fedea

# The Incentive Effects of Minimum Pensions: extended version

by
Sergi Jiménez-Martín*

**Documento de Trabajo 2014-04**

May 2014

* Universitat Pompeu Fabra, Barcelona GSE and FEDEA, sergi.jimenez@upf.edu


ISSN:1696-750

# NON-TECHNICAL SUMMARY

The minimum pension, a vital part of the welfare program in many countries, is a key influence on the retirement decisions of low-income workers and workers with intermittent employment histories. While the main purpose of minimum pension benefits programs in developed countries is to guarantee a minimum standard of living after retirement, in many developing countries its main purpose is to alleviate poverty (see Dethier et al, 2010).

However, a minimum pension can have undesirable indirect effects, mainly by reducing or removing incentives to keep working and to save, thereby reducing wealth accumulation. In general, contributory minimum pensions whose benefits are available only after the normal retirement age have little incentive effect on low-income workers. But contributory minimum pension benefits that are available at early retirement age can have strong incentive effects on the transitions to retirement of both employed and unemployed workers. The strength of the effect depends on both the eligibility conditions and the generosity of the guaranteed minimum pension relative to the average wage. Recent research for Ukraine found large reductions in the labor supply following a tripling of the minimum pension benefit.

The simplest type of contributory minimum pension is the flat minimum pension, which provides a basic benefit amount irrespectively of the number of years of contribution, provided the minimum retirement age criterion is met. In some countries, the minimum benefit is related to the flat-rate pension. Other cases are more complex. For example, in Belgium people are eligible for the minimum pension after 45 years of contributions regardless of their age. In France, people are eligible for the full benefit after 41 years of contributions or when they reach the retirement age of 65. In Luxembourg, people need to contribute for 40 years to receive the full minimum pension. Both France and Luxembourg reduce the benefit amount proportionally for fewer years of contributions. Chile introduced a funded minimum pension system, the Garantía Estatal, in 2008 to complement the private pension system. Benefits in the minimum pension program are determined by gender, age, and years of contributions. In Spain, people are eligible for the minimum pension when they reach the early retirement age of 61 and have contributed for at least 15 years; the benefit level increases at the normal retirement age of 65.

The average minimum pension standard in OECD countries is 25% of the average wage, but it varies considerably across countries. The minimum pension benefit is as low as 3% of average earnings in Korea and as high as almost 39% in New Zealand. Coverage also varies considerably. While average coverage of the retired population is 30%, coverage ranges from less than 2% in the Czech Republic, Germany, and Slovakia to more than 75% in Australia, Greece, and Portugal.

**The effect of minimum pension**

Introducing a minimum pension in a consumption-savings life cycle model changes outcomes in fundamental ways. First, a minimum pension redistributes

income from high- to low-income workers. In this way, the pension system generates a more egalitarian distribution of income across society. Although somewhat less visibly, the program also reduces the welfare of individuals whose taxes finance this extra generosity (typically through mandated social security system contributions that are larger than needed for their own pensions).

Redistribution is the most visible consequence of a minimum pension program, but there are other, more subtle ones. A minimum pension program changes the economic behavior of those who anticipate participating in it. Most of the changes derive from the increase in total life-cycle wealth. That increase boosts consumption, while a reduction in the marginal value of lifetime wealth and the severed link between current work and future pensions encourage fewer working hours. As a result, savings can fall substantially before retirement, appreciably reducing the accumulation of private assets. Depending on the program's coverage, this behavior can affect asset prices and financial markets.

Minimum pensions have a particularly strong impact on the retirement decision, as mentioned, because of the lower marginal value of lifetime wealth and the severed link between current contributions and future pensions. The key to understanding this mechanism is that the minimum pension eliminates the incentive to work in order to ensure a future pension, making it optimal for most low-income workers to retire at the earliest age possible. Minimum pensions also have an income effect, as they effectively increase an individual's life-cycle wealth and so reduce the marginal value of wealth.

For example, In the case of Spain, Jiménez-Martín and Sánchez-Martín (2007) estimated using Spanish year for the 1995 that the effect of the introduction of minimum pensions is a fundamental change in the shape of the retirement probability distribution. As the Figure 1 illustrates, after the introduction of a minimum pension  a remarkable spike emerges at age 60 as the probability of retiring exactly at the early retirement age almost triples, from 6.6% to 18.0%, and retirement at the normal retirement age drops by 30%. Thus, the minimum pension moves the retirement age of large groups of individuals from 65 to 60, and the retirement probability distribution changes from a single peak at age 65 to dual peaks at ages 60 and 65. Overall, introducing a minimum pension implies a 10% increase in early retirement and preretirement and a four-month lowering of the average retirement age.

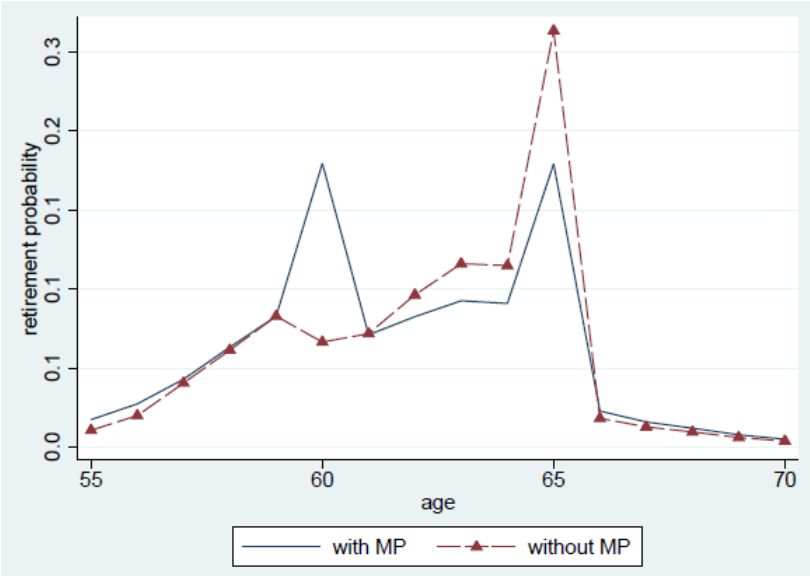
**Conclusions**

The main purpose of minimum pension and social assistance benefits of all kinds is to alleviate poverty by supporting a minimum standard of living after retirement.. However, the design of many minimum pension programs tends to create employment disincentives for low-income workers who become eligible for the program.

The evidence indicates that introducing a minimum pension or increasing its generosity (as observed in recent reforms of the pension system in many European countries) reduces the employment incentives of workers as they approach eligibility for the benefit. Consequently, to increase the labor supply of older, low-income workers, countries experiencing increasing labor shortages should design minimum pension benefit programs that minimize the potential employment disincentives for low-income workers (See Sánchez-Martín et al, 2014). One way is

to delay eligibility to the normal retirement age. Another approach is to make the accumulation of minimum pension rights after the early retirement age compatible with continuing employment, which could incentivize some (the more productive and/or healthy) low-income workers to work longer. Specifically for developing countries a clear distinction between non-contributory (assistance) and contributory minimum pensions is needed in order to incentivize contributions (work in the formal sector).

**Figure 1. Simulated aggregate retirement probabilities for Spain show a strong shift to early retirement with the introduction of a minimum pension (MP).**




Source: Jiménez-Martín and Sánchez-Martín (2007), figure 7.

**References**

Dethier JJ, P Pestieau, R Ali "The impact of a minimum pension on old age poverty and its budgetary cost. Evidence from Latin America", Core DP, 2010.

Jimenez-Martin, S., and A. R. Sanchez Martin. "An evaluation of the life-cycle effects of minimum pensions on retirement behavior." *Journal of Applied Econometrics* 22 (2007): 923–950.

Alfonso R. Sánchez & J. Ignacio García Pérez & Sergi Jiménez-Martín, 2014. "Delaying the normal and early retirement ages in Spain: behavioural and welfare consequences for employed and unemployed workers," Working Papers 2014-06, FEDEA

# The Incentive Effects of Minimum Pensions: extended version*

Sergi Jiménez-Martín†

May 10, 2014

**Abstract**

The minimum pension program is one of the key welfare programs in many developing and developed countries and a key influence in retirement of low income workers or workers with intermittent working careers. The main purpose of minimum benefits programs is to guarantee a minimum standard of living after retirement. In general minimum contributory pensions that are only made available after the normal retirement age have little (but sizeable) incentives effect in at least low incomer workers. Alternatively minimum contributory benefits made available at the early retirement age can generate substantial incentive effects on transitions to retirement of employed and unemployed workers. The importance of this effect critically depends upon both the eligibility conditions and the generosity of the minimum pension, that is, in the relationship between the guaranteed minimum pension and the average or the minimum wage.

Keywords: Retirement, life cycle model, minimum pension.
JEL Class: D91, J26, H55

*I thank financial assistance from project ECO2011-30323-C03-02. Most of this document is product of joint work with Alfonso Sánchez-Martín

†Universitat Pompeu Fabra, Barcelona GSE and FEDEA, sergi.jimenez@upf.edu

# 1 Introduction

Developed countries share a considerable concern about the financial sustainability of their social insurance systems. The origin of these worries can be found on two well documented processes: an unfavorable demographic performance (see Diamond 2007, and Lutz et al. 2008), and a tendency towards reducing the age of retirement on those economies (see Gruber and Wise, 1999 and 2004 and Fenge and Pestieau 2005). The former process has not improved in the last few years, especially in Europe, despite growing immigration, but the latter shows some signs of being affected by the recent trend, especially in the United States, towards higher labor force participation by older individuals. In this context, the analysis of the possible distortive effects of minimum retirement benefits programs may be important, especially in developing or middle-income countries. In those countries apart from the standard interest in the effects on labor supply, saving and wealth, there is strong interest in the effect on the density of contributions.[1]

The minimum pension program is one of the key welfare programs in many developing and developed countries and a key influence in retirement of low income workers or workers with intermittent working careers. The main purpose of minimum benefits programs is to guarantee a minimum standard of living after retirement. In many developing countries the purpose of minimum retirement benefits is to alleviate poverty[2], however undesirable indirect effects may appear as more and more low income people participates in Social Security. Alternatively, in developed countries the main purpose of the minimum pension program is either to guarantee or to provide complementary income to meet a (minimum) standard of living after retirement.[3]

Having said that, it is evident that the minimum pension has some side effects, mainly because it either reduces or removes the incentives to keep working, especially at the age at which the minimum pension is first made available. In general minimum contributory pensions that are only made available after the normal retirement age have little (but sizeable) incentives effect in at least low incomer workers (see for example Neumark and Powers, 2005). Alternatively minimum contributory benefits made available at the early retirement age can generate substantial incentive effects (see for example Jiménez-Martín and Sánchez-Martín, 2007) on transitions to retirement of employed and unemployed workers (see for example, Garcia-Pérez et al, 2013). The importance of this effect critically depends upon both the eligibility conditions and the generosity of the minimum pension, that is, in the relationship between the guaranteed minimum pension and the average or the minimum wage. Recent research (see Danzer, 2010) for Ucrania reveals large reductions in labor supply induced by a threefold unexpected increase of the minimum pension.[4]

[1] Here we focus on the labor supply effects of minimum benefits. See Pigott et al (2009) for an analysis of the effect on contribution densities.

[2] see Dethier et al (2010) for a simulation analysis of the introduction of a minimum pension in eighteen LatinAmerican countries.

[3] Note, however, that in many developed countries recent reforms have reduced or eliminated minimum pensions (Pearson and Whitehouse, 2009)

[4] see Pigott et al (2009) for other examples for developing countries.

The analysis of the effect of minimum pensions of retirement incentives has followed two main lines: the study of implicit incentives (Lazear, 1985; Kotlikoff and Wise (1987); Gruber and Wise, 1999; Blndal and Scarpetta, 1998 ; Jiménez-Martín and Sánchez-Martín, 2004); and dynamic models of conditional consumer decisions in a given economic environment (Stock and Wise,1991 and Rust and Phelan, 1997). The first line leads in many cases to the estimation of reduced-form models of retirement (Samwick,1998), where the minimum benefit is embedded in the calculus of implicit incentives to retirement (Gruber and Wise, 2004). The second line implies the simulation and/or the estimation of structural models of retirement.

Good recent examples of the first line are Neumark and Powers (1998, 2000, 2005), García Pérez et al (2013) and Danzer (2010). Neumark and Powers analyze the effect of the Supplemental Security Income on labor supply of older American workers. In the second paper the authors analyze the role of minimum pensions in explaining labor force transitions of employed and unemployed workers. Alternatively , Danzer (2010) analyses the effect of an threefold (unexpected) increase in the minimum pension. The paper estimates a pure income effect that caused additional retirement of 30 to 47 per cent. Good examples of structural modeling are Jiménez-Martín and Sánchez-Martín (2007),[5] who analyze the role of minimum pensions, and García-Pérez and Sánchez-Martín (2010) or Hairault et al. (2010), both focusing in the analysis of search frictions and transitions from unemployment. More recently, in the spirit of dynamic models, Joubert (2013) and Joubert and Todd (2013) develop and estimate a dynamic model of individual's and couples' labor supply and saving decisions. Their model allows them to analyze a major reform of the Chilean pension system with a focus on alleviating old age poverty and promoting gender equity. They found important increases in the take-up rate of the minimum benefit. Finally, Otero (2012) analyzes the implications of the 2008 Chilean reform on formality (participation in Social Security).

The rest of the contribution proceeds as follows. In section 2 we describe minimum pensions and analyze their importance in developed economies. In section 3 we present in an stylized life cycle model the key effects of minimum pensions. In section 4 we present evidence of the effect of minimum benefits for three very different pension setups. Finally we present some brief concluding remarks in section 5.

## 2 A taxonomy of minimum benefits

Following Pigott et al (2009) and OECD (2011) we consider three ways in which countries provide complementary income to meet a (minimum) standard of living after retirement: social assistance minimum, non-contributory minimum , and contributory minimum pension.

Social assistance minimum pensions ($sa$) are functions just functions of generosity, typically related to the average wage $\bar{w}$. However they are subject to an eligibility condition which depends

[5] In this paper the authors quantitatively assess the impact of the minimum pension scheme, on the retirement and savings patterns of Spanish workers.

of other sources of income ($i\bar{n}c$).

$$sa = f(\bar{w}) \quad if \quad g(\bar{w}) < \tilde{m}$$

where $\tilde{m}$ denotes the maximum level of other sources of income that qualifies for social assistance benefits.

Non-contributive minimum benefits ($ncmp$) can be characterized as functions of two elements: age ($a$) and generosity with respect to the average wage, usually related to a predefined poverty level, and relationship with respect to other sources of income ($\bar{m}$):

$$ncmp = f(a, \bar{w}) \quad if \quad g(\bar{w}) < \tilde{m}'$$

The first element (and also the income threshold) determines eligibility and the second sets the generosity with respect to average standard of living. Typical examples of this case are countries without a formal[6] minimum pension such as Germany and the US (SSI).

A contributive minimum pension or benefit ($mp$) can be a combination of three elements: age ($a$), generosity with respect to the average wage ($\bar{w}$),and years of contribution ($y$):

$$mp = f(a, \bar{w}, y)$$

Eligibility is a function of the first and/or the third elements, and generosity a function of the second, typically subject to government's discretionality. Furthermore, the minimum pension can increase with age and also with the number of years contributed. In some cases, the minimum benefit is means tested, so as in order to get the benefit income from other sources needs no to exceed a given amount, for example ($\bar{m}$).

The simplest example of contributive pension is the flat minimum pension, which gives a basic amount irrespectively of the number of years of contribution, provided the minimum age is achieved. Typical examples are Nordic and Anglo-Saxon countries were the minimum benefits is related to the flat-rate pension.[7] Other examples are more complex. For example, in Belgium the minimum pension is made available after 45 years of contributions regardless of age. In France, to be eligible for the full benefit, 41 years of contributions, or being aged 65 and over are needed (the minimum pension is pro-rated for shorter periods). In Luxembourg, 40 years of contribution are needed to get the full minimum pension, and it is proportionally reduced with less years of contributions. In Chile, a funded system the "Garantía Estatal" introduced in 2008 complements the private pension to a given minimum that depends on gender, age and years contributed. In Spain, having reached the early retirement age of 61 and having contributed for 15 years is needed. However, the minimum pension increases when the individual reaches the

[6]Note, however, that eligibility and minimum contribution requirements set an implicit minimum contributory pension for these countries

[7]Typically these countries have added contributive and occupational pension pillars to the flat core of their systems

normal retirement age of 65.

### 2.1 Incidence and generosity in developed countries

In this section we briefly review minimum pension provision in developed countries. As described in OECD (2011), many OECD countries only provide non-contributory minimum benefits, which are typically made available from the normal retirement age onwards. This group includes cases where basic pensions are residency-tested, such as the Netherlands and New Zealand. Alternatively, in Canada, Denmark and Iceland, entitlements are a combination of basic and resource-tested benefits. Finally, in countries including Austria, Finland, Germany, Italy and the U.S. (supplemental security income or SSI), this refers only to means-tested schemes, including social assistance. In other countries the system combines both the non-contributory and the contributory schemes. In Ireland and Korea, for example, contributory basic pensions are worth more than means-tested non-contributory schemes. In Chile, Greece, Portugal, Spain, Sweden and Turkey, contributory minimum pensions are set at a significantly higher level than the non-contributory ones. Finally, in Nordic and Anglo-Saxon countries the minimum benefit is related to the flat-rate pension.

The average minimum standard in OECD countries (Argandoña et al, 2013) is 25 percent of the average wage and the average incidence is about 30 per cent. However they both vary a great deal across countries. In this sense, the minimum standard it is often generous relative to a given country average earnings, especially in the contributory cases. For example, the minimum can be as low as 3.0 percent of average earnings in Korea and the maximum as high as 38.7 of average earnings in New Zealand (OECD, 2011). The incidence of the program also varies largely across countries: in Greece, Australia and Portugal more than 75 percent of the pensioners receive a minimum pension; in the U.S., 7 percent, and in Germany, Slovakia and the Czech Republic below 2 percent.

Using data from the OECD (2011) on incidence and generosity (and class of minimum) we run an aggregate regression of incidence on generosity. Surprisingly, we found (possible due to misspecification of the relationship) a negative correlation coefficient, which in principle seems to contradict the micro evidence that pension generosity increases take-up rates. Consequently we should be cautious when interpreting cross-country aggregate evidence.

## 3 The effect of minimum pensions in a life-cycle model

To explore the effects of minimum pensions on individual behavior we consider a life-cycle setting in the Modigliani/Brumberg tradition. [8] We represent the individual lifespan by $t$ and assume it to take random values between an initial planning age $t_0$ and a maximum longevity

[8] References: Modigliani and Blumber (1980), Gruber and Wise (1999), Jiménez-Martín and Sánchez-Martín (2007))

$\overline{T}$. Therefore, the individual is uncertain about the precise moment when her life will come to an end. We represent this uncertainty by the survival function $S(t)$. The life cycle presents two clearly different stages separated by the age of retirement ($\tau$). Before retirement, gross labor income depends on her "working hours" $h(t)$ and on the (annual) wage rate, $w$; After retirement, the individual stops her participation in the labor market and consume all her available time as leisure $l(t) = 1$. Note that, for simplicity, the time endowment is normalized to one ($1 = h(t) + l(t)$). We consider an institutional environment that includes a basic pension system: individuals contribute a fixed proportion $\varsigma$ of their labor earnings while active, being entitled to a gross pension $b$ throughout their retirement stage. The pension system is Define-Benefit and of the "Bismarkian" type, ie, we assume $b$ to be positively related to the pension age $\tau$ and to the labor income obtained in the first stage of the life-cycle (formally, $b(\tau, h)$ with $\frac{\partial b}{\partial \tau} > 0$ and $\frac{\partial b}{\partial h(t)} > 0$ for all $t < \tau$.[9])

On top of the forced savings imposed by the government, individuals can voluntarily save part of their income by accumulating a financial asset. For simplicity we only consider a riskless asset, paying an instantaneous return $r$, and differ the discussion of portfolio choices to the end of section 3.2 below. The size of the stock of accumulated assets at each age is represented by $a(t)$. Consumption decisions at each age, $c(t)$, joint with labor supply decisions, determine the period savings ($s(t) = inc(t) - c(t)$) and the instantaneous change in the stock of assets, $\dot{a}$:

$$\dot{a}(t) = r\, a(t) + inc(t) - c(t) \quad \text{with} \quad inc(t) = \begin{cases} w(t)\,(1-\varsigma)\,h(t) & t < \tau \\ b(h,\tau) & \text{otherwise} \end{cases}$$

$w(t)$ captures the market value of time and the change in productive capacity with age.[10] The credit market makes borrowing/lending possible subject to a life-cycle budget constraint:

$$Y = \int_{t_0}^{\bar{t}} e^{-r(t-t_0)}\, c_t\, dt \tag{1}$$

with Life-cycle Wealth

$$Y = a_0 + \int_{t_0}^{\tau} e^{-r\,(t-t_0)} (1-\varsigma)\, w(t)\, h(t)\, dt + \int_{\tau}^{\bar{t}} e^{-r\,(t-t_0)}\, b(h,\tau)\, dt \tag{2}$$

$a_0$ stand for initial wealth and $\bar{t}$ is strictly smaller than $\overline{T}$ in case of borrowing constraints.

Individual choices (consumption, savings, working hours and the retirement age) are obtained from the maximization of a standard, time-separable, life-cycle utility function $V(c, l) =$

[9] Pension details can vary greatly across countries, but proportional pensions are the most prevalent model around the world. Note that Anglo-saxon countries with systems build on a model of flat universal pensions ("Beverage") have typically added contributive and occupational pension pillars to the flat core of their systems. A comment on how our conclusions vary in economies with Defined Contribution (DC) pensions is included in section 3.2 below.

[10] The varying productive capacity with age is usually represented by a humped-shape endowment of efficient labor units, $\epsilon_t$. In that case, wages at age $t$ are $w(t) = w\,\epsilon_t$)

$\int_0^{\overline{T}} e^{-\delta\,(t-t_0)}\ \upsilon(c(t),\ l(t))\ dt$, where $\delta$ is a discount factor. For simplicity, we abstract from bequest motives and assume that the period-utility function is also additively separable in its two arguments: $\upsilon(c,l) = u(c(t)) + \nu(l(t))$. Both $u$ and $\nu$ are increasing and concave functions of their argument.

### 3.1 Optimal individual behavior

Individual choices are obtained by applying standard optimal control arguments. They are easily characterized by the following system of first order conditions (plus the budget constraint 1):

$$\text{Consumption} \quad d_t\ u'(c_t) = \quad \lambda \tag{3}$$

$$\text{Hours worked} \quad d(t)\,\nu'(l_t) = \quad \lambda\,[w_t\epsilon(t)\,(1-\varsigma) + \frac{d\,b}{d\,l_t}\,\mathcal{A}] \tag{4}$$

$$\text{Retirement} \quad \lambda\,e^{-r\,\tau}\,y'(\tau) = \quad e^{-\delta(\tau)}\,\Delta\,\nu(\tau) \tag{5}$$

We use the shorthand notation $\lambda$ for the lagrange multiplier associated to budget constraint (1) and $d_s$ for the net discount factor ($d_t = e^{r\,t-\delta(t)}$). Eq (3) shows how individuals smooth consumption through life by making the marginal utility of consumption at any instant equal to the marginal utility of wealth. This simply means that workers will consume an age-varying proportion of their Total Wealth, ie $c(t) = m(t)\,Y$. Working hours are controlled by eq (4). It simply states that the individual will provide work up to the point where the benefits (higher labor earnings and bigger future pensions) exactly match the utility costs. $\frac{d\,b}{d\,l}$ reflects the impact on the pension benefit of a marginal change in age-$t$ leisure/working-hours. $\mathcal{A}$ is an integrating constant that reflects how this change will have an impact during what remains of the individual life-cycle. Finally, eq (5) controls retirement behavior. In words, it says that the individual stops working when the marginal gains from staying in the labor force do not compensate for the extra utility cost. $y'(\tau)$ is the marginal change in life cycle wealth from delaying retirement at age $\tau$ (in present value) and $\Delta\,\nu(\tau) = \nu(1) - \nu(l_\tau)$ is the current utility cost of the foregone leisure.

A visual interpretation of the solutions in eq (3) to (5) (for a representative low-income wage earner) is provided in Figures 1 and 2.[11] The top-left panel of Figure 1 illustrates the marginal utility of wealth ($\lambda$) as a function of retirement age. The other three panels display the optimal life-cycle choices of the representative consumer: her income and consumption (top-left panel), savings (bottom-left) and assets accumulation (bottom-right). Figure 2 represents the determinants of optimal retirement for the same representative case: the marginal change in

[11] The simulated individual maximizes a log utility with a 1% discount factor, has a moderately concave income profile, corresponding to a low-skill worker (10% of the income distribution) and retires at age $\tau$=60. We do not permit borrowing from future pensions after retirement. The individual pension benefit is kept constant in real terms after $\tau$, but minimum pensions increase with annual productivity growth (assumed 2%). The proportional pension replacement rate is 60% (of a moving average of gross labor income). The minimum pension level is set at 75% of the minimum income.

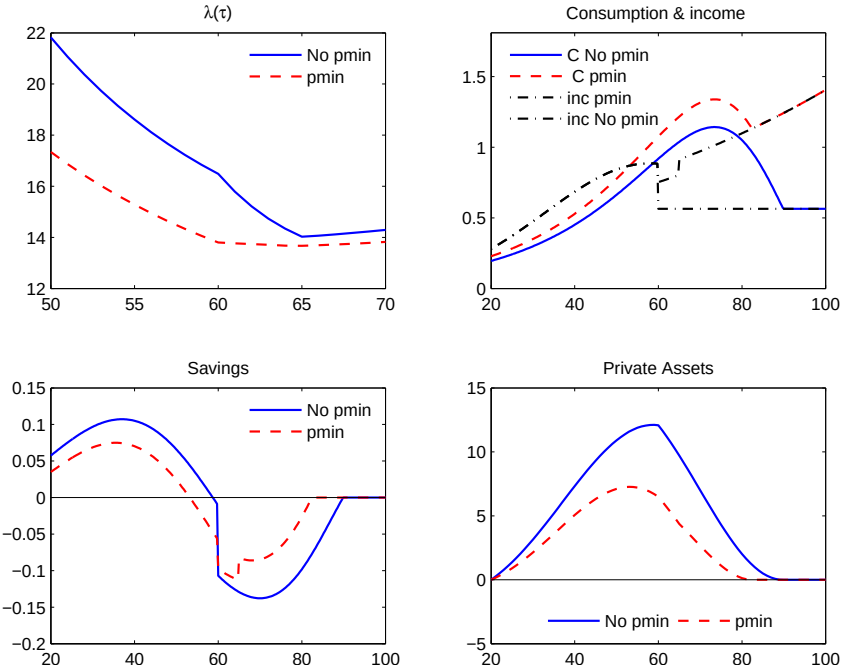



Figure 1: Optimal life-cycle behavior of a low income worker with and without minimum pensions (pmin)

life-cycle wealth by age (left panel) and the marginal change in utility by age (right panel). In all cases, the continuous lines represent the solution under a proportional pension system discussed above and the dotted line is the solution under minimum pensions.

For a representative consumer, real labor income (net of pay-roll taxes) increases until the mid 50s, drops moderately until retirement age and then falls to around 70% of the wages at the retirement age. After retirement, the flow of pensions keep income constant in real terms. In contrast, consumption is smoother, showing a moderately increasing pattern with age until the middle of the 70s. Then, the larger mortality risk leads to a decreasing pattern and the eventual exhaustion of the accumulated private wealth.[12] Savings are positive before retirement, negative after withdrawal from the labor force and (in presence of borrowing constraints) equal to zero during the last part of the life-cycle. Finally, retirement depends critically on the change in life-cycle income with age. Pension systems that include a Normal retirement age (NRA) and an Early retirement age (ERA) deeply alter this profile. Typically, they provide incentives to stay in the labor force until the NRA, but favor retirement at older ages.[13] The individual reaction to those incentives depends on the relative value of leisure and on the discounting of the future (left panel of Fig 2).

[12]Recall that we solve under the assumption of borrowing constraints after retirement.
[13]See Gruber and Wise (1999) for a extensive discussion and multiple examples of these patterns.

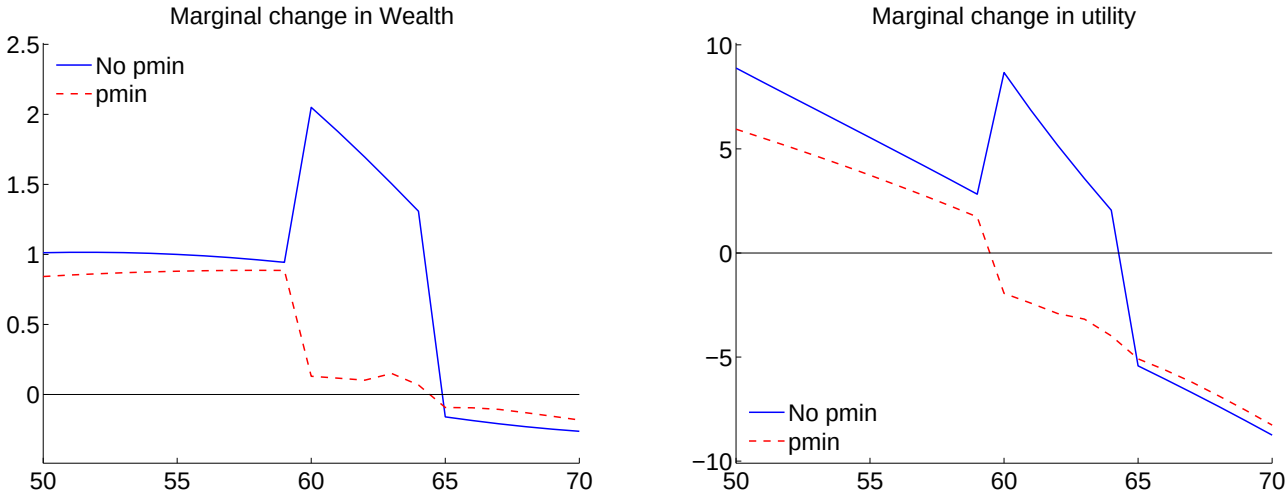



Figure 2: Determinants of optimal retirement with and without minimum pensions (pmin).

### 3.2 The effects of minimum pensions: redistribution and incentives.

Minimum pensions change the patterns described above in fundamental ways. First and foremost, they redistribute towards low-income workers. This is achieved by topping up pensions whenever the individual $b$ is below the guaranteed minimum (dotted line in the top-right panel of Figure 1). In this way, the pension system increases the consumption and welfare of the recipients and generates a more egalitarian distribution of income in the society. Obviously (although somewhat less visibly) the program reduces the welfare of those that have to finance this extra generosity (typically through higher social contributions that needed for their own pensions).

Redistribution is the most visible consequence of minimum pensions, but our economic analysis reveals additional (and subtler) consequences of the program: it changes the economic behavior of those who anticipate their participation in it. Most of these changes derive from the increase in total life-cycle wealth and the ensuing drop in the marginal utility of income (top-left panel of Figure 1). A bigger $Y$ pushes consumption up while a smaller $\lambda$ and a severed link with between current work and future pensions invites smaller working hours. As a result, savings can go down substantially before retirement (bottom-left panel of Figure 1) resulting in an appreciably smaller accumulation of private assets (bottom-right panel of Figure 1). Depending on the extension of the program, this behavior can bear some impact on assets prices and the workings of financial markets. Note that, in contrast, the individuals enjoy a larger income after retirement, which lead to slower di-saving.

The impact on labor supply extends beyond the reductions in hours work (not shown in the graphs, but easy to understand in light of eq (4)). It has a particularly large impact on retirement behavior. This is for the same two reasons mentioned above: because of the drop in $\lambda$ and because of a broken link between future pensions and current contributions. Note that, in

absence of minimum pensions, the change in life-cycle wealth by postponing retirement at any age after the ERA is:

$$y'(\tau) = w(\tau)(1-\varsigma) - b + b'\,\tilde{\mathcal{A}} \tag{6}$$

where $I(.)$ is an standard indicator function (where, again, $\tilde{\mathcal{A}}$ captures the cumulative effect of marginal changes in the benefit over the remaining individual lifespan). With minimum pensions, this expression simplifies to,

$$y'(\tau) = w(\tau)(1-\varsigma) - bm \tag{7}$$

Thus, the minimum pension eliminates the incentive to work stemming from any increase in future pensions, making it optimal for most low income workers to retire at the earliest possible age.[14] The magnitude of this *substitution effect* can be appreciated in the right upper panel of figure 5. Minimum pensions also have an *income effect*, as they effectively increase the individuals' life cycle wealth and so result in a smaller lagrange multiplier $\lambda$. The right panel of Figure 5 shows the overall impact on the marginal utility of a representative low income worker.

### 3.3 Minimum pensions and risk taking

Minimum pensions can also exert an influence on portfolio choice (and more broadly on any risk-taking behavior). It is intuitive that, by reducing the downside of risky bets, the income guarantee fosters riskier behavior.[15] In this way, minimum pensions can have an additional impact on financial prices and saving behavior. They also extend their behavioral consequences to economies with Defined Contribution pension systems (that guarantee a minimum portfolio return or pension income).

## 4 Some examples

In this section we show a few examples of the incentives embedded in alternative configurations of the minimum benefit. We analyze the cases of Spain, Chile and the U.S. The case of Spain is interesting because the minimum benefit is very relevant for low earners at the early retirement age. The case of Chile is also interesting because it combines an unfunded minimum benefit wit a funded component. Finally, the U.S. case shows that even social assistance may have important incentive effects on labor supply of older workers.

[14] An intermediate cases appears if minimum pensions are not immediately binding, but they eventually become so later in the life-cycle. In such a case the incentive effects are weaken, but disappear completely.

[15] More technically, the optimal size of a bet is limited by the negative impact on consumption experienced in the unfavorable states of the world. With typical utility functions, the small consumption enjoyed in those states will imply a very high marginal utility of wealth, which will act as a deterrent on the size of the bet. But large-enough minimum pensions will eventually dissociate the consumption level in the unfavorable states of the world from the size of the bet.

### 4.1 Spain

The public Spanish pension system (old-age, survivorship, disability) has two components. The first component is a compulsory state pension system, universal and financed by taxes, which guarantees a minimum source of income to all individuals. The second component is a defined benefit plan financed by contributions on pay-as-you-go (PAYGO) basis. The crucial element for redistribution and solidarity is the minimum pension. During the late 1970s and early 1980s, close to 70% of the Spanish pensioners received a minimum pension; in 2001 this percentage was still a very sizeable 32% of the stock of pensioners, with about 25% of new recipients starting out with a minimum pension. The minimum pension has been growing faster than the minimum wage and since year 2000 the minimum pension is higher than the minimum wage. Data on retirement patterns suggest that this minimum pension is far from being neutral (in a labor supply sense), since it increases retirement probabilities for an important fraction of workers, especially low income workers, which are potentially affected by the minimum pension.

Jim'enez-Martín and Sánchez Martín (2004, 2007) setup a life cycle model with endogenous retirement and borrowing constraints. The model is then calibrated again Social Security data. They show that the minimum pension increases the opportunity cost of the forgone pension income and utterly eliminates the incentive to work due to the early retirement penalties. These two effects make it optimal for most low income workers to retire at the earliest possible age (i.e., the ERA). This substitution effect is accompanied by an income effect as the minimum pension effectively increases individuals' life cycle wealth. This income effect also weakens the incentive to keep working in preretirement ages. These outcomes are reminiscent of the findings of Neumark and Powers (1998, 2000, 2005) on SSI. The net effect is a change in the shape of the retirement distribution in a fundamental way, shifting substantial amounts of probability mass from age 65 and the immediately preceding early retirement ages (6164) to the ERA, age 60 (see Figure 3). As minimum pensions carry the retirement age of large groups of individuals forward, the distribution changes from a unimodal shape with a single peak at age 65 to a bimodal one with peaks at ages 60 and 65. A remarkable spike emerges at age 60 as the probability of retiring exactly at the early retirement age almost triples, from 6.6 to 18.0 percent. Increases in the incidence of preretirement (retirement before age 60) are mirrored by decreases in retirement after the early retirement age. Early retirement before age 65 is reduced by 15.5 percent, and retirement at the normal retirement age drops by 30 percent. Overall, the introduction of the minimum pension implies a 10 percent increase in early retirement and preretirement. The introduction of minimum pensions, together with the other caps and ceilings, reduces the average retirement age by four months, from age 63.0 to age 62.66. Most changes occur at the low end of the income distribution

The authors also show that the minimum pension has effects on individual saving behaviors and welfare. For example, they find that the minimum pension does benefit low-income workers, but it also imposes higher contribution rates on the overall population. Finally, reform analysis

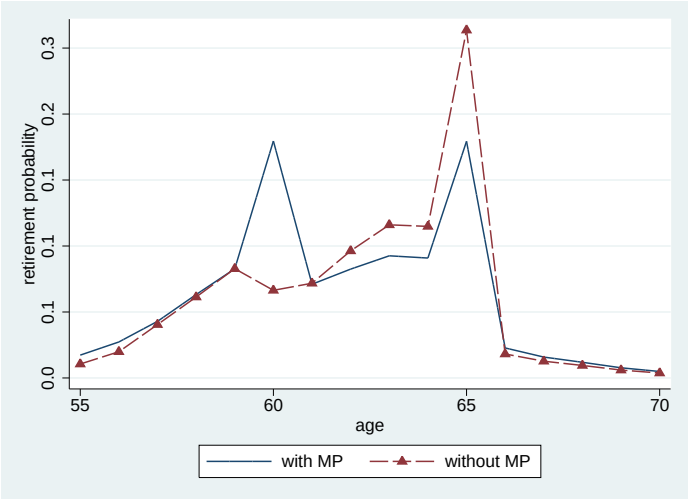



Figure 3: Simulated aggregate retirement probabilities by age in the economies with and without the minimum pension scheme. Spain. Source: Jiménez-Martín and Sánchez-Martín (2007).

shows that postponing eligibility to minimum pensions to the normal retirement age increases significantly labor force participation of older workers.

### 4.2 Chile

The current Chilean pension system can be decomposed into a social assistance pillar, a contributory pillar, and a voluntary pillar. Before the 2008 reform, the social assistance pillar was based on two components: a means- tested assistance pension (pensión asistencial, PASIS), and the minimum pension guarantee (MPG) for individuals who contributed to the individual capitalization scheme for at least 20 years but were not able to finance a minimum amount for their retirement. This configuration led to reduced contribution densities and provided incentives for informal rather than formal sector work (Valdés-Prieto 2008).

In 2008, Chile introduced a new reform aiming at both improving the living standards and increasing the coverage of the contributory part of the pension system. The reform introduced two minimum pension components: first, individuals with no contributions are entitled to an old-age basic solidarity pension (PBS); and, second, a pension-income-tested supplement (PAS) for those that satisfy a minimum contribution requirement. The supplement, a decreasing function of the contributory pension amount, is payable to all individuals whose defined-contribution pension is less than the maximum welfare pension threshold (PMAS), which is the maximum minimum pension available to eligible workers. Since the supplement is not taxed away 100 per cent as the contributory part increases, the disincentives generated by the supplement are expected to be lower than, for example, in the Spanish case. However, they are still substantial. For example, Sánchez-Martín et al (2012), in a structural model of the Chilean DC system, find the take-up rate of the minimum pension raises substantially. More recent and sophisticated

work reinforces this results and shows that the income effect maybe dominating other potential effects of the reform. Along these lines, in an unpublished manuscript Joubert (2013), uses administrative and self-reported panel data from Chile to estimate a dynamic household labor supply and saving decision model with a formal and an informal sector. He finds that minimum pension benefits can reduce female pension coverage significantly regardless of their design. With a similar technology Otero (2012) finds that the reform not only increases the average pension at retirement significantly, but also reduces the observed pension income inequality. He also find that the reform reduces formal labor market participation by 3.8% and 2.5% for those workers older than 50 and 55 years of age, respectively, at the time of the reform. Thus, the evaluation seems to point to a small reduction in labor force participation due to the income effect.

### 4.3 US

The United States provide a means-tested benefit for the elderly, known as supplemental security income. Individuals without an eligible spouse over the age of 65 can be eligible for up to USD 7236 a year depending on assets and other income. The benefit rate for cases where both members of a couple are eligible is USD 10848 (33% higher than the rate for singles). These benefit rates are equivalent to around 18% and 28% of the national average wage, respectively. The benefit is indexed to price increases. The asset tests are strict: individuals without an eligible spouse are limited to USD 2,000 worth of assets and eligible couples to USD 3,000, excluding personal belongings, a home, a car, funeral insurance and life insurance (the last two up to USD 1,500 in value). There is a small (USD 20 a month) disregard in calculating the entitlement. The benefit is then taxed at a 100% rate against income above this level. The analysis is complicated by the fact that states can supplement the federally determined minimum.

Neumark and Powers (1998, 2000, 2005) have analyzed the effect of SSI on labor supply incentives of older workers taking into account variation of SSI between states. Specifically, Neumark and Powers (2005) use confidential Social Security Administration data linked to multiple panels of the Survey of Income and Program Participation to infer the likelihood of SSI participation.

The empirical evidence leads to stronger evidence that the SSI program creates labor supply disincentives. The analysis reveals, for a bunch labor supply measures, that, among those individuals relatively likely to participate in SSI, labor supply falls off more as workers approach the age of eligibility for SSI in states that generously supplement SSI benefits. Their preferred results indicate that a likely participant aged 6064 is between 10 percentage points and 25 percent less likely to be employed at all in a more generous state. These huge magnitudes suggest that SSI policy may exert a powerful influence on the labor supply of older workers targeted by the program as they near the SSI eligibility age.

# 5 Conclusion

The main purpose of minimum pension benefits of any kind and configuration is to guarantee a minimum standard of living after retirement and/or to alleviate poverty. These target seem to be clearly achieved as many studies have demonstrated (see Dethier et al (2010) for a recent analysis). However design of minimum benefit programs should take into account (and maybe minimize) the potential labor supply effect on low income workers. In this sense the design of the Chilean pension supplement seems to be much better than the Spanish minimum pension.

The disposable evidence shows that introducing or increasing generosity of minimum pensions automatically reduces the labor supply of the incentivised workers. Consequently, in those countries with increasing shortages of labor supply changes in program design that would better integrate minimum pensions and recipiency of pensions rights can be an avenue to improve labor supply of older workers. Another interesting avenue is to make compatible accumulation of minimum pension rights after the ERA and work. Providing the mechanism is designed adequately, this may restore the incentives to continue working in equation .

# Key References


Gruber J. and D.A. Wise (1999): *Social Security and Retirement around the World.* Editors. The University of Chicago Press.

Gruber J. and D.A. Wise (2004): *Social Security Programs and Retirement around the World.* Editors. The University of Chicago Press.

Jiménez Martín, S. and A. R. Sánchez Martín (2007). "An evaluation of the life cycle effects of minimum pensions on retirement behavior," *Journal of Applied Econometrics*, 22, 923–950.

Jouber C (2013) "Pension design with a large informal labor market: Evidence from Chile", mimeo.

Neumark D and ET Powers, (1998). "The Effect of Means-Tested Income Support for the Elderly on Pre-Retirement Saving: Evidence from the SSI Program in the U.S," Journal of Public Economics 68(1): 181206.

Pearson and Whitehouse (2009), "Social Pensions in High-Income Countries", in R. Holzmann and N. Takayama (eds.), Closing the Coverage Gap: The Role of Social Pensions, World Bank, Washington DC.

Piggott J, D Robalino and S Jiménez-Martín (2009), "Incentive effects of Retirement Income Transfers", with D Robalino & J Piggott in Closing the Coverage Gap: the Role of Social Pensions and Other Retirement Income Transfers. D Robalino, R Holzmann & N. Takayama Eds. World Bank.


## Other References


Danzer, A. (2010) ''Retirement Responses to a generous pension reform: evidence from a natural experiment in Eastern Europe", Escirru W.P. 23.

Diamond, P.A. (2007): "Top-Heavy Load: Trouble Ahead for Social Security Systems." *CES ifo Forum,* **8-3** 28–36.

Dethier JJ, P Pestieau, R Ali "The impact of a minimum pension on old age poverty and its budgetary cost. Evidence from Latin America", Core DP, 2010.

Fenge, R., and P. Pestieau (2005): *Social Security and Early Retirement,* MIT Press, Cambridge, MA.

García Pérez, J.I. a nd A. R. Sánchez Martín (2010): "Social Security and the search behavior of workers approaching retirement," FEDEA Working paper no. 2010-26.

Hairault JO, F Langot, T Sopraseuth, 2010. "Distance to Retirement and Older Workers' Employment: The Case for Delaying the Retirement Age," Journal of the European Economic Association, MIT Press, vol. 8(5), pages 1034-1076, 09.

Jiménez Martín, S. and A. R. Sánchez Martín 2004. "The effect of pension rules on retirement monetary incentives with an application to pension reforms in Spain," Hacienda Pública Española, IEF, vol. 169(2), pages 35-66, June.

Joubert C and P Todd (2013) "How the Design of a Pension System Influences Old Age Poverty and Gender Equity: A Study of Chile's Private Retirement Accounts System", mimeo.

Jouber C (2013) "Pension design with a large informal labor market: Evidence from Chile", mimeo.

Kotlikoff, Laurence and David A. Wise. "The Incentive Effects of Private Pension Plans," in *Issues in Pension Economics*, ed. Z. Bodie, J.B. Shoven, D.A . Wise, Chicago: UCP, 1987. Pp. 283-336. ,

Lazear, Edward P. "Incentive Effects of Pensions", *Pension, Labor, and Individual Choice*, edited by David A. Wise. Chicago: University of Chicago Press, (1985), pp. 253-282. ,

item Leung, S. F. (2000). "Why do some households save so little? a rational explanation", Review of Economic Dynamics 3, 771800.

Lutz, W., Sanderson, W., and S. Scherbov (2008): "The coming acceleration of global population ageing," *Nature*, **451-7** 716–719.

Neumark D and ET Powers, (2005) "The Effect of the SSI Program on Labor Supply: Improved Evidence from Social Security Administrative Files", Social Security Bulletin, Vol. 65 No. 3, 2005.

Neumark D and ET Powers, (2000). "Welfare for the Elderly: The Effects of SSI on Pre-Retirement Labor Supply." Journal of Public Economics 78(12): 5180.

Neumark D and ET Powers, (1998). "The Effect of Means-Tested Income Support for the Elderly on Pre-Retirement Saving: Evidence from the SSI Program in the U.S," Journal of Public Economics 68(1): 181206.

Modigliani, F. and R. Brumberg (1980). Utility analysis and aggregate consumption functions: an attempt at integration. In A. Abel (Ed.), *The Collected Papers of Franco Modigliani.* MIT Press.

OECD (2011), "Basic, Targeted and Minimum Pensions", in Pensions at a Glance 2011: Retirement-income Systems in OECD and G20 Countries, OECD Publishing.

Otero, A. (2012) "Informality and Pension Incentives: A Structural Household Life Cycle Model of Consumption, Labor Supply and Pension Saving" (Job Market Paper), mimeo.

Samwick A. 1998. "New evidence on pensions, social security and the timing of retirement". *Journal of Public Economics* 70: 207-236.

Sánchez-Martín, A., Jiménez-Martín, S., Robalino, D. and Todeschini, F., 2012. "Labor Income and the Design of Default Portfolios in Mandatory Pension Systems: An Application to Chile," Working Papers 2012-04, FEDEA.

Rust, J., and C. Phelan (1997): "How Social Security and Medicare Affect Retirement Behavior in a World of Incomplete Markets," *Econometrica,* **65** 781–831.

Valds-Prieto, Salvador. 2008. "A Theory of Contribution Density and Implications for Pension Design." Social Protection Discussion Paper 0828, Pension Reform Primer Series, World Bank, Washington, DC.

**ÚLTIMOS DOCUMENTOS DE TRABAJO**

2014-04: "The Incentive Effects of Minimum Pensions: extended version", **Sergi Jiménez-Martín**.
2014-03: "A practitioners' guide to gravity models of international migration", **Michel Beine, Simone Bertoli y Jesús Fernández-Huertas Moraga**.
2014-02: "L'auberge espagnole y el apartamento francés: los determinantes del aprendizaje del francés en España", **Brindusa Anghel y Maia Güell**.
2014-01: "Temporary Intergenerational Mobility and the Informational Content of Surnames" **Maia Güell, José V. Rodríguez Mora y Christopher I. Telmer**.
2013-25: "Informal Care and intergenerational transfers in European Countries", **Sergi Jiménez-Martín y Cristina Vilaplana Prieto**.
2013-24: "Inference Based on SVARs Identied with Sign and Zero Restrictions: Theory and Applications", **Jonas E. Arias, Juan F. Rubio-Ramírez y Daniel F. Waggoner**.
2013-23: "Estimating Dynamic Equilibrium Models with Stochastic Volatility", **Jesús Fernández-Villaverde, Pablo Guerrón-Quintana y Juan F. Rubio-Ramírez**.
2013-22: "Perturbation Methods for Markov-Switching DSGE Models", **Andrew Foerster, Juan Rubio-Ramirez, Dan Waggoner y Tao Zha**.
2013-21: "Do Spanish informal caregivers come to the rescue of dependent people with formal care unmet needs?", **Sergi Jiménez-Martín y Cristina Vilaplana Prieto**.
2013-20: "When Credit Dries Up: Job Losses in the Great Recession", **Samuel Bentolila, Marcel Jansen, Gabriel Jiménez y Sonia Ruano**.
2013-19: "Efectos de género en las escuelas, un enfoque basado en cohortes de edad", **Antonio Ciccone y Walter Garcia-Fontes**.
2013-18: "Oil Price Shocks, Income, and Democracy", Markus **Brückner , Antonio Ciccone y Andrea Tesei**.
2013-17: "Rainfall Risk and Religious Membership in the Late Nineteenth-Century US", **Philipp Ager y Antonio Ciccone**.
2013-16: "Immigration in Europe: Trends, Policies and Empirical Evidence", **Sara de la Rica, Albrecht Glitz y Francesc Ortega**.
2013-15: "The impact of family-friendly policies on the labor market: Evidence from Spain and Austria", **Sara de la Rica y Lucía Gorjón García**.
2013-14: "Gender Gaps in Performance Pay: New Evidence from Spain", **Sara de la Rica, Juan J. Dolado y Raquel Vegas**.
2013-13: "On Gender Gaps and Self-Fulfilling Expectation: Alternative Implications of Paid-For Training", **Juan J. Dolado, Cecilia García-Peñalosa y Sara de la Rica**.
2013-12: "Financial incentives, health and retirement in Spain", **Pilar García-Gómez, Sergi Jiménez-Martín y Judit Vall Castelló**.
2013-11: "Gender quotas and the quality of politicians", **Audinga Baltrunaite, Piera Bello, Alessandra Casarico y Paola Profeta**.
2013-10: "Brechas de Género en los Resultados de PISA: El Impacto de las Normas Sociales y la Transmisión Intergeneracional de las Actitudes de Género", **Sara de la Rica y Ainara González de San Román**.
2013-09: "¿Cómo escogen los padres la escuela de sus hijos? Teoría y evidencia para España", **Caterina Calsamiglia, Maia Güell**.
2013-08: "Evaluación de un programa de educación bilingüe en España: El impacto más allá del aprendizaje del idioma extranjero", **Brindusa Anghel, Antonio Cabrales y Jesús M. Carro**.
2013-07: "Publicación de los resultados de las pruebas estandarizadas externas: ¿Tiene ello un efecto sobre los resultados escolares?", **Brindusa Anghel, Antonio Cabrales, Jorge Sainz e Ismael Sanz**.
2013-06: "DYPES: A Microsimulation model for the Spanish retirement pension system", **F. J. Fernández-Díaz, C. Patxot y G. Souto**.
2013-05: "Vertical differentiation, schedule delay and entry deterrence: Low cost vs. full service airlines", **Jorge Validoa, M. Pilar Socorroa y Francesca Medda**.
2013-04: "Dropout Trends and Educational Reforms: The Role of the LOGSE in Spain", **Florentino Felgueroso, María Gutiérrez-Domènech y Sergi Jiménez-Martín**.
2013-03: "The European Crisis and Migration to Germany: Expectations and the Diversion of Migration Flows", **Simone Bertoli, Herbert Brücker y Jesús Fernández-Huertas Moraga**.
2013-02: "Understanding Different Migrant Selection Patterns in Rural and Urban Mexico", **Jesús Fernández-Huertas Moraga**.
2013-01: "Publicizing the results of standardized external tests: Does it have an effect on school outcomes?, **Brindusa Anghel, Antonio Cabrales, Jorge Sainz y Ismael Sanz**.
2012-12: "Visa Policies, Networks and the Cliff at the Border", **Simone Bertoli, Jesús Fernández-Huertas Moraga**.
2012-11: "Intergenerational and Socioeconomic Gradients of Child Obesity", **Joan Costa-Fonta y Joan Gil**.
2012-10: "Subsidies for resident passengers in air transport markets", **Jorge Valido, M. Pilar Socorro, Aday Hernández y Ofelia Betancor**.