Under such conditions, DB schemes run into the same technical problems outlined above. During the contribution phase a substantial part of the lifetime income tax burden due has already been paid. At retirement the open tax liability can comprise between one-third and one-half of this tax burden. Consequently, the pension benefit annuity under the distributed payment option is higher than under the immediate payment option but lower than under the deferred payment option. In contrast, the tax annuity under the deferred payment option is higher than under the immediate payment option (where it is nil) but lower than under the deferred payment option.

Such adjustment considerations for t^* would render the level of implementation ease of the distributed payment option difficult under both DC and DB schemes, but relatively less difficult under a DC scheme as the key measurement instruments (such as tax and benefit annuities) are easier to develop and are part of the overall design.

Table 5.1 compares DC and DB schemes under the three payment options.

Table 5.1: Comparison of DB and DC schemes under frontloaded tax assignment and three payment options with regard to ease of implementation and equivalence with backloaded taxation

Payment option	DB scheme	DC scheme	Comments
Immediate	Relatively easy	Very easy	The more the DB scheme is redistributive and unsustainable, the higher the difficulty
Deferred	May be quite cumbersome	Very easy	Same as above, but in addition requires technical effort to determine tax annuities for DB schemes
Distributed	Very, very easy or very difficult	Very, very easy or moderately difficult	For both schemes, very easy if tax rate t^* can be left fixed; else technically very difficult for DB, but less difficult for DC schemes

6. Conclusions

A feature of globalization is the increasing international mobility of individuals during their working life and after retirement. This trend has existed since the 1960s and does not seem to be easing. For mobile individuals as well as for home and host countries, this raises the issue of portability of acquired pension rights as well as the taxation of pensions. If the design and arrangements for these issues between source and destination countries are not done well, the result will be less fairness for individuals, less fiscal fairness for countries, and lower administrative efficiency. The effects on these three outcome criteria also depend on the type of pension benefit scheme in place – DB or DC.

Portability of pension benefits and related retirement income savings can be established through three types of instruments: unilateral, bilateral, or multilateral legal arrangements; multinational providers from the private sector; and benefit redesign. These three

instruments are both substitutes and complements. Thus a pension benefit redesign toward DC schemes simplifies the portability of pensions as accumulated resources can be easily transferred; likewise, benefits in payment can be easily granted as they do not contain redistributive components. This feature makes BAs – the workhorse of portability – either unnecessary or easier to establish. The DC approach also makes multinational schemes easier to operate. Yet portability of both DB and DC benefits may be impeded by tax considerations, particularly if tax concessions granted during accumulation must be repaid when migrating.

The current taxation of cross-border pensions across all migration corridors is highly complex and inconsistent. This violates the condition of fairness to individuals and countries, and of bureaucratic efficiency. This outcome is not sustainable in a world of labor and retirement mobility. The key reasons are the mix and heterogeneity of taxation principles in countries and the economically unsound international guidance in the OECD model tax convention. This may result in no taxation of pension benefits or their double taxation in source and residence country, as often happens when tax preferences for contributions and returns on assets are granted in the source country while benefits are fully taxed in the residence country.

No conceptual guidance currently exists in the economic literature on how cross-border pensions should be best taxed to achieve the three outcome criteria. This paper proposes moving toward a frontloaded expenditure tax treatment of pensions. In addition, it suggests three economically equivalent payment options – immediate, deferred until retirement, or distributed across the whole pension cycle of contribution payment, pension wealth return, and benefit disbursement. The paper compares and assesses the capacity to and ease with which DB and DC schemes can achieve the three outcome criteria under frontloading and the three proposed payment options. DC schemes dominate DB schemes in all payment options except the distributed one. If the reduced tax rate across all three phases remains fixed, then DB and DC schemes are equally easy to operate under the distributed payment option. The results are suggested to apply for both financial and nonfinancial schemes but seem more easily achievable under NDCs, an assessment that may not be universally shared.

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Appendix 1. Two-letter country abbreviations subject to ISO code 3166

AL Albania	CY Cyprus	GR Greece	MC Monaco	RO Romania
AM Armenia	CZ Czech Republic	HR Croatia	MD Moldova	RS Serbia
AT Austria	DE Germany	HU Hungary	ME Montenegro	RU Russia
AU Australia	DK Denmark	IR Ireland	MK Macedonia	SE Sweden
AZ Azerbaijan	EE Estonia	IS Iceland	MT Malta	SI Slovenia
BE Belgium	ES Spain	IT Italy	NL Netherlands	SK Slovakia
BG Bulgaria	FI Finland	LI Liechtenstein	NO Norway	TR Turkey
BY Belarus	FR France	LT Lithuania	NZ New Zealand	UA Ukraine
CA Canada	GB United Kingdom	LU Luxembourg	PL Poland	US United States
CH Switzerland	GE Georgia	LV Latvia	PT Portugal	

Appendix 2. OECD Model Tax Convention on Income and on Capital

Article 18 PENSIONS

Subject to the provisions of paragraph 2 of Article 19, pensions and other similar remuneration paid to a resident of a Contracting State in consideration of past employment shall be taxable only in that State.

Article 19 GOVERNMENT SERVICE

1. a) Salaries, wages and other similar remuneration paid by a Contracting State or a political subdivision or a local authority thereof to an individual in respect of services rendered to that State or subdivision or authority shall be taxable only in that State.

b) However, such salaries, wages and other similar remuneration shall be taxable only in the other Contracting State if the services are rendered in that State and the individual is a resident of that State who:

(i) is a national of that State; or

(ii) did not become a resident of that State solely for the purpose of rendering the services.

2. a) Notwithstanding the provisions of paragraph 1, pensions and other similar remuneration paid by, or out of funds created by, a Contracting State or a political subdivision or a local authority thereof to an individual in respect of services rendered to that State or subdivision or authority shall be taxable only in that State.

b) However, such pensions and other similar remuneration shall be taxable only in the other Contracting State if the individual is a resident of, and a national of, that State.

3. The provisions of Articles 15, 16, 17, and 18 shall apply to salaries, wages, pensions, and other similar remuneration in respect of services rendered in connection with a business carried on by a Contracting State or a political subdivision or a local authority thereof.

Article 21 OTHER INCOME

1. Items of income of a resident of a Contracting State, wherever arising, not dealt with in the foregoing Articles of this Convention shall be taxable only in that State.

2. The provisions of paragraph 1 shall not apply to income, other than income from immovable property as defined in paragraph 2 of Article 6, if the recipient of such income, being a resident of a Contracting State, carries on business in the other Contracting State through a permanent establishment situated therein and the right or property in respect of which the income is paid is effectively connected with such permanent establishment. In such case the provisions of Article 7 shall apply.