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Analyzing the *Ouverture du Capital* at France Télécom

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Francois Degeorge
HEC School of Management

Dirk Jenter
Harvard University

Alberto Moel
Harvard Business School

Peter Tufano
Harvard Business School and NBER

Selling Shares to Worker-Investors: Analyzing the *Ouverture du Capital* at France Télécom

In 1997, France Télécom, the French telecommunications firm, went through a partial privatization or “Opening of Shareholding.” As part of this process, the government offered current and prior France Télécom employees the opportunity to buy portfolios of shares with various combinations of discounts, required holding periods, leverage, tax treatment, and levels of downside protection. We adapt a neoclassical model of investment decision-making that takes into account firm-specific human capital and holding period restrictions to predict how employees might respond to the share offers. Using a new database that tracks over 200,000 eligible participants, we analyze the employees' characteristics and their decisions regarding (a) whether to participate; (b) how much to invest; and (c) what form of stock alternatives they selected.

As predicted by the neoclassical model, *participation* increases with wealth and current income, and decreases with job tenure (our measure of firm-specific human capital). However, the tenure effect is small, and civil servants and non-retired former employees—all of whom have less human capital at risk—participate less, inconsistent with our predictions. Consistent with the concept that as the retirement horizon decreases, risk aversion increases, older workers tend to invest less frequently. With respect to *investment amounts*, wealthier and better-paid workers invest more and workers with greater tenure invest less, as predicted by the model and consistent with the participation results. However, the amount of funds invested in the stock plans seems driven by a different set of forces than the decision to participate. Older workers, civil servants, men, former employees and retirees are *less* likely to participate in the offering, but if they do, they tend to invest more (or no less) than others. We suspect that this phenomenon reflects a “threshold effect.” If an employee's desired investments (and perceived participation benefits) do not exceed his cost of analyzing the offering, he does not participate; conditional on participating, however, his investments will be large. Marketing and communication efforts by the firm seem reduce this cost of analysis materially. Finally, we find that the *characteristics* of the chosen portfolios (holding period restrictions and downside protection) are broadly consistent with theoretical predictions from our neoclassical model.

Contact information: Degeorge, HEC School of Management, 78351 Jouy en Josas Cedex, France (degeorge@hec.fr); Jenter, Moel and Tufano, Harvard Business School, Boston, MA 02163 (djenter@kuznets.fas.harvard.edu; amoel@hbs.edu; ptufano@hbs.edu)

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1. Introduction

Many of the proposed solutions to the misalignment of managers', workers', and shareholders' interests recommend that managers and workers hold shares in the firms in which they work.¹ By giving employees the financial incentives of shareholders, they will act to increase shareholder value. These prescriptions are embodied in a number of institutional practices: the payment of stock (and stock options) to executives and workers as a portion of their compensation, the establishment of Employee Stock Ownership Plans (ESOPs) at firms, the sale of discounted stock to employees, and government mandates that workers of privatized firms buy shares in the firms for which they work.

Yet selling stock to their employees often proves a substantial challenge for companies. In many developed countries, there is still little tradition of individuals investing in the stock market. Moreover, for diversification purposes workers may be reluctant to hold their employer's stock.² To the contrary, workers whose undiversified human capital fluctuates with the fate of their employer may prefer to invest their financial assets *outside* the firm. Thus the sale of company stock to employees represents a large-scale marketing challenge. Designers of schemes to encourage workers to buy shares must motivate workers to buy and hold the firm's stock, while respecting the budget constraints of the firm (or government).

In this paper, we study one of the larger privatizations in Europe, which faced this problem: France Télécom's 1997 *Ouverture du Capital* or "opening of shareholding." The state-owned French telecommunications giant was planning to sell shares to private investors, and under French law, needed to induce employees to invest as well. The firm created four distinct investment vehicles to allow and encourage employees to invest. The schemes were all based upon the firm's common stock, but differed along five dimensions: the level of discounts and free shares granted to employees; the access to

¹ See for instance Blinder (1990) and the articles therein, Jones and Kato (1995), and Scholes and Wolfson (1990). Employee stock ownership can also serve as a means for corporate tax savings and as a takeover deterrent. The case for employee ownership is advanced by the National Center for Employee Ownership (<http://www.nceo.org>)

² Brennan and Torous (1999) show that the welfare costs of under-diversification can be large.

subsidized financing and additional leverage; the period that employees were required to hold the stock; the tax treatment; and finally, the degree of downside protection offered to the employee in the event that the stock price declined below the initial offering price.

Our paper analyzes the employees' response to the firm's stock offering proposal. Our database consists of information on each of the more than 200,000 past and present France Télécom workers eligible to participate. For each eligible participant, we have personnel data including their age, tenure, rank, gender, and employment status (civil servant, non-civil servant, retiree, or former employee). We also have information on the number and type of shares requested and obtained for each employee.

We have two related goals in writing this paper. The first is to *describe* the employee response to the investment offers, addressing three related questions. Which employees chose to participate in the employee stock offering plan? How much did they invest in the plan? And how did the employees choose from among the four different alternatives?

Our second goal is to extend existing theory to produce *testable implications* about the investment choices of the worker-investors at France Télécom. Drawing primarily upon neoclassical models of optimal investment and consumption, we build a stylized model of the investment choices facing a risk-averse worker-investor whose human capital is partially firm-specific, i.e., his labor income is correlated to the firm's fortunes. (The model is detailed in the Appendix). We can then examine how the size of human vs. financial capital, the degree of firm-specificity in human capital, the investors' horizon, and the degree of relative risk aversion should influence the investment choice of the worker-investor. We then attempt to relate these unobserved parameters to observed employee characteristics in order to draw implications about different investment choices. For example, our sample includes current workers (both civil servants and employees-at-will), retirees, and prior workers still in the workforce. We appeal to these differences to capture levels and firm specificity of human capital.

We acknowledge that we cannot "test" whether the prescriptions of optimal investment theory are correct. Even if the France Télécom employees were to behave exactly according to theory, observable measures of the simplest of theoretical variables

are very noisy and often highly correlated. Nevertheless, given the dearth of empirical studies of investor behavior, a study of this kind can begin to illuminate how human capital and other factors influence individual's investment decisions.

We find that the decisions of *whether* to participate in the offering, and of *how much* to contribute, are driven by different factors. Specifically, several groups of employees –civil servants, men, and former employees and retirees – participated less frequently, but conditional on participating, invested more. It appears that a threshold level of desired investment must be attained for participation to occur. For some groups, this threshold may be higher (and participation likelihood lower), but conditional on meeting it, personal contribution is higher. We conjecture that this threshold arises due to the cost of analyzing the France Télécom offering, and offer some supportive empirical evidence. Overall, our findings hint at the importance of marketing efforts in the employee stock offering.

We find some evidence of a human capital effect, but the magnitudes are small. We use tenure at France Télécom as a proxy for a worker's firm-specificity of human capital, and we find that workers with tenure one standard deviation above the mean are 0.5% less likely to participate in the offering, and make 6-9% smaller personal The small size of the human capital effect may be consistent with the observation that little human capital is at risk in France, or rather that employees falsely act *as-if* this were so.

The effects predicted by the neoclassical model for financial wealth and salary are borne out by the data: workers with higher financial wealth and salary participate and invest more. Consistent with the concept that as retirement horizon decreases, risk aversion increases, older workers tend to invest less. Finally we find modest gender-related differences in participation and investment.

The remainder of the paper is organized as follows: Section 2 provides a brief background on privatizations in general and on the Opening of Shareholding at France Télécom. Section 3 describes the alternatives the government and France Télécom made available to eligible participants in the employee stock plan. These choices allowed employees to trade-off larger discounts in return for either longer holding periods or some downside protection. Section 4 reviews the existing theory of investment decision-

making and discusses the predictions of this theory as applied to our problem. The formal model we use is detailed in the *Appendix* to the paper. Section 5 describes the data and the variables we use. Section 6 provides the core of the empirical analysis, in which we report on the three aspects of employee response: the decision to participate, the quantity of funds invested, and the portfolio of attributes (discounts, holding period, and downside protection) selected. We examine the cross-sectional dispersion of employee choices as a function of observable characteristics. Finally, Section 7 briefly concludes and discusses next steps for this project.

2.

2. The privatization of France Télécom³

The political context surrounding the privatization of France Télécom was complex and the conservative governments in place between 1993 and 1997 were divided on the issue. Advocates of privatization, including the firm's top executives, argued that a state-owned France Télécom could not compete effectively in a deregulated European telecommunications market. The full liberalization of the European telecommunications market was scheduled for January 1, 1998, and across the continent, state-owned telecommunications firms were turned over to private control. Telefonica of Spain was privatized in February 1997; Italy partially privatized Telecom Italia in 1995; and Deutsche Telekom was privatized in 1996 and 1997.

Initially, France Télécom's unions were strongly against its privatization. The vast majority of the firm's employees were civil servants, who enjoyed job security and a generous pension scheme that privatization could jeopardize. On October 12, 1993, 75% of France Télécom employees went on strike against privatization. France Télécom negotiated an agreement with unions which defused employees' fears successfully. Under the June 1996 deal, the State would keep a stake of at least 51% in France Télécom; current employees would keep their civil servant status even after privatization, while new employees would acquire private sector status; and France Télécom would make a one-time payment to the State to fund its employees' pensions.

³ For a study of a related French privatization, see Collat and Tufano (1994).

By April 1997, all hurdles had been cleared and the privatization of France Télécom was ready. President Chirac called general elections, which brought a socialist government in power. Its campaign platform explicitly opposed the privatization of France Télécom. It thus seemed as if the offering would have to be postponed until a new political majority came to power. Instead, the socialist government performed a quick about-face, and in September 1997 officially announced a slightly scaled-back privatization of France Télécom. The official reason given for the change in policy was the need to list the France Télécom stock so that a stock swap between France Télécom and Deutsche Telekom could be arranged. Fiscal realism played a role too. Countries wishing to join in the European monetary union had to maintain a ratio of budget deficit to GDP below 3%, and privatization proceeds were counted as revenues toward this goal. Finally, an important driver of the socialist change of heart was the upcoming full deregulation of European telecommunications, as witnessed by the string of privatizations in Italy, Germany and Spain. Yet, the political unease felt by the French socialist government about privatizing France Télécom was still palpable in the label chosen for the offering: not a privatization, but an "Opening of Shareholding" (*Ouverture du capital*).

The Opening of Shareholding took place on September 23, 1997. The offer price for individual investors was set at FF 182, while the price for institutional investors was FF 187. The individual investor tranche was oversubscribed by 2.91 times, while the institutional investor tranche was oversubscribed 20 times. The first day closing price was FF 206.50, for a one-day return of 13.5% from the individual investor offer price.⁴

Employee ownership

Achieving a high level of employee ownership was an explicit goal of the government and France Télécom management, not least to defuse any remaining hostility to privatization within France Télécom. Having a large number of employees purchasing France Télécom stock would amount to a vote of confidence in privatization and in the

⁴ By comparison, the first day returns of prior French privatizations were 7.17% for UAP, 10.65% for Elf, 16.15% for Rhone-Poulenc, 1.74% for Usinor, -8.29% for Pechiney, and 15.46% for BNP.

company's strategy. It would also create the proper incentives for workers. Finally, French law dictated that employees purchase shares in the firm, or else the firm would bear the carrying cost of the unsold employee shares.

The challenge of selling France Télécom stock to the France Télécom workforce was substantial.⁵ In general, the fraction of French individuals with prior experience in stock investing was quite low. In 1986, only 8.4% of French households were estimated to hold stocks, and in 1992, this percentage was estimated at 11.8%. French research showed that less well-to-do households (such as the blue-collar workers at France Télécom) were less inclined to hold shares.⁶ An overwhelming majority (78%) of France Télécom employees were civil servants. Their choice to be civil servants might indicate a low tolerance for bearing risk or a minimal interest in the private sector. Although no data are available on employees' portfolios of financial assets, it is likely that only a minority were familiar with the basic mechanisms of stock market investing.⁷ Finally, at least some employees might appreciate the appeal of diversification—i.e., that they might not want to put all of their eggs in one basket—and might prefer to invest elsewhere.

France Télécom devoted substantial resources to marketing the employee portion of the offering. Executive management wished to see as many employees as possible participate – even if they contributed small amounts.⁸ Three thousand employees were trained to market the offering throughout the company. A Minitel⁹ service allowed employees to simulate the value of the various France Télécom offerings under various scenarios for the France Télécom stock price.¹⁰ Literature distributed to employees exhorted employees to participate: “All of you who have contributed to make France

⁵ Former employees and retirees who left France Télécom after 1991 were also eligible for the employee offering.

⁶ See Arrondel and Masson (1990) and Szpiro (1995).

⁷ We have been told that many employees did not understand why the stock price simulations in the offering documents included cases in which the stock price fell. After the offering, whenever the stock price went down, France Telecom received telephone calls from employees asking for an explanation.

⁸ However, confidentiality was guaranteed. No one in the France Télécom hierarchy had any knowledge of whether their subordinates, peers, or bosses participated in the offering.

⁹ Minitel is an interactive teletext-based electronic information system widely used by French households.

¹⁰ The actual offering price was announced several days before employees were to submit their share requests.

Télécom the great company that it is today, by becoming shareholders, can now become partners in its future success.”¹¹

While the firm could expend personnel resources to make the offering a success, the financial incentives the government could offer to employees were constrained by law and politics. The amount of concessions was determined by negotiation with the government. In this instance, the ultimate offer to employees was reported to be “the best ever agreed to by the State to employees of companies that list their shares in the Stock Exchange.” It was not feasible to merely give the shares to employees, so to induce workers to buy shares (albeit at a discount) the security designers needed to create an attractive set of investments.

3. The privatization of France Télécom: The offering schemes

The challenge of designing employee stock offerings that simultaneously addressed the poor liquidity of most employees, their risk aversion, their poorly diversified human capital and their hesitation with holding shares had been an issue in all of the prior French privatizations. For its “Opening of Shareholding,” France Télécom adapted the program initially used by the French *Trésor* and Rhône-Poulenc in 1993.¹² In literature describing the program to employees, the company outlined the principles that dictated the design of the offerings:

“To make the purchase of France Télécom shares accessible to everyone, the offer reserved for employees follows five principles:

- concentrate a majority of benefits on the first few thousand francs in investment.
- help each of you to finance your investment by offering payment terms and by offering a plan with a bank loan.
- offer a number of choices, and the possibility of investing in more than one plan at the same time.
- give incentives for long-term shareholding to foster the creation of a stable shareholder base.
- respect the freedom of choice of each agent and guarantee the confidentiality of the operation.”

¹¹ France Telecom document, “Guide for the Salaried Shareholder,” 1997. Subsequent quotes detailing the plan come from this document.

¹² See Collat and Tufano (1994).

The desire to offer employees choices was manifested in the fact that France Télécom offered its employees four different share ownership programs. Each share ownership program varied along five dimensions: (a) discounts, which could come in the form of discounts from the public offering price as well as bonus (matching funds) and free shares; (b) access to subsidized financing and additional leverage; (c) the length of the required holding periods; (d) tax-free treatment; and (e) protection from losses in the form of implicit put options.

Four different share ownership schemes were structured, representing different bundles of these attributes: *Abondix*, *Multiplex*, *Simplix*, and *Disponix*. In general terms, the employee could get bigger discounts, more attractive financing, tax-free treatment or protection from losses by committing to hold the France Télécom shares for a longer period of time. **Table I** shows a summary of each program's attributes.

All 174,091 current French employees of France Télécom (or of more than 50%-owned subsidiaries) were eligible to participate. In addition, 30,985 former employees who left the firm between 1991 and 1997 were eligible to participate, but could purchase only two of the four plans (*Simplix* and *Disponix*). The group of former employees includes 22,357 retirees as well as 8,628 former employees who left prior to retirement.

(a) *Disponix: "Be able to sell the shares at any point in time."*

The *Disponix* alternative contained the fewest benefits and the fewest employee restrictions in terms of required holding period. The name of the plan derived from the fact that the shares were available immediately and at the employee's disposal (*disponible*) as there was no mandatory holding period. Shares in this program carried no purchase discount and had to be bought at the individual offer price of FF 182.00. If the shares were held for more than one year, the government would give participants one free share for each three shares (up to 37 shares), which effectively translated into a maximum 33% premium for participants. The *Disponix* program offered no financing benefits and the employee had to pay for the shares in cash at the time of purchase. There was no

downside protection were the employee to hold the shares and they were to drop in value. Dividends and capital gains from this program were taxable.¹³

(b) Simplix: “Achieve a balance between offering plan benefits and holding period.”

In return for agreeing to hold the France Télécom shares for two years, employees who participated in the simple or *Simplix* share program would enjoy a number of additional benefits including discounts, free shares, and subsidized financing. Shares could be purchased in this program at a 20% discount from the offering price (FF 145.60.) If the shares were held for more than three years, the government would give one free share for each share up to 20 shares, and one free share for each four shares above 20.¹⁴ Like the *Disponix* alternative, dividends and capital gains from this program were taxable and the plan contained no downside protection.

(c) Abondix: “Acquire numerous advantages and invest for the long term.”

If the employee was willing to hold the shares for *five* years, he or she could enjoy the *Abondix* alternative, which offered additional bonus (or matching) shares, tax-free treatment, and an additional financing alternative. The purchase price, payment options, and free shares were identical to *Simplix*. But participants in the *Abondix* program received three additional benefits. The first was the high company-matched bonus shares (called the *abondement*), which is comparable to an employer-matching program. The company would give a 100% bonus for the first FF 3,000 of *Abondix* requested. For example, if the employee contributed FF 3,000, the company would match the employee’s contribution one-for-one, so that the employee could buy FF 6,000 of shares at 145.6, or 80% of the initial offer price. The matching rate was 50% for the next FF

¹³ Under the French tax regime, the first FF 8,000 of dividends for individuals, and the first FF 16,000 for couples are tax free. Above this, dividends are taxed at regular income rates, which would range from 28% to 37% for the bulk of France Télécom employees. Capital gains are taxed at a 20.9% rate.

¹⁴ Payment for the shares in the program could be made in one of three different ways: (a) in cash, (b) in three interest-free payments of 30% upon delivery, 30% after a year, and 40% after two years, or (c) in 36 equal monthly interest-free payments.

6,000 (up to a maximum of FF 3,000) and a 25% for the next FF 66,000. No bonus would be given for purchases above FF 75,000 (3,000 + 6,000 + 66,000).

Second, because the shares would be held in the company retirement plan, the bonus shares, capital gains, and paid dividends would be tax-free (although social security contributions of 3.9% would be applicable). Third, payment could be made through the exchange (transfer) of equivalent value assets from the company pension plan (known as the PEG), although payments made through transfers would carry no bonus.

While the participant in *Abondix* agreed to hold the shares for five years, redemption was allowed in years 3 through 5 under special circumstances. In case of “early redemption” by the employee, the shares would be sold at market price to pay off the 20% discount, the bonus, and a 5% penalty of the value of the shares sold. Any excess would be transferred to the employee’s pension plan.

(d) *Multiplix*: “Multiply, with full security, your savings capacity.”

The *Multiplix* share purchase program offered a unique combination of leverage and downside protection. The employee could purchase shares at FF 145.60 (a 20% discount from the offering price) and would receive a 50% bonus for the first FF 2,000 of *Multiplix* requested.¹⁵ For each *one* share the employee bought in *Multiplix*, he would enjoy 100% appreciation beyond the offer price (FF 182) on *ten* shares. In addition, the employee was guaranteed a 25% total return on his personal contribution at the end of five years (or 4.6% per year).¹⁶ In the five years that the employee participated in the *Multiplix* program, he would forgo all dividends and associated tax credits on the shares. Bonus shares and capital gains would be tax free, as the shares would be held in the group savings plan.

Functionally, the *Multiplix* scheme is quite different from the other three plans. Where they offer linear payoffs, *Multiplix* offers a non-linear, option-style payoff. The payoff could be represented a number of ways. Perhaps the simplest is as two

¹⁵ If the employee contributed FF 3,000, the company would provide another FF 1,000 which could be used to buy shares at 80% of the offer price.

¹⁶ Early redemption would void the 25% guaranteed return on the employee contribution.

components (a) a risk-free zero-coupon bond paying 1.25 times the employee's personal contribution plus bonus, and (b) 10 call options struck at the offer price for each share that the employee bought directly. **Figure 1** plots the final portfolio value after five years of an initial FF 9,000 investment in either *Abondix* or *Multiplix*, including all bonuses and free shares. Legally, this payoff was delivered through a unique "loan" which allowed the employees to buy nine additional shares for each one purchased through personal contribution and bonus.¹⁷ As is apparent from the figure, the *Multiplix* option dominates investments in *Abondix* for a wide range of final stock prices; it is both downside protected, and offers much larger upside. It is only over a narrow range of ending stock prices (FF 80 to FF 200, versus an initial offer price of FF 182) that *Abondix* is marginally better.

Means of payment, taxation, and holding period requirements were the same as those of *Abondix* (except that the employee could not transfer funds from the company pension plan to pay for the *Multiplix* shares).

(e) Program constraints and portfolio composition

Overall, the share alternatives were quite attractive to the employees. To give a sense, were an employee to invest 9000 FF, he could buy about 12,000 FF of stock under the *Disponix* plan, 16,312 FF under *Simplix* and 25,610 FF under *Abondix*. (These ignore the subsidized financing, avoidance of transaction costs, and tax-free status under *Abondix*). Were he able to invest 9,000 FF in *Multiplix*, he would receive a package worth between 27,500 and 39,000 FF, depending on the volatility of France Télécom stock. These are substantial benefits, large enough to attract employee attention.

- Under the principle of allowing employees freedom of choice, the program allowed employees to participate in more than one plan, subject to certain limitations as stated below.

¹⁷ What makes this loan peculiar is that the repayment is effected through the withholding of the dividends and tax credits (over the five year life of the plan) and a variable repayment schedule at maturity that is a function of the ultimate France Télécom stock price. In effect this loan repayment schedule is equal to the positive difference between the value of ten shares less the payoff to the employee described above. **Figure 1** assumes that the dividend plus tax credit yield on France Télécom is 3.6%.

- Total contributions to the pension plan (under the *Abondix* and *Multiplix* programs) each year could not exceed 1/4 of the employees' gross France Télécom income. The loan implicit in *Multiplix* would count towards this limit. This rule is often a binding constraint on portfolio design.
- The total personal investment into *Multiplix* could not exceed FF 9,000.
- The total bonus paid into the pension plans could not exceed FF 22,500, and the *Abondix* bonus would be allocated before the *Multiplix* bonus.
- In order to participate in *Multiplix*, employees must have bought at least one share in one of the other programs.
- The value of all free shares received under the *Abondix*, *Disponix* and *Simplix* programs combined could not exceed FF 6,860, or 37 to 47 shares, depending on the discount offered (0% or 20%). Free shares are paid first to *Disponix*, then to *Simplix*, and finally to *Abondix*.
- The maximum request for shares could not exceed FF 823,200. The bonus and the bank loan implicit in *Multiplix* counted towards this total, while free shares were excluded.
- Were the employee offering to be oversubscribed, the rationing rules would be determined and announced by France Télécom and the government at that time. Formal allocation rules were not announced in advance.

With combinations of the four alternatives, employees could create highly customized shareholding packages. They could vary the degree to which investments were taxable, the average holding period, the average payment option, the average total discount (taking into account discounts, bonuses and free shares) and the average number of shares with downside protection. However, the constraints outlined above were often binding and must be considered in any analysis.

If we were to ignore taxes, risk aversion, needs for liquidity, and heterogeneity among workers, we could solve the linear programming problem suggested by the constraints above to calculate the “optimal” (value-maximizing) investment package. Given the extreme discounts offered, investors would certainly participate in the offering. Our calculations show that *Abondix* and *Multiplix*, which offer the highest discounts,

dominate the optimal portfolios. *Simplix* enters the value-maximizing portfolios only for small personal investments to take advantage of the free shares, and again for large personal investments when the constraint on the combined investment into *Abondix* and *Multiplix* bind. In brief, investors would prefer combinations with the largest effective discounts, as they place no value on liquidity. This results in the purchase of the maximum amounts of *Abondix* and *Multiplix* allowed under the constraints. Whenever the combined constraint on *Abondix* and *Multiplix* is binding, *Abondix* is the preferred choice over *Multiplix*.

This analysis is far too simplistic in that it ignores all of the very real and important aspects of the actual problem facing employees and security designers hoping to encourage these employees to buy any of the alternatives:

- Employees are risk-averse.
- Employees have a mix of human and financial capital.
- Human capital can be risky and also firm-specific, i.e., its value can be related to the value of France Télécom. Note that human capital risk is not simply the probability of being fired (which is zero for civil servants, and may not be very high for other employees, in view of the high costs of firing workers in France). If France Télécom performs poorly, its employees are unlikely to obtain salary raises or promotions, they may be subject to forced job relocations, or France Télécom may find it hard to attract and retain talented co-workers.
- Employees may be unable to borrow against their illiquid positions and thus the holding period of an investment may be important.
- The pool of workers is heterogeneous with respect to these characteristics.

To understand what the optimal portfolio might be in these circumstances is much more complicated, and requires us to more formally model the joint consumption, investment and portfolio choices of investors

4. Applying investment decision-making theory at France Télécom

The designers or marketers of the France Télécom schemes would have liked to know who might buy the products, how much they might buy, and what variety they might prefer. We can reframe these marketing questions as portfolio allocation problems and use financial theory to help predict consumer response:

- *Purchase*: What investors would choose to add a risky asset (France Télécom stock) to their portfolios vs. either adding a safe asset or consumption?
- *Purchase size*: What is the optimal mix of risky and safe assets in an individual's portfolio?
- *Product choice*: How might investors differ in the price they might pay for down-side protection (*Multiplex*)? For shorter required holding periods (*Disponix*)?

Models of savings and portfolio choice provide theoretical bases for framing these investment decisions, where France Télécom employees must tradeoff risk, return, and liquidity. Risk can be adjusted by buying more downside protection, return could be changed by buying schemes with larger discounts, and liquidity could be altered by choosing a package with shorter holding periods. The correlation between the proposed risky asset (France Télécom stock) and the individual's stock of human capital complicates the employee decision. This section discusses the existing approaches to this portfolio selection problem, and develops a stylized model that produces empirical predictions regarding employees' investment choices.

Extant theoretical approaches

There are two principal strands of theory dealing with portfolio choice decisions, standard neoclassical models and behavioral finance approaches to the portfolio selection problem.

Standard neoclassical models, as developed in Samuelson (1969) and Merton (1969,1971), derive optimal consumption-portfolio decisions from utility maximization by rational consumers. Preferences are assumed to be well-behaved and stable, and the resulting optimal portfolio describes how a rational individual should allocate his or her savings between different assets. A number of extensions of these models consider

portfolio allocation decisions when investors have non-diversified human capital or when they face uncertain labor income. Bertaut and Halliasos (1997) solve a three period life-cycle model in which investors choose portfolios in order to buffer against long-run career uncertainty. They find that higher variance and persistence of labor income shocks reduce the holding of risky stock relative to labor income. The implications of this model would be that employees with more risky human capital would be less likely to participate in the France Télécom offerings, and on the margin more likely to prefer a scheme with downside protection like *Multiplex*.

Viceira (1997) solves an infinite horizon consumption and portfolio selection problem where labor income is subject to permanent and transitory shocks, and employees face an exogenously given probability of retirement per period. He shows that the demand for the risky asset declines as workers approach retirement, implying that younger workers would be more likely to participate in the risky France Télécom share offering. If labor income shocks were positively correlated with the risky asset (as would be expected in the case of employees purchasing France Télécom stock), Viceira demonstrates a negative hedging demand for the risky asset. This demand tends to offset the retirement savings motives, and in extreme cases, the demand for the risky asset (France Télécom stock) may be smaller for younger workers than for older ones.

Bodie, Merton, and Samuelson (1992) choose a somewhat different strategy to model labor income uncertainty. They allow human capital to be partly random and partly under the control of the investor. Their main result is that flexibility in labor supply induces higher risk taking. Negative portfolio returns are smoothed out by increased labor supply, especially for young workers, who can assume relatively more risk in their financial portfolio. This implies greater participation by younger France Télécom workers.

There is relatively little empirical work addressing how well these models perform in predicting investing behavior. Guiso, Jappelli and Terlizzese (1996) test the propositions that uninsurable income risk and expected future borrowing constraints reduce the share of risky assets in a household's portfolio. They employ the 1989 Bank of Italy Survey of Household Income and Wealth, which combines data on household asset

holdings with data on subjective assessments of income risk and demographics of 8274 Italian households. Risky financial assets are defined as the sum of long-term government bonds, corporate bonds, investment fund units, and equities. The average share of risky assets in the financial portfolio is 5.7%, and the median share is 0%. They find that the share of risky assets is lowest for young households and increases by 20 percentage points over the life-cycle to reach its peak at age 61. This supports the hypothesis that the young are more likely to be borrowing constrained buffer-stock savers, and goes against the argument of Bodie, Merton and Samuelson (1992).

A quite different theoretical approach to understanding investors' choices comes from the behavioral finance literature. This approach derives predictions about individual behavior based on a set of anomalies reported in the psychology literature and observations from experimental studies. In this literature individuals are not rational utility-maximizers as in the neoclassical framework, but instead suffer from mental biases and use simplifying heuristics when assessing decision situations.

Kahneman and Tversky (1979) first incorporated behavioral biases in a formal decision theoretic model in their prospect theory model.¹⁸ Their formulation encompasses a number of behavioral effects, one of which – loss aversion – is of particular importance for portfolio allocation. Loss aversion means that investors perceive losses relative to the status quo as worse than equivalent foregone gains, and that investors behave strictly risk-averse even for infinitesimal gambles. Hence prospect theory predicts a strong preference for certain outcomes even over favorable bets. In the context of the employee stock offering at France Télécom, prospect theory pushes investors to minimize the downside risk of their investments, while being less concerned about large up-side potentials. This might push employees toward the *Multiplix* scheme.

A related phenomenon is described by regret theory: Investors alter their behavior in order to avoid regret even if the resulting decisions are incompatible with expected utility maximization. Regret favors inaction and standard behavior, since the potential pain from regret dominates the potential gain from a beneficial decision. Clarke, Krase

¹⁸ See Laibson and Zeckhauser (1998) for a review of the impact of prospect theory on behavioral economics.

and Statman (1994) argue that because of regret considerations, investors will tend to follow the crowd. It is easier to justify a bad decision *ex-post* when everyone else made the same mistake, and more difficult when an investor made an unconventional decision. Applied to the employees of France Télécom, regret theory implies more uniformity in the investment decisions than predicted by the neoclassical framework. Regret theory itself does not give clear guidance as to what investment strategy is likely to emerge as consensus behavior.

Mental accounting as described in Thaler (1984) and Shefrin and Statman (1993, 1994) and Thaler (1998) refers to the tendency of investors to subdivide their total wealth into disjoint accounts and apply different decision rules to different accounts in isolation without pursuing overall utility maximization. In Shefrin and Thaler (1988), agents distinguish current wage income, asset income and future income, and spend differently out of the present values of these three mental accounts. Applied to the decision situation faced by the France Télécom employees, the mental accounting hypothesis casts doubt on the notion that investors consider their human capital when allocating their financial portfolio.

Another behavioral bias that might be relevant in the asset selection decision of France Télécom employees is the naïve diversification phenomenon of Benartzi and Thaler (1999). For example, some pension plan investors follow what Benartzi and Thaler call the *1/n strategy*, whereby they divide their contributions evenly across the funds offered in the plan. This strategy, if followed by France Télécom employees, could lead to significant deviations from the neoclassical optimal portfolio weights, and substantial welfare losses.

The theory of self-control has received considerable attention in the behavioral economics literature (Schelling (1984), Thaler and Shefrin (1981), Shefrin and Statman (1984)). Agents are seen as having a high myopic time preference rate and suffer from inner conflicts between myopic and long-run objectives. The problem to restrain one's short-term behavior leads to the adaptation of rules and self-imposed constraints on behavior. An example of self-restraining rules is the large role non-discretionary schemes play in retirement saving. Social security contributions and defined contribution plans are

interpreted as institutionalized rules that help individuals to overcome myopic temptations. Investors seem to follow a strict rule that prevents going into debt under almost all circumstances. The implications of self-control considerations for the employees at France Télécom are twofold: Firstly, the long holding periods of the *Abondix* and *Multiplex* packages may be attractive because they can constrain myopic consumption decisions. Secondly, if investors follow a rule against borrowing, then the fact that the *Multiplex* package was framed as including a bank loan may be detrimental to its success.

While we are able to intuit some predictions of behavioral theory, when applied to the problem at hand, it is difficult to produce clear testable hypotheses.¹⁹ While we will frame our analysis primarily in terms of neoclassical investment behavior, we acknowledge that behavioral forces could provide alternative explanations for our results.

Predictions from a simple model of portfolio selection

While the neoclassical models of investment behavior are rich, no one model is designed to capture the essence of the problem faced by the France Télécom employees. In particular, employees have risky human capital tied to the value of the France Télécom stock, have a choice of liquidity (holding period), and can buy assets with down-side protection. There are constraints on the amounts investors can put into the long-lived assets, and the bonuses and free shares cause the expected return on any asset to be a decreasing function of the invested amounts. It is not clear *a priori* what the optimal investment behavior is given this unusual investment opportunity set. As an illustration, consider the constraint that the total amount invested into the two long-lived assets cannot be larger than one quarter of annual labor income, with the loan implicit in *Multiplex* counting towards the constraint. Here the neoclassical investor cannot simply decide on the optimal asset mix on the basis of his preferences for expected return and downside protection. Instead the investor has to take into account that buying one unit less of *Multiplex* allows him to purchase *ten* additional units of *Abondix* whenever this constraint

¹⁹ Shiller (1997) discusses the difficulties in testing the behavioral approaches.

is binding.

We developed a simple, three-period model to obtain predictions with respect to the employees' decisions about participation, level of investment, and choice of investment vehicle in this particular setting. The model explicitly analyzes how employees would choose among a set of investments that are realistic representations of the choices facing the France Télécom workers. In addition to the France Télécom offerings, the investor is given the choice of a riskless asset and an additional risky asset unrelated to France Télécom. The *Appendix* details the setup of model and relates it to the existing literature. Starting from a realistic baseline calibration, we analyze the consumption, savings and the optimal period 1 investment by the worker-investor as a function of his relative risk aversion, his initial financial wealth, the level of labor income/human capital, the firm specificity of his human capital, and the idiosyncratic riskiness of labor income.²⁰ Selected predictions are discussed in the following paragraphs, and all predictions are summarized in **Table II**.

Participation rate and investment intensity. The model predicts that all employees will participate in at least one of the stock choices. At face value, as more than a third of eligible participants choose not to participate, the model obviously fails to capture some critical aspect of their decision-making.

However, the model does predict that the intensity of participation will vary across the population. Bearing out simple intuition and echoing earlier models, it predicts that employees who are more willing and able to bear financial risk hold more risky securities:

- More risk-averse employees shift away from the risky France Télécom assets

²⁰ The standard calibration of the three period model uses the following parameter values: Initial wealth W_1 equals FF 200,000 and initial labor income equals FF 180,000 p.a. The relative risk aversion (RRA) parameter is set to 5 and varied between 2 and 20. This range is arbitrary, but relates to extant empirical work. Friend and Blume (1975) find an aggregate relative risk aversion coefficient of 2. More recent findings attempt to calculate RRA coefficients for subsets of investors. Brav and Geczy (1996) find that RRA parameters for US households in 1980-1991 range from 3 to upwards of 20. Mankiw and Zeldes (1991) find RRA parameters of 36 to 100. The individual time preference rate is equal to the risk-free interest rate at 5 percent. The risk parameters in the baseline calibration are a 30 percent annual volatility for the France Télécom stock return, a 25% volatility for the orthogonal 'market' asset and a 5 percent volatility for the independent labor income shock. ρ , the parameter controlling the covariation between stock returns and labor income, is set to 0.1.

towards cash until they hold only moderate amounts of the downside protected *Multiplex*. With the baseline calibration, the predicted personal contribution falls from FF 59,800 for log-utility (relative risk aversion of 1) to FF 2,700 for relative risk aversion of 20.

- Workers whose labor income is more correlated to the firm invest less in the risky financial assets offered by France Télécom. Again with the baseline calibration, the predicted personal contribution is at FF 42,800 for no correlation and falls to FF 2,100 for strongly positive correlation between labor income and stock returns (ρ greater than 0.3).
- When labor income (human capital) increases for a given financial wealth then the intensity of participation increases, but less than proportional to the increase in total wealth. The predicted personal contribution rises from FF 13,600 for no labor income to FF 45,800 for an annual labor income of FF 2,000,000. This less than proportional increase corresponds to the hedging motive in Viceira's (1997) model: Increasing labor income while holding financial wealth constant implies that the investor has more total wealth, but also more exposure to France Télécom. While the wealth gain induces the employee to invest more, the positive correlation between labor income and stock returns dampens the desired investment. The net effect is weak and not monotone, and depends on the ratio of labor income to financial wealth²¹.
- The effect of adding idiosyncratic risk to the labor income process has an ambiguous effect on the intensity of participation. The unavoidable risk in human capital discourages risk taking in the financial portfolio, but at the same time increases the savings rate for precautionary reasons. For relative risk aversion of 5 we find the net effect on personal contribution to be positive, while for relative risk aversion of twelve it is negative.

²¹ The relationship between labor income and personal contribution is not monotonically increasing. This is due to the constraint that not more than $\frac{1}{4}$ of annual salary can be invested into the two long-lived assets combined. Whenever we increase annual salary for constant initial wealth, this constraint is gradually

Mix of investments among participants. The decision of how to allocate the personal savings among the France Télécom assets and the outside alternatives is severely restricted by the rules of the offering. Because the *Multiplix* plan delivers downside protection yet appreciation on ten shares, it is a nearly dominant security and without additional constraints would be part of all participating employees' choices. (More generally, Leland (1980) suggests that downside protected investments should be more attractive to investors who are more risk averse, and we see a similar pattern in our model.) However, due to the constraint on the total amount investable in *Multiplix* and *Abondix* combined, the investor has to trade-off each unit of *Multiplix* against ten units of *Abondix* whenever the constraint is binding. We focus on the predictions for the relative allocations to the France Télécom assets, since any holdings of outside risky or riskless assets are not observable to us. The model abstracts from the distinction between *Disponix* and *Simplix* and analyzes the choice between the long-lived assets *Abondix* and *Multiplix* and a short-lived asset based on France Télécom stock.

- As relative risk aversion increases, the investor's portfolio of France Télécom assets shifts from 87% in the short-lived asset with relative risk aversion of 1 to 100% in *Abondix* with relative risk aversion of 5 and finally to 100% in *Multiplix* with relative risk aversion of sixteen and higher.
- As the firm-specificity of human capital (ρ) increases, the pattern is very similar to increasing relative risk aversion: With no correlation, the portfolio of France Télécom assets is 71% in *Abondix* and 29% in the short-lived asset, shifts to 100% in *Abondix* with ρ equal to 0.1 and finally to 100% in *Multiplix* with ρ equal to 0.3 and larger.²²
- When labor income increases for given financial wealth, the investor shifts

relaxed, essentially enlarging the investment opportunity set available to the investor.

²² The effects of risk aversion, human capital, firm-specificity of human capital and idiosyncratic labor income risk are not always monotone. An investor with low risk aversion or low exposure to France Télécom may buy *Multiplix* purely to capture the high returns, an investor with medium risk aversion or medium exposure may not buy *Multiplix* due to the constraint on the combined investment into the long-lived assets, and an investor with high risk aversion or high exposure may again buy *Multiplix* to take advantage of the downside protection. We find these non-monotonicities to be a robust phenomenon in our calibrations, but they are not large enough to reverse the broad patterns described in the text.

from the short-lived France Télécom asset to *Abondix* and finally to *Multiplix*. With no labor income, the investor is 100% in the short-lived France Télécom asset, shifts to 100% in *Abondix* with annual labor income of FF 100,000 and finally to 100% in *Multiplix* with labor income of FF 1,000,000. This pattern is caused by both the income-based constraint on the total investment in long-lived assets and by the negative effect of increased human capital on the desire to take on additional exposure to France Télécom.

In our model, as the willingness or ability to take additional exposure to France Télécom decreases, the average holding period of the portfolio of France Télécom assets *increases*. This result is due to the investors' ability to substitute away from the France Télécom assets in favor of outside assets. For very low risk aversion, no firm-specificity of human capital or little human capital relative to financial capital, the slightly discounted short-lived France Télécom asset is part of the optimal portfolio. Increasing either risk aversion or the exposure to France Télécom causes the investor to replace the short-lived asset by assets unrelated to France Télécom, leaving only the long-lived France Télécom assets in the observable portfolio.

The model delivers a set of predictions about the factors that should drive participation, extent of contribution, and the mix of stock plans utilized. These predictions are framed with respect to a handful of theoretical parameters: the amount of labor income, the firm specificity of that labor income, the idiosyncratic risk of that labor income, and the employee's risk aversion. The empirical challenge is to find the best-possible proxies for these parameters, which we discuss in the following section.

5. Data description

Our data set consists of a unique database of 205,076 current and former employees of France Télécom. The data was kindly provided to us by France Télécom's Internal Shareholders Department. For each individual we have data on age, gender, job tenure, job category, salary level, whether the employee is currently employed or retired, and the location of the employee's business unit. We also have information on the number of shares demanded and obtained by each employee. Finally, we have the postal

code of the employee's home, which we have matched to demographic data from the INSEE, the French government statistical agency. **Table III** provides summary statistics for some of the observed variables.

Amount of human capital: The present value of labor income (human capital) is a function of the current level of salary, its growth rate, and the time horizon over which salary will be received. *Current salary* captures the first component and *age* captures the third aspect of human capital, with younger workers generally having more human capital (future value of labor income) than older workers. In addition, we can identify *retirees*, whose human capital (future labor earnings) is presumably small.

Firm specificity of human capital: We have a number of proxies for the firm-specificity of human capital. First, we can identify *former (non-retired) workers* versus current workers. The former would have no France Télécom firm-specific capital, as they were no longer in the firm's employ. For current workers, we use *job tenure* as a proxy for firm-specificity of human capital. Prior theoretical and empirical research suggests that tenure is a relatively good measure of this variable.²³ In the empirical analysis, we distinguish the tenure effect between civil servants and non-civil servants. While the

²³ A number of theoretical rationales can be found in the labor and contracting literature why higher job tenure should be associated with higher salaries and human capital. Following Becker (1964), the simplest models assume the acquisition of firm-specific skills over time, which increase the marginal productivity on the current job, but are useless when the current employment relationship is terminated. Wages that rise with job tenure leave workers with a stake in the specific value of the employment relationship and thus provide incentives for the acquisition of firm-specific skills. A different strand of the literature relies on search and matching models to explain the relationship between tenure and human capital. In Jovanovic (1984), the quality of the match between employee and employer reveals itself gradually over time. Good matches are more likely to survive than bad matches and result in a higher marginal product and wage payment to the worker. While Jovanovic deals only with voluntary unemployment, the effect of involuntary layoffs in his framework is straightforward: A well-matched employee has on average longer tenure and more to lose from the termination of the relationship. The reduction in human capital through an involuntary layoff is equal to the monetary value of having found a good match. The empirical evidence on the relationship between job tenure and firm-specific capital is convincing. Topel (1991) finds that 10 years of current tenure raise the wage of the typical male worker in the US by more than 25 percent above and beyond the effect of general labor market experience. Workers with longer prior job seniority suffer substantially greater losses from lay-offs than worker with less prior tenure. A person with 15 years of current tenure would suffer an immediate 33% loss in salary if his or her job were exogenously terminated. Topel interprets his results as evidence of firm-specific human capital acquisition over time. This interpretation has been challenged by Williams (1991), who presents evidence that Topel's results are more likely to be due to differences in the quality of the match between employer and employee. For our purpose, the two interpretations are equivalent, since both imply that an employee with higher tenure will suffer greater losses through an exogenous termination of the employment relationship.

firm-specificity of human capital increases in tenure for both groups, we would anticipate that the job security implicit in the civil servant status makes this effect less relevant for civil servants. We use the log of tenure, rather than tenure itself, because firm specificity of human capital is probably non-linear: an employee will likely acquire more firm-specific skills in his first two years in the company than in his last two.

Idiosyncratic shock to human capital: The possibility of a sudden shock to human capital should affect the workers investment decision. Here we exploit the differences between the *civil servant employees* of France Télécom and the non-civil servants. The former have much more job security than the latter and thus, we argue have lower levels of idiosyncratic labor shocks.

Financial wealth: We do not directly observe the financial wealth of the workers, but we constructed two instruments to proxy for this variable. First, we know the postal code for each worker's home. We match these postal codes to the INSEE (French National Statistical Service) database, and use the average income of the households in the same postal code as a rough measure of wealth. Our logic is that choice of residence is a function of wealth (and income) and given the large disparities between towns and neighborhoods, it captures some of the unmeasured variation in household wealth.

We also construct a second measure of wealth, based on the idea that financial wealth is related to accumulated salary. Workers that earned higher salaries and who are older have an opportunity to accumulate greater financial assets. We create a rough measure of this opportunity for accumulation with an *interaction term* that multiplies current salary by the years in the work force (age minus 18). This is a crude instrument for family wealth, as it fails to capture elements like inherited assets, spouse's income, and spending needs (function of family size and age.)²⁴ In a multivariate setting, it is difficult to interpret, as it must be evaluated alongside of the age and salary variables from which it was constructed.

²⁴ The correlation between the INSEE measure and the years in the workforce times current salary is 0.68, indicating that they capture similar economic factors.

Other control variables: To test Viceira's predictions that time to retirement can affect employee's retirement motives to invest in risky assets, we also control for employee *age* and *age-squared*. Age is a variable that could have many interpretations in this analysis. Not only does it capture years to retirement, but also it affects human capital, financial capital and the ratio of the two.²⁵ Younger people have large future labor income but smaller financial assets, whereas older people have smaller remaining future labor income and larger financial assets. At some point, financial assets begin to dwindle as people use them to pay for children's education, support of aging parents or retirement, and to capture this non-linearity, it is appropriate to include not only an "age" variable, but a squared age term as well.

Prior research, such as Barber and Odean (1999) suggests that men and women make different investment decisions. They attribute this to differences in self-confidence, but more generally gender differences could reflect other factors as well, such as risk aversion. To account for these differences, we include *gender* as a control variable.

Omitted variable bias and risk aversion: In spite of the uniqueness and breadth of our database, we acknowledge that some potentially very helpful data have not yet been made available. For example, we have no information on employees' marital status, number of children, whether their spouse is an employee of France Télécom, and whether the employee is a homeowner: clearly, such variables have bearing on France Télécom employees' participation in the share offering. Nor do we have information on employees' promotion history, union affiliation, training, or other portfolio holdings, which may have influenced employees' attitudes toward the offering.

While some of these variables might be made available at some time, the one key variable that will always be unavailable is risk aversion. However, other observable variables could be related to risk aversion. Absolute risk aversion should decrease with total wealth and income. Wealthier workers may be more willing to buy risky assets than less wealthy workers. The endogenous decision to become a civil servant may reflect higher risk aversion; if so, civil servants might be less likely to participate in the offering.

²⁵ See the discussion in Bodie, Merton and Samuelson (1992).

Risk aversion may change over a person's lifetime, so older people may become more risk averse. Risk aversion could differ between men and women. It is prudent to remember that there is no independent measure of risk aversion, virtually all observable variables may be correlated with it, and thus it may be difficult to interpret the empirical results.

6. Empirical results

In this section of the paper, we analyze the behavior of all individuals to whom the investment schemes were offered. The discussion is divided in five parts. Part (a) reports the frequency with which different groups of individuals participated in the offering. Part (b) deals with the amounts individual investors offered to invest into the schemes. Part (c) analyzes how individuals allocated their investment among the portfolios with different attributes. Specifically, we study the holding period selected by employees and the degree to which they sought down-side protection on their shares through the purchase of *Multiplex*. Part (d) discusses the relation between the participation and personal contribution results and our tentative explanation: threshold effects. Part (e) presents possible behavioral explanations for our findings.

(a) *Participation*

While the theoretical model we developed predicted nearly universal participation in the offering, only 62.8% of eligible current and former employees participated in the France Télécom offering. This first-order mismatch between our simple model and reality probably reflects the over-simplified nature of the model as we discuss in section (d).

We predict that employees with the lowest human capital exposure to France Télécom stock should be the most willing participants in the offering. The participation ranking should then be (1) former employees and retirees, (2) currently employed civil servants, and (3) currently employed non-civil servants. Among current workers, higher tenure should be inversely related to participation. **Table IV** presents univariate participation percentages for different groups of potential investors. The observed ranking of participation by employee groups is the exact opposite of our model prediction.

Current employees were more likely to participate than non-retired former employees (68% vs. 22%). Among current employees, non-civil servants participated more than civil servants (74% v. 67%).

Our model predicts that employees with higher labor income and especially wealthier employees should be more willing to invest. **Figure 4, Panel A** reports participation rates by salary grade. As predicted, employees with higher salaries (and presumably greater wealth) are more likely to participate. In the extreme, participation among the “cadre dirigeant” or executives was 100%.

To check whether these univariate results are driven by heterogeneity among employees in other dimensions, we run a probit regression of the probability of participation on individual characteristics, reported in **Table V**. Consistent with the univariate results, former employees were less likely to participate than are current employees. To gauge the economic effect of the various factors, we calculate the marginal probabilities from the Probit, setting all other variables at their mean levels. Former (non-retired) workers are 72 (40) percentage points less likely to participate than current workers. The reluctance of former employees to participate despite their lack of firm-specific capital in France Télécom may perhaps be explained by any number of factors not included in our model. First, they could only choose from a subset of the plans; the two most financially attractive packages (*Abondix* and *Multiplix*) were not offered to them. It may also have been harder to market the offering to retirees and former employees, as they were not physically present at France Télécom at the time of the offering.²⁶ They may have had pessimistic views of the future of France Télécom, evidenced by their decision to leave the firm.²⁷

Employees with higher salaries and greater financial wealth (as proxied by the INSEE measure or a constructed wealth measure) are more likely to participate. Inspecting the relationship between salary grades and coefficients, there is nearly a

²⁶ Marketing efforts may also have been impeded by legal uncertainty as to which former employees were eligible.

²⁷ However, the evidence from previous French privatizations was that substantial short-term and long-term abnormal returns had been realized (See footnote 4).

monotonically increasing relationship between salary levels and the propensity to participate, even after controlling for age, tenure, civil servant status and job category. Moving from the lowest salary grade for “ordinary employees” to the lowest salary grade for “middle managers,” the probability of participating increases by 52-58 percentage points. These findings are consistent with the notion that employees with greater total wealth have lower absolute risk aversion and are therefore more willing to invest in risky assets.

We predicted that civil servants, facing more certain labor income, might be more willing to participate. They are not. In **Table V**, we see that they participate less frequently in the stock plans than do non-civil servants. Based on the probit marginals evaluated at the means, civil servants are about 5 percentage points less likely to participate (calculated from the second specification in **Table V**). One explanation for the lower participation among civil servants could be higher average risk aversion, evidenced by their revealed preference of taking a civil servant position. An alternative explanation is that perhaps some residual opposition against the privatization existed. Such opposition may have been more likely among employees who joined France Télécom fully expecting a lifelong public sector career, and who may have felt betrayed when France Télécom turned itself into a capitalist entity.

If tenure captures firm-specificity of human capital, longer-tenure workers should be less likely to participate. The evidence in **Table V** gives weak support to this prediction: among current employees, both civil servants and non-civil servants, workers with longer tenure were less likely to participate. However, this effect is small. A current worker with tenure one standard deviation above the mean is less than 0.5 percentage points less likely to participate than workers with tenure at the mean. The small magnitude of this coefficient could reflect the observation that there is little human capital risk at FT, and hence only minor effects of differential firm-specific human capital.

We find that older employees are less likely to participate in any of the stock purchase plans, with workers one standard deviation older about 2% less likely to participate. According to Viceira’s (1997) model, investors closer to retirement will be

more risk-averse, since they expect their propensity to consume out of wealth to go up soon. Hence our finding is consistent with the idea that this negative effect of age on the demand for risky assets overwhelms the positive effect of diminished firm-specific human capital on the hedging demand for the risky asset.²⁸ In the extreme, we see that retirees are much less likely to participate in the stock plan than are current workers, also consistent with Viceira’s hypothesis. Retirees were 42-47% less likely to participate, evaluating the probit coefficients at their mean values.

Finally, while we have no clear hypothesis for why gender should affect the decision to participate in the stock plans, it does have an effect. Women were about 4-6% more likely to participate than men. This might result from differences in family status: French households are more likely to have two incomes if the woman works than if the man works. It could also reflect differences in risk aversion²⁹, or a more careful reading of the plan documents. We merely report the result as consistent with the notion that gender has some impact on this investment decision.

(b) *Personal contribution*

The simple neoclassical model we develop predicts that the “average worker” (as determined by our baseline calibration but with no human capital at risk) should invest about 26,000 FF in the offer (see **Table VII, panel B**). This actual investment among workers, conditional on participating, is roughly this amount, as shown in **Panel A** of **Table VII**. This equivalence is mildly comforting, in that it suggests that the model is capturing results of a similar order of magnitude to those we observe in the data.

Does human capital—and the firm specificity of that human capital—affect the *amount* employees choose to invest? In **Figure 2, Panel B** we graph the desired contribution against tenure (our proxy for firm-specificity of human capital) for currently employed individuals in different age groups. We expect the human capital effect to be

²⁸ The hedging demand is negative due to the positive correlation between human capital and stock returns. For a given level of wealth and firm-specificity of human capital, diminishing human capital makes the negative hedging demand smaller in absolute value.

²⁹ Sunden and Surette (1998) document that women invest their retirement savings more conservatively than do men, even after controlling for marital status, age, and risk return/preferences.

strongest for individuals in the middle of their career (in the age group 35 to 50): individuals in this age group have a significant portion of their total wealth in the form of firm-specific human capital and display a wide spread in individual job tenure. **Panel B** in **Figure 2** illustrates that the desired contribution is strongly decreasing in tenure for current employees in this age group. For all other groups the relationship is essentially flat.

Table VI summarizes the requested amounts (conditional on participation) and the average ratio of personal contribution to monthly salary for subgroups of employees.³⁰ While retirees and not-retired former employees were less likely to participate, when they do invest, they make comparatively large investments. We discuss this finding in section (d) below.

In **Panel A** of **Table VII** we present observed personal investments by employees with different levels of wealth and income, and contrast them with selected predictions from our model in **Panel B**. As we note above, the model predictions are of the same order of magnitude as the observed behavior. Furthermore, investments differ markedly among various subgroups of employees, both in theory and in practice.³¹

To more thoroughly analyze these relationships, we carry out three multivariate analyses of personal contribution on individual characteristics: Tobit, double-hurdle and a truncated regression model.³² Unlike the Tobit model, the double hurdle and truncated regressions frameworks allow the determinants of the participation decision to differ from the amount of investment decision without merely throwing away zero-investment observations and biasing the results. This added flexibility can accommodate several reasonable deviations from the standard choice setting: Even when the optimal contribution level is non-zero, participation may still not occur due to search, information

³⁰ The data for monthly salary was available only as averages for the three employee groups of (1) workers and technicians, (2) middle managers and (3) managers. Executives and employees of France Télécom subsidiaries were dropped from the sample for this analysis.

³¹ We cannot exactly match the predicted to actual investments because we have a noisy measure of financial wealth. As we move from low to high salary levels in **Panel A**, we cannot hold financial wealth constant.

³² We focus on the investment amounts demanded as opposed to the amounts granted. Due to the oversubscription of the offering, the actual invested amounts were smaller than the stated demand in many cases.

and transaction costs. Similarly, the potential investor may first decide whether the offering is worth analyzing, and only if the answer is in the affirmative, go on to decide the desired contribution level.

The truncated regression specification (which we report in **Table VIII**) uses a MLE framework, correcting for the bias that would occur if one merely ignored the non-participation data (See Hausman and Wise (1975) or Greene (1993)). The double-hurdle specification is closely related to the censored regression model first proposed by Tobin (1958) and the sample-selection models described by Heckman (1976). It follows the model of Cragg (1971), in which the first-hurdle is a probit model for participation, and the second hurdle is a censored regression for the contribution level similar to Tobin's model. We estimate both equations simultaneously using full information maximum likelihood.³³ The results of the truncated regression and double-hurdle models are similar, and differ markedly from the Tobit model.³⁴ The Tobit results are consistent with the probits reported in **Table V**, which suggests that they are dominated by the participation decision. However, the analysis of contribution amounts under the double-hurdle and truncated regression methods suggests that there may be substantial differences between the decisions of whether and how much to participate. We therefore focus on the results from the double-hurdle and truncated regression model in this section.

In **Table VIII**, we find a negative effect of tenure on invested amounts for current employees, whether civil servants or other employees.³⁵ This result is consistent with the prediction from our model that as human capital becomes more firm specific, the amount invested should fall. However, the magnitude of the effect is modest. One standard deviation of tenure above the mean is associated with 5.6%-8.6% less investment. Surprisingly, the larger effect is for civil servants whose firm-specific human capital should be less at risk.

³³ For an in-depth treatment of limited dependent variable models with selectivity, see Lee (1983). A recent application of the techniques employed in this section can be found in Maki and Nishiyama (1996).

³⁴ Because of this similarity, we do not report the results of the double-hurdle model.

³⁵ This result is driven primarily by the subgroup of male employees; for female civil servants and female non-civil servants, there is no relationship between tenure and amount of contribution.

In addition, we see that higher-paid workers and those with greater wealth (as measured by the INSEE measure) are not only more likely to participate, but also to invest more in the stock offering plan. Moving from salary grade 11 to salary grade 31 (31 to 41) results in a 62% (51%) increase in personal contribution. These results are also consistent with the comparative statics from our model. While the model predicts a less than proportional increase of personal contribution as a function of labor income, this prediction is derived holding wealth constant. Clearly the INSEE measure is an imperfect proxy for wealth, and the labor income coefficients are likely to pick up much of the residual variance in wealth.

However, the situation with respect to age, civil servant status, retirees/former employee status and gender is complicated. The Tobit results mimic those of the probit: older workers, civil servants, men, former employees and retirees are *less* likely to participate. However, the double hurdle or truncated regression models suggest that conditional on participating, these participants invest *more* (or no less than) than others.³⁶ This is strong evidence that the decisions of whether and how much to invest may be driven by different factors. We further discuss this issue in subsection 6 (d) below.

(c) *Type of Offer*

How did participating employees allocate their funds among the four plans? **Table IX, Panel A** reports the actual frequencies with which the different assets are chosen. For current employees, the two long-horizon plans with large discounts were favored: *Abondix* is the most preferred package, followed by *Multiplix*.³⁷ **Panel B** reports the frequencies of particular asset combinations by different groups of individuals. For current employees, pure *Abondix* is by far the most preferred choice, followed by the *Abondix-Multiplix* combination. Employees heavily weighted their portfolios to long-horizon/high discount offerings, with all but 2.2% of participating employees buying *Abondix*, *Multiplix* or both. We also see this in **Table VII**, which reports that the average

³⁶ The marginal effects on personal contribution are as follows: retired workers: 15% more; former employees: 17% more; women: 18% less; and 10 years older: 9% more.

³⁷ The numbers in **Table IX, Panel A** do not add to one because portfolios may contain multiple assets.

participant selects a plan with required holding period of 4.6 years, thus heavily tilting his portfolio to the long-horizon plans. In general, the average employee portfolio is very much like the the utility-maximizing portfolios we derive from our model.

Our model not only suggests the overall composition of the “optimal portfolios,” but also how portfolio characteristics should vary among participants. We would expect the wealthiest participants to invest in short-horizon plans, as they were limited in their participation in long-horizon plans. Similarly, we would expect that the fraction of the portfolio that is downside protected (invested in *Multiplix*) should rise with risk aversion, firm-specific human capital exposure, and idiosyncratic risk. Due to the limits on the French Franc contributions on *Multiplix*, it should decline as a fraction of holdings for wealthier workers. **Figure 3** plots actual portfolio allocations by employee characteristics. **Panels A to D** present the averages of the portfolio weights chosen by current employees as a function of salary grade, age, tenure of non-civil servants and tenure of civil servants respectively. (*Simplix* and *Disponix* have been aggregated into a single measure labeled “stock” to facilitate comparison with the model predictions.) The graphs show that liquid assets are more popular with very young and very old investors. This observation conforms with general neoclassical model predictions: These employees are most likely to need to consume out of their investments between the offering date and the maturity of the long-lived assets.³⁸ However, tenure—our measure of firm-specificity of human capital—has no material effect on the chosen portfolio allocations. The marked increase in weightings in the short-term “stock” choices for better paid workers in **Panel A** is inconsistent with the theoretical predictions.

In **Table X**, we analyze the composition of the chosen portfolios as a function of employee characteristics. We stress the functional characteristics of the portfolios: the average chosen holding period and the fraction of the portfolio protected by puts (invested in *Multiplix*). This analysis is conducted only for employees who chose to contribute and is limited to current employees (as former employees and retirees did not

³⁸ While this is most certainly true for very young employees, one might argue that old employees close to retirement have accumulated significant lifetime savings. Since we do not observe financial wealth, we cannot test whether the near-retirees purchase stock despite having a large buffer-stock of savings.

have access to the longest horizon or payoff protected plans.)

With respect to holding period, we have several testable hypothesis: Holding period should increase in the firm-specificity of human capital, in relative risk aversion and in labor income. We see the first two effects in the first column of **Table X**. As we predict, chosen holding periods rise with tenure, our measure of firm-specific human capital, and is higher for civil servants, who are likely to be more risk averse. Holding period should decrease with initial financial wealth, which is confirmed by the negative coefficient on the INSEE wealth measure. The finding that holding period decreases in labor income is inconsistent with our predictions, and again most likely caused by insufficient control for wealth. (Salary and wealth effects should go in opposite directions, and the more precise salary variable is probably picking up wealth effects.) In addition, we find that women choose longer holding periods than men.

The second column in **Table X** analyzes the fraction of the portfolio invested in *Multiplix*, the plan with downside protection. Our model predicts the desired downside protection to be increasing in relative risk aversion, firm specificity of human capital, labor income and weakly in idiosyncratic labor income risk. Consistent with the predictions, we find that the downside-protected share is increasing in tenure. The result that civil servants, whom we expect to be more risk averse, purchase less *Multiplix* goes against our predictions. The effect is barely significant though and most likely caused by civil servants having less idiosyncratic and firm-specific risk in their labor income. Labor income decreases the downside-protected share, which is again most likely due to insufficient controls for financial wealth. Given the limitations on the amount that employees could invest into *Multiplix*, our model predicts a strong negative coefficient on wealth. This prediction is confirmed by the negative coefficient on the INSEE wealth measure.

Overall, a few preliminary salient facts emerge from the analysis of portfolio allocations. Investors seem undeterred by long holding periods. Over 90 percent of currently employed participants choose some assets with the five-year holding periods, and over 90 percent of former employees choose some assets with a two-year holding

period.³⁹ The portfolio compositions are roughly consistent with our predictions regarding wealth and firm-specific human capital, suggesting that the neoclassical model is not at odds with the data.

(d) Reconciling participation and personal contribution: A threshold effect

To us, the most puzzling finding is that decisions of *whether* and *how much* to invest seem to be driven by different factors, rather than result from a single optimizing decision by employees. Specifically, older workers, civil servants, men, former employees and retirees are less likely to participate, but conditional on participating, these participants invest more than others. One possible explanation is that a threshold level of desired investments must be attained for participation to occur. For some groups, this threshold may be higher, and therefore conditional on meeting it, personal contribution is higher.

What might account for such a threshold? Our suspicion, reinforced with our discussions with management, is that our findings could be explained by the “cost” (in time and effort) for employee to evaluate the France Télécom offer, which was not trivial, especially workers not used to investing in the stock market. The offering documents sent to employees include a fair bit of legal paperwork, and as section 3 attests, analyzing the nuances of the four different plans can be taxing (even for finance academics!) We suspect that investors with less investable funds, perceiving less of a benefit from reviewing the offer, might simply choose to ignore the paperwork, but those with more investable funds might have taken the time to complete their analysis. As in models with search costs, the employees for whom this “analysis” cost is higher are less likely to participate, but conditional on participating will invest more.

Testing this explanation is hard because it is not obvious why this “analysis cost” should vary across groups. It could be that various groups differ in their innate levels of diligence (for example, male employees may have spent less time analyzing the offering in detail than female employees) but we have we no way of measuring these differences.

³⁹ The assets with five-year holding periods were not available to former employees.

France Télécom assured us that the marketing effort devoted to the offering was spread evenly across employees, so there is no reason to think that some employees got better access to information than others. However, it seems clear from our conversations with managers that the marketing effort was significantly lower toward former employees and retirees than toward current employees. Having former employees and retirees invest in France Télécom was not a top priority of management. This difference was reflected in the marketing effort: the offering was “pushed” toward current employees, not toward former employees or retirees. Current employees could hear presentations on the offer and compare notes with one another, former employees had to make the decision on their own. We hypothesize that this difference could explain the difference in participation and personal contribution. If “search costs” were lower for current employees, and according to our threshold story, we would expect the determinants of participation and personal contribution to diverge less for current employees than former employees or retirees. Comparing **Tables VI** and **IX**, we find that such is indeed the case, lending support to our threshold explanation.⁴⁰

While we believe the threshold story is quite plausible, we are open to alternative explanations. Another possibility is that these differences could be attributed to certain groups of employees attempting to “game” the system by requesting more shares than they actually wanted, in order to end up with a post-rationing amount they desired. As we note earlier, the rationing rules were not announced in advance, so it may have been difficult to place orders strategically. Further, we were told that employees were surprised that any rationing took place, suggesting that their requested investments were their desired investments. Nevertheless, suppose employees were completely prescient, and could predict how many shares they would be allocated conditional on their requests. Then, it would be appropriate to analyze the not their original orders, but their *post-rationing allocations* of shares. When we repeated **Table VIII** using the *ex post* measure of wealth invested, the results are virtually identical to those we report in the table. This

⁴⁰ Under the assumption of non-zero thresholds for participation, the truncated regression and Tobit regression in **Table IX** are misspecified. Both regression models assume a threshold level of zero, and the estimated coefficients will be biased when the true thresholds differ from zero.

suggests that while gaming may have been a problem, it cannot explain the inconsistency between the determinants of participation and investment amount.

(e) Can behavioral decision theory explain France Télécom employees' response to the offering?

Behavior finance, grounded in the psychological aspects of decision making, provides alternative explanations for only some of the empirical results we report here. Based on a naïve understanding of loss aversion, we would have expected *Multiplix* to prove to be even more attractive than our model predicts, as it offered complete downside protection, as well as a sizeable share of the upside on the France Télécom stock. However, more than half of participants invested nothing in *Multiplix* (**Table IX**) and the fraction of contribution in protected shares was not substantially larger than we anticipated (**Table VII**.) Far from being "irrational," employees seem to have correctly recognized the subtle constraints put on the combined investment in *Multiplix* and *Abondix*, whereby it can be optimal to substitute *Abondix* for *Multiplix*.⁴¹ We can only conjecture that loss aversion was either not sufficiently strong or may have conflicted with a self-control rule against borrowing: the fictional bank loan embedded in *Multiplix* may not have been recognized as fictional.

The small size of the human capital effects may be due to many factors⁴², but could be consistent with the mental accounting hypothesis (Thaler 1998). If employees assigned their France Télécom human capital to a different account than their France Télécom financial capital, they will not have perceived the increased risk exposure due to the correlation of the two. Given the mental accounting effects documented in the behavioral literature when just money is at stake, the mental separation of human and financial capital is plausible.

⁴¹ Employees also did not follow a naïve 1/N rule, attempting to equally allocate their funds among all choices, as has been found in other circumstances. See Bernartzi and Thaler (1999.)

⁴² If tenure is an imperfect measurement of the firm-specificity of human capital, the coefficient on tenure in our regressions will be attenuated. More importantly, human capital may not be greatly at risk in France.

Loyalty effects may have been at work in the offering. Employees in the high-salary range may be better performers and therefore feel greater loyalty to France Télécom, and express it through more participation and more personal contribution.

We find these *post-hoc* behavioral explanations of our findings unsatisfying, in part reflecting of what Laibson and Zeckhauser (1998) label the “promiscuous prediction problem”: behavioral theories may yield opposite predictions, and allow too many degrees of freedom. However, as Laibson and Zeckhauser note, “the promiscuous prediction problem also plagues mainstream economics. Both behavioral models and standard economics models are often so flexible that almost any outcome can be explained by them.”

7. Conclusions

The “opening of shareholding” at France Télécom offers an interesting setting for analyzing the investment decisions of individuals with human and possibly financial capital at risk. We develop a neoclassical model that attempts to capture the essential features of the decision facing employees, and compare the predictions of our model to the observed participation of France Télécom employees.

The data are consistent with many predictions from the simple neoclassical model. In general terms, we expect that employees who are better able and willing to bear risk will participate in the stock offers. We find evidence to this effect. Wealthier workers and those who are better paid are more likely to buy shares in France Télécom, consistent with the predictions of the model, and invest more in the firm. They also invest more in short-horizon assets and less in *Multiplex*, given the plan limitations on their investments in long-horizon assets.

Our most surprising finding is that the decisions whether to participate and how much to invest are driven by different factors. It seems that a threshold level of desired investments must be attained for participation to occur, perhaps because of the cost to employees of analyzing the offering. We interpret this finding as manifesting to the importance of marketing efforts in the employee stock offering, but recognize that alternative explanations might be at work

Our empirical analysis reveal two other puzzles: human capital considerations suggest that former employees should have been the most eager participants, followed by currently employed civil servants, and finally by non civil servants. We find the opposite pattern. To be sure, we do find some evidence of human capital effects, but they are small: one standard deviation of tenure above the mean is associated with 0.5% less likelihood of participation, and with 5.6%-8.6% less personal contribution, conditional on investing. Secondly, we find that men and women invest differently with respect to their likelihood of participating, the levels of their investments and their chosen portfolios.

In future versions of this work, we hope to have access to finer measures of the empirical variables and establish our findings with some greater confidence. Even if we were to succeed in getting more data, we acknowledge that empirical work of this sort is almost by definition messy and incomplete. Nevertheless, further empirical studies of investor behavior, while imperfect, can yield new insights into the investment decision-making process of households.

Appendix

Setup of a simple model of portfolio selection

Our stylized three-period model provides intuition and testable predictions of the determinants of portfolio choice in a setting with risky labor income, incomplete markets and a binding choice of holding period. Markets are incomplete along three dimensions: Firstly, there is no borrowing at either the risky or riskless rate. This extends the liquidity constraints which have gained prominence in the literature on precautionary savings (Browning and Lusardi (1996)). Second, idiosyncratic labor income risk is not insurable. Since labor income is exogenous in our model, the associated risk is related to the concept of unavoidable background risk (Gollier and Pratt (1996)). Finally, there are no markets in the long-lived assets between the date of purchase and the maturity date.

There are two distinguishing characteristics of our model. First are the state-dependent period two budget constraints: An investor cannot sell any of the long-lived assets purchased in period one to finance consumption or new investments in period two. Thus the period two consumption and investment decision depends on three factors: The amount of consumable financial wealth, realized period-two labor income, and the value of and composition of the non-consumable portion of financial wealth. Second are the numerous discounts, matching bonuses and free shares as well as the constraints on the amounts that can be invested. It is not clear whether the general predictions from the portfolio selection literature continue to hold with this unusual investment opportunity set, which we therefore model explicitly.

Worker-investors choose their investment and consumption in three periods, subject to shocks to both risky financial assets and risky labor income. The investment choice set—modeled to closely reflect the choices facing the France Télécom workers—includes the assets from the France Télécom offering and additionally the standard risk-free asset and a risky asset unrelated to France Télécom.

In the first two periods, the investor decides about his current consumption and about the composition of his financial portfolio. In period one, the investor has the choice between five different assets. The first asset is the standard risk-free bond. The second asset is a slightly discounted share in France Télécom. The share can be traded in

period 2, and is meant to represent a simplified version of the *Disponix* and *Simplix* products, which have short holding periods (one and two years respectively) in exchange for reduced purchase discounts.⁴³ To capture the discounts, the investors receive free shares as a function of the number of shares purchased based on the actual terms of the *Disponix* offering.

Additionally, there are two illiquid, long-lived assets based on the France Télécom stock. These assets cannot be sold in the intermediate period, such that any investment has to be held until period three. The first illiquid asset, *Abondix*, is nothing more than the standard France Télécom stock, sold at a 20% reduced price. *Abondix* also comes with a matching bonus and delivers a number of free shares as a function of the number of units purchased. The second long-lived asset, *Multiplix*, is downside protected: Investors have to pay the same price as for *Abondix* and are guaranteed a return of 25% on their personal investment in period three. On top of the guaranteed repayment, investors receive a matching bonus in period one and ten times the positive difference between the period three share price and the period one share price as final payoff. *Multiplix* thus delivers the upside on ten shares for each share purchased, and the guaranteed personal investment is augmented by an additional matching bonus.⁴⁴

The model takes into account the rules applied to the granting of bonuses and free shares in the offering, and incorporates the constraints put on the amounts that can be invested into the long-lived assets. In particular, for each level of period one labor income, not more than 25% of this amount can be invested in *Multiplix* and *Abondix* combined. The bonuses as well as the implicit leverage in *Multiplix* count towards the constraint.⁴⁵

Finally, the period one investment opportunity set contains a risky asset unrelated to France Télécom. This captures the possibility to invest into the stock market or other

⁴³ In reality, *Disponix* and *Simplix* have different number of free shares, purchase discounts and holding period tradeoffs which we do not adequately capture in our simple model. We make this simplification in order to concentrate on the longer-lived assets and to make the model more tractable.

⁴⁴ For simplicity, we ignore tax considerations and subsidized financing.

⁴⁵ The rules under which the discounts, bonuses and free shares are granted as well as the relevant constraints are described in detail in the body of the paper.

risky assets independently from the France Télécom offering. Realistically, one would have to take into account that the French stock market, and probably most risky assets available to French retail investors, are correlated with the return on the France Télécom stock. Instead we make the simplifying assumption that the return on the unrelated risky asset is orthogonal to the return on the France Télécom stock.

In period two, the investor has to hold on to any illiquid assets *Abondix* and *Multiplex* bought in period one. He then faces the standard consumption-savings decision, and has to allocate any additional savings between the two short-term risky and the riskless asset. The only assets available for investment at in period 2 are risk-free bonds, standard France Télécom shares and the independent risky asset. We assume that the investor receives no utility from bequests and consumes all his wealth in period three.⁴⁶

The uncertainty in our model unfolds as follows. The one-period return on the France Télécom share is given by:

$$R_{FT,t} = R_f + \text{premium} + \varepsilon_{FT,t} \text{ for } t = 1,2$$

where $R_{FT,t}$ is the gross risk-free rate, premium is the equity premium and $\varepsilon_{FT,t}$ is a mean-zero shock to the stock return between period t and period $t+1$. Similarly, the return on the unrelated risky asset is given by:

$$R_t = R_f + \text{premium} + \varepsilon_t \text{ for } t = 1,2$$

The investor in our model receives labor income in each period. Period one labor income L_1 is known with certainty, but second and third period labor income is risky. It is subject to two random shocks, one of which corresponds to the shock to the France Télécom stock. This formalizes the notion that human capital is a risky asset, and related to the performance of the employing firm. The second shock represents idiosyncratic labor income risk, such as illness, layoffs, or unexpected income windfalls. Shocks to labor income are persistent, such that a shock at $t=2$ affects income at $t=3$. Formally, period 2 labor income is given by:

⁴⁶ We are in the process of extending the model to reflect a longer investor horizon. For this time, we reflect this concern by over-weighting utility derived from $t = 3$ consumption (ending wealth).

$$L_2 = L_1(1 + \rho \cdot \varepsilon_{FT,1}) \cdot (1 + \varepsilon_{L,1})$$

where $\varepsilon_{FT,1}$ is the shock to the France Télécom stock return and $\varepsilon_{L,1}$ is a mean-zero idiosyncratic labor income shock. The covariation between labor income and stock returns is strictly increasing in the parameter ρ . Labor income in period 3 continues to be subject to shocks to the France Télécom stock:

$$L_3 = L_2(1 + \rho \cdot \varepsilon_{FT,2})$$

For simplicity, we set the idiosyncratic labor income shock in period three to zero. To prevent our investor from simply hedging the positions in the illiquid assets at $t=2$, we assume that short sales of both risky and riskless assets are prohibited.⁴⁷ All three sources of risk - $\varepsilon_{FT,t}$, ε_t and $\varepsilon_{L,t}$ - are mutually independent.

The preferences of our investor are described by a constant-relative-risk-aversion utility function, a formulation that is common in the neoclassical portfolio selection literature, and we assume the standard Von Neumann-Morgenstern time-separability conditions. Thus the investor's objective function is to maximize utility of consumption over the three periods, which is given by⁴⁸

$$U(c_1, c_2, c_3) = u(c_1) + \delta u(c_2) + \delta^2 u(c_3)$$

and

$$u(c_t) = \frac{c_t^{1-\gamma}}{1-\gamma}$$

where δ represents the time discount factor, and γ is the coefficient of relative risk aversion.

In order to solve the model, we assume that each of the three sources of risk – the France Télécom shock, the shock to the unrelated asset and the labor income shock – can take on only one of two values in each period. We represent the underlying uncertainty in the form of a binomial tree and solve the model numerically by backward induction.

⁴⁷ Were employees able to sell stock short, they would have immediately purchased infinite amounts of the discounted asset, shorted them and earned arbitrage profits by “monetizing” the discount.

⁴⁸ Because we are trying to model the tradeoff between liquidity and return, we cannot assume that the investor is maximizing over final wealth, since in that case the portfolio weight on the liquid, low return asset would be zero.

The standard calibration of the model uses the following parameter values: Initial wealth equals FF 200,000 and initial labor income equals FF 180,000 p.a. The relative risk aversion (RRA) parameter is set to 5 and varied between 2 and 20. This range is arbitrary, but relates to previous empirical work⁴⁹. The individual time preference rate is equal to the risk-free interest rate at 5%. The risk parameters in the baseline calibration are a 30% annual volatility for the France Télécom stock return, a 25% volatility for the unrelated risky asset and a 5% volatility for the independent labor income shock. The outside risky asset has a more attractive Sharpe-ratio than the France Télécom stock, capturing the idea that holding (for example) an indexed fund offers in general a more favorable risk-return tradeoff than holding a single stock. The parameter controlling the covariation between stock returns and labor income, ρ , is set to 0.1

⁴⁹ See footnote 20 for a discussion of the relevant literature.

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Payoff to Abondix and Multiplx (FF 9,000 Personal Contribution)

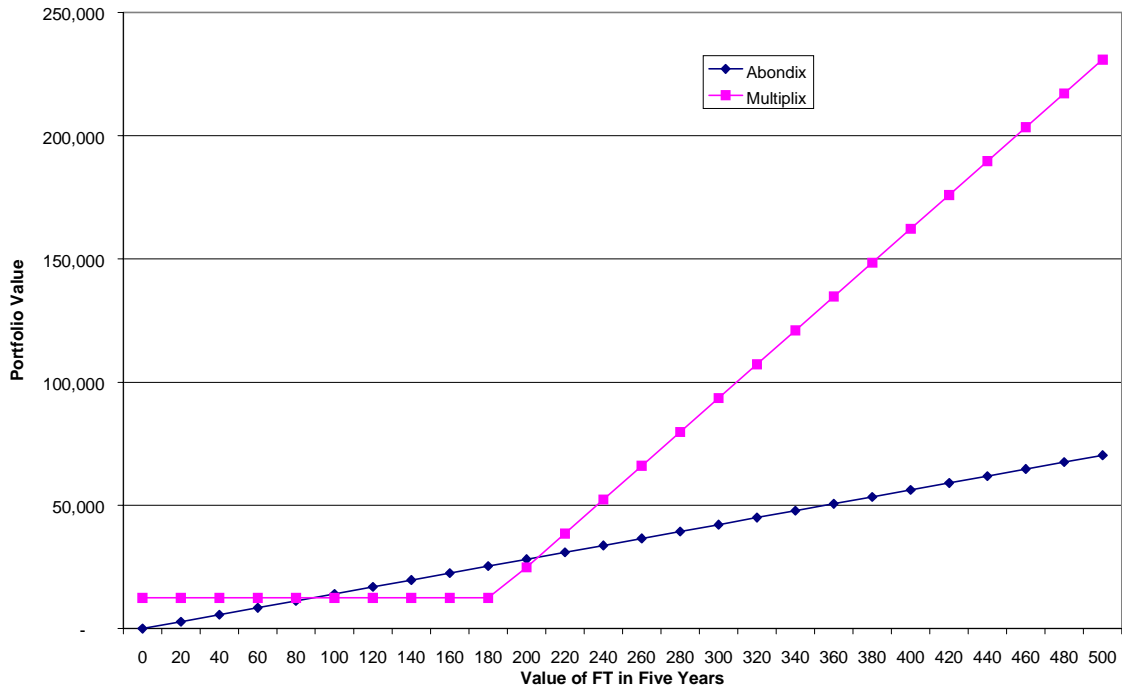
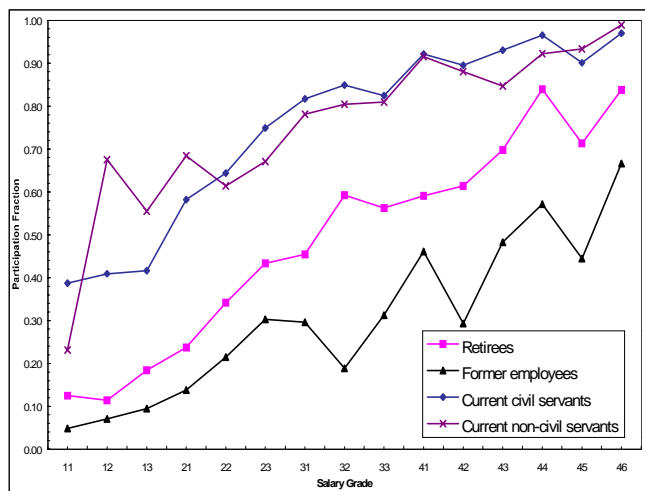
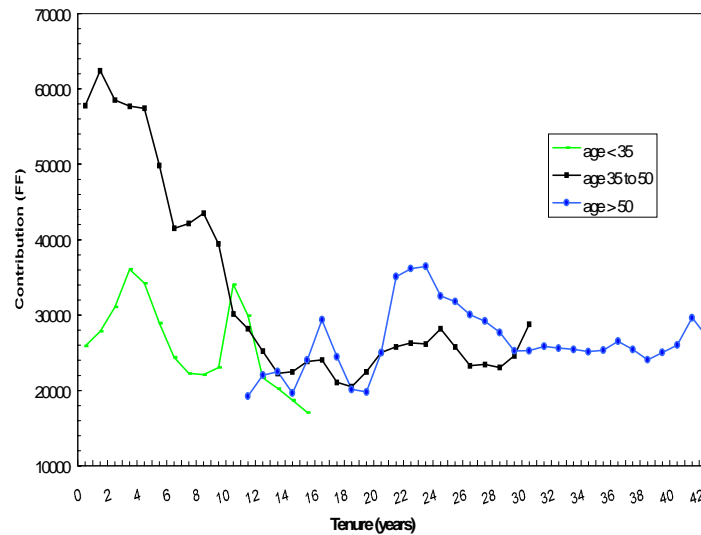


Figure 1: Payoff of *Multiplx* vs. *Abondix* for the maximum allowed *Multiplx* investment amount

Final portfolio value after five years of an initial FF 9,000 investment in either *Abondix* or *Multiplx*, including all bonuses and free shares, assuming that the dividend plus tax credit yield on France Télécom is 3.6%.



Panel A

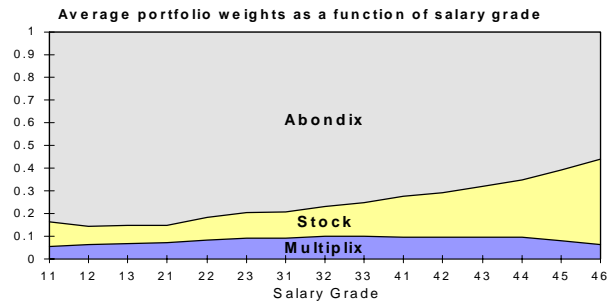


Panel B

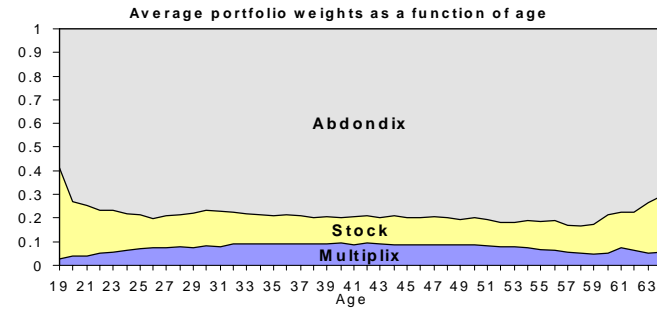
Figure 2: Employee participation and contributions

Panel A plots participation rate against salary grade, for the different classes of eligible current or former France Télécom workers. **Panel B** plots the amount of requested employee investment, as a function of age and tenure.

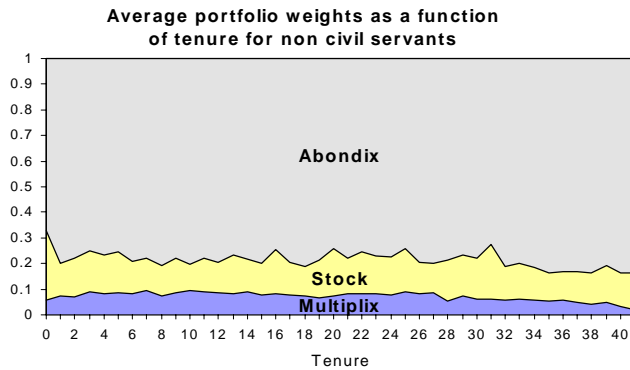
Panel A



Panel B



Panel C



Panel D

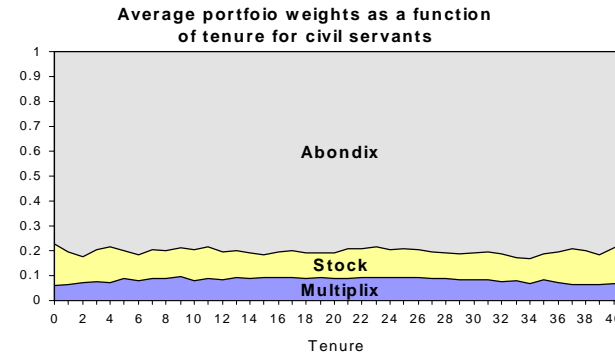


Figure 3: Average observed portfolio allocations as a function of employee characteristics

Averages of the portfolio weights chosen by current employees as a function of salary grade, age, tenure of non-civil servants and tenure of civil servants respectively. *Simplix* and *Disponix* have been aggregated into a single measure labeled stock to facilitate comparison with the model predictions.

Table I
Description of the France Télécom Privatization Offerings to Employees

This table summarizes the characteristics of the four share programs offered to France Télécom employees during its privatization ^a

Program	Discount	Matching Bonus	Free Shares ^b	Tax Treatment	Required Holding Period	Payment Options	Guarantees	Limits
<i>Abondix</i>	20% off of offer price	<ul style="list-style-type: none"> ▶ 100% for first FF 3000 ▶ 50% for next FF 6000 ▶ 25% for next FF 66000 	<ul style="list-style-type: none"> ▶ One for each share purchased up to FF 3000 ▶ One for each four shares purchased for the next FF 3860 	Tax free ^c	5 years	<ul style="list-style-type: none"> ▶ In cash ▶ In three payments over two years ^d ▶ In 36 monthly payments ^e ▶ Through transfer from company pension plan ^f 	None	PEG limits ^g
<i>Multiplix</i> ^h	20% off of offer price	<ul style="list-style-type: none"> ▶ 50% for first FF 2000 ▶ Plus 9 x (personal contribution and bonus) as a guaranteed bank loan. ▶ The investor forgoes dividends and tax credit 	None	Tax free ^c	5 years	<ul style="list-style-type: none"> ▶ In cash ▶ In three payments over two years ^d ▶ In 36 monthly payments ^e 	<ul style="list-style-type: none"> ▶ 25 % return over five years on personal contribution ▶ guaranteed repayment of the bank loan 	<ul style="list-style-type: none"> ▶ PEG limits ^g ▶ Personal contribution less than FF 9000
<i>Simplix</i>	20% off of offer price	None	<ul style="list-style-type: none"> ▶ One for each bought share up to FF 3000 ▶ One for each four shares purchased for the next FF 3860 	Taxable	2 years/ 3 years for free shares	<ul style="list-style-type: none"> ▶ In cash ▶ In three payments over two years ▶ In 36 monthly payments ^e 	None	5 times the annual Social Security limit (FF 823,200 in 1997)
<i>Disponix</i>	none	None	<ul style="list-style-type: none"> ▶ One for each three shares bought up to FF 6860 	Taxable ⁱ	none/ 1 year for free shares	In cash only	None	5 times the annual Social Security limit)

a. Eligibility: Eligible for all programs are (i) the personnel of France Télécom or of French subsidiaries of which France Télécom owns more than 50% of capital. To be eligible for access to the group savings plan PEG (*Multiplix+Abondix*) requires furthermore at least three month seniority at the time of subscription. Only current employees can purchase *Multiplix* and *Abondix*. Employees with bad credit history are not eligible for participation in *Multiplix*.

b. The free shares have a global limit of FF 6,860 for all share programs combined. Free share payments will be made to *Disponix* first, then *Simplix*, and last, *Abondix*. The maximum request for shares cannot exceed 5 times the Social Security limit, or FF 823,200 for 1997.

c. Since the shares are held by the group savings plan (PEG), the bonus, capital gains and paid dividends are tax free. Social security contributions (CSG/CRDS) are applicable.

d. The three payments of 30% at delivery, 30% after one year and 40% after two years are interest free.

e. The 36 monthly payments are interest free.

f. Payments made through transfers from the pension plan carry no bonus.

g. The total annual investment in the group savings plan (PEG) cannot be larger than one quarter of the annual salary of the employee. Furthermore, the total bonus paid into PEG cannot exceed FF 22,500, whereby the *Abondix* bonus is allocated before the *Multiplix* bonus.

h. In order to participate in *Multiplix*, the employee must have bought at least one share in one of the other programs.

i. Under the French tax regime, the first FF 8,000 of dividends for individuals, and the first FF 16,000 for couples are tax free. Above this, dividends are taxed at regular income rates, which would range from 28% to 37% for the bulk of France Télécom employees. Capital gains are taxed at a 20.9% rate.

Table II

Predictions from a simple model of portfolio selection

This table presents the predictions from the model of portfolio selection described in the **Appendix**. **Panel A** shows the comparative statics for the level of personal investment as a function of relative risk aversion, labor income, financial wealth, and idiosyncratic risk. **Panel B** shows the statics for the choice between France Télécom assets as a function of the same parameters.

Panel A: Comparative statics for the level of personal investment

Increasing relative risk aversion (RRA) lowers the amount of personal investment.	The predicted contribution falls from FF 59,800 for RRA=1 to FF 2,700 for RRA=20.
Increasing the correlation between labor income (human capital) and the stock decreases the personal investment.	The predicted contribution falls from FF 42,800 for no correlation ($\rho=0$) to FF 2,100 for strongly positive correlation ($\rho=0.3$).
Increasing labor income (human capital) increases the amount of personal investment.	The predicted personal contribution rises less than proportionally from FF 13,600 for no labor income to FF 45,800 for an annual labor income of FF 2,000,000. The effect is not monotonic.
Increasing initial financial wealth increases the amount of personal investment.	The increase is less than proportional due to the income-linked constraints on investment into the long-lived assets.
Increasing the idiosyncratic risk in labor income has an ambiguous effect on personal investment.	The net effect of increasing precautionary savings and decreasing risk taking is positive for low levels of risk aversion (RRA=5) and negative for high levels of risk aversion (RRA=12).

Panel B: Comparative statics for the choice among France Télécom assets

Increasing relative risk aversion (RRA) shifts the portfolio from short-lived France Télécom assets first to <i>Abondix</i> and then to <i>Multiplex</i> .	The portfolio is 87% in short-lived France Télécom assets for RRA=1, 100% in <i>Abondix</i> for RRA=5 and 100% in <i>Multiplex</i> for RRA \geq 16.
Increasing the correlation between labor income (human capital) and the stock shifts the portfolio from short-lived France Télécom assets first to <i>Abondix</i> and then to <i>Multiplex</i> .	The portfolio is 29% in short-lived France Télécom assets and 71% in <i>Abondix</i> for no correlation ($\rho=0$), 100% in <i>Abondix</i> for $\rho=0.1$ and 100% in <i>Multiplex</i> for strongly positive correlation ($\rho\geq 0.3$).
Increasing labor income (human capital) shifts the portfolio from short-lived France Télécom assets first to <i>Abondix</i> and then to <i>Multiplex</i> .	The income based constraint does not allow much investment into the long-lived assets for low levels of labor income. As labor income increases, the constraint is relaxed, but the increased exposure of total wealth to France Télécom shifts the demand towards the downside protected <i>Multiplex</i> . For high labor income, the <i>Multiplex</i> demand is constraint by the FF 9,000 limit.
Increasing initial financial wealth decreases the portfolio share invested into the two long-lived assets.	The income-linked constraint on the investment into the long-lived assets becomes binding as financial wealth is increased.
Increasing the idiosyncratic risk in labor income tends to shift the portfolio from <i>Abondix</i> to <i>Multiplex</i> for workers with high RRA.	The effect is restricted to workers with high RRA. For employees with RRA=12, increasing idiosyncratic labor income risk from 0 to 20% shifts the portfolio from 50% in <i>Abondix</i> and 50% in <i>Multiplex</i> to 100% in <i>Multiplex</i> .

Table III
Descriptive statistics on characteristics of individuals eligible to participate in France Télécom employee share offerings

This table below show information about the 205076 employees eligible to participate in the France Télécom employee offering scheme in 1997. **Panel A** reports age and job tenure (date of employment through time of offer.) **Panel B** shows the breakdown by type of participant, job category, and gender. **Panel C** presents the sample by salary grade. Salary grade code 11 is the lowest and 46 is the highest salary level. Salary grade codes below are for employees at majority owned subsidiaries of France Télécom. Salary grades 11 to 23 indicate ordinary employees and technicians. In this group the average monthly salary in 1997 was FF 12,562 for men and FF 11,928 for women. 31 to 33 are middle managers, with an average salary of FF 17,104 for men and FF 16,059 for women. Finally, 41 to 47 are managers, with an average monthly salary of FF 25,445 for men and FF 22,548 for women. CD stands for cadre dirigeant (executive) while OE, AM and CA refer to employees at subsidiaries and stand for clerical/technical employee, foremen and manager respectively.

Panel A

	Age (years)	Job tenure (years)
Mean	44.5	19.9
Standard Deviation	10.4	10.5
Number of observations	200,216	200,606

Panel B

Type of employee	Number	Job category	Number	Sex	Number
Current employee	174091	Civil servant	143781	Male	124444
Former employee, not retired	8628	Non civil servant	38010	Female	80146
Retiree	22357				
Total	205076	Total	181791	Total	204590

Panel C

Salary Level	Number	Salary Level	Number
11	1102	42	6981
12	3066	43	3200
13	17313	44	1378
21	41514	45	650
22	52000	46	161
23	24212	CD	130
31	4128	OE	9207
32	6559	AM	2664
33	12167	IN	2650
41	4651	CA	7189
		Total	200925

Table IV
Offering Participation Statistics

Participation ratios and total number of eligible employees for each class of employee: current, former, retired, civil servant and non-civil servant.

	All potential investors	Current employees	Currently employed civil servants	Currently employed non-civil servants	Retired	Former employees (not retired)
Participation ratio	62.8%	68.0%	66.5%	73.5%	37.8%	21.6%
Total number of individuals	205,076	174,091	135,891	38,200	22,357	8,628

Table V
Probit analysis of participation in France Télécom
employee share offering program

The dependent variable is a dummy variable that equals one if the employee requested any shares under any of the four programs. The independent variables are log tenure, age, age squared, claimant category, salary grade and job category (not reported). The claimant category dummies are to be interpreted relative to current employees and the salary grade dummies relative to salary level 11, the lowest.

	Coefficient	p-value	Coefficient	p-value
Constant	-0.6062	0.0000	-0.6618	0.0000
Log Tenure				
current civil servants	-0.0484	0.0000	-0.0170	0.0739
current non-civil servants	-0.1576	0.0000	-0.0310	0.0017
former employees	0.2319	0.0000	0.2417	0.0000
Age	-0.0103	0.0000	-0.0068	0.0000
Age squared	0.0000	0.4166	-0.0001	0.0161
Civil servant dummy	-0.0484	0.1102	-0.1416	0.0000
Female dummy	0.1622	0.0000	0.1489	0.0000
Retiree dummy	-1.3061	0.0000	-1.3292	0.0000
Former employee dummy	-2.0147	0.0000	-2.1618	0.0000
Wealth measure [(age-18)*salary]				
current employees	0.0043	0.0007		
retirees	0.0018	0.2615		
former employees	-0.0030	0.2133		
INSEE wealth measure	0.0044	0.0013	0.0038	0.0020
Salary levels				
11 (lowest)	*		*	
12	0.2793	0.0000	0.6169	0.0000
13	0.4361	0.0000	0.6525	0.0000
21	0.7564	0.0000	0.9776	0.0000
22	0.9305	0.0000	1.1424	0.0000
23	1.2699	0.0000	1.4781	0.0000
31	1.3941	0.0000	1.6512	0.0000
32	1.5356	0.0000	1.7919	0.0000
33	1.4779	0.0000	1.7288	0.0000
41	1.8115	0.0000	2.1548	0.0000
42	1.6576	0.0000	1.9341	0.0000
43	1.8514	0.0000	2.0727	0.0000
44	2.2084	0.0000	2.4705	0.0000
45	1.9041	0.0000	2.1713	0.0000
46 (highest)	2.5012	0.0000	2.7575	0.0000
AM*			1.4063	0.0000
CA			1.7469	0.0000
IN			2.1224	0.0000
OE			0.8105	0.0000
N	151943		167229	

* The lettered salary grade codes are for employees at majority owned subsidiaries of France Télécom.

Table VI
Average Personal Contributions

Average personal contributions in French Francs of each employee class, and the personal contribution as a fraction of monthly salary. This table considers only employees who chose to participate in the offering, thus represents personal contributions conditional on some contribution. The ratios for retirees and not-retired former employees are calculated on the basis of their last salary at France Télécom.

	All potential investors	Current employees	Currently employed civil servants	Currently employed non-civil servants	Retired	Former employees (not retired)
Personal contribution	26,491	26,305	22,594	40,311	25,038	44,571
Personal contribution / monthly salary	159%	157%	147%	199%	165%	230%

	Ordinary employees and technicians (Grades 11-23)	Middle Managers (Grades 31-33)	Managers (Grades 41-47)
Personal contribution / monthly salary	130%	162%	247%

Table VII
Contrasting the observed investment behavior with the predictions from the portfolio selection model

The table below shows the investment behavior of current employees and selective predictions from the three-period model. In **Panel A**, we distinguish between three salary levels: Low salary corresponds to ordinary employees and technicians with average salary of FF 12,250, medium salary to middle managers with average salary of FF 16,500 and high salary to managers with average salary of FF 24,000. Employees with high wealth are identified as the top 5% quintile of the INSEE wealth measure, employees with low wealth as the bottom 5% quintile of the INSEE wealth measure. In **Panel B**, the salary levels are set equal to the actual France Télécom salary grades used in **Panel A**. Low initial financial wealth is set to FF 200,000, medium wealth to FF 300,000 and high financial wealth to FF 600,000. Relative risk aversion is set to either 2 or 5, and the parameter of covariation (ρ) between labor income and stock returns to either 0 or 0.1. All other parameters are set equal to the standard calibration described in the **Appendix**.

Panel A: Investment behavior of current employees

	All current employees	Civil servants	Non civil servants
full sample			
Personal investment	FF 26,305	FF 22,594	FF 40,311
Average holding period	4.6years	4.6 years	4.5years
Downside protected share	8.3%	8.6%	7.0%
low wealth, low salary			
Personal investment	FF 13,524	FF 12,563	FF 20,109
Average holding period	4.8 years	4.8 years	4.7 years
Downside protected share	7.6%	7.9%	5.5%
low wealth, high salary			
Personal investment	FF 58,486	FF 57,597	FF 61,64
Average holding period	4.4 years	4.5 years	4.3 years
Downside protected share	9.0%	9.3%	7.7%
high wealth, low salary			
Personal investment	FF 16,457	FF 16,345	FF 17,118
Average holding period	4.8 years	4.8 years	4.6 years
Downside protected share	6.3%	6.55%	5.15%
high wealth, high salary			
Personal investment	FF 89,518	FF 91,170	FF 87,521
Average holding period	4.31 years	4.33 years	4.29 years
Downside protected share	7.94%	8.12%	7.72%

Panel B: Predicted investment behavior

	RRA=5, $\rho=0$	RRA=5, $\rho=0.1$	RRA=2, $\rho=0.1$
medium wealth, medium salary			
Personal investment	FF 26,615	FF 19,273	FF 49,903
Average holding period	3.90 years	5.00 years	2.51 years
Downside protected share	3.45%	4.76%	2.22%
low wealth, low salary			
Personal investment	FF 22,868	FF 12,313	FF 57,666
Average holding period	3.15 years	5.00 years	3.15 years
Downside protected share	7.69%	14.29%	0.00%
low wealth, high salary			
Personal investment	FF 27,533	FF 12,390	FF 40,152
Average holding period	4.20 years	5.00 years	3.86 years
Downside protected share	10.00%	33.33%	4.76%
high wealth, low salary			
Personal investment	FF 35,487	FF 22,944	FF 75,811
Average holding period	2.5 years	3.40 years	1.47 years
Downside protected share	0.00%	0.00%	0.00%
high wealth, high salary			
Personal investment	FF 38,883	FF 22,925	FF 67,570
Average holding period	2.79 years	5.00 years	1.63 years
Downside protected share	3.45%	7.69%	1.75%

Table VIII
Truncated regression and Tobit analysis of personal contribution levels

The dependent variable is the log of total employee contribution. The independent variables are log tenure, age, age squared, claimant category, salary grade and job category (not reported). The claimant category dummies are to be interpreted relative to current employees and the salary grade dummies relative to salary level 11, the lowest. The first column shows the results using the truncated regression model (Greene 1993), while the second column shows the results of a standard Tobit .

	Truncated regression		Tobit regression model	
	Coefficient	p-value	Coefficient	p-value
Constant	8.7416	0.0000	-1.7905	0.0000
Log Tenure				
current civil servants	-0.0654	0.0000	-0.0719	0.0922
current non-civil servants	-0.0608	0.0000	-0.1495	0.0004
former employees	-0.0936	0.0071	1.6916	0.0000
Age	0.0090	0.0000	-0.0268	0.0000
Age squared	-0.0001	0.0301	-0.0004	0.0333
Civil servant dummy	0.0633	0.0013	-0.4828	0.0000
Female dummy	-0.1795	0.0000	0.5265	0.0000
Retiree dummy	0.1446	0.2419	-8.5946	0.0000
Former employee dummy	0.1661	0.0807	-13.1820	0.0000
INSEE wealth measure	0.0180	0.0000	0.0296	0.0000
Salary levels				
11 (lowest)	*		*	
12	0.0941	0.1479	3.6865	0.0000
13	0.2276	0.0002	3.7353	0.0000
21	0.3151	0.0000	5.8340	0.0000
22	0.4859	0.0000	6.7672	0.0000
23	0.6243	0.0000	8.4187	0.0000
31	0.6175	0.0000	9.0306	0.0000
32	0.7640	0.0000	9.6151	0.0000
33	0.9217	0.0000	9.6140	0.0000
41	1.1289	0.0000	10.7452	0.0000
42	1.3967	0.0000	10.5509	0.0000
43	1.6815	0.0000	11.2656	0.0000
44	1.9549	0.0000	12.4027	0.0000
45	2.1855	0.0000	12.2274	0.0000
46 (highest)	2.5225	0.0000	13.8525	0.0000
AM*	0.8157	0.0000	8.3605	0.0000
CA	1.4463	0.0000	10.1470	0.0000
IN	0.8403	0.0000	10.1455	0.0000
OE	0.5126	0.0000	5.3309	0.0000
N	167229		167229	

* The lettered salary grade codes are for employees at majority owned subsidiaries of France Télécom.

Table IX
Choice of Assets and Asset Combinations

Panel A reports the participation percentages for each type of the four assets broken down by employee type. The Transfer class corresponds to the purchase of *Abondix* using the employee's existing pension plan assets. Retirees and former employees were not allowed to purchase *Abondix* or *Multiplix*. These percentages need not add up to one as employees could participate in multiple share schemes. **Panel B** reports the fraction of each class of employee that purchased each combination of assets, focusing on the most popular asset combinations.

Panel A

	All potential investors	Current employees	Currently employed civil servants	Currently employed non-civil servants	Retired	Former employees (not retired)
<i>Abondix</i>	90.5%	97.2%	98.2%	93.7%	n/a	n/a
Transfer (<i>Abondix</i>)	10.9%	10.9%	11.2%	9.7%	n/a	n/a
<i>Multiplix</i>	40.9%	44.4%	45.6%	40.0%	n/a	n/a
<i>Disponix</i>	11.5%	11.0%	10.9%	11.1%	16.7%	22.2%
<i>Simplix</i>	21.8%	16.3%	15.3%	20.4%	92.8%	94.5%

Panel B

	Current employees	Currently employed civil servants	Currently employed non-civil servants	Retired	Former employees (not retired)
<i>Abondix</i>	40.8%	40.7%	41.1%	n/a	n/a
<i>Abondix-Multiplix</i>	29.0%	29.8%	25.9%	n/a	n/a
<i>Abondix-Transfer</i>	4.2%	4.2%	4.0%	n/a	n/a
<i>Abondix-Simplix</i>	3.4%	3.2%	4.2%	n/a	n/a
<i>Abondix-Transfer-Multiplix</i>	3.2%	3.5%	2.4%	n/a	n/a
<i>Abondix-Multiplix-Disponix-Simplix</i>	2.3%	2.3%	2.4%	n/a	n/a
<i>Abondix-Disponix</i>	2.2%	2.2%	2.2%	n/a	n/a
<i>Simplix</i>	1.5%	0.8%	4.1%	82.9%	77.8%
<i>Disponix</i>	0.4%	0.4%	0.6%	5.6%	5.5%
<i>Disponix-Simplix</i>	0.3%	0.2%	0.8%	11.5%	16.7%

Table X
Holding Period and Downside Protection Measures as a Function of
Employee Characteristics

Two-sided censored Tobit regressions for holding period and downside protection as a function of employee characteristics. The dependent variable in the first column is the average contribution-weighted *ex ante* holding period, in years. The dependent variable in the second column is the fraction of the employee's personal contribution invested in *Multiplix* (protected by puts). This analysis is conducted only for employees who chose to contribute and is limited to current employees (as former employees and retirees were not eligible for long-term plans, including *Multiplix*). The independent variables are log tenure, age, age squared, claimant category, the INSEE wealth measure, salary grade, and job category (not reported). The claimant category dummies are to be interpreted relative to current employees and the salary grade dummies relative to salary level 11, the lowest

	Holding period		Downside protection	
	Coefficient	p-value	Coefficient	p-value
Constant	5.4418	0.0001	0.3034	0.0001
Log Tenure				
current civil servants	0.1440	0.0001	0.0092	0.0001
current non-civil servants	0.1150	0.0001	0.0105	0.0001
Age	-0.0003	0.8485	-0.0003	0.0983
Age squared	0.0004	0.0013	0.0000	0.0001
Civil servant dummy	0.3200	0.2334	-0.0808	0.0299
Female dummy	0.3642	0.0001	0.0013	0.4254
INSEE wealth measure	-0.0216	0.0001	-0.0021	0.0001
Salary levels				
11 (lowest)	*		*	
12	1.8574	0.0001	0.1186	0.0001
13	1.3939	0.0001	0.0929	0.0001
21	1.3498	0.0001	0.0869	0.0001
22	1.0028	0.0001	0.0865	0.0001
23	0.9135	0.0001	0.0852	0.0001
31	0.8467	0.0001	0.0824	0.0001
32	0.6639	0.0001	0.0777	0.0001
33	0.4479	0.0019	0.0721	0.0001
41	0.3685	0.0120	0.0635	0.0001
42	0.0892	0.5327	0.0592	0.0001
43	-0.1670	0.2540	0.0406	0.0088
44	-0.3685	0.0174	0.0195	0.2229
45	-0.6914	0.0001	-0.0123	0.4861
46 (highest)	-1.0176	0.0001	-0.0443	0.0709
AM*	1.2447	0.0001	0.0822	0.0001
CA	0.3810	0.0076	0.0528	0.0005
IN	0.7851	0.0001	0.1019	0.0001
OE	1.3901	0.0001	0.0961	0.0001
N	102258		105302	

* The lettered salary grade codes are for employees at majority owned subsidiaries of France Télécom.