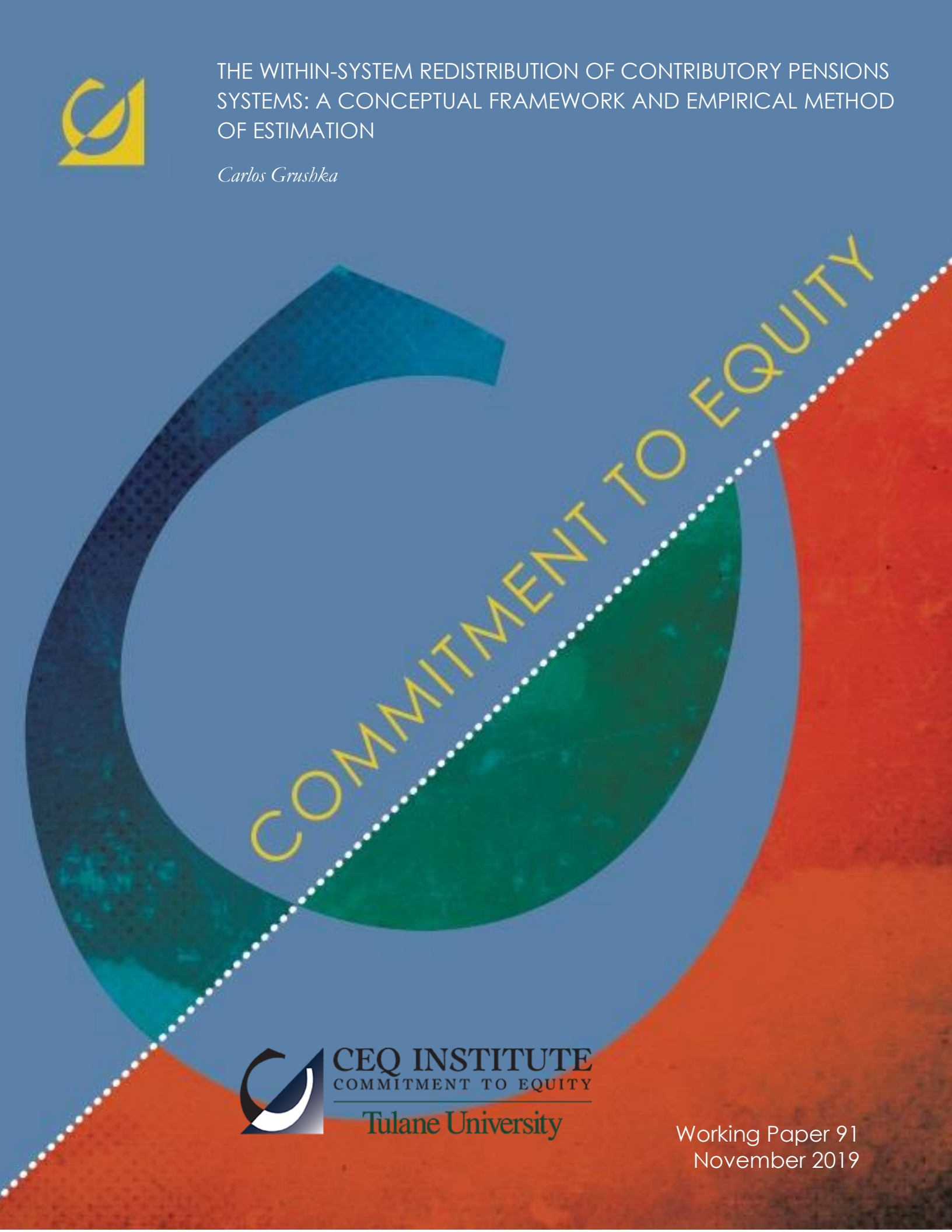
THE WITHIN-SYSTEM REDISTRIBUTION OF CONTRIBUTORY PENSIONS SYSTEMS: A CONCEPTUAL FRAMEWORK AND EMPIRICAL METHOD OF ESTIMATION

Carlos Grushka



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ABSTRACT

When discussing the distributional impacts of pension systems, the difference between the underlying rationale for considering them as tax-transfers or deferred wage schemes is critical. The way that benefits are determined (usually with decreasing replacement rates by income level) plays a significant role to determine within-system redistribution. However, to evaluate the overall effective redistribution it is crucial to incorporate the effects of coverage or "selectivity", and the funding or financing of the benefits under payment. The within-system redistribution is highly affected by the changing rules along time, the specific ways that they apply in each country, the different approaches for data definition (on revenue, expenditure, and coverage) and data availability. After analyzing in detail the case of Argentina and all the variables involved, we propose a simplified redistribution index, defined as the difference of gross substitution rates by education levels (proxy of lifetime income). This index can be estimated from cross-sectional income surveys and works as an excellent complement--or as a reasonable proxy--for the extent of redistribution within contributory pensions systems in different countries and periods.

JEL: H50, H55, D31, J14

Keywords: social security and public pensions, personal income distribution, economics of the elderly, Argentina

* This paper shall be included as a chapter in the CEQ Handbook: Lustig, Nora (editor). Commitment to Equity Handbook. A Guide to Estimating the Impact of Fiscal Policy on Inequality and Poverty. Brookings Institution Press and CEQ Institute.

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The within-system redistribution of contributory pensions systems: a conceptual framework and empirical method of estimation[1]

Carlos Grushka[2]

November 2019

Abstract

When discussing the distributional impacts of pension systems, the difference between the underlying rationale for considering them as tax-transfers or deferred wage schemes is critical. The way that benefits are determined (usually with decreasing replacement rates by income level) plays a significant role to determine within-system redistribution. However, to evaluate the overall effective redistribution it is crucial to incorporate the effects of coverage or "selectivity", and the funding or financing of the benefits under payment. The within-system redistribution is highly affected by the changing rules along time, the specific ways that they apply in each country, the different approaches for data definition (on revenue, expenditure, and coverage) and data availability. After analyzing in detail the case of Argentina and all the variables involved, we propose a simplified redistribution index, defined as the difference of gross substitution rates by education levels (proxy of lifetime income). This index can be estimated from cross-sectional income surveys and works as an excellent complement--or as a reasonable proxy--for the extent of redistribution within contributory pensions systems in different countries and periods.

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I. Introduction

The paper presents a conceptual framework to estimate the within-system redistribution, analyzes in detail the case of Argentina, and proposes a viable empirical approach to estimate the extent of redistribution in different countries and periods. Although the paper is framed in terms of the distinction between deferred wage and tax-transfers Social Security (SS) systems, we recognize that the boundary is not simple given that pension systems have multiple objectives -at a minimum, consumption smoothing, insurance and poverty relief-. The discussion attempts not to ignore the complex distinction between risk-sharing (i.e. insurance) and redistribution.

In principle, if SS pensions are considered deferred wages, the redistributive effects should be analyzed as an income redistribution within the life cycle (from her younger to her old self) and not among individuals (such as from the richer to the poorer). Thus, pension benefits are strictly actuarial, usually considered as neutral, depending only on (a) the size of the worker's pension accumulation, (b) the remaining life expectancy at pension age of her birth cohort and (c) the return to pension saving over her retirement. However, in the simplest case, this rule is violated in significant ways. With uniform annuity pricing there is redistribution from men to women, from less to more healthy (for smokers to non-smokers), and from poorer people (with shorter life expectancies on average) to richer people. Separately-priced annuities for each of these groups might be considered but is difficult to implement (treating men and women separately is ruled out in the EU and USA, among other countries, by law as well as custom). A lower bound on redistribution is the group insurance with individuals remaining life varying from the average.

The way that benefits are determined plays a significant role to determine within system redistribution. Besides, SS coverage is crucial to incorporate the effects of the labor market performance on reaching or not most of the elderly, providing some sort of compensation to those who lacked opportunities during active ages. In any case, the financing of the benefits under payment is crucial to evaluate the overall effective redistribution: SS "selectivity" and distribution are not independent from its funding.

It is also important to distinguish between a pension system, and the different elements of the system, which Barr and Diamond (2009) refer to as pension plans. Since pensions have multiple objectives, a well-designed system generally comprises multiple plans, e.g. in the Netherlands, the mandatory system includes a tax-financed non-contributory pension and fully-funded industry plans. In Chile, the system comprises competing fully funded individual accounts run by private pension managers (AFPs) and the solidarity pension. In both countries, a holistic view of the system would also include income-tested social assistance. The analysis on redistribution should cover the system, not only a plan. In the case of Argentina, the mature and almost universal "Pay-as-you-go" (PAYG) SS system encompasses different plans and special treatments for specific groups of workers and pensioners, and the overall redistributive effect of this defined benefit system is very controversial (Moncarz, 2015).

After this introduction, in the second section, we present the background and motivation emphasizing the discussion on the way SS pensions are commonly considered, as tax-transfers or as deferred wages. In the third section, we analyze how SS pensions and the levels of redistribution are basically a question of definition, leading to review concepts as neutrality and actuarial fairness. In section IV, we present how SS works in Argentina, detailing its fragmentation and heterogeneity. In section V, we analyze different ways of redistribution within SS Pensions in Argentina, and finally, in section VI, we provide an alternative methodological framework, introducing a simple redistribution index based just on cross-sectional data.

II. Are pensions systems Tax-transfers or deferred wages schemes?

This section discusses the underlying rationale for considering pension systems as tax-transfers schemes (where government collect taxes and spends as in any other area or public policy) or deferred wage schemes (where the role of the public sector is neutral, and pensions should be considered part of the wages earned by workers but paid later at an actuarially fair value). The difference between these two approaches is critical when discussing the distributional impacts of pension systems. If the first approach is to be adopted, then all taxes and benefits should be considered in the same way than other taxes and payments are. On the other hand, supposing pensions are deferred wages, the distribution impact would depend on whether benefits are an actuarially fair payment of previously held wages and, if not, the difference between actual payments and fair estimations should be considered a transfer and accounted for distributional analysis purposes.

Pension systems are relatively modern public policies that aim at providing income support to the elderly once they retire from the labor force and become unable to finance their consumption with wages or other income sources. These policies originated in industrial economies in the late 1800s, as salaried work expanded to all areas of activity, in a context where traditional family arrangements to support the elderly were declining. The basic design principles of these programs are built from two alternative models, usually referred to by the name of its creators, Bismarck and Beveridge.

As the first modern program was created in Germany in the 1880s, Chancellor Otto von Bismarck has been credited as being the founder of modern SS. He introduced the concept of contributory pensions, which aim at replacing pre-retirement income by requiring contributions that are proportional to earnings while active and then provide a proportional benefit after retirement. Most continental European countries, as well as several in Latin America, adopted similar models in the early years of last Century, thus focusing on the “formal” labor force (that is, workers that were formally registered and made their contributions). SS systems were designed as PAYG schemes, where revenues are used to pay benefits immediately, or as “funded” schemes, where contributions were accumulated and invested and then assets used to pay benefits in the form of annuities. The rationale of this design provided two clear advantages that were important to gain support among policy makers. First, the programs can be self-sufficient in financial terms, as contributions can

finance benefits, eliminating the need to find other fiscal resources to protect the elderly's income. Also, by linking rights to previous contributions, the program has an implicit self-targeting mechanism. Given the goal of replacing labor income after retirement, if the program requires workers to contribute a part of their salaries, these contributions not only finance current benefits, but also identify the contributors as salaried workers that will need benefits in the future. In the same logic, those who do not contribute are excluded from the system, because their lack of contributions indicate that they do not have salaries, hence there is no need to replace them after retirement. On the other hand, contributory schemes have some risks and disadvantages. First, restricting coverage to those who contributed excludes several groups that, in many cases, may represent a large proportion of the population. This includes, for example, the self-employed, informal workers or housekeepers. Besides, if the programs become financially unbalanced and require funding from other fiscal sources, inequities and undesired distributive impacts may arise, as those excluded from the systems may end up financing part of the benefits of participants.

At the end of the II World War, the United Kingdom implemented a different model, inspired in a report prepared by Lord William Beveridge, which aimed at providing a basic income protection to all workers. In a clear difference from what was already common in other countries, the Beveridge approach focused on redistribution. The system still required contributions from active workers, but the size of the pension was not linked to those contributions. This approach, later adopted by other countries, solves the issue of poverty relief, but it creates a new challenge, as benefits cannot truly replace previous income (or a fixed proportion of it), so individuals need to rely on other income sources (either savings or additional pension plans) in order to maintain an income flow consistent with their pre-retirement earnings.

The differences in objectives and design between these two models have resulted in two very different approaches to the analysis of the fiscal and distributive impacts on pension systems. On one hand, if pension schemes are assumed to be contributory schemes where each and every participant pays for his or her own future benefits, then the programs can be thought of as a deferred wage or a compulsory savings scheme. If this is the case, it would be reasonable to argue that there are no fiscal impacts (as the public institutions involved in managing the programs are only collecting the deferred salaries and then paying them) and of course no distributional effects (as each individual finances his or her own pension, so the lifetime income is not affected). As Barr (2012) noted, a further complication is whether workers perceive benefits to be actuarial: future benefits 'are payable only in certain contingencies, can be changed by legislation, and will depend on marital status; and it is not possible to borrow against future benefits, which must therefore be weighted by the probability that each benefit will be received at some given future date. The weighted benefits must then be discounted to present value using the market rate of interest or, for people who cannot borrow as much as they wish, at a personal rate of time preference'.

On the other extreme, a pure Beveridge style program can be considered in the same way than any other public policy, such as education, defense, or utilities' subsidies, where the State collects some revenues (in this case, taxes on wages) and uses them (or other resources) to finance the provision

of transfers or services to a certain part of the population. According to this analytical approach, all contributions should be considered part of the fiscal revenues, all benefits part of the public expenditures and both taxes and transfers will have some impact on income distribution. It is important to note that, while the alternative designs maybe associated to the alternative analytical approaches, this is not a pre-requisite. In fact, there is no reason for somebody studying distributional impacts of pension systems to adopt a full tax-transfer approach even if the system under analysis is a contributory one, and vice-versa.

It is important to note that the analytical criteria should not be defined by the stated principles that were used to originally design the pension systems, but by the conceptual approach of the analyst, considering what are his or her main concerns when discussing income distribution.

As policies evolved and real-world restrictions and demands were confronted, pension systems in most countries have converged to models that mix components from the two original models. In most modern economies, there are pension systems that pay benefits linked to previous contributions, but with some internal distributive provisions, such as the use of minimum and maximum pensions, as well as progressive benefit formulas and different pooling mechanisms. In addition, non-contributory pensions, also known as social pensions or universal basic pensions are offered in most countries to those that, for different reasons, do not qualify for the contributory schemes. Both, contributory and non-contributory schemes, are usually financed by a mix of earmarked wage and non-wage taxes, as well as general revenue by the governments.

In this context, measuring distributive impacts of pension system is a serious conceptual and methodological challenge. If we take a “pure” tax transfer approach, the situation appears to be rather simple: all contributions should be considered in a similar way than other taxes (hence, their distributional impact will depend on the distribution of those contributing), and benefits are transfers from the public sector to families. However, a significant challenge remains, and that is the treatment of privately managed pension funds (usually, complementary to public schemes) with compulsory participation. In principle, if the objective is to understand the distributive impact of the pension system, then the whole system should be considered, regardless of whether management is public or private, given that participation is required as part of a public policy.

In practical terms, the question is to determine the limit between a public intervention (that should be considered) and private initiative. Is this limit defined by the institutional character of the agency in charge of managing the system (i.e. public or private)? Or maybe, it should depend on whether authorities register contributions and payments as part of the fiscal accounts? These limits are blurred, and almost identical programs can fall on one side of the classification or the other in different countries for reasons that should not be relevant in this analysis. On the other hand, an alternative test should be whether participation is voluntary or compulsory.

If the analysis starts from a deferred wages viewpoint, the analysis becomes more complex. In a first look, the approach should consider what is the actuarially fair benefit level and then consider a transfer (or a tax) all payments in excess (or defect) of this level. However, several questions

immediately arise. For example, the issues of when an excess payment should be considered a transfer or how heterogeneity should be treated are two critical questions:

a) **Timing**: Distributional analysis is usually based on period data. Unless the assessment considers the lifetime of all individuals, the excess or defect income must be assigned to a certain period. In this regard, there are four possible approaches to take:

i. Estimate a "fair" annual benefit based on the accumulated contributions, and categorize any excess (or defect) from this level as a transfer for each year. This requires knowledge (or assumptions) about a number of variables, such as contribution history, mortality rates, implicit interest rates, marital status (if survivors' benefits are available), as well as benefit history and expected trends in benefit levels.

ii. Estimate a "fair" annual contribution, based on the expected benefits, and categorize any excess (or defect) from this level as a transfer for each year. This option is similar to the previous one, except that assigns the transfer to the active years instead of the retirement period.

iii. Apply a similar approach to case (i), but instead of assigning the excess (or defect) proportionally to each year of benefits, estimate the number of years the beneficiary would receive a benefit at the current level if actuarially fair rules were applied and then consider a transfer all additional years of benefits

iv. Similar to (iii) but applied on the contribution side of the process.

b) **Intra-cohort transfers**: Defining an actuarially fair benefit requires considering actual flows of contributions and expected benefits for each individual. A reasonable approach to this would be to consider all individuals to be average, assuming similar contributory histories, mortality risks, and marital status, as well as some level of stability on system's rules. However, if a simplified assumption of no heterogeneity in the population is adopted, then by definition there will be no distributional impacts, as everyone will contribute and receive the same. In fact, the interesting aspect of this analysis is that we know that populations are not homogeneous, and we expect that those differences will have an impact. Hence, it is critical to define what dimensions should be considered in this analysis. Among those:

i. Income: is clearly a critical variable, as it reflects the objective of the analysis (income distribution) and is a critical element that defines differences in treatment in most pension systems. As discussed before, most pension systems have income related rules, such as minimum and maximum pensions and nonlinear formulas that are designed to have a distributional impact. Income is also a strong determinant of other relevant variables, such as employment, formality, and mortality, producing an indirect impact that should be measured.

ii. Sex: Data around the world shows that income and mortality are consistently different by sex. Women tend to have lower income (for a number of reasons liked to labor markets performance, individual choices and, of course, discrimination), but they also tend to have a lower mortality.

iii. Economic sector: Pension systems usually have differential regimes with conditions more generous for specific groups of workers, who either are exposed to higher risks and society tries to compensate them or have found a way to receive an advantageous treatment thanks to effective lobbying of policymakers. As a result, these groups receive a higher benefit (and, consequently, a higher transfer) than others.

In this context, it seems that there are several approaches to measure the distributive impacts of pension systems that might be reasonable, but not necessarily consistent across countries. Hence, we would suggest adopting a two-stage approach to improve comparability across countries. First, all pension system distributive impact analysis should be conducted under two alternative assumption sets. On one hand, the analysis should be prepared assuming they are a tax-transfer scheme, which includes privately managed component with publicly mandated participation. This would imply that all contributions should be considered part of gross income (and, consequently, taxes), while benefits should be considered government transfers that contribute to after-market income. Additionally, a specific analysis considering the systems as deferred labor income schemes should be prepared. In this case, for simplicity, pension contributions should be considered part of labor income (which is compulsory "saved"); meanwhile, actuarially fair pension benefits should be considered a reduction in savings, and any excess (or defect) benefits beyond those actuarially fair would be transfers (or taxes).

III. Redistribution, neutrality and actuarial fairness

Social Security (SS) pensions and the levels of redistribution are basically a question of definition. According to William Beveridge (1942), "SS is first and foremost a method to redistribute income, in order to put the most urgent needs first". However, there are so many ways to look at redistribution that they should require a very careful (explicit) approach. What should we call "neutrality"? There are different groups involved within SS Pensions: Sex, Race, Education, Occupation, and Income. The analysis might be based on period or cohorts; cohorts' behavior might be considered ex-ante or ex-post. Neutrality depends on individuals along time ("actuarial fairness") or it is couple's (household) decision at different periods?

Besides, there are different channels of redistribution. A more direct one (and well known), from "rich" to "poor", through the establishment of minimum pensions, fixed sums and / or differentiated scales (formula to determine benefits). However, on a more veiled level, there are other mechanisms based on social cuts that might be regressive: on the one hand differential mortality (life expectancy at retirement age) and, on the other, labor market characteristics that determine participation (entry and stability) and/or access to coverage (requirements)

There are many variables affected by pension systems design that have an impact of the prevailing levels of redistribution: Retirement age (IAA, 2016), Contribution Rates, Required years of contribution, Determination of the benefit, Benefit adjustment, Replacement rates, Duration of benefit (life expectancy at retirement). The present chapter will attempt to analyze most of the

variables involved, and propose a simplified model based on available data in Argentina and the experience during the last decade.

SS Pensions in Argentina are characterized as relative low contribution in active ages (Bertranou et al., 2011, 2012 and 2015; CEPAL, 2018; Rofman and Oliveri, 2011) and thus, despite high requirements, the elderly (ages 65 and over) average few years of contribution and the analysis will include differentials by sex and education.

Besides, elderly SS coverage may be estimated from different data sources, for all type of benefits (old-age, survivorship, "moratoria", provinces, non-contributive), varying from 91 to 98%, circa 2015 (Grushka et al., 2016). Differential Regimes for 'unhealthy' activities allow specific groups to retire with less effective years of service and age than required. Additionally, there are a few Special Regimes, with different legal framework, requirements and benefits that deserve a separate analysis. While demography of contributors and benefits in the National Pension System (*SIPA*) and Special Regimes affects financial (dis)equilibrium, the way that income increases by age, how pension benefits are established (and distributed by quintile), and differential adjustments should also be considered (Grushka, 2016).

Regarding differential mortality by pension income, Bramajo and Grushka (*forthcoming*) analyzed the odds of dying and their differentials according to age, sex and pension income in Argentina in 2015/16. They also estimated life expectancy at age 65 (e65), by sex and pension income. "Doubling the income" results in average gains close to one year for males and females. This also means that those who earn larger pension amounts tend to enjoy their benefit longer, implying a regressive redistribution.

A challenge ahead for Argentina might attempt to integrate empirical observed differences in an "actuarial" model that determines contributions and wages by age, based on educational levels, and separate estimates for self-employed, "waged-general", and "special regimes" to be applied proportionally.

For individuals, a pension system is usually considered "fair" or "actuarially fair" as long as benefits are established proportionally to the contributions as in the classical formula

$$B(R,t) = \frac{K(R,t)}{a(R;t)} = \frac{\sum_{x=15}^{R-1} c(t)\, w(x,t)(1+i)^{(R-x)}}{\sum_{x=R}^{w} p(R;x-R)\left({}^{1}/_{(1+i)}\right)^{(x-R)}} \qquad (1)$$

Where: B=benefit, R=age of retirement; t=time/period; K=accumulated capital; c=contribution rate; w=wage or salary; i=interest rate; p(R;x-R)= survivorship probability from age R to age x>R.

Thus, the pension system as a whole is considered "neutral" and sometimes is wrongly considered "sustainable", just because the ways that benefits are determined. However, there are many caveats and the role of the different variables involved is not that clear.

Obviously, the accumulated capital is a function of: 1) contribution rate (varying across time, although usually supposed to be constant); 2) wage (varying across age and time); 3) interest rate (usually supposed to be constant although it varies across time); 4) survivorship by age (varying across time). Each one of these variables have a different impact on the individual level of benefit, and also affect the averages for each cohort (see simulations in ISSA, 2007).

In PAYG regimes, the way benefits are established imply different "winners" and "losers": benefits might be a function of last (or best) salary, average of (few) last years, or lifetime average. With the exception of the last alternative, those with earnings increasing at higher rates tend to benefit more than those with almost constant (minimum) salaries. Besides, the way that nominal salaries are indexed becomes especially relevant for high inflation countries.

Another relevant point is that wages have to be earned (and contributions paid). Unemployment and informality are two key variables that play significant roles determining individual and average contribution "densities" (proportion of years with effective contributions in terms of the total years in active ages). In PAYG regimes, many times there is a required minimum years of contributions, and thus, the probability of not receiving a benefit is highly associated with being part of the less favored groups (women and less educated and less skilled workers, who become unemployed or are employed in the informal sector), as shown for Argentina by Moncarz (2015).

Barnay (2007) posits that differential mortality responds to social heterogeneities and inequalities based in socioeconomic position. In the context of French PAYG DB SS System and taking into account the concept of actuarial fairness, the author suggests that in order to avoid an anti-redistributive impact, different retirement ages should be considered for different social categories (similar to different annuity prices as discussed above). He concludes that the most favored groups (executives and intermediate professions) benefit the most from because of their higher life expectancy in comparison to less favored groups (manual workers). That means that there is a lack of equality in flows between contributions and pensions due to differential mortality. Thus, a possibility to achieve actuarial equilibrium is to allow unskilled workers to leave the labor force market earlier. In the future, if life expectancy differences among different groups tend to narrow, probably a single retirement age will be adequate enough.

Caselli et al. (2003) express a similar concern regarding the Italian system. The unprecedented growth in third and fourth age populations stimulated to rethink and redesign the traditional pension systems. Considering that Italy had one of the highest life expectancies in the globe and by extent, one of the lowest old-age dependency rates, a change from a PAYG system with a defined benefit to a notional defined contribution scheme was gradually adopted (Barr and Diamond, 2015).

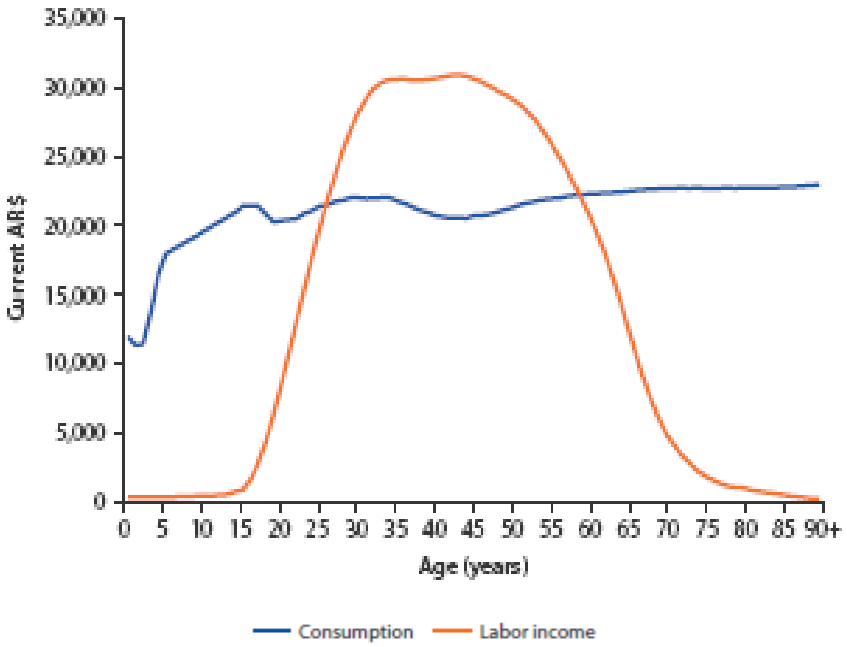
While Barnay (2007) was more concerned with differences among social groups based on occupation, the Italian researchers, after analyzing life expectancy at age 60 by gender and region, establish how gender-based and regional conversion factors differ from the legislated values at the time. They find that those conversion factors were very sensitive to even slight variations in mortality, particularly important due to the rapidly increasing survival rates of old age adults. Ultimately, Caselli et al. (2003)

reach a similar conclusion than Barnay: actuarial fairness (with uniform annuity pricing) is not enough as a mechanism to guarantee neutrality, due to differential mortality, there is a substantial degree of redistribution from high mortality groups to low mortality groups.

IV. SS Pensions in Argentina

As previously established, SS Pension systems allow to reassign funds from active to inactive ages. Comelatto (2014) established how consumption and labor income per capita differed by age in Argentina during 2010. Although there are three ways to reassign surplus to deficit, in this case SS (public transfers) clearly play a more significant role than family support and other income (own savings).

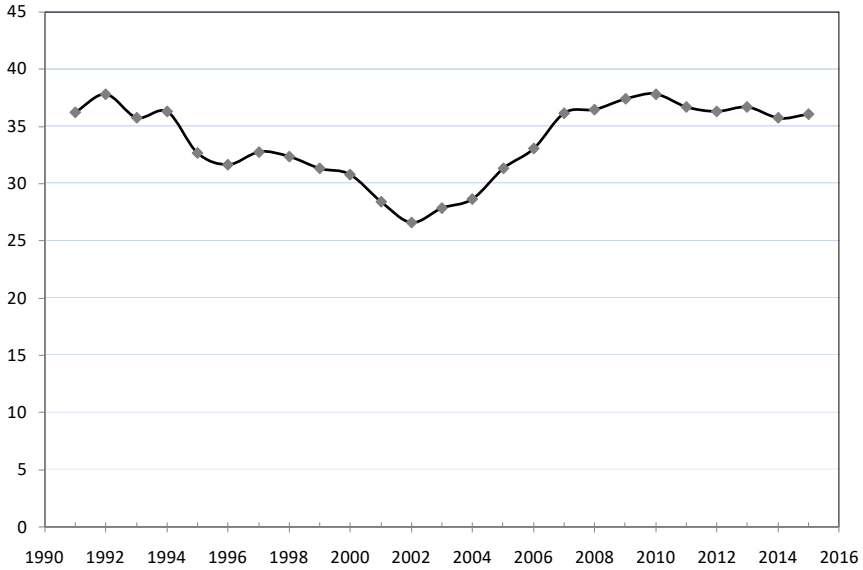
Graph 1. Life-Cycle Deficit: Consumption and Labor Income per Capita, Argentina, 2010



Source: Comelatto (2014).

SS in Argentina have a relative low participation during active ages, a topic that is not developed in this study but is highly relevant for a global perspective, and specially due to its differential impact (Bertranou et al., 2011, 2012 and 2015; CEPAL, 2018; Rofman and Oliveri, 2011). During the 1990s the proportion of active age population contributing to SS fell from 38% to 26% and it took several years to recover up to the initial levels.

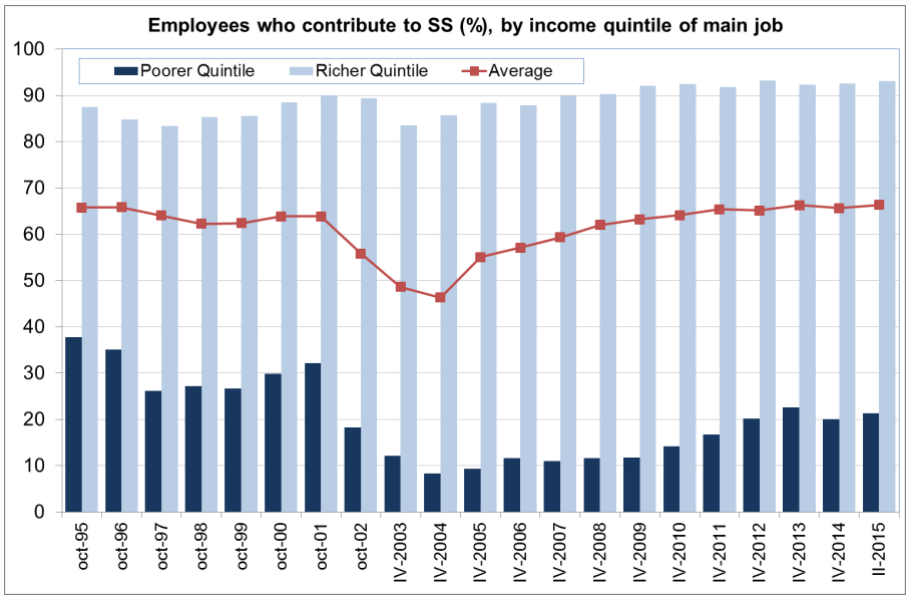
Graph 2. Active Age Population Contributing to SS (%)



Source: own elaboration based on Bertranou et al. (2011).

In the same way, the proportion of waged workers contributing to SS fell from more than 60% to less than 50% between 2001 and 2004, and only reached the previous levels in 2008. A significant point to make is the different impact that these proportions have had on the different quintiles (based on income from the main occupation): while the first quintiles fell from 30% to less than 10% and recover up to 20%, the fifth quintile maintained over 80% during the whole period (Graph 3).

Graph 3. Formal employment based on waged workers contributing to SS

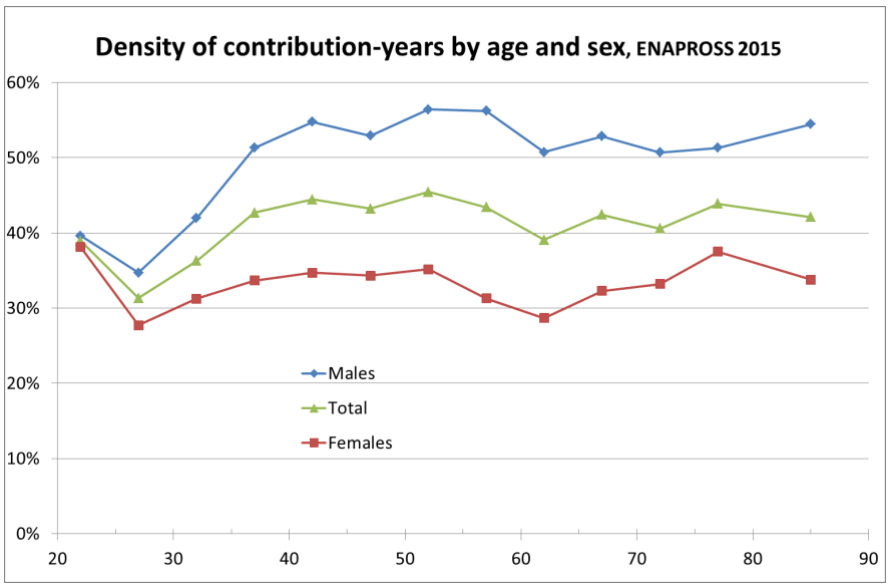


Source: own elaboration based on EPH-INDEC (Encuesta Permanente de Hogares), 1995-2015.

Unfortunately, there are very few surveys or data sources that allow for a longitudinal approach. Retrospective reports on years of work and contribution based on ENAPROSS (2015) tend to compensate the lack of individual histories (as there are in Chile and Uruguay).

For the elderly population (aged 65 and over) the average number of contribution-years is 20 (26 for males and 15 for females). The gender differential is partly due to less years of work (32 for males and 23 for females), but also to the larger labor informality (lack of contributions) among women. Density of contribution (defined as the proportion of active years since age 20) averages around 50% for males and 30% for females (Graph 4).

Graph 4. Retrospective Reports on Years of Contribution

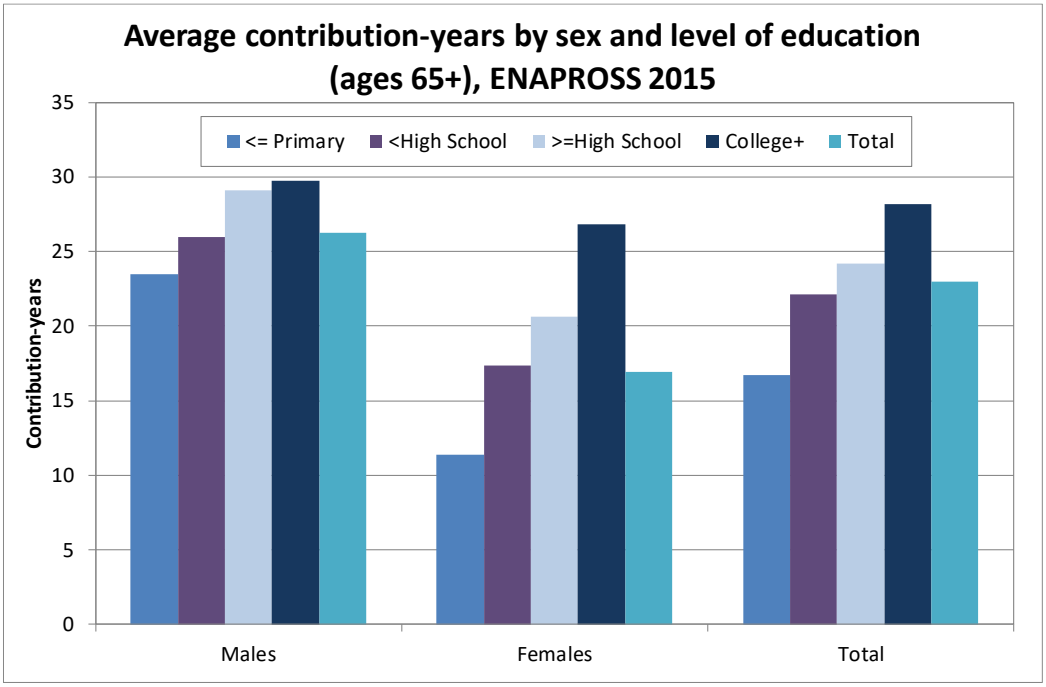


Source: own elaboration based on ENAPROSS (2015).

The relation of low density to redistribution arises when people with low density get no benefit at all (becoming regressive), and where low actuarial benefits cause concerns about adequacy which in turn lead to other, progressive redistributive parts of the system being larger than they would be with higher contribution densities.

The average density is clearly different according sex and levels of education: depending on completion of high (secondary) school, it varies from less than 50% to more than 60% for males and from about 25% to 45% for females. Similarly, the average number of contribution-years varies from less than 20 to more than 26, especially for women (from 14 to 24).

Graph 5. Contributions based on retrospective reports



Source: own elaboration based on ENAPROSS (2015).

SS coverage for the elderly (ages 65 and above) has become almost universal during the last decade, through different type of benefits: old age, survivorship, "moratoria", provincial regimes, non-contributive pensions (see Table 1 and Bertranou et al. (2011) for a detailed explanation).

Table 1. Elderly Social Security Coverage: Different data sources, all type of benefits, ages 65+, *circa* 2015

Censo Nacional (Octubre 2010)	93,0%
EPH (II Trim 2015)	90,8%
EAHU (2014)	90,6%
ENAPROSS (2015)	93,5%
Registros ANSES (2015)	97,5%

Source: Grushka, Gaiada and Calabria (2016).

A significant characteristic of SS in Argentina is the level of fragmentation with many different rules applying to special groups. The General Regime (Law 24241) requires 30 years of service and 65 years of age for males (60 for females), and establishes the defined benefit as a flat sum (around 15% of the average salary) plus 1.5% per every year of contribution applied to the average wage earned during the last 10 years of service.

One of those groups called Differential Regimes, mostly related to hard and insalubrious work, requires fewer effective years of service and age. During 2015, there were 48 thousand new cases (30% of old age pensions), averaging 59 years of age and 27.5 of service. There are also special norms for workers on given public enterprises and additional payments for beneficiaries living in the Austral Zone (Law 19485 and Decree 1472/08).

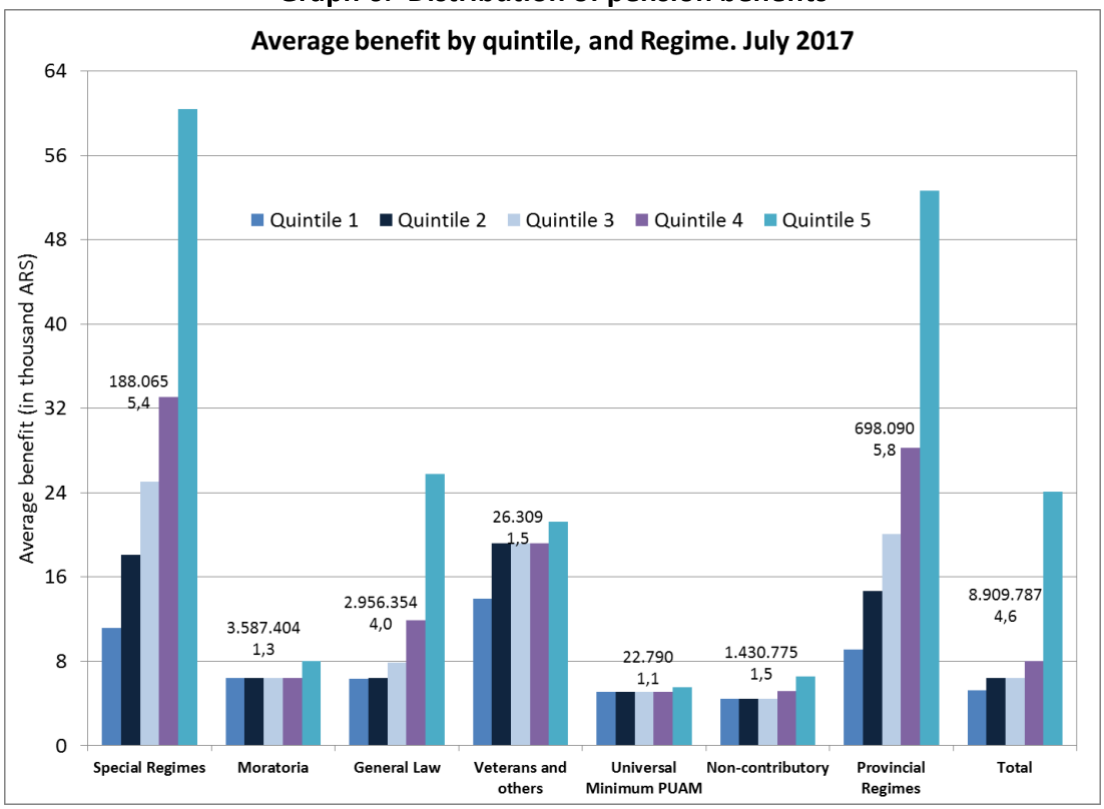
The most favored groups, called Special Regimes, have specific legal frameworks, different requirements and better benefits than the General Regime. There are five Special Regimes that correspond to Teachers (Law 24016, Decree 137/05), University Professors (Law 26508), Scientific Researchers (Law 22929, Decree 160/05), Judiciary Power (Law 24018), and Foreign Service (Law 22731). Many times, they are considered together with Electricians (*Luz y Fuerza*) who only have a better benefit. They amount to half a million contributors or 5% of the total[3].

Employeees of the Special Regimes take advantage not only of a higher income but also of a higher growth rate with age during their career (3.8% per year, compared to 1.8% for other employees, 1.6% for contributing self-employed and 0.1% for domestic service). In addition, their pension is established around 82% of the final salary. Special Regimes have 0.2 million benefits (3% of the total)[4], although they take 9% of the total expenditure.

In Graph 6, we summarize the level of fragmentation already mentioned, showing differences inter- and intra- groups of beneficiaries. Note that Special Regimes have also different rules to adjust their benefits but during the last decade, they tended to converge to SIPA averaging 30% a year, about 2% over annual inflation.

3 See Annex Table 1.
4 See Annex Table 2.

Graph 6. Distribution of pension benefits



Source: own elaboration, based on ANSES data prepared for the Social Security Secretariat.

V. How redistribution works for SS Pensions in Argentina

Equilibrium in a pure PAYG Model, based on Iyer (1999), is determined by the equation:

$$A^t \times W^t \times c^t = B^t \times P^t,$$

that is, in a given period of time (t), the product of active contributors (A), salaries (W), and the contribution rate (c) equals the product of beneficiaries (B), and pension amounts (P).

Then, the "equilibrium" contribution rate depends on a demographic ratio ($\frac{B^t}{A^t}$)and the effective replacement rate ($\frac{P^t}{W^t}$).

$$c^t = \frac{B^t}{A^t} \times \frac{P^t}{W^t}$$

Also, taking into account the demographic impact through differentials by age (x) and sex (s),

$$c^t = \frac{\sum_{x;s} B^t_{x;s} \times P^t_{x;s}}{\sum_{x;s} A^t_{x;s} \times W^t_{x;s}}$$

In Table 2, we show the differential values for these ratios for SIPA employees under the General Law and Special Regimes, and compare the "fair" to the effective contribution rates.

Table 2. SIPA and Special Regimes Ratios

Pension Regime	Demography (A/B)	Replacement rate (W/S)	"Fair" contrib-ution rate	Effective cont-ribution rate
Teachers	2,5	125%	50%	22%
University Professors	13,8	157%	11%	22%
Scientific Researchers	4,5	90%	20%	25%
Electricity	0,3	60%	178%	22%
Judiciary Power	2,5	91%	37%	27%
Foreign Service	1,8	86%	49%	27%
Total Special Regimes	**2,4**	**111%**	**46%**	**23%**
General Law - employees	2,3	50%	22%	22%
SIPA without self-employed	**2,3**	**54%**	**24%**	**22%**

Note: University professors have a significant participation of "mixed" contributors and beneficiaries.
Source: own elaboration, based on ANSES data prepared for the Social Security Secretariat.

In Table 3, we show that under PAYG rules "general-employees" are close to equilibrium, but Special Regimes are responsible for the deficit of SIPA wage earners (self-employed and domestic service are not taken into account because they receive a significant subsidy).

Table 3. SIPA and Special Regimes financial (des)equilibrium, in millions of pesos (ARS), July 2017

Pension Regime	Revenue	Expenditure	Result	"Equilibrium" Res/Rev
Teachers	1 466	3 272	-1 805	-123%
University Professors	349	182	167	48%
Scientific Researchers	398	325	72	18%
Electricity	138	1 108	- 970	-702%
Judiciary Power	418	576	- 158	-38%
Foreign Service	53	97	- 44	-82%
Total Special Regimes	**2 822**	**5 561**	**-2 738**	**-97%**
General Law - employees	34 048	34 634	- 587	-2%
SIPA without self-employed	**36 870**	**40 195**	**-3 325**	**-9%**

Source: own elaboration, based on ANSES data prepared for the Social Security Secretariat.

Differential mortality by pension income in Argentina, 2015/16

While differential mortality by sex is well known and documented for most of the countries in the world, and especially for Argentina (Grushka, 2014; United Nations, 2017), there are few studies showing differentials by income. Bramajo and Grushka (*forthcoming*) analyzed the odds of dying and their differentials according to age, sex and pension income in 2015/16. They also estimated life expectancy at age 65 (e65), by sex and pension income, taking advantage of near 4.7 million SS records from pensioners (SIPA, Non Contributive Pensions and Non Transferred Provinces) for July 2015. They use a maximum likelihood logit models in order to establish the incidence of sex, age, and pension income in the probabilities of death in the pensioner population.

Table 4. Logit model of mortality by age, sex and pension income

Variable	Coefficients	
	B	Exp (B)
Age	.091	1.095
Sex	-2.185	.122
Age*Sex	.022	1.022
Ln Income	-.157	.855
Intercept	-8.336	

Source: Bramajo and Grushka (*forthcoming*).

Estimates of e(65) for selected values of pension income, derived from the established coefficients, are shown in Table 5. e(65) for those pensioners with an income of 8 minimum pension benefits (MPB) is 2.5 years higher than those who only earn the MPB, so each income duplication implies a gain of 0,8 years. When income doubles, the differences by sex will be the same, due to the model specification.

Table 5. ***e(65)*** **by sex and selected amounts of pension income (in terms of minimum pension benefits, MPB). Argentina, 2015-16**

e(65) **by sex**	**Pension income**				**Diff. 8 - 1 MPB**
	MPB	**2 MPB**	**4 MPB**	**8 MPB**	
Males	15.1	15.9	16.7	17.6	**2.5**
Females	18.9	19.7	20.5	21.3	**2.4**
Difference	3.8	3.8	3.8	3.7	---

Source: Bramajo and Grushka (*forthcoming*).

As expected, inequalities based in different socioeconomic positions persist even in old age: people with higher pension incomes tend to have a higher life expectancy at 65 compared with those who earn a minimum pension benefit.

SS pensions in Argentina, despite important improvements in regards to pension coverage, still have a regressive feature since those with higher benefits have lower risks of dying, hereby enjoying them for longer times.

Preliminary estimates of redistribution

Following Barnay (2007), it is possible to estimate the impact of the different variables analyzed through representative agents, modifying values one at a time.

In a simplified model where workers contributes 20% of their salary, with a 70% density between ages 20 to 65, salaries growing annually 1%, and a real interest rate of 1%, the accumulated capital is equivalent to pay during 15 years about 63% of the last salary (or 60% of the average during the last 10 years). Just by chance, this is quite close to the simulated PAYG defined benefit (around 58%).

However, while high earners employees (under “general” rules) meet declining replacement rates (from 90% at the minimum to 50% at the top) due to the flat sum, participants in “special regimes” take many advantages:

- The lack of solidarity expressed in their proportionally high 82% represents larger earnings a difference from 90% to 415%).
- The higher growth rate of their salaries (3% a year instead of 1%) while basing the benefit on the last salary make them earn up to 14% more.

- The fact that those with higher educational levels and higher earnings live longer represents about a 10% differential.
- Adding the three previous elements, benefits more than double “actuarially fair” values.

The political path dependency of Special Regimes is understandable, but these regimes imply a highly inefficient pension design, as the empirical analysis shows. The general theoretical balance in terms of redistribution still needs to find the proper weights to apply proportionally for self-employed, employees, and “special regimes”. The continuing changes in rules and practices and the need to estimate the effective contribution rate (which is no publicly available) pose a very difficult challenge ahead.

VI. An alternative methodological framework

Given the lack of detailed data, an alternative approach to assess redistributive effects in different countries and periods, consists on trying to determine their levels only from cross-sectional data. Thus, we will compare only two or three groups of the population based on their level of education. The idea is that level of education works as a proxy of lifetime income and its use allows comparisons of different cohorts, assuming there are no significant changes in schooling during the last three decades.

Taking into account that many of the rules present in any SS pension system may have different impact on the general level of redistributions, we will only compare a “gross” substitution rate (GSR) estimated as the ratio between average pension income (PI, ages 65+) and average work income from main job (WI, ages 20-64).

$$GSR^t = PI^t / WI^t$$

Using this approach, we estimate the general balance, in terms of redistribution, as the difference in GSR by (extreme) education levels. This measure is denominated **redistribution index** (**RI**).

When the SS pension system is neutral we might expect no difference between GSR at different levels of education (RI=0). When the SS system is extended (universal) and progressive, we might expect declining GSR at increasing levels of education (RI>0). When the SS system is segmented (not universal) and/or regressive, we might expect increasing GSR as education increases (RI<0).[5]

Let us illustrate the case of SS Pensions in Argentina (Table 6). By 2003, RI is negative (-.08) mainly due to the lack of coverage at low levels of education. By 2006, after some exceptional increases for minimum pensions were applied, the system is less regressive (RI=-.01). By 2009, the program to expand coverage begins to play a significant role in equalizing GSR at higher levels (RI=-.01). In recent years (since 2009 up to 2017), pensions were indexed not only to wages but also to general revenue

5 It is important to note that the average pension income is estimated including those without pensions (PI=0).

(benefited from economic growth) growing more than general wages (although not that much for the well-educated)[6]. Redistribution improved as RI reaches values larger than .10.

Table 6. Approaching estimates of redistribution of pension benefits.

Gross substitution rates by level of education and Quarter. Argentine urban aglomerates EPH, selected Quarters 2003-2018

Level of education	IV 2003	IV 2006	IV 2009	IV 2012	II 2015	IV 2018
< High School	53.8%	53.5%	56.6%	63.9%	72.6%	74.7%
High School	62.5%	58.9%	57.4%	64.4%	68.6%	74.9%
College +	61.4%	54.7%	57.7%	60.6%	60.5%	64.7%
Total	47.0%	47.6%	48.7%	56.5%	62.1%	63.5%
RI = GSR(< HS) - GSR (College)	**-0.08**	**-0.01**	**-0.01**	**0.03**	**0.12**	**0.10**

Source: own elaboration based on EPH-INDEC (Encuesta Permanente de Hogares), 2003-2018.

Note that GSR for the total population increases significantly during the period (due to increasing coverage and specific policies), but with lower levels than the three groups considered, only possible for the different (and changing) distribution by level of education at active and advanced ages. College+ represents around 22% among workers and only 11% among the elderly.

The redistribution index (RI) is useful to provide an idea on how the SS pension system works, but also gives a hint for the debate on tax-transfers (when RI>0) or deferred wages (when RI<=0)[7]. Note however, that additional knowledge on three related variables is always necessary: the rules for determining benefits, the level of SS coverage, and the level of funding from general revenue[8].

As stated in the introduction, the way that benefits are determined (usually with decreasing replacement rates by income level) plays a significant role to determine the within-system redistribution of contributory pensions systems. However, to evaluate the overall effective redistribution it is crucial to incorporate the effects of SS coverage or "selectivity", and the funding or financing of the benefits under payment.

The within-system redistribution is highly affected by the changing rules along time, the specific ways that they apply in each country, the different approaches available for data on SS revenue and expenditure, and the lack of up-to-date estimates for SS coverage. The proposed ***redistribution index*** can be estimated from cross-sectional income surveys, and works as an excellent complement or as a reasonable proxy of SS redistribution in a given period.

A final remark, without any intention to be original, more research is needed, the challenge is ahead!

6 Besides, many widowhood pensioners had the chance to increase their income by obtaining their own old-age pension.
7 Just as an example, RI for Paraguay (Encuesta Permanente de Hogares Continua 2019) was -0.1, due to the low SS coverage for the elderly.
8 The extent of redistribution that derives from general government revenue depends not only on who gets the pension benefits, but also on who pays the taxes: redistributive pensions financed from a progressive tax on high earners will be more redistributive than one financed from a regressive sales tax.

Annex Table 1. Distribution of Contributors to SIPA and Special Regimes

Type of contributors	Cases	
TOTAL Employees	**7,174,186**	**76.7%**
Employees - General Regime	**6,715,993**	**71.8%**
Special Regimes TOTAL	**458,193**	**4.9%**
Teachers	332,833	3.6%
University Professors	69,908	0.7%
Scientific Researchers	29,364	0.3%
Electricity	13,300	0.1%
Judiciary Power	11,688	0.1%
Foreign Service	1,100	0.0%
Self-employed	**2,177,096**	**23.3%**
Registered professionals	357,460	3.8%
Simplified program "Monotributo"	1,392,670	14.9%
Domestic Service	426,966	4.6%
Total	**9,351,282**	**100.0%**

Source: own elaboration, based on ANSES data prepared for the Social Security Secretariat.

Annex Table 2. Distribution of SIPA and Special Regimes Benefits

SS Regime	Cases	
Teachers	131,996	1.9%
University Professors	5,060	0.1%
Scientific Researchers	**6,579**	0.1%
Electricity	39,154	0.6%
Judiciary Power	4,709	0.1%
Foreign Service	624	0.0%
Total Special Regimes	**188,122**	**2.8%**
Moratorium	3,589,003	52.9%
General Law	2,974,778	43.9%
Malvinas Veterans	22,112	0.3%
Political Prisoners	4,198	0.1%
Total SIPA	**6,778,213**	**100.0%**

Source: own elaboration, based on ANSES data prepared for the Social Security Secretariat.

Bibliography

Barnay, Thomas (2007) **Redistributive Impact of Differential Mortality in the French Pay-As-You-Go System**. The Geneva Papers (32):570-582. The International Association for the Study of Insurance Economics 1018-5895/07 www.palgrave-journals.com/gpp

Barr, Nicholas (2012) **The Economics of the Welfare State**, 5th edition, Oxford University Press.

Barr, Nicholas and Peter Diamond (2009) Reforming pensions: Principles, analytical errors and policy directions, **International Social Security Review** 62(2). http://economics.mit.edu/files/4025

Barr, Nicholas and Peter Diamond (2015) "Italy's pension reforms: facing the facts". Italy 24 op-ed. P.I. 00777910159

Bertranou, F., O. Cetrángolo, C. Grushka, and L. Casanova (2011) **Encrucijadas en la seguridad social argentina: reformas, cobertura y desafíos para el sistema de pensiones**. CEPAL-OIT, Buenos Aires. http://www.ilo.org/buenosaires/publicaciones/WCMS_BAI_PUB_94/lang--es/index.htm

Bertranou, F., O. Cetrángolo, C. Grushka, and L. Casanova (2012) "Más allá de la privatización y reestatización del sistema previsional de Argentina: cobertura, fragmentación y sostenibilidad". **Desarrollo Económico, Revista de Ciencias Sociales** 52(205):3-30. Buenos Aires, abril-junio.

Bertranou, F., O. Cetrángolo, L. Casanova, A. Beccaria and J. Folgar (2015) **Desempeño y Financiamiento de la Protección Social en Argentina**, OIT, Buenos Aires. http://www.ilo.org/wcmsp5/groups/public/---americas/---ro-lima/---ilo-buenos_aires/documents/publication/wcms_427607.pdf

Bramajo, Octavio and Carlos Grushka (*forthcoming*) ""Mortalidad diferencial de adultos mayores en Argentina, 2015-16. El rol del ingreso previsional". **Revista Latinoamericana de Población**. Asociación Latinoamericana de Población, ALAP, Buenos Aires.

Caselli, G.; F. Peracchi; E. Barbi; and R.M. Lipsi (2003) **Differential Mortality and the Design of the Italian System of Public Pensions** LABOUR 17 {Special Issue) 45-78. CEIS, Fondazione Giacomo Brodolini and Blackwell Publishing Ltd. 9600 Garsinglon Road. Oxford, 0X4 2DQ, UK, and 350 Main Street, Maiden, MA 02148, USA.

CEPAL (2018) **Panorama Social de América Latina, 2017**. Comisión Económica para América Latina y el Caribe (LC/PUB.2018/1-P), Santiago.
https://repositorio.cepal.org/bitstream/handle/11362/42716/4/S1800002_es.pdf

Comelatto, Pablo (2014) "Cuentas nacionales de transferencias en Argentina" Chapter 3 in Gragnolati, M. et al., ed. (2014) **Los años no vienen solos. Oportunidades y desafíos económicos de la transición demográfica en Argentina**, World Bank, Buenos Aires. http://documents.worldbank.org/curated/en/419121468002092154/pdf/880550WP0P13310o0vienen0solos0FINAL.pdf

Grushka, Carlos (2014) "Casi un siglo de mortalidad en Argentina…", **Revista Latinoamericana de Población** 8(15):93-118. Asociación Latinoamericana de Población, ALAP, Buenos Aires.

Grushka, Carlos (2016) **Perspectivas del Sistema Integrado Previsional Argentino y de ANSES, años 2015-2050**.
http://observatorio.anses.gob.ar/archivos/documentos/Perspectivas%20del%20Sistema%20Integrado%20Previsional%20Argentino%20y%20de%20ANSES%20anios%202015-2050-1.pdf

Grushka, C., J. Gaiada, and A. Calabria (2016) **Sistema(s) previsional(es) en la Argentina y cobertura: análisis de las diversas fuentes de datos y de los diferenciales por edad, sexo y jurisdicción**. ANSES, Buenos Aires.
http://observatorio.anses.gob.ar/archivos/documentos/DT_1601_Cobertura%20Previsional.pdf

IAA (2016) **Determination of Retirement and Eligibility Ages: Actuarial, Social and Economic Impacts**. Population Issues Working Group (PIWG) of the Scientific Committee of the International Actuarial Association
http://www.actuaries.org/LIBRARY/Papers/PIWG_Retirement_and_Eligibility_Ages_Paper_final_11March2016.pdf

Moncarz, Pedro E. (2015) Implicit redistribution within Argentina's social security system: a micro-simulation exercise. **Latin American Economic Review** 24:2. DOI 10.1007/s40503-015-0016-8

Rofman, Rafael and María Laura Oliveri (2011) **La cobertura de los sistemas previsionales en América Latina: conceptos e indicadores**. Serie de Documentos de Trabajo sobre Políticas Sociales Nº 7, World Bank, Buenos Aires.

United Nations (2017). **World Mortality Report 2015** Department of Economic and Social Affairs, Population Division, New York (ST/ESA/SER.A/381).